Diabetes Pathways Project:

When to see a CDE – advice for people with diabetes at different ages and stages of life

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Contents

Introduction

Diabetes education is considered by the World Health Organisation to be "highly cost effective"[1]. However, there is currently no clear, Australian information for people with diabetes, healthcare providers and others that sets the standard for when people with type 1, type 2, gestational or other types of diabetes should see a Credentialled Diabetes Educator (CDE) for diabetes education, care and management.

The Diabetes Pathways Project aims to provide guidance for the care of people with diabetes by examining the available evidence and utilising expert consensus. The Australian Diabetes Educators Association (ADEA) Diabetes Pathways will help people with diabetes and health care professionals navigate diabetes education and management services from the time of a diagnosis of diabetes mellitus, through the lifespan. They will include changes to medical status such as changes in medical treatment, complications and co-morbidities, and ongoing support and maintenance. They will take the form of simple diagrams for each Pathway accompanied by additional resources and information regarding how journeys are individualised for each person with diabetes.

This report provides an overview of existing evidence to inform the ADEA Diabetes Pathways with an emphasis on the role of the Credentialled Diabetes Educator. It encompasses global best practice in diabetes and considers the available literature in developing simple pathways for diabetes education. It also refers to when other health professionals should be consulted.

The report has been prepared by Peta Tauchmann, RN (NP) CDE, on behalf of ADEA. The Pathways Project has been guided by a CDE Working Party and an Expert Reference Group with membership from Diabetes Australia, the Australian Diabetes Society and ADEA (see Appendices).

Abbreviations

ADA	American Diabetes Association
ADEA	Australian Diabetes Educators Association
ADIPS	Australian Diabetes in Pregnancy Society
APD	Accredited Practising Dietician
CDE	Credentialled Diabetes Educator
DA	Dietitians Australia
DE	Diabetes Educator
DSME	Diabetes Self-Management Education
GP	General Practitioner
HCP	Health Care Professional/s
ISPAD	International Society for Paediatric and Adolescent Diabetes
MDT	Multi-Disciplinary Team
MNT	Medical Nutrition Therapy
NDSS	National Diabetes Services Scheme
NP	Nurse Practitioner
RACGP	Royal Australian College of General Practitioners
RN	Registered Nurse

Definitions

Credentialled Diabetes Educator™ (CDE)

The Australian Diabetes Educators Association (ADEA) defines the CDE as a health care professional (HCP) who has completed an ADEA accredited post graduate course and a period of clinical practice that fulfills the continuing educational requirements of the ADEA credentialling program[2]. The CDE title is trademarked and can only be used by those whom ADEA assesses to meet the standards of the program.

CDE's are specialised health professionals who provide comprehensive diabetes self-management education across a variety of clinical settings[2-5]. They integrate health behaviour and education theory to inform, motivate and support people with diabetes to adopt healthy lifestyles and self-care behaviours[3]. They are skilled in the assessment of the individual to provide person-centred health education interventions. It is a unique role which encompasses comprehensive knowledge of diabetes, teaching and learning.

The following health disciplines are recognised by ADEA as eligible for Credentialling[2-4]

- Registered Nurses
- Registered Midwives
- Accredited Practising Dietitians
- Registered Pharmacists
- Registered Medical Practitioners
- Registered Podiatrists
- Accredited Exercise Physiologists
- Registered Physiotherapists

Both diabetes educators (DE's) and CDE's contribute to the care of people with diabetes. Unlike the diabetes educator, a CDE must hold specialised tertiary qualifications in diabetes education and management and adhere to the ADEA National Standards of Practice, Role and Scope of Practice and National Competencies to maintain Credentialling. Consulting with a CDE also allows the person with diabetes to claim rebates from Medicare and the Department of Veteran's Affairs (DVA) with a referral from a general practitioner and from some private health insurers[1-4].

The term Credentialled Diabetes Educator™ is trademarked by ADEA and may only be used by clinicians who are assessed against the ADEA Standards of Practice, Competencies and Credentialling Program[2, 3]. The ADEA authorises the use of the CDE trademark to eligible health professionals who are assessed annually against the ADEA credentialling criteria.

In this report the term CDE is used to indicate clinicians who have similar training and expertise to the standards of ADEA. The term 'diabetes educator' is used to designate those HCP's who have not been assessed against the ADEA standards for credentialling.

Diabetes Self-Management Education (DSME)

Diabetes Self-Management Education (DSME) is described as the structured process of teaching people with diabetes the knowledge, decision making concepts and skills necessary for optimal diabetes self-care and is considered a basic component of diabetes care[5-8]. It is person-centred: that is it places the person with diabetes at the centre of care to facilitate collaborative decision making and goal setting[2]. DSME is intended to provide people with diabetes the information and skills for informed decision making, positive self-care behaviours, constructive problem solving and collaboration with the multidisciplinary team to facilitate good clinical outcomes[6].

Evidence shows that structured diabetes education is associated with:

- Improved diabetes knowledge and self-care behaviours
- Lower HbA1c
- Reduced weight
- Improved quality of life
- Reduced all-cause mortality risk[6, 7, 9]

Diabetes Pathway

Clinical Pathways can be described as health management plans for clinical intervention that incorporate data from multiple evidence-based sources. They are usually considered a guide for HCP's and are designed to provide a sequence and timing for clinical interventions for optimal patient outcomes. Practically, they should be a simple device that provides a framework for decision making grounded in evidence based practice[10].

Referral Pathways provide guidance to HCP's coordinating care for people with diabetes. They complement the clinical pathway by identifying key referral points for the multidisciplinary team to provide clinical intervention.

The **Diabetes Pathways Project** has developed referral pathways that are specific to the care of people with diabetes and highlight the important and holistic role of the CDE in DSME.

Multidisciplinary Team (MDT)

Occurs when professionals from a range of disciplines work together to deliver comprehensive care that addresses a person's health needs[11]. The members of the group will have different but complimentary skills and contribute to the overall objectives of patient care[12].

In the care of people with diabetes the multidisciplinary team can involve (but is not limited to) the Credentialled Diabetes Educator (CDE), General Practitioner, Endocrinologist,

Dietitian, Podiatrist, Exercise physiologist, Physiotherapist, Optometrist, Ophthalmologist, Psychologist, Pharmacist, Aboriginal Health Worker/Practitioner, General Practice Nurse, Diabetes Nurse Practitioner and Dentist.[13]

The Credentialled Diabetes Educator in delivery of DSME

There is no doubt that diabetes mellitus is a growing significant health condition in Australia. At March 2020 there were 1,351,885 people with diabetes in Australia registered to the National Diabetes Services Scheme (NDSS). This includes 1,179,521 people with type 2 diabetes (87%) and 122,869 people with type 1 diabetes (9%). An additional 49,495 people were noted to have gestational diabetes (3%) and "other" types of diabetes (1%). In the twelve months to March 2020, 101,732 people were added to the NDSS register[14].

The Australian Diabetes Educators Association (ADEA) reported in 2020 that 1578 diabetes educators were CDE members who are active participants in its credentialling program.[15] The majority of these are registered nurses, followed by accredited practising dietitians (APD), pharmacists and others: medical practitioners, podiatrists, accredited exercise physiologists and physiotherapists. The literature consulted for this report (Table 1) identifies numerous health care professionals involved in delivering education to people with diabetes through the life span. Additionally, non- medical sources included peers, media and internet sources contributing to a possible lack of consistent diabetes information.

