Do primary health care nurses address cardiovascular risk in diabetes patients?

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ABSTRACT

Aims: To identify factors associated with assessment and nursing management of blood pressure, smoking and other major cardiovascular risk factors by primary health care nurses in Auckland, New Zealand.

Methods: Primary health care nurses ($n = 287$) were randomly sampled from the total ($n = 1091$) identified throughout the Auckland region and completed a self-administered questionnaire ($n = 284$) and telephone interview. Nurses provided details for 86% ($n = 265$) of all diabetes patients they consulted on a randomly selected day.

Results: The response rate for nurses was 86%. Of the patients sampled, 183 (69%) patients had their blood pressure measured, particularly if consulted by specialist (83%) and practice (77%) nurses compared with district (23%, $p = 0.0003$). After controlling for demographic variables, multivariate analyses showed patients consulted by nurses who had identified stroke as a major diabetes-related complication were more likely to have their blood pressure measured, and those consulted by district nurses less likely. Sixteen percent of patients were current smokers. Patients consulted by district nurses were more likely to smoke while, those >66 years less likely. Of those who wished to stop, only 50% were offered nicotine replacement therapy. Patients were significantly more likely to be advised on diet and physical activity if they had their blood pressure measured ($p < 0.0001$).

Conclusions: Measurement of blood pressure and advice on diet or physical activity were not related to patient's cardiovascular risk profile and management of smoking cessation was far from ideal. Education of the community-based nursing workforce is essential to ensure cardiovascular risk management becomes integrated into diabetes management.

1. Introduction

The increasing prevalence of people with type 2 diabetes in New Zealand (NZ) [1] and the associated increased risk of cardiovascular (CV) events and total mortality [2] has necessitated an integrated approach to managing people with type 2 diabetes based on their absolute CV risk [3]. Smoking cessation and achieving guideline lipid and blood pressure targets [3] are essential in reducing CV events in people with diabetes.

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Cigarette use is a well-established risk factor for CV disease [4,5] and total mortality [6,7]. People with type 2 diabetes who smoke have significantly more CV events [8], chronic kidney disease [9] and its progression [10] and other diabetes-related complications, particularly peripheral vascular disease and lower limb amputations [11]. It is recommended for all people who smoke, but especially those with diabetes, to be asked about their motivation to stop and encouraged to do so at every consultation [12].

Blood pressure targets for people with diabetes <130/80 mmHg have been recommended nationally [3] and internationally [12,13]. Hypertension has been linked with endothelial dysfunction [14], increased risk of all diabetes-related complications [15] and CV events [16]. Several trials using multiple antihypertensive agents showed risk reductions for all diabetes related end-points [15], myocardial infarction, stroke [15,17] and all-cause mortality [17], although a recent meta-analysis showed no significant improvements in CV outcomes <140/90 mmHg compared with <130/80 mmHg [18].

Low-density lipoprotein (LDL)-cholesterol is a causal risk factor for CV disease [19] and lipid lowering randomised controlled trials (RCTs) have reported reductions in major CV events in people with diabetes [20]. Further, practice-based nurse-led lifestyle RCTs have also reported improved lipid levels in those with diabetes [21].

In NZ, people with type 2 diabetes are managed within general practice or by independent primary health care (PHC) providers. Practice nurses (PNs) are mostly employed by general practitioners (GPs). PNs and are the largest of the four main PHC nursing groups involved in the care and management of people with diabetes. District nurses (DNs) are the second largest group and provide hospital outreach services to patients at home or in community clinics predominantly for wound care. The other two groups are specialist nurses (diabetes specialist nurses (DSN) and chronic care management (CCM) nurses). DSN provide specialist diabetes care and are employed by secondary care services or Primary Health Organisations that provide PHC to an enrolled population [22]. CCM nurses either work in general practice or for independent care providers and provide specialist community-based care for people with chronic care conditions [23]. Although DSN were not able to prescribe medications at the time of the study they typically advise patients on titrating glycaemic mediations and all nurses are expected to discuss medication management with patients.

