An evaluation of community pharmacy-based services for type 2 diabetes in an Indonesian setting: patient survey

Yosi Wibowo, Richard Parsons, Jeffery Hughes, Bruce Sunderland

Background: Diabetes is an emerging chronic disease in developing countries. Its management in developing countries is mainly hospital/clinic based. The increasing diabetes burden in developing countries provides opportunities for community pharmacists to deliver a range of services. Since the management of diabetes requires the patient's own involvement, it is important to gain their views in order to develop pharmacy-based diabetes services. Studies on diabetes patients' views have been limited to developed countries. **Objectives:** To investigate, within a developing country setting (Indonesia), current use of pharmacy services by type 2 diabetes patients; and to evaluate their views regarding community pharmacists' roles, and the characteristics that influence their views. **Methods:** A questionnaire survey was conducted within 10 purposefully selected community pharmacies in Surabaya, Indonesia. Each pharmacy recruited approximately 20 patients seeking antidiabetic medications. Usage of pharmacy services was identified using binary responses ('yes'/'no') and views on pharmacists' roles were rated using Likert scales; an open-ended question was used to identify priority roles. Logistic regression models were used to determine characteristics associated with patients' views. Results: A total of 196 pharmacy patients with type 2 diabetes responded. Most patients used community pharmacies for dispensing (100%) and education on how to use medications (79.6%). There were mixed views towards pharmacists providing services beyond dispensing. The highest priorities identified were from the 'patient education' domain: education on medications [i.e. directions for use (64.5%), storage (26.6%), common/important adverse effects (25.5%)]; and the 'monitoring' domain: monitoring medication compliance (37.3%). Patients with higher incomes or who were working were less supportive of these expanded services; whereas patients who previously used a service, those with risk factors for complications or having poor/unknown glycaemic control were more supportive. **Conclusions:** Community pharmacies in Surabaya, Indonesia in this study were mainly utilised for dispensing. However, many type 2 diabetes patients using these pharmacies report limited monitoring of blood glucose levels and poor glycaemic control, which indicates an opportunity for greater pharmacist involvement. Yet for this to occur, patients' limited expectations of pharmacists roles will need to be

broadened. Characteristics influencing these views should inform the development of pharmacy-based diabetes services in the environment of the burgeoning burden of diabetes.

Title

An evaluation of community pharmacy-based services for type 2 diabetes in an Indonesian setting: patient survey

Abstract

Background: Diabetes is an emerging chronic disease in developing countries. Its management in developing countries is mainly hospital/clinic based. The increasing diabetes burden in developing countries provides opportunities for community pharmacists to deliver a range of services. Since the management of diabetes requires the patient's own involvement, it is important to gain their views in order to develop pharmacy-based diabetes services. Studies on diabetes patients' views have been limited to developed countries.

Objectives: To investigate, within a developing country setting (Indonesia), current use of pharmacy services by type 2 diabetes patients; and to evaluate their views regarding community pharmacists' roles, and the characteristics that influence their views.

Methods: A questionnaire survey was conducted within 10 purposefully selected community pharmacies in Surabaya, Indonesia. Each pharmacy recruited approximately 20 patients seeking antidiabetic medications. Usage of pharmacy services was identified using binary responses ('yes'/'no') and views on pharmacists' roles were rated using Likert scales; an open-ended question was used to identify priority roles. Logistic regression models were used to determine characteristics associated with patients' views.

Results: A total of 196 pharmacy patients with type 2 diabetes responded. Most patients used community pharmacies for dispensing (100%) and education on how to use medications (79.6%). There were mixed views towards pharmacists providing services beyond dispensing.

The highest priorities identified were from the 'patient education' domain: education on medications [i.e. directions for use (64.5%), storage (26.6%), common/important adverse effects (25.5%)]; and the 'monitoring' domain: monitoring medication compliance (37.3%). Patients with higher incomes or who were working were less supportive of these expanded services; whereas patients who previously used a service, those with risk factors for complications or having poor/unknown glycaemic control were more supportive.

Conclusions: Community pharmacies in Surabaya, Indonesia in this study were mainly utilised for dispensing. However, many type 2 diabetes patients using these pharmacies report limited monitoring of blood glucose levels and poor glycaemic control, which indicates an opportunity for greater pharmacist involvement. Yet for this to occur, patients' limited expectations of pharmacists roles will need to be broadened. Characteristics influencing these views should inform the development of pharmacy-based diabetes services in the environment of the burgeoning burden of diabetes.

Authors

Yosi Wibowo[1,2]

Richard Parsons[1]

Bruce Sunderland[1]

Jeffery Hughes[1]

1. School of Pharmacy, Faculty of Health Sciences, Curtin University, GPO Box U1987, Perth, Western Australia 6845, Australia
2. Centre for Medicines Information and Pharmaceutical Care (CMIPC), Faculty of Pharmacy, Surabaya University, Jl. Raya Kalirungkut, Surabaya, East Java 60293, Indonesia

Corresponding author:

Yosi Wibowo

Centre for Medicines Information and Pharmaceutical Care, Faculty of Pharmacy, Surabaya University, Jl. Raya Kalirungkut, Surabaya, East Java 60293, Indonesia

Phone: +62 31 298 1170

Email: yosi.wibowo@postgrad.curtin.edu.au

Introduction

Indonesia is a major developing country with a population of 237.6 million [1], and is among the top 10 countries in the world according to number of people with diabetes [2]. In 2013, it was estimated that 8.5 million people in Indonesia were living with diabetes, and this number is expected to increase to 14.1 million by 2035 [2]. Diabetes in Indonesia is currently managed in hospital outpatient or clinic settings [3,4]. An increased number of people with diabetes will require more community-based care, providing an opportunity for community pharmacists to deliver a range of diabetes services.

