Diabetes in Pregnancy:
A Model of Care for Ireland

National Clinical Programme for Diabetes
Clinical Design & Innovation, HSE

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In 2022, we invited women who had experienced a pregnancy affected by diabetes to complete a questionnaire on their experiences of care. Women were invited to answer three questions – what was good? What could be improved? And what do you think is important? Quotes from this study are interspersed throughout this document to illustrate some of the important issues in diabetes in pregnancy care in Ireland.

On use of language: while we recognise that most people who are pregnant identify as female, it is important to acknowledge that some females do not identify with that term and transgender men may experience pregnancy. Therefore, the terms “women with diabetes” or “pregnant people with diabetes” or “people with diabetes” are used throughout this document to convey respect to the variety of life and peoples wishes. Within this guidance we use the terms ‘woman’ and ‘women’s health’. However, it is important to acknowledge that people who do not identify as cis-gender women are excluded from this descriptor, including people who identify as transgender, gender diverse and gender non-binary (1). We also appreciate that there are risks to de-sexing language when describing female reproduction (2, 3). Services and delivery of care must be appropriate, inclusive and sensitive to the needs of people whose gender identity does not align with the sex they were assigned at birth. This includes training and education regarding diverse pathways to pregnancy and the use of practices which affirm the sexual and gender identities of all people using Obstetrics and Gynaecology services.

Language use is key to effectively communicate options, recommendations, and respectfully accept a woman’s fully informed decision (4). With this in mind, the use of birth is preferable to the term delivery in all circumstances and is used consistently where possible throughout the guidelines. It is acknowledged that in some circumstances (e.g., in the case of a medically indicated intervention or surgery) and in some contexts, substituting with the term delivery is considered appropriate and this term may be used instead.

CDI Clinical Practice Guidance Document Cover Sheet

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Contents

Diabetes in Pregnancy Model of Care Working Group Members

This model of care was written by a group comprising experts by experience (women who had experienced diabetes in pregnancy) and experts by knowledge (members of the clinical multidisciplinary team). The importance of person centred individualised care and the multidisciplinary team will be a constant theme throughout this document.

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"Excellent MDT (multidisciplinary) approach. General care by the nurses (and midwives). Care was always coherent, systematic in approach and extremely well followed up".

"The care I received in (hospital name redacted) was fantastic. I was so closely monitored and the second time round was better as I think the pandemic meant thinking outside of the box and most of my (diabetes) care could be done remotely, which meant less of a travel burden. The MDT was amazing, particularly the diabetes midwife and the dietitian".

"The only thing I want to say is that I felt huge stigma about having GD (gestational diabetes) but going into (name redacted) clinic felt like my safe space where I was never judged and my baby and I were so well cared for. Thank you for all that you do and for making me feel that way."

"Ultimately put the individual patient in the centre.....explain the pathways and science, what the results mean".

Foreword

Diabetes in Pregnancy (DIP) is the most common metabolic condition encountered and the prevalence and number of women affected continues to increase. The **types and complexity** of DIP cases also continue to change with advances in diagnostic and therapeutic interventions in medicine. In addition to type 1 diabetes (T1DM), type 2 diabetes (T2DM) and gestational diabetes (GDM), we now encounter many cases of diabetes related to cystic fibrosis (CF), post-transplant diabetes and diabetes secondary to treatment such as steroids, immune-suppressant agents and disease modifying agents. Finally **advances in genomics**, allows us to identify many types of monogenic diabetes (MODY). The **skillset of healthcare professionals** caring for this unique population also continues to change with the introduction and advancement of continuous glucose monitoring (CGM) and its interpretation, introduction of pumps and now closed loop systems, intelligent insulin pen delivery devices and novel third generation analogue insulins.

The **impact** of DIP for both mother and baby can be far reaching, and we now understand the trans-generational nature of intra uterine exposure to hyperglycaemia. We now understand that children born to mothers with diabetes have an increased lifetime risk of diabetes and obesity and are also subject to neurocognitive dysfunction. Mothers with established pre-gestational diabetes may experience worsening of diabetes-related complications (retinopathy and nephropathy) because of pregnancy and those with GDM have an increased lifetime risk of T2DM and cardiovascular disease. Because of this complexity of diabetes in pregnancy, its impact on perinatal outcomes and the long-term effects for both mother and offspring, it is essential that every effort is made to achieve optimum obstetric outcomes and prevent long-term disease.

The development of this **Model of Care (MoC)** for pre-gestational diabetes (PGDM) and GDM is designed to support **standardisation of care** irrespective of geographical location and encourage best clinical practice. It is designed to assist all clinicians and health care providers caring for women with DIP in their decision-making process and help to standardise delivery of care at primary, secondary and tertiary levels. This MoC is based upon up-to-date scientific evidence and expert consensus and has considered Slaintecare and the National Maternity Strategy documents. As well as guidance to the clinical community this document provides strategic and policy direction for the future of Diabetes in Pregnancy Care in Ireland. There has been **multi professional** input and a **strong patient voice** in developing this MoC and members are listed on page 5. This MoC sets out a significant programme of change to systematically improve the quality of care received by women who experience diabetes in pregnancy and with adequate resourcing, should be fully rolled out in the coming years. The next step will be to support the development of an implementation plan. We would like to thank all of those who have provided their support and assistance in the development of this model. A special thanks to the outstanding programme managers (Dervla Kennedy and Cliodhna O'Mahony) and National Leads in Diabetes (Professors Sean Dinneen and Derek O'Keeffe). We wish to express sincere gratitude to the Working Group members, as most of this work was performed on an honorary basis and in addition to their usual work commitments.

Professor Fidelma Dunne
Consultant Endocrinologist

Professor Mary Higgins
Consultant Obstetrician

Executive Summary

The potential adverse effects of Diabetes in Pregnancy (DIP) are a real risk and concern among all teams managing this high-risk patient group. For the most part services addressing pre-gestational diabetes (PGDM) and gestational diabetes (GDM) have not changed significantly in response to the dramatic increase to the growing numbers of patients, complexity of disease and advances in treatments and technologies. The multidisciplinary teams involved in the care of women with diabetes recommend intensive glucose management treatments as per international guidelines and standards but need the support of adequately resourced multidisciplinary teams, as set out in this MoC, to deliver high quality evidence-based services.

This MoC was guided by the Sláintecare Report and the Sláintecare Action Plan and encompasses the principles set out by Sláintecare as key considerations when service planning or designing models of care – population health perspective, person-based care, health and wellbeing, equity, co-ordination of care, self-care and self-management, top of licence practice and teamwork, supported by technology and quality and safety.

This MoC aligns closely with both the HSE's Model of Integrated Care for Type 2 Diabetes and the Integrated Model of Care for the Prevention and Management of Chronic Disease, with care provided across five levels of service from Level O (Living well at home) through to Level 4 (Specialist Hospital Maternity Care).

It is envisioned within this new MOC that all women/pregnant people with diabetes in pregnancy receive the right care, at the right time, by the right team and in the right place, from pre-pregnancy to postpartum care, in order to optimise maternal and neonatal outcomes.

DIP has a higher risk of complications for both mother/person and baby and as such women with DIP should not be cared for in the supported care pathway (Appendix 1 Care pathways). Women/pregnant people with PGDM, which includes T1DM, T2DM, cystic fibrosis-related, mature onset diabetes of the young (MODY), transplant-related or latent autoimmune diabetes in adults (LADA) and with GDM should receive care in line with the specialised care pathway.

Care should be provided using a "Hub and Spoke" model with larger tertiary level units being "Hubs" supporting smaller units as "Spokes" – in this document this is described based on the Hospital Groups system, though this may change when HSE Health Regions are introduced.

People with DIP should have full access to the multidisciplinary team (MDT), tailored to their individual needs, and irrespective of their geographical location. However, for women/pregnant people with more complex medical needs tertiary level care may be more appropriate.

The MDT includes the woman/person at the centre of care, with specialist clinical care from midwifery (including clinical specialist and advanced practitioners as well as general midwifery), endocrinology, obstetrics, dietitian (senior or clinical specialist), general practitioner, medical scientists and administrator as the "core" MDT, with input from perinatal mental health, ophthalmology and nephrology (especially for PGDM), social work, lactation consultant, sonographer/ultra-sonographer, physiotherapist, pharmacist and health and social care practitioner depending on the needs of the person.

Diabetes is one of the most common metabolic conditions to complicate pregnancy and women with PGDM have an increased risk of serious adverse pregnancy outcomes. Pre-pregnancy care (PPC) is the targeted support and additional clinical care offered to women planning pregnancy with established diabetes. There is convincing evidence that PPC is both clinically effective and cost effective in improving pregnancy outcomes for women with PGDM and should be offered to all people with PGDM considering pregnancy. Two levels of PPC should be provided: Pre-pregnancy awareness and specialised PPC clinics.

Women living with diabetes have multiple contacts with healthcare professionals throughout their lives as part of their routine care, including GPs, practice nurses and specialist community and hospital diabetes teams. All these healthcare professionals have a role to play in pre-pregnancy awareness for women with PGDM. In line with the principles of 'Making Every Contact Count' (Appendix 2), every routine consultation with women with PGDM should be used to raise awareness of the importance of pre-pregnancy planning. Simple key messages for these women should be consistent: If you have diabetes and would like to get pregnant, engage with your diabetes team to prepare for the pregnancy in advance. If you are not trying to get pregnant, ideally you should be using some form of contraception. Specialised PPC clinics are delivered by specialist hospital diabetes multidisciplinary teams. All hospital groups should offer PPC clinics as part of this care. To use resources efficiently, specialised PPC clinics could be organised on a regional basis or across an entire hospital group. They may be delivered in the hospital OPD setting or an outreach service could be set-up in the specialist ambulatory care hubs in the community, delivering care closer to the woman's home.

This MoC sets out the recommended Care Pathways for women/pregnant people with Pre Gestational Diabetes Mellitus and Gestational Diabetes Mellitus in detail. Important recommendations to highlight include the following:

- For people with PGDM, once pregnancy is confirmed, the person enters the specialised care pathway for high-risk pregnancy. Details of the PGDM specialised care pathway is provided on page 45.
- Universal screening for GDM should be implemented. This can use a one-step (alone) or two step (GCT and if positive then OGTT) model.
- A post-partum pathway of care and routine assessment for Type 2 Diabetes must be implemented. Women who receive a diagnosis of GDM during pregnancy are at higher risk of developing T2DM and CVD in later life and therefore should be followed up on a regular basis to manage these risks. Such women who have delivered their baby since 2023 are eligible for enrolment in the Prevention Programme in GP.
- As part of the implementation of this model of care there should be a significant investment to increase resources and staffing levels for Diabetes in Pregnancy services.
- It is recommended that all clinical staff providing DIP care should be educated in use of Diabetes technology to a level commensurate to their requirements to provide care. That is, an endocrinologist and AMP/CMS/CNS will require more detailed knowledge of technology than a midwife on a labour ward, but all should be aware of complication management and safety netting principles, including when to call for more advanced care. There is increased use of technology in DIP management, including continuous glucose monitoring (CGM), insulin pumps therapy (continuous sub-cutaneous insulin infusion – CSII), and use of apps to "upload" glucose results to a central secure database to allow clinical review.

- Training opportunities and engagement in CPD should be in accordance with staff roles and responsibilities. All team members should have a basic and standardised knowledge of diabetes in pregnancy care (relevant to pre-conceptual period through to postnatal care). In addition, team members should engage in focused CPD relevant to their specialism and commensurate and appropriate to their scope of practice. Team members require ongoing training with new and emerging technologies.
- It is proposed that DIP services should adopt a 'hub and spoke' clinical network model (See Figure 3) with the three maternity hospitals in Dublin acting as hubs for their respective hospital groups. The three maternity units with the highest number of deliveries will be the hubs for the other three hospital groups.
- DIP maternity networks should be created to promote a culture of learning across all disciplines and should develop and deliver, either solely or in partnership with key bodies, relevant multidisciplinary undergraduate and postgraduate DIP training, and on-going professional development including patient safety and quality and audit. A commitment from the maternity networks to provide annual development funding for this is essential.

Glossary of Acronyms

Acronym	Meaning
ADIPS	Australasian Diabetes in Pregnancy Society
AMP	Advanced Midwife Practitioner
ANP	Advanced Nurse Practitioner
BMI	Body Mass Index
BP	Blood Pressure
CBT	Cognitive Behavioural Therapy
CEMACH	Confidential Enquiry in to Maternal and Child Health (now MBRAACE)
CF	Cystic Fibrosis
CGM	Continuous Glucose Monitoring
CHO	Community Health Organisation
CMS	Clinical Midwife Specialist
CNS	Clinical Nurse Specialist
CPD	Continuous Professional Development
CSII	Continuous Subcutaneous Injectable Insulin
DAME	Diabetes and Antenatal Milk Expression trial
DIP	Diabetes in Pregnancy
EAPM	European Association of Perinatal Medicine
EBCOG	European Board and College of Obstetrics and Gynaecology
EFW	Estimated Fetal Weight (on ultrasound assessment)
IFGO	International Federation of Gynaecology and Obstetrics
GCT	Glucose Challenge Test
GDM	Gestational Diabetes Mellitus
GP	General Practitioner
HAPO	Hyperglycaemia and Adverse Pregnancy Outcomes trial
HbA1c	Glycosylated Haemoglobin A1c (measurement of glycaemia)
HSE	Health Service Executive
IADPSG	International Association of the Diabetes and Pregnancy Study Groups
IDF	International Diabetes Federation
IMC	Irish Medial Council
LADA	Latent Autoimmune Diabetes in Adults
LGA	Large for Gestational Age
MBRRACE	MBRRACE-UK: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries

Acronym	Meaning
MDI	Multiple daily injections (of insulin)
MDT	Multidisciplinary Team
MMUH	Mater Misercordiae University Hospital
MoC	Model of Care
MODY	Mature Onset Diabetes of the Young
NICU	Neonatal Intensive Care Unit
NMBI	Nurses and Midwives Board of Ireland
NWHIP	National Women and Infants Health Programme
OGTT	Oral Glucose Tolerance Test
PET	Pre-eclampsia Toxaemia
PGDM	Pre-gestational diabetes mellitus
PPC	Pre-Pregnancy Care
RAMP	Registered Advanced Midwife Practitioner
RANP	Registered Advanced Nurse Practitioner
RoI	Republic of Ireland
SCBU	Special Care Baby Unit
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TFT	Thyroid Function Test
UK	United Kingdom
WHO	World Health Organisation
WTE	Whole Time Equivalent

Strategic Background

The HSE National Clinical Programme (NCP) for Diabetes was established in 2010 to provide clinical leadership to improve the access and quality of Diabetes care nationally, to enhance the clinical outcomes for all people living with Diabetes while utilising health care resources effectively. Clinical leadership is pivotal to transforming change within our health service which meets the patients' clinical needs and expectations. The programme was established in partnership between HSE and the professional training body, Royal College of Physicians, Ireland. The HSE's National Clinical Programmes have used Models of Care (MoC) as a framework to co-design, develop and implement changes within the health service to improve the quality of services.

A MoC outlines best practice, evidence-based patient care delivery through the application of a set of service principles across identified clinical streams and patient flow continuums. A Model of Care broadly defines the way health services are delivered.

This DIP MoC is in alignment with the Slaintecare implementation strategy goal 2 to "provide high quality, accessible and safe care that meets the needs of the population". The alignment of this MoC with the Slaintecare principles is set out on page 24.

This MoC is in alignment with national health policies and HSE priorities including;

- The National Maternity Strategy (2016-2026)
- The National Framework for the Prevention and Management of Chronic Disease (2020-2025)
- The Slaintecare Implementation Strategy and Action Plan 2021-2023

The development of this model involved multiple stakeholders from people with experience, Diabetes Ireland, medical, nursing, midwifery and HSCP professionals, researchers and higher education institutes. Following a consultation and editing process the document was approved by:

- Speciality specific groups e.g. Institute of Obstetricians and Gynaecologists, Directors in Midwifery
- National Clinical Programme for Diabetes
- Clinical Advisory Group of Consultant Endocrinologists
- National Clinical Advisor and Group Lead for Chronic Disease
- HSE's Chief Clinical Officer (CCO) Clinical Forum

Diabetes in Pregnancy

Pre-gestational Diabetes

" I would have liked to meet other ladies with (pre-gestational) diabetes"

Pre-gestational diabetes mellitus (PGDM) commonly refers to women with established Type 1 diabetes (insulin deficiency) and Type 2 diabetes (combination of insulin deficiency and insulin resistance). It is well established that women with a diagnosis of PGDM face multiple complications during pregnancy(5). Rates of pre-eclampsia, macrosomia, caesarean delivery, congenital malformation and perinatal mortality are increased compared with women with normal glucose tolerance. It is estimated that 1:250 pregnancies are affected by PGDM and with circa 56,500 deliveries per year in Ireland, we anticipate 226 cases per year nationally. Women with T1DM may also have evidence of vascular disease e.g. retinopathy(6), nephropathy, hypertension, further increasing risks for the pregnancy. The number of women with T2DM entering pregnancy has also increased, now accounts for about 30% of women with PGDM(5). Women with T2DM are also more likely to have obesity and hypertension complicating their pregnancy or be taking medications ordinarily used for T2DM but contraindicated in pregnancy(7). There is convincing evidence that PPC is both clinically effective and cost effective in improving pregnancy outcomes for women with PGDM(8) (9).

The annual report of the Confidential Enquiry into Maternal Deaths and Morbidity, published by MBRAACE (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries) includes surveillance data on women who died during or up to one year after pregnancy in the UK (10). In addition, it can also include Confidential Enquiries into specific clinical scenarios of women who died in the UK and Ireland. A consistent recommendation from MBRAACE reports – now in their seventh year – and following on from previous CEMACE reports is the importance of MDT care for women/people with co-morbidities or complex clinical issues. In 2022, the report also included a Morbidity Confidential Enquiry into the care of women with diabetic ketoacidosis in pregnancy (11). This included recommendations for professional bodies, policy makers, health professionals and health educators. Highlighted points included the importance of input from other clinical specialities where "Women's care needs could not all be met by the diabetes pregnancy clinic or the diabetes specialist team or the obstetric medicine clinic and multidisciplinary specialist care was required from multiple teams often in multiple locations" and "Women with similar and complex problems should be identified early in pregnancy and need a multidisciplinary team (MDT) approach that can respond to changes through pregnancy, birth, postpartum and plan for (or avoid with adequate contraception) the next pregnancy…it is not clear that this is often considered in the context of pregnancy"(11).

