Monitoring of International Diabetes Federation-recommended Clinical Diabetes Indicators in a Public Health Centre in Southwest Trinidad

AS Dhanoo[1, 2], BN Cockburn[2], N Shah[3], R Superville[1], F Hill-Briggs[1, 3]

ABSTRACT

Objectives: *To examine availability of International Diabetes Federation (IDF)-recommended diabetes indicators in the medical charts of patients in active care at a public health centre in southwest Trinidad and Tobago, and to determine clinical status of the patient population according to Caribbean Health Research Council/Pan American Health Organization (CHRC/PAHO) guidelines for disease control.*

Methods: *Data were extracted from the medical records of consecutive patients with diagnosed diabetes who presented for routine care at the health centre over a seven-month period. The three most recent dates and results for the following clinical indicators were extracted: glycated haemoglobin (HbA_{1c}), blood pressure, lipid panel, random blood sugar and weight.*

Results: *Data were extracted from 486 patient medical records (91% of patients who presented for care). The majority of records, 366 (76%), had one of three recommended IDF indicators of HbA_{1c}, blood pressure or low-density lipoprotein (LDL) in the past year, 58 (12%) had two, 55 (11%) had three and seven (1%) had no indicators recorded. Random blood sugar and blood pressure were recorded in 93% of records, while only 20% had an HbA_{1c} reported in the past year. The vast majority of patients did not meet guidelines for control of blood sugar, blood pressure or cholesterol. Due to a non-standardized HbA_{1c} assay, rate of controlled HbA_{1c}, based on CHRC/PAHO clinical guidelines, could not be determined.*

Conclusions: *Although availability of indicators suggests an increase from prior audits reported in the literature, current reporting patterns challenge optimal patient management and future systematic evaluation of trends in diabetes care and outcomes.*

Keywords: Clinical indicators, diabetes, disease control, health system, medical record

Monitoreo de Indicadores Clínicos de Diabetes Recomendados por la Federación Internacional de Diabetes en un Centro de Salud Pública del Sudoeste de Trinidad

AS Dhanoo[1, 2], BN Cockburn[2], N Shah[3], R Superville[1], F Hill-Briggs[1, 3]

RESUMEN

Objetivos: *Examinar la disponibilidad de indicadores de diabetes recomendados por la Federación Internacional de Diabetes (FID), en las historias clínicas de pacientes bajo cuidado activo en un centro de salud pública del suroeste de Trinidad y Tobago, a fin de determinar el estado clínico de la población de pacientes, según las normas para el control de enfermedades, establecidas por el Consejo del Caribe para Investigaciones de la Salud y la Organización Panamericana de la Salud (CCIS/OPS).*

Métodos: *Se extrajeron datos de las historias clínicas de pacientes consecutivos diagnosticados con diabetes, que acudían a recibir cuidados de rutina en el centro de salud, durante un período de siete meses. Se tomaron las tres fechas más recientes y los resultados de los siguientes indicadores clínicos: hemoglobina glucosilada (HbA_{1c}), presión sanguínea, panel de lípidos, glucemia aleatoria, y peso.*

Resultados: *Se tomaron datos de las historias clínicas de 486 pacientes (91% de los pacientes que se presentaron para recibir atención médica). La mayoría de las historias, 366 (76%), tenían uno de los tres indicadores recomendados por la FID: HbA_{1c}, hipertensión arterial o lipoproteína de baja*

From: [1]Diabetes Research Programme, Trinidad and Tobago Health Sciences Initiative, [2]Department of Life Sciences, The University of the West Indies, St Augustine, Trinidad and Tobago and [3]Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA.

Correspondence: Dr F Hill-Briggs, Welch Center for Prevention, Epidemiology and Clinical Research, Johns Hopkins Medical Institutions, 2024 E Monument Street, Suite 2-518, Baltimore, MD 21287, USA. E-mail: fbriggs3@jhmi.edu

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densidad (LDL); el año pasado, 58 (12%) tenían dos, 55 (11%) tenían tres, y siete (1%) no habían registrado ningún indicador. Glucemia aleatoria y presión arterial fueron registradas en el 93% de las historias, mientras que sólo el 20% tuvo un reporte de HbA_{1c} el año pasado. La inmensa mayoría de los pacientes no cumplía con las normas de control de azúcar en la sangre, la presión arterial o el colesterol. Debido a un ensayo de HbA_{1c} no estandarizado, no se pudo determinar la tasa de HbA_{1c} sobre la base de las normas de CHRC/OPS.