GPs and PNs are expected to carry out 5-year CV risk assessments in all patients with type 2 diabetes and to actively manage CV risk factors for those at high risk [3]. All PNs are expected to play a major role in the community management of diabetes, work more independently [24], identify patients at increased risk of diabetes-related complications (including CV events), initiate lifestyle changes, and for DSN and nurse practitioners to have prescribing rights [24,25].

The aim of this paper is to report factors associated with the assessment and management of major CV risk factors for people with diabetes consulted by PHC nurses in community-based settings.

2. Subjects, materials and methods

2.1. Study population

Sampling and details of the nurses has previously been described [23]. Briefly, 35% of the total PHC nurses ($n = 1091$) in the greater Auckland region were randomly selected and of those 335 (88%) were working and invited to participate in the survey – of whom 287 (86%) agreed. Of those, 210 were PNs, 49 DNs, 19 DSN and nine CCM nurses. All participants completed a telephone interview and 284 completed and returned a postal self-administered questionnaire on biographic and workplace details from 2006 to 8. Ethics approval was obtained from the Northern Regional Committee (NTX/05/10/128).

2.2. Diabetes patients sampled

During the telephone interview information was collected on the nurses' diabetes management practices and on the number of diabetes patients nurses had consulted on a randomly selected day each nurse had worked over the past seven days. Additional anonymous demographic and health information was gathered from each patient's record and on nursing assessments and care provided during the consultation. On the randomly selected day, 58% of the 287 nurses sampled did not consult any diabetes patients, while 42% had consulted 308 diabetes patients and 41% ($n = 117$) were able to provide information on 265 (86%) of those patients. Because of the random sampling of nurses and day of the week, the patients sampled represent of all diabetes patients treated by PHC nurses at the time of the survey. During the telephone interview specific questions were asked on nursing assessments and care. For example, all nurses were asked 'during this consultation did you take the patient's blood pressure?', 'what medication has this patients been prescribed?' and 'does this patient smoke?' – if yes 'do they want to stop?'.

2.3. Statistical analysis

PROC FREQ in SAS version 5.1 (SAS Institute, Cary, NC, 2012) was used to analyse data from the nurses. PROC CROSSTAB and PROC MULTILOG in SUDAAN (version 11 Research Triangle Institute, 2012) was used to analyse patient data and correct for clustering effects by nurses who had consulted more than one diabetes patient on the randomly selected day, for calculation of relative risk (RR) and odds ratios (OR), respectively and generate adjusted Wald F P-values. The two specialist nurse groups (DSN and CCM nurses) were combined for all analyses, due to the small numbers of CCM nurses, and referred to as specialist nurses.

3. Results

3.1. Demographic and anthropological details of patients consulted

Of the 117 nurses who provided data on their patients, 78 (38%) PNs consulted 153 patients, 16 (57%) specialist nurses

consulted 65 patients and 23 DNs consulted 47 patients. Demographic details on the 265 diabetes patients sampled are described in Table 1. The majority of patients were aged over 50 years, most had type 2 diabetes and 16% smoked. Mean systolic blood pressure (SBP) was 132 mmHg, diastolic blood pressure (DBP) 77 mmHg and mean total cholesterol was 4.8 mmol/l and did not differ by nurse-group. While similar proportions of patients consulted by specialist nurses (20%) and DNs (23%) were smokers, significantly more patients consulted by DNs used tobacco compared with those consulted by PNs (11%, $p = 0.039$). Records for serum creatinine and microalbumin levels were only available for 34% and 18% of patients respectively, with levels indicating some renal dysfunction for the majority of those patients.

Table 1 – Demographic composition of diabetes patients (n = 265), consulted by PHC nurses and smoking status, blood pressure, total cholesterol, microalbumin and serum creatinine.