Gestational Diabetes

To ensure an adequate nutrient supply to the developing foetus, maternal insulin resistance increases during pregnancy. This results in impaired insulin action by the second trimester of pregnancy. Ideally, insulin synthesis and secretion are sufficient to overcome this challenge, but in some women the response is inadequate and hyperglycaemia develops. This scenario is termed GDM. Clinically, GDM may be defined as carbohydrate intolerance resulting in hyperglycaemia of variable severity with first onset or first recognition during pregnancy(12). This definition will also include women who have diabetes but which was unknown until they received a screen in pregnancy, this is usually referred to as DIP and is based on either an HbA1C > 6.5% or 47.5 mmol/mol, fasting plasma glucose (FPG) > 7 mmol/L or a random plasma glucose > 11.1 mmol/L(13). It is now recommended that pregnant women are tested for DIP by either of these 3 tests at their first antenatal appointment to identify unrecognised DIP. Precise prevalence data for GDM are not available due to use of a variety of diagnostic criteria but figures generally point towards an increase in prevalence by 10–100% over the past 30 years. The International Diabetes Federation(14) reports that one in six (16.8%) pregnancies are affected by diabetes worldwide and the majority (86.4%) are classified as GDM. The increase in GDM prevalence is in line with the obesity epidemic, increasing maternal age and decreasing physical activity(15). GDM is now one of the most common medical disorders of pregnancy, and its impact on the maternal–foetal dyad is significant. Women with GDM are more likely to develop pre-eclampsia and experience perineal trauma or caesarean delivery(16). Although glucose homeostasis appears to return to normal in the majority of women postpartum, GDM is a strong risk factor for T2DM and cardiovascular disease in later life (17). These non-communicable diseases occur at a much younger age than the population average and as such present additional challenges and burden on the health service (ref). Offspring of women with GDM are more likely to have a higher birth weight with associated complications such as neonatal hypoglycaemia, jaundice, birth trauma and even stillbirth.

The most up to date Irish prevalence of GDM comes from the Atlantic DIP universal screening of over 5,000 women showing a prevalence rate of 12.4%(18).This prevalence rate is in keeping with the international literature which quotes a prevalence of 17% across 15 centres, ranging from 9-25% in the HAPO study (19). With circa 56,500 births annually in Ireland, there are likely to be up to 7,006 women with GDM per year. Debate continues around screening all pregnant women for GDM. In the Irish context if we apply risk-factor based strategies rather than a universal screening strategy population, many cases are missed(20).

The mainstay of treatment is lifestyle intervention and this is low cost and highly effective(21). As women with GDM frequently have a high body mass index in the overweight (OW) and obese (OB) categories, managing this risk is also essential(22, 23). When dietary and lifestyle changes are not sufficient many women require insulin(24).

"The label of gestational diabetes has so many implications, I hate the idea of it being stuck on my file forever and having to mention it if I'm getting life insurance etc. It's also full of stigma and associated with being fat"

"Care from the endocrinology department was very fast once I was diagnosed. They were helpful with showing me how to inject insulin and with giving me guidance once a week by email along with some in person visits"

Other Forms of Diabetes

With advancing medical discoveries and treatments we now see many women with DIP of different aetiologies(25), including those related to medications, Cystic Fibrosis and genetic forms. Transplantation rates in Ireland continue to rise and diabetes as a consequence of anti-rejection drugs including steroids is more common. People with other forms of diabetes require input from experienced practitioners across many specialties for success. Pregnancy-related morbidities are greater in these women.

Another area where pregnancy success is now common is in women with CF. Again experienced teams are required to balance weight gain with glucose targets and insulin management. While a detailed description of CF-related diabetes is beyond the scope of this MoC, the basic principles are that women with CF related diabetes should be provided with care by a multidisciplinary team as outlined in this MoC, but with the addition of the full CF MDT. With the introduction of CF-receptor modulator drugs more women with CF are choosing pregnancy and it is likely that their numbers, though small compared to those with GDM, will increase.

Genetic forms of diabetes are now more frequently recognised and identified in pregnancy. These fall under the umbrella of Maturity Onset Diabetes of Youth (MODY) encompassing a variety of genetic abnormalities.

Current Service Provision

Current Maternity Model of Care

In 2020, 56,812 babies were live born in Ireland and 120 babies were stillborn(26, 27). The majority of babies are currently born in hospital under a consultant-led system of care though this system is beginning to change(28). Irish maternity services are good and compare well with international standards, with low rates of severe maternal morbidity and perinatal morbidity(29, 30). There have been several reports and reviews that have highlighted both service deficits and failings that both undermined public confidence in the Irish maternity service and the morale of clinical and non-clinical staff working within the service(28). Despite these significant concerns, the National Maternity Experience Survey showed that the vast majority (87%) of women responding rated their care as either good or very good(31, 32).

Maternity care is currently provided in nineteen maternity units; of these, the three standalone maternity hospitals in Dublin (Coombe Women and Infants University Hospital, Rotunda Hospital and the National Maternity Hospital) and one in Cork (Cork University Maternity Hospital) have more than 8,000 births each per year. Twelve units have less than 2,500 births per year and all are located within general medical hospitals. Of the remaining three, with birth-rates between 2,500 and 6,000/year, Limerick is a stand-alone maternity hospital and Galway and Drogheda maternity units are located within a general medical hospital(26, 30). Planned home births occur either with the support of self-employed community midwives (SECMs) on behalf of the HSE or, community midwifery teams working within an existing maternity unit (31, 33, 34). 848 women were registered for a home birth from January 1st 2018, to December 31st 2020 ((n=231, n=272 and n=345, respectively). Of these, 489 women gave birth at home(35).

Most women attending for maternity care in Ireland have shared antenatal care between a General Practitioner (GP) and hospital linked antenatal care, usually consultant led but increasingly midwifery provided and led. Every women who is pregnant and ordinarily resident in Ireland is entitled to maternity care under the Maternity and Infant Scheme. The Maternity and Infant Care Scheme provides an agreed programme of care to all expectant mothers. This service is provided by a family doctor (GP) of your choice and a hospital obstetrician or midwife. Virtually all GPs have agreements with the Health Service Executive to provide these services; they do not have to be part of the GP medical cards system.

Some women choose hospital-based care, and this can be public care, semi-private (in some hospitals) or private care. As a result of the implementation of the National Maternity Strategy (outlined below) midwifery provided antenatal care is increasingly being provided to normal risk women. Births within hospitals are usually within an obstetrician led unit, though Drogheda and Cavan both have Midwifery Led Units (MLUs) for provision of care to normal risk women(31).

Evolving Maternity Model of Care (Maternity Strategy)

The National Maternity Strategy, published in 2016, aims to overhaul the current maternity service so that *"Women and babies have access to safe, high quality care in a setting that is most appropriate to their needs; women and families are placed at the centre of all services, and are treated with dignity, respect and compassion; parents are supported before, during and after pregnancy to allow them give their child the best possible start in life(28)"*. The strategy highlighted the current high-quality service provided to women, but also highlighted issues of increased proportion of complex pregnancies and caesarean births, poor

staffing, geographic variance, lack of choice for women and aging infrastructure. Four strategic priorities were identified:

- A Health and Wellbeing approach is adopted to ensure that babies get the best start in life. Mothers and families are supported and empowered to improve their own health and wellbeing;
- Women have access to safe, high quality, nationally consistent, woman-centred maternity care;
- Pregnancy and birth is recognised as a normal physiological process, and insofar as it is safe to do so, a woman's choice is facilitated;
- Maternity services are appropriately resourced, underpinned by strong and effective leadership, management and governance arrangements, and delivered by a skilled and competent workforce, in partnership with women.

The Maternity Strategy proposes that maternity care changes from consultant led hospital based to *"integrated team based care"* with a *"named lead healthcare professional with overall clinical responsibility for her care"*.

Women can be classified into three risk groups: normal risk, medium risk (requiring a higher level of oversight) and high risk (requiring a more intensive level of care, either throughout or at a particular stage of care).

Three care pathways are proposed and are being integrated into the maternity system: **supported care** (for normal risk mothers and babies, with midwives leading and delivering care within a multidisciplinary framework), **assisted care** (for medium risk mothers and babies, or women choosing obstetric care, with a named obstetrician responsible for co-ordination of a woman's care which is provided by obstetricians and midwives together as part of the multidisciplinary team) and **specialised care** (high risk mothers and babies, led by a named obstetrician and care provided by obstetricians and midwives as part of a multidisciplinary team). An individualised, multidisciplinary, multispecialty approach to care and care planning should be utilised.

Two important points should be made in the context of diabetes and pregnancy care related to the Maternity Strategy. Firstly, while for most women pregnancy and birth is a normal physiological process, for women with pre-gestational diabetes (PGDM) or gestational diabetes (GDM) this changes to a higher risk pregnancy. In PGDM, women with diabetes face risks to the pregnancy related to their diabetes, and risks to their diabetes related to their pregnancy. For women with previous GDM or newly diagnosed GDM, this is a complication of pregnancy and is not a physiological process. Despite international work aiming to achieve similar pregnancy outcomes in women with diabetes compared to the general obstetric population(36), *"..much has already been accomplished but even more remains to be done"*(37) and pregnancy in women with PGDM and GDM remains high risk. The impact of GDM on the physical and mental health of the mother and the physical wellbeing of the foetus and neonate must be considered and interventions applied to mitigate these impacts. GDM is a dynamic condition that can often progress to requiring medication or intensive management in a short time period.

As the insulin resistance associated with a GDM pregnancy increases progressively throughout the pregnancy, it is necessary to review women with GDM frequently to adjust their management. Therefore, it is imperative that staff looking after women with GDM have specialist DIP training and that women with newly diagnosed GDM have the opportunity for frequent communication and attendance with these skilled practitioners.

Secondly, in the context of diabetes and pregnancy care, the specialised care pathway has been the system of care for women with diabetes in Ireland for many years (38) and continues to be recommended(39). Women with PGDM are usually booked for care to a specialist antenatal clinic from early pregnancy (often at 5-7 weeks gestation, in comparison to the normal first visit ("booking visit") of 10-14 weeks gestation)(40). Care is provided by a multidisciplinary team including advanced midwife practitioners, clinical specialist midwives or nurses, endocrinologists (usually with an interest in diabetes in pregnancy), obstetricians (in the busier units Maternal-Fetal Medicine specialists), senior (or clinical specialist) dietitians with experience in diabetes, social workers, ultra-sonographers/radiologists and ophthalmologists/ophthalmic physicians(41). Women usually attend multiple times in pregnancy, with more frequent visits required than those suggested by the routine antenatal care schedule(40). In many of the units clinics are jointly shared between the team, but in some units endocrinology and obstetric care are geographically divided.

Risk Assessment

As per national guidelines (39), all women presenting for antenatal care should have a risk assessment performed and the level of risk should be kept under review throughout pregnancy, birth and in postnatal care. Care streams should be women-centred and team-based irrespective of risk stratification. Appropriate continuity of antenatal care should be promoted and, if the level of risk evolves, women should be able to transition seamlessly between care streams. Women should be informed about their individual risks related to pregnancy. They should be given an opportunity to input into any decisions about risk assessment. Up-to-date local hospital-level clinical data should be available and used in assessing and communicating risk to pregnant women (for example, data from the Irish Maternity Indicator System (IMIS)). Risk stratification in the maternity services should be consistent and aligned with national clinical guidelines. Implementation of care streams in individual maternity units should take cognisance of local resources and, where appropriate, may need to be provided on a maternity network or national basis. Women with PGDM are recommended to be provided care in the specialised pathway. For women with GDM, their care may have started in the supported pathway, but once GDM is diagnosed, women should be advised that care is transitioned to the specialised pathway, with multidisciplinary care. No one clinician can provide all the care for any person with DIP – women require midwifery, obstetric, endocrine and dietetic input as minimum.

Current Provision of Diabetes and Pregnancy care in the Republic of Ireland

There have been multiple publications outlining the current provision of care to women with PGDM and GDM within the Republic of Ireland, including peer reviewed publications (5, 6, 7, 15, 23, 25, 42, 43, 44, 45) and chapters in many of the published annual reports from the large maternity units or hospital groups (46, 47, 48). These are summarised on the next pages.

Pre-Gestational Diabetes

"specific clinic in (hospital name redacted). Weekly review of blood sugars. Specialised care. Endocrinologist in the clinic. Anatomy scan and fetal echo (heart scan) as standard. Direct link with (hospital name redacted) for checking eyes in every trimester"

In 2017, an Irish audit of 185 women with PGDM across fifteen centres was completed. It found that women with diabetes were poorly prepared for pregnancy as evidenced by low rates of pre-pregnancy care (PPC) attendance (22.1%), high rates of overweight (57.8%) and obesity (34.6%), inadequate doses of folic acid pre-pregnancy (60%) and failure to reach optimum HbA1c goals in the first trimester (70%). Over half (56.7%, n=105) of the women required hospitalization during pregnancy. Most babies were born by caesarean (66%, n=103) and a large proportion of infants required Neonatal Intensive Care Unit (NICU) (47%, n=74)). Rates of macrosomia (16.6%) were significantly higher than in the general population(49, 50).

Another study published outcomes associated with pre-gestational diabetes in 174 women who attended one tertiary level maternity hospital in Dublin, Ireland, between 2015 and 2017(42). Of the 174 women, 50 (28.6%) had T2DM, and 124 women (71.4%) had T1DM. Women with T2DM were older (36 vs. 34 years, p 0.02) and had a higher BMI (32.6 vs. 26.2 kg/ m^2, $p<0.05$). Duration of diabetes mellitus in T1DM and T2DM was 15.7 and 5.7 years respectively. Mean HbA1c in women with T2DM at booking was 44.5 mmol/mol (6.2%) and in women with T1DM was 56.3 mmol/mol (7.3%). Forty women (32%) with T1DM used continuous subcutaneous insulin infusion (CSII). Of the 174 pregnancies, 45.4% were born by caesarean. Six infants tragically were stillborn and seven were diagnosed with a congenital abnormality. Infants of women with diabetes using multiple daily injections (MDI) were lighter (3.58 kg) than infants of those using CSII at 3.75 kg. More births occurred by emergency caesarean section in the CSII group than in the MDI group (37.5% vs. 28.5%), while the elective caesarean section rate was higher in the MDI group (17.8% vs. 12.5%). Infants of women treated with CSII had more congenital malformations (10% vs. 2.3%)

An older paper, published in 2011(45), aimed to compare the outcomes of pregnancies affected by maternal PGDM in the three Dublin maternity hospitals compared to all units within England, Wales and Northern Ireland as described in a Confidential Enquiry in Maternal and Child Health report(51, 52). For context of comparison, it should be noted that the Rotunda, Coombe and National Maternity Hospitals are tertiary level maternity units with combined multidisciplinary clinics providing care to women with diabetes and the CEMACH report included all units from district general to tertiary level. Of the 110 women with PGDM who delivered in Dublin, thirty (27%) had T2DM (vs. 27% in the UK). At that time, over half (53%) women had a booking HbA1c less than 7% (vs. 66% in the UK). There was a higher rate of miscarriage with nineteen women (17.3%) having a first trimester miscarriage (vs. 8.5%). Of the 91 remaining women, 71 (78%) underwent induction of labour (vs. 38.9%). Over half of the women (59.3%) had a caesarean birth (vs. 67.4% in the UK). Two infants (2.1%) were macrosomic (vs. 5.7%). There was one intrauterine death (0.1% vs 0.6%) and no maternal deaths (vs five). These results serve to underline the continued importance of multidisciplinary care for pregnant women with diabetes.

Gestational Diabetes

"Excellent care from diagnosis – was diagnosed on a Friday morning and received excellent care from that moment. I was admitted within an hour or so and started on insulin. Once I was discharged it was very easy to send my blood glucose readings to the hospital and I always got a prompt response on what insulin changes to make within a few hours. I was also immediately looked after on my second pregnancy. I rang the CNS (clinical nurse specialist) after my positive pregnancy test and was seen within a few days. I can't fault any of the care I received during my pregnancy"

"If GDM had been diagnosed earlier and managed earlier, infant may not have been so big which impacted on delivery choice"

The rate of GDM was increasing in pregnancy even before publication of the HAPO study (53, 54), and the change in diagnostic criteria as a result of HAPO resulted in a further increase(46, 47, 48). It is well recognized that a diagnosis of GDM can be upsetting and stressful during pregnancy, even for women with recognized risk factors(44). This can be particularly stressful for women who previously were considered "normal risk" and where specialist care is now crucial. Women with GDM also report stigma, which may affect their mental and physical health. Early access to a team that can provide education, training and support to help women (and their families) adapt to GDM makes a significant difference (43).

An audit of GDM within the nineteen units has been performed (55). It is worth noting that this audit was performed prior to the Covid-19 pandemic and therefore changes have already been made. No centre currently offers universal screening for GDM. All 19 maternity units in Ireland adopt a risk factor-based screening strategy for GDM. Most units use a one-step Glucose Tolerance Test (GTT), though one unit uses a two-step method with a Glucose Challenge Test (GCT), and if positive complete an OGTT. (note: many units changed the screening practice for GDM during the COVID-19 pandemic as per national and international advice (56, 57)). All but one unit continued to provide care for women with GDM in their unit, one transferred care to a regional centre. All women diagnosed with GDM are linked with a dedicated multidisciplinary Diabetes and Pregnancy team. Education and advice are delivered across all maternity units once GDM is diagnosed (note: this has often changed to virtual education with the pandemic, and this may continue afterwards). Most commonly this is delivered by several members of a MDT such as diabetes midwife and nurse specialists, dietitians, and physiotherapists. Small group support sessions were the most common pathway of education delivery by the MDT (66%; n=12) with the remaining 7/18 (38.8%) units offering one-on-one support to all women. The gold standard is personalised care but where staff are under resourced the clinicians use group education.

There is a wide variation in practice across units about access to dietetics services. Some units report fortnightly routine dietitian review while others have a dietitian review at the time of diagnosis with subsequent consultations reserved for emerging management issues such as hunger, blood glucose levels out of target or weight loss. Two units report no review by a dietitian at any point.

