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Knowledge and behavior changes in clinician after training of partnership for Diabetes Control in Indonesia

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ABSTRACT

Background and aims: One of the main determinants of successful diabetes management is the quality of healthcare provider including general practitioner and internist which can be increased through medical training. This study aimed to describe the changes of clinician's knowledge and behavior of comprehensive diabetes management training program around Indonesia.
Method: We conducted a three-day training program for general practitioners and internists for 3.5 years, 2013 to 2016. All clinicians invited as voluntary participant to send their patient data from medical record. Each participant was expected to submit a minimum of 25 type 2 diabetes (T2DM) set patient data before and 6 months after training program to analyze the impact of program in physician knowledge and behavior related to diabetes management.
Result: 120 of 489 voluntary participants submitted completed baseline data with 4676 patient data. Meanwhile, only 32 participants that submitted completed data of 6 months before after training with 886 patient data. Most of parameters were improve before and after program. The greatest and lowest improvement were on A1c measurement (21%) and smoking assessment (2%).
Conclusion: Intensive seminar and training was not enough to empower diabetes management. This research might push the creation of clinical practice program that were tailored to each care facilities and integrated within routine care aimed at continual improvement of its healthcare worker.

1. Introduction

Diabetes is a national health problem in Indonesia. The threat of diabetes develops together with rapid cultural and social changes, ageing population, increasing urbanization, dietary changes, reduced physical activity, and other unhealthy behavior in the nation [1]. Prevalence of diabetes in Jakarta, Indonesia has risen from 1,7% in 1982, to 5,7% in 1993 and eventually 12,8% in 2001 [2]. Recent data from 2018 Indonesian basic health research (Riskesdas) showed that the prevalence of Diabetes Mellitus (DM) was 10.9% in Indonesia [3]. Study by Widyahening et al. [4] from annual Indonesian Association of Family Practitioners seminar participants had shown that 89% general practitioners were aware of Indonesian type 2 diabetes guideline existence, guideline adherence was still lacking for blood glucose target with only 21%, 34% prescribed statin and 2% recommended screening for patient with risk factors. Another data from Riskesdas 2013 showed that based on ADA 2011 guideline and symptoms, proportion of DM in the population aged ≥15 years in man and woman were 5.6% and 7.7% respectively. However, the proportion of DM diagnosed by health worker were 2.2% and 2.5% (in man and woman, respectively) [5]. Meanwhile, based on Riskesdas 2018, the proportion of DM patients have not received diabetes treatment according to the diagnosis of doctors was 9.3% [3]. Physician education and food regulation remains as one of non pharmacological treatment to increase the quality of diabetes management.

Currently the assessment of diabetes management in Indonesia is limited to Riskesdas which only assess prevalence of A1c, types of drugs used, and patient's reason for inadequate drug adherence [3].

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Despite relatively short (1–5 days) physician training seminar regularly used to increase physician knowledge regarding diabetes, currently there is no assessment of the benefit of such training for diabetes management. At the time of the study, most medical doctor referred to American Diabetes Association (ADA) diabetes management guidelines since Indonesian Society of Endocrinology (PERKENI) did not release its guideline until 2015. Despite the widespread occurrence of such practice, there is still no assessment on the feasibility of such practice and the real work limitation of adapting international guideline for a developing country.

This study aimed to evaluate the result of the Partnership for Diabetes Control in Indonesia (PDCI) training program in improving the knowledge and disease management of the participants by comparing baseline and 6-month data post training collected through patient chart abstractions. Indicators of this study were changes in physician knowlegde and behavior of diabetic management.

