



# Practice nurses' role and knowledge about diabetes management within rural and remote Australian general practices

R Livingston\*, T Dunning

## Introduction

Diabetes is a chronic, common and costly health problem. In Australia, diabetes is the fifth national health priority and the sixth leading cause of death.<sup>1,2</sup> In 2007, the standardised death rate for diabetes was 16.5 per 100 000 population.<sup>3</sup> Thus, diabetes is a serious public health issue with an estimated overall prevalence of 7.4% and is responsible for 5% of the total disease burden, especially in remote Australia among Aboriginal people and in some migrant groups.<sup>4</sup> The quality of care and education provided depends on the provider's knowledge and experience. An educated and competent workforce is needed to address primary and secondary diabetes healthcare issues. Nurses, especially practice nurses (PN) in primary care, are often the first point of contact for people with dia-

## Abstract

**Background:** The increasing prevalence of diabetes and obesity represents a significant disease burden in Australia. Practice nurses (PNs) play an important role in diabetes education and management.

**Aim:** To explore PNs' roles, knowledge and beliefs about diabetes education and management in rural and remote general practice in Australia.

**Method:** Exploratory study undertaken in three phases: 1) Pilot study to test the performance of the questionnaire; 2) One-shot cross-sectional survey using self-complete questionnaires; 3) Individual interviews.

**Results:** Ten PNs completed the pilot test; the draft questionnaire was deemed appropriate to the study purpose. Then, 65 questionnaires were distributed to PNs and 21 responded. Fourteen respondents had worked in the role <5 years, and most PNs attended diabetes education programmes in their workplace. A minority (40%) used diabetes management guidelines regularly. Most knew obesity to be the most common risk factor for diabetes but only 50% knew that glycosylated haemoglobin indicates blood glucose levels over the preceding three months. Self-reported competency to assess patients' self-care practices and medication management practices varied.

**Conclusion:** PNs' diabetes management was self-reported; their knowledge varied and their perceived benefits of diabetes education differed from those of patients.

## Key words

Practice nurses; diabetes; rural; knowledge; role

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betes.<sup>5</sup> As a result PNs' diabetes management knowledge could impact significantly on the health outcomes of people with diabetes.

The current focus of the Australian National Diabetes Strategy (1999) (NDS) 2000–2004 and the Chronic Non-Communicable Diseases Framework is on developing diabetes prevention and risk-management strategies, educating multidisciplinary collaborative teams and employing PNs in general practice. A second priority of the NDS is implementing population-based lifestyle and self-management education programmes to reduce the prevalence of diabetes.<sup>6</sup>

Practice nurses are registered or enrolled nurses (nurse's aids) employed in general practice.<sup>7</sup> PNs

usually work part-time with two or more general practitioners (GPs), often for <5 years.<sup>6,8,9</sup> Some 73% are over 40 years of age, most are hospital trained and have limited experience in primary care settings.<sup>10</sup> These findings suggest that PNs need current diabetes information and support for their practice.

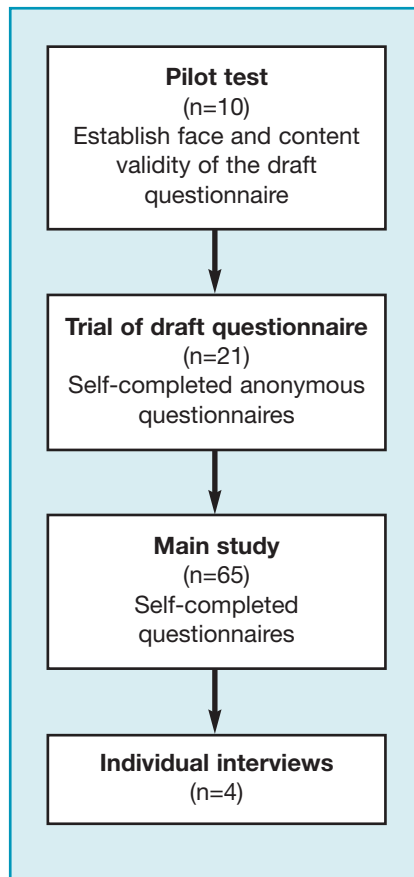
In 2009, PNs were employed in almost 60% of general practices and an increasing number of Medicare Benefits Schedule items were allocated to PN services.<sup>11</sup> Medicare items (10993, 10996, 10994, 10995, 19997, 16400, 711) are available for PNs to provide specific types of services on behalf of GPs, and address diabetes, asthma, mental health, immunisa-



