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## Challenges and opportunities in managing diabetes in Cambodia; a qualitative study of patients' perspectives and health care providers' perspectives

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3 **Challenges and opportunities in managing diabetes in Cambodia; a qualitative study of patients'**  
4 **perspectives and health care providers' perspectives**  
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## ABSTRACT

**Objective:** This study aimed to explore the challenges of managing diabetes mellitus (DM) in a low- and middle- income country (LMIC) facing a projected rise in DM prevalence.

**Design:** In-depth interviews with health service providers and focus group discussions with DM patients.

**Setting:** Urban, semi-urban, and rural areas in Cambodia.

**Participants:** Thirty health service providers and fifty-nine adult DM patients.

**Intervention:** In each study site representing a different level of urbanicity, in-depth interviews and focus group discussions were conducted with health service providers and adult DM patients respectively. Content analysis comprised of inductive and deductive approaches was applied to qualitative data.

**Primary outcome measures:** The challenges encountered by health care providers and patients in managing diabetes.

**Results:** Most of the 59 DM patients reported having developed DM complications when they first sought treatment. The biggest challenges for the patients were geographical barriers, diet control, and shortage of drugs. The healthcare staff expressed concerns about their limited knowledge and lack of confidence to treat diabetes, limited availability of diabetes service, inadequate laboratory services, shortage of staff, poor patients' compliance, and insufficient drug supplies. Both healthcare staff and patients urged an expansion of diabetes services in Cambodia and prioritization of diabetes care in a manner similar to communicable disease control programmes of the recent past.

**Conclusions:** A LMIC's health system with a strong record of communicable diseases control like that of Cambodia is likely to face challenges of largely unmet rising demand for non-communicable disease services.

**Keywords:** diabetes, health services, qualitative, challenges, opportunities, Cambodia

## Article Summary

### Strengths and limitations of this study

- This study provides an insight into the diabetes care services in Cambodia.
- We interviewed patients and health care providers both in public and private sectors allowing the triangulation of the diverse perspectives on diabetes management.
- We managed to include DM patients from different geographical regions of Cambodia including the regions near the border and geographically isolated areas.
- Most of the patients in this study were recruited at the hospitals or through the service providers, hence diabetes patients who did not have access to these health services may not be included in this study.

### 1. Introduction

Like other low- and middle-income countries (LMICs), Cambodia is experiencing a double burden of communicable and non-communicable diseases. While the crude death rate of tuberculosis decreased over the period between 2000 and 2012, the mortality due to ischemic heart disease and stroke increased leading them into top three causes of death. Cardiovascular diseases and diabetes mellitus (DM) accounted for the third highest disability-adjusted life years (DALYs) number (1). The prevalence of impaired fasting glycemia and diabetes have dramatically increased from 1.4% and 2.9% in 2010 (2) to 8.9% and 9.6% in 2016 (University of Health Science, Ministry of Health. Prevalence of non-communicable disease risk factors in Cambodia. STEPS Survey Country Report 2016) respectively. A modelling study based on STEPS Survey 2010 data projected a 10% increase of type 2 DM prevalence (80% increase in absolute numbers) in older than 35 years old in Cambodia by 2028 (3). Remarkably of Cambodia, the percentage of deaths before 60 years of age attributable to DM and the prevalence of adults with undiagnosed DM is higher than in most other countries (4). It has been reported that more than 50% of persons with DM were not treated (5) while there was a high prevalence of complications such as renal failure in people with DM (6). The socio-economic burden of DM in Cambodia is substantial with a clear upward trend (3) but the

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2  
3 health system has been traditionally oriented towards communicable diseases control and may not be ready  
4  
5 to cope with the rising burden of non-communicable diseases (7).  
6

7 In order to formulate effective policies and interventions, it is imperative to understand the challenges and  
8  
9 opportunities of managing DM in the local population. However, these issues have not been addressed in  
10  
11 Cambodia in depth yet. In this study we aimed to explore the challenges and opportunities of managing  
12  
13 DM from a health service providers' perspective and patients' perspective.  
14  
15

## 16 **2. MATERIALS AND METHODS**

### 17 **2.1 Research design**

18  
19 A qualitative cross-sectional study was conducted to explore the challenges and opportunities in  
20  
21 managing diabetes in Cambodia.  
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23

### 24 **2.2 Study sites**

25  
26 This study was conducted in 4 provinces of Cambodia: Phnom Penh (capital of the country), Siem Reap  
27  
28 and Banteay Meanchey (north-west of the country), and Mondulhiri (east of the country) (Figure 1). These  
29  
30 study sites were selected based on the level of urbanicity, geographic location, and feasibility.  
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33  
34 In each area, we conducted in-depth interviews (IDIs) with health service providers and focus group  
35  
36 discussions (FGDs) with DM patients.  
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### 39 **2.3 Data collection**

40  
41 To achieve maximum variation, we interviewed thirty health care providers with a minimum of one-year  
42  
43 experience in providing DM or chronic disease care in the hospitals at the national, provincial and district  
44  
45 level and peer educators of a local non-governmental organization (NGO) providing DM service.  
46  
47

48 Health care staff in participating institutions helped the research team in recruiting DM patients at any stage  
49  
50 for FGDs. In total, fifty-nine adults aged 21 and above, diagnosed with any type of DM with any duration  
51  
52 of the disease participated in focus group discussions. There were seven FGDs with five to ten DM patients  
53  
54 per FGD.  
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3 Semi-structured interview guides were used to facilitate IDIs and FGDs. For IDIs, the interview questions  
4 focused on the burden of DM and the challenges and opportunities for managing DM in health services.  
5 For FGDs, the participants were asked about their perceptions, experiences and challenges in dealing with  
6 DM with follow up questions. The interviews were conducted in Khmer by trained researchers.  
7  
8  
9

## 10 11 12 13 **2.4 Data analysis**

14 Bilingual research staff transcribed all interviews verbatim and translated them into English. We used both  
15 inductive and deductive approaches when analysing the data. Inductive analysis was used in the early stage  
16 to explore the ideas and meanings contained in the raw data and to identify concepts, patterns, and themes.  
17 Similar codes were collated to form initial themes. Once patterns, themes, and sub-themes were established  
18 by open coding, deductive content analysis was used to validate these in an iterative process. QSR NVivo  
19 11 for Windows was used to manage the data.  
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## 30 31 32 **2.5 Ethics considerations**

33 Ethics approval was obtained from the National University of Singapore Institutional Review Board (S-17-  
34 293), Singapore, and the National Ethics Committee for Health Research, Cambodia (199NECHR). Written  
35 informed consent was obtained prior to enrollment in the study. Participants were provided with a symbolic  
36 token of appreciation for their time.  
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## 43 44 **2.6 Patient and Public Involvement**

45 We did not involve patients or the public in our work.  
46  
47

# 48 49 **3. RESULTS**

## 50 51 **3.1 Characteristics of participants**

52 The characteristics of participants are shown in Tables 1 and 2. The participants of the IDIs were represented  
53 by approximately equal proportions of doctors and nurses from public sector with a few peer educators  
54  
55  
56  
57

from NGO. 73% had received diabetes training with 33% having received the training in the past six months prior to the interview.

Most of the FGD participants were farmers and housewives. Half of the participants had been diagnosed with DM at least 5 years ago, and most reported having known complications associated with DM.

**Table 1. Characteristics of in-depth interview participants**

Age (median, IQR*)	35 (31 – 48)
Gender (N, %)	
Male	21 (70.00)
Female	9 (30.00)
Education (N, %)	
Primary School	2 (6.67)
Secondary School	2 (6.67)
High School/Professional Technical training	6 (20.00)
University/Post graduate	20 (66.67)
Profession (N, %)	
Doctor	14 (46.67)
Nurse	12(40.00)
Peer Educator	4 (13.33)
Year of work in DM care (N, %)	
0-<1 year	4 (16.67)
1-5 years	11 (36.67)
5-10 years	9 (30.00)
>10 years	5 (16.67)
Number of patients treated in the past 6 months (N,	
0 – <10	4 (13.33)
10 - <40	7 (23.33)
>40	19 (63.33)
Received DM training	
Yes	22 (73.33)
No	8 (26.67)
Received DM training in the past six months (N, %)	
Yes	10 (33.33)
No	20 (66.67)
Level of health care providers (N, %)	
National level Hospital	7 (23.33)
Provincial hospital	9 (30.00)
Referral hospital	9 (30.00)
Operational district hospital	1 (3.33)
Peer Educator Network	4 (13.33)

\*IQR=the interquartile range



**Table 2. Characteristics of focus group participants**

Age (median, IQR*)	56 (50 – 63)
Gender (N, %)	
Male	14 (25.45)
Female	41 (74.55)
Education (N, %)	
Primary School	31 (56.36)
Secondary School	10 (18.18)
High School	4 (7.27)
Post graduate (Master/PhD)	1 (1.82)
Other#	9 (16.36)
Ethnic (N, %)	
Khmer	54 (98.18)
Cham	1 (1.82)
Marital status (N, %)	
Married	39 (70.91)
Unmarried	4 (7.27)
Divorced	1 (1.82)
Widowed	11 (20.00)
Employment status (N, %)	
Employed	2 (3.64)
Unemployed	10 (18.18)
Housewife	10 (18.18)
Farmer	20 (36.36)
Unskilled worker	1 (1.82)
Daily wages	4 (7.27)
Student	8 (14.55)
Household income (N, %)	
No defined income	11 (20.00)
Irregular income	33 (60.00)
Regular income	11 (20.00)
Time since diagnosis of diabetes mellitus, years	5 (3 – 10)
Time on treatment for diabetes mellitus, years	4 (3 – 10)
Having Diabetes complication (N, %)	48 (87.27)
Regular visit to clinic/ hospitals (N, %)	42 (76.36)

\*IQR=the interquartile range

#Other=no formal education

## 3.2 Patients' experiences and perspective

### 3.2.1 DM diagnosis and feelings associated with it

Patients in our FGDs had suffered from symptoms such as fatigue, frequent urination, blurred vision, and numbness in hands and feet for a few months to years before they finally sought medical help. Most patients went to private clinics for their initial check-up while a minority were referred to public hospitals by other DM patients in their community who recognized their symptoms. A few patients were diagnosed at the time of hospitalization with serious DM complications.

