PATIENT AND PROVIDER PERSPECTIVES ON HYPERTENSION, DIABETES AND DYSLIPIDAEMIA SCREENING IN A LOW-INCOME SINGAPOREAN RENTAL-FLAT COMMUNITY

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ABSTRACT

Aims:

Patient and provider barriers to cardiovascular disease screening in disadvantaged Asian populations are under-studied. We conducted a qualitative study of attitudes to hypertension/diabetes/dyslipidaemia screening within low-income communities in Singapore.

Methods:

Interviewers elicited barriers/enablers to blood pressure measurement/fasting blood glucose/fasting blood lipid amongst residents and healthcare providers serving low-income communities. Transcripts were analysed thematically and iterative analysis carried out using established qualitative methodology.

Results:

Twenty patients and nine providers were interviewed. Comments were grouped into seven content areas: primary care characteristics (PCC), procedural issues, knowledge, costs, priorities, attitudes, and information sources. For hypertension screening, procedural issues were enablers; however, for fasting blood tests, procedural issues were perceived as both enablers and barriers, including issues of pain, needle and blood phobia, and lag between tests and results. Costs of screening and treatment were cited as issues for diabetes and cholesterol screening, but for hypertension screening, concerns about cost of treatment dominated. While blood pressure measurement using sphygmomanometers and fasting lipid tests were generally perceived as the accepted screening tests for hypertension and hyperlipidaemia, fasting glucose tests were not perceived as the accepted screening test for diabetes. Barriers and enablers to cardiovascular screening, as perceived by patients and providers, were largely concordant.

Conclusion:

Procedural issues predominated in patients' percept ions of hypertension screening, while knowledge and attitudes played a more significant role for diabetes and dyslipidaemia. Interventions to raise screening uptake in these disadvantaged communities must be tailored to the main barriers for each modality.

Keywords:
Asia; Cardiovascular; Screening; Low-income; Qualitative

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INTRODUCTION

Early detection of cardiovascular disease risk via screening is an important part of prevention. However, screening adherence remains poor in many countries,[1,2] especially amongst those of low socioeconomic status (SES). Few studies address equity in access to cardiovascular screening.[3-6] There is a paucity of data from Asian societies, though isolated studies have demonstrated inequalities in access to screening.[7,8] Achieving equitable access to screening is important given rising income inequality in urbanising Asian societies.[9] Qualitative studies on perceived barriers and enablers to participation in cardiovascular risk screening could shed light on these disparities and inform future interventions. However, studies from Asian populations are lacking. The majority of studies come from Western societies,[10-13] in which findings may not be easily generalisable to the context of urbanising Asian societies and a different sociocultural milieu.

Singapore is one such multi-ethnic urbanised Asian society. Cardiovascular diseases contributed 19.7 percent of all disability-adjusted life years lost in Singapore in 2004.[14] The prevalence of hypertension was estimated at 16.7 percent in the 40-49 age bracket, while the prevalence of diabetes and dyslipidaemia was estimated at 12.1 percent and 18.0 percent, respectively.[15] Screening for cardiovascular disease is fairly common, with 63.9 percent, 72.2 percent, and 78.0 percent going for regular blood pressure, fasting blood glucose, and fasting blood lipid tests, respectively.[16] Clinical guidelines[17,18] encourage regular cardiovascular disease screening: those ≥40 years of age are encouraged to go for yearly blood pressure checks, and fasting glucose/lipids tests every two years. Under the national Integrated Screening Programme, screening for hypertension, diabetes and dyslipidaemia is available at primary care clinics for S$8 (=US$6.40).[19] To encourage access to treatment for hypertension, diabetes and dyslipidaemia, the Chronic Disease Management Programme allows patients to use Medisave (a compulsory healthcare savings account) for outpatient treatment, reducing out-of-pocket payments.[20] However, we found hypertension management was poorer in low-income communities,[21] and these communities had poorer access to cardiovascular disease screening. This was due to both patient factors (e.g. lack of education, misperceptions, and lack of awareness), as well as systemic factors (e.g. lack of convenient screening).[8] While there are local qualitative studies of patients' attitudes to treatment and management,[22-24] no studies focus on the preventive aspect. As such, we conducted a qualitative study of attitudes to cardiovascular disease screening for hypertension, diabetes and dyslipidaemia, within low-SES communities in Singapore. We sought to obtain perspectives from not just the patients, but also the health providers working within these needy communities, in order to get an additional perspective of how health systems and interventions could be further modified to overcome barriers to screening, from the providers' point of

view. While patient perspectives allow us to identify the main barriers/enablers to screening, providers' perspectives enable us to identify the potential touchpoints within the system that can be easily modified to help patients overcome those barriers.

