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Perceived facilitators and barriers to chronic disease management in primary care networks: a qualitative study

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6 2 **primary care networks: a qualitative study**
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1
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3 **20 Abstract**
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6 **21 Objective:** The increasing chronic disease burden has placed tremendous strain on tertiary healthcare
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8 **22** resources in most countries, necessitating a shift in chronic disease management from tertiary to primary
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10 **23** care providers. Therefore, the Primary Care Network (PCN) policy was promulgated as a model of care to
11
12 **24** organise private general practitioners (GPs) into groups to provide GPs with resources to anchor patients
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14 **25** with chronic conditions with them in the community. As the PCN is still in its embryonic stages, there is a
15
16 **26** void in research regarding its ability to empower GPs to manage chronic patients effectively. This
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18 **27** qualitative study aims to explore the facilitators and barriers for the management of chronic patients by
19
20 **28** GPs enrolled in the PCN.
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24 **29 Design:** We conducted 30 semi-structured interviews with GPs enrolled in a PCN followed by a thematic
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26 **30** analysis of audio transcripts until data saturation was achieved.
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29 **31 Setting:** Singapore
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32 **32 Results:** Our results suggest that PCNs facilitated GPs to more effectively manage chronic patients through
33
34 **33** 1) provision of ancillary services such as diabetic foot screening, diabetic retinal photography and nurse
35
36 **34** counselling to permit a “one-stop-shop”, 2) systematic monitoring of process and clinical outcome
37
38 **35** indicators through a chronic disease registry (CDR) to promote accountability for patients’ health
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40 **36** outcomes and 3) funding streams for PCNs to hire additional manpower to oversee operations and to
41
42 **37** reimburse GPs for extended consultations. Barriers include high administrative load in maintaining the
43
44 **38** CDR due to the lack of a smart electronic clinic management system and financial gradient faced by
45
46 **39** patients seeking services from private GPs which incur higher out-of-pocket expenses than public primary
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48 **40** healthcare institutions.
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3 41 **Conclusion:** PCNs demonstrate great promise in empowering enrolled GPs to manage chronic patients.
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5 42 However, barriers will need to be addressed to ensure the viability of PCNs in managing more chronic
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7 43 patients in the face of an ageing population.
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13 45 **Strengths and limitations of this study**
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- 16 46 - This is the first qualitative study on the PCN as a model of primary care due to this recent
17
18 47 implementation; thus, this study addresses a gap in research.
19
20
21 48 - There is a need to understand the facilitators and barriers that this model of care brings to the
22
23 49 private GPs in terms of improving chronic disease management to assess its potential to scale up.
24
25 50 - We interviewed a total of 30 GPs, who represent 8 out of the 10 PCNs that are in operation. As a
26
27 51 similar contractual backbone bound each PCN, the results are generalisable to all networks.
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30 52 - There might be some level of self-selection bias during the recruitment process as GPs who had a
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32 53 positive experience with the PCN might be more inclined to participate in our study.
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60 Introduction

61 As the global population ages at an alarming pace, the number of patients with chronic conditions is set
62 to rise in tandem. This unparalleled surge in demand for healthcare culminates into higher bed occupancy
63 rates and emergency department presentations, which impose substantial expenditures on the
64 healthcare system [1–3]. Singapore, a developed city-state with a healthcare system accessible through
65 an extensive network of hospital, step-down and primary care providers, is no exception. Singapore's
66 primary care sector is divided between privately and publicly run entities. Public primary healthcare
67 institutions called polyclinics are multi-doctor practices. Public healthcare institutions (polyclinics and
68 hospital specialist outpatient clinics (SOCs)) are government-funded, with subsidised consultations,
69 medications and diagnostic investigations available for eligible patients.

70 As polyclinics and SOCs are inundated with high patient loads, there is an impetus to shift stable chronic
71 patients away from these public healthcare institutions to the private primary care space. The private
72 primary care sector managed by private general practitioners (GPs) accounts for 80% of all primary care
73 utilisation, yet only 20% of patients turn to them for chronic disease management [4]. To more effectively
74 harness this pool of untapped resources and lessen the burden afflicting public healthcare institutions, a
75 model of care that promotes the anchorage of chronic patients with private GPs is imperative.