Based on the 2012 Indonesia Health Profile, there is a total of 17,613 pharmacies [5], mainly community-based. Community pharmacies in Indonesia are privately owned and currently have limited roles within Government insurance plans [6]. The inclusion of pharmaceutical care in the Indonesian Government standards in 2006 has emphasised the need for community pharmacists to be involved in the care of patients with chronic diseases, including diabetes [7]. A previous study involved a survey of community pharmacists in Surabaya, Indonesia reported community pharmacists' willingness to take up a broader role in diabetes care [8]. Since diabetes is a chronic disease that requires daily care in the hands of patients [9], it is important to explore the perspectives of diabetes patients on pharmacy-based services that would assist with their care.

International studies have been conducted to investigate patient views regarding aspects of community pharmacists' roles, and some of these studies have included diabetic patients. However, it should be emphasised that studies involving diabetes patients have thus far been limited to developed countries, such as the UK and the USA [10-14]. This study aims to assess the views of patients with diabetes to inform the development of pharmacy-based diabetes services in a developing country setting (Indonesia). Two previous small studies conducted in community pharmacies in Indonesia have found that the majority of general patients had positive perceptions of pharmacy services, providing a basis for pharmacists to develop their professional roles [15, 16]. This study aims to investigate the current use of community pharmacy services by patients with type 2 diabetes within an Indonesian setting; and to evaluate their views on the roles of community pharmacists, and the characteristics that influence their views.

Methods

This study was approved by the Human Research Ethics Committee of Curtin University (PH-09-11) and *Ikatan Apoteker Indonesia* – IAI (Indonesian Pharmacists Association) (001/SK/BPD-IAI/SURABAYA/2010).

Setting and sample recruitment

The aims of the study included the estimation of the prevalence of service usage and patient views. A total sample size of 200 was selected as this would lead to estimates which were moderately precise. Assuming that the sample is broadly representative of the population of pharmacy patients with type 2 diabetes in Surabaya, the 95% confidence intervals for the true prevalence estimates would be within 7% of the figures obtained from the sample (based on a prevalence estimate of 50%). For the analysis of factors associated with their views, a sample of 200 would be expected to be adequate to identify any independent variables exhibiting a moderate to small effect size (with power=80%, α=0.05) [17].

Community pharmacies were used as sampling points to obtain access to pharmacy patients with type 2 diabetes in Surabaya, Indonesia. Ten community pharmacies were purposefully selected from community pharmacies involved in a recent pharmacist survey [8], to include different geographical areas and socio-economic levels in Surabaya. Surabaya consists of 31 sub-districts which can be categorised into five geographical areas, namely: centre, west, east, north and south; and four socio-economic levels, from high (labelled '1') to low (labelled '4') [18]. Each

pharmacy was responsible for recruiting approximately 20 patients. Patients eligible for the survey were those aged over 18 years, with a diagnosis of type 2 diabetes for which they were receiving oral antidiabetic medications. Patients were recruited as they were seeking oral antidiabetic medications at these pharmacies, and their written consent was obtained.

Data Collection

Questionnaire development. The survey questionnaire consisted of four sections: (A) patient demographics, (B) services for type 2 diabetes patients – use of services and views on pharmacists' roles, (C) diabetes profile, and (D) monitoring profile. The questionnaire cover page contained information about the study and a consent form. Section B of the questionnaire contained a list of services for type 2 diabetes patients that was drafted based on a generic model generated from the literature [9, 19-21]. A binary choice question was used to capture patient usage of each service ('yes'/'no'), and a 6-point Likert scale was used to reflect patient views on pharmacists' roles (1=definitely no, 6=definitely yes). This was followed by an open-ended question to explore patient priorities regarding their views of pharmacist roles: *'In your opinion, what are the five most important services that should be provided at pharmacies to assist you with your diabetes?'* The questionnaire was face and content validated by a panel of seven academics, two board members of the IAI, two Indonesian community pharmacists and two diabetes patients. Their feedback, where appropriate, was incorporated into the questionnaire.

The questionnaire (English version) then went through a translation process to an Indonesian version: (i) forward translation to Bahasa Indonesia by one of the investigators whose first language is Bahasa Indonesia; (ii) back-translation to English by an independent English first-

language translator; and (iii) the back-translation was compared to the original version by two of the investigators whose first language was English. The forward-translation questionnaire was piloted by 10 type 2 diabetes patients. This resulted in minor changes to the final questionnaire. To assess reliability, the questionnaire was distributed on two occasions separated by a two-week interval; the resulting Kappa scores for diabetes services (Section B) ranged from 0.412 to 1.000, which were classified as 'acceptable' to 'excellent' levels of test-retest reliability [22].