METHODOLOGY

Setting and Recruitment

Patients were recruited via purposive sampling techniques from two rental-flat communities in Singapore, in end-2012 through to early 2013. Public rental flats are a good marker of socioeconomic status in Singapore. The majority of Singaporeans (≥85%) stay in public housing and home ownership is high (90.3%).[25,26] Public rental flats provide heavily subsidised rentals for the needy. Respondents were chosen to ensure roughly similar proportions of gender and ethnicities compared to the population at large, with roughly equal numbers of younger (aged 40-59 years) and older (aged ≥60) participants. These two sites contained all rental blocks in their respective estates and were in the eastern and western zones of Singapore respectively, which have the largest number of such blocks.[26] Inclusion criteria included: age ≥40 years, and having lived in the community for ≥3 years. Patient participants were recruited via letters of invitation and were reimbursed S$10. This study was approved by the National University of Singapore Institutional Review Board (reference code: 11-243), and written informed consent was sought.

Separately, healthcare providers were recruited via purposive sampling to represent various organisations providing medical services to these communities. In Singapore, the bulk of primary care is delivered via public primary care clinics called polyclinics, as well as private general practitioner (GP) clinics.[27] Tertiary hospitals handle more complex cases. Free clinics and door-to-door consultations provided by voluntary welfare organisations[28] fill gaps for the needy. We recruited representatives of these organisations, who must have stayed in their current roles for ≥2 years and be directly involved in patient care. Provider participants were recruited via letters of invitation sent to the organisations and were not reimbursed.

Conduct of Interview Sessions

Individual interviews (approximately an hour each) were carried out in residents' homes for patients, and at the offices of healthcare providers. Interviewers were four medical students with extensive previous engagement in community outreach initiatives that provided medical care to these needy communities.[28,29] These students were chosen both because of their experience in working with this low-income population, and also because the insights gained could be potentially useful in improving their community outreach initiatives. These interviewers underwent qualitative research training by the senior author prior to study commencement, which comprised participation in a week-long workshop on research methodology and qualitative/quantitative research skills. In addition the senior investigators (the first and last authors) demonstrated techniques of qualitative interviewing through active role-playing sessions, and in the initial interviews, accompanied the medical students to supervise the process. We matched interviewers to patient interviewees, conducting the interview in the interviewee's first language and pairing

Table 1. Interview guide for residents and healthcare providers

Section A: General health-related questions only for residents	
General attitudes toward cardiovascular disease and screening tests 1. "What things do you think cause high blood pressure, diabetes or high cholesterol?" 2. "Are there things people can do to prevent high blood pressure, diabetes or high cholesterol?" 3. "Where do you get most of your information about high BP, diabetes or high cholesterol? How much do you trust the information that you get from _____?"	
Section B: Specific screening modality questions for residents and healthcare providers	
Questions for residents	**Questions for healthcare providers**
Hypertension	**Hypertension**
1. Have you ever heard of a test for hypertension (blood pressure measurement using sphygmomanometer)? 2. What do you feel/think about this test? 3. What might keep you from doing this test? What makes it difficult for you to do this test? 4. What kinds of things would work to get people, like yourself, to want to do this test? What makes it easy for you to do this test?	1. Do needy patients that you see know about hypertension/blood pressure measurement using sphygmomanometer? 2. What do you think are their ideas/beliefs about hypertension/blood pressure measurement using sphygmomanometer? 3. What do you believe keeps needy patients in your community from participating in hypertension screening? 4. What kind of things would work well to get needy patients in your community to do hypertension screening? What would make it easier for them to do this test?
Diabetes	**Diabetes**
1. Have you ever heard of a test for diabetes (fasting blood glucose test)? 2. What do you feel/think about this test? 3. What might keep you from doing this test? What makes it difficult for you to do this test? 4. What kinds of things would work to get people, like yourself, to want to do this test? What makes it easy for you to do this test?	1. Do needy patients that you see know about diabetes/fasting blood glucose test? 2. What do you think are their ideas/beliefs about diabetes/fasting blood glucose test? 3. What do you believe keeps needy patients in your community from participating in diabetes screening? 4. What kind of things would work well to get needy patients in your community to do diabetes screening? What would make it easier for them to do this test?

with an interviewer fluent in the language. For Tamil and Malay, the interviewers were native speakers. For dialects, the interviewers were fluent in the respective dialects. Interviewers used an interview guide developed by the investigators, comprising a series of open-ended questions (**Table 1**) to elicit interviewees' feelings about cardiovascular disease screening using three screening modalities (i.e. blood pressure measurement using sphygmomanometers for hypertension, and fasting blood glucose and lipids for diabetes mellitus and dyslipidaemia). All residents were asked about general attitudes toward cardiovascular disease (**Table 1; Section A**). Residents eligible for the various screening modalities were queried about the corresponding screening modality (**Table 1; Section B**). Eligibility was determined based on the local Ministry of Health's guidelines for health screening.[17] For providers, similar questions were asked (**Table 1; Section B**). Interviewers performed member checking with interviewees by paraphrasing and summarising to clarify points brought up.