Table 1: Health care professionals noted in studies consulted for this report

CREDENTIALLED DIABETES EDUCATORS AND DIABETES SPECIALIST ROLES	**NON-CREDENTIALLED HEALTH CARE PROFESSIONALS**
• Registered Nurses • Registered Midwives • Accredited Practising Dietitians • Registered Pharmacists • Medical Practitioners, including endocrinologists and diabetologists • Registered Podiatrists • Accredited Exercise Physiologists • Registered Physiotherapists	• Registered Nurses • Accredited Practising Dietitians • Pharmacists • Medical Practitioners, including endocrinologists and diabetologists • General Practice Nurses • Podiatrists • Accredited Exercise Physiologists • Physiotherapists • Optometrists • Obstetricians • Registered Midwives • Dentists • Aboriginal Health Workers • Traditional Chinese Medicine Practitioners • Complementary and Alternative Medicine practitioners (e.g.: naturopaths, chiropractors, herbalists)

Characteristics of diabetes education in Australia:

- Diabetes education delivered by a CDE is cost effective as it reduces the incidence of hospital admission and improves long term outcomes for people with diabetes[1, 16]. Benefits extend beyond glycaemic targets and include cardiovascular risk reduction and psychosocial benefit[1, 6, 17, 18].
- Cost benefit is more durable when people with diabetes have access to the CDE for regular and routine care[1, 7, 19-22].
- More than half of people with diabetes have never seen a CDE[1].
- The available CDE workforce has the capacity to provide care to 57% of people with diabetes in Australia[1].
- The Australian Bureau of Statistics *Health Service Usage and Health Related Actions* report states that in 2014 – 2015 only 16.6% of people with diabetes had consulted a diabetes educator in the preceding 12 months[23]. This was lower than attendances for general practitioners (84.8%) and for diabetes specialist physicians (24.3%).
- CDE's commonly work in the following settings: [5, 24]
    - Primary care clinics / GP practices
    - Community health services
    - Hospitals
    - Private Sector (working from own consultation rooms).

Hospitals are thought to employ the largest proportion of the CDE workforce. However, people with diabetes are increasingly being managed in the primary care sector.[1]

In its Standards of Medical Care[6] the American Diabetes Association identify four "critical time points" for assessment by the multi-disciplinary team including referral to a diabetes educator. These are:

1. At Diagnosis
2. Annually for the assessment of self-management and lifestyle factors
3. When new factors arise (health conditions, physical limitations, mental health factors, basic living needs)
4. Transitions in care.[6]

CDE's report the following triggers for a first referral:[24]

- Initial diagnosis
- Commencement of glucose lowering medicine including insulin therapy
- Revised medication regimen
- Where glycaemic targets were not being met
- Gaps in self-care knowledge
- Problems with skills or confidence
- Recurring hypo/hyperglycaemia or ketoacidosis
- Diagnosis of complications or other co-morbidity

A report commissioned by ADEA in 2012 considered referral pathways to CDE's by General Practitioners (GPs).[24] GP's noted that as coordinators of general medical management including the (Medicare) Chronic Disease Management process they were also the first point of contact for the patient and were uniquely placed to implement screening for those at risk of diabetes and prevention programmes. They believed continuity of care could be best coordinated in the primary care setting. They tended to refer to a CDE because of three main trigger points: a new diagnosis, initiation of insulin therapy and when glycaemic targets were not being achieved.[24]

Convenience was the main reason CDE's were employed by primary care clinics because the patient was familiar with the centre, communication within the team was good and services could be provided in one place. A GP was more likely to refer to a private CDE if bulk billing services were offered and the CDE was also able to provide dietary advice.[24]

The Diagnosis of Diabetes

A new diagnosis of diabetes can be emotionally distressing, and individuals psychological adjustment is variable.[6, 25, 26] The person with type 2 diabetes may not associate the seriousness of their diagnosis with a new treatment regimen when symptoms are not present. It places pressure on self-regulation for positive outcomes that may seem intangible. A diagnosis of type 1 diabetes can lead to feelings of grief, guilt or blame and the change in health status can contribute to psychological vulnerability.[6, 25]

This emotional stress must be addressed so that important information can be conveyed and understood.[25] Too much information at the time of diagnosis is unhelpful.[27] The CDE must balance and plan education for important safety skills against the readiness of the person to learn.

GP's reported that they found the person who has just been diagnosed with diabetes challenging to initially manage and the large volumes of information needed for effective self-management were better delivered by a CDE. This was especially because the CDE spent more time with the patient and followed up frequently enough to support the stress of a potentially "traumatic and life changing experience".[24]

There is agreement in the literature that the CDE should be involved with self-management education as soon as practical following initial diagnosis.[5, 6, 20, 24, 28] The education required and at which time point is dependent on the individual and the complexity of the diagnosis [1, 13, 25]. Table 2 shows the common themes of DSME.

Table 2: Common themes of DSME

What is diabetes?	Practical skills:
Emotional/psychological response Medications prescribed Dietary advice Activity/exercise/sport Treatment targets Complications and screening Role of family +/- carers Hypoglycaemia Hyperglycaemia and sick day management Preventing ketosis Support systems and services	blood glucose monitoring home blood glucose monitoring continuous glucose monitoring intermittent (flash) glucose monitoring insulin therapy device use injection technique insulin pump therapy matching carbohydrates to insulin requirements

Nutrition and advice for healthy eating

Dietitians Australia (DA) and ADEA in their joint statement recommend that all people with diabetes should see an Accredited Practising Dietitian (APD) for diabetes specific nutritional advice.[6, 29] General nutrition education can be provided by a CDE where an APD is not available or where the CDE identifies need for supplemental general nutrition education. Additionally, the CDE and APD are considered to have complimentary roles in delivering general nutrition education and medical nutrition therapy, respectively. It should also be noted that some APD's are also CDE's.[29]

General nutrition education provided by a CDE can be given as an introduction to diabetes nutrition or part of ongoing education. Medical Nutrition Therapy (MNT) is a clinical function of the APD which builds on general nutritional education through assessment and prescription of nutritional advice. Moreover where other medical conditions exist (e.g. coeliac disease, renal failure) or complex intervention is needed (e.g.: carbohydrate counting) the APD is skilled in the design and delivery of MNT which forms an integral part of disease management. [29]

The *Academy of Nutrition and Dietetics nutrition practice guideline for type 1 and type 2 diabetes*[30, 31] reports a quantifiable reduction in HbA1c of 0.3 – 2% in type 2 diabetes and 1.0 – 1.9% in type 1 diabetes when educationwas delivered by registered dietitian/nutritionists with specific training in diabetes (USA). Reductions in weight and maintenance of weight loss for five years was more likely to be successful if ongoing education and support was provided.

Exercise and Physical Activity

All people with diabetes should be prescribed physical activity and evidence demonstrates the benefit of aerobic and resistance training for lowering of HbA1c[6, 32, 33]. The advice should be individualised by the type of diabetes, age and stage of life, current activity level and pre-existing complications and comorbidities. Exercise and Sports Science Australia (ESSA) recommends that exercise programmes should be designed and delivered by appropriately trained and qualified personnel[32]. However, the evidence is less clear about the need for the exercise prescription to be provided by someone who has been trained in diabetes management and education.

Physical activity is an integral part of DSME. The CDE assessment considers multiple elements relevant to the implementation and efficacy of a structured exercise program.[3, 34] Review of glycaemic management, micro and macrovascular complications, meal planning, prevention and management of hypoglycaemia, medication management, goal setting and support for motivation and behaviour change are discussed by the CDE during the diabetes self-management assessment. Incidental activity such as housekeeping, gardening, hobbies, and work-related activity should also be discussed. While this alone does not lead to a prescription for activity it is a valuable step which contributes to the prescription itself.

The CDE plays a valuable role in the assessment of activity and exercise and supporting the person with diabetes with problem solving and motivation.