2. Methods

This Retrospective study was conducted on changes in knowledge and behavior in participant of diabetic management training program. The training was performed in 3 days to 5000 general practitioners and 500 internists between June 2013–December 2016, gradually. Participants were from primary, secondary and tertiary health care. This was first collaboration study between PERKENI and ADA to develop a curriculum of diabetes management called Partnership for Diabetes Control in Indonesia (PDCI). We collaborated based on local adaptation to increase clinical competencies on prevention, diagnosis, treatment, and diabetic complication that could be easily applied in daily practices. This research acquired ethical clearance from Ethical Committee of Brawijaya University, Indonesia No.236/EC/KEPK/05/2016. The targeted population in this study were doctors who participated the three days training of Partnership for Diabetes Control in Indonesia (PDCI). It was developed and held by Indonesian Endocrinology Society (PERKENI) and supported by American Diabetes Association (ADA) and Ministry of Health of Indonesia for 4.5 years.

The training included lecture and workshop. Material of lecture consist of basic knowledge of diabetes based on epidemiology data, pathogenesis, diagnosis criteria, non-pharmacological treatment, pharmacological management, acute and chronic complications of diabetes. Meanwhile, the workshop consist of non-pharmacological therapy, case studies, demonstrations such as injecting insulin steps, type of oral diabetes medications, such as diabetic, foot risk detection and self-monitoring of blood glucose.

The curriculum started with training of trainer for endocrinologists and internists by PERKENI and ADA. This trainer taught other internists and general practitioners. They come from almost all the large cities in Indonesia. All participants stayed in a hotel for 3 days on weekend. This trainer taught other internists and general practitioners. This study attempted to portray Indonesia as a whole with nationwide sampling from 20 major cities across multiple island by comparing baseline and 6 month post training data.

The inclusion criteria were general practitioners and internists who received the PDCI training and agree as voluntary participants to submit their T2DM patient data in this study. Each participants was expected to submit a minimum of 25 T2DM patient data before and 6 months after the training to analyze the impact of training on the changes of physician knowledge and behavior. Participants were allowed to withdraw their participation anytime within the study. Participants who submitted uncompleted data after 6 months of training were excluded from the study. Participants did not participate the similar training or other program in diabetes prevention program either before or after PDCI training. However there might be incidental educational activities such as symposium or continuing medical education (CME) in particular topics of diabetes. Meanwhile we did not assess the status of patient regarding their participation in diabetes prevention program. We evaluated the changes in quality of service.

The parameters of evaluation were changes in physician knowledge and behavior before and 6 month after training, consist of measurement and outcome of A1c, plasma glucose, LDL cholesterol, triglyceride, blood pressure, body mass index (BMI), foot examination and smoking assessment. Another parameters were diabetes education, fibrate prescribed, ACE/ARB prescription, and also therapy of medical nutrition, antihypertensive and aspirin.

A1c measurement and outcome of A1c was patient who was performed A1c testing and reach A1c goal $\leq$7%. Plasma glucose measurement and outcome was patient who performed plasma glucose outcome and reach plasma glucose ranged 90–130 mg/dL, LDL cholesterol measurement and outcome was patient who performed LDL cholesterol testing and reached LDL cholesterol level of <100 mg/dL, triglyceride measurement and outcome was patient who was performed triglyceride and reached triglyceride level of <150 mg/dL. Blood pressure measurement and outcome was patients who performed blood pressure testing and reached blood pressure goal (<130/80 mmHg). BMI was patients who was calculated their body mass index in the last 6 month. Foot examination was patients who received at least one documented foot examination. Diabetes education was patient who received diabetes education. Fibrate prescribed was patient prescribed a fibrate, ACE/ARB prescription was patients who are treated with an ACE inhibitor or with an ARB. Antihypertensive therapy was patient who was treated with an antihypertensive therapy. Aspirin therapy was patients that have cardiovascular disease risk and were taking aspirin daily within 6 months.

All patient data were submitted directly from training participants to ADA online-based outcome assessment tool (www.nethealthllc.com/ADAPIM/signin.aspx) that could be accessed from 2013 to 2017. Completed data that collected could only be accessed by ADA data coordinator. Each voluntary participant could only access their submitted data and not others. The data presented in this paper was given directly from ADA data coordinator.

2.1. Statistical analysis

Any differences was identified and documented in final Statistical Analysis Plan (SAP) prior database locked. The data were descriptively summarized using average initial performance, average improved performance, and average improvement. There were some difference of improvement percentage between baseline and 6 months post PDCI training data because of rounding effect by system automatically.