"I didn't know I had diabetes and then in the evening I felt dizzy and fell in coma. Then I was taken to the hospital. But it was a private Clinic called xxx that tested my blood sugar. They told me that I had high sugar. So, I decided to buy drugs for high sugar .... "[female, semi-urban, PS04]

Most patients reported that they were scared and felt hopeless when they learned their diagnosis, as they associated DM with severe outcomes such as amputations and death. Some patients said they were determined to fight it.

"I don't want other people to know, actually that feeling, we don't want anyone to know, but our family, our wife, we don't hide, ..... we are very scared, diabetes is a disease, I can see arms and legs amputations..." [male, urban, PP01]

"Talking about feeling, from rumours I heard any DM patients cannot survive; I felt quite hopeless but if there was medication for DM for me to take, I had to use it regularly to fight against this disease, if I die even if I take the medication, I won't regret". [female, rural, PB06]

### 3.2.2 DM treatment and traditional medicine use

Some participants were treated at private clinics first and then switched to public hospitals when they thought that the treatment was ineffective. There were only a few participants who sought initial treatment in the public sector.

"P7: Previously I bought medication from the pharmacy. When it got serious I seek the doctor." [male, rural, PB06]

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2  
3 Patients in Phnom Penh reported that they did not believe in using traditional medicine to control DM.  
4  
5 However, most participants living in the provinces said that they took traditional medicine concurrently  
6  
7 with DM medication prescribed by the doctors. Most traditional medicines consumed included herbs such  
8  
9 as *Morinda citrifolia*, *Zizyphus cambodiana*, *Elephantopus scaber*, *Syzygium cumini*, *Plukenetia volubilis*,  
10  
11 and *Azadirachta indica*. Participants took traditional medicine concurrently with modern medicine as they  
12  
13 believed that a combination of these two would be more effective in controlling their blood glucose.

14  
15  
16 “I think I should use apart from traditional and apart from modern (laughing) because people told me I  
17  
18 should do that. So, every day I ask someone whom I know to buy “Sdav” (*Azadirachta indica*) bark for  
19  
20 me” [female, rural, PB07]  
21

### 22 **3.2.3 Living with diabetes in the community**

23  
24 Patients expressed that living with diabetes was a huge burden for them as their lives were changed for  
25  
26 worse.  
27

28  
29 “We are afraid of falling, injury or cut, we are afraid, overall people who have diabetes have a huge burden  
30  
31 from safeguarding themselves, from taking medication regularly, coming to the hospital regularly, exercise  
32  
33 and diet, dieting, there are many. We were not like this before we were ill, we go to the restaurant we can  
34  
35 eat anything, eight dishes, we can eat nine dishes, it is fine, but now we cannot, we diet, ..... it is something  
36  
37 difficult. “[male, urban, PP01]  
38

39  
40 Most patients said there was no discrimination against them and the community felt pity for them.

41  
42 “Some people in the community feel pity for us, we are not discriminated as HIV patients. They feel  
43  
44 condolences for us because diabetes cannot be cured. [female, urban, PP02]  
45

46  
47 Only a few reported that they had encountered discrimination.

48  
49 “Yes. They are afraid of transmission; they don’t even come to ask you how you are, they stop coming to  
50  
51 drink water at your house, they walk away from us.” [male, semi-urban, PS04]  
52

### 53 **3.2.4 Challenges**

#### 54 **3.2.4.1 Diet**

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3 The majority of patients reported the most challenging factor for them was diet control. Some participants  
4 even thought that diabetes was worse than HIV as they could not eat as much as they desired.  
5

6  
7 "In my body, I find that I cannot control my eating; for example, the doctor told me that I can eat the banana  
8 and other food but when eaten, my blood sugar rises at the level higher than it was when coming to see him.  
9

10  
11 So, controlling your diet is the hardest to manage" [male, rural, PB06]  
12

13  
14 "...diabetes personally is more difficult than AIDS. People with AIDS can eat, don't have any side effect,  
15 have a long life. On the other hand, diabetes, if you eat, you will have a short life. [female, urban, PP02]  
16

17  
18 Generally, patients knew that they should not consume large quantities of food, however, they had limited  
19 knowledge about the types of food they should avoid such as high carbohydrate foods. Patients also thought  
20 they would have less energy if they ate less. Hence, patients complained that if they ate more to get energy,  
21 their blood glucose increased and if they ate less, they felt tired and couldn't perform their daily activities.  
22

23  
24 It was a significant challenge for them to properly balance between these two; gaining energy and  
25 controlling blood glucose.  
26

27  
28 "if we eat much, we can have power but eating much increases blood sugar and the DM symptoms occur;  
29 eating less, we are less energetic" [female, semi-urban, PS05]  
30

### 31 32 33 **3.2.4.2 Medication supply** 34

35  
36 The next challenging factor for patients was a regular medication supply. Most hospitals were only able to  
37 provide two to four weeks of medication per visit and it was difficult for patients, especially those from the  
38 provinces, to travel to the hospitals regularly to get the medications. Sometimes there was also a medication  
39 shortage at the hospitals. Some patients used traditional medicine as an interim measure when there was a  
40 shortage of medication.  
41

42  
43 "When I run out of medication, I go there for nothing and I just have medication left for 1 or 2 days more  
44 and not seeing them or no stock wait sometimes until next week, so my daily treatment is interrupted. So,  
45 my request is to supply drugs regularly, it will be good because if we don't take medication regularly, we  
46 feel unwell." [female, urban, PP02]  
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3 “I used traditional medicine when there was no medication from “xxx” yet. When there was no medication  
4 from “xxx”, everyone used traditional medicine.” [female, rural, PB06]  
5  
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### 7 **3.2.4.3 Distance**

8  
9 For participants attending FGDs, especially those who lived far from the hospitals, traveling and  
10 transportation expenses outweighed the cost of medications.  
11

12  
13 “Traveling by car took the whole morning and whole afternoon almost a whole day; then when arriving  
14 there, waiting to receive the service there was also the whole day. I went there, I waited for the doctor since  
15 morning until around 2-3 pm that I received the treatment....” [male, rural, PB07]  
16  
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18  
19 Nonetheless, they acknowledged that the cost of medications could be prohibitive for people living in  
20 poverty, and several patients were not able to get treatment due to lack of financial resources even though  
21 they knew their disease condition.  
22

23  
24 “In my point of view, for those who are normal economic status they can afford regular treatment fee, they  
25 can continue their lives with current treatment service but for those who cannot afford, they die faster.  
26 ...And therefore, I would like to request the government to make it a priority just like AIDS .....” [female,  
27 urban, PP02]  
28  
29

## 30 **3.3 Health providers’ perspective**

31  
32 All health care providers we interviewed recognized the rising burden of DM and the challenges it poses to  
33 the health care system. They mentioned it was quite common to see DM patients with complications and  
34 the most common complications were renal dysfunction, diabetic eye disease and foot ulcers. Most health  
35 care staff reported they had seen more female patients than male patients.  
36

### 37 **3.3.1 Challenges**

#### 38 **3.3.1.1 Limited knowledge and skills**

39  
40 Many healthcare staff at the provincial and district hospitals expressed concerns about their limited  
41 knowledge and lack of confidence to treat DM, especially those with complications.  
42

43  
44 “I am a doctor, but I am not specialized in this field. I only look after minor illnesses, in case of severe  
45 diabetes, I am afraid to treat.” [HP11, medical doctor, rural]  
46  
47

1  
2  
3 "For our nurses, they haven't got the skill relating to diabetes patient care because they never attended a  
4 training course related to diabetes." [HP29, nurse, urban]  
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6

7 This was compounded by the fact that most patients had already developed complications at the time of  
8 diagnosis.  
9  
10

11 "The majority nowadays come in with problems related to complications such as a problem with the kidneys  
12 or leg ulcers, eye problems as well. Err...the majority of diabetes patients, once they are diagnosed, one or  
13 two complications have already developed." [HP09, medical doctor, urban]  
14  
15

16 "Most of the patients know about their diabetes after being sick for five to six years. They didn't come to  
17 see us immediately, this is from my experience, four to ten years." [HP 06, medical doctor, urban]  
18  
19

### 20 21 22 **3.3.1.2 Lack of diabetes services** 23

24 DM services are only available at referral hospitals and national hospitals. There are very few district  
25 hospitals that have DM services. Clinicians in those hospitals expressed frustration about the lack of  
26 capacity to treat patients and the need to refer them to other hospitals. Moreover, some patients could not  
27 afford to go to the referral hospitals and instead chose to get alternative treatment or treatment at the  
28 hospitals near their homes even though they knew these hospitals had limited capacity to provide proper  
29 DM care.  
30  
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32 "They [the patients] come to seek us, and we refer them, this means that we have failed, this means that we  
33 have failed. .... they will seek the Khmer medication." [HB28, medical doctor, rural]  
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35

36 "They are poor. When we need to refer them, it is around 40 to 50 km from their home. If they get treatment  
37 near their home, their wife or children could cook rice for them or cook in the hospital, they spend less. But  
38 if they go there, they have to spend more. .... Because they decided that they don't go, they don't attend  
39 the counselling, we explain. We are out of options; we cannot send a sick patient who is about to die home.  
40 At least we have a doctor to treat". [HB28, medical doctor, rural]  
41  
42

### 43 44 45 **3.3.1.3 Limited medication supply** 46

47 Generally, public hospitals were supplied with medicines every quarter. However, the supply was usually  
48 not sufficient to cope with the patients' needs and the hospitals had to purchase the medicines with hospital  
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3 funds or encourage patients to buy their medications at the private pharmacies. Due to limited supply, some  
4 hospitals could only provide a one or two weeks supply of medicines to patients. This impacted negatively  
5 on patients' compliance to medication as some patients lived far from the hospitals and were not able to  
6 come and collect their medicines regularly.  
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10  
11 "For example, a patient lives far, sometimes the hospital supplied them two weeks. They run out of  
12 medication, they don't have the fee to come and pick up the medication, so err, at the district hospital or the  
13 health centre near their home should have this medication for them to access." [HM10, nurse, rural]

