Diagnosis and management practices for gestational diabetes mellitus in Australia: Cross-sectional survey of the multidisciplinary team

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Background: Gestational diabetes mellitus (GDM) is one of the most common pregnancy disorders; however, if well managed, women with GDM experience similar pregnancy outcomes to those without. Currently, there is limited evidence on actual management practices across Australia or how multidisciplinary teams interact to optimise care.

Aims: To examine the current screening, diagnostic, task and role perceptions and management practices, as reported by members of the GDM multidisciplinary team.

Methods: A 64-item electronic survey containing multiple choice, Likert scale and open-ended questions was developed for this cross-sectional observational study and advertised through health professional organisations and Queensland Health facilities in May and June, 2017.

Results: The 183 survey respondents included 45 diabetes educators, 43 dietitians, 21 endocrinologists/diabetes specialists, 14 obstetricians and 21 midwives. Although almost 90% reported using updated diagnostic guidelines, less than two-thirds used GDM management guidelines. While 68% reported using the same blood glucose targets for GDM management, there was variation to what criteria prompted the commencement of medication to control blood glucose levels. There was a good consensus concerning the health professional responsible for tasks such as medical nutrition therapy, gestational weight gain and self-blood glucose monitoring education and ultrasound use. Other tasks appeared to be the role of almost any member of the GDM multidisciplinary team.

Conclusions: The survey results indicate there is a need for consistent evidence on how to best manage GDM and that role identity, access to specialist knowledge and best practice need to be clearly defined within GDM models of care.

Keywords: gestational diabetes, health care delivery, multidisciplinary, survey
INTRODUCTION

Gestational diabetes mellitus (GDM), a condition of maternal hyperglycaemia, is one of the most common pregnancy disorders. In Australia, around 10% of pregnant women are diagnosed with GDM each year.1 In 2016–2017, over 37 000 women registered for the National Diabetes Service Scheme with GDM which has doubled since 2012. The maternal and infant consequences of GDM include pre-eclampsia and macrosomia resulting in birth trauma and caesarean deliveries.2 Longer term, women with GDM are at a seven-fold increased risk of developing type 2 diabetes3 and offspring are more likely to develop type 2 diabetes later in life.4 If well managed, women with GDM experience similar pregnancy outcomes to women with normoglycaemia.5,6

Despite understanding the risks of GDM, there is no consensus for screening, diagnosis and management among clinical guidelines worldwide. In Australia, health professionals may rely on the Australasian Diabetes in Pregnancy Society (ADIPS) guidelines,7 state and local guidelines or professional expertise to guide their treatment. Many states have published guidelines, including Queensland Health which released its guideline in 2015.8 This guideline incorporates the World Health Organization (WHO)/ADIPS-endorsed screening and diagnostic recommendations9 and advise that medical nutrition therapy, self-blood glucose monitoring (SBGM) and physical activity are the primary treatments for GDM.8 Medication such as insulin may also be required when hyperglycaemia persists, which introduces a greater level of risk, treatment intensity and cost.8

A multidisciplinary team (MDT) consisting of a diabetes educator or nurse practitioner, dietitian and endocrinologist/obstetric physician in addition to obstetricians and midwives should be involved in GDM management.8,10–14 However, it is poorly understood how the MDT interact to optimise treatment for women, or the most efficient way to produce effective results. Recent changes to the diagnostic criteria in Australia may increase the GDM workload by 20–30%,15,16 with a recent study demonstrating a 30% increase.17 Therefore, it is important to develop models of care that allow women with GDM access to specialist care within the finite healthcare budget.

First, it is important to understand how care is currently organised in Australia, how health professionals perceive their roles and others’, and barriers and enablers to implementing changes to practice. There is limited Australian literature investigating the management practices for GDM, and no Australian studies have examined healthcare professionals’ perceptions of GDM management tasks or MDT member roles. Therefore, the aim of this study was to examine the current screening, diagnostic and management practices, and task and role perceptions as reported by members of the GDM MDT.