3. Results

Initially, 489 training participants registered as voluntary participants to submit their patient data but only 120 participants submitted completed T2DM patient data. 4676 baseline patient data were collected and considered as initial phase data. It meant average contributed patient data each patients before PDCI training were 10 compared with targeted in this study, which were 25. Based on Table 1, majority of participants aged 40–49 years (41%) with equal gender. In addition, most of participants were internist (64%) and located in urban area (68%). Number of patient encountered per week was showed in Fig. 1 and number of patient with diabetes was showed in Fig. 2.

After 6 months training program, completed data included 886 patient data that came from 32 participants. It meant average

Table 1
Baseline characteristics.

Parameters	n (%)
Age (years), n = 464	
20-29	34 (7)
30-39	172 (37)
40-49	190 (41)
50-59	57 (12)
60-69	11 (3)
Gender (male), n = 487	244 (50)
Medical specialty, n = 487	
General practitioner	175 (36)
Internist	312 (64)
Years of clinical experience, n = 465	
<10 years	87 (19)
>10 years	378 (81)
Health center location, n = 487	
Urban	332 (68)
Rural	155 (32)
Supportive examination availability in each health center, n = 489	
A1c testing	186 (38)
Glucose testing	479 (98)

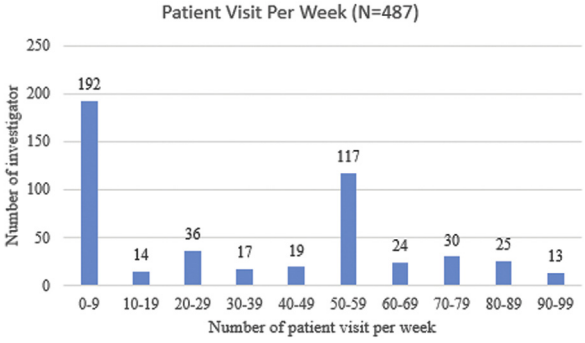

Fig. 1. Patients visit per week.

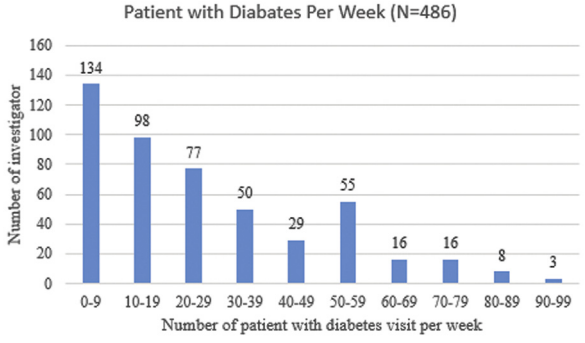

Fig. 2. Patients visit with diabetes per week.

contributed patient data each participants after training were 28. Meanwhile, 88 participants withdrawn from the study. The participant assessed current practice using online assessment tools. The change on knowledge and behavior in disease management of investigators showed in Table 2.

Table 2 showed there were average improvement of A1c measurement (21%), A1c measurement outcome (3%), plasma glucose range (5%), LDL-C measurement (13%), LDL-C measurement outcome (3%), triglyceride measurement (14%), triglyceride measurement outcome (3%), foot examination (10%), smoking assessment (2%), weight measurement (9%), and weight management (10%), diabetes education (20%), medical nutrition therapy (9%), fibrate prescribed (7%), treatment for nephropathy (5%) and aspirin therapy (4%). In addition, A1c measurement had greatest improvement among other parameters. Meanwhile, there were decreased of A1c treatment (−4%), blood pressure measurement (−2%), blood pressure measurement outcome (−2%), and antihypertensive therapy (−13%). In addition, there was no average improvement of plasma glucose measurement.