Qualitative Content Analysis

Using a phenomenological approach, iterative content analysis of the verbatim transcripts of the audiotaped interviews was carried out. The interview transcripts were first translated into English by an interviewer who was fluent in the original language. For the initial transcripts, the investigators identified and highlighted every codable "unit of text" in the transcripts that represented a singular idea. Each unit of text was then reviewed and a list of themes representing distinct barriers/enablers to screening was created from each transcript. Investigators then met to discuss the collated lists of themes and produce a master list comprising all unique themes identified. The master list was then used to pilot-code one patient and one provider manuscript, and consensus was sought to refine the master list. All accumulated transcripts were then recoded using the master list. The team met regularly, repeating this multiple times, allowing addition of new themes to the master list as they arose. Additional residents/ providers were interviewed until saturation was reached.[30] The final master list was then used by the investigators to independently review all transcripts and recode them accordingly; finally meeting to compare recoded transcripts and resolve divergences through consensus.[30,31]

RESULTS

Participants' Characteristics

There were a total of 29 participants (20 patients, 9 providers). Participants' characteristics are reflected in **Table 2**. The majority were Chinese (85%). These patients were of lower-SES: two-thirds were unemployed, and all had a household income of ≤$1500/month (compared with the average household income of $7,570/month in 2012[32]). A majority of providers were doctors; all had come into contact with low-SES communities.

Major Content Areas

For each of the three modalities (hypertension, diabetes, and dyslipidaemia), patient and provider comments fell into seven content areas: primary-care characteristics, procedural issues

Table 2. Sociodemographic characteristics of study participants, comprising residents staying in two rental-flat communities in Singapore (n=20), as well as the healthcare providers serving them (n=9)

Residents (N=20)		Healthcare providers (N=9)	
Characteristics	**n (%)**	**Characteristics**	**n (%)**
Site		**Occupation**	
Site A	12 (60.0)	Doctors	8 (88.9)
Site B	8 (40.0)	Nurses	1 (11.1)
Age (years)		**Organisation**	
40-59	11 (55.0)	Polyclinic (public primary care clinic)	2 (22.2)
≥60	9 (45.0)	Free clinic	4 (44.4)
Gender		Medical advisors to grassroots organisations	2 (22.2)
Female	9 (45.0)	Family medicine department in tertiary hospital	1 (11.1)
Male	11 (55.0)		
Married			
Not currently married	9 (45.0)		
Married	11 (55.0)		
Ethnicity			
Chinese	17 (85.0)		
Non-Chinese	3 (15.0)		
Educational attainment			
Primary education and below	15 (75.0)		
Finished secondary education	5 (25.0)		
Employment			
Currently unemployed	12 (60.0)		
Currently employed	8 (40.0)		
Monthly household income			
≤$500/mth	11 (55.0)		
>$500/mth, ≤$1500/mth	9 (45.0)		

related to screening, knowledge, costs, priorities, attitudes, and information sources. Representative quotations of the various content areas are presented in **Table 3** (patients) and **Table 4** (providers).

Differences Across Health Screening Modalities—Patient Perspectives

There were subtle differences in how the three screening modalities (for hypertension, diabetes and dyslipidaemia) were perceived. Intrinsically, screening for high blood pressure (using a mercury sphygmomanometer) is a different procedure from the fasting blood test, which can be used to screen for diabetes and cholesterol. This was reflected in patients' perceptions of the procedural issues associated with the different modalities. There was a dichotomy between blood pressure screening and the fasting blood test. Amongst patients, for hypertension screening, procedural issues were enablers, in that patients found the test convenient, especially if brought door to door; once they had gone through the screening process, they were keen to repeat it on a yearly basis:

"Yes, the blood pressure cuff can be a bit uncomfortable, very tight at first. But okay, I tried it and then I realised it was actually ok. So the discomfort will not cause me not to go for blood pressure checks." (Patient 2)

However, for fasting blood tests, procedural issues were perceived as both enablers and barriers, including issues of pain, needle and blood phobia, and lag between tests and results. In some cases, having personally gone through the fasting blood test, residents were not keen to have it repeated again because of the procedural issues they experienced:

"I am scared of the needle. They say the test is like an ant-bite but it's much worse than that. That time I did there were also so many bruises. No, I won't do it again because of the pain." (Patient 4)

Similarly, costs of screening and treatment were cited as issues for diabetes and cholesterol screening, but for hypertension screening, costs of screening did not feature prominently in patients' narratives; instead, costs of treatment dominated. This could potentially be due to the ubiquity of blood pressure measurement and the ability of individuals to potentially monitor their own blood pressure (using automated blood pressure monitors), whereas fasting blood tests could only be done by healthcare professionals, hence influencing patients' perceptions that costs of screening were potentially higher for diabetes/dyslipidaemia compared to hypertension:

"Blood pressure, I can even do it at home. Not a problem. But for high sugar, need to go and see a doctor, take blood, seeing a doctor is not cheap! So I try not to do it if I can." (Patient 5)