MATERIALS AND METHODS

Study design and participants

This was a cross-sectional study using snowball and purposive sampling of all members of the MDT involved in GDM management across Australia. An online survey using Survey Monkey® with a letter of invitation was disseminated via the professional organisations: Endocrine Society of Australia; Dietitians Association of Australia; and Australian Diabetes Educators Association. The survey link and participant consent information was sent to organisation members between May and June, 2017. It was also disseminated via contacts in 14 Hospital and Health Services across Queensland Health and the Queensland State-wide Diabetes and Maternity and Neonatal Clinical Networks. A reminder email was sent every two weeks after the initial email. The survey was open for eight weeks. Participation in the survey was considered implied consent. Ethics approval was received from Metro North Royal Brisbane and Women’s Hospital (HREC/17/QRBW/9) and Queensland University of Technology (1700000111) Human Research Ethics Committees.

Instrument development

An instrument development process was undertaken due to the absence of a pre-existing, validated tool assessing the outcomes of interest. A literature review was used to find similar tools, and the survey included 15 questions adapted from existing questionnaires8–21 relating to GDM service provision and demographic characteristics. For the remaining questions, the Queensland Clinical Guideline for GDM8 was used to compile a list of tasks and recommendations for GDM management. From this, questions relating to screening, diagnosis and management practices were developed. Each question had multiple response options with some open text boxes. The tasks for GDM management in the Queensland Clinical Guideline8 formed the basis of questions assessing MDT role perceptions and level of agreement with each task using a Likert scale response from one (strongly disagree) to five (strongly agree). Participants were also asked to select the MDT member(s) who could undertake each task.

The survey was reviewed by seven experts (obstetrician, endocrinologist/obstetric physicians, dietitians, clinical nurse consultant and statistician), and piloted among five MDT members to establish content and face validity. The final version was a 64-item questionnaire in three sections (Appendix S1). The first section had 27 questions relating to GDM service provision, and the diagnosis and management of women with GDM. The second section related to task and role perception and had 30 questions. The final section had five questions on demographic characteristics.

Data analysis

Analysis was performed using Microsoft Excel and SPSS Statistics version 20 (SPSS Inc., Chicago, IL, USA). 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 and open-ended responses were summarised according to the same response-type and quantitatively analysed. Many questions allowed for more than
one answer and tallied results were greater than 100%. Likert response scales were collapsed into three categories (agree, neutral, disagree).

RESULTS

There were 183 respondents, consisting of 45 diabetes educators, 43 dietitians, 21 endocrinologists/diabetes specialists, 14 obstetricians, 21 midwives, three medical doctors (other) and one lactation consultant. Unsurprisingly, over 56% were from Queensland due to the targeted recruitment method used in this state. The remaining participants were from Western Australia (15%), New South Wales (14%), Victoria (10%), Australian Capital Territory (3%) and South Australia (2%). The demographic profile of survey respondents is shown in Table 1.

### Screening and diagnosis of GDM

Ninety-four percent of respondents stated that all women were screened for GDM (universal screening). Almost 90% of respondents reported using the WHO/ADIPS criteria for the diagnosis of GDM and the same number used the 75 g oral glucose tolerance test (OGTT).

### Management of GDM

Sixty-three percent used guidelines for the management of women with GDM and an additional 21% reported that guidelines were available at their health service, but they used their professional expertise to manage GDM. Eight percent of respondents stated their workplace did not have guidelines. Women were usually seen for initial education within 1–2 weeks (55%) or <1 week (41%) with face-to-face contact used 98% of the time. Group education was used most frequently for initial education (53%); however, around 40% reported seeing women for an individual appointment. The health professional(s) responsible for the various tasks involved in managing GDM and appointment frequency are outlined in Table 2.

The initial approach for managing GDM involved SBGM (98%), medical nutrition therapy provided by a dietitian (82%), physical activity (79%) and gestational weight gain advice (72%). Diet advice provided by any healthcare professional was reported by 34% while commencement of pharmacotherapy may be used as a first-line approach according to 22% of respondents. Factors that warranted ongoing dietary advice included unstable blood glucose levels (BGLs) (93%), excess gestational weight gain (85%), weight loss (82%), or concerns from a health professional (82%) or patient (69%) about nutrient deficiencies. Seventy-six percent reported that gestational weight gain was tracked throughout pregnancy.