Insulin Administration

The NDSS reports that in Australia 458,915 people or 32% of all people with diabetes are injecting insulin therapy (at March 2021). Of these 68% have type 2 diabetes, 28% have type 1 diabetes and 3% have gestational diabetes.[14] There is strong evidence for the benefit of structured education on injection technique delivered by specialist diabetes educators.[21, 22, 35-39] The importance of correct technique required for optimal insulin delivery is noted to be more complex than people with diabetes and health care professionals realise.[38] Even when a device seems simple to use, poor injection technique can cause dangerous errors.[35]

Studies which delivered structured diabetes education delivered by diabetes educators, nurse upskilled in diabetes management and diabetes medical specialists demonstrated greater HbA1c reductions than other clinicians (general practitioners, pharmacists, general nurses, and pharmaceutical representatives)[21, 22, 35-38]. Reduction in total daily insulin requirements ranged from 6 to 10 units and HbA1c lowered by 0.5 – 1%. The incidence of unexplained hypoglycaemia and glucose variability and lipo-hypertrophy were reduced.[22, 36]

Successful subcutaneous injection technique requires ongoing assessment by health care professionals who are experienced and trained[39]. Education required for subcutaneous

injection technique is detailed (Table 3). Assessment and reinforcement of injection technique at least every six months has demonstrated sustained lower HbA1c g[22, 40]. This is because the amount of information required for insulin initiation is unlikely to be retained[35, 40]. Current injection technique guidelines recommend a minimum of annual assessment by a CDE and ideally at every visit throughout a 12-month period[39, 41, 42].

Table 3: Education required for successful subcutaneous injection technique [39]

Injection regimen including timing and action of prescribed medicines.	
Choice of	injection site
	needle length
	injection device
Use of	Pen Devices
	Syringes
Angle of injection	
Use of lifted skin fold	
Rotation of injection sites	
Care and self-examination of injection sites	
The importance of single use of needles and syringes	
Safe disposal of sharps	
Storage of injectable medicines	
Skin preparation	
Structured self-monitoring of blood glucose	
Hypoglycaemia including symptoms, prevention and treatment	
Travelling and flying with injectable medicines	
NDSS registration	

Mental Health

There is agreement in available literature that anxiety is associated with poor glycaemic management in both type 1 and type 2 diabetes[43] and that successful treatment improves glycaemia[17, 18]. Incorporating healthy lifestyle programmes into mental health service delivery is shown to improve overall health outcomes[44].

The NDSS guide "Diabetes and Emotional Health" [45] highlights the tendency of HCP's to focus on clinical outcomes over emotional outcomes. The daily demands of self-management can negatively impact on the emotional well-being and quality of life for people with diabetes, and the diabetes HCP should routinely screen for depression, anxiety, disordered eating and cognitive capacity at each consultation and during critical time points.

The critical time points where psychological vulnerability can occur have been identified by ADA and NDSS as:

1. At Diabetes Diagnosis:
   e.g. adjustment to life with diabetes, the need to absorb large amounts of new information, the individual's response and coping mechanisms.
2. Annual assessment of self-management and lifestyle factors.
3. When new factors arise:
   e.g. hypoglycaemia, co-morbidities and complications, physical limitations, mental health factors, basic living needs, social and economic factors.
4. Transitions in care:[6, 45]
   e.g. changes in treatment (oral glucose lowering medicines to insulin), changes in treatment team (paediatric to adult service providers, change in physical location).

Diabetes Distress (DD) is described as undesirable psychological responses to self-management of diabetes that affects ability to perform daily diabetes management task potentially compromising health outcomes[46]. DD can take the form of generalised worry about having diabetes, or worries about various aspects of diabetes self-management. The occurrence of DD is triggered by change in medical status, is impacted by social determinants of health and contributes to psychological vulnerability [17, 18, 47, 48].

The DAWN Study also considered the longer-term effects of living with diabetes. It found that after 15 years people with diabetes expressed fear of complications and psychological burden of diabetes self-management remained high[49]; 41% of those surveyed reported poor well-being.[48]

The REDEEM study demonstrated that where DD is attributed to a specific area of diabetes management (e.g. intensification of therapy, commencing insulin therapy, diagnosis of complications, end of honeymoon phase,) targeted diabetes education was helpful.[17]

Technology

Technology in diabetes education and management is a rapidly changing area that affects all aspects of the CDE role, and the CDE is identified as a core member of the multidisciplinary team for successful use of technology[25, 50-52]. Platforms are available via the internet, smart phones, email, social media, and electronic gaming designed to track, monitor, communicate, motivate, and inform. Therapeutic interventions can be effectively delivered via telehealth (phone, video and web based interventions).[5, 25, 50-54] There is increasing research to support the use of telemedicine for glucose lowering in type 2 diabetes[52, 53]. The use of web-based systems and complex devices for insulin delivery and the monitoring of blood glucose data is becoming more widespread and CDE's must adapt the services they provide.

The RACGP identify three main areas where technology is used in diabetes: [52, 54]

1. Information technology:
   applications for mobile phones, fitness trackers, use of SMS and web-based software and chronic disease management software.
2. Technological innovation used to monitor glycaemia:
   continuous glucose and flash glucose monitors.
3. Technology for the delivery of medicines:
   insulin pump therapy and smart insulin pen devices.

ISPAD recommends that diabetes education for children and adolescents include utilising technology as a vehicle for education and motivation[25]. Mobile and internet-based tools can improve diabetes management, support training for technical devices (e.g. insulin pumps and continuous glucose monitoring) and provide alternatives to face-to-face consultation where there is limited access to specialised diabetes services.

Two-way communication has been shown to have greater benefit on glycaemia than those that do not encourage interaction with the HCP.[50, 51] The security of sensitive medical information and data sharing via registered medical devices is protected under the law.[55] The use of downloadable blood glucose devices, insulin pumps and continuous glucose monitoring devices has facilitated communication via electronic means.

Diabetes care has extended beyond the traditional clinic consultation and this has raised new challenges. Unregistered health applications present security and data risks for those using and sharing data.[50, 55] There has been a proliferation of applications for smart phones with over 8000 health-related apps available in the Apple App Store in 2012.[56] Several studies examining the design and use of health applications found data sharing via unregulated apps occurred frequently. Many applications were not updated regularly, were frequently unsuitable for older users, and did not conform to recommendations in evidence-based guidelines.[55-59]

The use of complex medical devices such as insulin pumps and continuous glucose monitoring should be provided by diabetes health care professionals specially trained in their use[25, 50, 52-54, 60]. The ADA states that "simply having a device or application does not change outcomes unless the human being engages with it…this underscores the need for the health care provider to assist the patient in device use and to support its use"[53]. As the CDE undertakes specific training in diabetes management technology and clinical use of these devices, they are best placed to provide this education and support.

These developments in the use of technology in diabetes care have led to pressure on the CDE to provide services that are not traditionally resourced or funded.[50] The ease with which information can be shared means that health care providers are accessible at any time of day raising new ethical and legal questions. The ongoing training and assessment required for successful use of technology requires clinicians to have specialised training for successful patient outcomes and to translate this information into patient education.[25, 55] Security of consumer data and access for consumers and other HCP's raises issues for

clinicians for data management. Australia's experiment with telehealth during the SARS-CoV2 pandemic will provide interesting information for the future of telehealth.

Culturally and Linguistically Diverse (CALD) groups

Culturally and Linguistically Diverse people are defined as people born overseas where English is not the main language.[61, 62] In 2008 31% of Australians were born overseas, and about 2/3 of those were born in non-English speaking countries. Migration patterns into Australia have changed from largely European origins after World War II, to South East Asian nations since the 1970's.[62] The Western Pacific Region (as defined by the International Diabetes Federation) has 35% of all people with diabetes and 1/3 of all people at risk of diabetes globally live in this region.[63]

Australia's location within the Western Pacific Region means that migration and genetic risk factors for diabetes coalesce to form a population that is at higher risk of diabetes. Genetic, environmental, lifestyle and migration factors contribute to higher rates of diabetes in CALD communities.[5, 64] The incidence of diabetes, especially type 2 diabetes, is higher in some cultural groups and the large numbers of Australians who have emigrated to Australia explains why so many people with diabetes come from CALD backgrounds.