76 This augmentation came in the form of the Primary Care Network (PCN) which organises private GPs into
77 groups de novo, a move touted by Singapore's Ministry of Health (MOH) and its statutory board the
78 Agency of Integrated Care (AIC) as a vehicle to enhance chronic disease management for enrolled GPs.
79 The migration of chronic disease management to primary care contexts necessitates a team-based
80 approach whereby a multidisciplinary group of professionals coordinate with the GP to accomplish shared
81 goals within and across settings to achieve higher quality care [5,6]. Hence, the PCN is a model of care
82 that enshrines the delivery of team-based primary health services, through a team of physicians, nurses,

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3 83 care coordinators, and administrative assistants [7]. Such networks have been established in Canada, New
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5 84 Zealand and Germany since the early 2000s, and have produced improved patient access to primary care
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7 85 and quality of care [8–10]. In Germany, PCNs have displayed positive results in the management of chronic
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9 86 diseases such as diabetes by serving as a conduit of care that focuses on improving access to care and
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11 87 chronic disease self-management practices through the use of multidisciplinary teams [10,11]. PCNs in
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13 88 Alberta had also demonstrated their capacities in reducing presentations to emergency departments and
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15 89 hospital days for non-elective acute care, further emphasising the significance of team-based care at the
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17 90 primary care interface [12,13]. Furthermore, PCNs facilitate sharing of resources, allowing for greater
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19 91 bargaining power when tendering for services, sharing expertise between parties and reducing the
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21 92 organisational workload of practices [14].
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26 93 As of August 2020, a total of 527 private GP practices have been enrolled in the ten existing PCNs in
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28 94 Singapore, each helmed by two GP leaders and furnished with a certain level of resources which will be
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30 95 further elaborated in the results section [7]. To our knowledge, only two quantitative studies were
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32 96 conducted to evaluate the effectiveness of PCN in Singapore, both exclusively for diabetes management
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34 97 [15,16]. However, there are no qualitative studies investigating how the PCN facilitates or challenges the
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36 98 management of chronic diseases from the providers' perspective, which is a crucial step to undertake to
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38 99 explore its scalability as a viable model of primary care. Therefore, this study aims to understand the
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40 100 experiences of GPs enrolled in PCNs and explore the facilitators and barriers of PCN in helping GPs manage
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42 101 patients with chronic diseases.
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50 103 **Method**

53 104 **Study Design**

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3 105 Our study employed a qualitative research design [17] using data collected from semi-structured in-depth
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5 106 interviews conducted with participants who met the inclusion criteria of being a private GP enrolled in a
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7 107 PCN at the time of the interview. The consolidated criteria for reporting qualitative research (COREQ)
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10 108 criteria was applied throughout the research process (research checklist) [18].
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12 13 109 **Recruitment**

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16 110 Purposive and snowball sampling strategies were used to recruit eligible participants. Participants were
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18 111 contacted via email or telephone, as most contact details were available on publicly accessible websites.
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20 112 Snowball sampling was used in reaching out to eligible participants whose contact details were not made
21
22 113 available on public domains. A total of 30 eligible participants took part in the study (81% response rate)
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24 114 while seven declined participation, citing insufficient time to be interviewed.
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26 27 115 **Data collection**

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30 116 The semi-structured in-depth interviews were conducted at a place of the participants' convenience. The
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32 117 interviews ranged from 40 to 90 minutes and occurred from January 2019 to January 2020. The team was
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34 118 trained in qualitative research, had no prior relationship with the participants and had a profound
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36 119 knowledge of the Singapore healthcare system.
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39
40 120 The topic guide used was designed with questions on the primary care landscape and how the PCN had
41
42 121 shaped the way GPs manage patients with chronic conditions (attached as supplementary material). The
43
44 122 questions created starting points to dive deeper into aspects salient to the research questions by further
45
46 123 probing participants based on their initial responses. The topic guide was pilot tested with four GPs before
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48 124 implementation. As the interviews were semi-structured, there were no restrictions to conversation flow,
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50 125 but the interviewers facilitated the conversation to elicit responses that could answer the research
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53 126 question. Fieldnotes were also collected to provide contextual information during data analysis. After the
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3 127 interviews, the audio recordings and subsequently, audio transcripts were de-identified to ensure
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5 128 anonymity.