Unlike diagnosis, there was greater variation reported for blood glucose targets for GDM management. For women not on any form of pharmacotherapy, 68% reported using the ADIPS targets (fasting ≤ 5.0 mmol/L, one hour ≤ 7.4 mmol/L, two hours ≤ 6.7 mmol/L) while 22% reported different targets ranging from <5.3 mmol/L (fasting) to <8.0 mmol/L (two hours post-prandial). Elevated BGLs were the most common way to identify women requiring pharmacotherapy. From 123 responses, the following reasons for commencing pharmacotherapy were given: two or more elevated BGLs in one week (38%), three or more elevated BGLs in one week (20%), consistently elevated BGLs or average BGL elevated (20%), elevated BGLs plus evidence of fetal macrosomia (19%) and at discretion of obstetrician or endocrinologist (3%). Almost 90% of respondents reported that BGL targets remained the same after commencing pharmacotherapy.

Eighty-five percent of respondents indicated that women are advised to undertake a postpartum OGTT with their GP, while 24% reported that this was done at the hospital. Almost 60% of respondents indicated that women were advised to optimise postpartum

| Employment sector                                      | Percentage of respondents |
|-------------------------------------------------------|---------------------------|
| Public hospital with specialised diabetes in pregnancy services | 56                        |
| Public hospital without specialised diabetes in pregnancy services | 17                        |
| Public diabetes centre                                | 4                         |
| Private hospital                                       | 3                         |
| Private practice                                       | 10                        |
| Community health centre                                | 10                        |

| Geographic location                                   | Percentage of respondents |
|-------------------------------------------------------|---------------------------|
| Metropolitan                                           | 51                        |
| Regional                                               | 30                        |
| Remote                                                 | 19                        |

| Years in profession                                    | Percentage of respondents |
|-------------------------------------------------------|---------------------------|
| <5                                                    | 9                         |
| 5–10                                                  | 25                        |
| 11–20                                                 | 35                        |
| >20                                                   | 31                        |

| Years in area of GDM                                   | Percentage of respondents |
|-------------------------------------------------------|---------------------------|
| <5                                                    | 25                        |
| 5–10                                                  | 37                        |
| 11–20                                                 | 28                        |
| >20                                                   | 10                        |

| GDM clients/month                                      | Percentage of respondents |
|-------------------------------------------------------|---------------------------|
| ≤5                                                    | 20                        |
| 6–10                                                  | 14                        |
| 11–20                                                 | 13                        |
| >20                                                   | 53                        |

GDM, gestational diabetes mellitus.
and interpregnancy weight, 71% provided dietary or other lifestyle advice, while 57% advised on breastfeeding.

### Role perceptions and attitudes about management principles

The level of agreement for each of the 15 tasks according to respondents is shown in Table 3. Most respondents agreed that: a MDT approach is best; women should be given advice on physical activity, SBGM and gestational weight gain; blood glucose monitoring records should be checked at follow-up appointments; and women who do not achieve optimal BGLs should receive pharmacotherapy (Table 3). There was less agreement on tasks such as routine and repeat ultrasounds to monitor fetal growth, advice on the antenatal expression of milk, and urine testing for the presence of protein or ketones (Table 3).

For many of the tasks, it appeared some were clearly considered the responsibility of certain health professionals (Fig. 1). Medical nutrition therapy was the domain of the dietitian, fetal growth monitoring via ultrasound scan the obstetrician, commencing pharmacotherapy the endocrinologist and SBGM education the diabetes educator (Fig. 1). For other tasks it was less clear and 60–70% of respondents felt that these many tasks could be performed by any MDT member (Fig. 1).

Other tasks or requirements in GDM management as indicated by open responses were: guidelines around insulin and metformin use; working within scope of practice; dietary guidelines; culturally appropriate dietary education; peripartum management including induction; adequacy of education for those in rural and remote regions; the role of other testing methods; and counselling support.

### DISCUSSION

Diagnostic criteria have dominated the recent scientific discourse in GDM, while the evidence for optimal management strategies remains inconclusive and varied. To the best of our knowledge, this is the most comprehensive MDT survey reporting on the current practices in GDM management in Australia. While the results show there is consistency in diagnosing GDM, there is disparity in management principles, including blood glucose targets, initial management strategies and role perceptions. This may be partially explained by the absence of workplaces using guidelines and around one-fifth of respondents reporting they use their professional expertise instead of guidelines.