Questionnaire administration. Owners of the 10 selected pharmacies were approached. In the case of refusal, that pharmacy was replaced with another pharmacy in the same geographical area and socio-economic level (Table 1). At each pharmacy, the pharmacist and/or pharmacy staff member was briefed about the study and how to complete the questionnaire. Eligible patients were invited to participate, and each pharmacy aimed to recruit approximately 20 patients. Once completed, the questionnaire was placed in a sealed envelope by the respondent and submitted to the pharmacist/pharmacy staff. The questionnaires were then handed to the investigators by the agreed deadline.

Data Analysis

Descriptive statistics were used to summarise the patient characteristics: demographics (Section A), diabetes profile (Section C), and monitoring profile (Section D). SPSS version 19.0 was used to perform the analysis.

In relation to diabetes services (Section B), frequencies were calculated for binary responses ('yes'/'no') related to the patient usage of services and for responses from Likert scales related to

158 the extent of patient agreement regarding pharmacists' roles. Moreover, content analysis was
159 used for responses from the open-ended question to explore patient views on the five priority
160 services at the pharmacies. These responses were coded, and frequencies were calculated.
161
162 Logistic regression models were employed to identify patient characteristics associated with
163 patients' views of pharmacists' roles. Responses regarding patients' views for each type of
164 service were classified into binary variables, to indicate 'agreement' (Likert scale ratings of 5 to
165 6) versus 'disagreement' (Likert scale ratings of 1 to 4), and were used as the dependent
166 variables. Some of the activities were grouped together if they related to the same theme for
167 which a mean rating was calculated, and converted into a binary variable as above. Patient
168 characteristics included as independent variables were gender, age, education, employment,
169 income, health insurance cover, diabetes organisation membership, duration of diabetes (time
170 since diagnosis), risk factors for complications, complications and diabetes (glycaemic) control.
171 The models also included an independent variable indicating patients' previous use of the service
172 (binary responses: 'yes'/'no'). The responses were grouped in a similar way to the dependent
173 variables for which a mean value was calculated. To calculate the mean, a 'no' response was
174 classified as '0', and a 'yes' was classified as '1'; the mean was treated as a continuous variable.
175 A backward elimination strategy was used to identify all the variables which significantly
176 contributed to each model. Through this approach all independent variables were included
177 initially, and then the least significant variable was dropped (one at a time) until the p-value
178 associated with each of the variables remaining in the model was less than 0.05.
179
180

Results

Sample recruitment

This study included 10 community pharmacies as sampling points after approaching 11 community pharmacies in Surabaya. One pharmacy refused, as the employee pharmacist was planning to resign and they were in the process of recruiting a new one. From the final 10 pharmacies, a total of 204 patients were recruited; however, eight patients reported the use of insulin at the beginning of their therapies and were deemed to have type 1 diabetes, leaving a sample size of 196 (Table 1).

[Insert Table 1 here]

Characteristics of pharmacy patients with type 2 diabetes

The demographic information of participating patients (Section A) is summarised in Table 2. Approximately 60% of respondents were female and half of respondents were aged 60 years or older. Approximately half of the respondents did not have health insurance plans.

[Insert Table 2 here]

The diabetes data reported by participating patients (Section C) are shown in Table 3. The median duration of diabetes (time since diagnosis) was seven years. More than 80% of respondents reported that their treatment regimen included oral antidiabetic medications and diet modifications. It is important to note that this variable did not measure whether the doctor made

the medication/diet/exercise recommendations, but rather whether the patient remembered and/or reported it. Almost 60% of the respondents reported having at least one diabetes-related complication, and most of the patients reported having at least one risk factor for complications.

[insert Table 3 here]

Table 4 shows the monitoring profile reported by participating patients (Section D). To provide insight to patients' diabetes (glycaemic) control, variables related to the symptoms of hypo/hyperglycaemia and HbA1c values were combined to indicate: fair-good control (i.e. no symptoms and HbA1c ≤8.0%); poor control (i.e. presence of symptoms and/or HbA1c >8.0%); and unknown (i.e. symptoms 'none/don't know' and/or HbA1c values 'none/don't know'). Using this derived variable, most respondents were perceived to have either poor diabetes control (45.9%) or unknown diabetes control (42.3%).

[insert Table 4 here]

Patients' use of pharmacy services and their views on pharmacist roles

Responses describing patient usage of pharmacy services are summarised in Table 5. In addition to the traditional role of dispensing ('treatment administration'), the most frequent services received were 'patient education' about medications, particularly directions for use (79.6%) and special precautions to follow (71.9%).

Table 5 also shows responses regarding pharmacists' roles. All patients agreed with pharmacists' roles in dispensing. Beyond dispensing, more than 70% of respondents expected pharmacists to provide 'patient education' about medications. About half of respondents supported other activities related to 'patient education' and 'monitoring'.

[insert Table 5 here]

In terms of the priority roles of pharmacists, patients' responses can be seen in Table 6. The top five services perceived as priorities by patients (in addition to pharmacists' traditional roles of dispensing) were from the 'patient education' domain – education related to medications [i.e. directions for use (64.5%), common/important adverse effects (25.5%), storage requirements (26.6%)] and the 'monitoring' domain – monitoring compliance with medications (37.3%). No new services were raised from this open-ended question.