The current staffing levels in Ireland reveal that 12/19 maternity centres have little or no dietetic staff. Nutrition advice when it is provided is being provided by non-dietetic staff. In practice, when dietetic staffing is in place, due to low staff numbers, input from dietitian is often provided at initial diagnosis and

review is sought for situations requiring more detailed dietetic expertise e.g. motivational interviewing relating to following dietary advice, personal/cultural dietary restrictions, weight loss, other conditions affecting food intake e.g. pregnancy sickness, coeliac disease.

Women's experience of maternity care in Ireland with PGDM or GDM

The maternity experience survey, published in 2020, had responses from 3,204 women out of an eligible population of 6,357 women. Unfortunately, the only specialist service that was analysed was that of neonatal care, so care within a Diabetes and Pregnancy service was not analysed. Equally, while women with a long term condition had poorer experience than the overall population, these conditions referred to general physical and mental health disabilities and did not include diabetes(32).

Care provided to women with PGDM is within a consultant provided multidisciplinary team where there is clear continuity of care, factors which are favourable to their better experience of maternity care.

On the other hand, women have reported frustration with increased hospital visits and surveillance of their blood glucose levels. Women with GDM often report frustration following the diagnosis of GDM, and fear of what this may mean both for themselves and their pregnancies, though with support of the multidisciplinary team most are comfortable with GDM management at the time of birth (44, 58).

Rationale for Diabetes in Pregnancy Model of Care

The potential adverse effects of DIP are a real risk and concern among all teams managing this high-risk patient group. The impact of DIP for both mother and baby can be far reaching, and we now understand the trans-generational nature of intra uterine exposure to hyperglycaemia. We now understand that children born to mothers with diabetes have an increased lifetime risk of diabetes and obesity and are also subject to neurocognitive dysfunction. Mothers with established pre-gestational diabetes may experience worsening of diabetes-related complications (retinopathy and nephropathy) because of pregnancy and those with GDM have an increased lifetime risk of T2DM and cardiovascular disease. Because of this complexity of diabetes in pregnancy, its impact on perinatal outcomes and the long-term effects for both mother and offspring, it is essential that every effort is made to achieve optimum obstetric outcomes and prevent long-term disease.

Services addressing PGDM and GDM have not changed significantly in response to the dramatic increase to the growing numbers and complexity of cases. The multidisciplinary teams involved in the care of women with diabetes recommend intensive glucose management treatments as per international guidelines and standard but need the support of adequately resourced multidisciplinary teams to deliver the highest evidence-based practice.

Considerations when designing a Model of Care for Diabetes in Pregnancy in Ireland

1.	The large number of geographically dispersed maternity units, two thirds of which have 2000 or less births per year
2.	Current diabetes specialist services provision to maternity units e.g. a. In Dublin, the Mater Hospital provides sessional and on-call consultant endocrinology cover to all three of the maternity hospitals. b. In Saolta Hospital group, GUH provides consultant endocrinology cover to maternity units in Letterkenny and Mayo
3.	To maintain competence in all aspects of diabetes care, a consultant endocrinologist needs to work across maternity and non-maternity hospitals
4.	Whether hospital groups should provide the basis for a hub and spoke/clinical network for the provision of specialist diabetes care
5.	Type of DIP – pre-existing, new onset GDM, MODY, CF-related diabetes, latent autoimmune diabetes in adults and secondary diabetes services
6.	Complexity of diabetes care across the different maternity units
7.	The role of community services for this patient group, pre-pregnancy weight management, diagnosis of GDM and post-pregnancy follow up for GDM
8.	Uptake of PPC by women with PGDM is poor and provision of PPC varies widely throughout the country
9.	Technology use e.g. CSII (insulin pump) and CGM (continuous glucose monitoring) is increasing and will become standard of care thus requires specialty input

As per the National Maternity Strategy there are a number of contributing factors including; demographics, lifestyle and medical co- morbidities which means maternity care in Ireland has become more complex. The strategy indicates that the proportion of complex pregnancies is increasing, caesarean section rates are increasing, the proportion of low birth weight babies and preterm births are increasing and breastfeeding rates remain low. All of these factors impact on maternity service provision. The table above outlines factors relating to DIP which were considered in the context of this DIP MoC and impact on service provision.

Model of Care for Diabetes in Pregnancy

Aim

Informed by the strategic background and epidemiology the aim of this DIP MoC is to outline the spectrum of best practice care for people with DIP including pre- and post-natal care. With full implementation of this model of care there will be equitable access to safe, high quality nationally consistent and women and family centred care. To ensure full implementation of this MoC DIP services will need to be appropriately resourced to provide this high-quality service.

Vision and Principles

This MoC aligns with the Sláintecare principles as set out below.
All women with DIP receive the right care, at the right time, by the right team and in the right place, from PPC to postpartum care, in order to optimise maternal and neonatal outcomes.

Principles

As outlined in Strategic background section, this MoC reflects a number of policy and service developments and priorities and builds on previously published clinical guidelines and models of care for diabetes, chronic disease, and, the National Maternity Strategy. This MoC has also been guided by the Sláintecare Report and the Sláintecare Action Plan and encompasses the principles set out by Sláintecare as key considerations when service planning or designing models of care.

Figure 1 *Sláintecare Model of Care Principles*

Population Health Perspective

Population health is broadly defined as “the health outcomes of a group of individuals, including the distribution of such outcomes within a group”(59). Taking a population health perspective to the development of models of care means prioritising the needs of a population in designing services. This model draws on population health approach for chronic disease and national and international data available on prevalence of diabetes and DIP. In designing this MoC it is acknowledged that within the diabetes population, DIP is a high-risk, complex clinical area that requires specialised care, the majority of which is delivered by specialist acute services with collaboration and involvement of primary care and community services as appropriate.

Person-centred Care

This MoC organises care for DIP around the woman's individual needs before, during and after pregnancy. Care pathways and clinical management plans should all be individualised to optimise care for the woman and her baby. Individualised care plans should be developed through frequent team communication, in partnership with the woman throughout the pregnancy journey. As part of the implementations plan for this MoC Patient-reported outcome measures should be reviewed and incorporated into the monitoring and evaluation process.

Health and Wellbeing

Improved health and wellbeing is about empowering and supporting people to live healthier lives by addressing risk factors, early detection of disease and offering timely intervention. The phrase 'shift left' coined by Sláintecare, describes how early, targeted interventions can reduce risk factors and impact of disease. For women with PGDM and those at risk of GDM, the HSE's Self-Management Support Framework and Healthy Ireland Programme are two key elements to support them to self-manage their health behaviours and/ or diabetes. In addition, this MoC embraces 'Making Every Contact Count' framework and reinforces the importance of highlighting key messages about DIP, the importance of pregnancy planning and early intervention during routine consultations with women who have diabetes. All care pathways proposed in this MoC take into consideration not only the care that should be provided to the woman during pregnancy but also the pre- and post-pregnancy care and follow-up required to optimise the woman's and infants long-term health and wellbeing.

Equity

This model of care works to address challenges around equity of access to services and equitable provision of services nationally while facilitating local flexibility in the delivery of services. To ensure geographical equity in so far as possible, DIP care, a highly specialist clinical area, needs to be available in all 19 maternity units throughout Ireland with outreach and follow-up care available closer to home in the community setting as appropriate. Social determinants of health need to be considered and mitigated against with additional resources and supports tailored for and targeted at more vulnerable populations. This MoC sets out an approach to reduce health inequality, and measure variation in needs, experience outcomes and resourcing. Special consideration should be given to ensure care, education and resources provided are appropriate for women with culturally and linguistically diverse backgrounds.

Co-ordination of Care

Sláintecare describes integrated care as 'healthcare delivered at the lowest appropriate level of complexity through a health service that is well organised and managed to enable comprehensive care pathways that patients can easily access, and service providers can easily deliver.' Co-ordination of care between specialist maternity DIP services, community specialist ambulatory care hubs and General Practice is a fundamental aspect and key enabler in this MoC. At a minimum, care for those with DIP should be coordinated across primary and secondary care and should be as integrated as possible. Ensure teams have regular MDT meetings to discuss complex, challenging and difficult situations or treatment decisions e.g., consider starting diabetes technology.

Self-care and Self-Management

Women with DIP should be empowered by healthcare professionals to manage and optimise their own health (before, during and after pregnancy) and should be provided with the necessary skills and supports to do so. This MoC recognises the importance of providing women with timely information and education (using a variety of methods) and facilitating group and peer support networks to complement their care. Training and education, co-ordinated and facilitated at a national level, for all healthcare professionals involved in the care of these women is also encouraged to help them better support and encourage Self-Management.

Top of License Practice and Teamwork

Top of license practice refers to all health professionals delivering the care for which they are qualified and trained. Best-practice DIP care requires a collaborative, multi-disciplinary approach with all health and social care professionals working together to optimise care for the woman and her baby. To achieve consistent, high-quality, cost effective care, advanced practice and clinical specialist roles should be developed within specialist services for DIP, nursing and midwifery and dietetics health and social care professions. All staff occupying such roles must possess the relevant specialist qualifications to carry out specialist clinical care.

Supported by Technology

A national health information and communications infrastructure, including electronic health records, is essential for integrated services to improve communication and sharing of clinical information between health care professionals and across primary and secondary care services. The COVID-19 pandemic has presented opportunities to deliver care virtually. Going forward, service delivery should be flexible in nature using a mixture of face-to-face, online and blended models to best support individuals. Diabetes technology, for example, CSII, flash and continuous glucose monitoring, is advancing at pace and should be embraced to optimise DIP care where appropriate. Information, education and Self-Management support should be available to women in a variety of methods, including via online and mobile platforms. Training and protected CPD time for staff to keep up to date with advances in diabetes technology is essential. It is a rapidly expanding area and to support care by technology, staff need to be adequately trained and supported.

Quality and Safety

High-quality, safe care is fundamental to the provision of health and social care. Robust governance structures to support accountability and the delivery of high-quality, safe, patient-centred care are a key consideration in this MoC and should be in place in primary and secondary care services involved in DIP care. As we move towards the development of integrated health regions, integrated governance structures will further strengthen and facilitate the delivery of integrated DIP care. Robust measurement and evaluation processes will be developed to support this MoC. Quality will be measured by reported person experience to include, defined outcome measures, key performance indicators and reporting, audit and evaluation.

"I felt my diabetes care was excellent. I saw the endocrinologist very regularly to keep an eye on my levels. It was always a bonus to be able to see the baby on scan every time I was there"

"I found the regular contact with dietitians excellent. The diabetes nurses were excellent"

"The midwives/doctors I met – always friendly, never judgemental. The care my baby received was second to none"

"I would ensure that women are not blamed when their BG (blood glucoses) are difficult to control. Education is what works, not intimidation and insults"

"would like a service available in my regional hospital (name redacted)"

"more education of staff as during labour (post redacted) didn't have a clue what to do when I went hypoglycaemic and had visible panic"

"having diabetes in pregnancy was a pain in the proverbial – checking sugars seven times a day and the feeling of damaging your baby if they weren't within the recommended limits despite sticking rigidly to the recommended diet etc"

Model of Care for Diabetes in Pregnancy Services

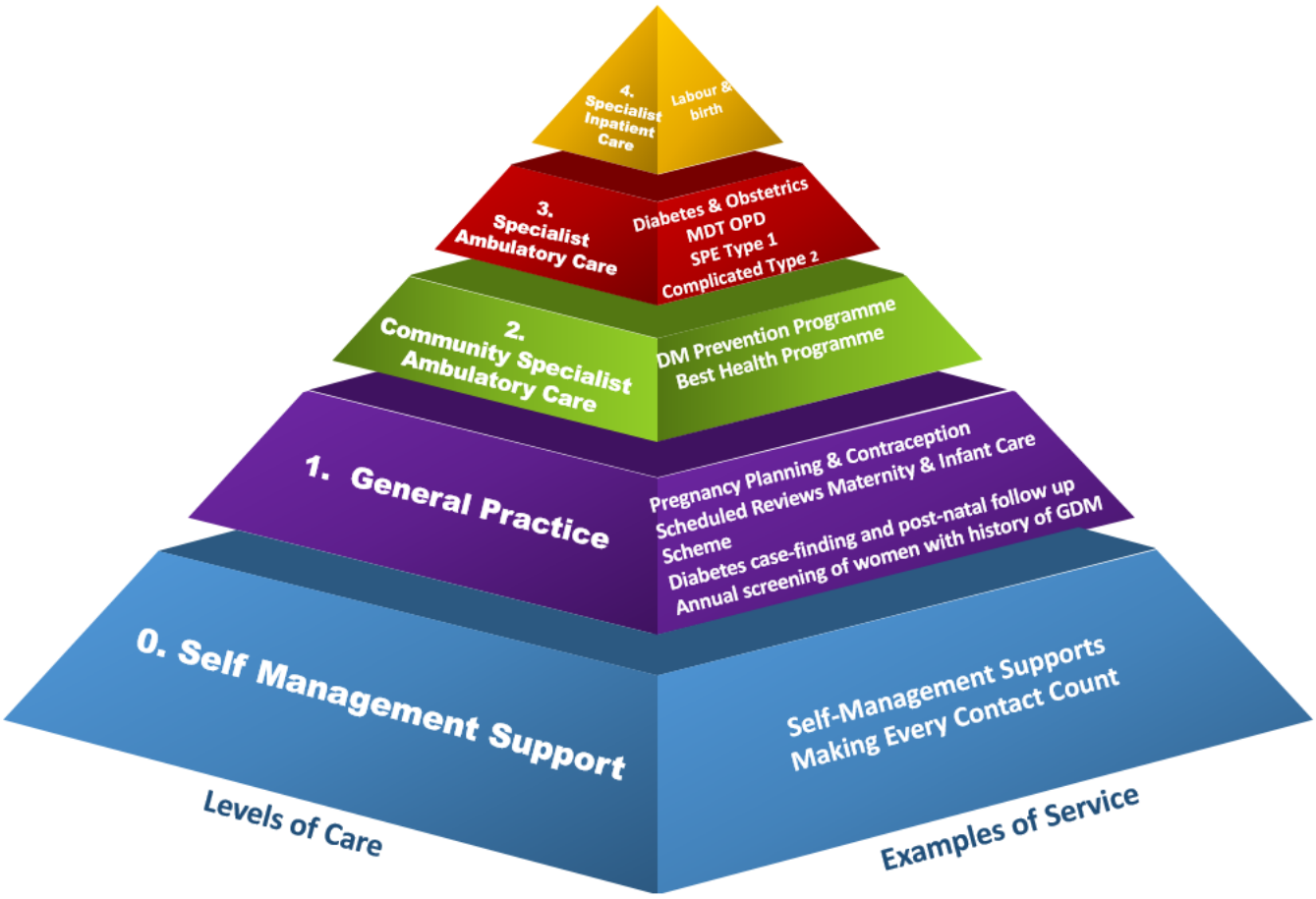


Figure 2 *Model of Care for Diabetes in Pregnancy*

This MoC (see Figure 2) aligns closely with the Model of Integrated Care for T2DM and the Integrated Model of Care for the Prevention and Management of Chronic Disease, with care provided across five levels of service. Services provided at each level are detailed below.

Level 0 - Living Well at home

In line with the goals of Making Every Contact Count (See Appendix 1), all health and social care professionals involved in DIP care will use their routine consultations to empower women to self-manage and optimise their own health to achieve positive long-term health outcomes for them and their baby. Peer support, information and educational resources should be made available to women in a timely fashion, through a variety of methods, before during and after their pregnancy to help increase their awareness of risks, manage health behaviours and support them in self-monitoring of blood glucose.

Level 1 - General Practice

As primary healthcare providers, the GP and practice nurse are key to the implementation of this model of care. They are involved in pregnancy planning and contraception advice / prescription; identification of risk factors for GDM; timely onward referral to specialist maternity care; delivery of the Maternity and Infant Care Scheme in General Practice (six visits during pregnancy); close liaison and integration with hospital and community services, and post-natal follow up for women with T2DM and those who have had GDM. Women with Type 1 diabetes usually continue care in the hospital setting post-delivery. Women with Type 2

DM prior to pregnancy can have their care provided by G.P., Community Specialist Team and/or specialist ambulatory Care/O.P.D. The GP has a valuable role in prevention of T2DM for women with prior GDM. These women require cardiovascular risk factor assessment and screening for T2DM (HbA1C and/or FPG (fasting plasma glucose) and/or RPG (random plasma glucose) and/or oral glucose tolerance test at 1 to 3 year intervals depending on risk as outlined in the ADA 2023 Standards of care.

The Structured Chronic Disease Management Programme in General Practice entitles individuals who are aged 18 years and over, and who have a medical card or doctor visit card and who have a diagnosis of type 2 diabetes, to two scheduled reviews with their GP per annum, and a preceding visit with their Practice Nurse for physical examination, bloods and medication review to be undertaken with a view to optimising risk factors and other aspects of diabetes care. These consultations focus on lifestyle health behaviour improvements and/or medical management of diabetes and associated risk factors, depending on the personalised needs of the person. The GP and patient agrees a joint care plan every 6 months to tackle aspects of their type 2 diabetes management that are of importance to the patient, with patients supported to self-manage their chronic conditions through referrals to Self-Management education programmes such as the Diabetes Discover Programme.

Currently in Ireland there is no agreed strategy for managing women who may become pregnant and who have a high risk of developing gestational diabetes or a history of previous gestational diabetes. If a woman opts to book an appointment with her GP to discuss conception, they are advised to commence folic acid. General health advice will be given regarding smoking, alcohol, physical activity and dietary advice. If risk factors for gestational diabetes are identified at that visit; the woman may be advised that she will likely be tested for gestational diabetes in the hospital as part of routine care.

Although maternity hospitals signpost women who have had a diagnosis of gestational diabetes to attend their GP for monitoring of HBA1c regularly, it was previously on an ad hoc basis and not resourced for those diagnosed with GDM prior to January 2023. Gestational Diabetes refers to a patient who has no diagnosis of diabetes prior to pregnancy and develops hyperglycaemia during pregnancy, after the 24th week. These patients are managed in pregnancy through a combined Endocrine and high-risk obstetric service per local guidelines. After their pregnancy is complete, the patient has a follow up OGTT at six weeks post-partum within the hospital setting to ensure resolution of hyperglycaemia.

