Staff resourcing, guideline implementation and models of care for gestational diabetes mellitus management

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Background: In 2014, updated screening and diagnostic criteria for gestational diabetes (GDM) were introduced across Australia. Many states including Queensland introduced clinical guidelines to include these changes and other recommendations for GDM management. While it is understood that GDM diagnosis has increased, it is unknown whether resources or service delivery have changed, or whether health services have implemented the guidelines.

Aims: To understand the staff resourcing, models of care, level of guideline implementation and barriers and enablers to implementing the guideline across Queensland Health GDM services.

Materials and Methods: A 22-item electronic survey containing multiple choice and open-ended questions was disseminated to healthcare professionals involved in GDM care across 14 Hospital and Health Services (HHS) in Queensland between August and October 2017.

Results: Fifty-three surveys were included for analysis. Between 2014 and 2016, Queensland GDM diagnosis increased by an average of 33%, yet only eight out of 14 HHS reported increases to staff resourcing. Full implementation of the GDM guideline was reported by 41% of metropolitan compared with 29% for regional and 25% for rural/remote services. Guideline recommendations were inconsistently delivered for physical activity advice, minimum schedule of dietetics appointments and psychosocial support. The most common barrier to guideline implementation was staff resourcing (85%), whereas enablers included staff/teamwork (42%), staff resourcing (21%), local protocols (21%) and staff education/knowledge (15%).

Conclusions: Increased staff funding as well as an implementation science-driven process for guideline implementation is required to ensure that the increasing number of women with GDM can receive evidence-based care.

Keywords
clinical practice guideline, gestational diabetes, health care delivery, survey
INTRODUCTION

Gestational diabetes mellitus (GDM), a common pregnancy condition, is defined as hyperglycaemia first detected during pregnancy.1 The primary complication arising from GDM is large-for-gestational-age infants or macrosomia, which can result in birth trauma and increased caesarean deliveries.2 Long-term risks for the infant include impaired glucose tolerance,3 development of type 2 diabetes mellitus in later years, and obesity.4 Women who have had GDM are 50–70% more likely to develop type 2 diabetes.5,6 All of these factors can add a significant health burden to both the women and their children, and the public health system. Treating women with GDM through individualised lifestyle modification, medical nutrition therapy and medication where necessary, results in similar pregnancy outcomes to women without GDM.7,8

The number of women with GDM is rising. In Queensland, the prevalence has doubled between 2010 and 2015 from 6 to 12% of pregnant women diagnosed.9 Similar increases have been experienced across Australia.10 Much of this increased prevalence can be attributed to new diagnostic criteria, informed by the 2008 Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study.2 The results of HAPO demonstrated a continuous linear relationship between maternal hyperglycaemia and perinatal outcomes such as infant birth weight, neonatal hypoglycaemia and caesarean section.2 New GDM diagnostic recommendations were formulated in 2010 by the International Association of Diabetes and Pregnancy Study Groups11 which were later endorsed by the World Health Organization (WHO)1 and Australasian Diabetes in Pregnancy Society (ADIPS).12

Changes were introduced to Queensland Health facilities in early 2015 and published in the first Queensland Clinical Guideline for GDM (https://www.health.qld.gov.au/qcg/publications), later that year. The changes were:

• screening and diagnostic criteria, which recommends early testing for women with known GDM risk factors
• the use of a 75 g oral glucose tolerance test (OGTT)
• revised diagnostic blood glucose cut-offs.13

Other Australian states and international organisations have also recently introduced or revised clinical guidelines to reflect the latest evidence for diagnosing and managing GDM.14-19

The Queensland Health Clinical Guideline for GDM provides health professionals with a comprehensive range of recommendations for the management of GDM, including risk assessment, diagnosis, antenatal care, pharmaceutical therapy, birthing and postpartum care.13 It also recommends a multidisciplinary team (MDT) approach to management, developing local criteria for low-risk models of care and a minimum schedule of dietetic appointments13 based on American Dietetic Association Nutrition Practice Guidelines.18 However, it is well understood that guidelines alone are not sufficient to produce changes to clinical practice.20 Therefore, understanding barriers and enablers to guideline implementation, including staff resourcing, is the first step to translating evidence into practice.