Since the 2013 screening and diagnostic changes in Australia, most workplaces have adopted the WHO/ADIPS approach. The 90% of respondents who report using the WHO/ADIPS criteria in this survey is up by 14% on a 2015 survey. Interestingly, 14 respondents in this survey reported using a two-step testing strategy involving the 50 g glucose challenge test and the 75 g OGTT, compared with none reported in 2015. Almost all respondents

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**TABLE 2** Appointment frequency and GDM management tasks as reported by healthcare professionals

| Responses (n) | Diabetes educator | Endocrinologist | Dietitian | Obstetrician | Nurse/midwife | GP | Other |
|---------------|------------------|-----------------|-----------|--------------|---------------|----|-------|
| Appointments with health professionals: | | | | | | | |
| Initial education | 157 | 93% (159) | 83% (139) | 16% (26) | 14% (24) | 6% (10) | 2% (1) |
| Follow-up | 154 | 71% (105) | 69% (107) | 36% (56) | 46% (71) | 49% (76) | 2% (1) |
| Frequency of follow-up appointments | | | | | | | |
| Weekly | 129 | 34% (40) | 36% (47) | 1% (1) | 29% (31) | 2% (29) | 1% (1) |
| fortnightly | | 17% (18) | 17% (18) | 5% (5) | 23% (24) | 23% (24) | 2% (1) |
| Monthly | | 21% (22) | 21% (22) | 1% (1) | 21% (22) | 2% (29) | 1% (1) |
| Unsure | | 15% (16) | 15% (16) | 2% (29) | 12% (13) | 12% (13) | 1% (1) |
| Health professional responsible for ongoing review of BGLs | | | | | | | |
| 153 | 78% (120) | 78% (120) | 56% (86) | 56% (86) | 51% (78) | 46% (71) | 46% (71) |
| GDM managed through diet – health care professional responsible for ongoing management | | | | | | | |
| 153 | 38% (58) | 38% (58) | 38% (58) | 38% (58) | 40% (62) | 40% (62) | 40% (62) |
| Health professional responsible for identifying women who require additional intervention | | | | | | | |
| 154 | 79% (121) | 79% (121) | 79% (121) | 79% (121) | 79% (121) | 79% (121) | 79% (121) |

BGL, blood glucose level; GDM, gestational diabetes mellitus; GP, general practitioner.
also recommended an OGTT 6–12 weeks postpartum to screen for type 2 diabetes, although actual rates of follow up are typically low.22 In Australia, women who are registered with the National Gestational Diabetes Register receive postal reminders which appears to have improved compliance to postpartum testing in recent years.23 Australia and New Zealand guidelines recommend lifelong type 2 diabetes screening and testing alternatives to the two-hour OGTT, such as glycosylated haemoglobin (Hba1C) and random plasma blood glucose, may be appropriate and more acceptable to women.7,14

Blood glucose targets remain an area of controversy, with the ADIPS guidelines acknowledging this is an area requiring further research.7 This is reflected by the variation in targets reported in this survey. BGLs should only form part of the picture when deciding whether pharmacotherapy should be commenced, and fetal growth should be considered when setting blood glucose targets.8,24 International and Australian recommendations include monitoring fetal response to GDM by way of repeat ultrasounds every 2–4 weeks in the second and third trimesters.8,25 Particular attention should be paid to the accurate measurement of fetal abdominal circumference8,25 and altering BGL targets based on normal or accelerated fetal growth may improve infant outcomes.24 While three-quarters of respondents of this survey agreed that BGLs should be considered alongside fetal growth and maternal weight gain, almost 100% agreed that BGLs were the best indicator of whether a woman with GDM should commence pharmacotherapy. This inconsistency highlights the need for ongoing research translation of best available evidence. Addressing this evidence–practice gap will help inform stratification of care based on high and low risk cases, and there may be a case for BGL targets that reflect women’s specific circumstances.