8 129 **Data analysis**

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11 130 All audio recordings were transcribed verbatim, and the transcripts were analysed thematically with QSR
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13 131 NVivo software (version 12) following an iterative six-step process outlined by Braun and Clarke [19].
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15 132 As such, we first familiarised ourselves with the transcripts, coded aspects that were salient to our
16
17 133 research question and organised the codes into themes, while simultaneously referring back to the
18
19 134 fieldnotes to enhance the reflexive process. Subsequently, the research team discussed the
20
21 135 definitions assigned for each theme to ensure that the themes accurately represented the
22
23 136 experiences of the participants. Final themes were agreed among all the authors after multiple
24
25 137 iterative rounds of feedback. Additionally, to ensure inter-rater reliability, we followed a similar protocol
26
27 138 when analysing the data until the agreement was high on the comparison of codes. Data analysis ended
28
29 139 after achieving thematic saturation, whereby no new themes emerged. All themes and subthemes,
30
31 140 along with the number of data units, are reported in our coding tree in Figure 1 below.

36 141 **Patient and public involvement**

38
39 142 There was no patient involvement, and all participants were private GPs who had provided us with
40
41 143 informed consent before participating in our study. The chance to edit their transcript as a form of
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43 144 member checking was also offered but not taken up by any participant.

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50 146 **Results**

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3 147 A total of 30 interviews were conducted. We interviewed participants from a total of eight out of ten
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5 148 PCNs, and all participants recruited at that point of time were involved in the delivery of chronic care in a
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7 149 PCN.
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10 150 **Participant characteristics**

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13 151 During the recruitment process, 28 participants were recruited by purposive sampling while two were
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15 152 recruited by snowball sampling. The average age of our participants was 49 years of age (range 31-68
16
17 153 years old), and their average duration spent in primary care was 18 years (range 3-35 years). In fact, most
18
19 154 participants had been in their own practice for a relatively long duration averaging 14 years (range 1-35
20
21 155 years). Our sample comprised of 27 male and three female private GPs.
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25 156 **Main findings**

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31 158 **Figure. 1** Coding tree developed based on the data analysis process
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34 159 Three themes were identified as facilitators and two themes as barriers to the management of chronic
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36 160 conditions summarised in tables 1 and 2 respectively. The facilitators are 1) ancillary services to provide a
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38 161 “one-stop-shop”, 2) chronic disease registry (CDR) to monitor care indicators and 3) funding for the
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40 162 network. The barriers are 1) administrative burden of maintaining the CDR and 2) loss of patients due to
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42 163 financial gradient in favour of public healthcare institutions.
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46 164 **Table. 1** Facilitators developed based on results
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Facilitator themes	Subthemes	Sample quotes

<p>Theme 1: Ancillary services provide a “one-stop-shop”</p>	<p>Subtheme 1.1. Convenience of having the ancillary services arranged for patients</p>	<p>“[...] 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)</p>
	<p>Subtheme 1.2. Additional manpower provided for conducting and coordinating ancillary services</p>	<p>“[...] CAs [clinic assistants] or my doctors will just have to register the patient, and then the PCCs 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)</p> <p>“The DRP, DFS I 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)</p>
<p>Theme 2: Chronic disease registry to monitor care indicators</p>	<p>Subtheme 2.1. Cross accountability to ensure practices meet specific standards of care</p>	<p>“[...] 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,</p>

		<p><i>all my patients are 9, then they will say that I am below average.</i></p> <p><i>So there is a benchmarking [...]" (R39)</i></p>
	<p>Subtheme 2.2. Reminder to fulfil care processes</p>	<p><i>"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)</i></p>
<p>Theme 3: Funding for the network</p>	<p>Subtheme 3.1. Care Plus Fee for extended consultation time</p>	<p><i>"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 patient], but of course, you must satisfy all the criteria [CDR requirements] stipulated to prove that you are managing a complex patient." (R15)</i></p>
	<p>Subtheme 3.2. Funding for additional manpower for backend office duties</p>	<p><i>"Primary care coordinators if I am not mistaken [...] is one FTE [full-time equivalent] to 3000 patients [...]" (R36)</i></p>
	<p>Subtheme 3.3. Funding for locums for GPs to attend continuing medical education sessions</p>	<p><i>"[...] I know that specifically there is funding for them to employ locum, so if they have to employ locum to go for this [CME sessions], there is funding to pay for their locum." (R48)</i></p>

	Subtheme 3.4. Funding for GP leads to perform PCN-related duties	<p><i>"[...] 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)</i></p>
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166 **Theme 1: Ancillary services to provide a “one-stop-shop”**

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

173 **Subtheme 1.1. Convenience of having the ancillary services arranged for patients**

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

180 **Subtheme 1.2. Additional manpower provided for conducting and coordinating ancillary services**

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2
3 181 The lack of ancillary service support and busy clinic hours raise the challenge of counselling patients on
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5 182 disease-modifying behaviours, diabetic eye and foot examinations for independent GPs. Having additional
6
7 183 manpower in the form of nurses hired by the PCN contributes towards the practices in carrying out these
8
9 184 essential ancillary services to prevent avoidable complications in patients. PCNs can either employ and
10
11 185 train their own nurses or outsource the services to external vendors that provide a roving team of nurses
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13
14 186 to conduct ancillary services at their clinics.