tion, antenatal care, cervical screening/preventative checks, and wound management.<sup>12</sup> In addition, the government provides significant financial assistance to GPs to employ PNs as part of the strategy to address shortages in the primary care workforce.<sup>11</sup> However, data about PNs impact on diabetes management outcomes is difficult to assess, and may be under-reported because most data focus on GPs and only provide limited information about PNs' roles and contributions to the outcomes achieved. For example, the Australian Institute of Health and Welfare (AIHW)<sup>13</sup> and Medicare Australia data indicate PNs played a role in only 3.2% and 3.9% respectively of patient encounters in 2006.

Since 2006, PNs' roles have become more autonomous as collaborative practice models were introduced.<sup>14</sup> Invariably, PNs roles within and among practices often focus on task-based care. However, in Australia, scholarships, grants programmes, and diabetes education packages are available to assist PNs in undertaking relevant education programmes that help to expand their scope of practice.

The Australian Diabetes Educators Association (ADEA), the Royal College of Nursing, Australia (RCNA), and the Australian Practice Nurses Association (APNA) provides diabetes education programmes for nurses. The ADEA and RCNA programmes are conducted in conjunction with the Royal Australian College of General Practitioners (RACGP), although increasing numbers of PNs undertake a Graduate Certificate in Diabetes Education in universities. However, the availability of diabetes education programmes, the number of PNs who actually complete such programmes, and their effect on PNs' diabetes



**Figure 1:** Schematic representation of the phases of a study investigating practice nurses' self-reported knowledge of diabetes

knowledge and competence are largely unknown.

Watts *et al* (2004) suggested that current PN education does not prepare PNs to meet the demands of the role because it requires advanced knowledge in specific areas of practice, such as diabetes education and management.<sup>9</sup> Other research has demonstrated deficits in nurses' diabetes knowledge, and significantly, a discrepancy between perceived and actual knowledge levels.<sup>15–17</sup> Findlow and McDowell also found that clinical experience had no significant influence on actual knowledge about diabetes management.<sup>17</sup>

Patterson and colleagues surveyed 67 PNs in Australia, who

felt their role was to assist the doctor, monitor patient care following medical interventions, provide specific diabetes-related medication, diet, wound care and pregnancy education, undertake triage activities and perform health risk assessments.<sup>18</sup> One can extrapolate from such studies that PNs, and nurses generally, have deficits about diabetes management and may not have the necessary knowledge and competence to manage or educate people with diabetes, especially given the complex nature of this disease and the rapid changes in its management practices and guidelines. Therefore, PNs working in rural and remote general practice may need specific initial and ongoing diabetes training to enable them to contribute effectively to diabetes management in general-practice settings.<sup>6,18,19</sup>

The purpose of the current study was to explore PNs' self-reported roles, knowledge and beliefs about diabetes management in Australian rural and remote general practices. The specific aims of the study were to determine factors that impact on PNs' role and the education that PNs believe they need to manage diabetes competently, deliver diabetes education, facilitate early identification of long-term complications, and assess patients' diabetes knowledge.

Although descriptive studies into health professionals' (HP) diabetes management knowledge has been undertaken by other researchers,<sup>15–17</sup> no existing valid questionnaires were identified that addressed the study aims. For example, Drass *et al*'s questionnaire<sup>15</sup> did not address PNs' diabetes management role, and El-Deirawi and Zuraikat did not describe how PNs' knowledge influences the care they provide.<sup>16</sup> The ADKnowl questionnaire<sup>20</sup> was rejected because it primarily focused on people with diabetes.



