

# BMJ Open Perceived facilitators and barriers to chronic disease management in primary care networks of Singapore: a qualitative study

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## ABSTRACT

**Objective** The increasing chronic disease burden has placed tremendous strain on tertiary healthcare resources in most countries, necessitating a shift in chronic disease management from tertiary to primary care providers. The Primary Care Network (PCN) policy was promulgated as a model of care to organise private general practitioners (GPs) into groups to provide GPs with resources to anchor patients with chronic conditions with them in the community. As PCN is still in its embryonic stages, there is a void in research regarding its ability to empower GPs to manage patients with chronic conditions effectively. This qualitative study aims to explore the facilitators and barriers for the management of patients with chronic conditions by GPs enrolled in PCN.

**Design** We conducted 30 semistructured interviews with GPs enrolled in a PCN followed by a thematic analysis of audio transcripts until data saturation was achieved.

**Setting** Singapore.

**Results** Our results suggest that PCNs facilitated GPs to more effectively manage patients through (1) provision of ancillary services such as diabetic foot screening, diabetic retinal photography and nurse counselling to permit a 'one-stop-shop', (2) systematic monitoring of process and clinical outcome indicators through a chronic disease registry (CDR) to promote accountability for patients' health outcomes and (3) funding streams for PCNs to hire additional manpower to oversee operations and to reimburse GPs for extended consultations. Barriers include high administrative load in maintaining the CDR due to the lack of a smart electronic clinic management system and financial gradient faced by patients seeking services from private GPs which incur higher out-of-pocket expenses than public primary healthcare institutions.

**Conclusion** PCNs demonstrate great promise in empowering enrolled GPs to manage patients with chronic conditions. However, barriers will need to be addressed to ensure the viability of PCNs in managing more patients in the face of an ageing population.

## INTRODUCTION

As the global population ages at an alarming pace, the number of patients with chronic conditions is set to rise in tandem. This surge in demand for healthcare results in

## Strengths and limitations of this study

- This is the first qualitative study on the Primary Care Network (PCN) as a model of primary care due to this recent implementation; thus, this study addresses a gap in research.
- There is a need to understand the facilitators and barriers that this model of care brings to the private general practitioners (GPs) in terms of improving chronic disease management to assess its potential to scale up.
- We interviewed a total of 30 GPs, who represent 8 out of the 10 PCNs that are in operation. As a similar contractual backbone bound each PCN, the results are generalisable to all networks.
- There might be some level of self-selection bias during the recruitment process as GPs who had a positive experience with the PCN might be more inclined to participate in our study.

higher bed occupancy rates and emergency department presentations, which impose substantial expenditures on the healthcare system.<sup>1–3</sup> Singapore, a developed city-state with a healthcare system accessible through an extensive network of hospital, step-down and primary care providers, is no exception. Singapore's primary care sector is divided between privately and publicly run entities. The private primary care sector is dominated by private general practitioners (GPs) who predominantly run as solo practices without the provision of much ancillary services if any. On the other hand, public primary care institutions known as polyclinics are government funded, with subsidised consultations, medications, diagnostic investigations and various ancillary services available for patients.

At present, polyclinics and specialist outpatient clinics at government hospitals are faced with high patient loads from Singapore's population of roughly 5.8 million.<sup>4</sup> From 2010 to 2019, polyclinic attendances had

seen an overall increase from approximately 4.3 million to 6.7 million and 4 million to 5.3 million at specialist outpatient clinics.<sup>5</sup> Furthermore, in 2020, the Singapore government was estimated to have spent US\$18.4 billion on healthcare which is forecasted to swell to US\$50 billion by 2029 due to chronic conditions emerging from a rapidly ageing population.<sup>6</sup> Therefore, there is an urgent need to shift patients with stable chronic conditions away from these public healthcare institutions to the private primary care space. The private primary care sector accounts for 80% of all primary care utilisation, yet only 20% of patients turn to them for chronic disease management, while polyclinics meet 52% of chronic attendances and the remaining is met by government hospitals.<sup>7</sup> To more effectively harness this pool of untapped resources and lessen the burden placed on public healthcare institutions, a model of care that promotes the anchorage of patients with chronic conditions with private GPs is imperative.

To tackle the imbalance in chronic care attendances, Singapore's Ministry of Health undertook a large coordinating role to use the capabilities of private GPs. This shift came in the form of the Primary Care Network (PCN) which organises private GPs into groups *de novo*, a move touted by Singapore's Ministry of Health and its statutory board the Agency of Integrated Care as a vehicle to enhance chronic disease management for enrolled GPs. The Agency of Integrated Care oversees the policy direction and funding for the PCN and will be referred to as the PCN oversight agency for the rest of this article. The PCN is a model of care that emphasises on the delivery of team-based primary health services, through a team of physicians, nurses, care coordinators and administrative assistants.<sup>8</sup> Such networks have been established in Canada, New Zealand and Germany since the early 2000s, and have produced improved patient access to primary care and quality of care for the general population and in particular, patients with chronic conditions.<sup>9–11</sup> In Germany, PCNs have displayed positive results in the management of chronic diseases such as diabetes by serving as a model of care that focuses on improving access to care and chronic disease self-management practices through the use of multidisciplinary teams.<sup>11 12</sup> PCNs in Alberta had also demonstrated their capacities in reducing presentations to emergency departments and hospital days for non-elective acute care, further emphasising the significance of team-based care at the primary care interface.<sup>13 14</sup> Furthermore, PCNs facilitate sharing of resources, allowing for greater bargaining power when tendering for services, sharing expertise between parties and reducing the organisational workload of practices.<sup>15</sup>

