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## Interweaving diabetes care – wellbeing of the Tongan people with Type 2 diabetes mellitus in New Zealand

Soana Muimuiheata, Gael Mearns, Elizabeth Smythe, Sione Vaka

*School of Clinical Science, Auckland University of Technology (AUT), Auckland*

**AIMS:** Quality standards for diabetes care and a range of initiatives have not improved outcomes for Pacific People with Type 2 Diabetes Mellitus (T2DM) in New Zealand. This research examined the meaning of being Tongan with T2DM in New Zealand, Tongan people's food practices, and strategies and services that are needed to improve diabetes management for Tongan people with T2DM.

**METHODS:** This study used a combined talanoa and hermeneutic phenomenology approach undertaken by a Tongan researcher for, and with, Tongan leaders to explore their lived experiences. This approach built upon Tongan values of listening to stories and seeking to find the meaning through interpretation of those stories.

**RESULTS:** Diabetes services for Tongan people with T2DM require a Tongan worldview and holistic approach that encompass mo'ui lōtolu, wellbeing of sino (body), 'atamai (mind), and laumālie (spirit/soul) to fulfil fatongia (duty/obligations). Participants acknowledged the importance of receiving practical and meaningful information that involves family, church, and community. Food practices and diabetes management is never about an individual. It is always about wellbeing within collective communal living. This approach is symbolised by a Tongan food basket, *Kato Polopola,* interweaving talanoa and the holistic approach that is fundamental to mo'ui lōtolu. *Kato Polopola* recognises the critical role of the loto (heart), the centre of authority in deciding what to accept and reject. The importance of loto'i Tonga (Tongan heart), willingness to transform knowledge into action and maintaining an authentic relationship (vā). It is about no one thing, it is about all the strands (factors) woven together, held by 'ofa (love/heart), 'ilo (knowledge/mind) and lotu (prayers/spirit).

**CONCLUSIONS:** Tongans with T2DM need meaningful information and appropriate support to enable commitment for sustainable behavioural changes. There are possibilities for modifying practice to enhance the ability of service providers and the Tongan community to get the benefit of talanoa and contextualised services.

## Increasing insulin pump uptake at Counties Manukau DHB by enhancing clinician expertise

Stephanie Zhang[1], Zara Houston[1], Hamish Crocket[2], Yenushka Goonesekera[1,3], Brandon Orr-Walker[1]

*[1]Whitiora Diabetes Centre, Counties Manukau District Health Board Auckland; [2]Te Huataki Waiora School of Health, University of Waikato; [3]Department of Psychological Medicine, University of Auckland*

Whitiora Diabetes Service at CMDHB had the opportunity to improve service delivery, and address long standing issues with equity following seed funding from the Ministry of Health (MOH) under "Improved Planned Care". Since September 2012, when pump therapy became a funded option, patient update has been low, with Māori and Pacific underrepresented. In 2021, the service began revising support for patients with diabetes, including professional development for clinicians.

**AIMS:** To improve clinician expertise to support patients using pump therapy within Whitiora Diabetes Service. With an increase in clinician expertise, we hypothesised that referrals for pump would increase, particularly for Māori and Pacific.

**METHODS:** The diabetes multidisciplinary team (MDT) completed an online survey using SurveyMonkey regarding pump expertise, and professional development needs. This was used to develop a staff education programme. The programme was developed and delivered by the pump project team and industry representatives. Fourteen staff education workshops were held over nine months in 2021. The survey was completed again at cessation of the programme to evaluate its effectiveness, and gaps in the education programme. Pump referral rates at the end of the staff education programme were compared to the year prior to the programme.

**RESULTS:** Twenty-five specialist diabetes clinicians from the MDT completed the pre-workshop survey. Fif-

teen have completed the post-workshop survey to date. Preliminary results indicate that staff report increased knowledge and confidence to support patients using pump therapy. Referrals for pump therapy have increased by 700% over the last 12 months.

**CONCLUSIONS:** A significant clinical and service benefit has been achieved through the implementation of a MDT training programme. Enhancing clinician expertise has an important contribution to CMDHB's goal to increase uptake, and successful use of pump by people with diabetes who have had lower rates of use to this technology, particularly Māori and Pacific.

## Diabetic foot interventions to improve outcomes for Indigenous populations in high-income countries: a scoping review

Michele Garrett[1,2], Belinda Ihaka[3], Rinki Murphy[1,2], Timothy Kenealy[1]

*[1] University of Auckland, School of Medicine; [2]Auckland District Health Board; [3]AUT University, School of Clinical Sciences.*

**AIMS:** Indigenous peoples represent 5% of the world's population.[1] They experience higher rates of diabetes and associated complications than non-indigenous people, including poorer outcomes for diabetes foot disease (DFD).[2,3] Providing equitable care through well-organized diabetes foot interventions can improve outcomes.[4] This scoping review provides an overview of the literature on diabetes foot interventions that incorporated a focus on equity for Indigenous peoples.