Variable and level	Total	
	n	%
Sex		
Male	142	54
Female	123	46
Age ($n = 263$)		
7–50 (years)	81	31
51–66	92	35
67–93	90	34
Ethnicity		
NZ European/European	108	41
Māori patients	48	18
Samoan/Tongan	64	24
Other Pacific Island patients	17	6
Asian	24	9
Other	4	2
Type of diabetes ($n = 263$)		
Type 2	244	93
Type 1	19	7
Tobacco use ($n = 264$)		
Yes	41	16
No	214	81
Not known	9	3
Biological variables	μ	(95% CI)
Blood pressure ($n = 214$)		
SBP (mmHg)	132	(129–136)
(mmHg)	77	(75–79)
Total cholesterol (mmol/L) ($n = 146$)	4.8	(4.6–5.1)
Serum creatinine (μmol/L) ($n = 89$)	73.0	(59.2–90.0)[a]
Microalbumin (mg/L) ($n = 47$)	111.1	(62.8–198.3)[a]
Variable and level	n	%
Total patients consulted and sampled	265	100
Practice nurses[b]	153	58
District/home care nurses[b]	47	18
Specialist nurses[b]	65	25

μ: mean; CI: confidence interval; SBP: systolic blood pressure; DBP: diastolic blood pressure.

[a] Geometric means -calculated from the antilog$_e$ of the μ & 95% CIs from multiplying & dividing the tolerance factor (antilog$_e$ 1.96 × se) from the mean.

[b] 78 practice, 23 district and 16 specialist nurses consulted at least one patient sampled on the randomly selected day.

3.2. Smoking

Of the 264 patients with information on smoking, 41 (16%) smoked tobacco and the status of nine patients was unknown. In univariate analyses only age was negatively associated with current smoking by patients; (relative risk (RR), 0.88; 95% confidence interval (CI), 0.50–1.53) for those 51–66 years and (RR, 0.37; 95% CI, 0.16–0.85, $p = 0.02$) for those aged 67–93 compared with patients aged <50 years. Patients consulted by DNs were more likely to smoke than those consulted by PNs but did not quite reach significance (RR, 2.31; 95% CI, 1.18–4.53, $p = 0.054$). Table 2 shows after adjusting for demographic variables (sex, age and ethnicity) and nurse-group in multivariate analyses the negative association between age and current smoking strengthened for those aged over 66 years, while patients consulted by DNs were significantly more likely to smoke compared with those consulted by PNs.

Of the 41 patients who used tobacco, eight of 30 (27%) patients who had been asked wished to stop, and of those, seven were advised on community support programmes including referral to the government supported telephone 'Quitline' counselling programme ($n = 4$), and four were advised to use nicotine replacement therapy (NRT), by more specialist nurses ($n = 3$), than PNs ($n = 1$). Significantly more patients who were current smokers were asked if they wished to stop if undergoing a special programme consultation (diabetes annual review or chronic care consult) or if aged >66 years. No demographic or other factors (such as nurse group, post-registration qualification, time at current practice, knowledge of smoking as a risk factor for complications or place of consultation) were associated with nurses asking patients if they wished to stop smoking.

3.3. Cholesterol

Of the 146 (55%) patients with recorded total cholesterol levels, 71% were above the national recommended level of <4.0 mmol/l. In the univariate analyses only being male was associated with elevated cholesterol levels compared with female (RR, 2.33; 95% CI, 1.30–4.14, $p = 0.003$). After adjusting for all demographic variables in the multivariate analyses, elevated cholesterol was positively associated with being male (OR, 3.75; 95% CI, 1.60–8.79, $p = 0.003$), while elevated SBP was inversely associated (OR, 0.46 95% CI, 0.21–0.99, $p = 0.048$) – separate data not shown.

3.4. Blood pressure

During the nurse consultations, 183 (69%) of patients had their blood pressure measured, and significantly more so if consulted by specialist nurses (83%) and PNs (77%) compared with those consulted by DNs (23%, $p = 0.0003$). An additional 31 patients had blood pressure levels recorded and reported. Of the 214 (81%) patients with recordings, 105 (49%) and 106 (50%) had a SBP > 130 mmHg and DBP > 80 mmHg, respectively. In multivariate analyses and controlling for demographic variables and nurse group, age and Maori ethnicity were associated with elevated SBP (Table 3).

