Original Article

An Internal Audit of Diabetes Care for Type 2 Diabetic Patients in a Public Hospital Diabetes Clinic in Malaysia

Yung Chun Hieng

Department of Medicine, Sibu Hospital, Batu 5 ½, Jalan Oya Lama, Sibu, Sarawak, Malaysia

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Abstract

Introduction: **Earlier studies have identified a gap between guidelines and actual clinical diabetes care in Malaysia.**

Objective: **We audited the quality of care for patients with type 2 diabetes mellitus (T2DM) attending our diabetes clinic at a public hospital.**

Methods: **A structured review of the outpatient clinic cards, prescriptions and laboratory results was conducted for patients attending the diabetes clinic at Sibu Hospital in October and November 2014.**

Results: **For the total of 233 patients who were audited, the levels of fasting blood sugar, blood pressure, body mass index and fasting lipid profile were satisfactory at 99.1%, 99.6%, 92.6% and 99.6% respectively. 79.7% of the subjects had had HbA1c performed at least once over the previous six months. Only 25.8% had annual foot screening, while the eye screening rate was 71.2% and the albuminuria screening rate was 93.6%. For outcome measures, the mean (SD) HbA1c level was 9.2% (1.91%), with 13 patients (6.7%) having HbA1c less than 6.5%; 36.4% of participants achieved BP < 130/80 mmHg; and 69.4% had LDL < 2.6 mmol/L. The majority of the patients were overweight or obese (91.4%).**

Conclusions: **Overall, the performance of diabetic care processes at our hospital was satisfactory, except for foot examination. The glycaemic and weight control among the subjects were suboptimal and warrant an optimised and comprehensive approach on the part of the management.**

Keywords: *audit, quality of care, type 2 diabetes mellitus, diabetes clinic, public hospital*

Introduction

Type 2 diabetes mellitus (T2DM) is a growing epidemic worldwide, especially in developing countries (1). In Malaysia, the prevalence of diabetes has increased over the last three decades, and this rate is accelerating. In the fifth and latest National Health and Morbidity Survey (NHMS), conducted in 2015, the prevalence of diabetes in adults aged over 18 had increased by 17.5%, compared to 11.6% in 2006 and 15.2% in 2011 (2). The microvascular and macrovascular complications of diabetes have led to increased mortality and significant healthcare costs to both patients and the community. Therefore, a comprehensive and systematic care package for diabetes patients is needed, to target not only the glycaemic control but also the cardiovascular risk factors, to ameliorate the long-term complications.

There is currently a large evidence base to underpin the optimal management of diabetes. In previous worldwide audits of diabetes care, a wide variation in quality has been observed, both in terms of care process performance and target achievement (3, 4). While the factors contributing to this variation are complex, Lee et al. (4) demonstrated that socio-economic circumstances play a significant part, meaning that European systems tend to display better performance than those in the rest of the world. In Malaysia, previous local studies conducted

at both tertiary and primary care levels have highlighted the inadequacy of both glycaemic control and the management of the associated cardiovascular risk factors (5–9). Accordingly, we conducted a clinical audit to assess the quality of care for T2DM patients who were followed up in our Diabetes Clinic.

Methods and Materials

Setting

The audit was conducted in the diabetes clinic in Sibu Hospital, a district hospital with major specialists. The hospital's Research Review Committee accepted this research work as a hospital-based internal audit, due to the use of depersonalised clinical data and achievements. This 630-bed public hospital not only services a direct population of 278,300 from Sibu, but is also a referral centre for the central zone of Sarawak, including Sarikei, Mukah and Kapit divisions, which have an additional combined population of up to 421,000. The diabetes clinic runs once a week every Wednesday afternoon and receives referrals of difficult diabetes cases, providing treatment and follow-up for diabetes and associated medical illnesses. In 2014, the clinic registered about 550 patients, who attended every three to four months on average. Each clinic was run by four resident medical officers and one general physician. There are two diabetic educators providing a counselling service to an average of five to six patients every session, as well as two pharmacists offering medication counselling for up to six patients per session. For individuals who require dietary counselling, a dietitian referral is made and a separate appointment provided. There is no podiatrist at Sibu Hospital.

Study population

The audit was done in October and November 2014. All patients attending the diabetic clinic during this period were screened.

Inclusion and exclusion criteria

The subjects included in the audit were 18 years old and above, had been diagnosed with T2DM more than one year previously, and had been followed up at the medical or diabetic clinics at Sibu Hospital for at least 12 months. Type 1 diabetes, gestational diabetes and diabetes that was secondary to other causes were excluded from this audit.