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17 187 Furthermore, PCNs are provided with additional manpower to arrange for ancillary services and remind
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19 188 patients to attend the arranged services which alleviate the workload for clinic assistants and improve
20
21 189 patient attendance. This task is fulfilled by primary care coordinators (PCCs), but PCCs can also be assigned
22
23 190 other PCN related tasks such as the consolidation of patient data for maintenance of the CDR (elaborated
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25
26 191 in theme 2).

29 192 **Theme 2: Chronic disease registry to monitor care indicators**

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32
33 193 The CDR is a platform that enables the systematic tracking of care components for patients. Data is
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35 194 tabulated into an excel spreadsheet which comprises over 200 fields, from basic sociodemographic data,
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37 195 date of clinical diagnosis and screening attendances to clinical parameters for chronic conditions in
38
39 196 accordance with local clinical practice guidelines. CDR data is submitted to AIC to ensure required care
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41 197 components are fulfilled before Care Plus Fee (CPF, elaborated in subtheme 3.1) is dispersed by AIC to the
42
43 198 PCN. Thus, the CDR gives GPs and AIC a dashboard view of the quality of care provided, allowing for the
44
45 199 identification of opportunities to refine existing management practices using quantitative parameters by
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47 200 improving processes and outcomes.

51 201 **Subtheme 2.1. Cross accountability to ensure practices meet specific standards of care**

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3 202 Most solo GP practices work in silos, and a certain level of accountability is needed to ensure that practices
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5 203 not only follow guidelines but provide the best care for their patients. Therefore, anonymised results of
6
7 204 performance indicators from the CDR of all practices are made available during implementation and
8
9
10 205 review sessions every quarter to perform benchmarking to reduce the variation in performance and
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12 206 improve quality of care for patients.

15 207 **Subtheme 2.2. Reminder to fulfil care processes**

16
17
18 208 The CDR platform allows practices to follow-up with patients when required and ensure judicious
19
20 209 completion of necessary procedures in their care management plans.

23 210 **Theme 3: Funding for the network**

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25
26 211 Every PCN is entitled to funding from the government. A commitment of \$45 million per annum by the
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28 212 government [30] will equip the network with more resources to better manage chronic patients than
29
30 213 what could be harnessed as an individual private practice. This funding is mainly disbursed on a
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32 214 reimbursement basis through AIC.

36 215 **Subtheme 3.1. Care Plus Fee for extended consultation time**

37
38
39 216 Private practices are business entities that generate revenue mainly through consultation fee and the sale
40
41 217 of medicines. As a result, the revenue generated is volume-based, making it more profitable for GPs to
42
43 218 see to more acute cases. However, complex chronic patients require a lengthened consultation. Hence,
44
45 219 the CPF was introduced to reimburse clinics for extended consultation time. However, process and clinical
46
47 220 outcome indicators stipulated in the CDR must be completed before the CPF is disbursed by AIC.

51 221 **Subtheme 3.2. Funding for additional manpower for backend office duties**

222 Funding is provided for PCNs to employ PCCs to coordinate ancillary services, track patients, remind
 223 patients to attend ancillary services and to consolidate data for the CDR as most solo practices do not
 224 have the manpower to conduct non-clinical duties. Funding for PCCs come in the form of full-time
 225 equivalents which is furnished by AIC based on the PCN's chronic patient load.

226 **Subtheme 3.3. Funding for locums for GPs to attend continuing medical education sessions**

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

230 **Subtheme 3.4. Funding for GP leads to perform PCN-related duties**

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

234 **Table 2.** Barriers developed based on results

Barrier themes	Subthemes	Sample quotes
Theme 4: Administrative burden of maintaining the CDR		<p><i>"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)</i></p> <p><i>"For those clinics using Clinic Assist [CMS] with the CMS 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</i></p>

		<i>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 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)</i>
Theme 5: Loss of patients due to financial gradient in favour of public healthcare institutions	Subtheme 5.1. Insufficient CHAS quantum	<i>"The CHAS 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 subsidy." (R48)</i>
	Subtheme 5.2. Heavily subsidised government-funded polyclinics	<i>"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> <i>"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)</i>

235

236 **Theme 4: Administrative burden of maintaining the CDR**

237 The maintenance of the CDR requires consolidation of data regarding the process and clinical indicators
 238 by both GPs and clinic assistants. Despite having additional administrative support from PCCs to
 239 consolidate registry data, routine documentation proved highly laborious for practices overstretched by
 240 other administrative duties and lean manpower structure, leading to more man-hours or overtime duties.