14  
15 Moreover, the variety of anti-diabetic drugs available at most hospitals was also limited. Some hospitals  
16 had only one type of anti-diabetic drug (metformin) and most hospitals did not stock insulin. The health  
17 care staff consistently mentioned limited variety of anti-diabetic drugs was a challenge impacting proper  
18 DM care.  
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26 "In our hospital, we have a shortage of medication, for some patients who arrived with hyperglycaemia, it  
27 is difficult for us because, to be specific, we have insulin shortage. We don't have anything to lower it. We  
28 only have oral medication like Glibenclamide, Metformin and, for injection, we only have intermediate-  
29 acting insulin. We don't have the rapid-acting insulin, so we are worried about this illness. If a diabetes  
30 patient with hyperglycaemia gets a coma, it is difficult for us. It causes concern among us." [HM-11,  
31 medical doctor, rural]  
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### 39 **3.3.1.4 Laboratory service**

40  
41 Another challenge for the health care staff was the inability to properly monitor patients' conditions due to  
42 inadequate laboratory facilities. Most hospitals did not have laboratory equipment to test HbA1c. Hence, it  
43 was difficult for the staff to monitor the patients' DM control.  
44  
45  
46

47 "... we treat diabetes too, but we do not have " diabetes specialist"(endocrinologist). Blood monitoring  
48 such as examining A1c haemoglobin is not available because we don't have a laboratory. And the  
49 medication specializes in lowering the blood glucose. We don't have a lot of kinds of medication. We only  
50 have Glibenclamide and Metformin." [HS18, nurse, semi-urban]  
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3 In addition, most patients did not have a glucometer to monitor their blood glucose regularly. They only  
4 tested their blood glucose once a month when they came to pick up their medicines at the hospitals or only  
5 when they were not feeling well.  
6  
7

8  
9 “Regarding monitoring, we test the blood glucose once per month or if the patients can afford, they could  
10 examine every two weeks. The worst would be to monitor once every three months.” [HS18, nurse, semi-  
11 urban]  
12  
13

### 14 15 **3.3.1.5 Shortage of staff**

16 Majority of health care staff mentioned the current manpower was insufficient to cope with the increased  
17 numbers of patients and thus this subsequently affected the quality of care.  
18

19  
20 “The challenges in providing service, the most important one is that our resources are limited. There are  
21 not many people working, so the quality of counselling, the quality of the provision is limited. [HS13,  
22 medical doctor, semi-urban]  
23  
24  
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### 28 29 **3.3.1.6 Poor self-management and compliance of patients**

30 The inability of patients to manage their condition well was an additional challenging factor for health care  
31 staff.  
32

33  
34 “The challenge with the patient is that they don't manage themselves appropriately, they leave their health  
35 to a difficult stage, the most difficult stage, so it is also difficult for the doctor too.” “...Patient has difficulty  
36 using insulin on their own, .... the difficulty is that their diet is not appropriate, and their usage of insulin  
37 is not appropriate”. [HP04, nurse, urban area]  
38  
39  
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42

## 43 44 **3.4 Suggestions from patients and health care providers**

45 Staff training, medication supply, and health education/counselling for patients consistently came up at the  
46 top as suggestions to improve DM management.  
47

48  
49 **Staff training.** Health care staff in both urban and rural areas expressed the need for training. A DM  
50 specialist in the urban area mentioned that the emphasis should be given to the healthcare staff in the rural  
51 areas as he had seen patients from rural areas with severe DM complications that could have been prevented  
52 if the staff in the rural area had been equipped with knowledge and skills to treat DM.  
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3 **Regular supply of medication.** Both patients and healthcare staff urged sufficient supplies of DM  
4 medicines. The interruption in the medication supply affected the compliance of patients, especially those  
5 living in poverty who could not afford to travel to the referral hospitals in other provinces or buy  
6 medications at private pharmacies.  
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11 **Health education and counselling.** Although healthcare staff recognized the need for improved health  
12 education and counselling for patients, they lacked time and resources to do so. They suggested having  
13 more staff and facilities to provide proper counselling and education to patients. Patients also wished for  
14 more counselling/health education so that they could manage their DM better.  
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19 **Coverage of DM service.** Another suggestion to improve DM management was to increase the coverage  
20 of the DM service so that it would reduce the geographical and consequently financial barriers for the  
21 patients to access care. Some healthcare staff suggested the coverage could be increased by enhancing the  
22 capacity of the existing health centres to provide the minimum standard of care for DM patients.  
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26  
27 **Setting diabetes as a priority.** Both health care staff and patients suggested that DM should be declared a  
28 national priority like TB or HIV infection, and that this would reduce the burden of the disease. A health  
29 staff said “An important factor is to set diabetes as a priority like other diseases as well, it is an important  
30 disease. . . . . Because from my experience, when our ministry sets a disease as a priority, when we put effort  
31 into it, sooner or later that disease begins to decrease including AIDS, TB and Hansen’s disease.” The  
32 patients thought if DM was prioritized like HIV/AIDS, they would receive subsidized care for diabetes  
33 which would tremendously reduce their financial burden.  
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43 **Financial protection for patients.** Health care staff mentioned that financial protection mechanisms, such  
44 as health insurance, should be established to minimize financial impact on patients and enable optimal  
45 treatment without having concerns for the finance.  
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#### 50 **4 Discussion**

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52 In this study, we discovered the challenges faced by health care providers and patients in dealing with DM  
53 in Cambodia. The top one cited by both patients and providers was that of insufficient medication supply.  
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3 Other challenges for patients included the inability to properly control their diet followed by the barriers to  
4 accessing DM services. Health providers listed limited knowledge to treat complications of DM, shortage  
5 of manpower, inadequate laboratory services, and poor patient compliance as additional challenges.  
6  
7 Suggestions to improve DM care included health education and dietary counselling for patients, training  
8 for health care staff, increasing effective coverage of DM service, and advocacy for prioritizing DM care.  
9  
10 We found that insufficient medication supplies affected patients' adherence, in particular for those with  
11 middle-level income. Patients took herbal medicine as an interim measure to control DM when prescribed  
12 DM medications became short. This appears to be a common practice in neighbouring countries in  
13 Southeast Asia (8). However, there is little knowledge about the effects of these alternative medicines on  
14 glycaemic control, and further research is warranted.

15  
16 Patients and health care providers also expressed the need for more health education. Health care staff  
17 acknowledged that they were not able to provide adequate health education to patients due to lack of time  
18 and manpower and wished that dedicated staff be available to hold health education sessions for patients.

19  
20 Dietary counselling is another area of opportunity for improving DM care. Currently there are no locally  
21 available dietary guidelines, information on nutrients in Khmer traditional dishes is missing. Having food  
22 composition data on local food will be helpful for health care staff in providing nutrition therapy  
23 recommendations for DM patients. Patients also reported that information, education & communication  
24 (IEC) materials (even a food chart poster), would be helpful in providing guidance for diet control.

25  
26 In addition, mental health counselling should be made available for DM patients as there were some patients  
27 reporting depression, fear and insomnia. This may be due to fears of amputation and death. This is consistent  
28 with findings from another study done in Cambodia (9). Although only a few patients reported  
29 stigmatization, more people are potentially exposed to the threat of discrimination because their condition  
30 in Cambodian context might be mistaken for stigmatised infectious diseases such as TB and HIV. In a study  
31 done by Jacobs et al, the initial discrimination from the community changed to sympathy once the disease  
32 was confirmed to be DM/hypertension (9).

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3 Limited knowledge in DM care appeared common in both public and private sector health care staff.  
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5 Although the curriculum for medical and nursing students covers diabetes management, general  
6  
7 practitioners and nurses do not have confidence to treat diabetes patients, especially those with  
8  
9 complications, and wish to have a specialized training in DM care. Patients also reported that the doctors  
10  
11 at the private clinic lacked knowledge and skills to treat their conditions and wanted the government to  
12  
13 establish a clear regulation of private health care services in providing diabetes care. Thus, training on DM  
14  
15 care, as well as continuing medical education programs, are much needed for health care professionals in  
16  
17 Cambodia.  
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19  
20 Coverage of DM service is another important area for improvement. Currently, district hospitals do not  
21  
22 provide DM services and patients have to travel to provincial or national hospitals in order to get proper  
23  
24 treatment. This imposes barriers and inequality to treatment as there are many patients who cannot afford  
25  
26 to travel far. Even for those who could afford to go to national hospitals in Phnom Penh or other provincial  
27  
28 hospitals, monthly travel cost is prohibitive in the long-term. This barrier predisposes to the development  
29  
30 of complications of DM which the health care staff at the provincial levels are not equipped to deal with.  
31  
32 Some health care staff suggested utilizing mobile technology to reduce the need to travel. In the Text  
33  
34 Messages Support for Diabetes Self-Management (TEXT4DSM) study in the Democratic Republic of  
35  
36 Congo (DRC), Cambodia and the Philippines, an increased interaction between patients and health care  
37  
38 providers was reported at one-year assessment (10). However, at the end of the two-year intervention, no  
39  
40 significant effects of the intervention were observed. Moreover, several indicators including frequency of  
41  
42 contact with educators and the number of participants with controlled diabetes ( $HbA1c < 7\%$ ) worsened  
43  
44 during the study period in Cambodia (11). Nonetheless, this finding should not discourage health care  
45  
46 providers to develop new and innovative methods of care delivery harnessing mobile technologies.  
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49  
50 Recognizing the need to improve DM care, there are some interventions being piloted or implemented in  
51  
52 Cambodia. The Ministry of Health (MoH) has established and implemented chronic disease clinics (CDC),  
53  
54 peer educator network, and the WHO Package of Essential Non-communicable (PEN) disease interventions  
55  
56 in selected operational districts (7). As the HIV/AIDS service has well-established resources and networks,  
57