It is recommended that women with a history of GDM and/or pre-eclampsia are included in the next phase of implementation of the Chronic Disease Management Programme. With the addition of gestational diabetes to the Chronic Disease Management care pathway, at the six-week check with their General Practice team, the diagnosis of GDM should be coded in their file, ICPC2 code W85. This will allow a practice to generate a list of patients with a specific disease/risk factor. The woman will be advised to attend annually for a routine review. The practice may opt to create a recall prompt to remind the patient to book in after a year. This is due to the very significant risk of progression to Type 2 Diabetes and cardiovascular disease in this population.

One aim of the annual visit is to assess the woman to see whether she has normoglycaemia, prediabetes or Type 2 Diabetes. An integral part of the assessment therefore will be a fasting blood glucose and HBA1c. Additional to bloods will be a weight and BMI check, blood pressure check, discussion about physical activity, smoking and alcohol use. This is an opportunity to re-educate regarding good lifestyle advice, weight management advice and signpost to quit smoking services. Gestational diabetes is an independent risk factor for cardiovascular disease so it is important to review this group regularly to enable and support behaviour and lifestyle change to delay the onset of both diabetes and cardiovascular disease. Where a diagnosis of prediabetes is made (FBG between 6.1-6.9) then patients can be referred to the National

Diabetes Prevention Programme structured education which is rolling out nationally. This structured education for women will support the lifestyle advice in general practice. Where a patient develops Type 2 DM they will be enrolled on the CDM programme for twice yearly reviews.

In women who have a diagnosis of GDM and wish to plan another pregnancy, this annual review will allow the GP to discuss pre pregnancy folic acid supplementation and allow for early notification to the obstetric services that this patient will be at higher risk of developing GDM in the subsequent pregnancies.

Vaccinations and Pregnancy

The National Immunisation Advisory Committee (NIAC) provides the Immunisation Guidelines for Ireland based on the latest clinical and scientific information. The immunisation guidelines for Ireland are available online on the Royal College of Physicians of Ireland (RCPI) website (1). Recommended vaccinations are provided in General Practice.

Non-live vaccines (e.g. acellular pertussis and Quadrivalent Influenza (QIV) Vaccine) are generally considered safe in pregnancy. Live attenuated viral vaccines (e.g. the MMR vaccine, varicella vaccine, Live Attenuated Influenza (Nasal Flu) Vaccine) pose a theoretical risk to a foetus and are contraindicated in pregnant women unless the benefits outweigh this theoretical risk (2). Pregnancy should be avoided for one month after vaccination with a live vaccine.

Vaccinations Recommended in the Antenatal Period

NIAC recommend some vaccinations in the antenatal period to protect the health of the mother, and to provide passive protection to infants, through intrauterine transfer of maternal antibodies, from birth until they can be actively protected by the routine infant vaccination programme.

Pertussis (Whooping Cough) Vaccine

Pertussis (whooping cough) is a highly infectious bacterial disease caused by Bordetella pertussis. Infants under the age of 6 months are most at risk of complications and hospitalisation, and are too young to be fully vaccinated. The NIAC has recommended pertussis vaccination for pregnant women since 2012 (62).

Maternal pertussis vaccination provides passive protection, through intrauterine transfer of maternal antibodies, to infants who are too young to be immunised (63, 64). Pregnant women should be offered the Tdap vaccine (which contains low dose acellular pertussis vaccine) as early as possible after 16 weeks and up to 36 weeks gestation in each pregnancy, to protect themselves and their infant (65). Tdap can be given at any time in pregnancy after 36 weeks gestation although it may be less effective in providing passive protection to the infant. Acellular pertussis vaccination has been shown to be safe in pregnancy (64).

Influenza (Flu) Vaccine

Pregnancy increases the risk of serious illness and hospitalisation following influenza infection (66, 67). Influenza during pregnancy may also lead to preterm birth, lower birth weight and stillbirth (67). Infants under the age of 6 months have the highest rates of hospitalisation and death from influenza (67) and are too young to receive an influenza vaccine.

Since 2011 NIAC have recommended the flu vaccine for all pregnant women every flu season (68). The inactivated flu vaccine can be given at any stage of pregnancy. Vaccination during pregnancy provides protection to the mother (69) and provides passive immunity to infants up to the first six months of life (70).

COVID19 Vaccines

Pregnant women with COVID-19 infection are more likely to be admitted to ICU or to die than similar aged non-pregnant women with COVID-19 (71, 72). COVID-19 in pregnancy may increase the risk of adverse pregnancy outcomes, such as miscarriage, stillbirth and preterm birth (72).

COVID-19 mRNA vaccination in pregnancy has been shown to be safe and effective, and is associated with a reduction in stillbirth (73).

Pregnant women are recommended to remain up to date with COVID-19 vaccines as per the latest NIAC immunisation guidelines (74).

Vaccinations Recommended in the Postnatal Period

Pertussis (Whooping Cough) Vaccine

If pertussis vaccine was not given during the pregnancy, NIAC recommend that vaccination should be offered in the week after delivery (62).

Rubella Vaccine (The MMR)

Maternal rubella infection in pregnancy may cause miscarriage or stillbirth. Rubella infection in pregnancy can result in congenital rubella syndrome, where the infant can have major birth defects such as deafness, blindness, brain damage or heart disease (75).

The MMR vaccine provides immunity to infection from rubella. The NIAC recommend that pregnant women who are found to be susceptible to rubella should be immunised with MMR after birth (76). The MMR is a live vaccine and pregnancy must be avoided for one month following vaccination.

Documentation of having received at least one dose of a rubella-containing vaccine is satisfactory evidence of protection against rubella. MMR vaccination is only required if there is no documentation of the women having had at least one MMR vaccine in the past, irrespective of serology (76).

Level 2 - Community Specialist Ambulatory Care

Specialist Community Diabetes Teams are based in the ambulatory care hub in the community, providing specialist services and routine care primarily for those with T2DM. These teams are resourced with Consultant Endocrinologist, Diabetes Clinical Nurse Specialists, Dietitians and Podiatrists. These teams may have a role to play in pregnancy preparation (assessing glycaemic targets/management with emphasis on monitoring, glycaemic targets, hypoglycaemic awareness, avoidance and treatment) and post-natal care (focus on weight management and physical activity, glycaemic targets, pregnancy planning and contraception) for those with more complex T2DM. They have strong links to both general practice and specialist hospital services in this regard.

The National Diabetes Prevention Programme is delivered from the specialist ambulatory care hub to help people reduce and manage their risk of developing Type 2 DM. Gestational diabetes is an independent risk factor for diabetes and cardiovascular disease so it is important to review this group regularly to maximise behaviour and lifestyle change to delay the onset of both diabetes and cardiovascular disease. Having a previous history of GDM is an independent risk factor for developing type 2 diabetes and women post GDM (irrespective of current FPG or HbA1c) can be referred to the National Diabetes Prevention Programme structured education which is rolling out nationally in the Specialist Ambulatory Care hubs.

Women who have previously had GDM who are planning a subsequent pregnancy should be facilitated in specialist ambulatory care hubs for pre-pregnancy care including a focus on life style behaviour change and weight management if required.

DISCOVER Diabetes (Diabetes Insights and Self Care Options via Education and Reflection) is a Self-Management Education course freely available to people with Type 2 Diabetes in the Specialist Ambulatory Care Hub. The course enable people with Type 2 DM to get up to date information on Type 2 DM, learn practical skills to help manage diabetes, discuss things that affect diabetes treatment like food choices,

being active, managing weight, medicines, smoking, alcohol, check-ups, eye care, foot care and more.

The Best Health programme is a structured group Self-Management education programme presently being rolled out nationally in the Ambulatory Care hubs for people who have over weight and obesity. Women who have over weight and obesity can avail of this service pre or post pregnancy.

Level 3 - Acute Specialist Ambulatory Care

Specialist DIP multidisciplinary teams are responsible for the majority of antenatal and postnatal care of women with DIP. This care will be delivered in accordance with the specialised care-pathway as outlined in the National Maternity Hospital Strategy. This care will be delivered primarily from the OPD setting with the option of providing outreach services (e.g. PPC) within the specialist ambulatory care hub as appropriate and as resources allow. DIP care can be intensive for the woman and a blended approach of care delivery utilising a mixture of face-to-face and virtual/telephone consultations should be considered to reduce burden on the woman while still optimising care.

Level 4 - Specialist Maternity Hospital Care

It is recommended that all women with DIP receive specialist inpatient care during labour and birth and the initial postnatal period. Midwifery and neonatal care for infants of mothers with DIP will also be required. During the ante-natal period, some women may also require admission as an in-patient to optimise care.

Hub and Spoke Model

The National Maternity Strategy outlines that maternity services cannot, and should not, operate in isolation as stand-alone entities. To provide the breath of high-quality care that is required within maternity services, maternity networks should be developed with close links and collaboration between maternity units within hospital groups. These linkages facilitate the sharing of expertise, and the operational resilience of smaller units can be strengthened to support them to provide high-quality, safe services.

In line with this recommendation, it is proposed that DIP services should adopt a 'hub and spoke' clinical network model (See Figure 3) with the three maternity hospitals in Dublin acting as hubs for their respective hospital groups. The three maternity units with the highest number of deliveries will be the hubs for the other three hospital groups. Table 1 outlines the hub and spokes within each hospital group.

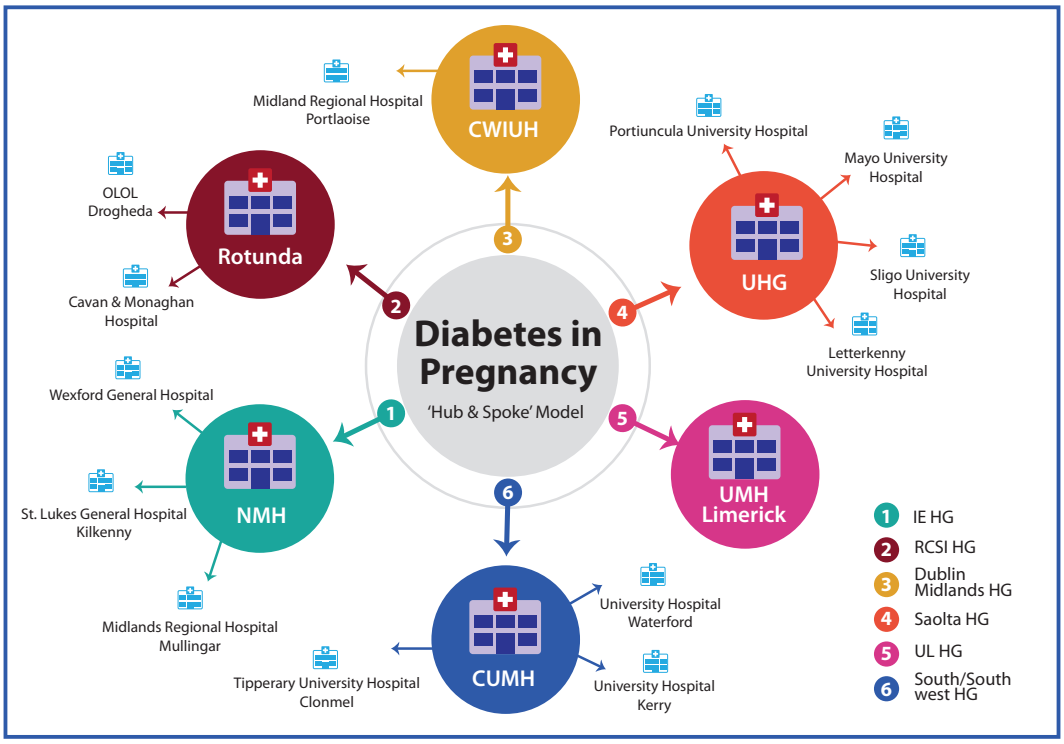


Figure 3 *Hub and Spoke Model Diabetes in Pregnancy Services*

Both hub and spoke hospitals will deliver specialist care pathways required for women with DIP. The vast majority of women with DIP will receive high-quality care, as close to home as possible, in their local hospital. However, for some complex cases, more specialised care may be required in which case a consult may be sought from, or a woman may be referred to the hub hospital within the group for more intensive, sub-specialist care. Direct and explicit referral pathways should be developed and agreed locally between hub and spoke hospitals to facilitate integrated working and ensure that the woman receives high-quality care in the most appropriate location.

Hospital Group	Hub Hospital	Spoke Hospital(s)
Ireland East Hospital Group	National Maternity Hospital Holles Street	Midland Regional Hospital Mullingar St. Luke's Hospital Kilkenny Wexford General Hospital
Dublin Midlands Hospital Group	Coombe Women and Infants University Hospital	Midland Regional Hospital Portlaoise
RCSI Hospital Group	Rotunda Hospital Dublin	Our Lady of Lourdes Hospital Drogheda Cavan & Monaghan Hospital
Ireland South Women and Infants Directorate	Cork University Maternity Hospital	Kerry General Hospital Tipperary University Hospital Waterford Regional Hospital
UL Hospital Group	University Maternity Hospital Limerick	N/A
Saolta Hospital Group	Galway University Hospital	Letterkenny University Hospital Mayo University Hospital Portiuncula University Hospital Sligo University Hospital

Table 1 *Hub and Spokes within each Hospital Group*

As is the case at present, the Mater Misericordiae University Hospital (MMUH) in Dublin will remain a 'super hub' providing consultant endocrinology cover for DIP services in the National Maternity Hospital, Rotunda University Hospital and the Coombe Women and Infants University Hospital. Future consultant appointments for DIP could be 60/40 (Maternity Hospital/ MMUH) split (with 60% of the consultant time in one unit and 40% in another unit) with the insertion in a contract that contractual time will be reviewed with the movement of the maternity hospital to a new building co-located with another acute hospital.

All hub hospitals currently manage high volumes of less complex cases, in addition to accepting transfers and bookings from women with more complex medical and obstetric issues. Spoke hospitals are smaller units which the National Maternity Strategy recommends are linked to the largest maternity hospital/unit within the hospital group. To implement this model of care successfully, all hub and spoke hospitals will require additional resources for diabetes in pregnancy services. Given the sub-specialist and complex nature of care delivered in hub hospitals, as well as the fact that they have a larger number of births per year, hub hospitals will require larger staffing resources in comparison to spoke hospitals. Higher levels of specialisation and experience across the team will also be necessary for the hub hospitals. Women who have CSII, or other complex technologies (e.g CGM) may be seen in Hub hospitals. However it should be recognised that in the future this will become the usual standard of care and will be incorporated into standard diabetes practice. This will require education and upskilling for the entire MDT (including midwives and obstetricians).

Multidisciplinary Team for Diabetes in Pregnancy

This model of care outlines that an MDT approach with input from a wide variety of clinical specialities and team members as listed below is essential to high quality effective and safe care. These clinicians are essential in the care pathway for women during pre-pregnancy care through to pregnancy, can respond to changes throughout pregnancy, birth, post-partum and plan for (or avoid with adequate contraception) the next pregnancy

General Practitioner

GPs are uniquely placed to provide lifelong care to women with both PGDM and GDM. GPs are the specialist providers of family planning and contraception advice in the community and are often the first healthcare practitioner to know that a woman with diabetes is planning to start a family or has a positive pregnancy test. GPs provide counselling on optimizing lifestyle measures such as weight management and smoking cessation prior to pregnancy and alter medication appropriately including discussions around teratogenicity of medications and starting high dose folic acid. Most women in Ireland attend their GP for at least six visits during their pregnancy. Although currently GPs do not offer GDM screening routinely, in the flow of shared antenatal care, glycosuria is routinely detected at GP visits and women are referred on for specialist care. In the post-natal period women return to the care of their GP and will need regular screening for the development of diabetes for the rest of their lives; it is well within the remit of a GP to provide this advice regarding risk modification for T2DM and future pregnancy planning. More detailed or specific advice for future pregnancies may require referral to maternity or endocrinology service. These women will need appropriate contraception and preconception medical advice should they choose to conceive again. Women have an enduring and trusting relationship with their GP which supports continuity of care for chronic disease management as well as family planning.

"more GP input"

"very difficult to arrange postnatal GTT - (hospital name redacted) told me to do it with GP but GP couldn't do that test"

Endocrinologist

An endocrinologist is a physician who specialises in treating disorders of the endocrine system, such as diabetes and is registered on the specialist division of the Irish Medical Council. The endocrinologist who leads on a DIP service, is expected to have completed additional sub-specialty training in this area and demonstrate that they have worked and delivered care in this area. The endocrinologist should coordinate the person's diabetes care with the other members of the multidisciplinary team and establish and regularly update the person's management plan. The endocrinologist with the full team members should conduct regular audit of services to inform future planning and reform as required.

"Constant blood sugar management with an endocrinologist every week"

Obstetrician

An obstetrician/gynaecologist is a medical doctor who is registered as a specialist in obstetrics and gynaecology with the Irish Medical Council. All obstetricians working in diabetes care should have clinical experience in this area and should maintain continuing professional development in diabetes and pregnancy care, working within their level of competence, experience and education in the field.

Ideally, obstetricians working in larger maternity units (>5,000 births/year) should have additional maternal/foetal medicine training. This is normally a two-year additional training at fellowship level in the sub-speciality of maternal-foetal medicine; diabetes is currently the most common clinical condition within maternal medicine.

"(Obstetrician) was excellent – he went above and beyond to ensure I got the best care during my pregnancy and delivery".

DIP Midwifery/ Nursing Staff:

Registered midwives: Registered midwives provide care to women with GDM and PGDM during and after pregnancy working within the MDT and with adherence to local and national policies and guidelines. This includes care related to PPC, promoting self-care and emotional well-being, nutrition, urine and blood glucose and ketone monitoring and oral and injectable therapies.

"The nurses were very helpful and available for queries or worries"

"Dedicated clinical midwife specialist in gestational diabetes – so useful"

"Amazing AMP (advanced midwife practitioner) CMS (Clinical midwife specialist)"

"Was always able to contact someone when I had a problem, for example the nurse specialist"

Clinical Midwife Specialist in Diabetes (CMS)/Clinical Nurse Specialist (CNS) in DIP

A CMS is a registered midwife working as a clinical specialist and in the case of DIP will have completed a post-registration programme in Diabetes Care at a minimum of Level 8 (60 ECTS) or above on the National Framework of Qualifications.