Migration itself is not a risk factor for diabetes. Immigrants who are required to participate in health screening by a host country were found to have better health than many Australians.[62] However this "Healthy Migrant Effect" [62] is shown to reduce after ten years of living in Australia. Migrants who speak English find it easier to access health care services and employment which in turn has beneficial socio-economic implications. Conversely those from a refugee background are considered particularly vulnerable because of exposure to difficult living conditions, lower levels of literacy and numeracy, poor standards of health care and trauma, and are more likely to have mental health problems.[62]

Barriers to health care for CALD groups include cultural beliefs, language and literacy, competing priorities (finance, employment and security), environment (access to transport and housing) and knowledge and skills.[64, 65] Some cultures trust traditional forms of health care rather than western medicine and unfamiliar food can cause changes to the diet that may be less healthy. In some cultural groups mixed gender activities are considered inappropriate. Finally conflicting priorities of needing to house, feed and clothe a family can influence self-care decision making.[8, 65]

CDE's act as "cultural translators" by developing trusting relationships, identifying embedded behaviours, and adapting diabetes self-management concepts in culturally relevant ways to enhance health literacy.[64-66] It is not just individualised care as it requires the CDE to synthesise complex information into flexible messages. Allowing adequate time and access to appropriate educational resources in a language relevant to the person with

diabetes has positive impacts on outcomes including clinical, knowledge, behavioural and self-determination.[5, 64]

Aboriginal and/or Torres Strait Islander Communities

In 2019 The Australian Institute of Health and Welfare reported that 13% of indigenous Australians are thought to have diabetes. The majority of those have type 2 diabetes, are younger and are four times more likely to be hospitalised than non-indigenous Australians with diabetes.[67] Remoteness correlates with higher incidence of diabetes: prevalence of diabetes in the indigenous population in Western Australia is 21.8% and 33% in Torres Strait Islander groups in the Northern Peninsula of Queensland.[68]

Barriers to diabetes education appear to be more pronounced in remote communities that are firmly built from and grounded in traditional culture.[67-70] Concepts of health are based on community and relationships and illness may be seen as magic, taboo or related to conflict in the community. Hospitalisation may represent a separation from culture, family, and the healing power of the land. The understanding of illness may be described in different ways that have the same meaning to the person with diabetes, but with different descriptions between individuals. Diabetes may be perceived as a new disease that traditional medicine cannot cure leading to confusion about the purpose of western treatments and medicines.

Trust, cultural sensitivity, and communication are important to the success of education for Aboriginal and/or Torres Strait Islander communities[5, 8, 64, 70, 71]. The model of cultural brokerage adopted by Aboriginal Health Workers (AHW) has been successful in increasing engagement and delivery of services in remote communities in Queensland, Northern Territory, Western Australia, and South Australia. The understanding of cultural norms and ability to communicate in language and concepts that are understood has been accepted by indigenous communities.[70, 71] Interestingly this has not correlated directly with clinical outcomes (HbA1c and blood pressure) except where doctors, nurses and diabetes educators were co-located.[71]

Pregnancy and Gestational Diabetes

According to the International Federation of Gynaecology and Obstetrics hyperglycaemia is one of the most frequently encountered medical conditions during pregnancy.[72, 73] In Australia about 3% of all people with diabetes have gestational diabetes[14] in addition to women of reproductive age who have type 1 or type 2 diabetes. The Australasian Diabetes in Pregnancy Society (ADIPS) reports that type 2 diabetes in women of reproductive age is at least as common as type 1 diabetes in teaching hospitals[74].

The Australian Diabetes in Pregnancy Society (ADIPS) has established guidelines for the management of women with diabetes who are planning pregnancy, during pregnancy and post- partum.[74] Women with type 1 or type 2 diabetes should be supported prior to conception to achieve tight management of blood glucose. Management should be coordinated by a multidisciplinary team that includes clinicians experienced in the management of diabetes in pregnancy. The CDE is a core member of the antenatal multidisciplinary team.[74]

Antenatal management goals are the same for women with type 1 and type 2 diabetes: the management of glycaemia and prevention of complications to mother and baby.[74] Women who have pre-diabetes (impaired glucose tolerance or impaired fasting glycaemia) are managed as though they have type 2 diabetes during their pregnancy.

The CDE should be involved as soon as possible following the diagnosis of GDM or when conception is confirmed in type 1 or 2 diabetes. The role includes information about the physiology of diabetes and pregnancy, monitoring BGLs and interpretation, screening for complications, lifestyle modification and support for glucose lowering medication.[74-76] Additional support should be offered to women confronted with a new diagnosis of hyperglycaemia.

Dietary advice will ideally be provided by a dietitian and general nutrition education can be provided by a CDE where an APD is not available or where supplementary information is needed. If insulin is prescribed an understanding of predictable changes in insulin requirements is important, in addition to clinical support as the need for changes is observed. Those using insulin pump therapy will require specialised support from a CDE for the technical aspects of their diabetes management.[74-77]

The clinical status and personal goals of the pregnant woman will determine the frequency of review following diagnosis. Typically, assessment is recommended every 1 - 4 weeks [73] until week 31. After this, weekly to fortnightly review is recommended. although the CDE may not be involved in every visit. If blood glucose range is outside target, potential reasons should be explored including diet, intercurrent illness, other medication, stress, exercise, and lifestyle. [74-77]

Diabetes in Children and Young Adults

There is a preponderance of research into type 1 diabetes, type 2 diabetes, and monogenic diabetes in young people. Guidelines on diabetes education in this age group do not differentiate between types of diabetes in these groups but rather focus on specific characteristics of children and adolescents that impact clinical and educational needs and standards of diabetes care.[25, 50, 60, 78]

There is clear guidance that the CDE is a core member of the multidisciplinary team alongside the Endocrinologist (preferably paediatric) and dietitian for children and

adolescents with diabetes. Diabetes education is critical through the lifespan to support personal and clinical changes and team members should complement each other with consistent messaging within their scope of practice.[25, 50, 60] Health care professionals should be appropriately trained in education that is focussed on behavioural approaches, and structured education should be available to all young people with diabetes and their carers.[25]

The differences between diabetes education in adults and children and adolescents can be broadly defined by:

- The age of the person with diabetes including dependence on family and caregivers
- Growth and developmental change
- Stage of diabetes
- Maturity and lifestyle
- Culture, attitudes, and beliefs
- Readiness to learn
- Learning style
- Literacy and numeracy
- Existing knowledge, experience, and skills
- Treatment modalities (glucose lowering medicines and technology)
- Proximity to health care services including specialised diabetes centres and health care professionals [25, 50].

While many of these things are important in the care of all people with diabetes the age and changing nature of the person with diabetes means that specialised care is required.[25, 50, 60, 78] Age specific education can be divided into age groups to refine the information and style of teaching and learning.[25] Education is noted to be a continuous process and repetition is important to the quality of self-care decisions. Young people who do not receive diabetes education are more likely to develop diabetes-related complications and co-morbidities.[78]

Education should be provided at diagnosis with regularly scheduled reviews every three months to optimise outcomes. A more detailed annual review is also recommended.[50] Education is required for the child or adolescent with diabetes and primary care givers and can also extend to secondary care givers such as extended family, teachers, and day care workers. Some of these messages are complicated by the need for technology to be integrated into the diabetes care plan.[25, 50, 60, 78] This means the education provided is not static with multiple similar messages containing the same information needed to suit different learners.