1  
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3 the feasibility of integrating services for these two chronic diseases (DM and HIV/AIDS) was tested in  
4 CDC and it was demonstrated to be a promising model for improving outcomes and increasing efficiency  
5 in health care delivery (12). It was also shown to reduce HIV-related stigma. However, there is no proper  
6 evaluation of intake among diabetes patients. It is pertinent to assess this before scaling up the intervention  
7 as diabetes patients may not want to be mistaken for having HIV in fear of stigma.  
8  
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10  
11 MoPoTsyo, a local non-governmental organization, uses a peer educator system to provide education,  
12 screening, and treatment for DM and hypertension in a few provinces with limited resources, which  
13 improved outcome indicators of DM care (fasting blood glucose and blood pressure) (13). Patients  
14 perceived peer educators more accessible and willing to spend more time to provide counselling/education.  
15 Although these interventions have shown some promise, they are only able to provide care for  
16 uncomplicated DM. There was still a need to refer to national hospitals for DM with complications.  
17 Moreover, currently provincial and referral hospitals do not have systematic screening or treatment facilities  
18 for complications such as diabetic retinopathy (DR), chronic kidney disease and foot ulcers. (14). The  
19 prevalence of DR is estimated at 30% and reduced renal function was found in 56% of DM patients in  
20 Cambodia (6, 14). Hence, in addition to strengthening preventive services and a minimum standard of care  
21 for diabetes, there is also a need to improve the capacity for secondary and tertiary care.  
22  
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25 However, Cambodia has many priorities competing for its limited resources (15) and it is an uphill task for  
26 Cambodia to face these challenges alone. Currently, the donor agencies have focused their attention on  
27 infectious diseases and there are very few organizations providing aid for non-communicable diseases  
28 (NCDs). It is time for the donor agencies to recognize the rising burden of NCDs in developing countries  
29 and contribute to fighting it. It is important to note that the individuals with chronic diseases are prone to  
30 infectious diseases and vice versa; for instance, DM triples the risk of tuberculosis (16) and adults living  
31 with HIV have an increased risk of cardiometabolic diseases (17-19).  
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## Limitations

Most of the patients in this study were recruited at the hospitals or through the service providers, hence DM patients who did not have access to these health services may not be included in this study. However, we managed to include DM patients from different geographical regions of Cambodia including the regions near the border and geographically isolated areas. In addition, we were able to triangulate the perspectives of patients and health service providers in diabetes care.

## 5. Conclusion

Currently, the Cambodian health care system has very limited capacity to provide quality care for DM. As a consequence, many patients are either left untreated or have interrupted care due to several barriers including financial, geographical, and lack of knowledge and skills. Although some diabetes care models are piloted and implemented on a small scale, there has been no proper evaluation and comparison of these activities. Moreover, these activities only cover basic diabetes care and may not address the needs of a significant proportion of DM patients who have already developed complications. In addition, there was no financial protection for long term outpatient care. Hence, a more comprehensive and multipronged approach is needed to improve DM care, which would require a collaborative effort from government, external funding agencies, private sector, and communities.

## Authors' contributions

EEKN was responsible for the conceptualization and design of the study, data collection, statistical analysis, and drafting the manuscript. CD, HLY, SS, VS, and KE contributed to study design. CD and SS were involved in data collection. CD and KE helped with data analysis. All authors contributed equally to interpretation of the results, critically reviewed the manuscript, and approved the final version.

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## Conflict of interest

The authors declare no conflict of interest regarding the publication of this paper.

## Data sharing statement

No additional unpublished data are available from this study.

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## Disclaimer

This article was prepared while Nang Ei Ei Khaing was employed at the National University of Singapore.

The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

## Figure

Figure 1. A map depicting the four study sites in Cambodia

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Figure 1. A map depicting the four study sites in Cambodia  
159x139mm (300 x 300 DPI)

# Reporting checklist for qualitative study.

Based on the SRQR guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the SRQR reporting guidelines, and cite them as:

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	Reporting Item	Page Number
<b>Title</b>		
	<a href="#">#1</a> Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	1
<b>Abstract</b>		
	<a href="#">#2</a> Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	2
<b>Introduction</b>		
Problem formulation	<a href="#">#3</a> Description and significance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	3-4

1	Purpose or research	<a href="#">#4</a>	Purpose of the study and specific objectives or	4
2	question		questions	
3				
4	<b>Methods</b>			
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7	Qualitative approach and	<a href="#">#5</a>	Qualitative approach (e.g. ethnography, grounded	4
8	research paradigm		theory, case study, phenomenology, narrative	
9			research) and guiding theory if appropriate; identifying	
10			the research paradigm (e.g. postpositivist,	
11			constructivist / interpretivist) is also recommended;	
12			rationale. The rationale should briefly discuss the	
13			justification for choosing that theory, approach,	
14			method or technique rather than other options	
15			available; the assumptions and limitations implicit in	
16			those choices and how those choices influence study	
17			conclusions and transferability. As appropriate the	
18			rationale for several items might be discussed	
19			together.	
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27	Researcher	<a href="#">#6</a>	Researchers' characteristics that may influence the	NA
28	characteristics and		research, including personal attributes, qualifications /	
29	reflexivity		experience, relationship with participants,	
30			assumptions and / or presuppositions; potential or	
31			actual interaction between researchers'	
32			characteristics and the research questions, approach,	
33			methods, results and / or transferability	
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39	Context	<a href="#">#7</a>	Setting / site and salient contextual factors; rationale	4
40				
41	Sampling strategy	<a href="#">#8</a>	How and why research participants, documents, or	4
42			events were selected; criteria for deciding when no	
43			further sampling was necessary (e.g. sampling	
44			saturation); rationale	
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48	Ethical issues pertaining	<a href="#">#9</a>	Documentation of approval by an appropriate ethics	5
49	to human subjects		review board and participant consent, or explanation	
50			for lack thereof; other confidentiality and data security	
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55	Data collection methods	<a href="#">#10</a>	Types of data collected; details of data collection	4
56			procedures including (as appropriate) start and stop	
57			dates of data collection and analysis, iterative	
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1		process, triangulation of sources / methods, and	
2		modification of procedures in response to evolving	
3		study findings; rationale	
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5	Data collection	<a href="#">#11</a> Description of instruments (e.g. interview guides,	4
6	instruments and	questionnaires) and devices (e.g. audio recorders)	
7	technologies	used for data collection; if / how the instruments(s)	
8		changed over the course of the study	
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12	Units of study	<a href="#">#12</a> Number and relevant characteristics of participants,	4-6
13		documents, or events included in the study; level of	
14		participation (could be reported in results)	
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17	Data processing	<a href="#">#13</a> Methods for processing data prior to and during	5
18		analysis, including transcription, data entry, data	
19		management and security, verification of data	
20		integrity, data coding, and anonymisation /	
21		deidentification of excerpts	
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26	Data analysis	<a href="#">#14</a> Process by which inferences, themes, etc. were	5
27		identified and developed, including the researchers	
28		involved in data analysis; usually references a specific	
29		paradigm or approach; rationale	
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33	Techniques to enhance	<a href="#">#15</a> Techniques to enhance trustworthiness and credibility	5
34	trustworthiness	of data analysis (e.g. member checking, audit trail,	
35		triangulation); rationale	
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38	<b>Results/findings</b>		
39			
40	Syntheses and	<a href="#">#16</a> Main findings (e.g. interpretations, inferences, and	8-15
41	interpretation	themes); might include development of a theory or	
42		model, or integration with prior research or theory	
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46	Links to empirical data	<a href="#">#17</a> Evidence (e.g. quotes, field notes, text excerpts,	8-15
47		photographs) to substantiate analytic findings	
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50	<b>Discussion</b>		
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52	Intergration with prior	<a href="#">#18</a> Short summary of main findings; explanation of how	15-18
53	work, implications,	findings and conclusions connect to, support,	
54	transferability and	elaborate on, or challenge conclusions of earlier	
55	contribution(s) to the field	scholarship; discussion of scope of application /	
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generalizability; identification of unique contributions(s) to scholarship in a discipline or field

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4	Limitations	<a href="#">#19</a>	Trustworthiness and limitations of findings 19
5			
6	<b>Other</b>		
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9	Conflicts of interest	<a href="#">#20</a>	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed 19
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14	Funding	<a href="#">#21</a>	Sources of funding and other support; role of funders in data collection, interpretation and reporting 20
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# BMJ Open

## Patients' and health care providers' perspectives of diabetes management in Cambodia; a qualitative study

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<b>Primary Subject Heading</b>:	Health services research
Secondary Subject Heading:	Qualitative research
Keywords:	General diabetes < DIABETES & ENDOCRINOLOGY, QUALITATIVE RESEARCH, challenges, Opportunities, Cambodia, Health services

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3 **Patients' and health care providers' perspectives of diabetes management in Cambodia; a qualitative**  
4 **study**  
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## ABSTRACT

**Objective:** This study aimed to explore the challenges encountered by patients and health care providers and opportunities for improvement in managing diabetes mellitus (DM) in a low- and middle- income country (LMIC) facing a rise in DM prevalence.

**Design:** Qualitative cross-sectional study.

**Setting:** Urban, semi-urban, and rural areas in Cambodia.

**Participants:** Thirty health service providers and fifty-nine adult DM patients.

**Results:** Most of the 59 DM patients reported having developed DM complications when they first sought treatment. The biggest challenges for the patients were geographical barriers, diet control, and shortage of medication supply. The healthcare staff expressed concerns about their limited knowledge and lack of confidence to treat diabetes, limited availability of diabetes service, inadequate laboratory services, shortage of staff, poor patients' compliance, and insufficient medication supplies. Both healthcare staff and patients urged an expansion of diabetes services in Cambodia and prioritization of diabetes care in a manner similar to communicable disease control programmes of the recent past.

**Conclusions:** Currently, the Cambodian health care system has very limited capacity to provide quality care for chronic diseases. As a consequence, many patients are either left untreated or have interrupted care due to several barriers including financial, geographical, and lack of knowledge and skills. A more comprehensive and multipronged approach is urgently needed to improve DM care, which would require a collaborative effort from government, external funding agencies, private sector, and communities.

**Keywords:** diabetes, health services, qualitative, challenges, opportunities, Cambodia



## Article Summary

### Strengths and limitations of this study

- Views of patients and health care providers from both public and private health care sectors allowed the triangulation of the diverse perspectives on diabetes management.
- Different levels of health care system including national, provincial, and district level were covered.
- The study was conducted in diverse geographical regions of Cambodia including the regions near the border and geographically isolated areas.
- Most of the patient participants were recruited at the hospitals or through service providers, hence diabetes patients who did not have access to these health services may have been missed.