As of August 2020, a total of 527 private GP practices have been enrolled in the 10 existing PCNs in Singapore, each headed by two GP leaders and furnished with a certain level of resources which will be further elaborated in the results section.<sup>8</sup> But briefly, each PCN is equipped to provide a set of mandated ancillary services such as diabetic retinal photography, diabetic foot screening and

nurse counselling, all of which can prevent the progression of diabetes and its complications. Additionally, GP practices enrolled in a PCN are required to maintain a chronic disease registry (CDR). This registry collects process and clinical outcome indicators that are central to ensuring high-quality care for patients with chronic conditions if monitored religiously. Historically, Singapore's private GP sector was devoid of these key elements which are enabling features for chronic disease management.

To our knowledge, only two quantitative studies were conducted to evaluate the effectiveness of PCN in Singapore, both exclusively for diabetes management.<sup>16 17</sup> In both studies, patients with diabetes were found to have better control over their disease condition and featured improvements in clinical parameters such as haemoglobin A1c (HbA1c) levels. However, there are no qualitative studies investigating how the PCN facilitates or challenges the management of chronic diseases from the providers' perspective, which is a crucial step to undertake to explore its scalability as a viable model of primary care. Therefore, this study aims to understand the experiences of GPs enrolled in PCNs and explore the facilitators and barriers of PCN in helping GPs manage patients with chronic diseases.

## METHOD

### Study design

Our study employed a qualitative research design<sup>18</sup> using data collected from semistructured in-depth interviews conducted with participants who met the inclusion criteria of being a private GP enrolled in a PCN at the time of the interview. The consolidated criteria for reporting qualitative research criteria was applied throughout the research process (research checklist).<sup>19</sup>

### Recruitment

Purposive and snowball sampling strategies were used to recruit eligible participants. First, for purposive sampling, we contacted eligible GPs based on a list made available on a publicly assessable government-run website designated for PCN and went through the list in a sequential order for each PCN. Second, snowball sampling was also employed whereby GPs whom we had finished interviewing had referred us to other GPs who met the inclusion criteria to take part in our study. A total of 37 eligible GPs were contacted by email or telephone to take part in our study, 28 were recruited by purposive sampling and 2 were recruited by snowball sampling, which resulted in 30 GPs willing to participate (81% response rate). Seven GPs whom we had approached declined participation, citing insufficient time to be interviewed.

### Data collection

The semistructured in-depth interviews were conducted face to face at a place of the participants' convenience. The interviews ranged from 40 to 90 min and occurred from January 2019 to January 2020. The team was trained

in qualitative research, had no prior relationship with the participants and had a profound knowledge of the Singapore healthcare system.

The topic guide used was designed with questions on the primary care landscape and how the PCN had shaped the way GPs manage patients with chronic conditions (attached as online supplemental material 1). The questions created starting points to dive deeper into aspects salient to the research questions by further probing participants based on their initial responses. The topic guide was pilot tested with four GPs before implementation. As the interviews were semistructured, there were no restrictions to conversation flow, but the interviewers facilitated the conversation to elicit responses that could answer the research question. Fieldnotes were also collected to provide contextual information during data analysis. After the interviews, the audio recordings and subsequently, audio transcripts were deidentified to ensure anonymity.

### Data analysis

All audiorecordings were transcribed verbatim, and the transcripts were analysed thematically with QSR NVivo software (V.12) following an iterative six-step process outlined by Braun and Clarke.<sup>20</sup> As such, we first familiarised ourselves with the transcripts, coded aspects that were salient to our research question and organised the codes into themes, while simultaneously referring back to the fieldnotes to enhance the reflexive process. Subsequently, the research team discussed the definitions assigned for each theme to ensure that the themes accurately represented the experiences of the participants. Final themes were agreed among all the authors after multiple iterative rounds of feedback. Additionally, to ensure inter-rater reliability, we followed a similar protocol when analysing the data until the agreement was high on the comparison of codes. Data analysis ended after achieving thematic saturation, whereby no new themes emerged.

### Patient and public involvement

There was no patient involvement, and all participants were private GPs who had provided us with informed consent before participating in our study. The chance to edit their transcript as a form of member checking was also offered but not taken up by any participant.

## RESULTS

A total of 30 interviews were conducted. We interviewed participants from a total of 8 out of 10 PCNs, and all participants recruited at that point of time were involved in the delivery of chronic care in a PCN.

### Participant characteristics

During the recruitment process, 28 participants were recruited by purposive sampling while two were recruited by snowball sampling. The average age of our participants was 49 years of age (range 31–68 years old), and

their average duration spent in primary care was 18 years (range 3–35 years). In fact, most participants had been in their own practice for a relatively long duration averaging 14 years (range 1–35 years). Our sample comprised of 27 male and three female private GPs. As participants were once in the general pool of private GPs prior to enrolment in PCN, their demographic characteristics are expected to be similar to that of the general pool.