In terms of knowledge, while blood pressure measurement using sphygmomanometers and fasting lipid tests were generally perceived as the accepted screening tests for hypertension and hyperlipidaemia, fasting glucose tests were not perceived as the accepted screening test for diabetes. Some of the low-income residents perceived that capillary blood glucose was an acceptable substitute:

"No need to do fasting blood test! My mum has diabetes also, at home the doctor told her to just prick her finger, check the blood sugar level. So sometimes I just borrow her test kit, check my blood sugar. It's normal. So don't need to go and pay money to see a doctor to check." (Patient 8)

Additionally, looking for glucose in the urine was also considered a method of screening in several narratives:

"Actually diabetes is very easy to test! If there is sugar in the urine, there will be ants and you will know. No need to go all the way to doctor to test." (Patient 12)

Provider Perspectives on Cardiovascular Screening

Similar to patients, providers also raised several procedural issues with screening. Examples included delays between screening and the release of results, issues with fasting and the pain of blood drawing. While some of these issues could not be entirely obviated, providers sought to give examples of how the procedure of screening could be simplified for needy patients. Providers focused on presenting the screening decision to patients in the correct context (e.g. in a context of cardiovascular health and detection of asymptomatic disease), and increasing convenience for patients by bringing screening to the doorstep (mobile screening clinics), as well as packaging screenings together in an integrated package of education on cardiovascular disease. They also pointed out the need for ancillary measures to prevent these needy patients from falling through the cracks—such as calling up patients who missed screening appointments, spending more time on education during busy clinical consults, addressing concerns regarding the cost of screening and treatment, and highlighting that for some of these issues, social issues needed to be worked out in tandem with their medical issues. Providers acknowledged, though, that these measures also required resources in terms of time and manpower, and that it was a challenge to sustain these measures especially in clinics with a heavy patient load.

Comparison of Patients' and Providers' Perspectives on Cardiovascular Screening

In general, barriers and enablers to cardiovascular screening, as perceived by patients and providers, were largely concordant, with overlaps between the perceptions of providers and patients. Only in the case of sources of information was there some divergence between patients and providers. While providers mainly perceived word of mouth as a key enabler to participating in cardiovascular screening, patients provided the perspective that word of mouth could be a barrier as well as an enabler. While some were nudged into going by peer pressure, others found the apathy of friends and neighbours to be a barrier to screening:

"I don't know much about high cholesterol, my friends hardly talk about it. I haven't heard much about it either. None of them go for screening anyway." (Patient 6)

For some, they were actively discouraged from participating in screening by negative feedback from friends and relatives. Some patients also trusted the advice of their friends and relatives, rather than their doctors:

"My friends said, no need to go for screening. Screen for what, have already also can't do anything. And they said, high blood pressure, just eat less salty food, no need to see doctor, see doctor get more stressed, blood pressure also go up, no point. So I just believe what they say. I trust them." (Patient 5)

While media information and community outreach served as key sources of information providing pro-screening and healthy lifestyle messages to the community, the media could also be a source of disinformation:

"That time, the newspaper advertisement say that if you take this pill (traditional medicine), good for many things, eyesight, heart, also high cholesterol very good. Can lower. No need to see doctor, no need to take medicine. So I think I don't need to go for screening, can just take the pill and I'll be ok." (Patient 8)

DISCUSSION

Disparities in access to screening exist in Singapore,[8,28] despite subsidised screening. Nationally, 63.9 percent had had regular hypertension screening, 72.2 percent had regular diabetes screening, and 78.0 percent had regular dyslipidaemia screening.[16] In our population of low-income Singaporeans staying in public rental flats, only 41.7 percent were going for regular hypertension screening, while only 38.8 percent and 30.8 percent were regularly going for diabetes and dyslipidaemia screening, respectively.[8] The causes of poor cardiovascular screening access are likely multifactorial, and differ by disease and the nature of the screening technique. Amongst patients, for hypertension screening, procedural issues were enablers, in that patients found the test convenient, especially if brought door-to-door; but for fasting blood tests, procedural issues were perceived as both enablers and barriers, including issues of pain, needle and blood phobia, and lag between tests and results. Providers also offered the perspective that providing integrated cardiovascular screening, and increasing its convenience by bringing it to residents' doorsteps, could be a feasible means of improving screening uptake, compensating for other procedural inconveniences that were intrinsic to the screening process (e.g. time lag between test and results; need to fast; need to draw blood). Previously, we found that when free cardiovascular screening was brought door to door in the rental-flat population by teams comprising medical and nursing student volunteers led by family physicians, uptake of hypertension screening was very high (from 41.7% to 99.2% post-intervention), but uptake of tests for diabetes (38.8% to 45.2%) and dyslipidaemia (from 30.8% to 37.0%), though significant, were more marginal.[8] This could be because the main barriers to hypertension screening identified in this study were primary-care characteristics (problems such as distant locations, inconvenient opening hours, and limited manpower), with convenient screening as a significant enabler. Thus, bringing primary care into the community[28] and hypertension screening door to door[29] nullified inaccessibility and enabled convenient screening, resulting in considerable gains in uptake. Such interventions can achieve not just gains in screening but also improvements in chronic disease management.[33]