Conclusiones: *Aunque la disponibilidad de indicadores sugiere un aumento en relación con las auditorías previas reportadas en la literatura, los actuales patrones de reportes apuntan a la necesidad de un tratamiento óptimo del paciente y una futura evaluación sistemática de las tendencias en el cuidado y resultados de la diabetes.*

Palabras claves: Indicadores clínicos, diabetes, control de enfermedades, sistema de salud, historia médica

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INTRODUCTION

The increasing global burden of diabetes is acutely reflected in Trinidad and Tobago (T&T), which is ranked as one of the highest in diabetes burden in the world with a national prevalence of diabetes estimated to be 12.52% (1), with premature mortality and excess disability from complications (2). The Trinidad and Tobago Health Sciences Initiative (TTHSI), a partnership between the government of Trinidad and Tobago and Johns Hopkins Medicine International, established the Diabetes Outreach Programme to improve diabetes prevention and healthcare delivery (3).

One health system barrier to optimal healthcare delivery in T&T may be lack of availability of comprehensive laboratory reports (3). Laboratory testing is important for optimizing diabetes control and minimizing complications, but the effectiveness of the testing becomes increasingly limited if it is not accurate (4), standardized (5), accessible (6) and most notably, timely (7). The International Diabetes Federation (IDF) guidelines recommend that blood sugar, lipids, blood pressure, body mass index (BMI) and particularly glycated haemoglobin (HbA_{1c}) should be tracked as key indicators for diabetes care (8). The Caribbean Health Research Council/Pan American Health Organization (CHRC/PAHO) diabetes clinical practice guidelines were developed to provide clinical targets for the Caribbean region (9).

In the setting of a public health centre in the South-West Regional Health Authority (SWRHA) with known high diabetes prevalence, the aims of this study were to: i) examine availability of recorded IDF-recommended clinical diabetes indicators in the medical charts of diabetes patients in active care at the health centre and ii) determine the clinical status of the health centre's active diabetes patients, according to CHRC/PAHO clinical guidelines for disease control.

SUBJECTS AND METHODS

Research approval was granted by the Ethics Committee of the Ministry of Health of the government of Trinidad and Tobago and by the Johns Hopkins Institutional Review Board. The study was conducted at a large public health centre in southwest Trinidad in the setting of a larger research study on patient self-care practices and barriers (10). All consecutive patients with diagnosed diabetes who presented for a routine clinic visit during the period of September 2011 to April 2012 were invited to participate in the study. Patients who participated gave informed consent for extraction of clinical data from their medical records at the health centre.

A structured medical record extraction form was used to record HbA_{1c}, blood pressure, total cholesterol, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol, triglycerides, weight and height. Random blood glucose values were also extracted since IDF guidelines indicate that in very limited settings, diabetes control may need to be based on measurements of plasma glucose (8). The three most recent values, the date of each test, and the source of the data (*eg* laboratory, point-of-care) were extracted. An accompanying electronic data entry form was designed for data collating. Descriptive data, including frequencies, means and standard deviations were performed using SAS v 9.3.

RESULTS

A total of 523 patients, 98% of patients with diagnosed diabetes who received care at the health centre, consented to medical record review. The sample was 63% female, mean age 59 ± 11 (range 25–87) years, and 489 (94%) were of East Indian descent. The majority, 351 (67%), reported primary school as the highest educational level completed, and 54 (10%) reported no formal education.

Medical records for 486 patients (91%) were available for study inclusion (Table). The following number (%) of patients had at least one value recorded at any time in the medical record for the respective indicators: random blood sugar, 485 (99%), blood pressure, 485 (99%), total cholesterol, 426 (88%), triglycerides, 422 (87%), LDL, 271 (56%), HDL, 290 (60%) and HbA_{1c}, 278 (57%). At least one weight was recorded in 468 (96%) charts; heights were not recorded for reporting of BMI. When examining whether the

Table: Patients' clinical status and percentage of patients outside of South-West Regional Health Authority (SWRHA) Laboratory and Caribbean Health Research Council/Pan American Health Organization (CHRC/PAHO) ranges[a]