### Main findings

Three themes were identified as facilitators and two themes as barriers to the management of chronic conditions. The facilitators are theme 1: ancillary services to provide a ‘one-stop-shop’, theme 2: CDR to monitor care indicators and theme 3: funding for the network. The barriers are theme 4: administrative burden of maintaining the CDR and theme 5: loss of patients due to financial gradient in favour of public healthcare institutions.

#### Theme 1: ancillary services to provide a ‘one-stop-shop’

Every PCN is outfitted with wrap-around ancillary services which included diabetic retinal photography, diabetic foot screening and nurse counselling. These ancillary services enabled private practices which were traditionally too small to sustain or arrange for such services an opportunity to provide more holistic and preventive care for their patients. The individual practices are also supported by a team of nurses and care coordinators, expanding the time for patient care by the entire primary care team.

#### Subtheme 1.1: convenience of having the ancillary services arranged for patients

Traditionally, private GPs would have to refer their patients to the polyclinics or government hospitals for ancillary services. However, the PCN enables each clinic to provide ancillary services to their patients when the services of a roving team are employed. Therefore, patients will not only be able to see the same doctor but also have the ancillary services conducted at the same location. As most patients reside near the clinic, this ‘one-stop-shop’ enables a higher level of convenience and lowers the perceived barriers to attend ancillary services.

[...] eye screening and nurse education [services available at polyclinics], but whereas in primary GP clinics, we are unable to offer that. So, the current workflow is that we need to refer patients back to even polyclinic or back to other service centres for eye screenings. These extra referrals or extra effort for the patient is not an optimal workflow for the patient and that will reduce the uptake on a lot of services. So PCN with our own ancillary and even mobile services, hopefully, will provide more convenience to the patient. (R26)

#### Subtheme 1.2: additional manpower provided for conducting and coordinating ancillary services

The lack of ancillary service support and busy clinic hours raise the challenge of counselling patients on

disease-modifying behaviours, diabetic eye and foot examinations for independent GPs. Having additional manpower in the form of nurses hired by the PCN contributes towards the practices in carrying out these essential ancillary services to prevent avoidable complications in patients. PCNs can either employ and train their own nurses or outsource the services to external vendors that provide a roving team of nurses to conduct ancillary services at their clinics.

Furthermore, PCNs are provided with additional manpower to arrange for ancillary services and remind patients to attend the arranged services which alleviate the workload for clinic assistants and improve patient attendance. This task is fulfilled by primary care coordinators, but they can also be assigned other PCN-related tasks such as the consolidation of patient data for maintenance of the CDR (elaborated in theme 2).

[...] CAs [clinic assistants] or my doctors will just have to register the patient, and then the PCCs [primary care coordinators] will then follow up with patients on their appointments, and then they will book, and then they will then get their appointments, work with the patients to get their appointments and then bring the provider [roving ancillary services team] to provide their service in our clinic. (R46)

The DRP [Diabetic Retinal Photography], DFS [Diabetic Foot Screening] believe is done by Diabetic Society [external vendor]. Their nurses will be running the services inside the van. [Name of PCN] has their own roving nurse, so I understand that they will be providing the nurse counselling and also maybe helping with some of the DRP, DFS. (R21)

### Theme 2: CDR to monitor care indicators

The CDR is a platform that enables the systematic tracking of care components for patients. Data are tabulated into an excel spreadsheet which comprises over 200 fields, from basic sociodemographic data, date of clinical diagnosis and screening attendances to clinical parameters for chronic conditions in accordance with local clinical practice guidelines. CDR data are submitted to the PCN oversight agency to ensure required care components are fulfilled before Care Plus Fee (elaborated in subtheme 3.1) is dispersed by the PCN oversight agency to the PCN. Thus, the CDR gives GPs and the PCN oversight agency a dashboard view of the quality of care provided, allowing for the identification of opportunities to refine existing management practices using quantitative parameters by improving processes and outcomes.

#### Subtheme 2.1: cross-accountability to ensure practices meet specific standards of care

Most solo GP practices work in silos, and a certain level of accountability is needed to ensure that practices not only follow guidelines but provide the best care for their patients. Therefore, anonymised results of performance indicators from the CDR of all practices are made

available during implementation and review sessions every quarter to perform benchmarking to reduce the variation in performance and improve quality of care for patients.

[...] my understanding of the CDR, is that they want to benchmark, they want to benchmark the care of the patient, that means, for example, within the PCN, let's say, everybody [PCN GPs] HbA1c for diabetic, you know is let's say 8, and for my clinic, all my patients are 9, then they will say that I am below average. So there is a benchmarking [...] (R39)

#### Subtheme 2.2: reminder to fulfil care processes

The CDR platform allows practices to follow up with patients when required and ensure judicious completion of necessary procedures in their care management plans.