**METHODS:** This review followed the PRISMA-ScR guidance for scoping reviews.[5] MEDLINE, Informit indigenous collection, CINAHL, PsychINFO, SCOPUS, and Embase were searched to the 17 June 2021 using search terms relating to the diabetic foot, interventions, and Indigenous peoples. All publications were eligible if they described a diabetes foot intervention that included Indigenous peoples from high-income countries. Two reviewers independently screened titles, abstracts, and full-text publications, and contributed to data charting. Key study characteristics included country, Indigenous population, intervention description, any foot-related outcomes, and alignment with the CONSIDER statement.[6]

**RESULTS:** We screened 730 publications and 30 met the eligibility criteria. Interventions focused on indigenous peoples from Australia (n=12), Canada (n=6), USA (n=6), New Zealand (n=2), Greenland (n=2) and Nauru (n=2). Primary prevention interventions were predominant (n=20) with a focus on increasing foot screening rates (n=16). Other interventions included health promotion and education (n=4), comprehensive foot interventions (n=4), a diabetic foot ulcer management protocol, and a service brokerage model. Only one study of the 27 evaluated met all the CONSIDER checklist requirements; 55% (n=15) met fewer than 9 items; few (n=3) met both items in the participation domain.

**CONCLUSION:** A limited number of diabetes foot interventions in the literature described diabetes-related foot outcomes for Indigenous peoples. Specific cultural approaches to foot interventions were not evident. To inform future DFD policies and programs and help guarantee equitable outcomes, research led by non-indigenous researchers needs to be conducted in partnership with Indigenous communities.

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## The Australian and New Zealand Diabetic and Ischaemic Foot Outcomes Study (ANZ-DIFOS): preliminary findings

Odette Hart[1,2], Claire O'Shea[3], Manar Khashram[1,2]

*[1]Department of Vascular Surgery, Waikato Hospital, New Zealand; [2]Department of Surgery, The University of Auckland, New Zealand; [3]Waikato District Health Board, New Zealand.*

**AIMS:** Diabetic foot disease (DFD) is a common and debilitating condition. In New Zealand, there is a high incidence of lower limb amputation during hospitalisation for DFD and an over-representation within New Zealand Māori populations.[1,2] The Australia and New Zealand Diabetic and Ischaemic Foot Outcomes Study (ANZ-DIFOS) is a binational prospective study with an aim to report the presentation, management, and outcomes of DFD.[3]

**METHODS:** This multicentre study includes Waikato Hospital, New Zealand; Sir Charles Gairdner Hospital, Perth; the Royal Adelaide Hospital and Queen Elizabeth Hospitals, SA; and Prince of Wales Hospital, Sydney. Participants with DFD that meet inclusion criteria will be reviewed at baseline, 1, 3, 6 and 12 months. Service and referral details, demographic, and clinical history, wound and perfusion data, outcomes and discharge information will be collected. The primary outcomes are time to wound healing, major amputation, overall mortality, and amputation-free survival at 12 months. Recruitment began in August 2020 in New Zealand, February 2021 in Perth, March 2021 in Adelaide, and July 2021 Sydney.

**RESULTS:** Only NZ data are discussed. One hundred and twenty participants were included, with a median age of 69 years (range 30–91 years), 39 were females and 49 (41%) identified as New Zealand Māori. Major limb amputation at 30 days was 7.5%, with 25 (21%) and 28 (23%) participants overall having undergone a major limb amputation and a minor limb amputation respectively. Furthermore, 68% of major limb amputations occurred in Māori participants. The 30-day mortality is 1.7%. Overall, 20 (17%) New Zealand participants have died, with 50% of these deaths occurring in Māori participants.

**CONCLUSIONS:** This preliminary data from ANZ-DIFOS highlights the burden of DFD. Whilst recruitment and follow up are ongoing, this study may show emerging evidence of the risk of lower limb amputation, variations in treatment and outcomes in DFD.

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## Is it feasible to use first antenatal HBA1C to target Northland pregnant women at high risk for gestational diabetes mellitus for earlier intervention?

Tomas Ashford[1], Nicole McGrath[2], Ashley Abraham[3]

*[1]University of Auckland Medical School; [2]Diabetes Service, Northland DHB; [3]Quality Improvement Directorate, Northland DHB.*

**AIMS:** HbA1c levels fall by approximately 10% in early pregnancy so first antenatal Hba1c 36–49 mmol/mol may indicate pre-diabetes. National guidelines recommend referral to diabetes services only if HbA1c is in the diabetes range of 50 or greater; screening for gestational diabetes mellitus (GDM) at 24–28 weeks' gestation for all others. In Northland, GDM screening and treatment is often delayed or difficult due to geographical spread and low socio-economic status. We therefore sought to establish whether referral based on first antenatal HbA1c would capture women with GDM earlier and allow better intervention. We also audited whether national guidelines are being followed.

**METHODS**: We captured all women who had a first antenatal HbA1c at any Northland laboratory between 1 January to 31 December 2020. We focused on women with HbA1c 36–49 and completed pregnancy. We collected basic demographic data, GDM screening results and subsequent outcomes.