Data collection

A structured review of the outpatient clinic cards, prescriptions and laboratory results was undertaken during each patient's clinic visit.

The process measures of clinical care were defined as measurements having been done for fasting blood glucose (FBG), blood pressure (BP) and calculation of body mass index (BMI) at every visit over the previous year; glycosylated haemoglobin (HbA1c) levels had to have been assessed at least once over the previous six months, and patients should have had screening of lipid profile, fundoscopic and foot examinations, and urine protein or microalbuminuria done annually.

Data collected on intermediate outcome measures included the most recent HbA1c, FBG, BP and low-density lipoprotein cholesterol (LDL-C) levels, and BMI over the past year; the number of patients receiving statin, aspirin, angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin receptor blocker (ARB). The clinical outcome of diabetes care was defined as good control if the documented values were FBG < 6.1 mmol/L, HbA1c < 6.5%, LDL-C < 2.6 mmol/L, BP < 130/80 mmHg and BMI < 23 kg/m^2.

The selection of variables was based on the recommendation of the Malaysian Clinical Practice Guideline of Management of Type 2 Diabetes Mellitus, 4th Edition, 2009.

Data analysis

Statistical analysis was performed using SPSS version 16.0 (SPSS, Chicago, IL, USA). All data represented the most recent results available within the preceding 12 months. Descriptive data were expressed as mean value (with standard deviation) unless otherwise specified. As this was a clinical audit of diabetes care, ethical approval was considered not to be necessary.

Results

Of the total 275 patients who attended the diabetic clinic during the study period, 42 were excluded (26 patients were T1DM, 11 had been followed up for less than 12 months, while five had been newly diagnosed with diabetes for less than 12 months), leaving 233 patients for the statistical analysis. Their demographic and clinical characteristics are presented in Table 1. Mean age (SD) of the patients was 56 (11.7) years old; mean duration of diabetes was 12.6 years,

with almost half of the participants having been sufferers for more than 10 years. The majority of our patients were Chinese (55.3%), followed by Sarawak Natives (33.9%), Malay (9.9%) and other races (0.9%).

The process measures of diabetes care are summarised in Table 2, while Table 3 shows the achievement for the intermediate outcome measures.

Glycaemic control

The prevalence of the recording of fasting blood sugar (FBS) during every clinic visit was 99.1%, while the rate of HbA1c being recorded at least once over the preceding six months was 79.7%. Among the 195 patients who had had HbA1c done, the mean (SD) HbA1c level was 9.2% (1.91%), with 13 (6.7%) having HbA1c of less than 6.5% and 22 (11.3%) having HbA1c of

Table 1. Demographic and clinical characteristics of patients (N = 233)

Variables	Frequency (%)	Mean (SD)
Age		55.9 (11.69)
Sex		
Male	102 (43.8)	
Female	131 (56.2)	
Race		
Malay	23 (9.9)	
Chinese	129 (55.3)	
Sarawak Natives	79 (33.9)	
Others	2 (0.9)	
Smoking status		
Current smoker	19 (8.2)	
Ex-smoker	31 (13.3)	
Never smoked	176 (75.5)	
Not documented	7 (3)	
Duration of diabetes		12.6 (7.33)
1–5 years	36 (15.5)	
6–10 years	79 (33.9)	
> 10 years	114 (48.9)	
Missing	4 (1.7)	
Treatment received		
Treatment for diabetes		
Lifestyle modifications alone	1 (0.4)*	
Oral Monotherapy	7 (3.0)	
Oral Therapy Combination	37 (15.9)	
Insulin ± OHA	188 (80.7)	
Antihypertensive Medications		
Nil	17 (7.3)	
Single Agent	38 (16.3)	
2 agents	62 (26.6)	
≥ 3 agents	116 (49.8)	

* This patient is ESRD on HD has recently stopped insulin

Table 2. Indicators of process measures

Indicators	Frequency (%)
Fasting blood sugar recorded at every visit	231/233 (99.1)
Blood pressure recorded at every visit	230/231 (99.6)
Body mass index recorded at every visit	213/230 (92.6)
HbA1c recorded at least once over last 6 months	185/232 (79.7)
Fasting lipid profile recorded at least once over last 12 months	232/233 (99.6)
Annual complication screening	
Eye	166/233 (71.2)
Foot	60/233 (25.8)
Albuminuria	218/233 (93.6)
Urine Microalbumin done if no overt proteinuria	29/145 (20.0)
Prescription rate	
Antiplatelet	131/233 (56.2)
Statin	206/233 (88.4)
ACE-I/ARB	177/233 (76.0)
Baseline ECG documentation	136/233 (58.4)