Alright, so I guess in a way it [CDR] reminds especially the private doctors, especially when your clinic so busy. A lot of times we will overlook, or we will forget certain things [...] So this, in a way, it is a constant reminder to making sure that this is done for the patient. (R26)

### Theme 3: funding for the network

Every PCN is entitled to funding from the government. A commitment of US\$45 million per annum by the government<sup>21</sup> will equip the network with more resources to better manage patients with chronic conditions than what could be harnessed as an individual private practice. This funding is mainly disbursed on a reimbursement basis through the PCN oversight agency.

#### Subtheme 3.1: care plus fee for extended consultation time

Private practices are business entities that generate revenue mainly through consultation fee and the sale of medicines. As a result, the revenue generated is volume-based, making it more profitable for GPs to see to more acute cases. However, patients with complex chronic conditions require a lengthened consultation. Hence, the Care Plus Fee was introduced to reimburse clinics for extended consultation time. However, process and clinical outcome indicators stipulated in the CDR must be completed before the Care Plus Fee is disbursed by the PCN oversight agency.

The Care Plus Fees are incentives for all members of the PCN [...] who are managing complex chronic cases. They will receive a financial incentive per patient because it takes longer and more time resource to manage these patients. So per year, they are given a quantum of 100 dollars [per chronic disease case], but of course, you must satisfy all the criteria [CDR requirements] stipulated to prove that you are managing a complex patient. (R15)

### Subtheme 3.2: funding for additional manpower for backend office duties

Funding is provided for PCNs to employ primary care coordinators to coordinate ancillary services, track patients, remind patients to attend ancillary services and to consolidate data for the CDR as most solo practices do not have the manpower to conduct non-clinical duties. Funding for primary care coordinators come in the form of full-time equivalents which is furnished by the PCN oversight agency based on the PCN's load of patients with chronic conditions.

Primary care coordinators if I am not mistaken [...] is one FTE [full-time equivalent] to 3000 patients [...] (R36)

### Subtheme 3.3: funding for locums for GPs to attend continuing medical education sessions

Funding is provided for PCN GPs to hire locums when they attend continuing medical education sessions. The availability of locums motivated GPs to attend continuing medical education sessions while maintaining clinic services in the interim.

[...] I know that specifically there is funding for them to employ locum, so if they have to employ locum to go for this [continuing medical education sessions], there is funding to pay for their locum. (R48)

### Subtheme 3.4: funding for GP leads to perform PCN-related duties

Funding for PCN leaders is used to backfill time lost at their practice when performing PCN-related duties. Duties include developing working relationships with leaders of other PCNs, providing strategic and clinical leadership and spearheading quality improvement over member practices.

[...] PCN leads are given 0.4 FTE [full-time equivalent] [...] for a GP because it is an opportunity cost to be taken away from his clinic. That money goes directly into his pocket. That is to compensate him for the time lost because he could be otherwise seeing his patients. (R36)

### Theme 4: administrative burden of maintaining the CDR

The maintenance of the CDR requires consolidation of data regarding the process and clinical indicators by both GPs and clinic assistants. Despite having additional administrative support from primary care coordinators to consolidate registry data, routine documentation proved highly laborious for practices overstretched by other administrative duties and lean manpower structure, leading to more man-hours or overtime duties. Clinics also face difficulty in extracting data from their clinic management system due to the lack of a smart extraction tool that aligns with CDR requirements.

Fortunately, our staff are understanding, but you cannot say it's the same for other solo practices. The technical staff may not actually want to do paperwork, and if it falls on the onus of the doctors to do it, I don't think they have the time also beyond their clinical time. (R18)

For those clinics using Clinic Assist [a brand of clinic management system] with the CMS [clinic management system] that is linked to PCN yes, that will be easier. You just need to key in your numbers and click submit [smart extraction tool function], but for a lot of other clinics not using Clinic Assist and integrated with PCN, what do we do? We need to manually write it down or manually key in individual patient clinical indicators for both MOH [Ministry of Health] and PCN. With the busy clinic, the doctor has no time to do it, the staff has no time to do it, so we need to OT [overtime] to submit all these. (R26)

### Theme 5: loss of patients due to financial gradient in favour of public healthcare institutions

Perceptions of the affordability of healthcare affect the uptake of medical services. The high levels of government subsidies offered at public healthcare institutions such as the polyclinics and specialist outpatient clinics are highly attractive to price-conscious patients. Thus, the Community Health Assist Scheme, a portable medical subsidy that enables patients to enjoy a finite quantum by the government to offset medical expenses when seeking treatment at private primary care facilities was launched.<sup>22</sup> This subsidy scheme referred to as private healthcare subsidy for the rest of this article is intended to alleviate the stress placed on the public healthcare sector resulting from the huge volume of patients drawn to their subsidised services and medicines.

#### Subtheme 5.1: insufficient quantum for private healthcare subsidies

Complex chronic conditions require multiple visits to the clinic and long-term medication. Participants reflected that the quantum is usually sufficient for patients with simple chronic conditions but insufficient for patients with complex chronic conditions, as more medications need to be prescribed. Therein lies the possibility that care for multimorbid patients provided by their private GP might discontinue after the finite quantum of private healthcare subsidies has been exhausted.