For diabetes screening, although both patients and providers acknowledged the importance of knowledge and procedural issues as factors contributing to low screening uptake, negative attitudes about diabetes screening formed a significant proportion of patients' comments. Knowledge, procedural issues (e.g. needles needed for insulin injection) and attitudes (e.g. fear of side effects, complications) were also reported as issues in diabetes management in local qualitative studies.[23,24] It appears that these concerns extend to diabetes screening as well. Perceptions that diabetes screening was unnecessary as patients were healthy/not at-risk were also identified in qualitative studies from other underserved populations.[11,34] Perhaps as knowledge and attitudes needed more time to change, and procedural issues with fasting blood tests (pain, blood phobia, fasting) were more intractable, door-to-door fasting blood tests only achieved marginal gains in screening uptake within this low-income rental-flat population.[8] Fatalism, fear of diagnosis/treatment, ageism, and perceived superiority of traditional medicine were all attitudes that deterred diabetes screening in this low-income community. In a local study, 19.5 percent of respondents perceived traditional medicine as superior to Western medicine for diabetes treatment.[35] Healthcare providers need to be aware of these attitudes to dispel misperceptions.

In this underserved population, patients, more so than providers, acknowledged the importance of family and friends in influencing screening. In underserved populations, increased social participation was associated with increased awareness of diabetes;[36] and other qualitative studies also concurred on the importance of social networks in encouraging behaviour change to reduce cardiovascular risk.[37] Social dynamics were also important in encouraging dyslipidaemia screening.[38] Community-based efforts are important in encouraging better management of cardiovascular disease risk in these communities.[39] Providers also acknowledged the need for a "safety net" to catch needy patients who slipped through the cracks—such as spending more time to discuss screening, calling patients to remind them of missed appointments, and solving other medical/social issues in tandem with the screening discussion. However, this also required a significant investment of time and resources. In the context of a busy primary-care clinic, healthcare providers serving these needy populations may need more support and resources in order to maintain these safety nets for their less well-to-do patients.

Our study has its limitations. Using a qualitative approach allowed us to yield rich and detailed data on the perceptions of both patients and providers; however, we recognise that these

methods may have limited generalisability. In addition, there is the possibility of researcher bias in interpreting our findings, which we sought to minimise through a step-wise approach to data analysis, with multiple iterations of checking and cross-checking amongst researchers. Finally, there was a preponderance of the majority ethnic group in the sample, which may have resulted in under-representation of minority perspectives. The majority of the healthcare providers nominated by the organisations were doctors, which may have resulted in under-representation of perspectives from a nursing standpoint. While we sent out letters of invitation to private GPs in the neighbourhood, none responded to our requests for interviews; hence we were unable to obtain the perspectives of private GP providers. As interviewers were students, there may have also been some element of interviewer bias due to demographic disparities between interviewers and interviewees; we sought to minimise this through careful interviewer selection and intensive interviewer training.

CONCLUSION

In our study of patient-provider attitudes to cardiovascular disease screening for hypertension, diabetes and dyslipidaemia in a medically underserved Asian community, there are differences regarding perceived barriers and enablers to cardiovascular screening, across disease modalities. Procedural issues and system-based issues (e.g. characteristics of primary care, costs) predominated in patients' perceptions of hypertension screening, while knowledge and attitudes played a more significant role for diabetes and dyslipidaemia. Interventions to raise screening uptake in these disadvantaged communities cannot be one-size-fits-all, but must be tailored to the main barriers for each modality.

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Author Contributorship
Both authors contributed to study design, data acquisition and analysis, and writing of the manuscript.

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Table 3. Representative quotes from patients in two rental-flat communities in Singapore, organised by frequently mentioned content areas and themes