### 1. Introduction

Prevalence of diabetes mellitus (DM) is alarmingly increasing worldwide with approximately 425 million adults living with and 352 million at risk of developing type 2 diabetes in 2017 (1). The International Diabetes Federation (IDF) projected 629 million diabetics in 2045 and considered diabetes one of the largest global health emergencies in the 21<sup>st</sup> century (1). 79% of adults with diabetes live in low- and middle-income countries (LMICs), while South-East Asia and Western Pacific regions are at the epicentre of the diabetes crisis.

Cambodia located in the IDF Western Pacific region is facing double burden of communicable and non-communicable diseases. The mortality due to ischemic heart disease and stroke increased between 2000 and 2012 leading them into top three causes of death in Cambodia (2). The prevalence of impaired fasting glycemia and diabetes have dramatically increased from 1.4% and 2.9% in 2010 (3) to 8.9% and 9.6% in 2016 (4). A modelling study based on STEPS Survey 2010 data projected a 10% increase of type 2 DM prevalence (80% increase in absolute numbers) in the population older than 35 years of age in Cambodia by 2028 (5). Remarkably, the percentage of diabetes-related premature deaths and the prevalence of undiagnosed DM in Cambodia is higher than in most other countries (1). It has been reported that more than 50% of persons with DM in Cambodia were not treated (6) while there was a high prevalence of

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3 complications such as renal failure in people with DM (7). The socio-economic burden of DM in Cambodia  
4 is substantial with a clear upward trend (5) but the health system has been traditionally oriented towards  
5 communicable diseases control and may not be ready to cope with the rising burden of non-communicable  
6 diseases (8).  
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11 In order to formulate effective policies and interventions, it is imperative to understand the challenges and  
12 opportunities of managing DM in the local population. However, these have not been addressed in  
13 Cambodia in depth yet. Here we report patients' and health service providers' perspectives of managing  
14 DM in Cambodia.  
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## 19 **2. MATERIALS AND METHODS**

### 20 **2.1 Research design**

21 This qualitative cross-sectional study addressed the perspectives of patients and health care providers in  
22 managing diabetes in Cambodia.  
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### 26 **2.2 Sampling**

27 Four provinces of Cambodia: Phnom Penh (capital of the country), Siem Reap and Banteay Meanchey  
28 (north-west of the country), and Monduliri (east of the country) (Figure 1) were selected based on the level  
29 of urbanicity, geographic location, and feasibility.  
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### 33 **2.3 Eligibility criteria**

34 Health care providers were eligible to participate in in-depth interviews (IDIs) if they had at least one year  
35 of experience in providing care for diabetes/chronic diseases. Any individual aged 21 and above,  
36 diagnosed with DM with or without complications and/or with any duration of the disease since diagnosis  
37 was considered an eligible patient for focus group discussions (FGDs).  
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### 41 **2.4 Data collection**

42 To achieve maximum variation, we interviewed thirty health care providers at the national, provincial, and  
43 district level and peer educators of a local non-governmental organization (NGO) providing DM service.  
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3 Health care staff helped the research team in recruiting DM patients for FGDs as follows. The study was  
4 presented to the health care staff of the participating institutions, peer educators, and community leaders,  
5 whereupon they disseminated the information about the study among their patients or communities.  
6  
7 Individuals who expressed interest to participate attended information sessions organized by the study team  
8 and later joined focused group discussions. In total, fifty-nine eligible adults attended seven FGDs in groups  
9 of five to ten patients.  
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16 Semi-structured interview guides were used to facilitate IDIs and FGDs (Supplementary File 1 & 2). The  
17 interviews were conducted in Khmer by trained researchers.  
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## 21 **2.5 Data analysis**

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23 Bilingual research staff transcribed all interviews verbatim and translated them into English. We used both  
24 inductive and deductive approaches when analysing the data. Inductive analysis was used in the early stage  
25 to explore the ideas and meanings contained in the raw data and to identify concepts, patterns, and themes.  
26  
27 Similar codes were collated to form initial themes. Once patterns, themes, and sub-themes were established  
28 by open coding, deductive content analysis was used to validate these in an iterative process. We reported  
29 the results in patient-based, provider-based, and health-system based issues. QSR NVivo 11 for Windows  
30 was used to manage the data.  
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34 The figure illustrating the study sites was produced with QGIS 2.14.9-Essen. Administrative areas level 0  
35 and 1 for Cambodia, Thailand, Laos, and Vietnam (solid lines) were downloaded from the GADM (the  
36 Database of Global Administrative Areas). The roads data (dotted lines) were obtained from the  
37 OpenStreetMap Data Extracts.  
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## 46 **2.6 Ethics considerations**

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49 Ethics approvals were obtained from the National University of Singapore Institutional Review Board (S-  
50 17-293), Singapore, and the National Ethics Committee for Health Research, Cambodia (199NECHR).  
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3 Written informed consent was obtained prior to enrollment in the study. Participants were provided with a  
4 symbolic token of appreciation for their time.  
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## 9 **2.7 Patient and Public Involvement**

10 We did not involve patients or the public in our work.  
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## 14 **3. RESULTS**

### 15 **3.1 Characteristics of participants**

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17 The IDIs participants were represented by approximately equal proportions of doctors and nurses from  
18 public sector with a few peer educators from NGO (Table 1). 73% had received diabetes training with 33%  
19 having received the training in the past six months prior to the interview.  
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**Table 1. Characteristics of in-depth interview participants**

Age (median, min-max)	35 (24– 60)
Gender (N, %)	
Male	21 (70.00)
Female	9 (30.00)
Education (N, %)	
Primary School	2 (6.67)
Secondary School	2 (6.67)
High School/Professional Technical training	6 (20.00)
University/Post graduate	20 (66.67)
Profession (N, %)	
Doctor	14 (46.67)
Nurse	12(40.00)
Peer Educator	4 (13.33)
Year of work in DM care (N, %)	
0-<1 year	4 (16.67)
1-5 years	11 (36.67)
5-10 years	9 (30.00)
>10 years	5 (16.67)
Number of patients treated in the past 6 months (N, %)	
0 – <10	4 (13.33)
10 - <40	7 (23.33)
>40	19 (63.33)
Received DM training	
Yes	22 (73.33)
No	8 (26.67)
Received DM training in the past six months (N, %)	
Yes	10 (33.33)
No	20 (66.67)
Level of health care providers (N, %)	
National level Hospital	7 (23.33)
Provincial hospital	9 (30.00)
District hospital	10 (33.33)
Peer Educator Network	4 (13.33)

Most of the FGD participants were farmers and housewives (Table 2). Half of the participants had been diagnosed with DM at least 5 years ago, and most reported having known complications associated with DM.

**Table 2. Characteristics of focus group participants**

Age (median, min-max)	56 (33 – 73)
Gender (N, %)	
Male	14 (25.45)
Female	41 (74.55)
Education (N, %)	
Primary School	31 (56.36)
Secondary School	10 (18.18)
High School	4 (7.27)
Post graduate (Master/PhD)	1 (1.82)
Other#	9 (16.36)
Ethnic (N, %)	
Khmer	54 (98.18)
Cham	1 (1.82)
Marital status (N, %)	
Married	39 (70.91)
Unmarried	4 (7.27)
Divorced	1 (1.82)
Widowed	11 (20.00)
Employment status (N, %)	
Employed	2 (3.64)
Unemployed	10 (18.18)
Housewife	10 (18.18)
Farmer	20 (36.36)
Unskilled worker	1 (1.82)
Daily wages	4 (7.27)
Student	8 (14.55)
Household income (N, %)	
No defined income	11 (20.00)
Irregular income	33 (60.00)
Regular income	11 (20.00)
Time since diagnosis of diabetes mellitus, years (median, min-max)	5 (0.002 – 23)
Time on treatment for diabetes mellitus, years (median, min-max)	4 (0.002 – 20)
Having Diabetes complication (N, %)	48 (87.27)
Regular visit to clinic/ hospitals (N, %)	42 (76.36)

#Other=no formal education

### 3.2 Patients' experiences and perspective

#### 3.2.1 DM diagnosis and feelings associated with it

Patients in our FGDs had suffered from symptoms such as fatigue, frequent urination, blurred vision, and numbness in hands and feet for a few months to years before they finally sought medical help. Most patients went to private clinics for their initial check-up while a minority were referred to public hospitals by other DM patients in their community who recognized their symptoms. A few patients were diagnosed at the time of hospitalization with serious DM complications.

"I didn't know I had diabetes and then in the evening I felt dizzy and fell in coma. Then I was taken to the hospital. But it was a private Clinic called xxx that tested my blood sugar. They told me that I had high sugar. So, I decided to buy drugs for high sugar..." [female, semi-urban, PS04]

Most patients reported that they were scared and felt hopeless when they learned their diagnosis, as they associated DM with severe outcomes such as amputations and death. Some patients said they were determined to fight it.

"I don't want other people to know, actually that feeling, we don't want anyone to know, but our family, our wife, we don't hide, ..... we are very scared, diabetes is a disease, I can see arms and legs amputations..." [male, urban, PP01]

"Talking about feeling, from rumours I heard any DM patients cannot survive; I felt quite hopeless but if there was medication for DM for me to take, I had to use it regularly to fight against this disease, if I die even if I take the medication, I won't regret". [female, rural, PB06]

#### 3.2.2 DM treatment and traditional medicine use

Some participants were treated at private clinics first and then switched to public hospitals when they thought that the treatment was ineffective. There were only a few participants who sought initial treatment in the public sector.

"P7: Previously I bought medication from the pharmacy. When it got serious, I seek the doctor." [male, rural, PB06]

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3 Patients in Phnom Penh reported that they did not believe in using traditional medicine to control DM.  
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5 However, most participants living in the provinces said that they took traditional medicine concurrently  
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7 with DM medication prescribed by the doctors as they believed that a combination of these two would be  
8  
9 more effective in controlling their blood glucose. Most traditional medicines consumed included herbs such  
10  
11 as *Morinda citrifolia*, *Zizyphus cambodiana*, *Elephantopus scaber*, *Syzygium cumini*, *Plukenetia volubilis*,  
12  
13 and *Azadirachta indica*.