**RESULTS**: There were 240 women, 67.9% Māori, of 1,593 completed pregnancies, who had a first antenatal HbA1c of 36–49 mmol/mol. Of these, 21.6% were not subsequently screened for GDM (40% in subgroup

| First antenatal HbA1c | GDM (number of women) | No GDM: polycose only | No GDM: OGTT | Not screened |
|---|---|---|---|---|
| 36–40 | 31 | 74 | 63 | 42 |
| 41–44 | 10 | 2 | 3 | 8 |
| 45–49 | 4 | 0 | 1 | 2 |

HbA1c 41–49 including two women who had polycose test only). Of those who were screened, only 23.9% had GDM. Of the 30 women with HbA1c 41–49, five required emergency caesarean section (two treated for GDM); four newborn were macrosomic (two GDM pregnancies), and eight had hypoglycaemia (four GDM pregnancies). None of these outcomes were statistically significant.

**CONCLUSION:** We did not find that first antenatal HbA1c 36–49 mmol/mol predicted subsequent GDM. Our high non-screening rate, especially for women with HbA1c 41–49 mmol/mol, likely influenced this result.

## Effect of divergent continuous glucose monitoring technologies on glycaemic control in Type 1 diabetes mellitus: a systematic review and meta-analysis of randomised controlled trials

Mona Elbalshy[1], Jillian Haszard[2], Hazel Smith[1], Sarahmarie Kuroko[1], Barbara Galland[1], Nick Oliver[3], Viral N Shah[4], Martin I de Bock[5], and Benjamin J Wheeler[1,6].

*[1]Department of Women's and Children's Health, Dunedin School of Medicine, University of Otago, New Zealand; [2]Division of Sciences, University of Otago, New Zealand. University of Otago. Dunedin, New Zealand; [3]Department of Metabolism, Digestion and Reproduction, Faculty of Medicine, Imperial College, London, UK; [4]Barbara Davis Center for Diabetes, University of Colorado Anschutz Medical Campus, Aurora, USA; [5]Department of Paediatrics, University of Otago Christchurch, New Zealand; [6]Paediatric Endocrinology, Southern District Health Board, Dunedin, New Zealand.*

**AIMS:** We aimed to conduct a systematic review and meta-analysis of randomised controlled clinical trials (RCT) assessing separately and together the effect of the three distinct categories of continuous glucose monitoring (CGM) systems (adjunctive, non-adjunctive and intermittently scanned CGM [isCGM]), compared to traditional capillary glucose monitoring, on HbA1c and CGM metrics.

**METHODS:** PubMed, Web of Science, Scopus and Cochrane Central register of clinical trials were searched. Inclusion criteria were randomised controlled trials; participants with Type 1 diabetes of any age and insulin regimen; investigating CGM and isCGM compared to traditional capillary glucose monitoring; and reporting glycaemic outcomes of HbA1c and/or time-in-range (TIR). Glycaemic outcomes were extracted post-intervention and expressed as mean differences and 95%CIs between treatment and comparator groups. Results were pooled using a random-effects meta-analysis. Risk of bias was assessed using the Cochrane Rob2 tool.

**RESULTS:** This systematic review was conducted between January to April 2021; it included 22 RCTs (15 adjunctive, five non-adjunctive, and two isCGM)). The overall analysis of the pooled three categories showed a statistically significant absolute improvement in HbA1c percentage points (mean difference (95% CI): -0.22% [-0.31 to -0.14], $I^2$=79%) for intervention compared to comparator and was strongest for adjunctive CGM (-0.26% [-0.36, -0.16]). Overall TIR (absolute change) increased by 5.4% (3.5 to 7.2), $I^2$=71% for CGM intervention compared to comparator and was strongest with non-adjunctive CGM (6.0% [2.3, 9.7]).

**CONCLUSIONS:** For individuals with T1D, use of CGM was beneficial for impacting glycaemic outcomes including HbA1c, TIR, and time-below-range (TBR). Glycaemic improvement appeared greater for TIR for newer non-adjunctive CGM technology.

## Diabetes in pregnancy: using the sFLT-1/PLGF ratio to predict preeclampsia

Ruth Hughes[1-2], Ian Philips[3], Chris Florkowski[3-4], Jo Gullam[1-2]

*[1]Christchurch Women's Hospital; [2]Department of Obstetrics and Gynaecology, University of Otago Christchurch; [3] Canterbury Health Laboratories; [4]Christchurch Diabetes Centre, Christchurch, New Zealand*

Placental growth factor (PlGF) based tests are used internationally as prognostic markers in suspected preeclampsia. The Ministry of Health are yet to endorse these tests in New Zealand. A recent Christchurch study confirmed the effectiveness of the sFlt-1/PlGF ratio in predicting preeclampsia in a New Zealand population.

**AIMS:** To investigate the utility of the sFlt-1/PlGF ratio in pregnancies complicated by pre-existing diabetes (DM) and prediabetes (pre-DM).