## Methods

A descriptive exploratory study was undertaken using a combination of qualitative and quantitative methods. Data were collected from PNs working in three divisions of general practice (n=104) located in one health region in north central Victoria, Australia. The three divisions were broadly representative of all general practices in rural and remote Victoria. The study was undertaken in three continuous phases (Figure 1).

### Pilot test

A questionnaire was developed specifically for the study to explore the PNs' roles, knowledge and beliefs about diabetes education and management. The draft questionnaire consisted of closed and open-ended questions derived from existing questionnaires. These included Drass *et al.*<sup>15</sup> El-Deirawi and Zuraikat,<sup>16</sup> the literature, plus information supplied by diabetes experts, and the researcher who worked as a district nurse in one of the sampling divisions. The questionnaire had three sections:

- Demographic data and geographic and workforce characteristics related to the PN role
- Diabetes management, collaborative care, blood glucose monitoring and barriers to PNs delivering diabetes education and management
- Beliefs and knowledge about diabetes management and education that prevented or facilitated PNs to care for and educate people with diabetes.

A pilot test was undertaken to establish the face and content validity of the draft questionnaire. A panel of four experts participated in the pilot test: one member from each of the following categories, diabetes management and education, statistics, questionnaire development, and epidemiology. In addition, PNs from one division of

Characteristics	Range	Mean	SD
Age (y)	27–64	47.2	±8.7
First registered (y)	5–44	25.9	±9.2
Number of PNs working in a general practice	Number of responses	% Response rate	
1.00	6	28.6	
2.00	9	42.9	
3.00	3	14.3	
4.00	2	9.5	

**Table 1:** Demographic data and workforce characteristics of practice nurses (PNs) participating in the main section of a study assessing self-reported knowledge of diabetes (n=21)

general practice (Division A) in the region (n=10) completed the draft questionnaire to ensure the language was appropriate to the target audience. These PNs were excluded from the main study.

The questionnaire was distributed to the expert panel and the PNs in Division A. Members of the expert panel had individual face-to-face meetings with the researcher; they received a copy of the questionnaire, which they assessed independently using a structured-feedback format to ensure that responses were presented consistently.

The researcher delivered the questionnaires to the General Practice Support Officer (GPSO) working in Division A. The GPSO provided workforce details for 43 general practices. A practice manager subsequently distributed the survey packages to PNs via internal mail. Return-addressed reply-paid envelopes were supplied to encourage the return of completed questionnaires and maintain anonymity.

Inclusion criteria required participants to be English speaking, over the age of 18 years, and working within general practices located in Division A. Returning the draft questionnaire in the reply-paid

envelope was taken as consent to participate in the study. A computer database was developed to record the number of questionnaires distributed, to whom they were distributed, and when they were returned.

### Main study

A one-shot cross-sectional survey was undertaken using the questionnaire tested in the pilot phase. It was anonymous and completed by PNs working in rural and remote general practices across Division B and Division C.

Sixty-five survey packages were distributed through the practice managers of each Division: 40 in Division B and 25 in Division C. Each contained a letter explaining the study purpose, a plain-language statement, the questionnaire, a consent form for participants to indicate their willingness to participate in an interview, and two-reply paid, addressed, envelopes for the completed questionnaire and interview consent form. Reminder letters were mailed to each PN four weeks after the initial distribution; a second reminder letter was sent six weeks after the original mailing, to further increase the response rate. Return of the questionnaire was taken as consent to participate.



Practice nurses' current work profile	Frequency of n=21 responses	% Response rate
<b>Number of years worked as a PN in general practice</b>		
1–5	14	66.6
6–14	2	9.5
>15	5	23.8
<b>Daily business hours of nursing service</b>		
8	16	76.2
6	3	14.3
≤5	2	9.6
<b>Hours of nursing service per fortnight*</b>		
12–16	7	33.3
≥64	5	23.8
28	3	14.3
40	3	14.3
24	2	9.5
31	1	4.8
<b>Hours dedicated to diabetes management per fortnight</b>		
≤2	11	73.2
8	2	13.3
≥10	2	13.3
*A fortnight is 14 consecutive days/nights		

**Table 2:** Practice nurses' (PNs') current work profile in general practice

### Data analysis

Data were analysed using the Statistical Package for the Social Sciences (Version 12.0; SPSS, Chicago, IL, USA).<sup>21</sup> The study was descriptive; hence categorical responses were summarised using frequencies and percentages. Numerical information was summarised as means and standard deviations. Analysis of variance was used to determine the relationship among variables. Between group differences were analysed using the Mann–Whitney *U* test. *P* values ≤0.05 were considered statistically significant.