Table 3. Achievement for intermediate outcome measures

Variables	Frequency (%)	Mean (SD)
HbA1c (N = 195)		
Mean SD,%		9.2 (1.91)
< 6.5%	13 (6.7)	
6.6%–7%	9 (4.6)	
7.1%–8%	37 (19.0)	
8.1%–9%	41 (21.0)	
> 9%	95 (48.7)	
Fasting Blood Sugar (N = 232)		
Median ± IQR, mmol/L		9.4 (4.07)
≤ 6.1 mmol/L	54 (23.3)	
> 6.1 mmol/L	178 (76.7)	
Blood Pressure (N = 231)		
Systolic BP Mean ± SD, mmHg		137 (21.0)
Diastolic BP Mean ± SD, mmHg		71 (12.4)
≤ 130/80 mmHg	84 (36.4)	
131–140/81–90 mmHg	40 (17.3)	
141–160/91–100 mmHg	77 (33.3)	
> 160/100 mmHg	30 (13.0)	
Low -density lipoprotein cholesterol (N = 219)		
Mean ± SD, mmol/L		2.4 (0.93)
≤ 2.6 mmol/L	152 (69.4)	
> 2.6 mmol/L	67 (30.6)	
Body mass index (N = 222)		
Mean ± SD, kg/m^2		28.5 (4.63)
18.5–22.99 kg/m^2	19 (8.6)	
23–27.49 kg/m^2	87 (39.2)	
> 27.5kg/m^2	116 (52.2)	

less than 7%. The mean FBG was 9.4 mmol/L, with only 23.3% having achieved FBS of no more than 6.1 mmol/L. Most (80.7%) of the patients received insulin therapy (with or without oral hypoglycaemic agents), while only 3% had oral monotherapy and 15.9% had oral combination therapy without insulin.

Blood pressure

Almost all patients (99.6%) had their BP recorded at every clinic visit. Mean systolic BP was 137 mmHg, while mean diastolic BP was 71 mmHg. Only about one-third (36.4%) of the patients had achieved a BP target of no more than 130/80 mmHg, despite most receiving multiple oral anti-hypertensives. Approximately 50% of the participants had received three or more oral anti-hypertensive agents, whereas those on two agents, single agents or not on anti-hypertensives were 26.6%, 16.3% and 7.3% respectively.

Lipid management

The rate of annual testing for fasting lipid profile was 99.6% among the patients, while 88.4% had received statin treatment. Mean LDL level was 2.4 mol/L, with nearly 70% having achieved a target level of no more than 2.6 mmol/L.

Body mass index

92.6% of the patients had their BMI recorded during every visit. The mean (SD) BMI was 28.5 (4.63) kg/m^2. Out of 222 patients who had BMI recorded, more than 90% were overweight with BMI of more than 23, while only 19 (8.6%) had BMI of less than 23. In addition, 67.4% (157/233) of the patients in this audit were on metformin therapy. Interestingly, the BMI was not significantly different between those who received metformin and those who did not (BMI 28.1 (4.80) kg/m^2 for those on metformin versus 28.7 (4.56) kg/m^2 for those not; result not shown). Besides metformin, the use of other relatively weighty neutral anti-diabetes measures was minimal, as only one respondent was on subcutaneous enaxetide while five were on Dipeptidyl peptidase-4 inhibitor (DPPIV-i).

Complication screening

The screening rate for albuminuria by urine dipstick was as high as 93.6%. However, out of 145 patients with negative or trace urine albumin, only 29 (20%) were tested further for urine microalbumin. 71% of patients had had eye screening during the previous year, while only 25.8% had received a foot examination. Nearly 60% of the participants had had baseline ECG documentation.

Discussion

The National Diabetes Registry (NDR) Report Volume 1 (2009–2012) (10), which evaluated diabetes care in Malaysian governmental primary healthcare clinics run by the Ministry of Health, reported a goal attainment rate of 23.8% for HbA1c < 6.5%, 40.9% for BP < 130/80 mmHg and 37.8% for LDL of < 2.6 mmol/L in 2012. This HbA1c achievement was better than what was found in our audit, which could be explained by the variance in study population characteristics. Our diabetes clinic is designed to receive referrals for patients with poor or challenged sugar control, while patients with good sugar control would be discharged to the polyclinic for further treatment. In addition, our patients are mostly longstanding diabetics, with a mean duration of the disease of 12.6 (7.33) years, and 48.9% had had it for more than 10 years. In contrast, the mean duration of diabetes in the NDR (2012) was six years, with 48.5% of patients having been sufferers for less than five years. Early-stage diabetes is, in relative terms, less challenging in terms of sugar and BP control. This is further illustrated by the insulin usage of only 21.4% in the NDR (2012), as compared to 80.7% in our audit. The BP control < 130/80 mmHg was comparable (40.6% in the NDR (2012) versus 36.4% in our audit), while our LDL < 2.6 mmol/L achievement was better (37.8% in the NDR (2012) versus 69.4% in our audit). Poor LDL achievement in the NDR (2012) was likely due to limited higher potency statin at the primary care setting. Additionally, more patients in our audit (88.4%) were receiving statin therapy as opposed to 62.3% in the NDR (2012).