The CHAS [private healthcare subsidies] subsidies help, but it is for simple chronic illness, for simple cases [...] But when it comes to more medication [...] it makes it very difficult, even with the CHAS [private healthcare subsidies] subsidy. (R48)

#### Subtheme 5.2: heavily subsidised government-funded polyclinics

The adverse financial gradient between private primary care and polyclinics promotes specific health-seeking

behaviour. Being price-sensitive, patients turn to the largely government-funded polyclinics to obtain subsidised medications and enjoy lower consultation fees, promoting the severance in care continuity with their private GP.

You cannot fight with the polyclinic because they are subsidised, so you cannot compare. We have no subsidies for drugs. We have no subsidies for consultation. (R48)

I would say that we have been able to keep a certain number of chronic patients within the registry. But of course, the challenge is keeping them in [...] they did not come back after one visit since last year. So for this group of patients, I would assume that they have kind of withdrawn themselves from the system [...] Sometimes, they are, for example, going back to the polyclinic. Most of the time it is cost issues. (R20)

## DISCUSSION

The provision of human and financial resources to upkeep the day-to-day operations of the PCN which includes the wrap-around ancillary services increase the accessibility of team-based care to patients with chronic conditions and the use of the CDR to optimise care components are central in driving this care model forward. Ironically, the CDR, which is an enabler, also poses an administrative challenge for practices. Legacy issues regarding the financial gradient between private GP practices and polyclinics is another complex policy dilemma that requires further examination. Hereinafter the facilitators and barriers will be discussed in detail.

Ancillary services not traditionally offered by solo practices are now available through the PCN. The roving services provide diabetic retinal photography, diabetic foot screening and nurse counselling, which are proven to be catalysts for preventing avoidable amputations and blindness.<sup>23–25</sup> The inconvenience caused to patients in making extra trips to polyclinics where ancillary services are offered, which resulted in missed attendances, was alleviated through roving teams that conduct the services at clinics.<sup>26</sup> Thus, our findings support the results by studies conducted by Luo *et al*<sup>16</sup> and Chua *et al*<sup>17</sup> which evaluated the effectiveness of diabetes management in a pilot PCN in Singapore, showing that the provision of ancillary services at GP clinics which increased accessibility had resulted in improvements to HbA1c levels and better control of LDL-C and blood pressure overall.<sup>16 17</sup> Furthermore, a study by Schäfer *et al* indicated that one-stop-services provided at GP clinics improved accessibility, continuity and comprehensiveness of care.<sup>27</sup> As GPs are usually burdened by assuming organisational and administrative tasks while providing medical care, assigning the responsibility of arranging and conducting ancillary services to designated staff allowed GPs to focus on the medical care for their patients.<sup>28–30</sup> This team-based care approach as studied through a meta-analysis by Levenson

*et al* established that team-based diabetes management improved overall clinical indicators for diabetes patients, health services utilisation, diabetes-related morbidity and mortality.<sup>31</sup>

Our participants supported the concept of the CDR, which allows for a certain level of benchmarking with other practices within the same PCN and track the process and clinical outcome indicators for their patients. The pilot PCN studies by Luo *et al*<sup>16</sup> and Chua *et al*<sup>17</sup> had also briefly mentioned the use of a CDR but did not go into details as to how the CDR enabled better diabetes management.<sup>16 17</sup> Our findings support both quantitative studies by elucidating how the CDR led practices to conform to clinical guidelines. In this case, GPs were prompted to fulfil evidence-based process and clinical indicators such as the tracking of ancillary service attendances, HbA1c, LDL-C and blood pressure readings to monitor the disease condition of patients optimally throughout their patient journeys. Our qualitative findings thus corroborate with the quantitative improvements in diabetes status as stated in the pilot PCN studies.<sup>16 17</sup> Moreover, as defined by Schmittiel *et al*, disease registries can serve to generate performance feedback reports on clinical outcomes; identify patients out of therapeutic range; create point-of-care reminders and decision support; and create ‘high-risk lists’ that target patients who require more intensive management.<sup>32</sup> Other studies on electronic healthcare registries have suggested that disease documenting platforms if utilised in one or more of these ways as suggested by Schmittiel *et al*, can improve care delivery for patients with diabetes.<sup>32–35</sup>

Despite the advantages brought about by CDR, some barriers hinder its implementation. As reflected by our participants, the management of CDR is administratively burdensome, particularly for practices not supported by a clinic management system. Even for practices with a clinic management system, there is no smart extraction tool devoted to the exporting of CDR mandated fields. As a result, the GPs or clinic assistants would have to key in the required CDR fields manually, resulting in additional man-hours or ‘overtime’. In addition, the need for increased documentation of care and coordination planning for patients also reduces face-to-face time GPs have with patients.<sup>36</sup>

A lack of adequate compensation for the coordination of tasks hinders GPs from giving optimal care to their patients.<sup>28</sup> Therefore, funding for manpower to complete back-office tasks such as the coordination of ancillary services and consolidation of data fields for the CDR was allocated. Extra manpower such as having primary care coordinators perform data retrieval and entry for the CDR would also translate to more face-to-face time for GPs with patients, resulting in better patient understanding and thus treatment of the condition. However, to our knowledge, there are other challenges to this, such as providing a space in the clinic for primary care coordinators to work and the unwillingness of practices to grant access to patient data due to confidentiality issues.