It is currently unknown whether there have been any funding and staff resourcing increases across Queensland Health GDM services since the introduction of the Clinical Guideline. Considering the predicted 20–30% increase to GDM workload with changed diagnostic criteria,21 it is important to develop models of care that allow for consistent service delivery across the state, in line with guideline recommendations. Therefore, the aim of this study was to understand the staff resourcing, models of care, level of guideline implementation and barriers and enablers to implementing the guideline across publicly funded Queensland Health GDM services.

MATERIALS AND METHODS

Study design and participants

This was a cross-sectional study using snowball and purposive sampling of managers, directors and senior health professionals involved in GDM management across Queensland Health facilities providing antenatal care. An online survey using Survey Monkey18 with a letter of invitation email was disseminated via 28 contacts at individual hospitals across 15 of the 16 Queensland Health hospital and health services (HHS). Clinicians working in Children’s Health Queensland were not the target audience for the survey and were omitted from the sampling. Each HHS is made up of several hospitals and health facilities and it was requested that the contacts forward the survey to any other team members working within GDM services who they considered appropriate to also answer the survey. A reminder email was sent every two weeks and the survey was open for eight weeks. Follow-up phone calls were made to the original contacts or health professional they suggested to contact at each service to gather additional clarification around two questions involving staff resourcing, as these questions were not fully answered by most survey respondents. Participation in the survey and phone calls were considered as informed consent. Ethics approval was received from Metro North Royal Brisbane (HREC/17/QRBW/9) and Women’s Hospital and Queensland University of Technology (1700000111) Human Research Ethics Committees.

Survey development

The authors developed the survey instrument as a 22-item questionnaire designed to answer research questions relating to: available staff funding in 2014 and 2016, the year before and after the Clinical Guideline was introduced; level of guideline implementation; barriers and enablers to implementing the guideline; and models of care used for managing women with GDM. The
questionnaire had 13 multiple choice questions and nine open-ended questions (see Appendix S1). A draft questionnaire was reviewed for content validity by a nursing unit manager of a diabetes centre, statistician, and advanced Accredited Practising Dietitian.

Data analysis

Analysis was performed using Microsoft Excel and IBM SPSS Version 20. All available data were used with no missing data imputed, therefore the sample size varied across items. Descriptive statistics were reported as response category frequencies. Many questions allowed for more than one answer and tallied results were greater than 100%.

Open-ended questions were subject to content analysis where the lead author devised and assigned codes to describe the thematic content of each answer.22 This was cross-checked by a second researcher and in the case of disagreement of codes, discussions were held to ensure all researchers agreed on the specific theme and code of the answer.22 Respondents’ answers could be allocated more than one code. The codes were tallied and treated as variables in a quantitative analysis.

RESULTS

There were 54 respondents from 14 HHSs in Queensland, but after excluding one incomplete questionnaire, with only three demographic questions answered, 53 completed questionnaires were included in the final analysis. No response was received from Torres and Cape HHS.

Thirty-two percent of respondents reported working in a metropolitan location, 45% regional and 23% remote. Most respondents were made up of nursing unit managers (22%), clinical nurse consultants (20%), nurse/nurse practitioners or midwives (18%) or dietitians (17%). The remaining respondents were either a diabetes educator (6%), clinical director (6%) or other type of manager or director (11%). The median time spent in their role was five (interquartile range (IQR) 2–11) years.

Staff resourcing available for GDM management

For the initial electronic survey, only 40% of respondents provided an answer to questions relating to staff resourcing, which prompted us to make follow-up phone calls to contacts within the HHSs to obtain more complete answers. The final responses for staff resourcing available to GDM before and after the Clinical Guideline was introduced are shown in Table 1.

Regional and remote hospitals often relied on telehealth provided by another Queensland Health service for endocrinology support. In 2014, 64% percent of the HHSs reported 0.1 full-time equivalent (FTE) or less for diabetes educator support while 93% of the HHS had 0.1 FTE or less for dietitian support. Despite 34% increase in total GDM births between 2014 and 2016, only eight of the 14 HHSs reported an increase in staff resourcing, and the amount of additional FTE was often minimal (Table 1). Three HHSs reported an increase to endocrinology/physician FTE while three different HHSs reported an increase in diabetes educator FTE (Table 1). Five HHSs reported that dietitian FTE was increased (Table 1).