Clinical indicator	n	Result (Mean ± SD)	SWRHA Lab		CHRC/PAHO guidelines	
			Normal range	Patients outside of lab range n (%)	Clinical target	Patients not meeting clinical target n (%)
Random blood sugar (mg/dL)	485	214 ± 86	70–115	443 (91.3%)	90–130	406 (83.7%)[b] 7 (1.4%)[c]
Total cholesterol (mg/dL)	426	204 ± 49	< 200	215 (50.5%)	< 200	215 (50.5%)
Triglycerides (mg/dL)	422	183 ± 110	< 160	200 (47.4%)	< 150	224 (53.1%)
HDL (mg/dL)	290	43 ± 14	> 40	132 (45.5%)	> 40	132 (45.5%)
LDL (mg/dL)	271	128 ± 40	< 70	255 (94.1%)	< 70	255 (94.1%)
HbA_{1c} [mmol/mol (%)]	137	69 ± 3 (8.5 ± 2.1)%	29–41 (4.8–5.9)%[d]	133 (97.1%)	< 48 (6.5%)	NA[e]
	111	62 ± 3 (7.8 ± 2.4)%	8–22 (2.9–4.2)%[f]	106 (95.5%)		
	30	73 ± 3 (8.8 ± 2.4)%	20–42 (4.0 – 6.0)%[g]	28 (93.3%)		
Blood pressure (mmHg)	485	147 ± 26/ 83 ± 15	< 130/80	295 (60.8%)	< 130/80	295 (60.8%)
Weight (Kg)	468	72 ± 14	NA	NA	NA	NA

NA = Not applicable; HDL = high-density lipoprotein; LDL = low-density lipoprotein; HbA_{1c} = glycated haemoglobin
[a]Clinical data represent the most recent value appearing in the medical record, irrespective of whether the value was in the past year; [b]Above range (hyperglycaemia); [c]Below range (hypoglycaemia); [d]HbA_{1c} reference range from 2011 to present; [e]Clinical targets based on a standardized assay, and since the values are not based on a standardized assay, a direct comparison cannot be made. If simply applying the < 6.5 threshold to available HbA_{1c} values in the medical record, 220 (79.1%) would be deemed as not meeting clinical target; [f]HbA_{1c} reference range from 2008 to 2009; [g]HbA_{1c} reference range before 2008.

total patient population had primary IDF-recommended blood sugar and cardiovascular indicators of HbA_{1c}, blood pressure and LDL recorded in the past year, 366 (76%) had one of three indicators, 58 (12%) had two, only 55 (11%) had all three indicators, and seven (1%) had none.

Recency of all recorded clinical indicators is shown in the Figure. More than half of all most recent laboratory test results were older than two years. Lipid panels and HbA_{1c} were least recent, with values older than two years. Patients who met the IDF recommendation of at least one value in the past year (8) for each recommended marker were: HbA_{1c}, 96 (20%), blood pressure, 479 (99%), total cholesterol, 120 (25%), HDL, 81 (17%), LDL, 72 (15%) and weight, 458 (94%).

Clinical status of patients is shown in the Table along with reference ranges. The vast majority of patients were outside of recommended ranges for each clinical indicator. The SWRHA laboratory reported three different HbA_{1c} reference ranges since 2008. Therefore, for HbA_{1c}, the percentage of the sample outside of SWRHA laboratory reference ranges is stratified by year. Almost all patients (93–97%) had HbA_{1c} results outside the respective reference range. Because SWRHA laboratory methods are not National Glycohaemoglobin Standardization Programme (NGSP) certified and standardized to the Diabetes Control and Complications Trial assay (11), direct comparison to the CHRC/PAHO clinical target of 48 mmol/mol (< 6.5%) could not be made.

