

Standard 17

All patients with type 1 diabetes should have access to an experienced multidisciplinary team, including expertise in insulin pumps and continuous glucose monitoring (CGMS) when required.

Key practice points

- All people with type 1 diabetes should be provided with multidisciplinary support from the time of diagnosis onwards.
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- The multidisciplinary team should ideally be co-located and must include expertise and experience in insulin pumps and continuous glucose monitoring.
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- Coding within patient records should specify the type of diabetes to enable a register to be maintained.
- Living with type 1 diabetes is challenging and the navigation of health care requirements is complex with the need for appointments and partnerships with multiple providers. Practitioners should be aware of these challenges when providing and organising patient-centred care.

Read this standard in conjunction with the equality and diversity section in the Introduction to the Toolkit.

What the quality statement means for each audience

Service providers ensure people with type 1 diabetes have access to an experienced co-located multidisciplinary team including expertise in insulin pumps and continuous glucose monitoring systems when required.

Health care professionals ensure they are competent to provide care to people with type 1 diabetes within a multidisciplinary team including expertise in insulin pumps and continuous glucose monitoring systems when required.

Planners and funders ensure they commission services that provide co-located multidisciplinary care to people with type 1 diabetes that includes expertise in insulin pumps and continuous glucose monitoring systems when required.

People with type 1 diabetes receive care from a multidisciplinary team and expert advice and support with insulin pumps and continuous glucose monitoring (CGMS) if required.

Overview

The information below is separated into two sections:

- type 1 diabetes management and multidisciplinary team approaches
- insulin pumps and continuous glucose monitoring systems.



Introduction

Type 1 diabetes management and multidisciplinary team approaches

Around 10% of people diagnosed with diabetes are thought to have type 1 diabetes and Ministry of Health statistics (2013) suggest this would include over 24,000 individuals in New Zealand. However the prevalence of type 1 is increasing in New Zealand and other countries.

Map of medicine

The Map of Medicine is an interactive tool based on evidence-based, practice-informed care maps which connect all the knowledge and services around a clinical condition.

The information associated with type 1 diabetes is that:

- it generally presents with acute hyperglycaemic symptoms:
 - polydipsia
 - polyuria
 - polyphagia
 - tiredness
- it is often associated with ketonuria
- it is often associated with marked weight loss
- it often presents in younger patients
- the initial management should be started by a diabetes specialist and involve the care of a multidisciplinary diabetic team.

<http://healthguides.mapofmedicine.com/choices/map-open/diabetes1.html>

Multidisciplinary team

Diabetes New Zealand (Diabetes NZ) notes the importance of the individual working with health care professionals as a member of the health care team. For the individual, an understanding of the condition is vital as is the need for identification of team members and clear discussions around roles and responsibilities in order to achieve the best possible care. Potential members of the team are identified for people with diabetes by Diabetes NZ as:

- the family/whānau or caregiver
- general practitioner (GP)
- practice nurse
- dietitian
- pharmacist
- diabetes nurse/diabetes nurse educator
- diabetes specialist (diabetologist)
- optometrist/ophthalmologist
- podiatrist
- psychologist
- other health professionals, such as a midwife for gestational diabetes
- diabetes support organisations, eg, Diabetes NZ, or the local diabetes society/support group.

Insulin pumps and continuous glucose monitoring systems

Insulin pumps

Continuous subcutaneous insulin infusion (CSII) or insulin pumps are small battery powered external devices that deliver insulin through an infusion line into the skin by a removable cannula. They are programmed to deliver a continuous low rate of insulin during the day and night (basal) with additional insulin being delivered (as a bolus dose) at mealtimes or to correct a high blood glucose level. At snack and mealtimes (whenever food is eaten), the user enters the amount of carbohydrate into their pump as well as their blood glucose level and the pump calculates how much insulin is needed for the food and to achieve the target blood glucose level (Starship Children's Health).