Compared to other hospitals, our HbA1c goal attainment was again unsatisfactory, but blood pressure and lipid control were better. In the Diabcare-Asia project of 2003 (Malaysia), in which similar diabetes clinics were studied in 19 public hospitals across Peninsular Malaysia, HbA1c < 7% rate was significantly higher at 41%, but only 15% achieved BP < 130/80 mmHg and 32% achieved total cholesterol < 4.8 mmol/L (11). In another study of 2005 conducted in a general medical clinic at a local nearby tertiary centre in Sarawak, the HbA1c < 7% rate was 26%, BP < 130/80 mmHg rate was 32% and LDL < 2.6 mmol/L rate was 56% (12).

This audit clearly highlights the suboptimal weight management and glycaemic control among our patients. The high rate of overweight individuals (> 90%) could be partly attributed to the high insulin usage among our participants, which causes further weight gain. In this study, the metformin effect of weight loss was not seen; this could have been confounded by said high insulin usage. However, early deployment of other weight-neutral or weight-losing anti-diabetes medications, such as DPPIV-I and GLP agonist, in overweight patients may help to improve weight management (13). Unfortunately, this would translate into a higher cost of treatment. Lifestyle modifications, such as diet control and physical exercise, are the cornerstone of weight management; however these are heavily dependent on patients. Proactive referral to dietitians and diabetic educators could be helpful in encouraging a healthy lifestyle among diabetes sufferers.

Poor glycaemic control among our patients is partly due to a lack of home blood glucose monitoring (HBGM), which prohibits the effective titration of insulin therapy. From the author's observations, only 10%–20% of our participants were performing HBGM. While our healthcare system provides free insulin, the glucometer and the glucose test stripe are at the patient's own cost. Many cannot afford to undertake close sugar monitoring due to the high cost of the glucose test stripe; therefore, there is an urgent need to create an assistance program for HBGM. With shorter follow-up intervals of two to four weeks and faster and more effective titration of the insulin regime, the glycaemic control could be improved. Besides, modern insulin analogues that are premixed, such as Novormix or Humalog mix, should be considered for those diabetes patients with poor sugar control from human insulin, as they have been shown to provide better glycaemic control (14).

In this audit, almost all patients had FBS, BP and BMI documented during every clinic visit and fasting lipid profile blood testing annually. These findings are comparable with other local audits (15–17). The six-monthly HbA1c testing dropped to 76.7%, which is also comparable with other local audits (17), and is most likely due to the higher cost of processing the test. The statin and ACE-i/ARB prescription rates were relatively high (statin 88.4%, ACE-i/ARB 76%), but the anti-platelet prescription rate was only 56.2%. The relatively low anti-platelet prescription rate may be due to physicians' inertia over performing cardiovascular risk estimation as a result of the complexity of the scoring system.

Among the complications screenings, only nephropathy screening was relatively satisfactory, with 93.6% of patients having a urine dipstick performed at least yearly, while 71.2% had an annual eye screening and only 25.8% had their feet checked each year. The nephropathy screening could be further refined by improving the microalbuminuria detection rate, since only 20% of patients with negative proteinuria had microalbuminuria tested in this audit. The low foot examination rate is most likely due the time-consuming nature of these assessments for a busy diabetes clinic, which is possibly exacerbated by the lack of a podiatrist at our centre. However, shifting the responsibility for these exams to diabetic educators could improve diabetes patients' foot care and allow more time for physicians to concentrate on other aspects of patient care.

The accuracy of our audit is limited by the possibility of undocumented clinical variables, as this is a retrospective data collection. Second, patient knowledge, attitudes, practice and HBGM were not assessed in this audit. Similarly, different physicians' knowledge and perceptions, which may contribute to their level of care for patients, were not assessed in this study.

Conclusion

This audit highlighted the challenges inherent in the optimisation of diabetes care at our centre, especially as regards weight management and glycaemic control in chronic and longstanding diabetes.