Factors associated with measurement of patient's blood pressure are shown in Table 4. Age, being consulted at home,

Table 2 – Multivariate odds ratios (OR) of patients being current smokers (n = 254).			
Variable	n	OR (95% CI) Adjusting for all variables	P-value
Sex			
Female	119	1.00	0.81
Male	135	1.10 (0.50–2.40)	
Age (years)			
≤50	78	1.00	
51–66	89	0.70 (0.33–1.50)	0.36
67–93	87	0.23 (0.08–0.62)	0.004
Wald F P-value			0.01
Ethnicity			
European	109	1.00	
Māori	46	0.99 (0.37–2.69)	0.99
Pacific	74	0.96 (0.41–2.27)	0.92
Asian	25	0.37 (0.07–1.90)	0.23
Wald F P-value			0.66
Nurse group			
PN	150	1.00	
DN	41	3.53 (1.49–8.37)	0.005
SN	63	1.69 (0.75–3.78)	0.20
Wald F P-value			0.02
PN: practice nurses; DN: district nurses; SN: specialist nurses.			

Table 3 – Multivariate odds ratios (OR) of patients having elevated blood pressure (SBP > 130 mmHg), (n = 213).			
Variable	n	OR (95% CI) Adjusting for all variables	P-value
Sex			
Female	104	1.00	
Male	109	1.01 (0.58–1.76)	0.98
Age (years)			
<50	69	1.00	
51–66	77	1.51 (0.72–3.17)	0.27
67–93	67	3.56 (1.64–7.73)	0.002
Wald F P-value			0.006
Ethnicity			
European	84	1.00	
Māori	44	2.30 (1.03–5.12)	0.04
Pacific	68	1.46 (0.49–4.35)	0.50
Asian	17	0.89 (0.25–3.15)	0.86
Wald F P-value			0.13
Nurse group			
PN	126	1.00	
DN	26	1.75 (0.57–5.35)	0.32
SN	61	0.57 (0.26–1.21)	0.14
Wald F P-value			0.12
PN: practice nurses; DN: district nurses; SN: specialist nurses.			

and management by DNs were inversely associated, while Māori and Pacific Island ethnicity were positively associated, as were patients in a special programme review compared with those having usual follow-up consultations. Nurses who held or were working towards gaining post-registration qualifications, and those who identified stroke (88% compared with 64%, $p = 0.005$) as a diabetes-related complication, were more likely to measure a patient's blood pressure during the consultation. Duration of the consultation, the first patient consultation following diagnosis, nurse's time at their current practice, post-registration diabetes education, knowledge of hypertension as a risk factor and heart disease as a complication and patients prescribed antihypertensive medication were not related to measurement of blood pressure.

In multivariate analyses, and adjusting for demographic and other variables, only patients who had consulted nurses who had identified stroke as a complication of diabetes remained associated with blood pressure being measured (OR, 3.20; 95% CI, 1.16–8.86, $p = 0.03$), while DNs were less likely to measure blood pressure compared with PNs (OR, 0.10; 95% CI, 0.02–0.52, $p = 0.006$). In addition, patients who had their blood pressure measured were also more likely to receive advice on diet (OR, 6.47; 95% CI, 3.07–13.64, $p < 0.0001$) and physical activity (OR, 2.39; 95% CI, 1.22–4.68, $p = 0.01$) – separate data not shown.

3.5. Management related to cholesterol and blood pressure

Patients who had their blood pressure measured were also more likely to receive advice on diet and physical activity (Table 4) but not for patients with elevated total cholesterol (>4 mmol/L); (RR, 0.76; CI, 0.44–1.32 and RR, 0.82; CI, 0.46–1.46), respectively. Despite this, specific dietary advice aimed at reducing body weight (to reduce carbohydrate, fat and salt consumption, takeaways, portion sizes and regular meals) was given by a similar proportion of nurses regardless of

whether the patients consulted had elevated SBP or total cholesterol or not – separate data not shown. There was no difference in ACE inhibitors prescribed between patients with and without elevated SBP or statins for those with or without elevated total cholesterol. In addition, nurses planned to telephone 81 (31%) patients they had consulted, mostly to discuss follow-up visits, referrals and screening tests (54%). Of those, only 14% and 10% of PNs and specialist nurses respectively, planned to discuss management of specific risk factors or lifestyle changes.