Analysis of open-ended questions was undertaken using the framework method.<sup>22</sup> Emerging themes were identified, categorised and indexed to highlight patterns of association within the data.

### Ethics

Ethics approval to conduct the study was obtained from the University of Melbourne Human Research Ethics Committee. Permission to recruit PNs in the general practices was granted by the Divisions of General Practice Chief Executive Officers. Participant data were de-identified to ensure confidentiality and privacy was maintained.

### Results

#### Pilot test

Ten PNs returned questionnaires (response rate, 25%). All were female registered nurses (RN), working part-time. No participants reported any difficulty answering the draft questionnaire, and the expert panel indicated that the content was relevant to the study aims and likely

to elicit the necessary information. After pilot testing, minor grammatical and layout changes were made, to make the questions easier to follow and improve the questionnaire's appearance. The questionnaire was deemed to be appropriate for the main study.

#### Main study

Twenty-one of the 65 eligible PNs participated in the main study (response rate, 33%). Three participants were included in the study because most questions were answered; incomplete data were recorded as missing data. Twenty respondents were RNs and one was an enrolled nurse. Six participants also consented to participate in interviews: two PNs attended face-to-face interviews and two participated in teleconference interviews (interview results are reported elsewhere).

#### Demographic and geographic data

Demographic data and workforce characteristics are shown in Table 1. All respondents worked part-time. None reported having diabetes.

#### Qualifications and workplace profile

Eighteen PNs (86%) trained in hospitals; 11 PNs (58%) indicated they had no postgraduate qualifications. Fourteen PNs (67%) had worked in general practice ≤5 years, but five (24%) had worked ≥15 years. Table 2 provides information about current work profiles.

#### Knowledge and diabetes self-education

Fifteen respondents (62%) participated in diabetes in-service education programmes: of these, three (15%) expected to receive diabetes education during working hours. Other sources of information were lectures (n=9) and workshops (n=4). Notably, 15 PNs (71%) indicated they did not receive any diabetes education when they commenced work in





general practice, but they did not indicate whether they actively sought education. Respondents rarely or never used diabetes management guidelines, and only one had participated in a policy development process in their general practice. One indicated that medication management was the responsibility of the GP and patient. All PNs considered GPs' diabetes knowledge to be important. Four respondents had a family member with diabetes.

#### *Collaboration with diabetes specialists*

Seventeen respondents (80%) worked collaboratively with GPs, diabetes nurse educators, dietitians, and endocrinologists. However, four respondents were unsure whether they were involved in collaborative care with diabetes specialists. Notably, respondents reported that GPs often acted on patient assessments undertaken by PNs. Therefore, it appears GPs trust PNs' assessments, which could have a positive impact on PN autonomy. PNs believed they lacked sufficient time to provide effective diabetes management; barriers to PNs providing effective diabetes management are shown in Table 3.

#### *Diabetes risk factors*

Sixteen respondents (80%) correctly identified obesity as the most common risk factor for diabetes; cardiovascular disease was mentioned less often as a risk factor for diabetes (n=3). Fourteen respondents (74%) recognised family history as a major risk factor for type 2 diabetes. Four respondents cited lack of exercise and hypertension, but only one cited smoking as a risk factor for diabetes.