Primary care characteristics	
Barriers	
Lack of trust in healthcare system/healthcare professionals	"I don't trust doctors. They only want to see you when you are sick, why would they want to see you when you are well? Unless they want to make money. Seeing the doctor too often is also bad for you."(DM)
Healthcare professional does not often discuss screening – no time	"Don't know, doctor never explain. He just rush through, just listen to my heart, say everything is ok. If everything is ok, then ok." (HTN)
Characteristics of clinic (manpower, location, hours open)	"The queue is so long. And by the time I end work, the polyclinic is closed. No point going. I only go when I'm sick, that time no choice, got to go." (HChol)
Promoters	
Healthcare professional recommends patient to go for screening	"If I don't know anything I ask the doctor. When the doctor tells me to go for test, so I go. It's his job, he probably knows best." (HTN)
Screening integrated with other healthcare schemes	"Yes, the tests are necessary, definitely necessary, but a bit inconvenient to go down so many times for different things. Why can't they do it all at once? Take one vial and test all at once. So if I can test for all three- diabetes, cholesterol and high blood pressure together and the cost was not that high, I would go for screening. And if they bundle everything together, like mammogram, even better." (DM)
Procedural issues with screening	
Barriers	
Lag time between test and knowing results	"Yes. It is inconvenient because I have to go down once to do the test and another day to get the results. I would only do it if it was on the same day but if they were to tell me to come back another day I wouldn't go because of time constraints. I would rather they do everything on the same day then I wouldn't need to go back on another day." (DM)
Painful test	"I am scared of the needle. They say the test is like an ant-bite but it's much worse than that. That time I did there were also so many bruises. No, I won't do it again because of the pain." (HChol)
Need to fast	"The last time the doctor asked me to test. But he said I could not eat in the morning. I forgot what time he said. So I did not do the test in the end. Sometimes I forget, and I eat breakfast, then cannot do already." (DM)
Blood phobia	"No I don't need this test because I don't want to do it. When I see blood I get scared. I feel scared inside, didn't dare to look the last time around, I turned my head away. I don't like to go for such checks. When you prick my arm to get a bit of blood, my whole arm will have no strength." (DM)
Promoters	
Positive experience during test (e.g. not as painful as expected)	"Yes, the blood pressure cuff can be a bit uncomfortable, very tight at first. But okay, I tried it and then I realized it was actually ok. So the discomfort will not cause me not to go for blood pressure checks." (HTN) "I actually thought that it would be quite painful. But the nurse told me she'll use the smallest needle and when I did it the pain was bearable, and it was over very fast. So I think it's not a problem, I can do it again." (DM)
Convenient location of test (door-to-door)	"Yes, it is very easy to do this test. I went for it 3 years ago at the polyclinic, but I didn't go again because it was far. But when they came door- to-door to do it I also did it as well. Everybody went for it because they came door to door, so I also went with all my friends. I think if they came door-to door again to do it I would do it again. All my friends would also want to do it I think. It was very convenient." (DM)

Knowledge	
Barriers	
Not aware of screening	"Yes I have heard of diabetes, but I don't know how to test for it. I am not knowledgeable about all these things, never studied much." (DM)
No need screening as healthy	"I guess we are healthy if we are not sick. Actually, if you are healthy or not, you will know. If you have pain, you must go see the doctor! If not, why need! When I don't feel well, then I will go." (HChol)
No need screening as not at risk	"I know I don't have diabetes. Because I don't eat sweet things. I won't be scared and I won't go and test for them." (HChol)
Not aware of where to go for screening	"I know it's an important thing, but I don't know where to get tested." (DM)
Last test normal, so no need to go again	"The last time I tested was 5 years ago, at that time doctor said everything was fine, no problem. Test once good enough already, why need to go so many times?" ((HChol)
Screening may not be accurate/ alternative screening methods are better	"Actually diabetes is very easy to test! If there is sugar in the urine, there will be ants and you will know. No need to go all the way to doctor to test." (DM)
Promoters	
Increased awareness of screening	"I know about the blood test. I think it's a good idea to tell people, you have to let them know the message that it's good to discover early so you can start treatment early. If you don't go, you won't know what is going on." (DM)
Knowledge of risk factors	"I know high blood pressure can run in the family so I'm worried. I'll go for screening because my mother has hypertension. And my diet, you know, I work shift work so we eat outside all the time, a lot of salty food. So I think it's good for me to check." (HTN)
Cost	
Barriers	
Cost of screening	"I will do it if it's free but otherwise no. Screenings can be expensive." (DM)
Cost of treatment	"I don't want to go for screening, if I've something, need follow-up, then have to pay. Money is a big problem. Screen, then what about medicine? If I test, what if I get it? If it's not hospital, go clinic, need to spend a lot of money. My Medisave,[a] no more money. These long-term diseases, only rich people can afford to have, poor people cannot afford to have." (DM) "I don't want to go because it will cost a lot for me to take medication if I actually have something. And you need to take the medication forever, for life, so it can be quite a lot of money." (HChol)
Promoters	
Providing free/low-cost screening	"At the community centre the screening was also free, which is a good thing. It is very easy. I would go for the screening, if it wasn't too much." (DM) "I did it last year because it was free. I will do it if it's free but otherwise no. I did it last time, it was free, test for diabetes, dyslipidemia and blood pressure. So I did the blood test." (HChol)
Priorities	
Barriers	
No time to go, too busy	"I have to work. Even if I have something, there's no time to see the doctor anyway." (HTN)
Can spend money on other things	"I don't have money to see a doctor. So many things to pay for, food, power bills, phone bills… expensive but no choice, got to pay. So I don't have money to see doctor, how to go?" (HTN)
Attitudes	
Barriers	
Fatalism	"If get these diseases, nothing can be done anyway. You don't know when you get it, so you can't do anything anyway. So I think no need to check." (HTN)