[insert Table 6 here]

Characteristics associated with patients' views on pharmacist roles

Logistic regression models were used to identify patient characteristics which were associated with patients' views on pharmacists' roles. The odds ratios of significant characteristics are summarised in Table 7.

[insert Table 7 here]

Patient experience (previous use) with a service was strongly associated with their views that the service should be provided by pharmacists [Odds Ratios (ORs) 4.4 to 11.3]. Patients with poor/unknown glycaemic control or those who had risk factors for complications were more supportive of pharmacists providing some monitoring services (ORs 2.3 to 10.2). On the other hand, patients with higher incomes or those who were working were less supportive towards pharmacists providing some education and monitoring services (ORs 0.3).

Discussion

This study has found most type 2 diabetes patients recruited had complications and/or risk factors for complications, and/or had poor/unknown glycaemic control. It is evident that in the current hospital outpatient/clinic treatment model many patients were poorly monitored. This is consistent with a population study of type 2 diabetes patients in Indonesia which reported that 81% of type 2 diabetes patients had not achieved good glycaemic control (HbA1c <6.5%), and approximately 60% of the patients had complications and/or risk factors for complications (i.e. dyslipidaemia and/or hypertension) [3].

Moreover, this study reported that follow-up care tended to be inadequate, with only about one-third of respondents reporting annual HbA1c monitoring and eye or foot examinations. Supporting this finding, the Patient and Health Provider Survey in Indonesia (2012) indicated that the majority of patients had not received foot or eye examinations within the past year, only 30% had had their HbA1c checked and many had expressed a wish to see health care providers more often [23]. It was suggested that this poor quality of care and patient outcomes might relate

to the lack of awareness of, accessibility to and affordability of diabetes care for this patient group [23]. This finding provides a basis for community pharmacists to provide a range of services.

Patients' use of pharmacy services and their views on pharmacist roles

This study indicated little involvement of Indonesian community pharmacies in the care of patients with type 2 diabetes. Respondents mostly utilised pharmacists for their supply role (dispensing). A previous Indonesian study has confirmed the limited services provided to general pharmacy patients [15].

Amongst non-supply roles, many respondents chose roles closely related to dispensing as the priority roles of pharmacists, i.e. education related to medications, and monitoring compliance with medications. Similar findings were evident from some international studies involved diabetes patients [10-14]. Two qualitative studies indicated that patients identified the primary expertise of the community pharmacist as medicines supply, and there were mixed perceptions of community pharmacists' roles extending to advising on prescription medicines, providing disease-related/health advice or providing monitoring services (using clinical testing devices) [14, 24].

Characteristics associated with patients' views on pharmacist roles

The logistic regression models consistently found that a patient's support for a service was influenced by their experience (previous use) of the service (Odds Ratios, ORs $\geq$4.4). Supporting this finding, studies worldwide have shown that type 2 diabetes patients have increased

perceptions of pharmacists' ability to assist them after receiving pharmacy-based services [25-29]. It should be emphasised that most patients in this study (at that time) received limited services from community pharmacies, thus they might not be aware of what pharmacists should and could do.

The implementation of *Jaminan Kesehatan Nasional* - JKN (National Health Coverage) in 2014 provides the best opportunity to optimise the use of Indonesian community pharmacies. It is important for the Government and IAI to establish an agreement on the basic services that should be available in community pharmacies. While the current payment under the scheme includes a very low prescription fee [30], the IAI should negotiate adequate remuneration for pharmacists to provide the services, thus enabling community pharmacies to remain viable.

In addition to patients' past experiences, patients who were working and/or had higher incomes were generally less supportive of some of the proposed education or monitoring services (ORs $\leq$0.5). This might be because these groups of patients were likely to be younger (mean age 63.7 years for non-workers versus 54.0 years for workers, $p<0.0001$; and mean age 60.4 years for income $\leq$Rp 5 million versus 58.6 years for income >Rp 5 million, $p=0.358$). Two previous studies have reported that older patients, or those living with diabetes for a long time, were more supportive of pharmacists' contributions [14, 31]. It has been suggested that elderly people are one of the groups whose need for additional advice on medications and other related services has been demonstrated [32].

Notably, patients who had risk factors for complications and/or had poor/unknown glycaemic control were much more supportive of pharmacists monitoring treatment outcomes or adverse drug reactions (ORs ≥2.3). Such patients might reflect those with lower health status, representing a target group who might be more motivated and responsive to pharmacists' involvement. It has been suggested that patients who benefit most from pharmacist-led education/coaching and disease state management services include those with poor glycaemic control and multiple comorbidities [33]. It is evident that overall treatment outcomes in this patient cohort are concerning and expanding the community pharmacy role into patient management needs to be investigated.