#### *Usual type 2 treatment and glycosylated haemoglobin target*

Sixteen participants (86%) correctly identified insulin as the usual treatment for type 1 diabetes and oral hypoglycaemic agents (OHA),

	Frequency of responses	% Response rate
Patient's inability to self-manage diabetes	12	57.1
Patient's non-attendance at scheduled appointments	11	52.4
Time constraints	10	47.6
Inadequate podiatry services	8	38.1
Inadequate diabetes education services	7	33.3
Inadequate ophthalmology services	5	23.8
PN's lack of knowledge about diabetes management	3	14.3
Inadequate pharmacy services	1	4.8
Difficulties communicating with health professionals	1	4.8
Inadequate access to appointments within a reasonable timeframe	1	4.8
Dietitian services	1	4.8

**Table 3:** Barriers to practice nurses (PNs) providing effective diabetes management and education in general practice (n=21); some PNs cited more than one barrier

diet and exercise as the usual management of type 2 diabetes (62%). Three respondents incorrectly categorised people with type 2 diabetes as having type 1 diabetes, and four did not list OHAs as a treatment mode for type 2 diabetes. Eleven respondents correctly identified the current glycosylated haemoglobin (HbA<sub>1c</sub>) target as <7%, but few knew the normal range. Ten respondents correctly described HbA<sub>1c</sub> as a measure of the average blood glucose level over the preceding three months.

#### *Knowledge about diabetes complications*

The majority indicated that eye and foot checks were important regular complication screening procedures that GPs undertook collaboratively with PNs. Two respondents indicated that the GP, PN, and diabetes educator all undertook complication screening, and a further two respondents stated that blood pressure should be routinely monitored. Fifty per cent of respondents felt competent to assess diet and exercise behaviour, but there was a wide variation in self-reported

competency to assess patients' self-care practices, especially medication self-management. Table 4 shows practice nurses' self-reported knowledge of short-term and long-term diabetes complications.

#### *Relationship between diabetes knowledge and years working as a PN*

Table 5 summarises the relationship between median years worked as a PN and correct or incorrect responses to the six diabetes-knowledge questions.

#### **Discussion**

The current study adds to existing information about diabetes management in rural Australia, where the working environment and opportunities for clinical practice development are different from metropolitan settings (where more services and greater access, including diabetes management experts are available).

The overall response rate of 33% was disappointing, but is consistent with response rates to questionnaires from the similar populations in other studies.<sup>8,18,23</sup> Reasons for the low response rate were unclear



	Frequency of responses	% Response rate
<b>*Knowledge of short-term complications</b>		
Hypoglycaemia	11	61.1
Hyperglycaemia	9	50.0
**Other	6	33.3
<b>Knowledge of long-term complications</b>		
Retinopathy	17	89.5
Renal disease	12	63.2
Peripheral vascular disease	11	57.9
Peripheral neuropathy	8	42.1
Cardiovascular disease	7	36.8
Erectile dysfunction	2	11.2
Cerebrovascular disease	1	5.3
†Other	3	15.8
* Two respondents did not answer the question about short-term complications		
** Ketoacidosis, cellulitis, urinary tract infection		
†Weight issues and foot problems		

**Table 4:** Practice nurses' (PNs') self-reported knowledge about short-term and long-term diabetes complications (n=21).

but may be related to factors such as an increasing workload, frequently being asked to participate in research activities, or a fear of demonstrating diabetes knowledge deficits.<sup>24</sup> Other research conducted in similar populations derived similar demographic data, which suggests that the sample reflected the overall population in the study setting and this enhances its representativeness.<sup>9,25</sup>

The PNs had received limited education about diabetes management and our findings suggest that their diabetes information could be out-dated.<sup>9</sup> The mean years since registration was 26 years. Deficits in nurses' knowledge about diabetes management have been consistently reported since 1989,<sup>15</sup> which suggests that current education methods may be inadequate. Significantly, PNs' diabetes knowledge was deficient in key areas such as disease complications and screening procedures, which could impact on a PN's ability to follow

recommended diabetes monitoring guidelines and outcomes for people with diabetes.

Currently, Australia offers no formal qualification for general practice nursing, but diabetes management courses are available through universities and education providers such as the ADEA and the Department of General Practice at the University of Melbourne<sup>19,26–28</sup> which targets PNs.<sup>28</sup> Distance from education providers could be a barrier to remote or rural PNs' participation in continuing education programmes, but much information and self-directed education is available online.