Another facilitator that motivates GPs to manage more patients with chronic conditions is the Care Plus Fee. Patients with chronic conditions typically require a longer consultation and more face-to-face time than GPs customarily expend in routine practice.<sup>29 37</sup> If not compensated appropriately, these patients might not receive adequate consultation time, resulting in the omission of important standard-of-care items, reduced attention to patients' psychosocial concerns and limited discussion of management options.<sup>38</sup> As private practices are profit-oriented entities, the compensation for additional time spent on a patient with chronic conditions is appropriate to offset the potential reduction in acute cases seen. However, our participants revealed the highly contingent nature of this funding model, where the Care Plus Fee was disbursed only after the fulfilment of CDR requirements by religiously completing the necessary process and clinical outcome indicators. To our knowledge, the Care Plus Fee had only been distributed once since PCN's inception due to unspecified delays from the PCN oversight agency. We could only surmise that auditing of the fulfilment of CDR criteria took many man-hours at the PCN oversight agency's end as well. Nonetheless, the Care Plus Fee is seen as augmentation for both the GP in terms of reimbursement for their time and the patient who is ensured of evidence-based chronic disease care.

Given that PCNs group GPs practices together *de novo*, it is imperative for a strong leader to helm the network. Clinician leadership has been shown to be important in driving policy direction, strategic planning by operating across organisation boundaries and improving the practices within the network.<sup>39–41</sup> However, GPs might feel a strain taking on dual capacities, both as network leader and provider in their own practice. A study by Sephar *et al*<sup>42</sup> emphasised the challenges that GPs face between the clinical and leadership roles and a lack of formal training and preparation to assume the role of leader. Thus, the reimbursement for their time in conducting duties as a PCN leader was paid accordingly, and the lack of leadership, management and financing skills of the GPs can be nurtured through a national health leadership model embedded into continuing medical education curriculum.<sup>43 44</sup>

Continuing medical education is essential for GPs to keep abreast of the latest chronic disease management practices and serve as a platform to exchange experiences with their colleagues.<sup>45</sup> In addition, PCN leaders are no longer only the captain of their practice but gatekeeper of the entire network. Thus, continuing professional development in clinical, business and financial leadership should be cornerstones for the development of PCN leaders.<sup>46</sup> In both instances, GPs are provided with funding to hire locums to fill their duties when attending continuing medical education courses. This motivates GPs to improve pre-existing levels of competence while having the manpower to cover their duties during their clinical absence.

Perceptions of the affordability of medical care undoubtedly affect the uptake of chronic care treatment.<sup>47</sup> In Singapore, the Community Health Assist Scheme, referred here as private healthcare subsidies was introduced as a portable medical subsidy to improve access to private primary healthcare where recipients can seek subsidies for treatment at private GP clinics. In fact, this private healthcare subsidies scheme was enhanced in November 2019 to motivate more patients to adhere to management plans and seek appropriate care.<sup>48</sup> Despite these enhancements to encourage Singaporeans to shift their care from polyclinics to private GPs, our participants reflected that the quantum for private healthcare subsidies remains insufficient to drive that behaviour. This is especially true for patients requiring multiple medications due to their complex conditions. All our participants had voiced that the high cost of unsubsidised medicines at private GPs had pushed patients to seek care at the heavily subsidised polyclinics. This financial gradient between private and public primary healthcare institutions had long been the reason for patients sticking to polyclinics, especially in a healthcare system where services are mainly paid out-of-pocket and patients are free to choose their primary care provider.<sup>49</sup>

Currently, there are 20 polyclinics in Singapore, with the number set to increase to 30 by 2030.<sup>50 51</sup> Despite the introduction of private healthcare subsidies, polyclinics continue to be confronted with high patient volumes.<sup>52 53</sup> Affordability, convenience of travel and onsite laboratory facilities influence patients' choice of seeking treatment at polyclinics.<sup>49</sup> Increasing the convenience of onsite ancillary services at GP clinics will encourage more patients to seek services from their regular private GPs. Thus, the inconvenience resulting from the lack of co-located ancillary services was resolved through the provision of roving ancillary services teams by the PCN. However, the adverse financial gradient with polyclinics remains. With the emergence of more polyclinics, private GPs will find it increasingly difficult to compete for patients with chronic conditions who are price sensitive. This prevailing policy dilemma warrants further study. For now, we can only postulate that the increasing chronic burden might be too much for the consortia of private GPs alone to absorb, creating the need for more polyclinics.

To our knowledge, this is the first qualitative study conducted on the newly implemented PCN that explores the characteristics which make it a good model for chronic care management, in light of a growing ageing population with increased utilisation of primary care services. We also managed to recruit participants from eight out of ten PCNs. Therefore, we believe that our findings are transferable to all PCNs in Singapore as perspectives across PCNs should be similar, given the same contractual backbone for implementation and funding. In addition, we recognise the limitations of snowball sampling in our recruitment process but feel that our study results are unaffected as only two participants were recruited by snowballing. We also recognise potential self-selection

bias, whereby participants who had positive experiences with the PCN might be more inclined to be interviewed. Despite the potential one-sidedness in experiences, a range of views was demonstrated.