Transition to adult care should be predicted from late teens to mid-20's and is preferably managed by the MDT as a planned and structured transition to reduce the likelihood of adverse long-term health outcomes (diabetes-related complications and co-morbidities)[50]. The age of the young adult is less important than their maturity, and the challenge is to

support the conflicting priorities of an increasingly independent life with the day-to-day requirements of living with diabetes.

Time required to deliver DMSE

There have been few studies that consider the time required by a CDE to deliver diabetes education.[1, 20] The CDE is frequently part of a larger team delivering structured education towards quantitative biometric outcomes.

The Cochrane Review of *Individual Patient Education for people with type 2 diabetes mellitus* collated data on multiple studies into individual diabetes education delivered by nurses for people with type 2 diabetes.[20] It found that of the studies available many offered only 2 – 4 hours of face to face education over six months. The review noted that benefits of structured diabetes education delivered by nurses were quantified by improvements in HbA1c. But these improvements diminished three months after cessation of studies. It was also noted that group education, where included, increased contact hours to an average of 21 hours over 12 months, but without improvement to quality of life for study participants.

Retention of knowledge has also been considered by Khunti et al in the UK.[19] Participants in the DESMOND programme were followed up three years after a structured group diabetes education programme facilitated by CDE's. Using a combination of clinical data and individual surveys they screened approximately 590 people newly diagnosed with type 2 diabetes who had completed a 6-hour programme. At three years they re- assessed HbA1c, blood pressure, weight, lipids, smoking cessation, activity, quality of life, mental health and determined that biomedical outcomes were not sustained without ongoing diabetes education.

The importance of ongoing DSME to reinforce teaching and positive self- management behaviours is a consistent theme.[1, 8, 20, 60] Even where studies included longer interventions it was shown that reinforcement was needed to sustain outcomes.[5, 8] Norris found that HbA1c was reduced by 1% for each 23.6 contact hours with a diabetes educator.[7]

In 2014 ADEA commissioned the Deloitte Access Economics report *Benefits of Credentialled Diabetes Educators to people with diabetes and Australia.*[1] Its purpose was to examine the cost effectiveness of diabetes education delivered by CDE's and considered group and individual education. Deloitte found that for every $1 dollar of spending on care delivered by a CDE the health care system saved an additional $16, and annual savings of $2827 were achieved per recipient of CDE care.[1]

Reimbursement for diabetes education delivered by a CDE was first introduced by Medicare in 2005 and it is grouped with allied health providers. Rebates for five consultations (for a minimum of 20 minutes) per calendar year are to be shared among all allied health providers. This is considered insufficient time to complete a comprehensive CDE review and education. ADEA members report that 44.7% of consultations are of longer than 45 minutes duration and an additional 38.5% are between 30 – 45 minutes duration.[(1)] There is a clear shortfall between the funded 100 minutes of Medicare reimbursed allied health benefits and the actual time reported for CDE consultations. At the time of writing there is no predictable or consistent access to reimbursement for diabetes education provided by a CDE under private health insurance.[(79)]

Diabetes Education which contributes to the understanding of diabetes management and self-care when delivered to people with diabetes, can prevent or delay complications, decrease the frequency and duration of hospitalisation and increase quality of life. Patient education is therefore recognised as an essential component of diabetes management and self-care. [(20)]

Translating the Evidence into Diabetes Pathways

PROPOSED PATHWAY	EXISTING RESOURCES
TYPE 2 DIABETES	NICE: Type 2 diabetes in Adults [80] RACGP: General Practice Management of Type 2 Diabetes [13] Endocrine Health Network WA: Diabetes Model of Care [81]
INSULIN THERAPY & NON-INSULIN INJECTABLES	ADEA: Clinical Guiding Principles for SC Injection Technique [39] RACGP: General Practice Management of Type 2 Diabetes [13]
GESTATIONAL DIABETES & PREGNANCY WITH PRE-EXISTING DIABETES	NICE: Diabetes in Pregnancy Overview [75] FIGO: GDM- a pragmatic guide for diagnosis management and care [72] ADIPS: Antenatal Models of Care for women with GDM [73]
	ADIPS: Consensus guidelines for the management of type 1 and type 2 diabetes in relation to pregnancy [82] NICE: Diabetes in Pregnancy Overview [75]
DIABETES TECHNOLOGY	ADA: Standards of medical care #7- Diabetes Technology [53] NDSS: Diabetes Technology Standards [54] RACGP: Management of Type 2 Diabetes [52]
TYPE 1 DIABETES	NICE: diabetes in children and young people overview [83] NICE: type 1 diabetes in children and young people [83]
CHILDREN AND YOUNG ADULTS	ISPAD: Clinical Practice Consensus Guidelines 2018 [25, 50] Type 2 Diabetes in Children and Adolescents: A Model of Care and clinical practice guideline for Western Australia [84] NICE: Type 2 diabetes in children and young people [83] Straight to The Point [85]

Abbreviations: ADIPS: Diabetes in Pregnancy Society, FIGO: International Federation of Gynecology and Obstetrics, ISPAD: International Society for Pediatric and Adolescent Diabetes, NICE: National Institute for Health and Care Excellence, RACGP: Royal Australian College of General Practitioners.

Appendices

1. Members of Expert Reference Group

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2. Members of CDE Working Party

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3.Research Opportunities

Duration of diabetes educator sessions

There is minimal quantitative evidence about the duration of diabetes education sessions including what is required and what is performed.

Much of the evidence around duration of diabetes education is contained within multidisciplinary lifestyle studies. Duration of diabetes education sessions is frequently unclear because studies use a multidisciplinary approach. The actual duration of DE sessions is rarely stated.

Frequency of Diabetes Educator Sessions

The frequency of CDE consultations also lacks quantitative evidence. Stakeholders indicated differing frequency of DE interactions and this was a topic of much discussion.

The paucity of evidence about the frequency a person with diabetes should see a CDE may be related to the different needs of people with diabetes, different organisational structures and funding models, and differences in resource allocation. The multidisciplinary team approach to diabetes care which is ground in evidence also means that determining the impact of any one HCP discipline is challenging.

When drafting the Diabetes Pathways we attempted to address this by identifying common "milestones" and adjusted the frequency of CDE referrals to align with RACGP guidelines which

recommend three monthly medical review for people with diabetes [52]. Consensus was obtained from Expert Reference Group and CDE Working Party members for the final drafts of the Diabetes Pathways.

4. Stakeholder Feedback

Feedback was requested from external stakeholders, the Expert Reference Group and CDE Working Party between June and October 2020. The feedback received was largely positive and the support for the CDE and the remit of the Diabetes Pathways Project was widely supported.

Common Themes

4.1 Clinical vs Referral Pathways:

Stakeholder feedback was often of clinical nature suggesting that the concept of a referral pathway was unfamiliar. This is not unexpected as the concept of a referral pathway for CDE's is new and literature review suggests limited evidence of referral pathways for diabetes education.

The Diabetes Pathways Project aimed to produce new material that complimented but did not reproduce existing clinical pathways. By adding additional content the pathways became complex and the simple message of how to refer to a CDE was diluted. This led to rationalising clinical recommendations to highlight the role of a CDE via a referral pathway.

The definition of Diabetes Pathways has been amended to define both clinical and referral pathways.

4.2 The User Experience

The language used and suitability for the audience was determined to be of significance. HCP and consumer stakeholders agreed that pathways for consumers were of value, but the language and detail required was very different. HCP's desired greater detail to guide the referral decision and to understand the CDE role and scope of practice. Consumers wanted material which informed the timing of ongoing care but did not desire detailed information about what each visit to a CDE would entail.