**METHODS:** A subgroup analysis of a prospective cohort study of 240 singleton pregnancies with suspected preeclampsia at 20+0 to 36+6 weeks' gestation. Participants and clinicians were blinded to the sFlt-1/PlGF ratio results.

**RESULTS:** Included were 27 pregnancies (10 Type 1 DM, 8 Type 2 DM, 9 pre-DM), 11 participants were Māori, six Pasifika, six NZ European, one Filipino, one Indian. In the 11 (40.7%) pregnancies with elevated sFlt-1/PlGF ratios, seven had a clinical diagnosis of preeclampsia, two cases of preeclampsia were misdiagnosed, and two cases of placental insufficiency complicated by abruption were missed. In the 16 pregnancies with normal sFlt-1/PlGF ratios, disclosing the blood results may have prevented hospitalisation and/or reduced the frequency of day unit assessments in four participants. The sFlt-1/PlGF ratio was not raised in cases of chronic proteinuria, chronic hypertension, or worsening renal failure, however subsequent elevations indicated the onset of superimposed preeclampsia. In one pregnancy, renal dialysis caused transient mild elevations in the sFlt-1/PlGF ratio.

**CONCLUSIONS:** In pregnancies complicated by pre-existing DM or pre-DM, the sFlt-1/PlGF ratio performed better than clinical assessment and routine tests at identifying placental insufficiency, including preeclampsia. The sFlt-1/PlGF ratio differentiated between placental-mediated disease and chronic conditions such as hypertension and chronic kidney disease. Further study could assess the utility of a routine sFlt-1/PlGF ratio at 32 weeks' gestation in women with pre-existing DM to identify those at high risk of preterm placental insufficiency.

## The metabolic effects of a CREBRF gene variant in NZ Women – assessment of satiety and incretins

Bridget Moss[1], Robin Willink[2], Kirsty Danielson[3], Ana Holley[3], Rosemary Hall[4,5], Peter Shepherd[6,7], Troy L Merry[7,8], Jeremy Krebs[4,5], Patricia Whitfield[1,4]

*[1]Dept. of Medicine, University of Otago, Wellington; [2]Biostatistics Group, University of Otago, Wellington; [3]Dept. of Surgery and Anaesthesia, University of Otago, Wellington; [4]Centre for Endocrine, Diabetes and Obesity Research, Capital and Coast DHB; [5]School of Medical Sciences, University of Otago, Wellington; [6]Dept. of Molecular Medicine and Pathology, School of Medical Sciences, The University of Auckland, Auckland; [7]Maurice Wilkins Centre for Molecular Biodiscovery, The University of Auckland, Auckland; [8]Discipline of Nutrition, School of Medical Sciences, The University of Auckland, Auckland*

A variant of the *CREBRF* gene (rs373863828-A; p.Arg457Gln) is associated with an increase in BMI but a decrease in the risk for Type 2 diabetes and gestational diabetes. This variant is found almost exclusively in people of Māori and Pacific ancestry. Although the exact function of *CREBRF* is unknown, this variant has been found to be associated with an increase in postprandial insulin release in men. Glucagon-like peptide 1 (GLP-1) and gastric inhibitory peptide (GIP) are incretin hormones which mediate insulin release following a meal and regulate satiety.

**AIMS:** The primary objective of this study was to investigate the effect of the rs373863828-A *CREBRF* variant on postprandial incretin release in Māori and Pacific women, and to assess whether this effect is associated with a concordant difference in experiences of satiety.

**METHODS:** Fifty participants (14 homo- or heterozygous for rs373863828-A (AX), 35 reference genotype (GG), one excluded) were recruited to take part in a study where plasma samples and satiety scores were taken at baseline and 30, 60, 90, 120, and 150 minutes following a standardised mixed-meal test. Hormone quantification by ELISA and magnetic immunoassay was undertaken for a matched cohort of 28 participants (14 GG and 14 AX; matched for BMI, age and Polynesian ancestry). Postprandial GLP-1 and GIP concentration and satiety were analysed using a baseline-adjusted area-under-the-curve (AUC) and suddenness score.

**results:** No significant differences were found between the matched AX/GG pairs for AUC measurements and suddenness scores for both incretin release and satiety reports.

**CONCLUSIONS:** Preliminary evidence in women suggests that differential incretin or satiety responses do not appear to mediate the reduced risk of Type 2 diabetes associated with the rs373863828-A allele. A larger sample size may be necessary to reveal any potential differences based on the rs373863828-A variant.

## First clinical test results for a low-cost light-based glucose sensor

Jake Campbell[1], Josie Dixon[1], Christopher D McKinlay[2,3], Rachel Smith[1], Lisa Mravevich[2], Chris Pretty[1], Jane Alsweiler[2], Sabine Huth[2], J Geoffrey Chase[1]

*[1]Department of Mechanical Engineering, Centre for Bioengineering, University of Canterbury, New Zealand; [2]Liggins Institute, University of Auckland, New Zealand; [3]idz First Neonatal Care, Middlemore Hospital, South Auckland, New Zealand*

**AIMS:** Measuring blood glucose (BG) is central to diabetes management. However, glucometer BG measurements are infrequent, invasive, and painful, semi-invasive interstitial continuous glucose monitors (CGMs) are prohibitively expensive, and no non-invasive methods are currently available. This study presents first clinical validation test results for a low-cost (<NZ$250) light-based, non-invasive glucose sensor using discrete wavelength LEDs in the near infra-red (1400–1700nm) range.