Limitations

The stratified sampling method used in the study (20 patients from each of 10 pharmacies) was considered the only feasible manner by which it could be conducted. No full list of pharmacy patients with diabetes exists in Surabaya, so it was not possible to obtain a truly random sample of patients with this condition. However, the pharmacies covered a wide range of settings (geographic and socioeconomic), so that no particular group of patients would be excluded. The characteristics of the respondents in this study were comparable with respect to age, gender and duration of diabetes to those of a population study involving all type 2 diabetes patients visiting 18 medical centres across Indonesia between November 2008 and February 2009 (N=1785) [3]. Hence, although the sample is not truly random, the views of participants give some insight into the diabetes services used or desired at community pharmacies in Surabaya.

Conclusions

Community pharmacies in Surabaya, Indonesia in this study are mainly utilised for their basic services of dispensing. Many type 2 diabetes patients in these pharmacies reported limited monitoring of blood glucose and poor glycaemic control; in addition, their follow-up care and health outcomes were generally poor. These findings indicate a need and opportunities for community pharmacists to provide a range of services for patients with diabetes. Hence, strategies should be developed to broaden current pharmacy patients' limited views of pharmacists' roles which are mainly perceived as extensions to the supply roles. It is evident that patients support the provision of services once they have been provided. Patient characteristics that influence these views provide a target group for implementation of a pharmacy-based diabetes service that should be evaluated. This can provide a partial solution in the environment of a burgeoning burden of diabetes in Indonesia.

Acknowledgements

We thank all the participants who took part in the survey as well as *Ikatan Apoteker Indonesia* – IAI (Indonesian Pharmacists Association) and staff from the Centre of Medicines Information and Pharmaceutical Care (CMIPC), Pharmacy Faculty, Universitas Surabaya, for their technical support in making this study possible.

References

1. International Diabetes Federation (IDF). IDF Diabetes Atlas 6th edition [Internet]. Brussels: IDF; 2013 [cited 2015 May 15]. Available from: http://www.idf.org/sites/default/files/EN_6E_Atlas_Full_0.pdf. ISBN: 2930229853.
2. Fowler M. Microvascular and macrovascular complications of diabetes. Clin Diabetes. 2008; 26(2):77-82.
3. Soewondo P, Soegondo S, Suastika K, Pranoto A, Soeatmadji D, Tjokroprawiro A. The DiabCare Asia 2008 study – outcomes on control and complications of type 2 diabetic patients in Indonesia. Med J Indon. 2010; 19(4):235-244.
4. Soewondo P, Ferrario A, Tahapary D. Challenges in diabetes management in Indonesia: a literature review. Glob Health. 2013; 9(1):63.
5. Kementrian Kesehatan Republik Indonesia (Kemenkes RI). Indonesia health profile 2012 [Internet]. Jakarta: Kemenkes RI; 2013 [cited 2015 May 15]. Available from: http://depkes.go.id/downloads/Profil%20Kesehatan_2012%20(4%20Sept%202013).pdf
6. Wang H, McEuen M, Mize L, Cisek C. Private sector in Indonesia: a desk review [Internet]. Bethesda: Health Systems 20/20 project Abt Associates Inc.; 2009 [cited 2015 May 9]. Available from: http://www.healthsystems2020.org/content/resource/detail/2355/
7. Kementrian Kesehatan Republik Indonesia (Kemenkes RI). Keputusan Menteri Kesehatan nomor 1027/MENKES/SK/IX/2004: standar layanan kefarmasian di apotek [Ministry of Health Decree number1027/MENKES/SK/IX/2004: standards for pharmaceutical care in community pharmacies]. Jakarta: Kemenkes RI; 2006.
8. Wibowo Y, Parsons R, Hughes J, Sunderland B. An evaluation of community pharmacy-based services for type 2 diabetes in an Indonesian setting: Pharmacist Survey. Int J Clin Pharm. Forthcoming 2015. DOI :10.1007/s11096-015-0135-y.
9. American Diabetes Association. Standards of medical care in diabetes - 2013. Diabetes Care. 2013; 36 Suppl 1:S11-66.
10. Abduelkarem A, Sackville M, Morgan R, Hildreth A. An assessment of the level of type 2 diabetes patients' satisfaction with community pharmacists' services. Pharm J. 2003; 270(7242):446-449.