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Correspondence

Dr Yung Chun Hieng
MBBS (University of Malaya), MRCP (UK)
Medical Physician
Department of Medicine, Sibu Hospital,
Batu 5 ½, Jalan Oya Lama,
Sibu, Sarawak, Malaysia
Tel: +6019 486 6232
Fax: +6084 337 354
E-mail: chunhieng@hotmail.com

References

1. International Diabetes Federation IDF Diabetes Atlas. *International diabetes federation*. 7th. ed. 2015 [cited 2016 Sep 26]. Available from: http://www.diabetesatlas.org/

2. Institute for Public Health (IPH). *National health and morbidity survey 2015, Volume II: non-communicable diseases, risk factors and other health problems*. Institut Kesihatan Umum, Kementerian Kesihatan Malaysia; 2015.

3. Stone MA, Charpentier G, Doggen K, Kuss O, Lindblad U, Kellner C, et al. Quality of care of people with type 2 diabetes in eight European countries: findings from the guideline adherence to enhance care (GUIDANCE) study. *Diabetes Care*. 2013;**36(9)**:2628–2638. https://doi.org/10.2337/dc12-1759

4. Lee JD, Saravanan P, Varadhan L, Morrissey JR, Patel V. Quality of diabetes care worldwide and feasibility of implementation of the Alphabet Strategy: GAIA project (Global Alphabet Strategy Implementation Audit). *BMC Health Services Research*. 2014;**14**:467. https://doi.org/10.1186/1472-6963-14-467

5. Eid M, Mafauzy M, Faridah AR. Glycaemic control of type 2 diabetic patients on follow up at Hospital Universiti Sains Malaysia. *Mal J Med Sci*. 2003;**10(2)**:40–49.

6. Chew BH, Chia YC, Khoo EM. The control of type 2 diabetes and its complications in a primary care centre in Malaysia. *Ann Acad Med Singapore*. 2008;**37(Suppl 5)**:S11.

7. Eid M, Mafauzy M, Faridah AR. Non-achievement of clinical targets in patients with type 2 diabetes mellitus. *Med J Malaysia*. 2004;**59(2)**:177–184.

8. Lee TW, Chan SC, Chua WT, Harbinder K, Khoo YL, Ow Yeang YL, et al. Audit of diabetes mellitus in general practice. *Med J Malaysia*. 2004;**59(3)**:317–321.

9. Mafauzy M. Diabetes control and complications in private primary healthcare in Malaysia. *Med J Malaysia*. 2005;**60(2)**: 212–217.

10. Feisul MI, Azmi S, editors. 2013. *National diabetes registry report, Volume 1, 2009–2012*. Kuala Lumpur; Ministry of Health Malaysia; 2013 Jul.

11. Mafauzy M. Diabetes control and complications in public hospitals in Malaysia. *Med J Malaysia*. 2006;**61(4)**:477–483.

12. Tan F, Chan G, Wong JS, Rozario F. Standard of care for type 2 diabetic patients in a public hospital medical clinic: Report of a self-audit. *Med J Malaysia*. 2008;**63**:224–228.

13. Vilsboll T, Christensen M, Junker AE, Knop FK, Gluud LL. Effects of glucagon-like peptide-1 receptor agonists on weight loss: systematic review and meta-analyses of randomised controlled trials. *BMJ*. 2012;**344**:1–11. http://dx.doi.org/10.1136/bmj.d7771

14. Shah S, Benroubi M, Borzi V, et al. Safety and effectiveness of biphasic insulin aspart 30/70 (NovoMix 30) when switching from human premix insulin in patients with type 2 diabetes: subgroup analysis from the 6-month IMPROVE observational study. *Int J Clin Pract*. 2009;**63**:574–582. http://dx.doi.org/10.1111/j.1742-1241.2009.02012.x

15. Sazlina SG, Zaiton A, Ong I. A clinical audit on diabetes care in two urban public primary care clinics in Malaysia. *Malaysian Journal of Medicine and Health Sciences*. 2010;**6(1)**:101–109.

16. Suwattee P, Lynch JC, Pendergrass ML. Quality of care for diabetic patients in a large urban public hospital. *Diabetes Care*. 2003;**26(3)**:563–568. http://dx.doi.org/10.2337/diacare.26.3.563

17. Tan F, Liew Shan F, Chan G, Toh V, Wong See Y. Improving diabetes care in a public hospital medical clinic: report of a completed audit cycle. *Journal of Evaluation in Clinical Practice*. 2011;**17**:40–44. http://dx.doi.org/10.1111/j.1365-2753.2010.01367.x

18. Ministry of Health Malaysia. Clinical practice guidelines for the management of type 2 diabetes mellitus. 4th ed. 2009 (cited 2016 May 4). Available from: www.moh.gov.my/attachments/3878.pdf