A review of the literature around the effectiveness and economy of insulin pump therapy was commissioned by the Ministry of Health and performed by the Health Services Assessment Collaboration at the University of Canterbury (Campbell et al 2008). They concluded that 'when compared with optimised MDI [multiple daily injections], CSII results in a modest but potentially worthwhile improvement in glycosylated haemoglobin levels in all patient groups assessed (ie, adults with type 1 diabetes, children and adolescents with type 1 diabetes, and adults with type 2 diabetes). Due to the short duration of the clinical trials is not possible to evaluate the longer term benefits of such a difference in HbA1c levels; however, there is an expectation that it would be reflected in a reduction in long term complications. Although more immediate primary benefits from CSII may be associated with an impact on the incidence of severe hypoglycaemic events and improved quality of life (through greater flexibility of lifestyle), there is limited evidence to support this from the studies identified in this update.

However, despite the limited evidence it is postulated that CSII may reduce the number of severe hypoglycaemic attacks a patient experiences compared with MDI. According to the results of the cost-effectiveness analysis conducted herein, it is estimated that if every patient who changed from MDI to CSII therapy was able to avoid one severe hypoglycaemic attack every two years (ie, an improvement of 0.5 events per annum), the incremental cost per severe hypoglycaemic event avoided would be approximately \$6,000. The total incremental cost associated with the introduction of CSII compared to MDI for a patient with type 1 diabetes is approximately (in 2008) \$16,000 over six years (the approximated life of the pump)' (p vi).

Goenka et al (2011) note that there will be an increase in the uptake of insulin pump use for people with type 1, estimates in the UK being 10% of those aged over 12 years and 25% of those under 12. Consequently, the initiation and management of pumps should be an integral part of a Diabetes Specialist Service and should involve a multidisciplinary team trained in pump management. The team should include staff with a special interest in insulin pump therapy and clinical, psychological and educational expertise.

Continuous glucose monitoring systems (CGMS)

Continuous glucose monitoring systems (CGMS) measure blood glucose levels semi-continuously. Most modern CGMS consist of a small needle which is inserted in the abdominal subcutaneous fat. The tip of the needle houses a small glucose sensor which can measure glucose levels in the fluid which surrounds the fatty tissue.

A Cochrane review of CGMS for type 1 diabetes mellitus (Langendam et al 2012) included 22 studies in which a total of 2883 patients were randomised to receive a form of CGM or to use self-measurement of blood glucose using fingerprick. The follow-up period ranged from three to 18 months with most studies reporting results for six months of CGM use. This review shows that CGM helps in lowering HbA1c. In most studies, the HbA1c value decreased in both the CGM and the self-monitoring of blood glucose (SMBG) users but more in the CGM group. The

difference in change in HbA1c levels between the groups was on average 0.7% for patients starting on an insulin pump with integrated CGM and 0.2% for patients starting with CGM alone. The most important adverse events, severe hypoglycaemia and ketoacidosis, did not occur frequently in the studies and absolute numbers were low (9% of the patients measured over six months).

The American Diabetes Association (ADA) recommendations (ADA 2014) state that when used properly, continuous glucose monitoring (CGM) in conjunction with intensive insulin regimens is a useful tool to lower HbA1c in selected adults (aged ≥ 25 years) with type 1 diabetes. Although the evidence for HbA1c lowering is less strong in children, teens, and younger adults, CGM may be helpful in these groups. Success correlates with adherence to ongoing use of the device. CGM may be a supplemental tool to SMBG in those with hypoglycaemia unawareness and/or frequent hypoglycaemic episodes.



Guidelines

Type 1 diabetes management and multidisciplinary team approaches

The New Zealand Diabetes Workforce Service Review (2011) provides a diabetes care pathway for type 1 diabetes and states ‘the emphasis is on diabetes care being led and provided by specialist services particularly in the first month and year following diagnosis. On an ongoing basis specialist oversight is required but the majority of care may be provided in general practice with support from specialist services. Those with type 1 diabetes require long term care by a specialist multidisciplinary team with specific skills in managing all aspects of type 1 diabetes and its complications. Much of this care may be provided by nurse practitioners, specialist diabetes nurses and dietitians with expertise in type 1 diabetes and its complications. Other services will be required as the disease progresses and complications ensue, or for episodic care such as hospital admissions, travel plans, investigative procedure plans. Palliative care services are engaged at the appropriate stage and advanced care planning is embedded’ (p 18).