The CMS is an integral member of the multidisciplinary team providing diabetes specialist care to women with diabetes in pregnancy and providing support and treatment through the continuum of care. The post holder's practice is based on the five core concepts of the CMS role: Clinical Focus, Client Advocate, Education and Training, Audit and Research and Consultant Clinical Focus. The CMS has a strong woman centred focus.

The CMS reports to the Clinical Midwife Manager 3 or Assistant Director of Midwifery. The MoC recommends that all maternity units should have at least a 1.0 WTE of CMS dedicated to DIP care with hub sites aiming to have a ratio of 1:1000 of CMS DIP to births.

If the post holder is a CNS in DIP they work within the scope of nursing and refers any pregnancy or birthing related issues or concerns to the midwife or obstetrician.

Registered Advanced Midwifery Practitioner Diabetes in Pregnancy (RAMP)/Registered Advanced Nurse Practitioner (RANP) DIP

A RAMP is a midwife who is registered as an advanced midwifery practitioner with the Nursing and Midwifery Board of Ireland (NMBI); meets the advanced practice (midwifery) standards and requirements by the regulatory authority and operates within the scope of the registered midwife. All RAMP DIP are registered midwives, possess a Master's degree (level 9 or higher on the National Framework of Qualifications) which is relevant, or applicable, to the advanced field of diabetes, have extensive experience and qualifications in DIP and are registered as a Nurse/Midwife prescriber.

The RAMP is an integral member of the multidisciplinary team providing advanced diabetes practice care to women with DIP within the 'specialised care pathway' of the National Maternity Strategy. RAMPs utilise advanced clinical diabetes and midwifery knowledge and critical thinking skills to provide optimum care and improved clinical outcomes for women and their babies through higher levels of critical analysis, problem solving and senior clinical decision-making as a lead healthcare professional in diabetes care who is accountable and responsible for their own practice. A RAMP promotes wellness, offers healthcare interventions and advocates healthy lifestyle choices for women, their families and the community in collaboration with other healthcare professionals. The RAMP can request diagnostic tests, provides appropriate interventions, admissions and discharges, refers women within their care as necessary and takes referrals from other professionals.

As a senior practitioner, the RAMP DIP works strategically facilitating the development of high quality, evidence-based practice, initiating research and evaluation, and supporting the education and competency of midwives and other healthcare professionals in the diabetes care of women and their babies.

The RAMP DIP is professionally accountable to the Director of Midwifery and clinically accountable to the consultant/clinical lead in endocrinology and obstetrics. The MoC recommends that at a minimum, all hub hospitals should have at least one RAMP in diabetes care in pregnancy.

If the post holder is a RANP they work closely with the midwifery and obstetric team referring accordingly any pregnancy, birth or postnatal related issues, though general antenatal care should be provided by the obstetrics team.

Senior or Clinical Specialist Dietitian

A dietitian is a health care professional who has a Bachelors or Master's degree specialising in nutrition and dietetics and is registered with CORU. Dietitians are essential members of the DIP MDT and the only healthcare professional trained to assess, diagnose and treat dietary and nutritional problems.

Dietitians deliver dietetic care, based on current evidence and best practice, which supports women to make health behaviour change in the area of food choices and lifestyle that are associated with a healthy pregnancy and positive outcomes. Assessment and care planning takes into account many factors including access to food, knowledge and attitudes, cultural influences, use of diabetes technology,

insulin or pharmacotherapy therapy and other health conditions and procedures affecting food intake e.g. hyperemesis, bariatric surgery, CF. Dietitians make professional decisions in collaboration with other MDT members.

Grading for Dietitians:

Clinical specialist dietitian with experience in diabetes – is required in each maternity hub setting and for each community health organisation (CHO) in addition to senior posts. They bring advanced clinical judgement for more complex patients, guide and develop service delivery and dietetic practice within the specialty, and contribute to education and training.

Senior dietitian- as standard, it is recommended that women with DIP are referred to a dietitian who has experience working with people with diabetes (46). The experience of a senior dietitian is required for the area of DIP to ensure safe and effective practice and to plan and deliver a high-quality service.

Staff grade dietitian - should only provide dietetic care to woman with DIP when there is a senior dietitian or clinical specialist in the same maternity setting to provide training, supervision and mentoring (47). A staff grade dietitian should have some experience working in the area of diabetes.

"The session with the dietitian was very thorough and helpful"

"meeting with the dietitian was positive and the education information provided, such as booklet with suggested meals and how to plan them"

"The dietitian sheets of paper I received were old photocopies that would have benefited from being typed up and printed again. The food plan was generic and it didn't suit me at all and I don't remember meeting a dietitian for individualised attention – that may have made a difference"

"tailored dietary support for the individual instead of one online group lecture"

Perinatal Mental Health

Women with GDM are twice as likely to develop perinatal and postpartum depression. To support women with poor glycaemic control in pregnancy, there needs to be integrated physical and mental health care.

Psychiatric morbidity, diabetes related disorders and social problems are barriers to diabetes self-care which lead to worse outcomes and increased healthcare costs. For some women, there is a psychological impact on receiving the diagnosis as well as living with a chronic illness. Women with poor glycaemic control are at a great likelihood to develop depression and anxiety. Support is needed for lifestyle change including a focus on diet, breastfeeding, physical activity and emotional regulation. The cognitive behavioural therapy model of psychological support can be a pathway of care as well as access to medication management for those women who have more severe psychiatric morbidities.

Integrated clinics should provide education and awareness, access to information, service provision, wrap around services and support for families and carers. There is a need for a full MDT with psychiatry, psychology, social work and peer support. There is a need for 1 WTE consultant psychiatrist, 1 WTE senior psychologist, 1 WTE Social Worker and a full-time peer support worker in a busy maternity hospital that has 10,000 deliveries per annum. This MDT will in turn be able to provide advice and expertise to other units as a hub and spoke model.

A biomedical, psychological and social criteria-based referral system for identifying and managing high risk individuals with poor glycaemic control can lead to improved health in all dimensions for both mother and baby.

Pharmacist

A pharmacist with expertise in pregnancy is an essential member of the MDT. Input on medication safety, reconciliation and safety netting can be important in the provision of high quality and evidence-based care. This is particularly important with insulin use.

Psychologist

Psychologists seek to help people with a range of personal difficulties. Often these problems cause distress or difficulty in how someone is feeling, thinking or behaving. Psychologists are trained to apply their knowledge in practical ways to help people understand their difficulties and explore ways of making positive changes. Professionally qualified psychologists hold accredited postgraduate qualifications in areas such as clinical, counselling and educational psychology.

Clinical psychologists provide specific evidence based psychological assessments and interventions to assist with behaviour change, lifestyle modification, and to address mental health disorders that may impact on the mother or baby (for example, depression, anxiety, bereavement, trauma, substance abuse) or to assess risk of self-harm. Treatment takes place in both group settings and on an individualised basis. Psychological assessment and treatment may be required both for those with pre-gestational (pre-existing) diabetes or for those who develop gestational diabetes and are at any stage in the journey from ante-natal care to post-natal care and for longer term prevention. Clinical psychologists may also assess cognitive and neuropsychological aspects of diabetes. Service provision may be in both inpatient and outpatient settings and can include community-focused preventative interventions. In addition to direct clinical input with patients, psychologists are also an important source of expertise for training delivery (patient education and staff education), for consultation with the MDT and for research and evaluation.

"Absolutely horrendous. I suffered PTSD (post-traumatic stress disorder), depression and burnout after both pregnancies"

"Automatic link with perinatal mental health"

"It's very stressful, all the checking and injections. Not sure what could change when you just have to get on with it. I was also injecting for a blood clot and dealing with chronic hyperemesis so I felt very low dealing with everything. Maybe a referral to a mental health professional would have been good"

"…affected my mental health as I already felt very guilty that I was harming my baby because of the diabetes and I blamed myself for being overweight"

Ophthalmologist

The ophthalmogist is a doctor who examines eyes. A consultant ophthalmologist is a medical doctor who underwent basic medical/ surgical ophthalmology training and higher surgical/ medical training in ophthalmology and is registered on the specialist register with the Irish Medical Council. Ideally consultant ophthalmologists who are managing patients with diabetic retinopathy referred from diabetic retinal screening and women with diabetes who are pregnant will have undergone further subspecialty training in medical retina/ surgical retina.

Currently all people with Diabetes over the age of 12 years can be registered in the diabetic retinal screening service and as such should be getting free eye screening in the community for signs of diabetic retinopathy.

During pregnancy because of both increased circulating growth factors, physiological changes and a sudden tightening of sugar control there can be a progression of the woman's diabetic retinopathy. Due to this, women with diabetes who become pregnant require additional retinal screening.

Pregnant women who have pre-pregnancy Diabetes usually undergo extra ophthalmic examination and screening during pregnancy, looking for progression of their diabetic retinopathy. As part of the Diabetic retinal Screening program a retinal screening pathway during pregnancy has been created. This will be delivered in the community diabetic retinopathy screening clinics from 2024.

Women can be registered with the Diabetic Retina Screen via pregnancyeye@screeningservice.ie. This screening should before or soon after the first antenatal booking visit (8-12 weeks) and again at 28 weeks. If there are any early signs of diabetic retinopathy found, another test will be offered at 16-20 weeks of pregnancy. If significant diabetic retinopathy is found a referral to an eye specialist in a treatment clinic in hospital will be made, if the woman is not already attending for screening in a treatment centre.

If significant diabetic retinopathy is present more visits in a treatment centre may be required to monitor and/or organize treatment. This may be with pan retinal photocoagulation laser for proliferation of diabetic retinopathy or intravitreal steroid injection may be required for diabetic maculopathy.

Women with gestational diabetes do not require diabetic retinal eye screening.

After the pregnancy if no treatment was required most people with PGDM will continue their follow up in the community with the diabetic retinal screening service. Patients who require treatment will stay under the care of the consultant ophthalmologist in the hospital until they are stable.

Infant feeding Specialist/Infant feeding CMM

The lactation consultant in the maternity hospital has an important role in diabetic-specific antenatal education, focussing on the importance of breastmilk for both mother and baby's health in reducing the risk of developing diabetes in future. The lactation consultant works in collaboration with the rest of the MDT. Every maternity hospital should have a care pathway for breastfeeding/ optimum infant feeding for both mothers with T1DM and T2DM in pregnancy. Additionally, guidelines should be in place for the harvesting, transporting, storing and use of colostrum with a patient information leaflet on harvesting of colostrum/care pathway for supporting optimum infant feeding.

Every woman with DIP should have at least one opportunity to have a one-to-one consultation with the

lactation consultant during the third trimester (32-38 week's gestation preferably) to discuss and develop a personal breastfeeding plan for the individual mother and baby. During the antenatal consultation, the lactation consultant will support the mother in harvesting of colostrum, if found suitable.

Postnatally, the lactation consultant will offer further support based on the review of the Registered Midwives/ Registered Nurses or other members of the MDT. Women should have details of further support available to them from the maternity hospital as well as from the community. If needed, the mother and baby will be offered an individual consultation for sustaining breastfeeding/optimum infant feeding after discharge from the maternity hospital.

"Increased lactation support would have been really helpful for me"

"I stated my intention to breastfeed to every healthcare professional who asked me about it, but at no point was I informed about colostrum harvesting. I only learned this several years later through a Facebook group for gestational diabetes, (the group) which I only discovered after baby was born. It would appear to be very important for babies that may have blood sugar issues at birth. Baby was given formula feeds by the nurses during the first night and possibly subsequent nights, but definitely the first nights. He was also in distress with so many blood sugar tests administered to him. Being able to feed colostrum on the first day would have benefited him. I feel this was a big omission in our care" (note colostrum harvesting has only recently become more widespread)

Fetal Sonographer

A fetal sonographer can be a radiographer, radiologist, midwife, nurse or obstetrician with specialist training in pregnancy ultrasound. Women/people with diabetes in pregnancy require fetal ultrasounds in the first trimester (for viability, dating and to confirm if singleton or multiple pregnancy), second trimester (anatomy, plus fetal echocardiography if pre-gestational or early onset gestational diabetes) and in the third trimester (growth, wellbeing, liquor volume, and placental localisation). Postnatal women/people with diabetes may need postnatal ultrasound assessment. Specialist training can include Masters in Ultrasound, Maternal-Fetal Medicine fellowships or specialist modules.

Physiotherapist

Physiotherapists provide specific evidence-based exercise prescriptions for women with DIP. Treatment takes place in both group settings and on an individualised basis for those with complex needs or concurrent musculoskeletal or pelvic floor dysfunction. Physiotherapists work closely with other members of the multidisciplinary team to ensure that patients are exercising at a level that is sufficient to aid glycaemic management. Promoting exercise in pregnancy is key to establishing healthy lifelong behaviours for both mother and baby. Physiotherapists promote and monitor physical activity and associated musculoskeletal/pelvic floor dysfunction in women with diabetes in pregnancy

Medical Social Workers

Individuals living with diabetes confront an array of challenges, from both the disease and its treatment. Given the nature of diabetes, its escalating presence, and person-dependent treatment regimen, social workers have immense potential to improve the lives of people facing this chronic illness through well-established roles of educator, advocate, counsellor, therapist, community developer, and resource broker (77). Traditionally, many interventions for people with diabetes focus on biologic and behavioural factors, such as symptoms, diet and physical activity. However, it is equally important to address the influence of physical and social environment, which may include low income, employment insecurity, low educational attainment, and poor living condition on health outcomes. The profession of medical social work is located precisely at the intersection of health and inequality and practitioners are uniquely trained and skilled to address the broad scope of social determinants of health from a systemic perspective. As such, medical social workers are ideally placed to make a key contribution to the care of people with diabetes. The role of the Medical Social worker as part of the MDT can enable and support people with DIP to avail of resources and services available to them. The social worker provides a range of practical and psychosocial services to women who are receiving care in the hospital and are experiencing additional challenges such as coping with stress and changes, relationship issues, lack of social supports and managing mental health concerns.

Administration Staff

The position of administrator is pivotal to the smooth day to day running of a DIP service. They are responsible for all aspects of administration involving patient flow including receiving referrals, establishing and maintaining patient records, scheduling of clinics and appointments. The administrator works closely with other departments involved in the combined care of women with DIP, including obstetrics, ophthalmology, dietetics and social work. They manage and maintain a postpartum recall system, manages diabetes technology applications and provides support to service users as needed.

The administrator manages and maintains the diabetes specific clinical information system for a DIP service in a hospital group. They take responsibility for completion of patient records on the database and performs regular audits to ensure data accuracy, collecting data as necessary from hospital obstetric databases and patients' medical charts. The administrator provides ad hoc and fixed reports from the system, creates letter/report templates, sets up new users and provides training as necessary. Regular liaison with the database suppliers and the IT Department, testing of new functions, upgrades, interfaces etc are integral to the role.

The administrator participates in and leads out on initiatives to achieve efficiencies in all administrative pathways and processes associated with a DIP service. A grade 5 post is appropriate for the skills required.

Pre-Gestational Diabetes (PGDM)

Pre-pregnancy care for women with PGDM

Diabetes is one of the most common medical conditions to complicate pregnancy and women with PGDM have an increased risk of serious adverse pregnancy outcomes. Pre-pregnancy care (PPC) is the targeted support and additional clinical care offered to women planning pregnancy. There is convincing evidence that PPC is both clinically effective and cost effective in improving pregnancy outcomes for women with PGDM(8) (9).

In Ireland, the availability of PPC for those with pre-existing diabetes is inadequate. Where PPC is available, research has shown that only 40% of eligible women attend the service. Women with T2DM, those in ethnic minority groups and those with higher HbA1c/blood glucose levels out of target are less likely to attend PPC.

The following sections outline two levels of PPC that should be provided to women with PGDM:

- Pre-pregnancy awareness
- Specialised PPC clinics

Pre-pregnancy awareness

Women living with diabetes have multiple contacts with healthcare professionals throughout their lives as part of their routine care, including GPs, practice nurses and specialist community and hospital diabetes teams. All these healthcare professionals have a role to play in pre-pregnancy awareness for women with PGDM. In line with the principles of 'Making Every Contact Count', every routine consultation with these women should be used to raise awareness of the importance of pre-pregnancy planning. Simple key messages for these women should be consistent:

- If you have diabetes and would like to get pregnant, engage with your diabetes team to prepare for the pregnancy in advance.
- If you are not trying to get pregnant, ideally you should be using some form of contraception.

Additional information and advice should be provided to the women to empower them to make the best choices regarding pre-pregnancy planning and to answer any questions that they may have. All healthcare professionals involved in the care of those with diabetes should be aware of and familiar with their local referral pathways to specialised PPC clinics so that they can refer women to this service in a timely fashion when required.

Accurate and up-to-date PPC information needs to be included across the curricula of all available diabetes structured education programmes in Ireland

Specialised pre-pregnancy clinics

Specialised PPC clinics are delivered by specialist hospital diabetes MDTs. All hospital groups should offer PPC clinics as part of this care. To use resources efficiently, specialised PPC clinics could be organised on a regional basis or across an entire hospital group. They may be delivered in the hospital OPD setting or an outreach service could be set-up in the community, delivering care closer to the woman's home.

The main healthcare professionals involved in PPC clinics are the consultant endocrinologist, specialist or advanced nurse or midwife (diabetes), dietitian with diabetes experience and in some, more complex cases, the obstetrician/ maternal foetal medicine specialist may also be involved. Specialist PPC clinics may be led by the specialist or advanced nurse or midwife (diabetes) or the consultant endocrinologist depending on local arrangements, however, in all cases the MDT should be involved as required. PPC focuses on analysis and treatment of diabetes complications, discussion and change of medications for glucose and blood pressure control, commencement of folic acid and aspirin as required, achieving tight glycaemic targets with emerging technologies for continuous glucose monitoring (CGM), support diet, lifestyle changes and weight management as needed. Once pregnancy is confirmed the woman is referred for specialist combined multi-disciplinary antenatal care.

Referral to specialist PPC clinics may be made by the GP, specialist community diabetes teams, or hospital nursing and medical staff. Should a woman self-refer, a letter from her GP is requested. Referral criteria for specialised PPC clinics are that the woman is actively planning a pregnancy within the year and that they have a laboratory diagnosis of diabetes (e.g. T1DM; type 2 diabetes; CF associated diabetes; LADA; MODY; diabetes associated with transplantation).