Fear of diagnosis and/or treatment	"If you were to be diagnosed with diabetes your life would be horrible! You can't eat any sweet stuff at all and if you have a wound, it won't heal and you might lose the limb. I rather not know."(DM)
Too old to go for screening	"So old already, screen for what? Only a few more years left anyway." (HChol)
Traditional medicine is better	"I don't believe in all these things. See the *sinseh*[b], can already. The western medicine is too strong for me." (HTN)
Promoters	
Fear of diagnosis encouraging early detection via screening	"I want to go for screening because I'm scared. Last year my mother forgot to eat her medications for hypertension and dyslipidemia, then she got a stroke, so I'm scared. My mother warns me that since I have hypertension I must go see the doctor. If there is a complication, I might get a stroke. She also tells me how tiring it is to go to hospital and so I'm scared and I'm thinking of going to see whether my blood pressure is ok and get some medications to control my blood pressure. I'm scared I might just get a stroke or rupture a blood vessel." (HTN)
Sources of information	
Barriers	
No friends, relatives or family go for screening	"My friends said, no need to go for screening. Screen for what, have already also can't do anything. And they said, high blood pressure, just eat less salty food, no need to see doctor, see doctor get more stressed, blood pressure also go up, no point. So I just believe what they say. I trust them." (HTN) "My sister told me the diabetes screening is unnecessary. Check urine can already, see whether got ants. And if we eat healthily, shouldn't be a problem. I trust my sister because she reads more than me, she knows more. So if she says no problem, I think I don't need to check." (DM) "My world is very small, and I don't really have a lot of friends, so I don't know a lot of things. I don't really bother about a lot of things. I don't know much about high cholesterol, my friends hardly talk about it. I haven't heard much about it either. None of them go for screening anyway." (HChol)
Misperceptions spread by media (TV, newspapers)	"That time, the newspaper advertisement, say that if you take this pill (traditional medicine), good for many things, eyesight, heart, also high cholesterol very good. Can lower. No need to see doctor, no need to take medicine. So I think I don't need to go for screening, can just take the pill and I'll be ok." (HChol)
Promoters	
Word-of-mouth	"The last time I went because a lot of people went, my neighbors also asked me to go, they said checkup was good. And important. So I also went, because amongst my friends all of them went. I think if my friends tell me to go, I will go." (DM)
Media (TV, newspapers, etc)	"Yes. I hear about these things on television. Some television programmes or charity shows, when they hold the TV fundraisings for hospitals, they do talk about it and it helps increase my understanding. When I see advertisements on TV or newspapers promoting these tests, when I see, I'll go." (HTN)
Community outreach (talks, flyers, posters)	"That time medical students came down to the neighborhood, they came door to door, they gave out those pamphlets on high blood pressure, stroke, so I learnt more and I decided that I should go and screen especially since it was not too expensive!" (HTN)

HTN: Quotations from patients in reference to hypertension screening using sphygomanometers
DM: Quotations from patients in reference to diabetes screening using fasting blood glucose test
HChol: Quotations from patients in reference to dyslipidemia screening using fasting blood lipid test
[a] Medisave: national compulsory health savings account that can be used to pay for some screening modalities in order to decrease out-of-pocket costs
[b] *Sinseh*: traditional Chinese medicine practitioner

Table 4. Representative quotes from providers serving two rental flat communities in Singapore, organized by frequently mentioned content areas and themes

