31st August 2023

The Endocrine Society of Australia (ESA) welcomes the opportunity to submit this response to The House of Representatives Standing Committee on Health, Aged Care and Sport Inquiry into diabetes and obesity. ESA is a national non-profit organisation of medical specialists, researchers, and trainees, founded in 1958 and with over 1000 members, including recognised national and international experts in diabetes and obesity. Our members belong to medical and academic organisations across Australia, and are leaders within the Royal Australasian College of Physicians (RACP), hospital clinics, universities, faculties of medicine, medical institutes and Fellows of the Australian Academy of Science.

1. The causes of diabetes (type 1, type 2 and gestational) in Australia, including risk factors such as genetics, family history, age, physical inactivity, other medical conditions and medications used.

Type 1 diabetes (T1D) results from an autoimmune attack on pancreatic beta cells, leading to lifelong need for insulin replacement. T1D is thought to be caused by some form of environmental trigger in genetically susceptible individuals. Specific environmental triggers have been elusive but may include certain viruses. Genetic risk is exemplified in twin studies (concordance for T1D in identical twins ~50%) and sibling concordance rates from 6-10%. T1D usually presents in childhood or adolescence but can occur at any age.

Type 2 diabetes (T2D) is caused by failure of pancreatic beta-cells to secrete enough insulin to control blood glucose levels, usually in the face of obesity-induced insulin resistance. It has a strong genetic basis (concordance for T2D in identical twins ~80%) coupled with modifiable lifestyle risk factors including obesity, poor diet and physical inactivity. T2D is frequent in people with other medical conditions such as polycystic ovarian syndrome (PCOS), obstructive sleep apnoea, non-alcoholic fatty liver disease, Cushing's syndrome and acromegaly. T2D may be a complication of medications such as prednisone, and many anti-psychotics.

Gestational diabetes (GDM) is caused by failure of pancreatic beta-cells to secrete enough insulin to control blood glucose levels during pregnancy and has similar risk factors to T2D. It is a strong risk factor for future development of T2D.

2. New evidence-based advances in the prevention, diagnosis and management of diabetes, in Australia and internationally:

The major advances for T1D treatment have been in new monitoring devices and insulin delivery systems. Managing T1D relies upon insulin replacement therapy tailored to self-blood glucose measurements. There has been steady incremental improvement in insulin analogs, insulin delivery devices and blood glucose measuring devices. In particular, insulin pumps coupled with continuous blood glucose monitoring sensors in "closed loop" systems have become widely used in the treatment of children and adolescents with T1D; for adults, the requirement for private

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health insurance is a major barrier to insulin pump therapy. Continuous glucose monitors *per se* have had a substantial positive impact on management of T1D, due to greater ability to avoid hypoglycaemia and better titration of meal-time insulin. Islet or pancreatic transplantation is currently available to very few people with T1D.

For T1D, advances in prevention have been a long time coming but some immune modulating therapies are now showing promise; for instance, teplizumab (anti-CD3) has been approved by the FDA to delay progression from preclinical (Stage 2) to overt (Stage 3) T1D. Immune suppression is not without adverse effects and there is still much work to be done before such therapies can be translated widely into clinical practice.

Diagnosis of T1D is still nearly always based upon its clinical presentation; newly developed genetic risk scores may help identify individuals at highest risk for T1D, i.e. before the disease develops.

The use of HbA1c for diagnosis of T2D (MBS item approved after advocacy from the Australian Diabetes Society) has significantly improved diabetes diagnosis rates in Australia.

For T2D, prevention relies on weight control and healthy physical activity. Metformin has been shown to reduce progression to T2D in high-risk individuals; other advances in obesity management (see below) have also had some impact on preventing T2D.

T2D is treated in a stepwise fashion with lifestyle modification (improving diet and physical activity levels), oral medications (metformin, sulfonylureas, DPP4 inhibitors, SGLT2 inhibitors and thiazolidinediones), non-insulin injectables (GLP-1 analogs) and, ultimately, insulin. SGLT2 inhibitors ("flozins") represent a relatively new advance in managing not only T2D, but also its frequent complications of heart failure and chronic kidney disease. Bariatric surgery is an effective treatment for T2D in obese people. Emerging data from several recent clinical trials indicate combinations of GLP-1 and GIP analogs (tirzepatide) or GLP-1/GIP/glucagon analogs are very effective at inducing weight loss with concomitant improvements in diabetes control. In addition, GLP-1 analogs reduce the risk of cardiovascular events in patients with obesity and diabetes.

End-organ complications of diabetes can be delayed or prevented by addressing other risk factors including smoking cessation, hypertension, dyslipidaemia, regular eye reviews and podiatric care.