11. Weitzman A, McDowell K, Elswick B, Blommel M. Patient perceptions of pharmacists' role in diabetes: results of an Operation Diabetes initiative. J Am Pharm Assoc. 2009; 49(6):716-717.
12. Brown C, Green A. Expectations of patients with diabetes for pharmaceutical care services in community pharmacy settings. J Soc Admin Pharm. 2000; 17: 219-223.
13. Hermansen-Kobulnicky C, Worley M. Exploring the patient perspective regarding community pharmacists' educational roles in diabetes medication and blood glucose management. Int J Pharm Pract. 2008; 16(2):81-90.
14. Twigg M, Poland F, Bhattacharya D, Desborough J, Wright D. The current and future roles of community pharmacists: views and experiences of patients with type 2 diabetes. Res Soc Admin Pharm. 2013; 9(6):777-789.
15. Handayani R, Raharni, Gitawati R. Persepsi konsumen apotek terhadap pelayanan apotek di tiga kota di Indonesia [pharmacy customers' perceptions regarding pharmacy services in the three cities in Indonesia]. Makara Kesehat. 2009; 13(1):22-26.
16. Abdullah N, Andrajati R, Supardi S. Pengetahuan, sikap dan kebutuhan pengunjung apotek terhadap informasi obat di kota Depok [Pharmacy customers' knowledge, attitude and needs of drug information in the city of Depok]. Bul Penelit Sist Kesehat. 2010; 13(4):344-352.
17. Tabachnick B, LS Fidell L. Using Multivariate Statistics. 5th ed. Boston: Pearson Education Inc.; 2007.
18. Nugroho M. Analisis pengelompokan dan pemetaan kecamatan sebagai dasar program untuk mengatasi masalah-masalah sosial-ekonomi di Kota Surabaya [Analysis of distric mapping systemto manage socio-economic issues in Surabaya] [dissertation]. Surabaya: Institut Sepuluh Nopember; 2010.
19. Perkumpulan Endokrinologi Indonesia (PERKENI). Konsensus pengendalian dan pencegahan diabetes mellitus tipe 2 di Indonesia 2011 [The 2011 consensus for the management and prevention of type 2 diabetes mellitus in Indonesia] [Internet]. Jakarta: PERKENI; 2011 [cited 2015 May 17]. Available from: http://www.perkeni.org/
20. Power A, Douglas E, Mc Gregor A, Hudson S. Professional development of pharmaceutical care in type 2 diabetes mellitus: a multidisciplinary conceptual model. Int J Pharm Pract. 2006; 14(4):289-299.

21. Diabetes Australia. Diabetes management in general practice: guidelines for type 2 diabetes 2012/13. Canberra: Diabetes Australia Limited; 2012. ISBN: 9781875690190.
22. Landis J, Koch G. The measurement of observer agreement for categorical data. Biometrics. 1977; 33(1):159-174.
23. Novo Nordisk. Where economics and health meet: changing diabetes in Indonesia: the blueprint for change programme [Internet]. 2013 [cited 2015 May 11]. Available from:http://www.novonordisk.com/images/Sustainability/PDFs/Blueprint-for-change-Indonesia--52383_Korr19.pdf.
24. Gidman W, Cowley J. A qualitative exploration of opinions on the community pharmacists' role amongst the general public in Scotland. Int J Pharm Pract. 2013; 21(5):288-296.
25. Fera T, Bluml B, Ellis W, Schaller C, Garrett D. The diabetes ten city challenge: interim clinical and humanistic outcomes of a multisite community pharmacy diabetes care program. J Am Pharm Assoc. 2008; 48(2):181-190.
26. Garrett D, Martin L. The Ashville project: participants' perceptions of factors contributing to the success of a patient self management diabetes program. J Am Pharm Assoc. 2003; 43(2):185-190.
27. Hughes J. Final report: customised education programs for patients with diabetes mellitus − use of structured questionnaires and education modules (DMEP Study). Perth: Curtin University of Technology; 2006.
28. Abduelkarem A, Sackville M. Changes of some health indicators in patients with type 2 diabetes: a prospective study in three community pharmacies in Sharjah, United Arab Emirates. Libyan J Med. 2009; 4(1):31-36.
29. Hales J, Alderdice A, Staniford T, Manser J. Evaluation of the diabetes pilot program. Adelaide: Australian Government Department of Health and Ageing; 2010.
30. Kementrian Kesehatan Republik Indonesia (Kemenkes RI). Surat Edaran nomor HK/MENKES/31/2014: pelaksanaan standar tarif pelayanan kesehatan pada fasilitas kesehatan tingkat pertama dan fasilitas kesehatan tingkat lanjutan dalam penyelenggaraan program jaminan kesehatan [Operational standards for remuneration of primary and secondary/tertiary health care services in the health insurance program]. Jakarta; Kemenkes RI; 2014.

448 31. Ibrahim I, Al Tukmagi H, Wayyes A. Attitudes of Iraqi society towards the role of
449 community pharmacists. Innov Pharm. 2013; 4(2):1-10.
450 32. Cartwright A, Smith C. Elderly people, their medicinse, and their doctors. London:
451 Routledge; 1988. ISBN: 9780415006842
452 33. Sisson E, Kuhn C. Pharmacist roles in the management of patients with type 2 diabetes. J Am
453 Pharm Assoc. 2009; 49 Suppl 1:S41-45.
454

456 Table 1 Patient recruitment data from 10 community pharmacies

457

Pharmacy code	Geographical area	Socio-economic level	Average number of diabetes patients per month	Number of diabetes patients recruited
Pharmacy 1	East Surabaya	2	150	21
Pharmacy 2	Central Surabaya	1	200	18
Pharmacy 3	East Surabaya	3	70	20
Pharmacy 4	West Surabaya	4	100	19
Pharmacy 5	South Surabaya	3	140	20
Pharmacy 6	Central Surabaya	2	100	20
Pharmacy 7	South Surabaya	4	100	20
Pharmacy 8	North Surabaya	1	240	19
Pharmacy 9	West Surabaya	3	120	20
Pharmacy 10	North Surabaya	2	100	19
Total				**196**