The initial approach to managing GDM involves medical nutrition therapy, SBGM and physical activity advice.8,25,26 However, 20% of respondents reported that medical nutrition therapy and physical activity advice were not part of the initial approach at their workplace. The same number of respondents indicated that a dietitian is not involved in initial education, similar to results reported by Morrison et al. (2011).19 Of concern, almost one-quarter of our respondents indicated that pharmacotherapy may be used

Table 3 GDM management tasks and level of agreement according to survey respondents. Rows ordered by the percent agreeing

| Task                                                                 | Agree (%) | Neutral (%) | Disagree (%) |
|---------------------------------------------------------------------|-----------|-------------|-------------|
| Women should be given advice on physical activity                   | 99        | 0           | 1           |
| Women should have their blood glucose monitoring records checked at follow-up appointments | 99        | 0           | 1           |
| Self-blood glucose monitoring education should be provided to every woman diagnosed with GDM | 98        | 0           | 1           |
| A MDT approach is best for managing GDM                            | 96        | 1           | 3           |
| Women who do not achieve optimal BGLs with lifestyle modification should receive pharmacotherapy | 97        | 2           | 1           |
| Women should be given advice on what is and how to achieve appropriate gestational weight gain based on their pre-pregnancy body mass index | 95        | 4           | 1           |
| Women should be assessed for risk factors associated with GDM at the first antenatal visit | 94        | 3           | 3           |
| Women should have their gestational weight gain tracked at follow-up appointments | 93        | 5           | 2           |
| Medical nutrition therapy should be the first-line treatment in GDM | 90        | 7           | 3           |
| BGLs are the best indicator of whether a woman with GDM should commence pharmacotherapy | 82        | 13          | 5           |
| BGLs should always be considered alongside fetal growth and maternal weight gain before deciding whether a woman with GDM should commence pharmacotherapy | 75        | 15          | 10          |
| Women should have repeat ultrasounds to monitor fetal growth       | 74        | 21          | 5           |
| Women should undertake a routine ultrasound to establish a baseline for future evaluation of fetal growth | 69        | 27          | 4           |
| Women should have their urine tested at one or more follow-up appointments for the presence of protein | 61        | 29          | 10          |
| Women should be given advice on the antenatal expression of milk   | 57        | 38          | 5           |
| Women should have their urine tested at one or more follow-up appointments for the presence of ketones | 43        | 37          | 20          |
| Only women with BGLs outside of recommended targets should be provided with ongoing medical nutrition therapy | 28        | 12          | 60          |

BGL, blood glucose level; GDM, gestational diabetes mellitus; MDT, multidisciplinary team.
as a first-line approach in managing GDM and one-third indicated that diet advice may be provided by anyone in the MDT, inconsistent with current evidence.\(^5,6,25\)

Task and role perceptions as reported here indicated that certain tasks are considered the responsibility of specific MDT members, whereas others can be performed by almost any MDT member. For example, medical nutrition therapy and gestational weight gain advice is considered the domain of the dietitian, although half of the respondents also considered these tasks could also be undertaken by a diabetes educator with no specialist nutrition training. It is concerning that in 10 years there appears to be no increase in dietetic services for GDM in Australian with 20% of women still not accessing a dietitian.\(^19\)

Tasks such as commencing pharmacotherapy or ultrasound fetal measurements were predominately considered the domain of medical specialists, while SBGM education fell under the role of the diabetes educator. However, checking of blood glucose records was considered anyone’s task, as were most other tasks in this survey. As the authors were unable to identify any similar surveys on task and role perception in GDM management, it is difficult to ascertain whether this lack of role identity for tasks is unique to Australian GDM management. Our results may also highlight that specialist skills in certain regions are lacking considering that almost 20% of respondents were from rural or remote facilities.

To the best of our knowledge, this study represents the most comprehensive survey of a diverse range of members of the GDM multidisciplinary team on the management of GDM in Australia. A strength of the study is the breadth of respondents’ professions and the reported level of adherence to current Australian guidelines. However, there were several limitations to our study. Surveys rely on what is reported by the respondents according to the question responses provided and may not be representative of actual GDM practices. It was not possible to reach all relevant health professionals through the dissemination methods. Due to the large number of Queensland respondents (>50%), the risk of response bias is high, particularly considering the availability of clinical guidelines for this state. Finally, as the total number of health professionals in GDM management at the time of the survey was not known, it was not possible to calculate a response rate.

**CONCLUSION**

Overall, the results of this survey highlight considerable variation in how GDM is managed across Australia and demonstrates a need for further evidence in managing GDM. By understanding current practices, health services can begin to develop new models of care that can improve efficiencies, costs and patient care, given the predicted (and actual) workload increases in recent years. There is a real need to integrate new evidence into clinical guidelines and ensure that knowledge is translated into practice so that consistent care is provided across all regions and health services in Australia.
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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

Appendix S1. Questionnaire.