Ideally, the multidisciplinary care team should be co-located. Living with type 1 diabetes is challenging and the navigation of health care is complex with the need for appointments and partnerships with multiple providers.

The care pathway for children with type 1 can be found on page 53, and for adults aged over 18 years on page 54 (www.health.govt.nz/system/files/documents/pages/diabetes-workforce-service-review.pdf).

The National Institute for Health and Care Excellence (NICE) guidelines for people with type 1 diabetes are currently under review and will be finalised by August 2015. The 2004 guideline on diagnosis and management of type 1 diabetes in children, young people and adults is available here: www.nice.org.uk/Guidance/CG15.

Multidisciplinary teams

While there are no guidelines as such relating to teams, the following are requirements for a well-functioning multidisciplinary approach identified in a New Zealand report on multidisciplinary approaches in public health (Clewley et al 2005):

- clarity about the role and expertise of each team member
- a willingness to allocate tasks according to skills and joint responsibility for outcomes

- regular and effective communication, enhanced where possible by collocation, joint case notes or information technology systems
- support and ongoing education for team members
- flexible funding and employment arrangements
- rigorous and innovative research and evaluation into team processes, economic costs, and health outcomes with acknowledgement of the context in which the team operates
- development of a common understanding of vision and goals: provides the common ground for members of a team. Ideally the vision and goals are arrived at collaboratively by team members
- selecting the right team members: based not only on professional disciplines but also on appropriate skills and attitudes that are conducive to collaboration.

The report also identified the following obstacles to a multidisciplinary approach:

- turf protection/gate-keeping
- financial factors, eg, budget lines for ‘non-core’ work. Is the team funded as a separate entity (ie, budget line) or is funding drawn from the individual pre-existing budget lines of the professions/members involved?
- lack of professional training in multidisciplinary approaches
- logistics, eg, co-location, available meeting times, and physical resources
- differing reporting requirements for disciplines involved
- lack of formal evaluating criteria
- lack of trust between participating professions
- focus on professional autonomy
- legislative framework limiting the scope of professional practice.

Insulin pumps and continuous glucose monitoring systems

Insulin pumps

The Ministry of Health’s (2003) Service Specification provides, in no specific order, the following clinical priority access criteria for insulin pumps.

Patients with type 1 diabetes:

- with hypoglycaemic unawareness and autonomic neuropathy suffering recurrent severe hypoglycaemic episodes
- with poor glycaemic control and unacceptable fasting blood glucose levels due to a marked dawn phenomenon especially in adolescents
- with poor glycaemic control despite multiple daily injections (MDI) who are proven to have improved control with a trial of insulin pump therapy and recurrent diabetic keto-acidosis despite all efforts to avoid it
- with eating disorders (in highly selected cases)
- and other chronic illness, eg, coeliac disease
- variable or prolonged insulin action.

Additional criteria state that patients, caregivers or parents must:

- have the patient on optimal conventional therapy
- monitor and record blood glucose a minimum of four times per day, and make appropriate adjustments
- be responsible and psychologically stable
- be willing to quantitate food intake, especially carbohydrate in the diet
- be willing to comply with medical/nursing follow-up
- be able to cope with and manage the technical challenges of the equipment
- have committed parental/caregiver supervision in diabetes care.

Continuous glucose monitoring systems

A clinical practice guideline for the use of continuous glucose monitoring was developed by the US Endocrine Society, and can be accessed here: www.guideline.gov/content.aspx?id=35254.



Implementation advice

Type 1 diabetes management and multidisciplinary team approaches

A NICE care pathway for people with type 1 diabetes can be found at: <http://pathways.nice.org.uk/pathways/diabetes>.

Insulin pumps and continuous glucose monitoring systems

According to the Ministry of Health Service Specification (2003):

‘The regional service must use a documented assessment process, and attempt first to maximise MDI. This may require continuous glucose monitoring (using interstitial glucose sensors). The regional service should support secondary hospital diabetes services where it is practicable to undertake this assessment remotely.

The service should include a detailed programme for pre-insulin pump assessment, implementation, support, and on-going review of patients on insulin pumps. The service should provide for a trial period of insulin pump therapy to suitable patients.