Staffing of PPCs will depend on the location of service: The acute National Survey of Diabetes Care Delivery in Acute Hospitals (2018) prepared on behalf of the National Clinical Programme for Diabetes revealed only 12 of the 31 services were providing a PPC at that time. Depending on local circumstances within the hub, PPC could be provided in general endocrinology service, endocrinology and AMP/CMS specialising in diabetes in pregnancy or within the maternity service when obstetrics input is required.

The Pre-pregnancy consultation should consist of:

- A person centred approach is facilitated for PPC where the woman is a partner in her prenatal care, is supported to make informed decisions and enabled to self-manage her condition in preparation for conception
- The PPC consultation is facilitated by specialist or advanced nurse or midwife practitioner (diabetes) or the consultant endocrinologist as appropriate with the support of a dietitian with experience in diabetes
- Women with co-existing disease or complications (e.g. diabetic nephropathy, CF, renal transplant) or non-diabetic disease (e.g. inflammatory bowel disease requiring medications) or a significant obstetric complication in previous pregnancy e.g. severe preeclampsia, major obstetric haemorrhage) may also require obstetric pre-pregnancy counselling. This pathway should be operationalised within each hospital group.
- Written and electronic access to educational materials and information given including importance of breastmilk in prevention of diabetes in mother and infant.
- Baseline assessment completed.
- Contraception initiated or continued.
- Medications reviewed and changed as appropriate.
- Folic acid 5mg prescribed.
- Consider vitamin D supplementation
- Glucose monitoring reviewed and targets set for glucose and HbA1C or time in range if using CGMS. Hypoglycaemia awareness and prevention detailed.
- Assess the need for structured diabetes education
- Consider use of diabetes technology where appropriate to achieve desired glycaemic targets
- Referral for retinal screening
- Offered smoking cessation services
- Referral for bloods (Renal, rubella, TFT, vit D, coeliac, HbA1C, vitamin B12) according to the ADA 2023 standards
- Follow on care is at 1-4 week interval for glucose target review and insulin adjustments
- At visits, weight, BMI, BP are checked and HbA1C monthly until < 48mmol/mol
- When targets are achieved and diabetes is stable and following consultation with the woman, contraception should cease.
- Patient advised to report to PPC staff when pregnancy is confirmed so that antenatal care can be arranged.
- A standard transfer of care template from acute service or GP should be forwarded to maternity service when pregnancy is confirmed. This should include details on past medical history, retinal screening, diabetes complications.

Bereavement and Complex Needs

Before outlining the proposed care pathways for people with PGDM and GDM, it is important to acknowledge that not all people with DIP may give birth to a healthy baby. Pregnancy may end in miscarriage, early pregnancy loss (including ectopic and molar pregnancy), mid trimester miscarriage, intrauterine death or neonatal death. People with DIP may choose to end a pregnancy either by personal choice in the first trimester, or later due to medical complications that can increase their risk of severe harm or death, or fetal conditions that may lead to death in pregnancy or the first month after birth. For each and every situation appropriate respectful bereavement care should be provided, based on the needs and wishes of the individual and their family. Clinical psychology input can be sought where additional psychological care is indicated.

People with DIP may equally deliver an infant with complex needs, requiring early neonatal intervention and care. As such, members of the MDT providing care may expand to include fetal medicine, neonatology, paediatric cardiology, paediatric surgery, palliative care, genetics or other specialities as appropriate. Care may need to be moved to a tertiary level unit to provide more specialist care while still aiming to provide individualised person-centred care and some normality and bonding in the midst of complexity.

Care Pathway for PGDM

The care pathway for PGDM is shown in figure 4. Once pregnancy is confirmed, the woman enters the specialised care pathway for high-risk pregnancy. In this care pathway, the woman receives input from diabetes MDT, ophthalmology, obstetrics, midwifery, dietetics, and the ultrasound department. Care is focused on maintaining normal glycaemic targets using routine and new technologies for glucose monitoring and insulin delivery. Close fetal surveillance is an integral component of the service and delivery is individualised and planned. One to one consultation with Infant feeding specialist is facilitated and colostrum harvesting is supported if suitable, given the results from the DAME trial (78, 79). In the immediate post-natal period, care is continued by the multidisciplinary hospital team. Pre-pregnancy insulin regimes are initiated and medications restarted as appropriate for breast feeding. Follow up support should be provided for breastfeeding if unresolved issues persist. Future pregnancies and contraception are discussed at this point and appointments for ongoing diabetes care are in place at time of discharge.

Figure 4 Care Pathway for Pre-Gestational Diabetes Mellitus

All women with pre-gestational diabetes who are pregnant should be referred to Specialised Care Pathway (Diabetes in Pregnancy Services) as soon as possible. Women can self-refer or can be referred by GP or Endocrinology Service.

ANTE-NATAL CARE

In addition to standard antenatal care the specialist MDT should work in partnership with the woman to deliver the following specialised care:

- Specialist Multidisciplinary care including (at a minimum): Endocrinology, Obstetrics, Specialist Diabetes Nursing/ Midwifery, Dietetics and other Medical, nursing specialities as required (e.g. co-existing disease, Ophthalmology for Type 1DM).
- All MDT members work collaboratively with the woman to assess, determine and review personalised care plan at each consultation
- Frequent review (usually every two to four weeks) ± admission as clinically required. Review can be virtual or in-person. Women who have PGDM can have weekly telehealth consultations with the Diabetic midwife/nurse specialist team to allow for insulin adjustments and identification of any concomitant medical or other concerns that warrant emergent or sooner clinical review. Face to face consultations happen with the MDT on a monthly to forthnightly to weekly basis according to gestational age and other co-morbidities, with increasing antenatal care in the third trimester consistent with routine antenatal care for all women.
- Baseline assessment to include booking bloodwork, diabetes assessment, co-morbidities, history (e.g. DKA), physical examination (include weight, height, BMI), confirmation of pregnancy, dating and viability. Assess level of hypoglycaemia (un)awareness.
- At each visit BP and urinalysis performed, glycaemic control assessed & adjustments to medications made. Abdominal palpation for fetal size, position as appropriate, fetal heart beat checked. Gestational weight gain noted.
- Ultrasound scans at intervals to include dating scan, anomaly scan, fetal echocardiogram and fetal growth assessments with increased surveillance if required.
- Work collaboratively with woman regarding assessment & +/- treatment for hyperemesis
- Work in partnership with the woman to assess for complications of diabetes including hypoglycaemia awareness
- Regular review from specialist diabetes nurse or midwife as medication dose requirements may change e.g. with increase insulin resistance
- Retinal assessment as per the new Diabetic retina screening in pregnancy pathway
- Woman should engage with regular consultations with Clinical Specialist or Senior Dietitian
- Assessment and support from Lactation specialist to emphasize positive impact of breastfeeding on diabetes for mother and baby(unless clear contraindication against breast feeding). Opportunity for enabling harvesting of colostrum if suitable.
- As part of holistic, person-centred care, consider need for onward referral to Specialist Perinatal mental health; Psychology; Physiotherapy; Medical Social Work or other multidisciplinary team members.

LABOUR AND BIRTH

- Individualised care plan devised between team and woman considering all factors
- Birth in the right place at the right time with the right people e.g. term birth may be in a unit geographically close to the mother's home, but a pre-term birth/birth of baby with fetal concerns may require transfer to a level 3 neonatal unit/tertiary level maternity hospital
- Aim to minimise separation between mother and baby
- Encourage breastfeeding as approriate. Provide harvested/hand expressed colostrum if available.
- Promote continued skin to skin contact to reduce hypoglycaemic episodes.

POST NATAL CARE

- Postnatal pharmacological treatment planned by diabetes team in collaboration with the woman
- For those previously on insulin, the pre pregnancy insulin doses resume. If these are unknown reduce pre-delivery doses by 50% under supervision of endocrinology/nurse or midwife specialist.
- If breast feeding, metformin can restart. All other medications should only be restarted in consultation with the diabetes team/ pharmacy/lactation support.
- At discharge ensure follow up Lactation support either in the hospital or community if unresolved breastfeeding issues exist.
- Prior to discharge discuss future pregnancies and contraception
- At discharge ensure appointment is made for follow up of diabetes in pregnancy care in the hospital service for one post partum visit. Coordinate timely discharge summary to GP.

Type 1 Diabetes	Complicated Type 2 Diabetes	Uncomplicated Type 2 Diabetes
LONG TERM FOLLOW-UP	**LONG TERM FOLLOW-UP**	**LONG TERM FOLLOW-UP**
Hospital Specialist Diabetes Service	Care may alternate between General Practice and/or Ambulatory Care Hub/Hospital Specialist Diabetes Service	General Practice

Gestational Diabetes (GDM)

"wider testing – I had to keep reminding staff that I needed a GTT due to a risk factor"

"(GDM) is full of stigma and associated with being fat. I think it would help the stigma if there was universal screening rather than only screening those with a high BMI"

International societies and guidelines recommend that every women should have a check for undiagnosed diabetes at their first antenatal visit with their GP or hospital using an HbA1C (>48mmol/mol), fasting glucose (>7mmol/l) or post prandial fasting glucose (>11.1mmol/l) (as appropriate) (ADA Standards of Care 2023; IADPSG recommendations 2010; WHO guidelines 2014). Thereafter employing a national GDM screening strategy across all units allows for important comparisons of data, useful research and audit, and the ability to provide national data. There is a strong international focus now on harmonisation of GDM screening across countries.

Debate continues regarding universal or selective risk factor-based screening. Often the choice between universal and selective screening depends on the organization of prenatal care and the funding available. Many guidelines including the American Diabetic Association (ADA), World Health Organisation (WHO), International Federation of Obstetricians and Gynaecologists (FIGO), the European Board and College of Obstetricians and Gynaecologists (EBCOG), the European Association of Perinatal Medicine (EAPM), the Australasian Diabetes in Pregnancy Society (ADIPS) and the Endocrine Society recommend universal screening in countries with enough resources, with alternative screening strategies in low income countries(80-84). We recognise that the current NICE guidelines(85) recommend selective screening in the United Kingdom, but this is at variance with other guidelines. Selective screening carries the risk of missing significant proportions of GDM cases while universal screening identifies all cases. A variety of studies have confirmed that a risk factor approach misses 5-45 % of GDM cases (86-88) and missed GDM cases without risk factors have worse pregnancy outcomes than women without GDM(87, 88). Data from the Irish ATLANTIC-DIP study showed that selective screening based on risk factors missed 20% (using NICE criteria), 16% (using Irish selective screening guidelines) and 5% (using ADA guidelines) of women diagnosed with GDM using IADPSG criteria. Moreover outcomes in these pregnancies were worse compared with normal glucose tolerance pregnancies including hypertensive disorders, caesarean sections, polyhydramnios, and NICU admissions(88).

We recognise that some guidelines recommend pragmatic screening strategies based on resources, and we also recognise that this is a controversial area. This was a subject of much discussion amongst the geographically disparate multidisciplinary team who have written this model of care and having reviewed the evidence we recommend universal screening, but also recognise that this has significant resource implications and advocacy work will be required. This is not a strategy that can be introduced without resources.

Debate continues on which set of criteria to use. The Carpenter - Coustan criteria (modified from the original O'Sullivan criteria) are based on a sample size of circa 500 women in one state in the US. The criteria were chosen to identify women at high risk for the development of diabetes after pregnancy and not to identify pregnancies with an increased risk of adverse perinatal outcomes(89) . The IADPSG criteria are based on the HAPO blinded study of 23,000 women across five continents. The criteria are based on HAPO demonstrating a continuous and graded relationship between maternal hyperglycaemia and the risk for adverse perinatal outcomes(54, 90). These IADPSG criteria were adopted by WHO and are now

referred to as the 2013 WHO criteria for GDM(80, 91). The expected benefits of using IADPSG criteria to the offspring are inferred from intervention trials that focused on women with lower levels of hyperglycemia than identified using older GDM diagnostic criteria(92). Those trials found benefits including reduced rates of large-for-gestational age births and pre-eclampsia(49, 93). It is important to note that 80–90% of women being treated for mild GDM in these two randomized controlled trials could be managed with lifestyle therapy alone. The cut-offs in these two trials overlapped with the thresholds recommended by the IADPSG, and in one trial(49), the 2-h PG threshold (140 mg/dL (7.8 mmol/L) was lower than the cut-off recommended by the IADPSG (153 mg/dL (8.5 mmol/L)).

No randomized controlled trials of treating versus not treating GDM diagnosed by the IADPSG criteria but not the Carpenter-Coustan criteria have been published to date. However, a recent randomized trial of testing for GDM at 24–28 weeks of gestation using the IADPSG vs Carpenter-Coustan criteria showed that twice as many women with GDM were identified using IADPSG vs Carpenter & Coustan criteria. Despite treating more women for GDM using the IADPSG criteria, there was no population difference in pregnancy and perinatal complications (94). This paper generated plenty of debate as the study was not powered to identify the likely impact of the IADPSG approach. In addition, 27% of those randomised to the IADPSG protocol underwent Carpenter - Coustan protocol, 6% of the cohort received no testing and a subset of women assigned to the Carpenter - Coustan protocol did not meet the criteria for GDM but were treated as such because of an elevated fasting glucose. The intervention in this latter group would lead to a reduction in adverse outcomes but not in the number of women identified with GDM, increasing the apparent efficacy of the Carpenter - Coustan protocol(95). Indeed the author of this opinion piece is the same person whose name is given to the Carpenter - Coustan criteria and he urges caution in the interpretation of this RCT by Hilier and colleagues and recommends that the IADPSG approach should be given consideration for adaption in the US and beyond.

More recently Crowther and colleagues examined lower vs higher glycaemic thresholds using a randomized controlled trial design randomising 4,061 pregnant individuals in a 1:1 ratio to be evaluated for GDM diagnosis following a 75gram oral glucose load(96). From a population standpoint there was no difference in the primary outcome (rate of “large for gestational age” (LGA) infants) between the lower and higher glycaemic criteria groups at 8.8% and 8.9% respectively. A pre-specified subgroup analysis examined the effects of diagnosis and treatment of milder disease. In this analysis, 195 participants assigned to the lower glycaemic criteria group and treated were compared to 178 participants with similar glucose values on screening but assigned to the high glycaemic criteria group and therefore untreated. These individuals had similar baseline characteristics. Those who were treated gave birth to fewer LGA infants compared to those who were untreated (6.2% vs 18.0%), with a low number needed to treat of 4. In support of this finding, the rate of shoulder dystocia (0.5% vs 3.9%) and a composite infant outcome of any serious event (0.5% vs 3.9%) was higher in the untreated group. Neonatal adiposity is independently associated with childhood adiposity and portends poor future metabolic health(97). Therefore, LGA prevention could break a transgenerational cycle of metabolic diseases in addition to reducing the substantial cost of treating its immediate complications (98). Treated participants had significantly less gestational weight gain (10.0 kg vs 11.9 kg), had a lower incidence of preeclampsia (0.5% vs 5.6%) and were more likely to be successfully breast feeding at hospital discharge (99.5% vs 94.9%) when compared to untreated participants. Individuals with GDM have at least a 7-fold greater lifetime risk of developing type 2 diabetes compared to those without GDM. Type 2 diabetes risk is even greater if preeclampsia coexists in the mother with GDM(99)) and could be attenuated by weight management and successful breastfeeding. Finally, neonatal hypoglycemia was detected and treated more frequently in the lower glycaemic subgroup (27.2% vs 9.0%). As highlighted by the study authors(96) neonatal hypoglycemia is associated with adverse

neurodevelopment, and this finding raises concern for neonates in the higher glycaemic group who likely went undiagnosed.

Overall, the findings of this study support the concept that using lower glycaemic criteria for GDM diagnosis increases the number of individuals diagnosed with GDM but does not reduce immediate pregnancy complications within a large study population. However, the important benefits in individuals who were treated for milder disease are striking. With the understanding that GDM does not end with childbirth, we should not overlook the possibility that GDM diagnosis provides a unique opportunity to positively impact short- and long-term maternal-fetal health.

Debate also continues on whether a 1-step vs 2-step approach is best. The 1-step approach uses the 2 hour 75g OGTT as screen and diagnostic test and the woman has to attend once, but over an extended period rather than opportunistically during a routine antenatal clinic visit. The 2-step approach uses a GCT in the non-fasting state and if the glucose is > 7.8 mmol/L, the woman proceeds to a 100g OGTT over 3 hours. The advantage of this approach is that less women require the full OGTT. The disadvantages are that many women will need to attend twice, women with a positive GCT may not attend for an OGTT and maybe lost to follow up and women who may have a glucose abnormality based on a fasting blood glucose alone will be entirely missed. The WHO, IDF, EBCOG, FIGO, EAPM and ADIPS recommend using IADPSG criteria (1-step) while ADA and ACOG recommend either 1-step or 2-step approach using the Carpenter - Coustan criteria.

Overall, the advantages of moving to universal screening are strong. The conflicting recommendations from expert groups underscore the fact that there are data to support each strategy. A cost-benefit estimation comparing the two strategies concluded that the 1-step approach is cost-effective if patients with GDM receive post-delivery counselling and care to prevent T2DM(100). This is now part of the national programme to prevent diabetes in high-risk individuals. The decision of which strategy to implement must therefore be made based on the relative values placed on factors that have yet to be measured (e.g., willingness to change practice based on correlation studies rather than intervention trial results, available infrastructure, and importance of cost considerations). As the IADPSG criteria have been adopted internationally, further evidence has emerged to support improved pregnancy outcomes with cost savings (101) and IADPSG may be the preferred approach. Until there are more randomised trials, this MoC recommends national universal screening using either the 1-step IADPSG or the 2-step Carpenter - Coustan criteria(100). It is acknowledged that changing from risk factor-based screening to universal screening necessitates a change in practice and a significant increase in resources. Such resources include phlebotomy, availability of testing in community and hospital locations as appropriate, transport of samples to laboratories and medical scientists and administrative staff to oversee the process. It is acknowledged also that more women with milder glucose abnormalities will be identified where lifestyle intervention will suffice to keep glucose levels within a defined range. Nevertheless, additional clinicians, diabetes midwives/nurses and dietitians are likely to be required for their management.

For universal screening, ideally this should be completed as close to 24 weeks as possible, within the limitations of antenatal care. If the screening test is negative and clinical conditions changes (e.g. the fetus is macrosomic on ultrasound, or the woman has new persistent glycosuria) then rescreening should be considered. If GDM is diagnosed, the woman enters the specialised care pathway for high-risk pregnancy.