4. Discussion

This study showed that majority of parameters were improved before and after PDCI training. The greatest improvement was percentage of measurement of A1c and diabetes education frequency. The lowest improvement was smoking assessment and A1C achievement outcome (<7%). Meanwhile, some parameters were getting worse between before and after training, including using antihypertensive therapy, blood pressure measurement frequency and blood pressure measurement outcome <130/80 mmHg. In addition, there was no change on plasma glucose measurement before meal.

4.1. A1c and glucose control

Improvement A1c testing was greatest among other variables. Achievement of A1c < 7 was still low, it was only 3%. Based on ADA and PERKENI recommendation, measurement of A1c is every 6 months in patients who have stable glycaemic control or every 3 months in patients who are not reach glycaemic control [6,7]. The low achieved of A1c target might be due to shorter monitoring time compared with recommendation. Besides, based on Social Security Administrator (BPJS) policy, routine measurement of A1c is 3–6 months [8]. Moreover, patient who is in primary care should be referred to referral hospital to perform A1c measurement. It's affect on lack of opportunity for testing and require additional cost for patient. Low improvement of A1c goal (3%) in this study was consistent with studies in other countries. A study about effect of repeated audits of local guidelines and the adherence in rural Indiana, America by Kirkman et al. [9] showed proportion of A1c measurement were improved from 20% to 37% after a year. Another intervention study in primary care physician by Vidal-Pardo et al. [10] showed there was no difference in A1c measurement (54.3%–57.4%) after 12 months. Meanwhile there were only 30.8% of patients T2DM can achieve A1c below 7% and increasing A1c from 7.9% to 8.1% [11,12]. Systematic review by Rushforth et al. [13] found that many barriers to improve diabetes care especially feeling frustrations of compliance and anxieties for intensification therapy by the guideline.

We found a good number of plasma glucose measurement before the training (93%) but it was slightly decrease after 6 months training (92%). Plasma glucose measurement is simple through capillary blood examination and it is available in every health center [14]. However, improvement of fasting plasma glucose target was only 5%. It suggests that there is no significant increase in quality of diabetes management. Several factors contribute poor plasma glucose target, include age 40–60, being illiterate, having informal education only, longer duration of diabetes treatment, inadequate physical exercise, smoking, poor medication adherence and taking combination of insulin and oral medication [15,16].

4.2. Complications of diabetes and comorbidities screening

Impact of this training on comorbidities management that accompanies patients is unsatisfying. Before training, we found

Table 2
Change on knowledge and behavior in disease management of voluntary participants.

Measurement knowledge and behavior	Baseline performance (%)	6-month post-training performance (%)	Average improvement (%)
Glucose control			
A1C measurement	30	51	21
A1C measurement outcome (<7%)	9	13	3
A1C treatment	97	93	−4
Plasma glucose measurement	93	92	0
Plasma glucose range (90–130 mg/dL)	23	28	5
Diabetes complications and comorbidities screening			
LDL cholesterol measurement	49	62	13
LDL cholesterol measurement outcome	16	20	3
Triglyceride measurement	53	68	14
Triglyceride measurement outcome	16	20	3
Blood pressure measurement	95	93	−2
Blood pressure measurement outcome	32	30	−2
Foot examination	38	49	10
Smoking assessment	5	8	2
BMI/Weight measurement	63	73	9
Weight management	32	43	10
Diabetes therapy			
Diabetes education	45	65	20
Medical nutrition therapy	49	58	9
Fibrate prescribed	11	19	7
Antihypertensive therapy	53	39	−13
Treatment for nephropathy	21	27	5
ACE/ARB prescription	37	28	−8
Aspirin therapy	19	23	4

Some differences of improvement percentage between baseline and 6 months after PDCI training data because of rounding effect by system.

measurement of LDL cholesterol and triglycerides were 49% and 53% whereas there was a slightly increase after the training (13% and 14%, respectively). Previous study showed proportion of GP who measured triglycerides at least once a year was 62.9% [17]. Based on ADA recommendations [18], level of LDL and triglycerides should be measured at least annually or more often if needed in adult patient with diabetes but if values are at low risk level (LDL <100 mg/dL, triglycerides <150 mg/dL), measurement can be repeated every 2 years. Meanwhile, blood pressure testing was decrease from 95% to 93% after training and BMI measurement was increase from 63% to 73%, whereas ADA recommendations state that blood pressure and BMI should be measured every clinical visit [6]. It suggests quality of comorbid management of health center is still low.