Personnel requirements include:

- a specialist diabetes physician/paediatrician with experience in the selection and supervision of patients on insulin pumps
- a diabetes nurse specialist trained in continuous glucose monitoring and insulin pump therapy
- a specialist dietician with experience in providing appropriate dietary education for patients planning to use insulin pumps’ (p 2).

Reporting requires that for each referral the service must maintain a register that includes:

- the NHI and patient demographics including ethnicity,
- the indications for referral (using the referral criteria in this service specification),

- the report and outcome from an assessment using continuous glucose monitoring (if applicable)
- the final treatment (including optimised MDI, insulin pump, other specific treatment modalities, or assessment and treatment not completed) (p 3).

The **Australian Clinical Guidelines for Management of Type 1** (2011) suggests that individuals who may be likely to benefit from CSII pump therapy, as part of intensive diabetes management, are:

- some children and adolescents, including infants and young children, and pregnant women (ideally preconception)
- individuals with microvascular complications of diabetes
- individuals with reduced hypoglycaemia awareness
- individuals (or their supervising adults) with desirable motivational factors; for example, those seeking to improve blood glucose control and having realistic expectations
- individuals exhibiting desirable CSII treatment-related behavioural factors, including those who:
 - are able to perform carbohydrate counting
 - are currently undertaking four or more blood glucose tests per day
 - have reliable adult supervision (in paediatrics), and a history of good self-management skills (in adults)
 - are able to master the technical skills of CSII
 - are reliable in follow-up health care.

The UK's **NICE** guidelines state that continuous subcutaneous insulin infusion or insulin pump therapy is recommended as a possible treatment for adults and children 12 years and over with type 1 diabetes mellitus if:

- attempts to reach target HbA1c levels with multiple daily injections result in the person having 'disabling hypoglycaemia', or
- HbA1c levels have remained high (69 mmol/mol or above) with multiple daily injections (including using long-acting insulin analogues if appropriate) despite the person and/or their carer carefully trying to manage their diabetes.

Insulin pump therapy is recommended as a possible treatment for children under 12 years with type 1 diabetes mellitus if treatment with multiple daily injections is not practical or is not considered appropriate. Children who use insulin pump therapy should have a trial of MDI when they are between the ages of 12 and 18 years.

Insulin pump therapy should only be started by a trained specialist team. This team should include a doctor who specialises in insulin pump therapy, a diabetes nurse and a dietitian (someone who can give specialist advice on diet). This team should provide structured education programmes and advice on diet, lifestyle and exercise that is suitable for people using insulin pumps.

Insulin pump therapy should only be continued in adults and children 12 years and over if there has been a sustained improvement in the control of their blood glucose levels. This should be shown by a decrease in the person's HbA1c levels or by the person having fewer hypoglycaemic episodes. Such goals should be set by the doctor through discussion with the person or their carer.



Implementation examples / innovations

Type 1 diabetes management and multidisciplinary team approaches



The Type 1 Diabetes (T1D) Exchange Clinic Registry

This is a large scale study of children and adults with type 1 diabetes in the United States. Twenty-five thousand people have been enrolled and results have been published since 2013. A study of adults with type 1 diabetes of at least two years duration and not using continuous glucose monitoring compared those with excellent control (HbA_{1c} <48, N=627) and fair/poor control (HbA_{1c} >69, N=1267). Results showed that excellent control was associated with higher socioeconomic status; being older and married; not being overweight; frequent exercise; lower total daily insulin dose per kg; more frequent monitoring of blood glucose; administering mealtime boluses prior to rather than at or after eating; monitoring before giving a bolus and missing an insulin dose less frequently. Frequency of severe hypoglycaemia was similar for both groups but diabetic ketoacidosis was more common for those with poorer control (Simmons et al 2013).