3.6. Associations between nurse's knowledge of CV risk factors and management activities

Nurses were significantly more likely to know and report patient's elevated total- or LDL-cholesterol if they had identified the latter as a risk factor for diabetes-related complications (64% compared with 43%, $p = 0.03$), and if they had identified smoking as a risk factor they were significantly more likely to give specific advice related to patient's individual risk profile (58% compared with 21%, $p = 0.01$). In contrast, there were no significant associations between nurse's knowledge of the following risk factors or diabetes-related complications and related management: hypertension, heart or peripheral vascular disease and measuring blood pressure or promoting physical activity.

3.7. Proportion of patients prescribed CV and non-CV related medication

Table 5 outlines the proportion of patients prescribed cardiovascular-related medications which were known and recorded for 257 (97%) patients. The most commonly prescribed were statins and angiotensin-converting enzyme (ACE) inhibitors, outlined by nurse-group, and over half of

Table 4 – Univariate relative risk (RR) for patients having their blood pressure measured during the consultation (n = 265).				
Variable	N	BP measured (%)	RR (95% CI)	P-value
Sex				
Female	123	73	1.00	
Male	142	65	0.90 (0.75–1.07)	0.22
Age (years)				
≤50	81	83	1.00	
51–66	92	70	0.84 (0.70–1.01)	0.053
67–93	90	57	0.69 (0.55–0.86)	0.0003
Ethnicity				
European	111	58	1.00	
Māori	48	83	1.45 (1.14–1.84)	0.002
Pacific	80	76	1.32 (1.03–1.70)	0.03
Asian	26	69	1.20 (0.89–1.62)	0.24
SBP (mmHg)				
≤130	109	85	1.00	
>130	105	80	0.94 (0.83–1.06)	0.31
DBP (mmHg)				
≤80	108	86	1.00	
>80	106	79	0.92 (0.81–1.05)	0.19
Antihypertensive medication[a]				
No	82	57	1.00	
Yes	183	120	0.95 (0.80–1.12)	0.51
Patient weight (kg)				
≤80	55	87	1.00	
81–100	62	87	1.00 (0.88–1.14)	0.98
101–178	64	81	0.93 (0.80–1.08)	0.33
Type 2 diabetes	244	68	1.00	
Type 1 diabetes	19	79	1.16 (0.91–1.48)	0.28
Nurse group				
PN	153	77	1.00	
DN	47	23	0.30 (0.16–0.57)	0.0001
SN	65	83	1.08 (0.91–1.27)	0.38
Post-registration qualifications				
No	101	59	1.00	
Yes	162	75	1.26 (0.97–1.64)	0.071
Knowledge of stroke as a complication				
No	209	64	1.00	
Yes	56	88	1.36 (1.14–1.63)	0.005
Private room	203	77	1.00	
Home	40	30	0.39 (0.24–0.64)	0.0001
No room – (cubicle/other)	21	71	0.93 (0.63–1.36)	0.68
Type of consultation				
Follow-up	181	59	1.00	
Get Checked/careplus	52	100	1.71 (1.44–2.02)	<0.0001
Other	32	78	1.33 (1.02–1.74)	0.055
Dietary advice				
No	80	40	1.00	
Yes	185	82	2.04 (1.49–2.80)	<0.0001
Activity advice				
No	90	48	1.00	
Yes	175	80	1.67 (1.31–2.14)	<0.0001

SBP: systolic blood pressure; DBP: diastolic blood pressure; kg: kilograms; PN: practice nurses; DN: district nurses; SN: specialist nurses.
[a] Patients prescribed at least one of the following drugs: ACE inhibitor, Beta blocker, Calcium channel blocker or a thiazide diuretic.

patients were prescribed other non-cardiovascular medications – primarily for pain, arthritis (including gout) and depression (Table 5).

4. Discussion

This is the first report identifying factors associated with people with diabetes having their blood pressure measured and receiving advice on smoking cessation by PHC nurses.

Māori and Pacific patients and those consulted by nurses who had identified stroke as a major complication of diabetes were more likely to have their blood pressure measured, while those consulted by DNs were less likely. Reflecting the latter group's focus on wound management and the difficulty in carrying extra equipment into people's homes. Nurses were more likely to ask patients who smoked if they wished to stop, if they were attending special programme consultations.