Primary care characteristics	
Barriers	
Healthcare professional does not often discuss screening- no time	"Whenever the patient needs to watch out for high blood pressure, we will advise them on salt intake, and will spend some time explaining to them and how salt creeps into the diet. Sometimes they're convinced, then they'll be happy to go for testing and treatment. But for this you need some time to explain. So if you spend some time with this patient, they will be happy, but the one waiting outside will not. So we do not have a lot of time, it is a problem to do it sometimes." (HTN)
Promoters	
Healthcare professional recommends patient to go for screening	"We invite patients who missed screening for diabetes to come back, those who missed appointments. We will send them letters – don't' wait for them to come back and tell them or would be too late. So this helps us deal with the problem, that sometimes we cannot have time to talk about screening in the clinic, we can talk about it outside the clinic." (DM)
Procedural issues with screening	
Barriers	
Time lag between test and knowing results	"The results from fasting blood tests usually take 4-8 days to come back. Because the results cannot be back immediately, we still need to call them back for a followup. Some don't come. So this is the administrative hurdle. How to overcome, this, we haven't been able to resolve. Because the patient may go away thinking nothing wrong after we've done the test, but the reality is that the results are not out." (HChol) "Some patients want to do the fingerprick test instead. They like it better because the results come out on the spot. But random sugar not recommended, not being sanctioned by Health Promotion Board so we are encouraging change. But some patients don't understand why we use one test for screening and one for monitoring." (DM)
Painful test	"Drawing blood is an issue you know. It's an issue. Really. The pain, sometimes, people don't like it, especially if you've to do that again and again." (HChol)
Need to fast	"Chinese people don't like to fast? Malays and Indians, are ok, they fast all the time. Because of the need to fast, the morning crowd is the biggest, very long queue. So that turns off some people. I encourage them to skip lunch and come in the afternoon so that the queue is shorter. But they're not comfortable with that." (DM)
Blood phobia	"It's not just the pain, then there's some perception about drawing, giving your blood away. I don't know where that comes from but there are people who are averse to that. I think they feel that it makes them weak or something." (DM)
Barriers	
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Blood phobia	"It's not just the pain, then there's some perception about drawing, giving your blood away. I don't know where that comes from but there are people who are adverse to that. I think they feel that it makes them weak or something." (DM)
Promoters	
Convenient location of test (door-to-door)	"When we use mobile screening clinics, they just need to go down, makes it a lot easier for them. Then they are more likely to go. To make it convenient for them, that's why we bring the health screening to them." (HTN) "The patients tell us that bringing the blood test to the doorstep makes a lot of difference." (HChol)
Knowledge	
Barriers	
No need screening as healthy	"The problem is that they have no symptoms. If they don't know they have hypertension they won't feel the need to check. They think, 'I'm normal what, so leave it'. Until maybe they find themselves giddy, then they will go. Usually I think it's like that, when you have symptoms, then you go and see. Otherwise you just leave it." (HTN) "Ignorance is also a problem. They don't see the benefits of early detection, of treatment. They may have heard of the diseases but not the complications, especially for diabetes, blood pressure, so they don't really know how bad it can get and they're not so scared. These diseases are often "silent" at the critical stages where intervention could prevent complications, so patients think they're healthy and they don't go." (DM) "Lead time is a problem. Lead time from diagnosis to end-organ damage. That's my perception on why they don't go." (HChol)
No need screening as not at risk	"They think that because their family members don't have the disease, so they won't have also." (DM) "For a lot of people their idea of cholesterol is also fuzzy. Because they don't really know how to measure it, what it is. So they think that they're not at risk, just need to eat healthily and watch their weight can already." (HChol)
Promoters	
Increase awareness of screening	"I think really need some explanation. Knowledge. Let them know they need to do something. Let them know how it affects their body. We try to spend some effort in counseling them, to tell them what is the meaning of systolic and diastolic pressure. What is blood sugar and what is diabetes, what is cholesterol. I think it helps a lot because I show them frightening pictures too. An Indian lady saw it and for the next few weeks she didn't eat much." (HTN) "There's more awareness about diabetes than for some other diseases. Diabetes, glucose check, people understand, because when they go hospital it's also very common. So maybe they think, 'Okay lah, check check check'. Education is important. Because for a lot of them, the perception is like that. 'I didn't know, I didn't know that I'm healthy and need to go for regular checks. Now you tell me I'm more conscious'. So the awareness is important."(DM)

Integrated education about cardiovascular risk	"Initially when we started, we only screened those who have no history of any other comorbidity. We then found that not many people came forward. So now when we screen those who have other comorbidities, we find that we are picking up more. People who take up one will take up the others as well. Because diabetes, high blood pressure, they all lead towards the same endpoint. So people are more receptive if you package it all together." (DM)
Cost	
Barriers	
Cost of screening	"Health checkup in clinics and hospitals often costs more than a hundred dollars, which is a luxury for retired seniors." (HTN) "The cost of screening is an additional problem. They don't think they need it, so that need to pay a bit more, it provides that additional bit of resistance." (DM)
Cost of treatment	"Cost of treatment is a big problem. Very hard to get social help these days. Public Assistance- to qualify must have no house, no family, and then they only give $350 per month. It's not enough. It's very difficult to get money. You know how they say, it's cheaper to die then to fall sick in Singapore. Money is at the bottom of everything." (HTN)
Free screening test	"It doesn't cost a lot of money, cheap and good. Can even do at home." (HTN) "Of course free screening always attracts people." (DM)
Priorities	
Barriers	
No time to go, too busy	"They don't have time. They already work such long hours, when they come home they're so tired. Some of them have two, even three jobs to make ends meet. How can they begin to think about preventive care, the future and their health?"(HTN)
Promoters	
Social support	"We need to work out social support, some of their social issues, before they will be keen to go for screening." (DM)
Attitudes	
Barriers	
Fear of diagnosis and/or treatment	"They don't want to know they're sick. If sick, then need to take medicine. They'd rather die in their sleep." (HTN) "It's the fear of the diagnosis, and after that, for further management diet is an issue because a lot of them, they don't want to cut down. So yeah, it ends up like that. They don't go." (DM)
Sources of information	
Promoters	
Word –of-mouth	"We try to involve the people on the ground. We tie up with the community centres, they put information about free health screenings on their website. I think the grassroots are quite cooperative. It really helps to have the people in the neighborhood on your side, it gets the message out much more easily." (HTN)

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