Implementation of Queensland Clinical Guideline for GDM

Of the 53 survey respondents, 34 reported on the level of Clinical Guideline implementation at their hospital (Table 2). Forty-one percent of metropolitan respondents reported that the guideline had been fully implemented, compared with 29% of regional and 25% of remote respondents (Table 2). When asked about the aspects of the guideline that were consistently delivered, 50% or more of metropolitan respondents reported that 11 of the 17 guideline recommendations were consistently delivered compared with only four for regional and seven for remote respondents (Table 2). All locations reported low levels of guideline delivery for minimum schedule of dietetics appointments and psychosocial support (Table 2).

The recommendations that were delivered most consistently across all services involved blood glucose level education and monitoring, identification and communication of risks, fetal surveillance and appropriate medical nutrition therapy (as delivered by an Accredited Practising Dietitian) (Table 2). Interestingly, use of the appropriate diagnostic test (OGTT) was only reported by 40–50% of respondents.

Barriers and enablers to guideline implementation in Queensland

Thirty-three open-text responses were provided to questions about enablers and barriers to guideline implementation. Fifteen unique themes were identified among the responses (Table 3). The most common enablers to guideline implementation were the staff themselves (42%), followed by staff resourcing (21%), local protocols (21%), education/knowledge (15%) and communication (12%) (Table 3). While there were fewer barriers to guideline implementation reported overall, staff resourcing was the greatest barrier reported by 85% of respondents (Table 3).

Models of care

Dietitians and diabetes educators are the most common healthcare professionals reported to provide initial education, closely followed by midwives (Table 4). Medical specialists become increasingly involved during follow-up and ongoing reviews for women requiring medication, while dietitian and diabetes educator availability declines (Table 4). Respondents indicated that additional funding for staff and room availability would best assist their health service with achieving the Clinical Guideline recommendations (Table 4).

Communication between MDT members most often occurred by verbal conversations (80%) followed by hospital chart entries
| HHS                        | GDM pregnancies n (%) | Endocrinology/physician FTE | Diabetes educator FTE | Dietitian FTE | GDM pregnancies n (%), relative % ∆ | Endocrinology/physician FTE | Diabetes educator FTE | Dietitian FTE |
|---------------------------|-----------------------|----------------------------|----------------------|---------------|-----------------------------------|----------------------------|----------------------|---------------|
| Cairns and Hinterland     | 319 (8%)              | 0.0–0.3                    | 0.2–0.6              | 0.0–0.25      | 463 (13%, +60%)                   | 0.0–0.3                    | 0.4–0.6              | 0.0–0.5       |
| Central Queensland        | 242 (7%)              | TH                         | 0.1                  | 0.0–0.05      | 328 (10%, +48%)                   | TH                         | 0.1                  | 0.0–0.05      |
| Central West              | 5 (5%)                | TH + 0.1                   | 0.1–0.2              | 0.1           | 5 (7%, +26%)                      | TH + 0.1                   | 0.1–0.2              | 0.1           |
| Darling Downs             | 417 (10%)             | 0.2                        | 0.1–0.2              | 0.05–1.0      | 599 (15%, +50%)                   | 0.3                        | 0.1–0.2              | 0.05–1.0      |
| Gold Coast                | 489 (7%)              | 0.2                        | 0.1                  | 0.1           | 519 (7%, +4%)                     | 0.2                        | 0.1                  | 0.1           |
| Mackay                    | 214 (9%)              | TH + 0.1                   | 0.2–0.6              | 0.1–0.2       | 269 (12%, +31%)                   | TH + 0.1                   | 0.2–0.6              | 0.1–0.2       |
| Mater                     | –                     | 0.3                        | 0.4                  | 0.5           | –                                 | 0.3                        | 0.5                  | 1.0           |
| Metro North               | 1026 (9%)             | 0.2–0.6                    | 0.5–1.2              | 0.1–0.55      | 1683 (15%, +61%)                  | 0.25–0.6                   | 0.5–1.5              | 0.4–1.0       |
| Metro South               | 1672 (9%)             | 0.0–0.1                    | 0.1–0.6              | 0.1–0.8       | 2070 (12%, +23%)                  | 0.0–0.1                    | 0.1–0.6              | 0.4–0.8       |
| North West                | 87 (17%)              | 0.1                        | 0.1                  | 0.1           | 76 (16%, -2%)                     | 0.2                        | 0.1                  | 0.1           |
| Sunshine Coast            | 247 (6%)              | 0.05–0.15                  | 0.1–0.2              | 0.05–0.2      | 372 (9%, +48%)                    | 0.05–0.2                   | 0.1–0.3              | 0.05–0.25     |
| Townsville                | 414 (11%)             | 0.0–0.2                    | 0.1–0.4              | 0.05–0.1      | 429 (12%, +11%)                   | 0.0–0.2                    | 0.1–0.4              | 0.05–0.1      |
| West Moreton              | 243 (7%)              | 0.3                        | 0.2                  | 0.25          | 403 (13%, +77%)                   | 0.3                        | 0.2                  | 0.5           |
| Wide Bay                  | 193 (9%)              | TH + 0.05                  | 0.1                  | 0.07          | 220 (12%, +26%)                   | TH + 0.05                  | 0.1                  | 0.07          |