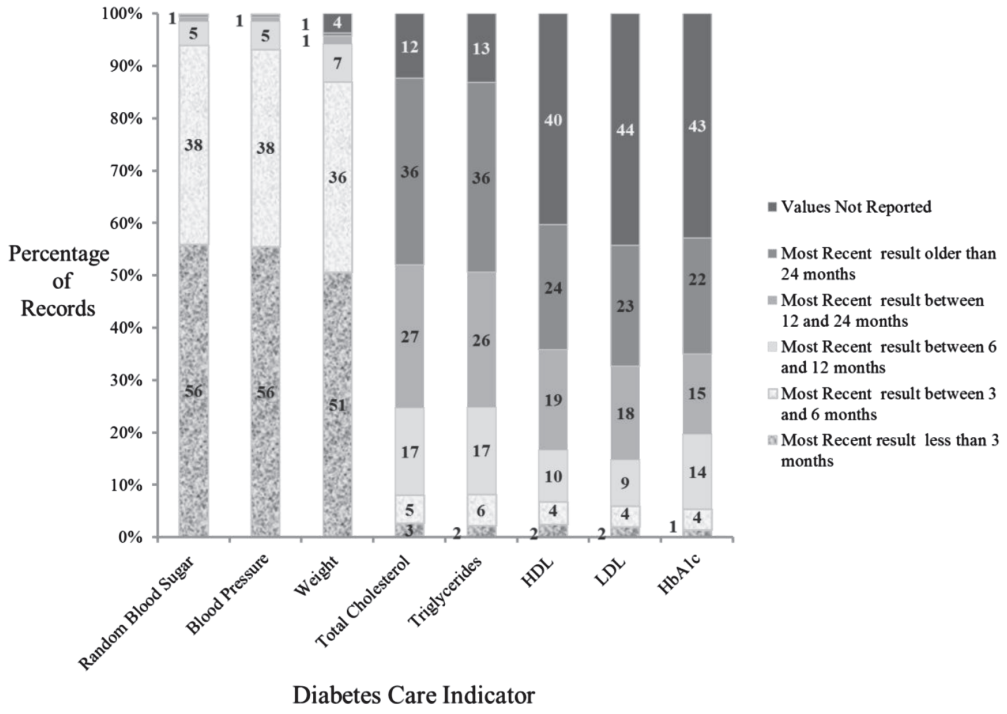

Figure: Timeliness of the most recent value for each clinical indicator extracted from the medical records of active patients with diabetes (n = 523) at a public health centre in southwest Trinidad.
HDL = high-density lipoprotein; LDL = low-density lipoprotein; HbA_{1c} = glycated haemoglobin

DISCUSSION

Of the recommended clinical diabetes indicators, blood pressure was recorded within the past year for almost all patients; however, fewer than 5% of the medical charts showed recent lipid panels. Glycated haemoglobin, the primary clinical indicator used to monitor diabetes treatment effectiveness (8), was least available, with almost half of patients having no HbA_{1c} recorded at any time in the medical record.

Although the study revealed reporting of clinical indicators at a frequency below IDF recommendations, there is evidence that the current findings represent a trend toward increased reporting. In a previous study comparing a medical chart audit of patients in primary care centres in T&T in 1993 to an audit conducted in 2003, Mahabir and Gulliford (12) reported an increase in blood glucose testing from 33% to 91% in that decade, and from a total absence of HbA_{1c} testing in 1993, to 9% of patients having an HbA_{1c} recorded in 2003. In comparison, in the current study, 99% of patients had random blood glucose testing and 20% had an HbA_{1c} test within the past year. Mahabir and Gulliford (12) found that almost all patients had blood pressure measurements in 1993 and 2003, and this pattern continues in the current data. Lipid values were not examined in the previous study but were available for 15%–25% of patients in the current study. Both the prior study and the current one conclude, however, that although availability of key clinical indicators has increased, the majority of patients consistently remain in sub-optimal disease control. Absence of HbA_{1c} tests can pose particular challenges both to clinical management of the individual patient and to monitoring and evaluating diabetes care and outcomes at a population level. Because guidelines identify HbA_{1c}, tested at regular intervals, as the primary measure by which clinicians evaluate glycaemic control with a view to reducing complication development (8), the absence of regular HbA_{1c} testing compromises optimal diabetes management (13). Additional barriers identified in this study include variability in the SWRHA laboratory HbA_{1c} reference ranges and lack of international glycohaemoglobin standardization, resulting in misalignment between SWRHA values and the CHRC/PAHO clinical targets (9). Non-standardized HbA_{1c} values may not be deemed optimally informative for the clinician, and the meaning of the HbA_{1c} values may be less interpretable for patients (11).

A limitation of the study is that reasons for the lack of HbA_{1c} results cannot be determined. This problem may have multiple contributing factors, including lack of routine ordering of HbA_{1c} by physicians, patient-level factors such as barriers getting to the laboratory or hesitance to have the sample drawn, or even practical factors such as unavailability of reagents at the laboratory.

Importantly, blood pressure, random blood glucose *via* glucose meter, and weight, which were recorded at the point of care, were found to be taken at a frequency and within a time frame most consistent with IDF practice recommendations. Although they are not the primary indicators of diabetes control, these values hold clinical significance for overall diabetes management (8, 14). The IDF supports use of random blood glucose in resource-limited settings for checking dips or elevations (8, 15), and appropriately monitoring and treating hypertension reduces cardiovascular morbidity and mortality (14).

Challenges of frequency and timeliness of key clinical indicators highlighted in this paper may be patterns found in health systems in countries with similar characteristics to T&T. Potential solutions may include point-of-care testing of diabetes clinical indicators, particularly HbA_{1c}, in primary healthcare so that results become more timely and reliable for patient management. There is also the need for standardization of HbA_{1c} assays in private and public laboratories throughout the country so that values can be universally applicable (11). When physicians have results that are timely and accurate to compare to the available practice guidelines then a radical enhancement in the quality of patient care and outcomes may become more attainable.

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