Practice nurses in the current study reported difficulties undertaking collaborative care and establishing relationships with diabetes specialist services; these findings are similar to other findings.<sup>19</sup> PNs were willing to explore information and technology opportunities to collaborate with PNs in other general practices. Best practice care

among PNs, GPs, and allied health workers should be conducted within a structured framework of funding arrangements, training provisions, and primary healthcare policy recommendations.<sup>11</sup>

Interestingly, Drass *et al*<sup>15</sup> and Jayne and Rankin<sup>29</sup> found that nurses lacked knowledge in key areas such as insulin action, injection sites, hypoglycaemic symptoms, and OHAs. These studies were generally undertaken in the USA and UK, where conditions are different from Australia, yet the findings are consistent between the three countries and with the current study. Significantly, these<sup>15,29</sup> and another study<sup>30</sup> show that there is a difference between perceived and actual diabetes knowledge, which could impact on PNs' practices and, ultimately, patient outcomes. Tolhurst *et al* indicated that PNs could undertake a more collaborative role in assessment and planning care for people with diabetes.<sup>30</sup>

Another study suggested that older physicians are more likely to deviate from management guidelines and use outdated information.<sup>31</sup> It is unclear whether age was a factor in the current study but most PNs were older and had limited experience in primary care prior to taking up the PN role. Therefore, PNs' diabetes knowledge could have been influenced by both age and lack of experience in general practice. However, Findlow and McDowell found that experience had no significant influence on actual diabetes knowledge level.<sup>17</sup> The extent of the effect of experience on knowledge in the current study is unknown and is worthy of further analysis.

Dunning and Martin suggested that although type 2 diabetes is a serious disease, how diagnosis is delivered often falsely reassures people that it is a mild disease – especially when management



Questions	Correct responses		Incorrect responses		Analyses	
	n	Median; range	n	Median; range	Mann-Whitney	P-value
Diabetes definition	13	2.0; 10.5	8	4.5; 10.8	44.5	NS
Mentioned gestational diabetes	13	2.0; 3.5	8	11.0; 19.5	14.5	0.006
Type 2 diabetes treatment	13	5.0; 13.5	8	3.5; 4.3	48.5	NS
Insulin use	14	2.5; 14.0	7	5.0; 5.0	37.0	NS
Normal HbA <sub>1c</sub> target	7	4.0; 16.0	14	3.0; 4.5	37.5	NS
HbA <sub>1c</sub> significance	9	4.0; 3.5	12	3.5; 11.0	50.0	NS
HbA <sub>1c</sub> , glycosylated haemoglobin; NS, not significant						

**Table 5:** Relationship between practice nurses' (PNs') diabetes knowledge and number of years worked as a PN (n=21)

consists of diet and exercise, and may affect patient self-care behaviours.<sup>24</sup>

General practices and PNs are often the first point of care for people with diabetes. Thus, a PN's ability to screen for diabetes and provide health promotion and illness prevention messages in a timely way is important. Interestingly, the PNs in the current study derived their information from both formal and informal sources (such as newspapers), which may not be current or accurate. In contrast, Findlow and McDowell found that nurses relied on journals, peers, doctors and patients for diabetes information, which can also be outdated, especially if the source is old or inexperienced.<sup>17</sup>

### Study limitations

The sample (n=21) represents a small proportion of the overall sampling population, and the findings may not be representative

of the sampling population or other PNs. Therefore, care must be taken when generalising these results outside of the study. In addition, PNs who participated in the study may have done so because they had a personal interest in diabetes. Likewise, only females responded, which represents gender bias; males may have different views. The questionnaire only had face and content validity, and may have had an unknown effect on the results.

### Conclusion

Our study findings show that PNs had a basic understanding of diabetes and its complications, but knowledge was lacking in key areas. PNs need appropriate initial and ongoing diabetes education to enable them to manage diabetes competently, deliver diabetes education and facilitate early diagnosis of risk factors for complications.

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### Conflicts of interest

None.

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