This has led the project team to produce "sets" of resources for the GP and consumer groups.

4.3 The Work of the CDE, funding and location

Stakeholder feedback on the expectations of the CDE role and referral pathway demonstrated inconsistencies between the work done, the work that is funded, how it is funded, and the work that is expected. There are indications that the actual work of the CDE is broader than some stakeholders realised and that the CDE often performs work that is not funded (such as on call requirements following commencement of technology or during insulin dose adjustment).

GP stakeholder feedback indicated a preference for referral via the CDM pathway, with one suggestion that it is the only pathway. There seems to be a lack of understanding of other referral pathways such as tertiary and community health settings, private attendance, nurse practitioner referral, or third-party funding from DVA or private health insurance.

4.4 Diabetes in Children and Young Adults

The need for separate pathways for type 1 and type 2 diabetes in the paediatric and adolescent population caused much discussion. The evidence for two referral pathways was not strong. However, there is evidence for different clinical pathways.

4.5 Frequency of CDE Intervention

The frequency of CDE intervention varied between stakeholders for paediatric and adolescent diabetes, pregnancy and gestational diabetes, and during the initiation of insulin. Where insufficient evidence identified during literature review to inform specific timelines for referral pathways consensus was required.

Paediatric diabetes HCP's indicated that immediately post diagnosis children and their families have contact with the diabetes team as frequently as once per day depending on clinical need. Most commonly stakeholders preferred weekly contact with a CDE for the first month post diagnosis.

Similarly, stakeholders reported differing frequency of interventions for insulin initiation and dose adjustment advice, pregnancy and gestational diabetes. ADiPs members recommended consideration of the addition of the report: "Antenatal models of care for women with gestational diabetes mellitus".[73] This feedback has been integrated into both the Diabetes Pathways and the Pathways report.

Consensus has been obtained from the Expert Reference Group and CDE Working Party to inform the frequency of CDE interventions in Diabetes Pathways where evidence was not available.

4.6 Complications screening

Stakeholder feedback highlighted differences between the timing of complications screening in the tertiary diabetes services and General Practice.

The Primary Care sector reported that complications screening is commonly guided by the Chronic Disease Management Plan which is funded by Medicare.[13, 52] Embedded in this process is the Annual Cycle of Care which recommends the timing of routine diabetes review and screening for complications by medical and allied health professionals at specific intervals over a twelve-month period. It was also noted the most common location for diagnosis was in the primary care space.

Tertiary diabetes services reported different patterns. In paediatric and adolescent age groups less frequent complications screening was noted and guidelines recommend assessment according to the age of the child, duration of diabetes and individual assessment of health needs. Adult tertiary diabetes services tended to care for more complex clients and may not have frequent contact with type 2 diabetes.

4.7 Other Feedback

Some stakeholder feedback was not included in the Diabetes Pathways. It was noted that some activities were part of normal clinical practice, others were outside scope of practice, or inclusion would have duplicated existing resources. This additional feedback is summarised below.

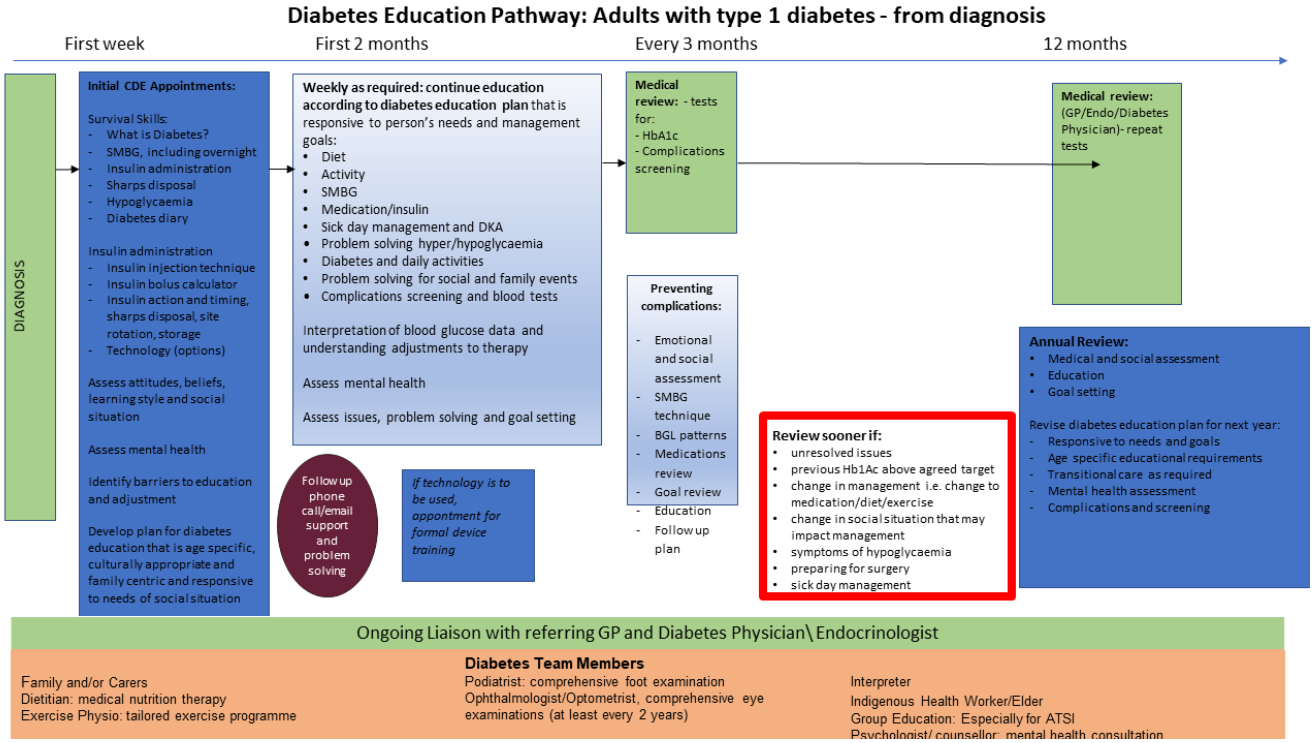
Feedback/topic discussed	**Reasoning for non-inclusion in the pathways**
Mental health support and diabetes burn-out Smoking cessation Building relationships with diabetes team Driving and diabetes Completion of forms for NDSS, Centrelink and JDRF Use of interpreters Weight management Preparation When to communicate with GP*	Part of the routine work of the diabetes educator *embedded in Chronic Disease Management (CDM) requirements for referral
Biochemical measurements (i.e.: Lipids, thyroid function, renal function)* Prescription and administrations of Immunisations** and contraception* Assess fitness to drive Assess for other autoimmune conditions* Polypharmacy* Formal assessment of cognitive function*	Outside CDE scope of practice * except where the professional has endorsement as a nurse practitioner ** except where the professional has endorsement as a nurse immuniser
Short term use of investigative tools such as CGM School education	Individual patient requirement
Referral processes and funding models used to access CDE services Chronic Disease Management (CDM) - MBS items MBS items PBS and Pharmacy funding Private health insurance	Information is available elsewhere: CDM: https://www1.health.gov.au/internet/main/publishing.nsf/Content/mbsprimarycare-chronicdiseasemanagement MBS: http://www9.health.gov.au/mbs/search.cfm?q=2517&sopt=S&= Community Pharmacy Agreement (&CPA: https://www.ppaonline.com.au/about-7cpa Not all referrals originate with a CDM and some patients are willing to attend CDE review privately.
Specific recommendations for when to see other allied health professionals	Allied health professionals are included in the Diabetes Team Members box on each pathway.