This MoC recommends as a standard of care that all pregnant women should be screened for GDM. An application to the National Screening Advisory Committee will be made upon publication of this MoC for consideration of this recommendation.

Women with GDM

Ideally PPC should be offered to women with prior GDM planning a subsequent pregnancy to allow them the time and expertise to assess and manage risk and support positive lifestyle changes and thus contribute to better pregnancy outcomes. Evidence supports that GDM can be prevented with lifestyle changes.

Care after a diagnosis of GDM

On receiving a diagnosis of GDM, the woman should be seen ideally within one week by the diabetes MDT to receive education on lifestyle changes and instruction on glucose monitoring and targets. The woman is scheduled in the combined ANC for appointments at least in line with standard antenatal care and additional appointments as deemed necessary by the multidisciplinary team. In this setting the woman receives input from obstetrics, midwifery, dietetics, and the ultrasound department. Care is focused on maintaining normal glycaemic targets using routine and new technologies for glucose monitoring and insulin delivery. Close fetal surveillance is an integral component of the service, birth is individualised and planned. One-to-one consultation with Infant feeding specialist lactation consultant should be facilitated for colostrum harvesting support, if suitable, given the benefits described in the DAME trial (78, 79). In the immediate post-natal period care is continued by the MDT. Breastfeeding continues to be facilitated and babies are kept with the mother where possible. Follow up breastfeeding support in maternity unit or community is facilitated if unresolved breastfeeding issues persists. Future pregnancies and contraception are discussed at this point and appointments put in place for post-partum OGTT prior to discharge. This post-partum OGTTcould be provided in the hospital or community setting or via a GP.

"The price of test strips was bad and galling to see medical card patients being handed them for free in front of me"

"ease of access to testing equipment financially"

"lower cost/free lances and strips"

"they stressed how urgent it was for me to get the medical testing equipment – plus it cost money. I wasn't sure who I was ringing and giving my credit card details to. I do not have a medical card and was not given details of any subsidy programme for buying the equipment"

" an information sheet to give to my employer would have been helpful as I needed extra time off for appointments following diagnosis and also extra time during the day for testing before and after meals, it looked like I was sneaking around the office but it was medically necessary"

" A test for diabetes is recommended once a year after the baby is born but I have to fight for it as (name redacted) don't think it's necessary. I would go so far as to say that there is no aftercare for people with gestational diabetes in Ireland once the baby is born. I need weight management advice since the baby is born but ..I don't know if they are the right people to talk to so I'm left with no advice on this. I also don't really know how to prevent Type 2 diabetes going forward but I know I am seven times more likely to develop it than regular pregnancies"

The assessment and care pathways for GDM is depicted in Figures 5 and 6 on the next pages. The care pathway for women with previous GDM is shown in Figure 7.

Figure 5 GDM Assessment Pathway

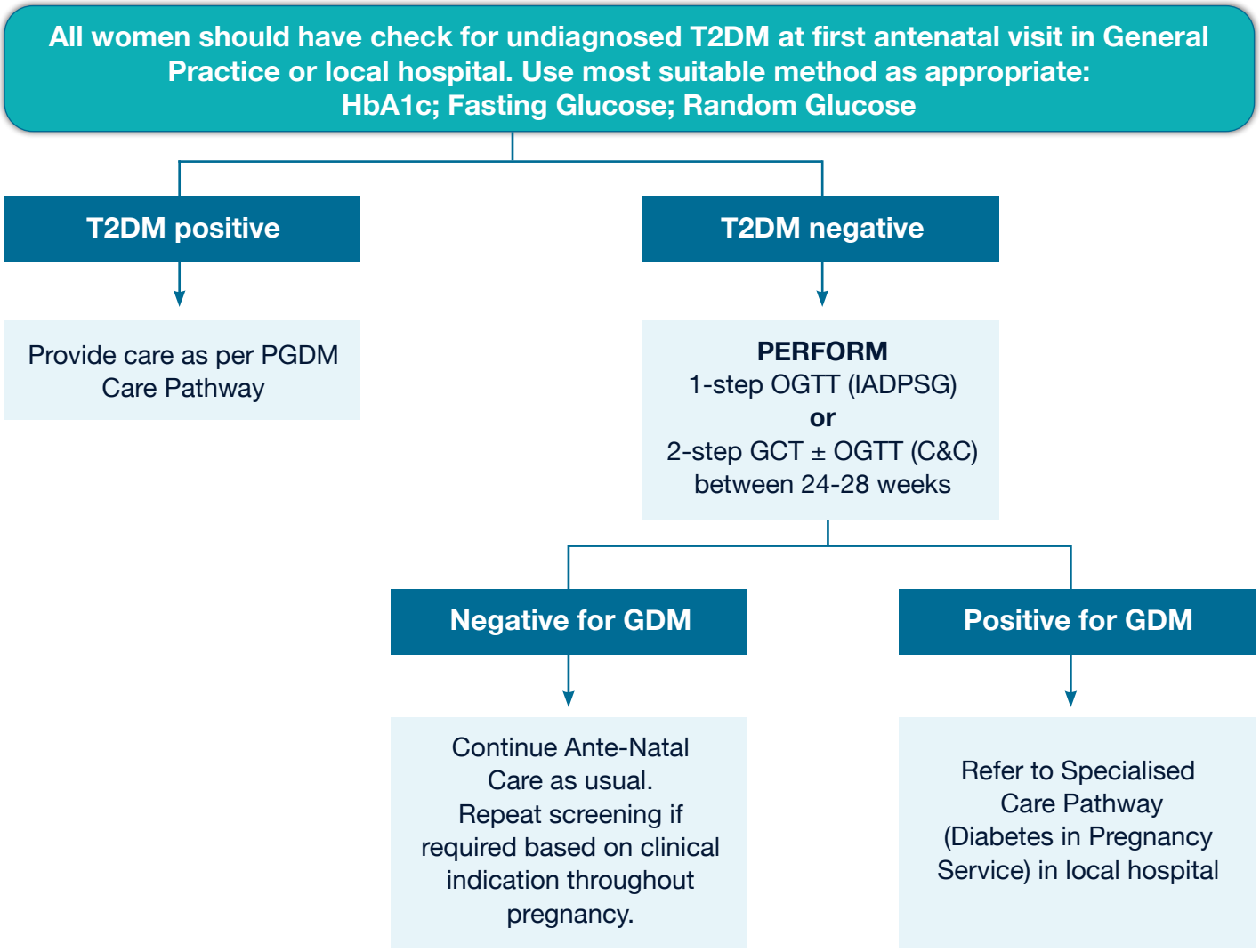


Figure 6 Care Pathway for GDM

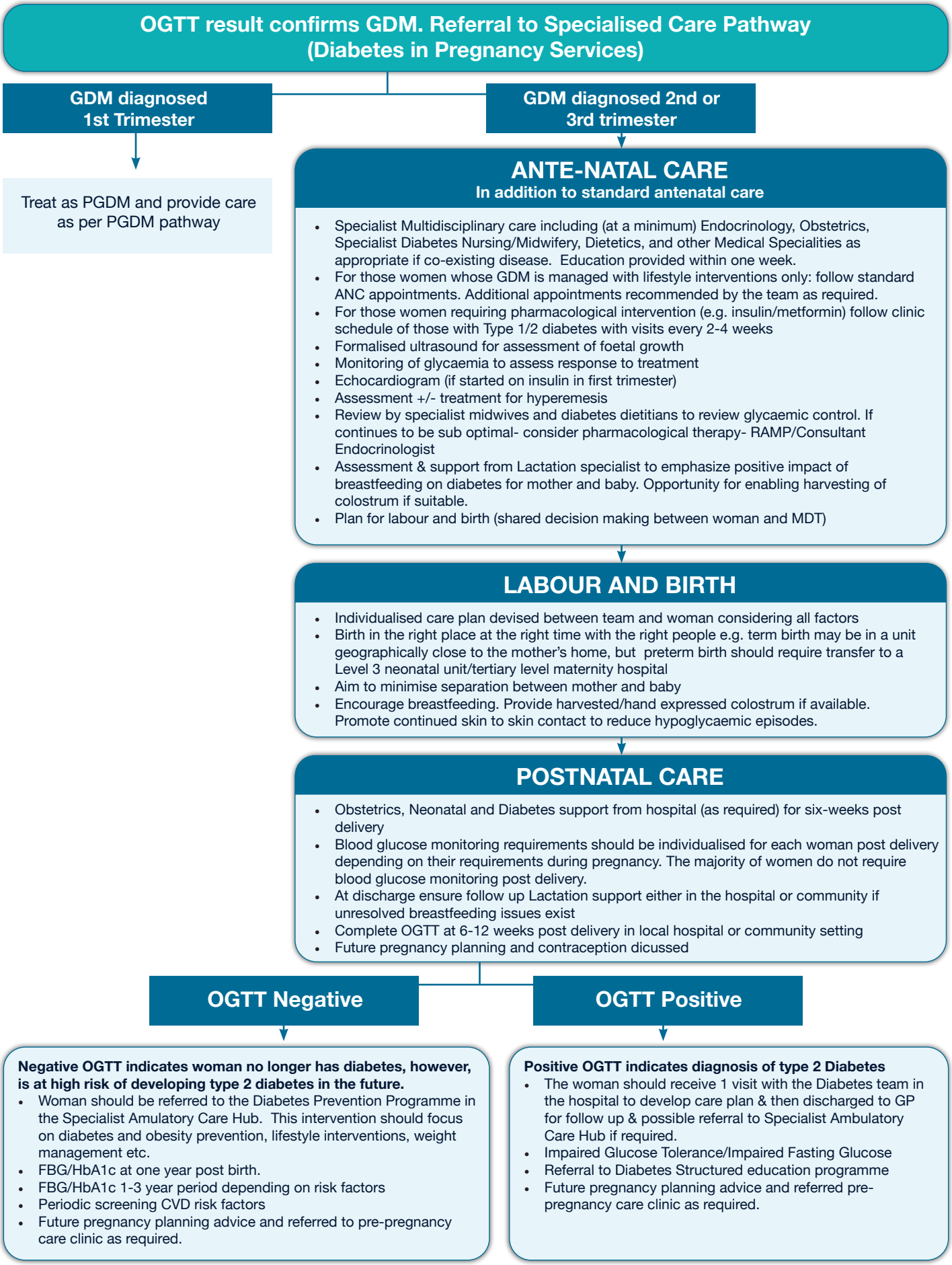
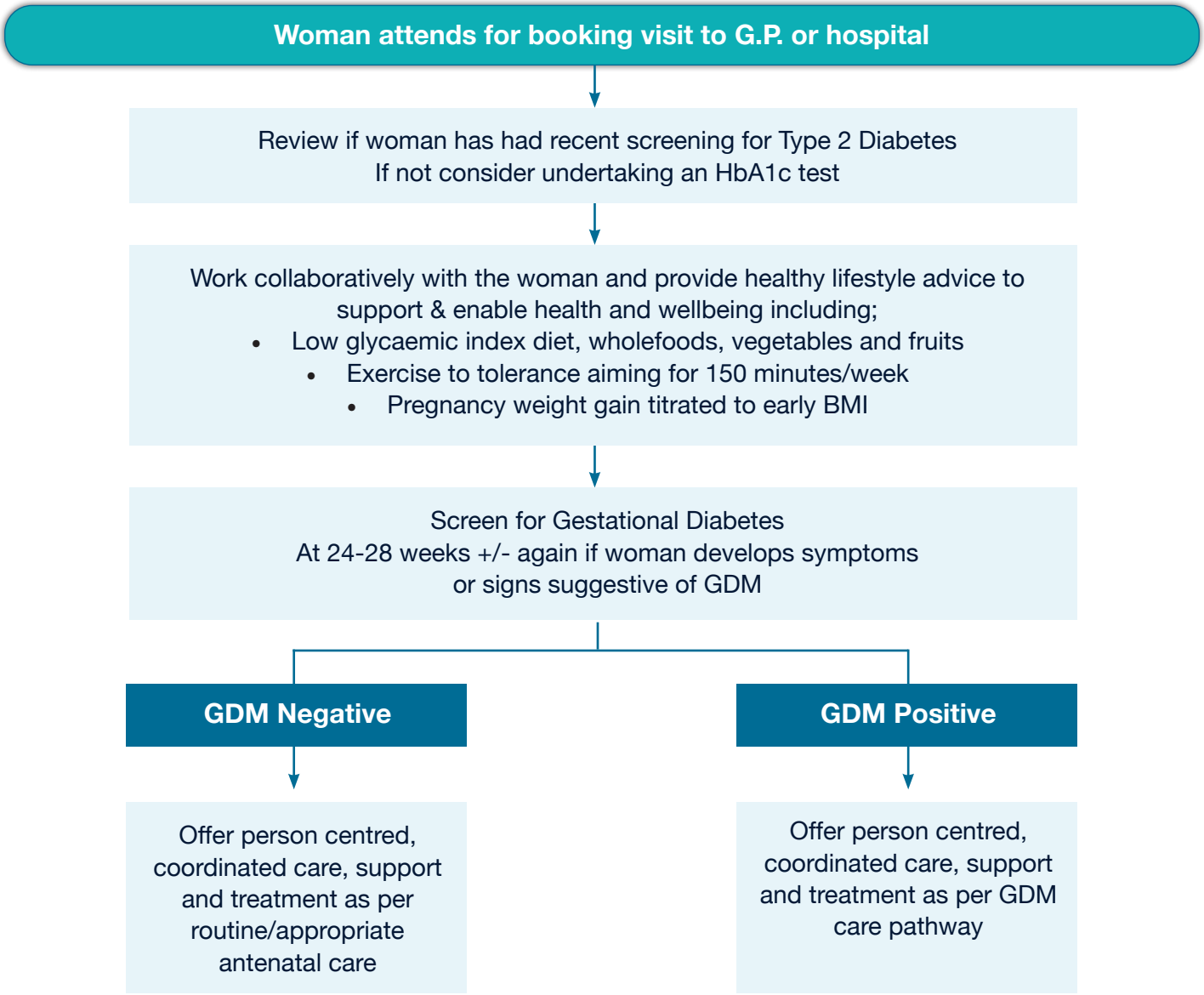


Figure 7 *Care Pathway for Women with Previous Gestational Diabetes (GDM)*



Key Enablers to Implement the Model of Care

Number of births per maternity centre and estimated births affected by Diabetes in pregnancy

Maternity Unit	Births 2018 (CSO,2018)	DIP (Est.15% births)	Birth 2020 (CS0, 2023)	DIP (Est.15% births)
Ireland East Hospital Group	**13044**	**1957**	**12,173**	**1826**
National Maternity Hospital Holles Street	7857	1179	7331	1100
Midland Regional Hospital Mullingar	1947	292	1835	275
St Luke's Hospital Kilkenny	1576	236	1429	214
Wexford General Hospital	1664	250	1578	237
Dublin Midlands Hospital Group	**9721**	**1458**	**8,941**	**1,341**
Coombe Women's & Infants University Hospital	8310	1247	7541	1,131
Midland Regional Hospital Portlaoise	1411	212	1400	210
RCSI Hospital Group	**13025**	**1954**	**12,455**	**1,868**
Rotunda	8468	1270	8261	1,239
Our Lady of Lourdes Hospital Drogheda	3052	458	2820	423
Cavan General Hospital	1505	226	1374	206
South Women and Infants Directorate	**11553**	**1733**	**10,557**	**1,584**
Cork University Maternity Hospital	7542	1131	7000	1,050
Kerry General Hospital	1251	188	1152	173
South Tipperary General Hospital	967	145	778	117
Waterford Regional Hospital	1793	269	1627	244
University of Limerick Hospital Group	**4432**	**665**	**4114**	**617**
University Maternity Hospital	4432	665	4114	617
Saolta University Hospital Group	**8999**	**1350**	**8,256**	**1,239**
Galway University Hospitals	2846	427	2597	390
Letterkenny General Hospital	1709	256	1540	231
Mayo General Hospital	1499	225	1409	211
Portiuncula Hospital General & Maternity Ballinasloe	1592	239	1393	209
Sligo General Hospital	1353	203	1317	198
Other	**7**	**1**	**2**	
Total National Births	**60781**	**9117**	**56498**	**8,475**

Current Staffing Levels for Acute DIP Services

In 2020, members of the DIP working group and clinical leads of the NCP Diabetes were requested to liaise with their local services and discipline speciality groups to determine the current staffing levels dedicated to DIP services within the 19 maternity units. The DIP MoC working group were requested to validate this data during 2022. The reported figures are documented in the table in appendix 2. Below table outlines the figures of whole time equivalent working in each speciality in DIP area across the 19 maternity units nationally.