14  
15  
16 “I think I should use apart from traditional and apart from modern (laughing) because people told me I  
17  
18 should do that. So, every day I ask someone whom I know to buy “Sdav” (*Azadirachta indica*) bark for  
19  
20 me” [female, rural, PB07]  
21

### 22 **3.2.3 Living with diabetes in the community**

23  
24 Patients expressed that living with diabetes was a huge burden for them as their lives changed for worse.  
25  
26 "We are afraid of falling, injury or cut, we are afraid, overall people who have diabetes have a huge burden  
27  
28 from safeguarding themselves, from taking medication regularly, coming to the hospital regularly, exercise  
29  
30 and diet, dieting, there are many. We were not like this before we were ill, we go to the restaurant we can  
31  
32 eat anything, eight dishes, we can eat nine dishes, it is fine, but now we cannot, we diet, . . . . it is something  
33  
34 difficult. “[male, urban, PP01]  
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37 Most patients said there was no discrimination against them, and the community felt pity for them.

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39 “Some people in the community feel pity for us, we are not discriminated as HIV patients. They feel  
40  
41 condolences for us because diabetes cannot be cured. [female, urban, PP02]  
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43  
44 Only a few reported that they had encountered discrimination.

45  
46 “Yes. They are afraid of transmission; they don’t even come to ask you how you are, they stop coming to  
47  
48 drink water at your house, they walk away from us.” [male, semi-urban, PS04]  
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### 50 **3.2.4 Challenges**

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52 The challenges encountered by patients are summarized in table 3.

#### 53 54 **i. Patient level**



## Diet

The majority of patients reported that the most challenging factor for them was controlling their diet. Some participants even thought that diabetes was worse than HIV as they could not eat as much as they desired.

"In my body, I find that I cannot control my eating; for example, the doctor told me that I can eat the banana and other food but when eaten, my blood sugar rises at the level higher than it was when coming to see him.

So, controlling your diet is the hardest to manage" [male, rural, PB06]

"...diabetes personally is more difficult than AIDS. People with AIDS can eat, don't have any side effect, have a long life. On the other hand, diabetes, if you eat, you will have a short life. [female, urban, PP02]

Patients also have the perception that they would have less energy if they ate less. Hence, patients complained that it was a significant challenge for them to properly balance between these two; gaining energy and controlling blood glucose.

"if we eat much, we can have power but eating much increases blood sugar and the DM symptoms occur; eating less, we are less energetic" [female, semi-urban, PS05]

## Distance and Transportation

For patients attending FGDs, especially those who lived far from the hospitals or those who have to get treatment in other district hospitals, traveling and transportation expenses outweighed the cost of medications.

"Traveling by car took the whole morning and whole afternoon almost a whole day; then when arriving there, waiting to receive the service there was also the whole day. I went there, I waited for the doctor since morning until around 2-3 pm that I received the treatment...." [male, rural, PB07]

### ii. Health provider level

#### Medication supply

The next challenging factor for patients was irregular or short-term medication supply. Most hospitals were only able to provide two to four weeks of medication per visit and it was difficult for patients, especially those from the provinces, to travel to the hospitals regularly to get the medications. Sometimes there was a

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3 medications shortage at the hospitals. Some patients used traditional medicine as an interim measure when  
4 there was a shortage of medication.  
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6  
7 “When I run out of medication, I go there for nothing and I just have medication left for 1 or 2 days more  
8 and not seeing them or no stock wait sometimes until next week, so my daily treatment is interrupted. So,  
9 my request is to supply drugs regularly, it will be good because if we don’t take medication regularly, we  
10 feel unwell.” [female, urban, PP02]  
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13 “I used traditional medicine when there was no medication from “xxx” yet. When there was no medication  
14 from “xxx”, everyone used traditional medicine.” [female, rural, PB06]  
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**Table 3. Summary of codes and quotations of patients' and health providers' perspectives in diabetes management**

	<b>Patients' Perspective</b>	<b>Health providers' perspective</b>
Patient level	<p><b>Self-management</b> "In my body, I find that I cannot control my eating; for example, the doctor told me that I can eat the banana and other food but when eaten, my blood sugar rises at the level higher than it was when coming to see him. So, controlling your diet is the hardest to manage" [male, rural, PB06]</p> <p><b>Distance and Transportation</b> "Traveling by car took the whole morning and whole afternoon almost a whole day; then when arriving there, waiting to receive the service there was also the whole day. I went there, I waited for the doctor since morning until around 2-3 pm that I received the treatment" [male, rural, PB07]</p>	<p><b>Self-management</b> "...Patient has difficulty using insulin on their own, .... the difficulty is that their diet is not appropriate, and their usage of insulin is not appropriate". [HP04, nurse, urban area]</p> <p>"The challenge with the patient is that they don't manage themselves appropriately, they leave their health to a difficult stage, the most difficult stage, so it is also difficult for the doctor too." [HP04, nurse, urban area]</p>
Health-provider level	<p><b>Medication supply</b> "When I run out of medication, I go there for nothing and I just have medication left for 1 or 2 days more and not seeing them or no stock wait sometimes until next week, so my daily treatment is interrupted. So, my request is to supply drugs regularly, it will be good because if we don't take medication regularly, we feel unwell." [female, urban, PP02]</p>	<p><b>Medication supply</b> "For example, a patient lives far, sometimes the hospital supplied them two weeks. They run out of medication, they don't have the fee to come and pick up the medication, so err, at the district hospital or the health centre near their home should have this medication for them to access." [HM10, nurse, rural]</p> <p><b>Limited knowledge and skills</b> "I am a doctor, but I am not specialized in this field. I only look after minor illnesses, in case of severe diabetes, I am afraid to treat." [HP11, medical doctor, rural]</p> <p><b>Limited Laboratory service</b> "Blood monitoring such as examining A1c haemoglobin is not available because we don't have a laboratory." [HS18, nurse, semi-urban]</p> <p><b>Shortage of staff</b> "The challenges in providing service, the most important one is that our resources are limited. There are not many people working, so the quality of counselling, the quality of the provision is limited. [HS13, medical doctor, semi-urban]</p>
Health-System level		<p><b>Lack of diabetes services</b> They [the patients] come to seek us, and we refer them, this means that we have failed, this means that we have failed. .... they will seek the Khmer medication". [HB28, medical doctor, rural]</p>

### 3.3 Health providers' perspective

All health care providers we interviewed recognized the rising burden of DM and the challenges it poses to the health care system. They mentioned it was quite common to see DM patients with complications and the most common complications were renal dysfunction, diabetic eye disease and foot ulcers. The challenges and quotations are summarized in table 3.

#### 3.3.1 Challenges

##### i. Patient level

###### Poor self-management and compliance of patients

Patient's poor self-management was a challenging factor for health care staff.

"The challenge with the patient is that they don't manage themselves appropriately, they leave their health to a difficult stage, the most difficult stage, so it is also difficult for the doctor too."

"...Patient has difficulty using insulin on their own, .... the difficulty is that their diet is not appropriate, and their usage of insulin is not appropriate". [HP04, nurse, urban area]

##### ii. Health- Provider level

###### Limited knowledge and skills

Many healthcare staff at the provincial and district hospitals expressed concerns about their limited knowledge and lack of confidence to treat DM, especially those with complications.

"I am a doctor, but I am not specialized in this field. I only look after minor illnesses, in case of severe diabetes, I am afraid to treat." [HP11, medical doctor, rural]

###### Limited medication supply

Generally, public hospitals were supplied with medicines every quarter. However, the supply was usually not sufficient to cope with the patients' needs and the hospitals had to purchase the medicines with hospital funds or encourage patients to buy their medications at the private pharmacies. Due to limited supply, some hospitals could only provide a one- or two-weeks supply of medicines to patients. Moreover, the variety of anti-diabetic drugs available at most hospitals was also limited. Some hospitals had only one type of anti-

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3 diabetic drug (metformin) and most hospitals did not stock insulin. The health care staff consistently  
4 mentioned that insufficient supplies and limited variety of anti-diabetic drugs impacted proper DM care.  
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7 "For example, a patient lives far, sometimes the hospital supplied them two weeks. They run out of  
8 medication, they don't have the fee to come and pick up the medication, so err, at the district hospital or the  
9 health centre near their home should have this medication for them to access." [HM10, nurse, rural]  
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13 "In our hospital, we have a shortage of medication, for some patients who arrived with hyperglycaemia, it  
14 is difficult for us because, to be specific, we have insulin shortage. We don't have anything to lower it. We  
15 only have oral medication like Glibenclamide, Metformin and, for injection, we only have intermediate-  
16 acting insulin. We don't have the rapid-acting insulin, so we are worried about this illness. If a diabetes  
17 patient with hyperglycaemia gets a coma, it is difficult for us. It causes concern among us." [HM-11,  
18 medical doctor, rural]  
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### 26 **Limited Laboratory service**

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28 Another challenge for the health care staff was the inability to properly monitor patients' conditions due to  
29 inadequate laboratory facilities. Most hospitals did not have laboratory equipment to test HbA1c.  
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32 "... we treat diabetes too, but we do not have a "diabetes specialist "(endocrinologist). Blood monitoring  
33 such as examining A1c haemoglobin is not available because we don't have a laboratory. And the  
34 medication specializes in lowering the blood glucose. We don't have a lot of kinds of medication. We only  
35 have Glibenclamide and Metformin." [HS18, nurse, semi-urban]  
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### 41 **Shortage of staff**

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43 Majority of health care staff mentioned the current manpower was insufficient to cope with the increased  
44 numbers of patients and thus this subsequently affected the quality of care.  
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47 "The challenges in providing service, the most important one is that our resources are limited. There are  
48 not many people working, so the quality of counselling, the quality of the provision is limited. [HS13,  
49 medical doctor, semi-urban]  
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### 53 **iii. Health-system level**

#### 54 **Limited effective coverage of diabetes services**

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3 DM services are available at national hospitals, provincial hospitals and few district hospitals. Some district  
4 hospitals in our study did not have diabetes service and clinicians expressed frustration about the need to  
5 refer diabetes patients to other hospitals with diabetes services.  
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10 “They [the patients] come to seek us, and we refer them, this means that we have failed, this means that we  
11 have failed. . . . . they will seek the Khmer medication.” [HB28, medical doctor, rural]