**METHODS:** Heathy adults (ethics approval from University of Canterbury Human Ethics Committee) and

neonatal ICU infants (ethics approval from NZ HDEC South) were tested. Adult subjects drank 330ml of Coca Cola (17.5g glucose). At 9 measurement intervals (t =0–60mins every 10mins, 90mins and 120mins) glucometer measurements and 3 light-based measurements (carotid artery, palm, and finger) were made, yielding 33 comparison pairs per test. For NICU subjects light-based glucose measurements were taken at 3 sites (foot, wrist, chest) every time a standard clinical BG measurement was made. Reference and light-based BG values are compared using a modified Clarke Error Grid (CEG).

**RESULTS:** N=27 subjects (22 neonates; five adults) with 290 measurements, yielded 163 pairs, where 117 did not record a pulse for light-based data analysis. The glucose range was 1.9–7.9mmol/L. The CEG contains 62%, 31%, 6% and 1% in zones' A, B, C and D respectively. Outliers in the C and D ranges had poor pulsatile signals for analysis, yielding larger error. Bland Altman analysis demonstrated slight overestimation of BG for neonates, and slight underestimation for adults using a joint overall calibration.

**CONCLUSIONS:** Results show good performance for a first prototype non-invasive light-based blood glucose monitor. There is a need to test a wider glucose range into hyperglycemia and to improve test use and/or light intensity to ensure a good pulse waveform is captured for analysis.

## Results from a national survey on diabetes inpatient management using the quality standards for diabetes care 2020

L J Bingham[1], L McTavish[1]

*[1]Endocrine, Diabetes & Research Department, Capital & Coast District Health Board (CCDHB)*

Following a keynote address at NZSSD in 2015 many clinicians were interested to investigate what was happening in New Zealand Diabetes inpatient care. We designed and administered an online survey using the Standards for Diabetes Care 2020, to get a snapshot of diabetes clinical care nationally.

**AIMS:** The aim of this survey was to investigate aspects of inpatient clinical care for people with diabetes in New Zealand in relation to the Quality Standards for Diabetes Care across 20 DHBs. The information could be used for Quality improvement initiatives, both locally and nationally. The objective was to design and survey all 20 DHBs on aspects of inpatient Diabetes care in relation to Standards 13–15, in the Quality Standards for Diabetes Care Toolkit 2014.

**METHODS:** The Quality Standards for Diabetes Care were reviewed. A survey of 20 questions was designed using SurveyMonkey, which was then emailed to Diabetes Nurses and Pharmacists across all DHBs, through the national professional organizations. The anonymised feedback was collated and analysed.

**RESULTS:** Feedback was received from 32 participants. Results demonstrated disparities across the DHBs for many aspects of Diabetes Clinical Care in relation to the Quality Standards for Diabetes Care 2020. The findings could be a useful basis for Quality Improvement initiatives both locally and nationally.

## Collaboration to improve diabetes service delivery, equity, and technology uptake

Zara Houston[1], Hamish Crocket[2], Stephanie Zhang[1], Yenushka Goonesekera[1,3], Brandon Orr-Walker[1]

*[1] Whitiora Diabetes Centre, Counties Manukau District Health Board Auckland; [2]Te Huataki Waiora School of Health, University of Waikato; [3]Department of Psychological Medicine, University of Auckland*

Whitiora Diabetes Service at CMDHB historically has low patient uptake of PHARMAC-funded insulin pump therapy. Approximately 2% of the eligible population with Type 1 diabetes (T1DM) use this treatment option, with Māori and Pacific, approximately 37% of the T1DM population, making up only 5% of pump patients.

**AIMS:** Use of targeted funding to develop a model of care (MOC) for pump therapy to improve and upscale service delivery, co-designed with our CMDHB patients. The focus was on equity and quality, with the ability to share tools and resources nationally.

**METHODS:** Development of a successful funding bid, with clear aims, objectives, and project deliverables to improve planned care. A governance group of stakeholders, and a project working group of multidisciplinary diabetes clinicians, and diabetes technology researcher, Hamish Crocket, were formed. The project working group collaborated with other DHBs, undertook pump user focus groups, and telephone reviews to inform the development of resources to support patients and staff. A staff pump training programme was developed and implemented in 2021.

**RESULTS:** A patient centric MOC is being developed. This includes a pump start pathway that all patients with Type 1 diabetes at CMDHB will be offered, and a broad range of patient resources: hardcopy, electronic, and video. Staff knowledge and confidence was enhanced following the pump training programme. Referrals for pump therapy have increased.