458

459

460

462 Table 2 Demographic data of patient respondents (N=196)

463

Patient demographics	Frequency (%)
Gender	
Male	80 (40.8)
Female	116 (59.2)
Age, years – median (range)	60.0 (32–86)
Ethnicity	
Asian	196 (100.0)
Others	0 (0.0)
Highest Education	
No schooling	6 (3.1)
Primary school	23 (11.7)
Junior high school	41 (20.9)
Senior high school	71 (36.2)
Diploma	18 (9.2)
Bachelor degree	25 (12.8)
Postgraduate degree	12 (6.1)
Employment status	
Working full-time (≥40 hours/week)	53 (27.0)
Working part-time (<40 hours/week)	20 (10.2)
Not working	123 (62.8)
Total household income (from all sources) per month[a]	
≤Rp 2 million	103 (52.6)
>Rp 2 million – 5 million	54 (27.6)
>Rp 5 million – 10 million	25 (12.8)
>Rp 10 million	12 (6.1)
Health insurance	
Self-sponsored insurance	31 (15.8)
Employer-sponsored insurance	56 (28.6)
Insurance scheme for the poor/near poor	9 (4.6)
No insurance	100 (51.0)
Member of a diabetes organisation	
Yes	74 (37.8)
No	122 (62.2)

464 Abbreviations: Rp, Indonesian rupiah
465 [a] 2 missing responses

467 Table 3 Self-reported diabetes and health profile of patient respondents (N=196)

468

Patient diabetes profile	Frequency (%) of 'yes'
Duration of diabetes, years – median (range)[a]	7 (1 – 42)
Current diabetes treatment	
Modifying diet	173 (88.3)
Exercise programme	123 (62.8)
Oral Antidiabetic Medication	189 (96.4)
Insulin	44 (22.4)
Risk factors[c]	157 (80.1)
BMI ≥25 kg/m^2[b]	88 (44.9)
(History of) smoking	41 (20.9)
High cholesterol[d]	77 (39.5)
High blood pressure[e]	104 (53.6)
Complications[c]	115 (58.7)
Heart disease	34 (17.3)
Eye problems	52 (26.5)
Foot discomfort	81 (41.3)
Foot ulcers	14 (7.1)
Kidney problems	16 (8.2)

469 [a]Some missing responses
470 [b]BMI, body mass index = weight (kg) divided by height^2 (m^2); some missing responses
471 [c]Respondents responded 'yes' for at least one complication/risk factor
472 [d]Respondents responded 'yes', either for *"Do you have high cholesterol?" or "Do you take medications to treat your high cholesterol?",* or for
473 both
474 [e]Respondents responded 'yes', either for *"Do you have high blood pressure?" or "Do you take medications to treat your high blood pressure?",*
475 or for both

477 Table 4 Self-reported monitoring profile of patient respondents (N=195)[a]

478

Patient monitoring	Frequency (%) of 'yes'
Diabetes (glycaemic) control	
High blood sugar reactions (in the last month)	56 (28.7)
Low blood sugar reactions (in the last month)	43 (22.1)
Severe blood sugar reactions (in the last year)	26 (13.3)
HbA1c last value	53 (27.0)[b]
<6.5%	18
6.5−8%	27
>8%	8
Routine tests	
SMBG (in the last week)	74 (37.9)
Medical monitoring (in the last 3 months)	
Blood sugar	167 (86.1)
Blood pressure	166 (85.1)
Weight	124 (63.9)
HbA1c measurement (in the last year)	65 (33.3)
Medical monitoring (in the last year)	
Cholesterol	127 (65.1)
Kidney	84 (43.1)
Eyes	48 (23.2)
Feet	41 (21.0)

479 Abbreviations: SMBG, self-monitoring of blood glucose; HbA1c, glycosylated haemoglobin
480 [a]1 missing response
481 [b]number of respondents reported their HbA1c last value

483 Table 5 Patients' use of community pharmacy services and their views on pharmacists' roles
484 (N=196)

Services	Being used N (%)	Being viewed as pharmacist roles[a] N (%)
Treatment administration		
Prepare medications	196 (100)	195 (100)
Provide labels with instructions for use	196 (100)	195 (100)
Patient education		
Disease process	93 (47.4)	120 (61.5)
Treatment targets	79 (40.3)	115 (59.0)
Antidiabetic medications:		
Directions for use	156 (79.6)	160 (82.1)
Use of insulin devices[b]	27 (61.4)	142 (72.7)
Storage requirements	93 (47.4)	144 (73.9)
Special precautions to follow	141 (71.9)	155 (79.5)
Common/important adverse effects	87 (44.4)	139 (71.3)
Exercise	66 (33.7)	96 (49.2)
Diet	84 (42.9)	101 (51.8)
SMBG	63 (32.1)	107 (54.9)
Prevention/treatment of acute complications	67 (34.2)	126 (64.6)
Prevention/treatment of chronic complications	45 (23.0)	116 (59.5)
Need for regular medical monitoring	48 (24.5)	97 (49.8)
Foot self-care	35 (17.9)	95 (48.7)
Smoking cessation[c]	12 (29.3)	72 (36.7)
Monitoring		
Monitor compliance with:		
Antidiabetic medications	100 (51.0)	127 (65.1)
Exercise plan	62 (31.6)	102 (52.3)
Diet plan	78 (39.8)	109 (55.9)
Plan for prevention/treatment of chronic complications	44 (22.4)	92 (47.2)
Scheduled medical monitoring	38 (19.4)	96 (49.3)
Monitor treatment outcomes:		
Check records on SMBG	58 (29.6)	101 (51.8)
Carry out blood glucose tests	58 (29.6)	113 (58.0)
Measure BMI	40 (20.4)	89 (45.6)
Measure blood pressure	55 (28.1)	103 (52.8)
Check results on patient laboratory tests	51 (26.0)	98 (50.3)
Monitor for adverse effects	63 (32.1)	110 (56.4)
Review		