Possible cause of low lipid profile examination due to patient and doctor factors. According to PERKENI guideline, patients must fast for 12 h to perform a triglyceride testSo it is likely that many patients are not adherent to fasting [19]. Although, Social Security Administrator (BPJS) policy guarantees lipid profile check every 6 months. Moreover ratio of general practitioners to population in Indonesia is large which is 45 per 100,000 population [20]. Average duration of patient doctor communication is 2.96 min at the primary health care, whereas the minimum and maximum duration are 1.31 and 7.09 min, respectively [21]. So that the education for examination of the lipid profile is not optimal.

In this study, we found that proportion patient who achieved target of LDL cholesterol and blood pressure after training were 20% and 30%. Previous report showed that 33–49% of patients did not achieve targets for glycaemic, cholesterol control, or blood pressure [6]. Study conducted by Yudin et al. [22] showed 37.6% of patients achieved LDL-C target. Another study showed medication possession ratio was significantly higher in patients who achieved the LDL cholesterol target than in those who did not [23]. There were some factors associated with non-achievement of LDL target including management of healthy diet, body weight, and hypertension [24].

Our study showed improvement of foot examination was 11% (from 38% to 49%). Study by Vidal-Pardo et al. [10] showed consistent improvement of foot examination from 19.5% to 30.1% after 12 months of primary care physician educational intervention. Another study conducted by Gallman et al. [25] showed that there was 20% increasing foot examination after quality improvement project. It should be noted that the increase of foot examination in this study was still less than expected, especially considering that our study included both general practitioner and internist. Although foot examination is simple, there is only a slight improvement in this study. Gallman et al. [25] stated that barriers to perform appropriate foot care are limited time, lack of awareness and training about foot examination, and lack of suitable foot examination tools such as a monofilament, tuning fork, or reflex hammer. Meanwhile, if patients do not report foot problem or do not request a foot exam, providers may not see the necessity of completing a routine foot exam [25]. Moreover, patients may refuse their physician's request to perform a foot exam because they are uncomfortable having their feet exposed or examined [25]. ADA recommendations state that comprehensive foot evaluation is performed at least annually to identify risk factors for ulcers and amputation [6]. Previous study showed patient diagnosed with chronic disease in primary care services receive only a half of recommended care, primarily because of limited time related number of patient, awareness of physicians, and lack of supporting infrastructure [26].

4.3. Diabetes therapy

Diabetes treatment consists of non-pharmacological therapy and pharmacotherapy. Non-pharmacological therapy consist of nutrition therapy, physical activity, smoking cessation and psychological care [6]. Non-pharmacological treatment is carried out by providing structured or unstructured education. In this study, diabetes education for patient after the training was improved from 45% to 65%. Lack of diabetes education happens from patients-side and physician-side. From patients-side, patients feel that they enough knowledge about diabetes, so they decided not willing to get diabetes education. Besides that, they feel inconvenience when they received diabetes education from physician. Meanwhile in physicians-side, they assumed that patients will refused their

diabetes educations. Moreover, physicians do not confident enough to give diabetes education [27]. Cox et al. [28] state that physicians do not give diabetes education because of they feel burnout, so many change in standards of care, reduced self-confident, and lack of time to communicate with patient. Based on ADA recommendation, there are four crucial time to evaluate the need of diabetes self-management education and support: at diagnosis, annually, when arise of complicating factors, and when transitions of care occur [6].

In addition, improvement of medical nutrition therapy was 9% after training (from 49% to 58%). Nutritional therapy has a role in overall diabetes management, and each person with diabetes should be actively involved in the development of an individual meal plan. It is associated with a reduction in A1c (0.3–2% for T2DM) [6]. Lack of improvement in nutritional therapy can be caused by population and personal factors. Population factors include changes of population, poor access, influence of western diet, poor healthcare quality, family eating habits, and lack of support from family and friends. Meanwhile personal factors include poverty, educational status, and perception about their illness [29]. Besides, changing habits in a short time is difficult.