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14 “They are poor. When we need to refer them, it is around 40 to 50 km from their home. If they get treatment  
15 near their home, their wife or children could cook rice for them or cook in the hospital, they spend less. But  
16 if they go there, they have to spend more. . . . . Because they decided that they don't go, they don't attend  
17 the counselling, we explain. We are out of options; we cannot send a sick patient who is about to die home.  
18 At least we have a doctor to treat”. [HB28, medical doctor, rural]  
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### 24 **3.4 Opportunities for improvement**

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26 Staff training, medication supply, and health education/counselling for patients consistently came up at the  
27 top of the list of suggested measures to improve DM management.  
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#### 30 **i. Patient-level**

##### 31 **Health education and counselling**

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33 Patients and health care providers expressed the need for more health education. Health care staff  
34 acknowledged that they were not able to provide adequate health education to patients due to lack of time  
35 and manpower and wished that dedicated staff be available to conduct regular health education sessions for  
36 patients. Both healthcare staff and patients provided the same opinion that patients need to get frequent  
37 health education sessions as patients can't remember the information if they hear it only once or twice.  
38 Dietary counselling is another area of opportunity for improving DM care as diet control is the most  
39 challenging factor for patients and yet there is no proper dietary counselling. Patients reported that  
40 information, education & communication (IEC) materials (even a food chart poster), would be helpful in  
41 providing guidance for diet control. In addition, mental health counselling should be made available for  
42 DM patients as some reported depression, insomnia, fears of amputation and death. This is consistent with  
43 findings from another study done in Cambodia (9). Although only a few patients reported stigmatization,  
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3 more people are potentially exposed to the threat of discrimination because their condition in Cambodian  
4 context might be mistaken for stigmatised infectious diseases such as tuberculosis or HIV. In a study done  
5 by Jacobs et al, the initial discrimination from the community changed to sympathy once the disease was  
6 confirmed to be DM/hypertension (9).  
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13 **Financial protection for patients.** The coverage by social protection schemes remains low in Cambodia.  
14 Health Equity Fund provides fee waiver only for extremely impoverished individuals that is for  
15 approximately 2.6 million people, less than one-fifth of the total population (10). Those not eligible for  
16 HEF subsidy can hardly afford lifelong treatment for a chronic condition. According to earlier reports some  
17 patients had to sell their land and other properties in order to finance their treatment (11). In our study,  
18 financial ability affects both patients' choices and the treatment prescription by the health care  
19 professionals. Medical doctors reported that the treatment options were often constrained by the financial  
20 ability of patients. They suggested that financial protection mechanisms, such as health insurance, should  
21 be established to minimize the financial impact on patients as well as to allow health care professionals to  
22 choose optimal treatment for patients without concerns for the financial burden on patients.  
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## 35 36 37 **ii. Health Provider-level**

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39 **Staff training.** Health care staff in both urban and rural areas expressed the need for training. A DM  
40 specialist in the urban area mentioned that the emphasis should be given to the healthcare staff in the rural  
41 areas as he had seen patients from rural areas with severe DM complications that could have been prevented  
42 if the staff in the rural area had been equipped with knowledge and skills to treat DM. Although the  
43 curriculum for medical and nursing students covers diabetes management, general practitioners and nurses  
44 do not have confidence to treat diabetes patients, especially those with complications, and wish to have a  
45 specialized training in DM care. Limited knowledge in DM care appeared common in both public and  
46 private sector. Patients reported that doctors at the private clinic lacked knowledge and skills to treat  
47 diabetes and yet they didn't refer patients to appropriate health care services until patients left them due to  
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3 ineffective treatment. Thus, training on DM care, as well as continuing medical education programs, are  
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5 much needed for health care professionals in Cambodia.  
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9 **Regular supply of medication.** Another area of opportunities to improve is to supply diabetes medication  
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11 to health services in public sector regularly and sufficiently. Both patients and healthcare staff urged  
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13 uninterrupted supplies of DM medicines. The interruption in the medication supply as well as the short-  
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15 term one- or two-weeks supply of medication affected the compliance of patients. Providing medication  
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17 regularly for a longer period of time would tremendously reduce this burden and improve patients'  
18  
19 compliance. Peer educator network (PEN) partners with pharmacies to provide medicines at a reduced price  
20  
21 (10). Although it is still higher than the subsidized price in the public sector, this may be a more sustainable  
22  
23 solution to provide a steady supply of medicines. This may also reduce travel cost as the pharmacies are  
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25 located closer to patients than referral hospitals are.  
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### 30 31 **iii. Health-system level**

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33 **Coverage of DM service.** Increasing effective coverage of the DM service is critical to the reduction of the  
34  
35 geographical and financial barriers for the patients to access care. Currently, only very few district hospitals  
36  
37 provide comprehensive DM services and patients have to travel to provincial or national hospitals in order  
38  
39 to get proper treatment. Some health care staff suggested utilizing mobile technology to reduce the need to  
40  
41 travel. In the Text Messages Support for Diabetes Self-Management (TEXT4DSM) study in the Democratic  
42  
43 Republic of Congo, Cambodia and the Philippines, an increased interaction between patients and health  
44  
45 care providers was reported at one-year assessment (12). However, at the end of the two-year intervention,  
46  
47 no significant effects of the intervention were observed. Moreover, several indicators including frequency  
48  
49 of contact with educators and the number of participants with controlled diabetes ( $HbA_{1c} < 7\%$ ) worsened  
50  
51 during the study period in Cambodia (13). Nonetheless, this finding should not discourage health care  
52  
53 providers to develop new and innovative methods of care delivery harnessing mobile technologies.  
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3 **Setting diabetes as a priority.** Both health care staff and patients suggested that DM should be declared a  
4 national priority like TB or HIV infection, and that this could help to reduce the burden of the disease. A  
5 health staff said “An important factor is to set diabetes as a priority like other diseases as well, it is an  
6 important disease. .... Because from my experience, when our ministry sets a disease as a priority, when  
7 we put effort into it, sooner or later that disease begins to decrease including AIDS, TB and Hansen’s  
8 disease.” A previous study in Cambodia reported that some patients even wished they had HIV/AIDS rather  
9 than diabetes due to subsidy given to HIV/AIDS patients (11). Patients perceived that the cost of diabetes  
10 treatment would be subsidized like HIV/AIDS if it was made a national priority.  
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#### 23 **4 Discussion**

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25 In this study, we discovered the challenges faced by health care providers and patients in dealing with DM  
26 in Cambodia. The top one cited by both patients and providers was that of insufficient medication supply.  
27 Other challenges for patients included the inability to properly control their diet followed by the barriers to  
28 accessing DM services. Health providers cited limited practical knowledge of treatment options for  
29 complications of DM, shortage of manpower, inadequate laboratory services, and poor patient compliance  
30 as additional challenges. Suggestions to improve DM care included health education and dietary  
31 counselling for patients, training for health care staff, increasing effective coverage by DM service, and  
32 advocacy for prioritizing DM care. Some of the reports by diabetes patients in our study align with findings  
33 in other LMICs (14). In Bangladesh, the barriers to receiving optimal care included lack of access to  
34 adequate care, limited knowledge of medical practitioners, and financial constraints (14). Like in Cambodia,  
35 subdistrict hospitals in Bangladesh did not have the ability to provide diagnostic service and patients had  
36 to travel to Specialist hospitals for diagnosis and care and even needed to travel further to the capital, Dhaka,  
37 to receive comprehensive check-up and care for diabetes complications (14). Thus, travelling cost in  
38 addition to medication cost imposed a huge burden on patients affecting their ability to seek care. Even in  
39 the highly subsidized health care system in Malaysia, lack of affordable transport is a critical barrier to  
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3 health care (15). In our study, patients in public sector reportedly spent ~ USD 12 per month for diabetes  
4 medicines and ~USD 25 if they required medicines for other co-morbidities. The cost is double in the  
5 private sector. The transportation costs range from USD 2.5 to USD 7.5 per visit. Thus, the total treatment  
6 costs could amount to USD 30 to USD 50 per month depending on the number of visits required to collect  
7 medication. The average monthly household income in Cambodia is approximately USD 116. Hence, it is  
8 a huge burden for patients especially those who need to travel far to get medication. Enhancing the capacity  
9 of the existing health centres to provide the minimum standard of care for DM patients may address this  
10 issue as health centres are geographically more accessible to patients. Currently the health centres staffed  
11 predominantly with nurses or midwives are not able to provide full diabetes care as only medical doctors  
12 can establish definitive diagnosis and initiate treatment. A nursing model enhanced with mHealth  
13 technology may offer a solution. Diabetes point-of-care devices could be used to transfer real time data to  
14 physicians, allowing physicians to monitor patient's conditions and adjust treatment (16) while nurses at  
15 health centres could implement the physician's recommendations delivered with mHealth technology.  
16 Point-of-care service model of management of chronic disease conditions has been tested and found to be  
17 feasible and acceptable in other LMICs (17).

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37 Recognizing the need to improve DM care, there are some interventions being piloted or implemented in  
38 Cambodia. The Ministry of Health (MoH) has established and implemented chronic disease clinics (CDC),  
39 peer educator network, and the WHO Package of Essential Non-communicable (PEN) disease interventions  
40 in selected operational districts (8). As the HIV/AIDS service has well-established resources and networks,  
41 the feasibility of integrating services for these two chronic diseases (DM and HIV/AIDS) was tested in  
42 CDC and it was demonstrated to be a promising model for improving outcomes and increasing efficiency  
43 in health care delivery (18). It was also shown to reduce HIV-related stigma. However, there is no proper  
44 evaluation of intake among diabetes patients. It is pertinent to assess this before scaling up the intervention  
45 as diabetes patients may not want to be mistaken for having HIV in fear of stigma.