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3 241 Clinics also face difficulty in extracting data from their clinical management system (CMS) due to the lack
4
5 242 of a smart extraction tool that aligns with CDR requirements.
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8 **243 Theme 5: Loss of patients due to financial gradient in favour of public healthcare**
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11 **244 institutions**
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14 245 Perceptions of the affordability of healthcare affect the uptake of medical services. The high levels of
15
16 246 government subsidies offered at public healthcare institutions such as the polyclinics and SOCs are highly
17
18 247 attractive to price-conscious patients. Thus, the Community Health Assist Scheme (CHAS), a portable
19
20 248 medical subsidy that enables patients to enjoy a finite quantum by the government to offset medical
21
22 249 expenses when seeking treatment at private primary care facilities was launched [20]. CHAS is poised to
23
24 250 alleviate the stress placed on the public healthcare sector resulting from the huge volume of patients
25
26 251 drawn to their subsidised services and medicines.
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31 **252 Subtheme 5.1. Insufficient CHAS quantum**
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34 253 Complex chronic conditions require multiple visits to the clinic and long-term medication. Participants
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36 254 reflected that the quantum is usually sufficient for patients with simple chronic conditions but insufficient
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38 255 for patients with complex chronic conditions, as more medications need to be prescribed. Therein lies the
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40 256 possibility that care for multimorbid patients provided by their private GP might discontinue after the
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42 257 finite CHAS quantum has been exhausted.
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46 **258 Subtheme 5.2. Heavily subsidised government-funded polyclinics**
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49 259 The adverse financial gradient between private primary care and polyclinics promotes specific health-
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51 260 seeking behaviour. Being price-sensitive, patients turn to the largely government-funded polyclinics to
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53 261 obtain subsidised medications and enjoy lower consultation fees, promoting the severance in care
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55 262 continuity with their private GP.
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56 264 **Discussion**
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9 265 The provision of human and financial resources to upkeep the day to day operations of the PCN which
10 266 includes the wrap-around ancillary services increase the accessibility of team-based care to patients with
11 267 chronic conditions and the use of the CDR to optimise care components are central in driving this care
12 268 model forward. Ironically, the CDR, which is an enabler, also poses an administrative challenge for
13 269 practices. Legacy issues regarding the financial gradient between private GP practices and polyclinics is
14 270 another complex policy dilemma that requires further examination. Hereinafter the facilitators and
15 271 barriers will be discussed in detail.

16 272 Ancillary services not traditionally offered by solo practices are now available through the PCN. The roving
17 273 services provide DRP, DFS and NC, which are proven to be catalysts for preventing avoidable amputations
18 274 and blindness [21–23]. The inconvenience caused to patients in making extra trips to polyclinics where
19 275 ancillary services are offered, which resulted in missed attendances, was alleviated through roving teams
20 276 that conduct the services at clinics [24]. A study by Schäfer et al. (2017) indicated that one-stop-services
21 277 provided at GP clinics improved accessibility, continuity and comprehensiveness of care [25]. As GPs are
22 278 usually burdened by assuming organisational and administrative tasks while providing medical care,
23 279 assigning the responsibility of arranging and conducting ancillary services to designated staff allowed GPs
24 280 to focus on the medical care for their patients [26–28]. This team-based care approach as studied through
25 281 a meta-analysis by Levngood et al. (2019) established that team-based diabetes management improved
26 282 overall clinical indicators for diabetes patients, health services utilisation, diabetes-related morbidity and
27 283 mortality [29].