Nurses could only access total cholesterol levels and blood pressure recordings for 55% and 81% of patients consulted,

Variable and level	n	%	Type of nurse						
			Practice nurses		District nurses		Specialist nurses		P-value
			n	(%)	n	(%)	n	(%)	
Total sample of patients			153		47		65		265
CV risk management medications									
Statin ($n = 251$)	159	63	95	(65)	21	(53)	43	(66)	0.34
ACE inhibitor ($n = 252$)	146	58	79	(54)	26	(63)	41	(63)	0.50
Aspirin ($n = 253$)	130	51	69	(47)	22	(52)	39	(60)	0.34
Beta blocker ($n = 251$)	69	27	44	(30)	11	(28)	14	(22)	0.34
Diuretic/furosemide ($n = 252$)	55	22	30	(20)	14	(35)	11	(17)	0.13
Calcium channel blockers ($n = 254$)	43	17	27	(18)	7	(15)	9	(14)	0.72
Warfarin ($n = 251$)	16	6	7	(5)	6	(15)	3	(5)	0.07[a]
Digoxin ($n = 251$)	10	4	8	(5)	1	(3)	1	(2)	0.54[a]
Other-mostly for angina ($n = 254$)	11	4	8	(5)	2	(5)	1	(2)	0.47[a]
Non-diabetes nor CV medication									
Other ($n = 257$)	133	52	71	(48)	31	(67)	31	(48)	0.13

Table 5 – Proportion of diabetes patients prescribed cardiovascular-related medication ($n = 265$), by nurse group.

CV: cardiovascular; ACE: angiotensin-converting enzyme.
P-value showing significance of variation in percentages in subgroups, from the chi-square value and either
[a] Fisher or Pearson exact tests used with small cell numbers.

respectively. Of those, 71% and 49% had total cholesterol and SBP above the recommended levels [3] and were no more likely to receive advice on diet or physical activity by the consulting nurse compared with patients with levels below that recommended. Knowledge of stroke as a complication of diabetes was probably a marker for more in-depth diabetes knowledge and extensive clinical experience as only 14% of nurses reported this knowledge, although significantly more DSN (36%) did so compared with PNs (13%) and DNs (8%) [26]. The proportion of patients prescribed a statin was similar to that reported in the large audit of patients with diabetes in West and South Auckland 66% in 2006 [27] and internationally proportions ranged from 61% to 74% [28–30].

Tobacco smoking was less common among patients sampled (16%) compared with the 18% of adult New Zealanders who currently smoke [31] and was similar for Pacific patients (18%), and European patients (13%) but far fewer for Māori patients (35%), compared with those in an audit of 5917 diabetes patients enrolled in general practices in West and South Auckland [27]. The discrepancy in the proportion of Māori patients who were current smokers in this study compared to those in the audit study in West and South Auckland maybe explained by fewer patients smoking in the higher socio-economic central Auckland area. In the current study, no Māori patients from the central Auckland area were current smokers, while 15% and 30% from the Waitemata (North and West Auckland) and Counties-Manukau (South Auckland) DHBs respectively, were current smokers.

Further, twice the proportion of sampled patients were smokers compared with diabetes patients exiting large international intensive glucose control trials [32–34]. In addition, both the ACCORD and ADVANCE trials reported reductions in smoking prevalence during the trial periods of around 4% over 3.5 years [32] and 6% over 5 years, respectively [33].

Of concern, only 50% of patients who wished to stop smoking were advised on NRT – the use of which approximately doubles

smoking cessation rates and decreases unpleasant withdrawal symptoms [35]. GPs and PHC nurses are in an ideal position to target diabetes patients who smoke. Despite several smoking cessation initiatives implemented in primary care settings in NZ, a recent update showed that the proportion of patients receiving advice to quit smoking (28–62%) remained well below the national 90% target set for 2012 [36]. Further, attempts to quit smoking in NZ compare poorly with international trends, with less than 60% of current smokers attempting to quit in one year, compared with over 80% in other developed countries [37]. The proportion of patients in primary care given advice to quit smoking by their GP and other healthcare providers was also lower compared with those in Australia [37], as is the proportion using NRT (particularly in males and Pacific and Māori populations) [38], despite it being heavily subsidised [37].