Refer patients if necessary	69 (35.2)	110 (56.5)

Abbreviations: SMBG, self-monitoring of blood glucose; BMI, body mass index

[a]1 missing response

[b]The percentage was calculated for patients currently/previously taking insulin (N=44)

[c]The percentage was calculated for patients currently (or had a history of) smoking (N=41)

490 Table 6 Patients' open-ended views on priority roles of pharmacists in diabetes care (N=169)[a]

491

Priority services[b]	Number of responses (%)
Treatment administration	
Prepare medications	35 (20.7)
Provide labels with instructions for use	66 (39.1)
Patient education	
Disease process	27 (16.0)
Antidiabetic medications:	
Directions for use	109 (64.5)
Use of insulin devices	15 (8.9)
Storage requirements	45 (26.6)
Special precautions to follow	37 (18.9)
Common/important adverse effects	50 (25.5)
Exercise	27 (13.8)
Diet	33 (16.8)
Prevention/treatment of acute complications	27 (16.0)
Prevention/treatment of chronic complications	20 (11.8)
Monitoring	
Monitor compliance with:	
Antidiabetic medications	63 (37.3)
Monitor treatment outcomes:	
Carry out blood glucose tests	30 (17.8)
Measure blood pressure	25 (14.8)
Monitor for adverse effects	23 (13.6)
Others *(not a specific service)*	
Provide a complete range of medications	12 (7.1)
Information about medications	16 (9.5)

492 Responses to an open-ended question: *"In your opinion, what are the five most important services that should be provided at pharmacies to assist*
493 *you with your diabetes?"*
494 [a]From a total 196 respondents, there were 26 missing responses and 1 invalid response, giving a total N=169
495 [b]Services selected by more than 10 respondents

Table 7 Odds ratios and 95% confidence intervals of significant characteristics associated with support for 'patient education' and 'monitoring' by pharmacists

	Patient education by pharmacists			**Monitoring by pharmacists**				
						Treatment outcomes		
	Medications[a]	Exercise	Diet	All education[b]	Compliance[c]	Perform clinical testings[d]	Check test results[e]	Adverse drug reaction
Income								
Low	reference	reference	reference	reference	reference			reference
Moderate	NS	0.4 (0.17-0.90)	NS	NS	NS			NS
High	0.3 (0.10-0.72)	0.3 (0.10-0.80)	0.3 (0.12-0.61)	0.3 (0.10-0.68)	0.3 (0.10-0.72)			0.2 (0.09-0.53)
Employment								
Not working		reference		reference	reference	reference	reference	
Working		0.3 (0.15-0.83)		0.5 (0.24-0.94)	0.4 (0.21-0.88)	0.5 (0.24-0.97)	0.3 (0.15-0.74)	
Risk factors								
No								reference
Yes								3.4 (1.46-8.03)
Diabetes (glycaemic) control[f]								
Good/fair						reference	reference	reference
Poor						NS	4.9 (1.20-20.55)	3.2 (1.05-9.97)
Unknown						2.3 (1.22-4.51)	10.2 (2.44-42.95)	4.3 (1.36-13.57)
Previous use of the service								
No	reference	reference	reference	reference	reference	reference	reference	reference
Yes	4.5 (1.79-11.53)	10.3 (4.6-23.15)	4.4 (2.30-8.30)	4.5 (1.60-12.51)	5.2 (1.79-11.52)	13.6 (5.21-35.51)	11.3 (4.51-28.13)	6.3 (2.82-13.90)

[a]A composite variable – education related to antidiabetic medications: directions for use, use of insulin devices (calculated only from those currently/previously taking insulin), storage, special precautions and common/important adverse effects; a mean rating ≥5 was used

[b]A composite variable – all education: disease process, treatment targets, antidiabetic medications, exercise, diet, self-monitoring of blood glucose, prevention/treatment of acute complications, prevention/treatment of chronic complications, need for regular monitoring, foot self-care and smoking cessation (calculated only from those currently, or had a history of, smoking); a mean rating ≥5 was used

[c]A composite variable – monitoring compliance with: antidiabetic medications, exercise and diet plan, plan for prevention/treatment of complications and scheduled medical monitoring; a mean rating ≥5 was used

[d]A composite variable – perform clinical testings (measuring blood glucose, blood pressure and BMI); a mean rating ≥5 was used

[e]A composite variable – check test results (patient self-monitoring records and laboratory data); a mean rating ≥5 was used

[f]Diabetes (glycaemic) control is a composite variable of hyper/hypoglycaemia symptoms and HbA1c values

NS = not significantly different from the reference