28 284 Our participants supported the concept of the CDR, which allows for a certain level of benchmarking with
29 285 other practices within the same PCN and track the process and clinical outcome indicators for their

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3 286 patients. A study by Luo et al. (2018) evaluated the effectiveness of diabetes management in a pilot PCN
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5 287 in Singapore [15]. The quantitative study briefly mentioned the use of a CDR but did not go into details as
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7 288 to how the CDR enabled better diabetes management. Our findings support the study by Luo et al. (2018)
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9 289 by elucidating how the CDR led practices to conform to clinical guidelines. As defined by Schmitt diel et al.
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11 290 (2015), disease registries can serve to generate performance feedback reports on clinical outcomes;
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13 291 identify patients out of therapeutic range; create point-of-care reminders and decision support; and
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15 292 create "high-risk lists" that target patients who require more intensive management [30]. Other studies
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17 293 on electronic healthcare registries have suggested that disease documenting platforms if utilised in one
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19 294 or more of these ways as suggested by Schmitt diel et al. (2015), can improve care delivery for patients
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21 295 with diabetes [31–33].

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26 296 Despite the advantages brought about by CDR, some barriers hinder its implementation. As reflected by
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28 297 our participants, the management of CDR is administratively burdensome, particularly for practices not
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30 298 supported by a CMS. Even for practices with a CMS, there is no smart extraction tool devoted to the
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32 299 exporting of CDR mandated fields. As a result, the GPs or clinic assistants would have to key in the required
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34 300 CDR fields manually, resulting in additional man-hours or "overtime". In addition, the need for increased
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36 301 documentation of care and coordination planning for patients also reduces face-to-face time GPs have
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38 302 with patients [34].

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42 303 A lack of adequate compensation for the coordination of tasks hinders GPs from giving optimal care to
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44 304 their patients [26]. Therefore, funding for manpower to complete back-office tasks such as the
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46 305 coordination of ancillary services and consolidation of data fields for the CDR was allocated. Extra
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48 306 manpower such as having PCCs perform data retrieval and entry for the CDR would also translate to more
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50 307 face-to-face time for GPs with patients, resulting in better patient understanding and thus treatment of
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52 308 the condition. However, to our knowledge, there are other challenges to this, such as providing a space
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3 309 in the clinic for PCCs to work and the unwillingness of practices to grant access to patient data due to
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5 310 confidentiality issues.
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8 311 Another facilitator that motivates GPs to manage more chronic patients is the CPF. Chronic patients
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10 312 typically require a longer consultation and more face-to-face time than GPs customarily expend in routine
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12 313 practice [27,35]. If not compensated appropriately, chronic patients might not receive adequate
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14 314 consultation time, resulting in the omission of important standard-of-care items, reduced attention to
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16 315 patients' psychosocial concerns, and limited discussion of management options [36]. As private practices
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18 316 are profit-oriented entities, the compensation for additional time spent on a chronic patient is appropriate
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20 317 to offset the potential reduction in acute cases seen. However, our participants revealed the highly
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22 318 contingent nature of this funding model, where CPF was disbursed only after the fulfilment of CDR
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24 319 requirements by religiously completing the necessary process and clinical outcome indicators. To our
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26 320 knowledge, CPF had only been distributed once since PCN's inception due to unspecified delays from AIC.
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28 321 We could only surmise that auditing of the fulfilment of CDR criteria took many man-hours at AIC's end
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30 322 as well. Nonetheless, the CPF is seen as augmentation for both the GP in terms of reimbursement for their
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32 323 time and the chronic patient who is ensured of evidence-based chronic disease care.
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38 324 Given that PCNs group GPs practices together de novo, it is imperative for a strong leader to helm the
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40 325 network. Clinician leadership has been shown to be important in driving policy direction, strategic
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42 326 planning by operating across organisation boundaries, and improving the practices within the network
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44 327 [37–39]. However, GPs might feel a strain taking on dual capacities, both as network leader and provider
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46 328 in their own practice. A study by Sephar et al. (2017) emphasised the challenges that GPs face between
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48 329 the clinical and leadership roles and a lack of formal training and preparation to assume the role of leader
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50 330 [40]. Thus, the reimbursement for their time in conducting duties as a PCN leader was paid accordingly,
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52 331 and the lack of leadership, management and financing skills of the GPs can be nurtured through a national
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54 332 health leadership model embedded into CME [41,42].
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3 333 CME is essential for GPs to keep abreast of the latest chronic disease management practices and serve as
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5 334 a platform to exchange experiences with their colleagues [43]. In addition, PCN leaders are no longer only
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7 335 the captain of their practice but gatekeeper of the entire network. Thus, continuing professional
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9 336 development in clinical, business and financial leadership should be cornerstones for the development of
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11 337 PCN leaders [44]. In both instances, GPs are provided with funding to hire locums to fill their duties when
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13 338 attending CME courses. This motivates GPs to improve pre-existing levels of competence while having the
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15 339 manpower to cover their duties during their clinical absence.
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19 340 Perceptions of the affordability of medical care undoubtedly affect the uptake of chronic care treatment
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21 341 [45]. In Singapore, CHAS was introduced as a portable medical subsidy to improve access to private
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23 342 primary healthcare where recipients can seek subsidies for treatment at private GP clinics. In fact, the
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25 343 CHAS scheme was enhanced in November 2019 to motivate more patients to adhere to management
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27 344 plans and seek appropriate care [46]. Despite the CHAS enhancements to encourage Singaporeans to shift
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29 345 their care from polyclinics to private GPs, our participants reflected that the CHAS quantum is insufficient
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31 346 to drive that behaviour. This is especially true for patients requiring multiple medications due to their
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33 347 complex conditions. All our participants had voiced that the high cost of unsubsidised medicines at private
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35 348 GPs had pushed patients to seek care at the heavily subsidised polyclinics. This financial gradient between
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37 349 private and public primary healthcare institutions had long been the reason for patients sticking to
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39 350 polyclinics, especially in a healthcare system where services are mainly paid out-of-pocket and patients
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41 351 are free to choose their primary care provider [47].
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47 352 Currently, there are 20 polyclinics in Singapore, with the number set to increase to 30 by 2030 [48,49].
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49 353 Despite the introduction of CHAS, polyclinics continue to be confronted with high patient volumes [50,51].
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51 354 Affordability, convenience of travel and onsite laboratory facilities influence patients' choice of seeking
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53 355 treatment at polyclinics [47]. Increasing the convenience of onsite ancillary services at GP clinics will
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55 356 encourage more patients to seek services from their regular private GPs. Thus, the inconvenience resulting
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3 357 from the lack of co-located ancillary services was resolved through the provision of roving ancillary
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5 358 services teams by the PCN. However, the adverse financial gradient with polyclinics remain. With the
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7 359 emergence of more polyclinics, private GPs will find it increasingly difficult to compete for patients with
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9 360 chronic conditions who are price sensitive. This prevailing policy dilemma warrants further study. For now,
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11 361 we can only postulate that the increasing chronic burden might be too much for the consortia of private
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13 362 GPs alone to absorb, creating the need for more polyclinics.