Moving forward, the next step is to evaluate the cost-effectiveness of PCN in managing chronic conditions compared with polyclinics and conduct studies on facilitators and barriers of PCN from the patients' perspective.

## CONCLUSION

The PCN initiative offers immense potential for the management of chronic diseases. The funding for streamlining back-office functions and increased manpower capacities to deliver a range of ancillary services to patients is a huge enabler for solo practices, who are now able to tap on more resources. Moreover, the CDR which tracks the patients' care delivery advances evidence-based care management. The challenges surrounding the administrative burden of maintaining the CDR need to be prioritised, and financial gradient between private and public primary care systems partially surmounted through enhancements to private healthcare subsidies remain to be addressed.

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**Data availability statement** Data are available on reasonable request. Transcripts will not be shared to protect the anonymity of the GPs. Readers who wish to gain access to the data can write to the corresponding author; data may be granted on reasonable request.

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## REFERENCES

- 1 Sampson MJ, Dozio N, Ferguson B, *et al*. Total and excess bed occupancy by age, specialty and insulin use for nearly one million diabetes patients discharged from all English acute hospitals. *Diabetes Res Clin Pract* 2007;77:92–8.
- 2 Donnan PT, Leese GP, Morris AD, *et al*. Hospitalizations for people with type 1 and type 2 diabetes compared with the nondiabetic population of Tayside, Scotland: a retrospective cohort study of resource use. *Diabetes Care* 2000;23:1774–9.
- 3 Wolff JL, Starfield B, Anderson G, Prevalence AG. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. *Arch Intern Med* 2002;162:2269–76.
- 4 Singapore Population. Worldometer, 2021. Available: <https://www.worldometers.info/world-population/singapore-population/>
- 5 Data.gov.sg. Attendances at accident & emergency departments, specialist outpatient clinics, polyclinics and public sector dental clinics, 2021. Available: <https://data.gov.sg/dataset/attendances-at-accident-emergency-departments-specialist-outpatient-clinics-and-polyclinics>
- 6 THE BUSINESS TIMES. Singapore healthcare market set to grow to S\$29.8b this year: Fitch Solutions, Government & Economy, 2021. Available: <https://www.business-times.com.sg/government-economy/singapore-healthcare-market-set-to-grow-to-s298b-this-year-fitch-solutions>
- 7 MOH. Primary care survey 2014 report, 2020. Available: <https://www.moh.gov.sg/resources-statistics/reports/primary-care-survey-2014-report>
- 8 Primary care Pages. Primary care network (PCN)., 2020. Available: <https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-pcn>
- 9 Hutchison B, Levesque J-F, Strumpf E, *et al*. Primary health care in Canada: systems in motion. *Milbank Q* 2011;89:256–88.
- 10 Cumming J. Integrated care in New Zealand. *Int J Integr Care* 2011;11:e138.
- 11 Ose D, Kamradt M, Kiel M, *et al*. Care management intervention to strengthen self-care of multimorbid patients with type 2 diabetes in a German primary care network: a randomized controlled trial. *PLoS One* 2019;14:e0214056.
- 12 Schlette S, Lisac M, Blum K. Integrated primary care in Germany: the road ahead. *Int J Integr Care* 2009;9:e14.
- 13 McAlister FA, Bakal JA, Green L, *et al*. The effect of provider affiliation with a primary care network on emergency department visits and hospital admissions. *CMAJ* 2018;190:E276–84.
- 14 Manns BJ, Tonelli M, Zhang J, *et al*. Enrolment in primary care networks: impact on outcomes and processes of care for patients with diabetes. *CMAJ* 2012;184:E144–52.
- 15 Mills J, Oyedotun L, Ridout J, *et al*. The opportunities for economies of scale in primary care. *InnovAIT* 2019;12:476–8.
- 16 Luo M, Poh Z, Koh G, *et al*. Diabetes management in a primary care network (PCN) of private general practitioners in Singapore. *Medicine* 2018;97:e12929.
- 17 Chua LKL, Chong CK, Hwee-Lin W. Primary care network (PCN) as a model of care for GP chronic disease management. *Singap Fam Physician* 2015;41:61–4.
- 18 Tracy SJ. Qualitative quality: eight “big-tent” criteria for excellent qualitative research. *Qualitative Inquiry* 2010;16:837–51.
- 19 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349–57.
- 20 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.