Δ, change; FTE, full-time equivalent; GDM, gestational diabetes mellitus; HHS, hospital and health services; TH, telehealth provided by another HHS.
(62%), emails (48%), hand-held records (39%) meetings and case conferences (32%), phone calls (26%) and letters (6%).

According to 28 respondents, 93% stated they felt as though the current model of care could be improved to positively impact patient outcomes or service efficiencies. Some of the improvements suggested were: increased support for indigenous and culturally and linguistically diverse clients, room availability and co-location of professionals, funding and resourcing, communication and consistency in decisions among healthcare professionals, and ability to apply full scope of practice.

DISCUSSION

Across Australia, most centres now follow the screening and diagnostic criteria for women with GDM recommendations since they were endorsed by ADIPS in 2014. Queensland Health incorporated these recommendations into the first Clinical Guideline for GDM and the aim of this study was to understand the staff resourcing, models of care, level of guideline implementation, and barriers and enablers to implementing the guideline across publicly funded Queensland Health GDM services. Although adherence to updated screening and diagnostic criteria was uniform across Queensland Health, many other aspects to the Clinical Guideline were not consistently delivered, suggesting that guidelines alone are not enough to change clinical practice. Less than half of metropolitan respondents indicated that their hospital had fully implemented the guideline and this figure was reduced greatly for regional and remote services. Again, metropolitan health services were able to consistently deliver a much higher number of guideline recommendations compared with regional and remote services.

The Queensland Guideline and others emphasise that medical nutrition therapy, self-blood glucose monitoring and physical activity advice are critical components of care. Table 2 provides a summary of the level of guideline implementation and aspects of the Clinical Guideline that respondents felt were delivered consistently by location.

### TABLE 2 Level of guideline implementation and aspects of the Clinical Guideline that respondents felt were delivered consistently by location (rows ordered by frequency of positive responses)

| Location (n = 53) | Metropolitan % (n) | Regional % (n) | Rural/remote % (n) |
|------------------|-------------------|---------------|--------------------|
| Level of guideline implementation by location (N = 34) | | | |
| Fully implemented | 32% (17) | 45% (24) | 23% (12) |
| Partly implemented | 29% (5) | 21% (5) | 25% (3) |
| Not implemented | 0% (0) | 4% (1) | 0% (0) |
| Unsure | 6% (1) | 4% (1) | 17% (2) |
| Aspects of guideline delivered consistently by location (N = 34) | | | |
| Self-monitoring of blood glucose (education and follow-up) | 76% (13) | 50% (12) | 42% (5) |
| Regular monitoring of BGLs | 71% (12) | 54% (13) | 50% (6) |
| Early identification of risk factors | 71% (12) | 42% (10) | 58% (7) |
| Understanding and communicating risks of GDM | 71% (12) | 42% (10) | 50% (6) |
| Use of appropriate diagnostic tests (OGTT) | 64% (11) | 50% (12) | 58% (7) |
| Fetal surveillance (growth and well-being) | 64% (11) | 42% (10) | 50% (6) |
| Medical nutrition therapy (education and follow-up by accredited practising dietitian) | 59% (10) | 50% (12) | 42% (5) |
| Tracking of gestational weight gain | 59% (10) | 42% (10) | 42% (5) |
| Model of care is multidisciplinary team approach | 59% (10) | 38% (9) | 58% (7) |
| Use of appropriate diagnostic plasma glucose levels | 53% (9) | 33% (8) | 33% (4) |
| 6–12 weeks follow-up using the OGTT by GP | 53% (9) | 21% (5) | 33% (4) |
| Initial assessment and development of individualised care plan | 47% (8) | 33% (8) | 50% (6) |
| Urine testing (for protein or ketones) | 41% (7) | 29% (7) | 33% (4) |
| Advice on optimising postpartum and interpregnancy weight | 41% (7) | 17% (4) | 25% (3) |
| Physical activity advice | 35% (6) | 29% (7) | 42% (5) |
| Minimum schedule of dietetics appointments | 35% (6) | 17% (4) | 25% (3) |
| Psychosocial support | 18% (3) | 17% (4) | 8% (1) |