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17 363 To our knowledge, this is the first qualitative study conducted on the newly implemented PCN that
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19 364 explores the characteristics which make it a good model for chronic care management, in light of a
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21 365 growing ageing population with increased utilisation of primary care services. We also managed to recruit
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23 366 participants from eight out of ten PCNs. Therefore, we believe that our findings are transferrable to all
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25 367 PCNs in Singapore as perspectives across PCNs should be similar, given the same contractual backbone
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27 368 for implementation and funding. In addition, we recognise the limitations of snowball sampling in our
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29 369 recruitment process but feel that our study results are unaffected as only two participants were recruited
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31 370 by snowballing. We also recognise potential self-selection bias, whereby participants who had positive
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33 371 experiences with the PCN might be more inclined to be interviewed. Despite the potential one-sidedness
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35 372 in experiences, a range of views was demonstrated.

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40 373 Moving forward, the next step is to evaluate the cost-effectiveness of PCN in managing chronic conditions
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42 374 compared to polyclinics and conduct studies on facilitators and barriers of PCN from the patients'
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44 375 perspective.

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49 50 377 **Conclusion**

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3 378 The PCN initiative offers immense potential for the management of chronic diseases. The funding for
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5 379 streamlining back-office functions and increased manpower capacities to deliver a range of ancillary
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7 380 services to patients is a huge enabler for solo practices, who are now able to tap on more resources.
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10 381 Moreover, the CDR which tracks the patients' care delivery advances evidence-based care management.
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12 382 The challenges surrounding the administrative burden of maintaining the CDR need to be prioritised, and
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14 383 financial gradient between private and public primary care systems partially surmounted through
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16 384 enhancements to CHAS remain to be addressed.
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398 **References**