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3 MoPoTsyo, a local non-governmental organization, uses a peer educator system to provide education,  
4 screening, and treatment for DM and hypertension in a few provinces with limited resources, which  
5 improved outcome indicators of DM care (fasting blood glucose and blood pressure) (19). Patients  
6 perceived peer educators more accessible and willing to spend more time to provide counselling/education.  
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13 Although the aforementioned interventions have shown some promises, they are only able to provide care  
14 for uncomplicated DM. There was still a need to refer to national hospitals for DM with complications.  
15 Moreover, currently provincial and district hospitals do not have systematic screening or treatment facilities  
16 for complications such as diabetic retinopathy (DR), chronic kidney disease and foot ulcers (20). The  
17 prevalence of DR is estimated at 30% and reduced renal function was found in 56% of DM patients in  
18 Cambodia (7, 20). Hence, in addition to strengthening preventive services and a minimum standard of care  
19 for diabetes, there is also a need to improve the capacity for secondary and tertiary care.  
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28 However, Cambodia has many priorities competing for its limited resources (21) and it is an uphill task for  
29 Cambodia to face these challenges alone. Currently, the donor agencies have focused their attention on  
30 infectious diseases and there are very few organizations providing aid for non-communicable diseases  
31 (NCDs). Hence, donor agencies need to recognize the rising burden of NCDs in developing countries and  
32 contribute to fighting it. Partnering with private sector may also be a potential way to increase the coverage  
33 of DM services and improve DM care delivery. Public-private partnerships (PPP) to strengthen health  
34 system received a lot of attention in LMICs (22). Cambodia has already implemented PPP model in other  
35 sectors such as transport, water, and power sector (23). In light of our findings, an extension of PPP  
36 framework to DM, and broader to NCDs services in Cambodia appears worth a consideration (23).  
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## 50 **Limitations**

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53 Most of the patients in this study were recruited at the hospitals or through the service providers, hence DM  
54 patients who did not have access to these health services may not be included in this study. However, we  
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3 managed to include DM patients from different geographical regions of Cambodia including the regions  
4 near the border and geographically isolated areas. In addition, we were able to triangulate the perspectives  
5 of patients and health service providers in diabetes care.  
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## 10 **5. Conclusion**

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12 Currently, the Cambodian health care system has very limited capacity to provide quality care for DM. As  
13 a consequence, a considerable number of patients are either left untreated or have interrupted care due to  
14 several barriers including financial, geographical, and lack of knowledge and skills. Although some  
15 diabetes care models are piloted and implemented on a small scale, there has been no proper evaluation and  
16 comparison of these activities. Moreover, these activities only cover basic diabetes care and may not address  
17 the needs of a significant proportion of DM patients who have already developed complications. In addition,  
18 there was no financial protection for long term outpatient care. Hence, a more comprehensive and  
19 multipronged approach is needed to improve DM care, which would require a collaborative effort from  
20 government, external funding agencies, private sector, and communities.  
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## 34 **Authors' contributions**

35 EEKN was responsible for the conceptualization and design of the study, data collection, statistical  
36 analysis, and drafting the manuscript. CD, HLY, SS, VS, and KE contributed to study design. CD and SS  
37 were involved in data collection. CD and KE helped with data analysis. All authors contributed equally to  
38 interpretation of the results, critically reviewed the manuscript, and approved the final version.  
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## 46 **Acknowledgments**

47 We would like to thank all the participating health care institutions and participants in this study.  
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## 52 **Conflict of interest**

53 The authors declare no conflict of interest regarding the publication of this paper.  
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### Data sharing statement

No additional unpublished data are available from this study.

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The authors did not receive funding from an external source.

### Disclaimer

This article was prepared while Nang Ei Ei Khaing was employed at the National University of Singapore. The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

### Figure

Figure 1. A map depicting the four study sites in Cambodia

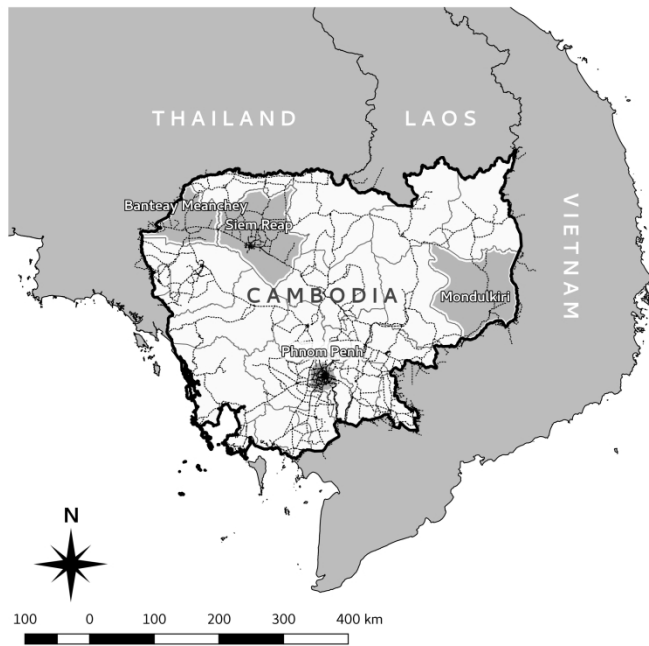
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For peer review only



A map depicting the four study sites in Cambodia

297x210mm (300 x 300 DPI)



## Supplementary File 1: Semi-structured interview guide for in-depth interview

### Icebreaker

#### *General questions about the participants*

- How long he/she has been practicing?
- How many staff in his/her health facilities caring for DM or chronic disease?

1. How is the magnitude of Diabetes Mellitus in the community?
2. What are the common risk factors of Diabetes Mellitus in Cambodian population?
3. In your opinion, what are the key factors in controlling Diabetes Mellitus?
4. How is the service to Diabetes Mellitus diseases given in the country?
5. In which types of health facilities Diabetes Mellitus services is available?
6. What are the challenges to provide Diabetes Mellitus services within the existing health care system?
7. What are the opportunities to provide Diabetes Mellitus services within the existing health care system?
8. In your opinion, what are the areas needed to improve to manage Diabetes Mellitus better?
9. In your opinion, what is the best way to improve the health services to manage Diabetes Mellitus effectively?
10. Is there something you would like to add?

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3 **Supplementary File 2. Semi-structured interview guide for focus group discussion**  
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- 5 1. Do you know what diabetes mellitus is?  
6  
7 2. Could you please describe about Diabetes Mellitus?  
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9 3. Can you tell me when and where did you first seek treatment for these symptoms?  
10  
11 4. Can you tell me about your feeling when you were first diagnosed with Diabetes Mellitus?  
12  
13 5. How do your community perceive Diabetes Mellitus?  
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15 6. Can you describe the treatment for Diabetes Mellitus you receive?  
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17 7. Can you tell me how was living with Diabetes Mellitus been like for you?  
18  
19 8. How is the service to Diabetes Mellitus diseases given in the country?  
20  
21 9. What are the challenges for you in managing Diabetes Mellitus?  
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23 10. What are the opportunities for you in managing Diabetes Mellitus?  
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25 11. How do you think how can Diabetes Mellitus management be improved?  
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27 12. What advice do you have for people with Diabetes Mellitus?  
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29 13. What else would you like to share with me about Diabetes Mellitus?  
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# Reporting checklist for qualitative study.

Based on the SRQR guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SRQR reporting guidelines, and cite them as:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med.* 2014;89(9):1245-1251.

	Reporting Item	Page Number
<b>Title</b>		
	<a href="#">#1</a> Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	1
<b>Abstract</b>		
	<a href="#">#2</a> Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	2
<b>Introduction</b>		
Problem formulation	<a href="#">#3</a> Description and significance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	3-4

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>Purpose or research question</p> <p><b>Methods</b></p> <p>Qualitative approach and research paradigm</p> <p>Researcher characteristics and reflexivity</p> <p>Context</p> <p>Sampling strategy</p> <p>Ethical issues pertaining to human subjects</p> <p>Data collection methods</p>	<p><a href="#">#4</a></p> <p><a href="#">#5</a></p> <p><a href="#">#6</a></p> <p><a href="#">#7</a></p> <p><a href="#">#8</a></p> <p><a href="#">#9</a></p> <p><a href="#">#10</a></p>	<p>Purpose of the study and specific objectives or questions</p> <p>Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.</p> <p>Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability</p> <p>Setting / site and salient contextual factors; rationale</p> <p>How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale</p> <p>Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues</p> <p>Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative</p>	<p>4</p> <p>4</p> <p>NA</p> <p>4</p> <p>4</p> <p>5</p> <p>4</p>
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1		process, triangulation of sources / methods, and	
2		modification of procedures in response to evolving	
3		study findings; rationale	
4			
5	Data collection	<a href="#">#11</a> Description of instruments (e.g. interview guides,	4
6	instruments and	questionnaires) and devices (e.g. audio recorders)	
7	technologies	used for data collection; if / how the instruments(s)	
8		changed over the course of the study	
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12	Units of study	<a href="#">#12</a> Number and relevant characteristics of participants,	4-6
13		documents, or events included in the study; level of	
14		participation (could be reported in results)	
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17	Data processing	<a href="#">#13</a> Methods for processing data prior to and during	5
18		analysis, including transcription, data entry, data	
19		management and security, verification of data	
20		integrity, data coding, and anonymisation /	
21		deidentification of excerpts	
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26	Data analysis	<a href="#">#14</a> Process by which inferences, themes, etc. were	5
27		identified and developed, including the researchers	
28		involved in data analysis; usually references a specific	
29		paradigm or approach; rationale	
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33	Techniques to enhance	<a href="#">#15</a> Techniques to enhance trustworthiness and credibility	5
34	trustworthiness	of data analysis (e.g. member checking, audit trail,	
35		triangulation); rationale	
36			
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38	<b>Results/findings</b>		
39			
40	Syntheses and	<a href="#">#16</a> Main findings (e.g. interpretations, inferences, and	8-15
41	interpretation	themes); might include development of a theory or	
42		model, or integration with prior research or theory	
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46	Links to empirical data	<a href="#">#17</a> Evidence (e.g. quotes, field notes, text excerpts,	8-15
47		photographs) to substantiate analytic findings	
48			
49			
50	<b>Discussion</b>		
51			
52	Intergration with prior	<a href="#">#18</a> Short summary of main findings; explanation of how	15-18
53	work, implications,	findings and conclusions connect to, support,	
54	transferability and	elaborate on, or challenge conclusions of earlier	
55	contribution(s) to the field	scholarship; discussion of scope of application /	
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generalizability; identification of unique contributions(s) to scholarship in a discipline or field

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4	Limitations	<a href="#">#19</a>	Trustworthiness and limitations of findings 19
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6	<b>Other</b>		
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9	Conflicts of interest	<a href="#">#20</a>	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed 19
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11			
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14	Funding	<a href="#">#21</a>	Sources of funding and other support; role of funders in data collection, interpretation and reporting 20
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