	Existing evidence-based guidelines are in place for the following groups: • Dietitians: APD and APD/CDE • Optometry • Podiatry • Exercise physiologist • Occupational therapist • Social worker

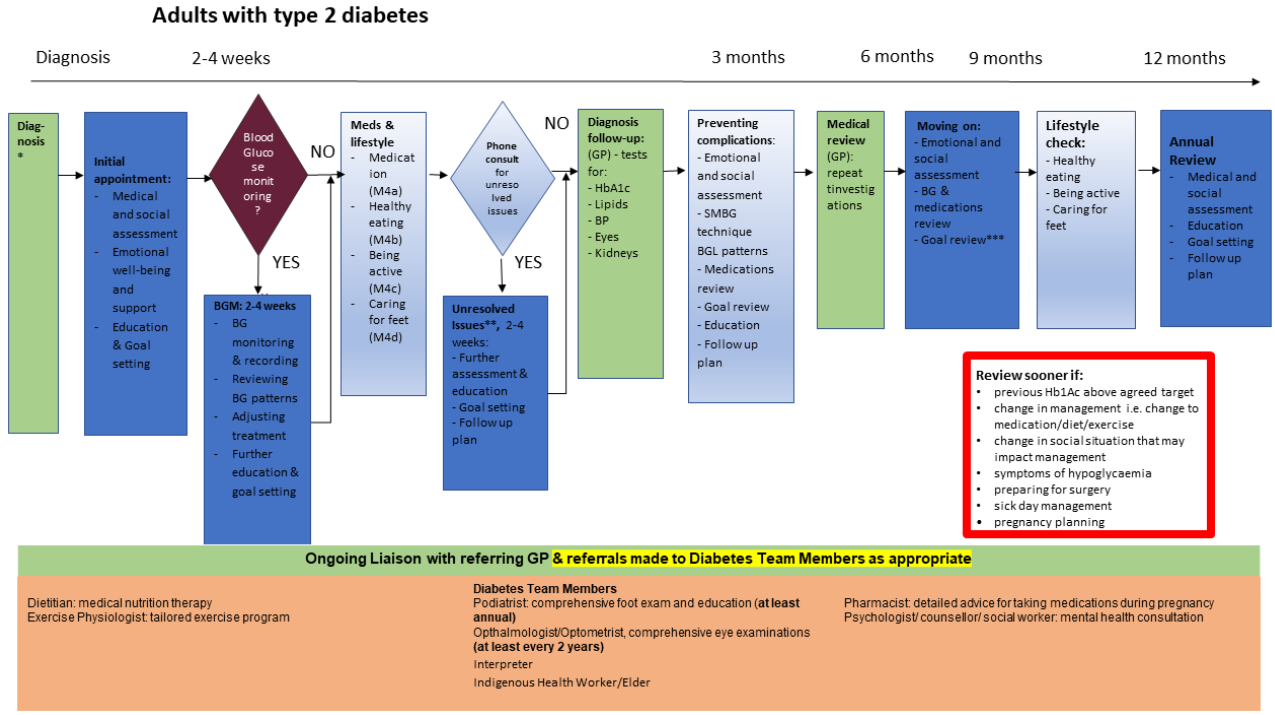
5. CDE Working Party Pathway concept development

The following diagrams represent the CDE working groups concept development for the Pathways and the details for the timepoints in the diabetes journey.