- 21 MOH. News highlights., 2020. Available: <https://www.moh.gov.sg/news-highlights/details/primary-care-networks-for-better-patient-care-in-the-community>
- 22 CHAS. Community health assist scheme. Available: <https://www.chas.sg/> [Accessed 17 June 2020].
- 23 Nather A, Cao S, Chen JLW, *et al.* Prevention of diabetic foot complications. *Singapore Med J* 2018;59:291–4.
- 24 Mayfield JA, Reiber GE, Nelson RG, *et al.* Do foot examinations reduce the risk of diabetic amputation? *J Fam Pract* 2000;49:499–504.
- 25 Skaggs JB, Zhang X, Olson DJ, *et al.* Screening for diabetic retinopathy: strategies for improving patient follow-up. *N C Med J* 2017;78:121–3.
- 26 Taber JM, Leyva B, Persoskie A. Why do people avoid medical care? A qualitative study using national data. *J Gen Intern Med* 2015;30:290–7.
- 27 Schäfer WLA, Boerma WGW, Schellevis FG, *et al.* Gp practices as a one-stop shop: how do patients perceive the quality of care? A cross-sectional study in thirty-four countries. *Health Serv Res* 2018;53:2047–63.
- 28 Stumm J, Thierbach C, Peter L, *et al.* Coordination of care for multimorbid patients from the perspective of general practitioners - a qualitative study. *BMC Fam Pract* 2019;20:160.
- 29 Østbye T, Yarnall KSH, Krause KM, *et al.* Is there time for management of patients with chronic diseases in primary care? *Ann Fam Med* 2005;3:209–14.
- 30 Margolius D, Wong J, Goldman ML, *et al.* Delegating responsibility from clinicians to nonprofessional personnel: the example of hypertension control. *J Am Board Fam Med* 2012;25:209–15.
- 31 Levensgood TW, Peng Y, Xiong KZ, *et al.* Team-Based care to improve diabetes management: a community guide meta-analysis. *Am J Prev Med* 2019;57:e17–26.
- 32 Schmittiel J, Bodenheimer T, Solomon NA, *et al.* Brief report: the prevalence and use of chronic disease registries in physician organizations. A national survey. *J Gen Intern Med* 2005;20:855–8.
- 33 Stroebel RJ, Scheitel SM, Fitz JS, *et al.* A randomized trial of three diabetes registry implementation strategies in a community internal medicine practice. *Jt Comm J Qual Improv* 2002;28:441–50.
- 34 Hoque DME, Kumari V, Hoque M, *et al.* Impact of clinical registries on quality of patient care and clinical outcomes: a systematic review. *PLoS One* 2017;12:e0183667.
- 35 Thomas KG, Thomas MR, Stroebel RJ, *et al.* Use of a registry-generated audit, feedback, and patient reminder intervention in an internal medicine resident clinic--a randomized trial. *J Gen Intern Med* 2007;22:1740–4.
- 36 Gottschalk A, Flocke SA. Time spent in face-to-face patient care and work outside the examination room. *Ann Fam Med* 2005;3:488–93.
- 37 Schellevis FG, Van de Lisdonk EH, Van der Velden J, *et al.* Consultation rates and incidence of intercurrent morbidity among patients with chronic disease in general practice. *Br J Gen Pract* 1994;44:259–62.
- 38 Barnes CS, Ziemer DC, Miller CD, *et al.* Little time for diabetes management in the primary care setting. *Diabetes Educ* 2004;30:126–35.
- 39 Willcocks S. Leadership: a challenge for GPs? *Br J of Care Manag* 2010;16:468–73.
- 40 Storey J, Holti R, Hartley J, *et al.* Devolving healthcare services redesign to local clinical leaders: does it work in practice? *J Health Organ Manag* 2019;33:188–203.
- 41 Weaver RR. Seeking high reliability in primary care: leadership, tools, and organization. *Health Care Manage Rev* 2015;40:183–92.
- 42 Spehar I, Sjøvik H, Karevold KI, *et al.* General practitioners' views on leadership roles and challenges in primary health care: a qualitative study. *Scand J Prim Health Care* 2017;35:105–10.
- 43 Swanwick T, Varnam R. Leadership development and primary care. *Leader* 2019;3:59–61.
- 44 Hargett CW, Doty JP, Hauck JN, *et al.* Developing a model for effective leadership in healthcare: a concept mapping approach. *J Health Leadersh* 2017;9:69–78.
- 45 Kjaer NK, Steenstrup AP, Pedersen LB, *et al.* Continuous professional development for GPs: experience from Denmark. *Postgrad Med J* 2014;90:383–7.
- 46 Raza A, Coomarasamy A, Khan KS. Best evidence continuous medical education. *Arch Gynecol Obstet* 2009;280:683–7.
- 47 Vuong Q-H, Ho T-M, Nguyen H-K, *et al.* Healthcare consumers' sensitivity to costs: a reflection on behavioural economics from an emerging market. *Palgrave Commun* 2018;4:1–10.
- 48 Chan CQH, Lee KH, Low LL. A systematic review of health status, health seeking behaviour and healthcare utilisation of low socioeconomic status populations in urban Singapore. *Int J Equity Health* 2018;17:39.
- 49 Chow WL, Wang VW, Low YS, *et al.* Factors that influence the choice of seeking treatment at polyclinics. *Singapore Med J* 2012;53:109–15.
- 50 hermes. Parliament: six new polyclinics by 2023, with up to six more by 2030. Straits times, 2019. Available: <https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030>
- 51 Straits Times. Parliament: six new polyclinics by 2023, with up to six more by 2030, 2019. Available: <https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030> [Accessed 10 March 2020].
- 52 Tan KB, Earn Lee C, Lee CE. Integration of primary care with hospital services for sustainable universal health coverage in Singapore. *Health Syst Reform* 2019;5:18–23.
- 53 Lim M-K. Shifting the burden of health care finance: a case study of public-private partnership in Singapore. *Health Policy* 2004;69:83–92.