Insulin pumps and continuous glucose monitoring systems



Starship Children's Health

Starship Children's Health runs an insulin pump programme which is summarised in a pdf, a link to which can be found here: <https://www.starship.org.nz/patients-and-families/directory-of-services/Diabetes-and-Endocrinology/>

Following consultation with a diabetes consultant around eligibility for pump therapy, the programme supports individuals and their families/whānau through:

- access to a pump (PHARMAC or self-funded)
- application for authority
- education on the pump and how it works
- dietary advice
- filling prescriptions for pump, consumables and insulin
- pump training (two half-days and a one-hour follow-up a week later)
- daily contact with diabetes team for up to a fortnight
- download pump weekly
- 3–4 monthly clinic follow-ups.



Clinical impact of insulin pump therapy

To examine the clinical impact of insulin pump therapy for children with type 1, de Bock et al (2010) conducted a retrospective analysis of a six-year cohort of children from the Starship paediatric diabetes database compared with the whole T1DM population and with an equal number of non-pump patients matched by age, sex, ethnicity and duration of diabetes. From the total group of 621 children, 75 were started and remained on pump therapy for 12 months. From their comparison the authors concluded that ‘in a pump-naïve regional paediatric population, insulin-pump therapy for T1DM was safe and effective, and associated with sustained improvements in HbA1c and lower risk of hypoglycaemia’.



Waikato District Health Board

A Waikato study (Reda et al 2007) compared HbA1c levels for a group of people with type 1 before and after the introduction of pump therapy. No comparison group was used and the data consisted of 105 individuals on continuous subcutaneous insulin infusion (CSII) at the time of the study. A significant improvement in HbA1c was found with an average reduction of 1%, which was maintained at three years. The incidence of severe hypoglycaemia reduced from 0.75 cases per patient year during multiple daily injections (MDI) pre-pump to 0.05 during CSII. Hypo awareness was restored for some individuals and there was no increase in diabetic ketoacidosis.



Assessment tools

Type 1 diabetes management and multidisciplinary team approaches

Structure

People with type 1 diabetes should have access to an experienced multidisciplinary team.

Process

- (a) The proportion of people with type 1 diabetes offered access to an experienced multidisciplinary team within the past 12 months.

Numerator	The number of people in the denominator recorded as being offered access to care from a multidisciplinary team in the past 12 months
Denominator	The number of people with type 1 diabetes

- (b) The proportion of people with type 1 diabetes receiving care from an experienced multidisciplinary team within the past 12 months.

Numerator	The number of people in the denominator receiving care from an experienced multidisciplinary team in the past 12 months
Denominator	The number of people with type 1 diabetes

Insulin pumps and continuous glucose monitoring systems

Structure

People with type 1 diabetes should have access to an experienced multidisciplinary team with expertise in insulin pump therapy and CGMS when required

Process

- (a) The proportion of people with type 1 diabetes using insulin pump therapy who would benefit from it in the past 12 months.

Numerator	The number of people in the denominator on insulin pump therapy in the past 12 months
Denominator	The number of people with type 1 diabetes who would benefit from insulin pump therapy

- (b) The proportion of people with type 1 diabetes using CGMS who would benefit from it in the past 12 months.

Numerator	The number of people in the denominator using CGMS in the past 12 months
Denominator	The number of people with type 1 diabetes who would benefit from using CGMS



Resources

The **Type 1 Diabetes Network** is an Australian organisation which provides information and support for people with type 1. They have produced an information Starter Kit for newly diagnosed individuals which is currently in its fourth edition.

‘The Type 1 Diabetes Network Starter Kit is the result of contributions from people living with type 1 diabetes in Australia. This document seeks to provide people newly diagnosed with type 1 a sense of what life is actually like on a day-to-day, 24/7 basis, including the good and bad; the funny and frightening; the reality and the myths. This document is intended to complement the information provided by health care professionals, diabetes organisations and other sources’ (p 3). It includes information on insulin pumps and can be accessed at: http://t1dn.org.au/wp-content/uploads/2013/11/StarterKit_Web_1312.pdf

PHARMAC’s information on insulin pumps can be accessed here:

www.pharmac.govt.nz/2012/08/08/2012-08-08%20Notification%20of%20Insulin%20pumps.pdf

A patient guide to continuous glucose monitoring has been developed by the US National Guideline Clearinghouse committee. It can be found here: www.hormone.org/patient-guides/2011/continuous-glucose-monitoring



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