BGLs, blood glucose levels; GDM, gestational diabetes mellitus; GP, general practitioner; OGTT, oral glucose tolerance test.
activity should form the cornerstone of GDM management, yet across Queensland, physical activity advice was one guideline recommendation not implemented by most services. Despite good evidence to support the minimum schedule of dietetic appointments, this too has been poorly implemented across most locations. Psychosocial support and advice on postpartum/interpregnancy weight were also lacking across most health services with the latter an important factor in reducing long-term disease burden and health outcomes of future pregnancies.

It appears as though the guideline recommendations, such as those listed above, are ones that required more resources in the form of education and follow-up and were less likely to be well implemented.

One known barrier to implementation of any guideline is lack of sufficient staff funding. Initially, the survey questions asking respondents to report the FTE for MDT positions were left unanswered by many respondents, potentially indicating that many did not know the FTE allocated to their own or other’s positions for GDM management. This prompted us to request this information via follow-up phone calls. Interestingly, staff resourcing was overwhelmingly reported as the biggest barrier to guideline implementation in Queensland even though it would appear most respondents of this survey may not know the current or historic staff resourcing available.

In the present study, six of the 14 HHSs experienced a 30% or greater increase in GDM diagnoses from 2014 to 2016 yet in most cases, the increase to FTE was non-existent or minimal and did not

### TABLE 3 Enablers and barriers to the implementation of the Queensland Clinical Guideline for gestational diabetes mellitus (rows ordered by frequency of the enablers)

| Enablers (%) | Barriers (%) |
|-------------|-------------|
| Staff/teamwork | 42 | 0 |
| Staff resourcing | 21 | 85 |
| Local protocols | 21 | 3 |
| Education/knowledge | 15 | 15 |
| Communication | 12 | 9 |
| Management/leadership | 6 | 0 |
| Local protocols | 6 | 0 |
| Postpartum services | 3 | 3 |
| Evidence-based practice | 3 | 3 |
| Guideline ease of use | 3 | 0 |
| Co-location | 3 | 0 |
| Guideline availability | 3 | 0 |
| Values | 3 | 0 |
| Patient compliance | 0 | 12 |
| Model of care | 0 | 3 |

### TABLE 4 Healthcare professional availability and enablers to achieving guideline recommendations for gestational diabetes mellitus initial education and follow-up as reported by Queensland Health respondents

| Healthcare professional availability | Initial education % (n) (N = 33) | Follow-up % (n) (N = 31) | Ongoing review (on medication) % (n) (N = 31) |
|--------------------------------------|----------------------------------|--------------------------|------------------------------------------|
| Dietitian                           | 85% (28)                         | 81% (25)                 | 52% (16)                                 |
| Diabetes educator                   | 85% (28)                         | 67% (21)                 | 61% (19)                                 |
| Midwife                             | 73% (24)                         | 77% (24)                 | 52% (16)                                 |
| Obstetrician/obstetric physician    | 33% (11)                         | 77% (24)                 | 68% (21)                                 |
| Other medical doctor or specialist  | 24% (8)                          | 35% (11)                 | 10% (3)                                  |
| Endocrinologist                     | 15% (5)                          | 55% (17)                 | 52% (16)                                 |
| Nurse practitioner                  | 9% (3)                           | 16% (5)                  | 10% (3)                                  |
| Clinical nurse consultant           | 3% (1)                           | 10% (3)                  | 10% (3)                                  |
| What would assist with achieving the Clinical Guideline recommendations? (N = 32) | 75% (24) | 80% (24) | 52% (16) |
| Availability of more FTE            | Room availability                | 72% (23)                 | 70% (21)                                 |
| Healthcare professional education support | 31% (10) | 30% (9) | 23% (7) |
| Availability of different healthcare professionals | 31% (10) | 23% (7) | 10% (3) |
| Organisational culture or support   | 28% (9)                          | 27% (8)                  | 10% (3)                                  |
| Telehealth                          | 25% (8)                          | 27% (8)                  | 10% (3)                                  |
| Use of other technology             | 25% (8)                          | 23% (7)                  | 10% (3)                                  |
| Equipment                           | 9% (3)                           | 7% (2)                   | 10% (3)                                  |
| Delivery of care/model of care      | 6% (2)                           | 0% (0)                   | 10% (3)                                  |