On the other hand, only 5% increase was observed in nephropathy since detecting nephropathy requires laboratory examination, which takes up more time. Vidal-Pardo et al. also demonstrated similar slight increase in micro-albuminuria measurement physician educational intervention (43.2%–50.6%, baseline vs 6-month post-intervention) [10]. Similar result was also found in Kirkman et al. showing no increase of annual microalbumin test (36%, 39% and 30% in baseline, 1 year, and 2 year respectively) after repeated clinical guidelines [9]. Patients with nephropathy usually needs to be referred to secondary healthcare facilities for further laboratory examinations which can burden both physician and patient itself. Due to high number of patients that needs to be screened and lack of integrated system to screen nephropathy, neglection can easily occurs.

Aspirin is one of the medications indicated to prevent cardiovascular events in patients with diabetes. In this study, the importance of aspirin as therapy was increased (from 19% to 23%). There were still many different perceptions toward the indication of using aspirin in diabetics, which may be due to the side effects concerns [30]. A study by Fosmire et al. [31] showed that approximately 20% of the patients indicated for and reporting aspirin use did not have aspirin documented in their EHR. This data shows the lack of awareness of many physicians regarding the use of aspirin in DMT2 patients [31]. Other possible explanation about lack of increase of aspirin usage was because there was no indication to do so. Based on ADA recommendation for antiplatelet agent, there are some points which are use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes and a history of atherosclerotic cardiovascular disease; For patients with atherosclerotic cardiovascular disease and documented aspirin allergy, clopidogrel (75 mg/day) should be used; Dual antiplatelet therapy (with low-dose aspirin and a P2Y12 inhibitor) is reasonable for a year after an acute coronary syndrome A and may have benefits beyond this period. B; Aspirin therapy (75–162 mg/day) may be considered as a primary prevention strategy in those with diabetes who are at increased cardiovascular risk, after a discussion with the patient on the benefits versus increased risk of bleeding [6].

Aspirin is a available drug in public health centres. The low use of aspirin in this study could be due to low doctor awareness or the lack of indications that patients should take aspirin. Based on characteristic data, most of the patients were dyslipidemia as comorbidity and only 20% reached LDL cholesterol and triglyceride target and the number of patients who reached the target blood pressure was only 30%. So there should be many patients who get aspirin, this is probably because the management is not good or it could be that the training carried out does not change the quality of management. Moreover, the drugs not always available.

This study have some limitations, including there were 489 of 5500 participants that voluntary submitted patient data in the baseline and only 120 participants submitted complete, thus only 32 participants submitted data after 6 months training. Moreover, In the baseline most submitted T2DM data to the system were internists (64%) besides general practitioners were more likely attended the training (5000) than specialists (500). This study depended on internet connection to submit patient data into the system and most participants came from urban area. The data does not represent Indonesia data because it is not possible to know which regions support the data.

This study uses larger data in analyzing the effect of training program on diabetes management for both internists and GPs. In addition, it was performed by long period of 3 years, which was carried out extensively area with 5500 participants, training modules were made by people who are experts (PERKENI and ADA) in their fields with participants who are already involved in managing daily diabetes and data collection is online.

5. Conclusion

This study described the situation of quality of diabetes care in Indonesia. The improvement of diabetic care quality that were achieved by three-day training program in this study were less than expected. A single event training program may not be enough to yield considerable changes in diabetes care. Further effort must be made to determine the ideal physician education program that help patient achieve target glycemic and other comorbidities control, as well as complication management.

Author contributions

Idea and study design, Literature searching, Article draft writing, Draft revision: EY; Idea and study design, Literature searching, Article draft writing, Draft revision: PS; Idea and study design, Literature searching: SAS; Idea and study design, Literature searching, Writing Supervision: AR.

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Declaration of competing interest

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