**CONCLUSIONS:** Ministry of Health resourcing for the project has enabled CMDHB to address historic challenges with service delivery, and technology uptake,

particularly for Māori and Pacific peoples. With an equity and quality focus, the MOC has been developed in collaboration with our patients and other DHBs, particularly Waikato DHB that have a much larger pump service. Resources will be shared nationally, ensuring access for all which should serve those with diabetes well as we move towards the Health NZ transition.

## Collaborative development of a real-time diabetes dashboard to improve outcomes in Waikato patients with Type 2 diabetes

Ryan Paul[1,2], Lynne Chepulis[1], Suzanne Moorhouse[3], Reuben Kendall[3], Elizabeth Johnson[4], Aman Sandhu[4], Kathy Knight[5], Alex Poor[5], Jo-Scott Jones[5]

*[1]Waikato Medical Research Centre, University of Waikato; [2]Waikato Regional Diabetes Service, Waikato District Health Board; [3]Hauraki Primary Healthcare Organisation, Waikato; [4]National Hauora Coalition, Waikato; [5]Pinnacle Primary Healthcare Organisation, Waikato*

**BACKGROUND:** Implementation of clinical guidance to manage Type 2 diabetes (T2D) is typically problematic resulting in marked inequities in care. Data analysis, education, and benchmarking all independently improve diabetes management and outcomes, and reduce the "post-code" variation and inequities in care. Consequently, we describe the collaborative development of a regional diabetes dashboard to provide real-time data to enable benchmarking, education, identification of people with T2D (PWT2D) and research to improve diabetes outcomes.

**METHODS AND DESCRIPTION:** Lead diabetes clinicians and data analysts from the DHB diabetes service and all three Waikato primary healthcare organisations worked collaboratively to develop a "live" dashboard for the 25,000 PWT2D in the region. Consensus was reached for practice-level data to be presented by ethnicity for key targets and appropriate prescribing as outlined by the NZSSD national T2D guidance including: 1) % with HbA1c <53 mmol/mol; 2) % on metformin with eGFR >30 mL/min; 3) % on ACEi/ARB with renal disease; 4) % on empagliflozin or dulaglutide; and 5) % with LDLc <1.8 mmol/L) with renal or cardiovascular disease (CVD), or a five-year CVD risk >15%; 6) % with HbA1c >90 mmol/mol on insulin etc. Practices receive a benchmarking report identifying inequities and potential areas to improve care. Education is provided on ideal management and staff can easily identify PWT2D not meeting each target, enabling proactive care. Studies using the dashboard data are planned to investigate the relationship between system- and practice-level factors and outcomes.

**RESULTS AND CONCLUSIONS:** No data are currently available on the effects of the dashboard on diabetes outcomes. But we believe the collaborative approach and demonstration of the dashboard "in action" will be of particular interest to the NZSSD audience, as the dashboard will likely be a useful tool in improving regional diabetes outcomes.

## The impact of multimorbidity on the ability to make lifestyle changes in those with prediabetes and excess weight – a qualitative study

Jenna Tidswell[1], Lisa Whitehead[2], Kirsten Coppell[1]

*[1]Department of Medicine, Dunedin School of Medicine, University of Otago, Dunedin, Aotearoa New Zealand; [2]School of Nursing and Midwifery, Edith Cowan University, Joondalup, Australia*

**AIMS:** Multimorbidity, where an individual is living with two or more conditions, is increasing worldwide. It is common among those with prediabetes, a risk factor for Type 2 diabetes (T2D) and cardiovascular disease. The aim of this study was to qualitatively examine the impact of multimorbidity on the ability to make lifestyle changes among adults with prediabetes and overweight/obesity.

**METHODS:** In the primary care-based Prediabetes Intervention Package study, 58 participants were interviewed on completion of the six-month intervention. They were asked about the impact of other health conditions on making lifestyle changes for their prediabetes. Interviews were transcribed and data analysed thematically. The socio-ecological model of personal, interpersonal, organisational, community and policy guided interpretation as to how multimorbidity impacted on ability to make lifestyle changes, how different conditions created challenges, and the ways these challenges were able to be overcome.

**RESULTS:** Of the 58 participants, almost half (48%) were Māori. Participants ranged in age from 28–69 years. At six months, 45% had regressed to normoglycaemia, and 55% had persisted with prediabetes or progressed to T2D. Fifty-five (95%) participants reported living with at least one other condition. More than half (53.4%) described how specific conditions were a barrier or challenge to making lifestyle changes. Joint pain reducing mobility, and mental health or stress, including weight stigma were the most frequently described difficulties. Health professional and community support such as free supportive pool access helped to overcome challenges. While there were challenges, many participants recognised their lifestyle changes not only positively impacted glycaemia and weight, but also other conditions e.g., hypertension, and dyslipidaemia.

**CONCLUSIONS:** This study confirmed multimorbidity is common among those with prediabetes and overweight/obesity, and this influenced their ability to implement lifestyle changes. The external environment presented challenges which often required interpersonal and community support to facilitate healthy lifestyle changes.