A more effective PHC systems approach and management is required to reduce the proportion of patients with major CV risk factors and substantially increase the number of smoking cessation attempts by patients. PHC nurses need to be able to prescribe NRT and ensure patients have easy access to prescriptions for essential pharmaceutical therapy to assist those who wish to stop smoking.

Nurses planned to telephone about a third of patients consulted mainly for follow-up appointments, rather than for health promotion or goal setting on reducing CV risk factors; despite the latter being highly recommended [3] and shown in those with diabetes to increase smoking cessation rates [39], adherence to a non-atherogenic diet and physical activity [40] and promote healthy lifestyle behaviours [41,42].

Type 2 diabetes should be contextualised as a CV disease and nursing management should shift from the current glucocentric approach to managing CV risk factors – smoking cessation (including registering as Quit Card providers), diet (with specific recommendations based on the national guidelines and related to patient's risk profile) and physical activity. Findings from the glucose intensive type 2 diabetes trials show a lack of benefit in lowering HbA1c levels on CV outcomes [43]

(with the exception of metformin in overweight patients) [44] and one trial found an increased mortality rate [32]. The lack of improvements in CV outcomes from the intensive glucose trials and in contrast the reduction in CV events reported from the blood pressure [15,16] and LDL-cholesterol lowering trials [20]; in those with type 2 diabetes and CV disease, and the large cohort studies reporting increased CV events [4,5] and total mortality [6,7]; in those who use tobacco has led to broadening the management of those with type 2 diabetes to include improving CV risk factors and smoking cessation. In the current survey, nurses weighed 58% of patients and gave advice on diet and physical activity to 70% and 66% of patients, respectively [45]. Despite this, only 20% of those nurses gave advice related to each patient's risk profile and only 12% advised patients to reduce body weight despite a mean body weight of 92 kg [45]. Lifestyle changes, that include weight loss in conjunction with a cardioprotective diet [46] have been shown to reduce both systolic and diastolic blood pressures [47]. The inclusion of the mnemonic 'ABC' (A1c, blood pressure and cholesterol), promoted in North America [48], and adapted to include smoking and physical activity in health promotion may assist PHC nurses when educating patients in their management of diabetes.

Study limitations include a lack of available data on total cholesterol, serum creatinine and microalbumin, and smoking status for patients consulted by DNs. Further, we cannot conclude that patients' blood pressures were not measured by physicians on the day of the PN or SN consultations and smoking status may have been known to physicians managing patients consulted by DNs. During the survey period, the PREDICT programme for calculating patients CV risk by PNs and GPs, based on the Framingham CV risk scores, was introduced into several general practices in Auckland and was expected to increase nursing management and assessment CV risk factors [49]. However, there is limited evidence about the use of these databases and programmes by PNs, although one report showed PNs completed 8% of patients CV risk assessments using PREDICT [49] and another reported a fourfold increase in its use after software installation and related education [50]. Despite the study limitations, this is a representative and large comprehensive cross-sectional survey of PHC nurses and the diabetes patients they consult with, in the largest city in NZ. It is the first study to document predictors for measuring blood pressure and management of tobacco use by nurses working in community settings.

In conclusion, patients were more likely to have their blood pressure measured by nurses who identified stroke as a diabetes-related complication and if patients were of Maori or Pacific Island ethnicity. Only special programme consultations were associated with nurses asking patients who smoked if they wished to stop. A large proportion of patients had modifiable CV risk factors (elevated blood pressure and total cholesterol) and twice the proportion smoked compared with those exiting large international type 2 diabetes intensive glucose trials. The main findings highlight the need for improved management of CV risk factors, particularly smoking to ensure PHC nurses play a major role in improving patient outcomes. Continuation of funding for post-graduate education and development of the PHC nursing workforce is

important to ensure CV risk factor management becomes an integral part of diabetes management.

Conflict of interest

The authors declare that they have no conflict of interest.

Acknowledgements

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