3. The broader impacts of diabetes on Australia's health system and economy as you have observed these impacts:

Almost 1.9 million Australians have diabetes, estimated to cost the economy $17.6 billion annually (diabetesaustralia.com.au). Diabetes diagnosed are increasing by 300 per day. Aboriginal and Torres Strait Islander Australians are at 3-fold higher risk developing T2D than non-Indigenous Australians, and 4 times as likely to die from it.

Diabetes has substantial impacts across the whole health system. Around 1.2 million people are hospitalised with diabetes-related conditions every year. Diabetes is the leading cause of preventable blindness, the leading cause of end-stage kidney failure requiring dialysis and the leading cause of non-traumatic lower limb amputation. Diabetes increases the risk of premature heart disease. Approximately 25% of all hospital inpatients will have diabetes.

Diabetes takes a high personal toll not only on those affected but also family members or carers who are often co-opted in diabetes management at home. People with diabetes may require specific medical endorsement to retain their driving licences, be prevented from certain types of work, and are at risk from premature retirement from work and/or permanent disability from complications. Patients with diabetes have higher rates of depression.

The personal and system-wide impacts from diabetes are higher in rural and remote regions due to lack of adequate healthcare resources, including primary care physicians, diabetes nurse educators, dieticians, optometrists, podiatrists and the wide range of medical specialists often required for diabetes management (endocrinologists, ophthalmologists, cardiologists, vascular surgeons etc).

4. Any interrelated health issues between diabetes and obesity in Australia, including the relationship between type 2 and gestational diabetes and obesity, the causes of obesity and the evidence-base in the prevention, diagnosis and management of obesity.

The strong inter-relationship between T2D and obesity has given rise to the term *diabesity*. T2D and obesity share common risk factors (poor diet, physical inactivity, social disadvantage, family history). Obesity increases the risk of T2D and GDM. Diabetes and obesity in the mother during pregnancy increase the risk of obesity and diabetes in their offspring. The risk of diabetes complications such as cardiovascular disease, chronic kidney disease and lower limb amputations are all increased by obesity.

Obesity is caused by adverse environments (poor diet, physical inactivity) in genetically susceptible individuals. The evidence base in prevention of obesity is limited but includes dietary education and promotion of physical activity.

Diagnosis of obesity is based upon body mass index (weight in kg divided by height in metres squared) and/or waist circumference, using ethnic-specific cutoffs. Diagnosis should therefore be inexpensive and readily available at any level of healthcare throughout Australia.

The management of obesity has been limited by poor access to effective pharmacological or surgical treatments, including GLP-1 analogs (semaglutide, dulaglutide, liraglutide, exenatide), sleeve-gastrectomy, laparoscopic adjustable gastric banding and Roux-en-Y gastric bypass surgery.

5. The effectiveness of current Australian Government policies and programs to prevent, diagnose and manage diabetes.

Diabetes and obesity diagnoses continue to rise in Australia. Current Australian Government policies and programs have had some impact in early diagnosis (MBS-funded HbA1c) and management of diabetes (approval of new pharmacotherapies on PBS, increased availability of CGM devices on NDSS, chronic health care plans on MBS). Prevention and early management of diabetes and obesity in primary care has been emphasised and partially facilitated by Government. Specialist physician care has been facilitated by the introduction of MBS 132/133 items for complex disease management plans; we believe there remains a gap in supporting specialist care of T1D (discussed below).

We see the following opportunities for future Governmental action:

i. Renewal of Type 1 diabetes clinical research network funding (CRN)

ii. A Diabetes and Obesity Mission, analogous to the Cardiovascular Mission, with similar total funding

iii. National public health policies and programs to target healthier diets and improve rates of physical activity across the lifespan. This may include provision of food subsidies for remote areas to make healthy food choices easier for lower income people.

iv. Pre-pregnancy planning for women with T1D, T2D or previous GDM

v. MBS item for specialist physician review of CGM device downloads; and separate MBS item for specialist physician review of insulin pump downloads

vi. Targeted funding to diabetes and obesity research programs (either through MRFF and/or NHMRC) and increased funding for PhD students and early/mid career fellowships in diabetes/obesity

vii. Increased workforce trained in diabetes and obesity care targeted to rural and remote areas (including diabetes educators/nurse practitioners, dieticians)

viii. MBS and PBS funding for obesity prevention and management, including drug therapies such as GLP1/GIP analogs (carefully targeted to be cost-effective, equitable and accessible)

ix. Improving availability of and access to islet cell and pancreatic transplantation for T1D

x. NDSS funding for CGM access to rarer subtypes of insulin-deficient diabetes, currently disadvantaged under current guidelines (e.g. type 3c diabetes, cystic fibrosis-associated diabetes)