## IEC standard test results for an open-source, ultra-low-cost insulin pump

Matt Payne[1], Francis Pooke[1], Jake Campbell[1], Lui Holder-Pearson[1], Jennifer Knopp[1], Martin de Bock[2,3], J Geoffrey Chase[1]

*[1]Department of Mechanical Engineering, Centre for Bioengineering, University of Canterbury, New Zealand; [2]Department of Paediatrics, University of Otago, Christchurch, New Zealand; [3]Department of Paediatrics, Canterbury District Health Board, Christchurch, New Zealand*

**AIMS:** Insulin pumps are the most consistent and accurate means of regulating blood glucose levels in T1 and T2 diabetes. However, insulin pump technology is underutilised due to high costs of NZ$7,000–10,000 and limited reimbursement. An ultra-low-cost insulin pump made widely available with an open-source design would significantly improve equity of access to the best care and outcomes. This study presents results validating the accuracy of an open-source ultra-low-cost (<NZ$150) insulin pump.

**METHODS:** The low-cost insulin pump was tested in-vitro to the IEC 60601-2-24 standard and set at a basal rate of 1U/h, delivering a 0.25U dose every 15 minutes. over a 25-hour period following a 24-hour stabilisation period. Insulin delivery was measured by total displaced fluid mass with a microscale. Data was processed into trumpet curves per the unit standard. Data were also processed to calculate accuracy over individual one-hour windows, and compared to published literature for the Medtronic 640G, Medtronic 670G, and Tandem t:Slim pumps.

**RESULTS:** N=5 tests, with a total of 500 individual doses administered. Overall percentage error in each of the five tests was 0.60%, 0.54%, 2.35%, -0.90%, 0.30%. Accuracy across one-hour windows was ±15% for 99% of doses, ±10% for 96.8% of doses and ±5% for 88.8% of doses. Comparable published data on commercial systems are shown in Table 1.

**CONCLUSIONS:** We demonstrate highly accurate insulin dosing using a prototype ultra-low-cost insulin pump. Our data compares favourably with commercially available systems. Clinical testing and further validation are required to ensure the design is robust and meets or exceeds all IEC standard requirements.

**Table 1:** Accuracy of Insulin pump dosing across one-hour windows.[1]

| Insulin pump | Doses delivered to accuracy of within | | |
|---|---|---|---|
| | ±15% | ±10% | ±5% |
| Medtronic 640G | 95.6% | 93.1% | 84% |
| Medtronic 670G | 99.4% | 97.8% | 90.3% |
| Tandem t:Slim | 99.8% | 98.9% | 91.4% |

## Insulin pump special eligibility criteria in New Zealand: a survey of prescriber opinion and practice

Michaela Groves[1], Sara Styles[2], Martin de Bock[1,3]

*[1]Department of Paediatrics, Canterbury District Health Board, Christchurch, New Zealand; [2]Department of Human Nutrition, University of Otago, Dunedin, New Zealand; [3]Department of Paediatrics, University of Otago, Christchurch, New Zealand*

**AIMS:** Funding for insulin pump therapy (CSII) in New Zealand for people with type 1 diabetes is determined by meeting PHARMAC special authority (SA) criteria. We aimed to survey the opinion and practice of CSII prescribers with respect to the current SA criteria and contextualise the results with respect to contemporary literature and best practice.

**METHODS:** Quantitative and semi-qualitative survey of CSII prescribers in New Zealand. Mixed qualitative and quantitative analyses were used.

**RESULTS:** Of the 94 survey respondents, 88% stated the criteria needed updating. However, 75% maintained CSII funding by PHARMAC should remain under updated SA criteria. Most (60%) of respondents thought the current criteria did not promote health equity for Māori and Pasifika. Only 33% of respondents strictly adhered to the criteria. Thematic analyses of free text responses indicated that the criteria did not reflect quality of life benefits offered by CSII, changes in life course, clinician or patient autonomy, and beneficence of CSII not otherwise stated in the current criteria.

**CONCLUSIONS:** The majority of CSII prescribers in New Zealand disagreed with the SA criteria, resulting in most not strictly adhering to them. Updated criteria are required to improve health equity and reflect best evidence.

## The OPTIMISE study protocol: a multicentre optimisation trial comparing continuous glucose monitoring, snacking habits, sleep extension and values-guided self-care interventions to improve glucose time-in-range in youth in Type 1 diabetes

Shelley Rose[1,2,3,4], Jillian J Haszard[5], Barbara C Galland[1], Esko J Wiltshire[2,6], Martin de Bock[7,8], Carmel E Smart[9,10], Miriama Ketu-McKenzie[11], Anna Campbell[12], Ruth Thomson[13], Craig A Jefferies[14,15], Benjamin J Wheeler[1,12], Sara E Styles[4]