FTE, full-time equivalent.
apply to all MDT members. We predict that the larger increases in GDM diagnoses in these HHSs are likely due to higher risks associated with GDM (maternal age, previous GDM/family history of diabetes, pre-pregnancy BMI <30 kg/m², ethnicity) present in the child-bearing populations. Should the necessary staff FTE remain unavailable in these HHSs, it is recommended that a focus on more efficient models of care should become a priority.

There is no doubt that better pregnancy outcomes are achieved for both mother and infant when GDM is well-managed. Therefore, the incomplete and inequitable implementation of the guideline is cause for concern. The model of care currently used by most HHSs and across Australia, involves a dietitian, diabetes educator, midwife, and medical physicians where necessary, particularly when medication is involved. The Queensland Guideline recommends that many women with GDM may be suitable for a low-risk model of care, presumably with fewer requirements for specialist resources. However, it was unclear from this survey whether any HHSs in Queensland have implemented different models of care based on risk. Similarly, there are few published studies that involve novel models of care for GDM, especially those based on risk profiles. To achieve guideline recommendations, particularly in low-resource settings, the researchers recommend that future research should look to innovative models of care based on stratification of risk to make the best use of funding and specialist knowledge.

Without a theory-driven implementation process, clinical guidelines such as the Queensland Clinical Guideline for GDM rarely promote a change in clinical practice. This survey is one step in understanding the GDM management environment as it currently exists in Queensland which appears to be a good representation of what occurs elsewhere in Australia. This provides clinicians and researchers with an understanding of current gaps in care, and a framework to guide implementation of best available evidence. There is opportunity to work with individual HHSs to develop models of care that can maximise available staff re-sourcing while providing equitable care for women with GDM.

The findings of this study need to be considered in the context of several limitations. The survey was originally sent to 28 contacts and the email invitation requested that the survey be forwarded to any other team members who may be appropriate to answer the questions. We acknowledge that the answers of the 53 survey respondents cannot be considered representative of all relevant health professionals working in GDM in Queensland and we could not accurately determine the true response rate. As with all surveys, there is a risk of response bias, both from those who chose to participate in the survey and those who chose to answer the open-ended questions. However, we believe that the results of this survey were strengthened by the dissemination method which involved one or more key GDM contacts in each HHS and by the follow-up phone calls that were placed to most facilities to gather the most accurate understanding of the current and historic FTE available. However, we do acknowledge that requesting details on staff FTE and listing this as a potential barrier for guideline implementation may have led to response bias. Finally, the barriers and enablers of guideline implementation were only reported from the perspective of the clinicians responsible for delivering GDM care and we acknowledge that the patient’s perspective may have provided alternate aspects that are important to consider.

The number of women being diagnosed with GDM has risen dramatically in recent years, particularly since the introduction of updated screening and diagnostic criteria. However, staff re-sourcing has experienced minimal change despite the increase in workload. It is unsurprising that health facilities are unable to fully implement recommendations for managing GDM such as those seen in the Queensland Clinical Guideline for GDM. The recommendations in guidelines reflect the best available evidence for consistent and efficient delivery of care, but unless staff are supported to implement guideline recommendations, it is unlikely women with GDM will receive the level of care required to properly manage their condition.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of the Wishlist Sunshine Coast Hospital Foundation which funded this project. The funding body had no role in the study design, in the collection, analysis or interpretation of data, in the writing of the manuscript or the decision to submit the manuscript for publication. The authors also wish to thank the Sunshine Coast Diabetes Centre, particularly Emma Holland and Dr Shyam Sunder, for helping with this study.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1. Questionnaire.