Table 4. *Total WTE of each profession working in DIP in 19 maternity units nationally.*

Discipline	Current WTE employed dedicated to DIP nationally
Endocrinology	2.15
Obstetrics	2.7
Midwifery & Nursing	
ANP/AMP	2
CMS/CNS	10.3
Clinical midwife/nurse manager	10.45
Dietetics	
Clinical Specialist	2
Senior Dietitian	5.9
Staff grade	0.2
Perinatal Mental Health	0.65
Psychology	0
Ophthalmology	0.8
Infant feeding Specialist/Infant feeding CMM	4.85
Foetal Sonography	3.6
Physiotherapy	
Clinical Specialist	0
Senior Physiotherapist	0.7
Staff grade Physiotherapist	0
Medical Social Worker	
Medical Social Work Senior	0.9
Medical Social Worker staff grade	0.1
Administration	3.4

Recommended Staffing Levels for Acute DIP Services & to Support Implementation of DIP MoC

Discipline	Minimum Recommended Staffing Levels dedicated to Diabetes in Pregnancy Services	Suggested Grading
Acute Hospital Maternity Unit Staffing Recommendations		
Endocrinology	1 WTE per 10,000 births*	Consultant
Obstetrics	1 WTE per 10,000 births*	Consultant
Midwifery and Nursing	1 WTE per 1000 births*	Midwifery and nursing staffing in DIP services must be a CMS/ CNS grade or higher. In addition, at a minimum, all hub hospitals should have at least one AMP/ ANP.
Dietetics	1 WTE per 1,500 births*	1 post at clinical specialist level per hub hospital and remaining at senior grade.
Psychology	1 WTE per 3000 births*	Senior Clinical Psychologist at a minimum
Infant feeding Specialist/Infant feeding CMM	1 WTE per 5000 births* .77/1000 births, allocate 0.5 LC/1000 women with Diabetes	
Foetal Sonography	1 WTE per 5000 births*	
Physiotherapy	1 WTE per 3000 births*	Senior Grade at a minimum. There should be 1.5 WTE Senior Physiotherapists per hub and 1WTE Senior Physiotherapist per spoke. This would equate to roughly 1WTE per 3000 births. This role would be dedicated to promotion and monitoring of physical activity and associated musculoskeletal/pelvic floor dysfunction in women with DIP.
Medical Social Work	1 WTE per 5000 births*	Senior Grade at a minimum
Administration	1 WTE per maternity unit	Grade 5
**Units with less than the designated number of births require at least 0.5 WTE*		
Acute Hospital with Diabetes Day Centre		
Senior Dietitian	0.2 Senior Dietitian per hospital with a diabetes unit offering pre-pregnancy care	Senior Grade at a minimum
Ambulatory Care Hub		
Clinical Specialist Dietitian	0.5 Clinical Specialist Dietitian per Specialist Ambulatory Care Hub	Clinical Specialist

Technology

Utilising Technology to Optimise Diabetes in Pregnancy Care

PGDM is associated with increased risk of a range of adverse pregnancy outcomes(85). Optimal glycaemic levels throughout pregnancy can help to reduce the risk of these adverse outcomes but it is often challenging to achieve. Glycaemic testing is the cornerstone of DIP management. Women with GDM are marginalised due to the defined period of their diabetes and they are unable to access subsidisation of their testing strips. This cost has a dramatic impact on a woman's ability to engage in Self-Management. For about 60% of women with GDM (non-GMS), the cost of testing strips is a minimum of €300 out of pocket over 12 weeks. Recent budget allocation must be operationalised to ensure all women with GDM can access test strips free of charge.

Diabetes technology can help optimise glycaemic management and is being used more frequently in DIP care(102-104). Diabetes technology is used to describe hardware, software and devices that women with diabetes use to help manage blood glucose levels and also to help improve quality of life, these include insulin pump therapy (CSII) and continuous glucose monitoring (CGM).

The NICE guidelines now recommend offering CGM to all women with pre-gestational T1DM to help them meet their pregnancy glycaemic targets and improve neonatal outcomes (85, 105). It is agreed that CGM-based glycaemic targets must be personalized to meet the needs of everyone with diabetes. Consensus glycaemic targets are 3.5– 7.8 mmol/L during pregnancy, along with a time in target of >70 % of time within target(106). **Irish guidance uses 3.9mmol/L as a safety range for fasting glucose**. Health economic modelling found that flash monitoring was the cheapest and most economical option, the quality of evidence was low with concerns about accuracy in low and high ranges – all low and high range blood glucose levels must be confirmed with capillary blood glucose levels(105). The CONCEPTT study has highlighted the clinical and cost effective benefits of CGM in women with T1DM and their babies (107) showing a mild improvement in HbA1c without an increase in hypoglycaemia, and a reduction in large for gestational age births, length of neonatal stay and neonatal hypoglycaemia (107). Increased time below range was associated with increased maternal pre-eclampsia and neonatal hypoglycaemia (108). Increased time in range is associated with a lower risk of large for gestational age births and composite neonatal outcome that included macrosomia, shoulder dystocia, admission to NICU for greater than 24 hours or neonatal hypoglycaemia (109). Diabetes teams must consider suitability for pregnancy when commencing women of child breading age on diabetes technology e.g., blood glucose target range suitable for pregnancy.

Insulin pump therapy (CSII) is an effective way to lower a HbA1c prior to and during pregnancy but the CONCEPTT study showed that pumps and MDI were similarly effective in achieving glycaemic levels. CSII may be advantageous if adequate blood glucose control is not obtained by optimised MDI therapy without significant hypoglycaemia. Insulin requirements may reduce in the first trimester and then increase from 16-20 weeks of gestation and pump settings will need to be adjusted to reflect this. Bolus insulin requirements increase to a considerably greater extent than basal insulin during pregnancy, with a 3-4-fold change in insulin: carbohydrate ratios from early to late pregnancy (greatest with breakfast), compared to a 1.25-1.5-fold increase in basal insulin requirements over the same time. This translates into a change in basal: bolus ratio from 50:50 in early pregnancy to approximately between 35:65 and 25:75 in later pregnancy. Pump settings should be reviewed frequently and adjusted using data from glucose profiles(110).

Clinical staff need to be able to work within their scope of practice in providing care to women using technology in pregnancy, including safety netting of care for insulin pumps and continuous glucose monitoring.

Education, Training and Continuing Professional Development (CPD)

Healthcare professionals involved in diabetes in pregnancy care should have access to education and training opportunities and engage in CPD in accordance with their roles and responsibilities. All MDT members should have a basic and standardised knowledge of care (relevant to pre-conceptual period through to postnatal care). In addition, MDT members should engage in focused CPD relevant to their specialism and commensurate and appropriate to their scope of practice. MDT members require ongoing training with new and emerging technologies.

DIP maternity networks should promote a culture of learning across all disciplines and should develop and deliver, either solely or in partnership with key bodies, relevant multidisciplinary undergraduate and postgraduate training, and on-going professional development including patient safety and quality. A commitment from the maternity networks to provide annual development funding for this is essential.

"(Speciality redacted) don't understand and are reliant on diabetic nurses and consultant who cannot always be present. (Speciality redacted) with low blood sugars and will not always listen to the patient"

"I felt really well cared for throughout – the only issue I ever had was from some of the non-diabetic (clinicians) - comments like "you need to eat healthy carbs, no chocolate bars for you" were not helpful and increased the stigma I already felt about having GDM> I almost felt like I was getting conflicting advice as on the one hand I was hearing that it wasn't my fault from the diabetes team but the other side were saying it was my fault (BMI etc.) So perhaps some training for (clinicians) that aren't on your team!"

Programme Metrics and Evaluation

Annual audit of care collecting variables is required to allow comparison of performance with other countries. While audit may highlight needs and deficits in service delivery it will also more importantly allow more informed planning and implementation of services for the best outcomes in future diabetes in pregnancy care. It will also allow us to target education, training and continuous professional development. As part of the implementation plan of this MoC an evaluation framework should be developed to support implementation and evaluation of this MoC. Patient-reported outcome measures should be reviewed and incorporated into the monitoring and evaluation process

National Level Surveillance

The development of a National Diabetes Register to enable accurate prevalence figures, evidenced based service planning and measurement of quality outcomes is essential. This MoC recommends the development of the following registries at national level:

- A national register/database of all people with diabetes
- A national register of people with previous GDM for follow up

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Appendix

Appendix 1

National Maternity Strategy (2016-2026) Pathways of Care

The Strategy recommends that maternity services should be woman-centred, and provide integrated, team based care, with women seeing the most appropriate professional, based on need. Every woman will have a named lead healthcare professional who will have overall clinical responsibility for her care.

The Strategy recognises that all pregnant women need a certain level of support, but some need more specialised care, and it proposes an integrated care model that encompasses all the necessary safety nets in line with patient safety principles, which delivers care at the lowest level of complexity, yet has the capacity and the ability to provide specialised and complex care, quickly, as required.

The Strategy classifies pregnant women/babies into three risk groups; normal-risk, medium-risk (requiring a higher level of oversight), and high-risk (requiring a more intensive level of care, either throughout or at a particular stage of care). Across all risk levels there is the potential need for an increased level of care and the importance of a smooth transfer between pathways of care is recognised.

A choice of pathway of maternity care will be available based on this risk profile. A woman will be supported to make an informed choice with regard to her care pathway and will have her care delivered by a particular team. All care pathways should support the normalisation of pregnancy and birth.

Supported Care: This care pathway is intended for normal-risk mothers and babies, with midwives leading and delivering care within a multidisciplinary framework.

Assisted Care: This care pathway is intended for mothers and babies considered to be at medium risk, and for normal risk women who choose an obstetric service. Care will be led by a named obstetrician and delivered by obstetricians and midwives, as part of a multidisciplinary team.

Specialised Care: This care pathway is intended for high-risk mothers and babies and will be led by a named obstetrician, and will be delivered by obstetricians and midwives, as part of a multidisciplinary team.

Appendix 2

Appendix 2 Making Every Contact Count

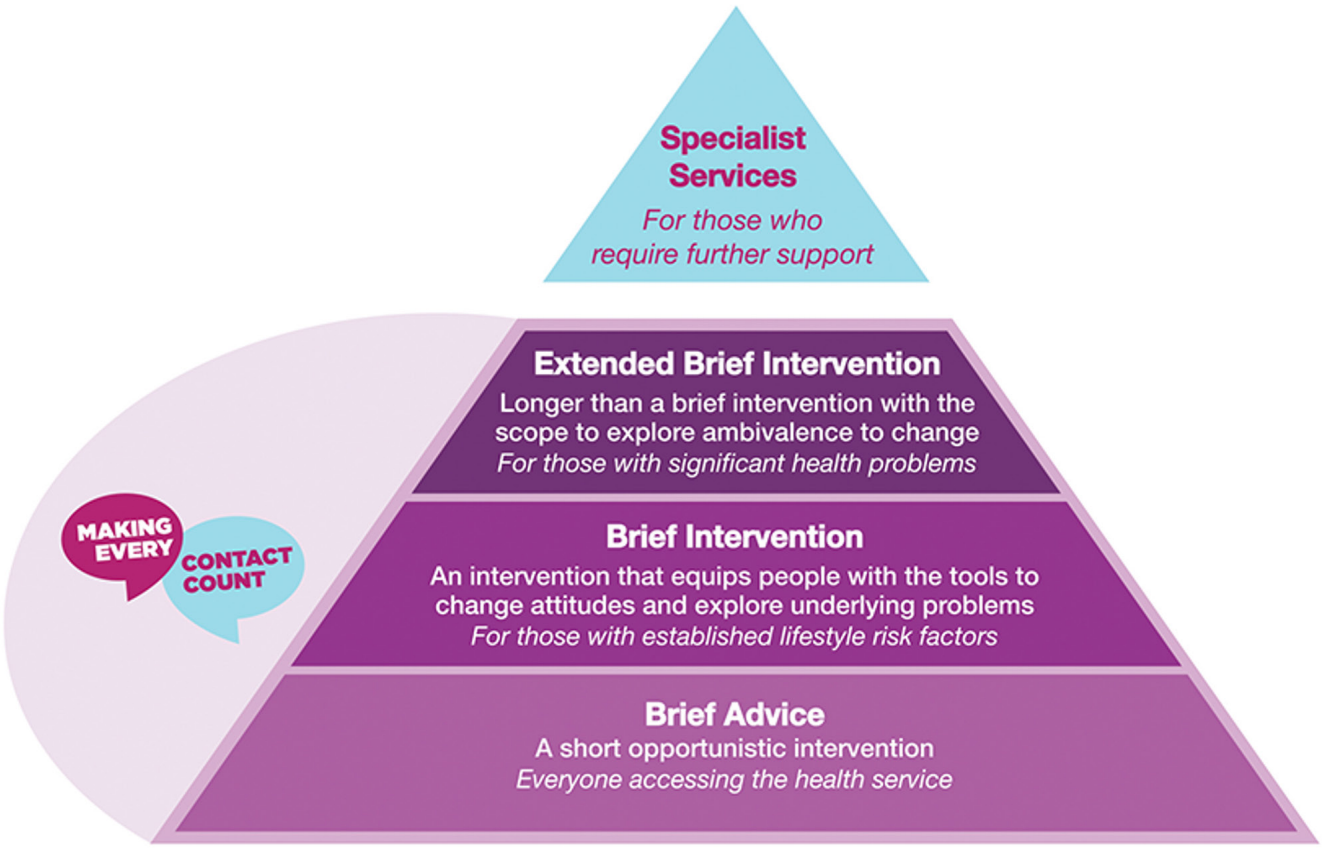
Chronic diseases, comprising of cancer, cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD) and diabetes, are the leading cause of mortality in the world. Despite the fact that the immediate risk factors for the development of chronic diseases are known and most are modifiable, tackling them continues to be one of the major challenges both now and into the future. HSCPs have millions of contacts each year with patients and these are all potential opportunities to improve the health and wellbeing of their patients.

Making Every Contact Count (MECC) Programme, established by the HSE in 2016, is about HSCPs using their routine consultation to empower and support people to make healthier choices to achieve positive long-term health outcomes. MECC focuses on modifiable health behaviours that are known risk factors

for chronic disease (tobacco use, physical inactivity, harmful alcohol consumption and unhealthy eating) in an effort to prevent the onset, slow the progression or reduce the complications associated with the major chronic diseases. MECC is an important aspect of living well in the community, the foundation level of the Integrated Model of Care for the Prevention and Management of Chronic Disease.

The model for MECC (Figure 5) is presented as a pyramid with each level representing an intervention of increasing intensity with the low intensity interventions at the bottom of the pyramid and the specialised services at the top.

Figure 5: *Model for Making Every Contact Count*



Implementing the Making Every Contact Count approach seeks to begin the process at the basic levels of brief advice and brief intervention. In practice this will mean that all health professionals and healthcare assistants will to be trained to a level that enables them to conduct a brief intervention with their patients.

It is envisaged that extended brief intervention will be conducted by health professionals with greater capacity to carry out this more lengthy intervention, because of their specialist role or due to the specific service that they work in. This intervention should be delivered to patients requiring more intensive support in their behaviour change efforts and/or who may be self-managing an existing chronic disease.

The specialist services are delivered by practitioners who use specialised or advanced approaches to support patients to change behaviour. These services include smoking cessation and dietetic services, along with services delivered by staff with in-depth counselling skills in the wider arena of supporting people to change. These services are part of existing clinical pathways for patients and while not the main focus of Making Every Contact Count they are an integral part of a comprehensive model for behaviour change, hence their inclusion in the model. In the implementation of this framework health professionals

working in these services are being asked to make every contact count in terms of lifestyle behaviour change. In the future, the Making Every Contact Count model will be an integral part of the clinical pathway for patients.

For further information and to register for MECC training visit: www.makingeverycontactcount.ie

Appendix 3

Current Staffing dedicated to Diabetes in Pregnancy in 19 maternity units (Reported by services to leads on working group 2020, and reviewed 2022)

Maternity Unit	Endocrinologist WTE dedicated to DIP	Obstetrician WTE dedicated to DIP	Advanced Midwifery/ Nurse Practitioners (Diabetes) WTE	Clinical Midwife/ Nurse Specialists (Diabetes) WTE	Clinical Midwife/ Nurse Managers WTE	Clinical Specialist Dietitian WTE	Senior Dietitian WTE	Staff Grade Dietitian WTE	Perinatal Mental Health (Psychiatry) WTE dedicated to DIP	Senior Clinical Psychologists WTE	Clinical Psychologists WTE	Ophthalmologist sessions dedicated to DIP	Lactation Consultants/ CMS in Breastfeeding/ CMM Breastfeeding WTE
Ireland East Hospital Group													
National Maternity Hospital Holles Street	0.2	0.7	1	0.6	2	1	1	0	0.05	0	0	0.05	0.1
Midland Regional Hospital Mullingar	0.1	0.1	0	0	0	0	0.5	0	0.1	0	0	0	1
St Luke's Hospital Kilkenny	0.1	0.05	0	0.1	0	0	0	0.1	0	0	0	0	0.1
Wexford General Hospital	0.1	0.1	0	1.0	0	0	0	0	0	0	0	0	0
Dublin Midlands Hospital Group													
Coombe Women's & Infants University Hospital	0.1	0.2	0	0	3.7	0	1	0	0.1	0.1	0	0.1	0.1
Midland Regional Hospital Portlaoise	0.1	0.1	0	0.8	0	0	0.2	0	0.1	0	0	0	0.1
RCSI Hospital Group													
Rotunda	0.1	0.2	0	0	1.75	1	0.5	0	0.1	0.1	0	0.1	0.1
Our Lady of Lourdes Hospital Drogheda	0.15	0.1	0	2	0	0	0.3	0	0	0	0	0	1.33
Cavan General Hospital	0	0	0	0	1	0.	0	0	0	0	0	0	1.32
South/SouthWest Hospital Group													
Cork University Maternity Hospital	0.4	0.1	0	1.4	0	0	1	0	0	0	0	0.1	0.1

Appendix 3 Cont'd

Maternity Unit	Endocrinologist WTE dedicated to DIP	Obstetrician WTE dedicated to DIP	Advanced Midwifery/ Nurse Practitioners (Diabetes) WTE	Clinical Midwife/ Nurse Specialists (Diabetes) WTE	Clinical Midwife/ Nurse Managers WTE	Clinical Specialist Dietitian WTE	Senior Dietitian WTE	Staff Grade Dietitian WTE	Perinatal Mental Health (Psychiatry) WTE dedicated to DIP	Senior Clinical Psychologists WTE	Clinical Psychologists WTE	Ophthalmologist sessions dedicated to DIP	Lactation Consultants/ CMS in Breastfeeding/ CMM Breastfeeding WTE
Kerry General Hospital	0.1	0.1	0	1	0	0	0.1	0	0.1	0	0	0	0.1
South Tipperary General Hospital	0.1	0	0	0	1	0	0.1	0	0	0	0	0	0.1
Waterford Regional Hospital	0.1	0.1	0	1.0	0	0	0.4	0	0	0	0	0.1	0.1
University of Limerick Hospital Group													
University Maternity Hospital	0.1	0.1	1	0	1	0	0.1	0	0.1	0	0	0.1	0.1
Saolta University Hospital Group													
Galway University Hospitals	0.1	0.05	0	1.1	0	0	0.6	0	0	0	0	0.1	0.1
Letterkenny General Hospital	0.05	0.05	0	0.1	0	0	0	0.1	0	0	0	0.05	0
Mayo General Hospital	0.05	0.1	0	0.5	0	0	0	0	0	0	0	0	0
Portiuncula Hospital General & Maternity Ballinasloe	0.1	0.1	0	0.2	0	0	0	0	0	0	0	0	0.1
Sligo General Hospital	0.1	0	0	0.5	0	0	0.1	0	0	0	0	0.1	0

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National Clinical Programme for Diabetes
Clinical Design & Innovation, HSE