*[1]Department of Women's and Children's Health, University of Otago, Dunedin; [2]Department of Paediatrics & Child Health, University of Otago Wellington, Wellington; [3]Diabetes and Endocrinology Service, Palmerston North Hospital, MidCentral District Health Board; [4]Department of Human Nutrition, University of Otago, Dunedin. [5]Biostatistics Centre, University of Otago, Dunedin; [6]Paediatric Department, Wellington Hospital, Capital and Coast District Health Board; [7]Department of Paediatrics, University of Otago, Christchurch; [8]Paediatric Department, Christchurch Hospital, Canterbury District Health Board; [9]John Hunter Children's Hospital, Hunter New England Local Health District, NSW Australia; [10]School of Medicine and Public Health, University of Newcastle, NSW Australia; [11]Ngāti Tūwharetoa and Ngāti Raukawa (ki Horowhenua), New Zealand; [12]Paediatric Department, Dunedin Hospital, Southern District Health Board; [13]Dietetic and Nutrition Services, Dunedin Hospital, Southern District Health Board; [14]Paediatric Diabetes and Endocrinology Service, Starship Children's Health, Auckland; [15]Department of Paediatrics, Liggins Institute, University of Auckland, Auckland*

Many young people with Type 1 diabetes (T1D) experience higher than recommended glucose levels, increasing their risk for short- and long-term diabetes complications. Multicomponent interventions to improve glycaemic control, psychosocial and/or behavioural functioning may be more effective than single-component interventions in young people with Type 1 diabetes, but may be more burdensome, and it is unknown which combination of components is most effective.

**AIM:** The OPTIMISE study uses a Multiphase Optimisation Strategy (MOST) to identify the best combination of four interventions targeting key diabetes self-care behaviours for use in clinical practice to improve short term glycaemic outcomes.

**METHODS:** This six-week trial will recruit 80 young people (aged 13–20 years) with T1D (≥6 months duration), and pre-enrolment HbA1c ≥58 mmol/mol [7.5%] in the prior six months. Both main and interaction effects will be estimated using a linear regression model with change in glucose time-in-range (TIR: 3.9–10.0 mmol/L) as the primary outcome. Participants will be randomised to one of 16 conditions in a factorial design using four intervention components: 1) real-time continuous glucose monitoring; 2) targeted snacking education; 3) individualised sleep extension; and 4) values-guided self-care goal setting. Baseline and post-intervention glucose TIR will be assessed with blinded continuous glucose monitoring. Changes in self-care (snacking habits, sleep timing and duration, and psychosocial outcomes) will be assessed at baseline and post-intervention to determine if these interventions impacted behaviour change.

**CONCLUSION:** The study outcomes will enable selection of effective and efficient intervention components that increase glucose TIR in young people who struggle to achieve targets for glycaemic control. The optimised intervention will be evaluated to inform a future randomised controlled trial and guide planning of effective clinical interventions in adolescents and young adults living with Type 1 diabetes. Trial registration: Australian New Zealand Clinical Trials Registry ID: ACTRN12620001017910.

## Metabolic effects of a CREBRF gene variant in New Zealand women

Patricia Whitfield[1,2], Danielle Sword[1], Ana Holley[1], Emily Walsh,[2] Mark Weatherall[1], Peter R Shepherd[3,5], Troy L Merry[3,4], Rosemary M Hall[1,2], Jeremy D Krebs[1,2]

*[1]Department of Medicine, University of Otago, Wellington; [2]Centre for Endocrine, Diabetes and Obesity Research, Wellington Hospital, Capital & Coast DHB; [3]Maurice Wilkins Centre for Molecular Biodiscovery, The University of Auckland; [4]Discipline of Nutrition, Faculty of Medical and Health Sciences, University of Auckland; [5]Department of Molecular Medicine and Pathology, Faculty of Medical and Health Sciences, University of Auckland*

**AIMS:** An Arg457Gln missense variant in the CREBRF gene (rs373863828) is prevalent in New Zealand Māori and Pacific people, but rare in other ethnic groups. The A allele of this variant is associated with increased BMI, but paradoxically reduced risk of Type 2 diabetes mellitus (T2DM) and gestational diabetes (GDM). rs373863828-A is associated with increased glucose-stimulated insulin release in men.[1] Here we present preliminary data on the metabolic effects of rs373863828-A in New Zealand women.

**METHODS:** Plasma insulin and glucose were measured at 30-minute intervals for 150 minutes during a mixed meal tolerance test (MMTT) in 50 New Zealand

Māori and Pacific women (A allele, n=14). Body composition and resting metabolic rate (RMR) were measured using DXA (Hologic, USA) and indirect calorimetry (Promethion, Sable Systems USA). The associations between insulin and glucose measurements over time after the MMTT and allele type were estimated by mixed linear models. ANCOVA estimated associations between allele type and other variables, with age, ancestry and BMI as covariates.

**RESULTS:** Rs373863828-A was associated with increased total lean mass of 4.9kg (95% CI 1.5–8.3), p=0.005 and increased RMR of 116.8 kcal/day (95%CI 13.4–1414.7), p=0.03 after adjusting for BMI and other covariates. There was no effect of rs373863828 on either plasma insulin or glucose response to a meal. There were no statistically significant differences in other outcome measures, including HOMA2-IR and HOMA2-%B.

**URL**: www.nzma.org.nz/journal-articles/proceedings-of-the-new-zealand-society-for-the-study-of-diabetes-annual-conference-may-13-14-2022-wellington