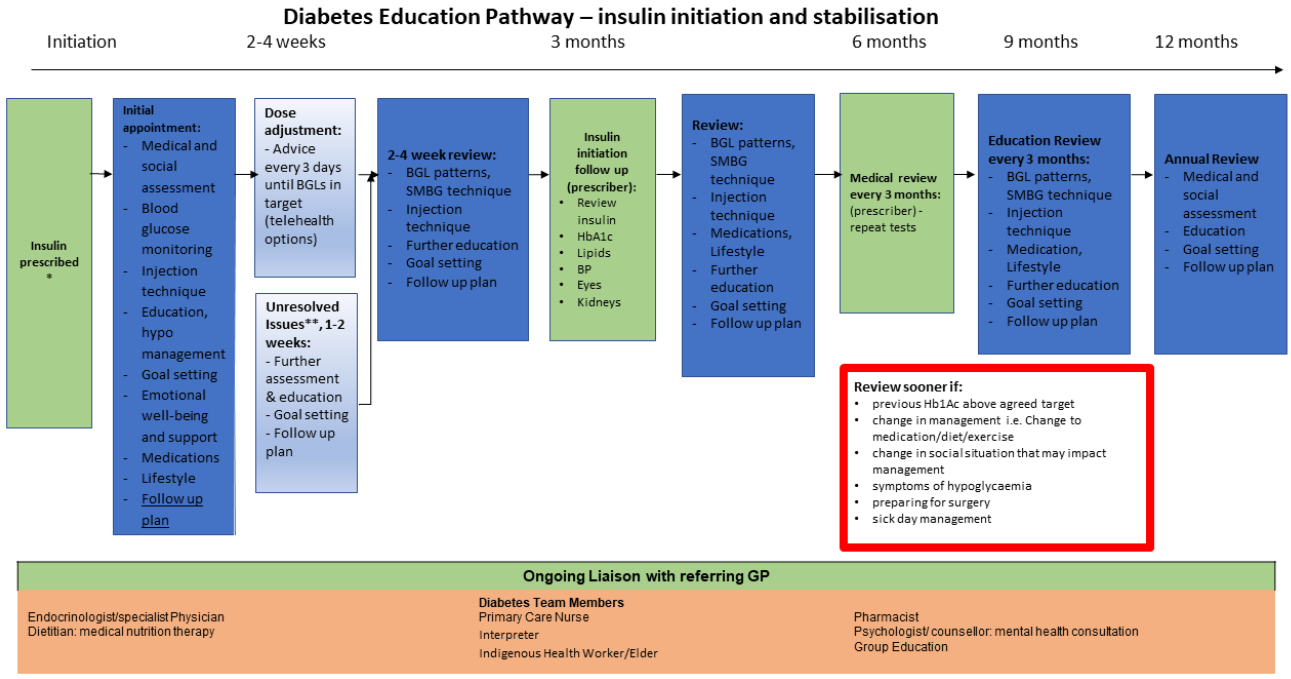
Type 1



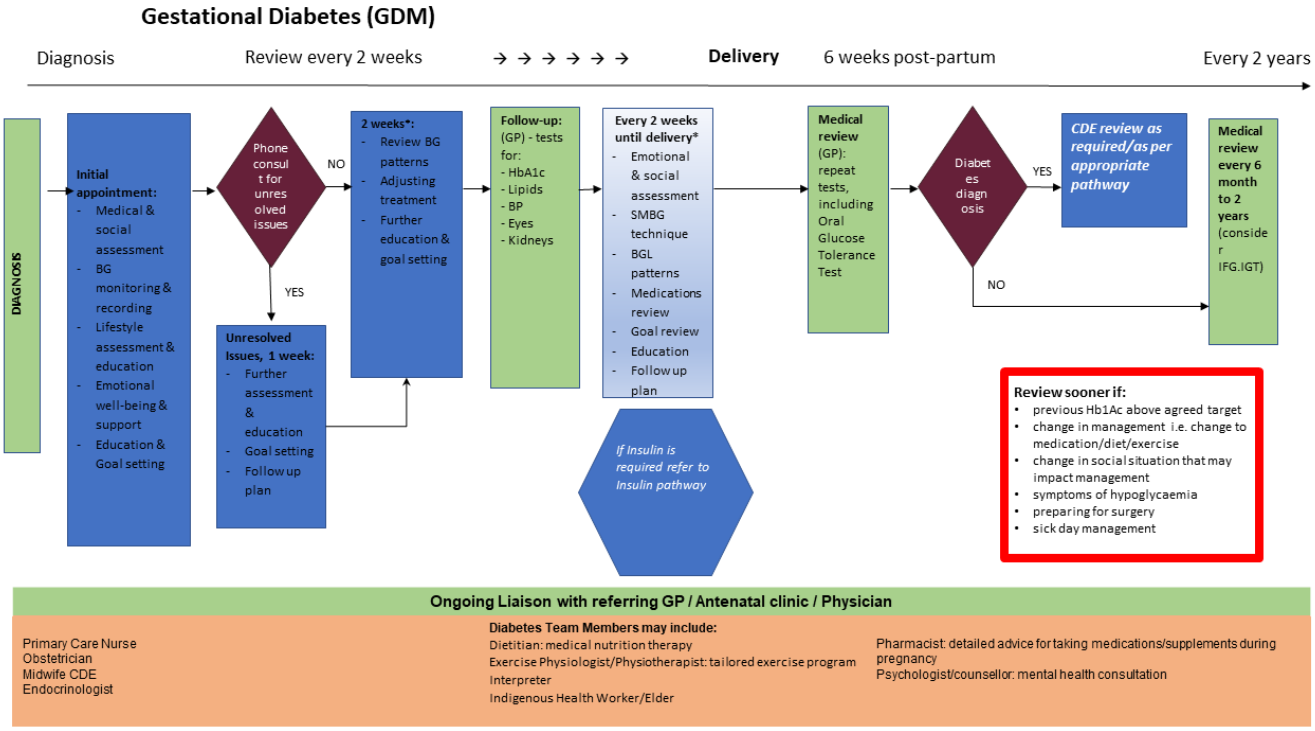
Type 2



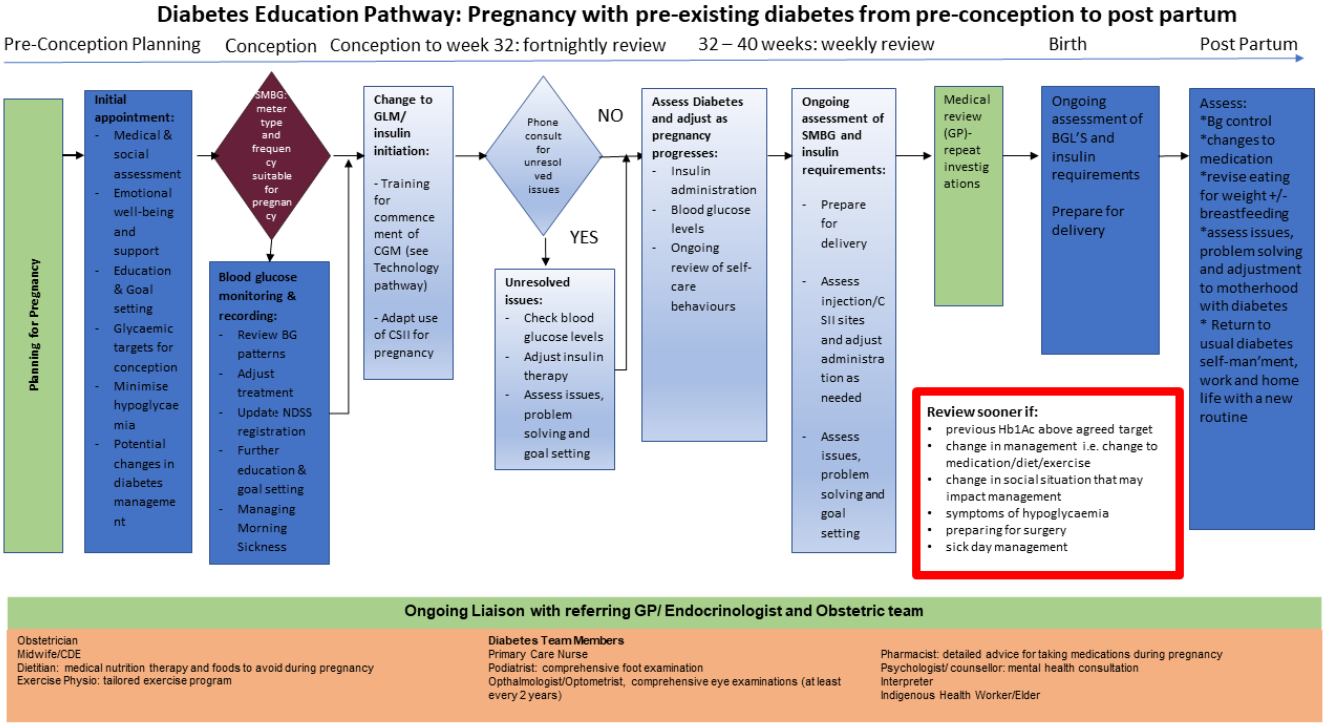
Type 2 insulin initiation and stabilisation



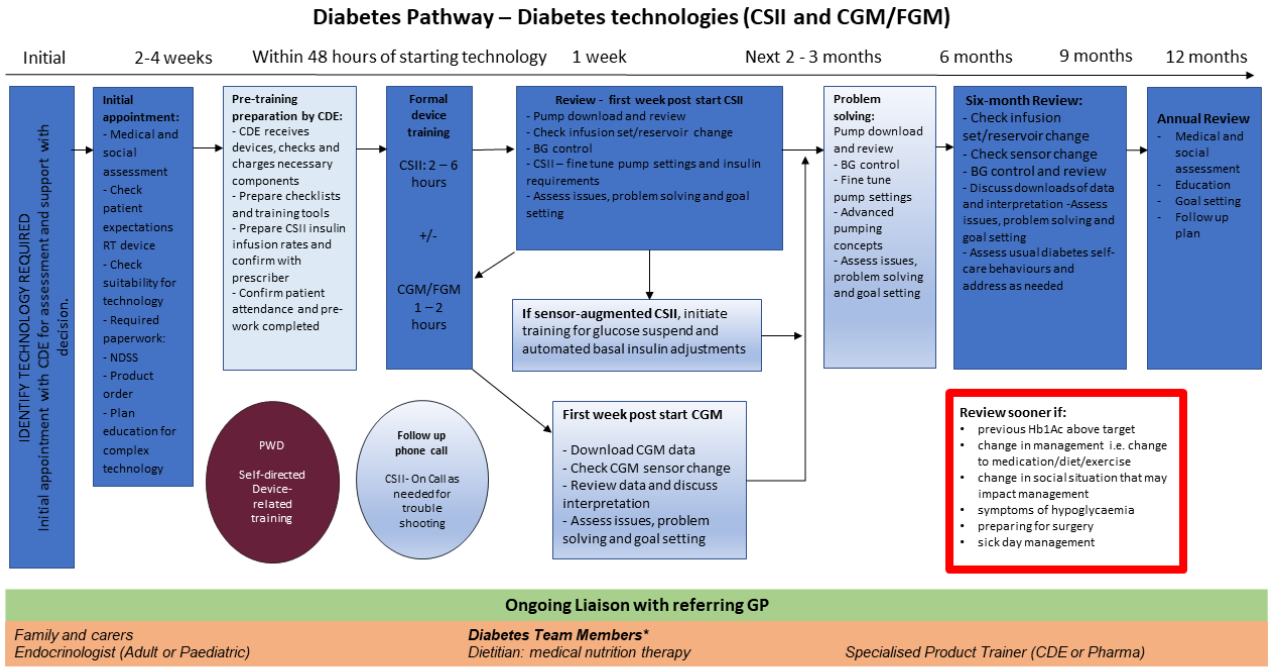
Gestational diabetes



Pregnancy with pre-existing diabetes



Diabetes Technologies



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