- 399 1 Sampson MJ, Dozio N, Ferguson B, *et al*. Total and excess bed occupancy by age, specialty and
400 insulin use for nearly one million diabetes patients discharged from all English Acute Hospitals.
401 *Diabetes Res Clin Pract* 2007;**77**:92–8. doi:10.1016/j.diabres.2006.10.004
- 402 2 Donnan PT, Leese GP, Morris AD, *et al*. Hospitalizations for people with type 1 and type 2 diabetes
403 compared with the nondiabetic population of Tayside, Scotland: a retrospective cohort study of
404 resource use. *Diabetes Care* 2000;**23**:1774–9. doi:10.2337/diacare.23.12.1774
- 405 3 Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic
406 conditions in the elderly. *Arch Intern Med* 2002;**162**:2269–76. doi:10.1001/archinte.162.20.2269
- 407 4 MOH | Primary Care Survey 2014 Report. [https://www.moh.gov.sg/resources-](https://www.moh.gov.sg/resources-statistics/reports/primary-care-survey-2014-report)
408 [statistics/reports/primary-care-survey-2014-report](https://www.moh.gov.sg/resources-statistics/reports/primary-care-survey-2014-report) (accessed 28 Mar 2020).
- 409 5 Wagner EH. The role of patient care teams in chronic disease management. *BMJ* 2000;**320**:569–72.
- 410 6 American College of Physicians, Smith CD, Balatbat C, *et al*. Implementing Optimal Team-Based Care
411 to Reduce Clinician Burnout. *NAM Perspect* 2018;**8**. doi:10.31478/201809c
- 412 7 Primary Care Network (PCN). [https://www.primarycarepages.sg/practice-management/primary-](https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn))
413 [care-model/primary-care-network-\(pcn\)](https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn)) (accessed 28 Mar 2020).
- 414 8 Hutchison B, Levesque J-F, Strumpf E, *et al*. Primary health care in Canada: systems in motion.
415 *Milbank Q* 2011;**89**:256–88. doi:10.1111/j.1468-0009.2011.00628.x
- 416 9 Cumming J. Integrated care in New Zealand. *Int J Integr Care*
417 2011;**11**.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3226018/> (accessed 9 Apr 2020).

- 1
2
3 418 10 Ose D, Kamradt M, Kiel M, *et al.* Care management intervention to strengthen self-care of
4
5 419 multimorbid patients with type 2 diabetes in a German primary care network: A randomized
6
7 420 controlled trial. *PLoS One* 2019;**14**:e0214056. doi:10.1371/journal.pone.0214056
9
10
11 421 11 Schlette S, Lisac M, Blum K. Integrated primary care in Germany: the road ahead. *Int J Integr Care*
12
13 422 2009;**9**.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2691944/> (accessed 21 Mar 2020).
14
15
16 423 12 McAlister FA, Bakal JA, Green L, *et al.* The effect of provider affiliation with a primary care network
17
18 424 on emergency department visits and hospital admissions. *CMAJ* 2018;**190**:E276–84.
19
20 425 doi:10.1503/cmaj.170385
21
22
23
24 426 13 Manns BJ, Tonelli M, Zhang J, *et al.* Enrolment in primary care networks: impact on outcomes and
25
26 427 processes of care for patients with diabetes. *CMAJ Can Med Assoc J* 2012;**184**:E144–52.
27
28 428 doi:10.1503/cmaj.110755
29
30
31
32 429 14 Mills J, Oyedotun L, Ridout J, *et al.* The opportunities for economies of scale in primary care.
33
34 430 *InnovAiT* 2019;**12**:476–8. doi:10.1177/1755738018761501
35
36
37 431 15 Luo M, Poh Z, Koh G, *et al.* Diabetes management in a Primary Care Network (PCN) of private
38
39 432 general practitioners in Singapore: An observational study. *Medicine (Baltimore)* 2018;**97**:e12929.
40
41 433 doi:10.1097/MD.00000000000012929
42
43
44
45 434 16 Chua LKL, Chong CK, Hwee-Lin W, *et al.* Primary Care Network (PCN) As A Model Of Care For GP
46
47 435 Chronic Disease Management. *Singap Fam Physician* 2015;**41**:61–4.
48
49
50 436 17 Tracy SJ. Qualitative Quality: Eight “Big-Tent” Criteria for Excellent Qualitative Research. *Qual Inq*
51
52 437 2010;**16**:837–51. doi:10.1177/1077800410383121
53
54
55
56
57
58
59
60

- 1
2
3 438 18 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-
4
5 439 item checklist for interviews and focus groups. *Int J Qual Health Care J Int Soc Qual Health Care*
6
7 440 2007;**19**:349–57. doi:10.1093/intqhc/mzm042
8
9
10
11 441 19 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;**3**:77–101.
12
13 442 doi:10.1191/1478088706qp063oa
14
15
16 443 20 CHAS. <https://www.chas.sg/> (accessed 15 Oct 2020).
17
18
19 444 21 Nather A, Cao S, Chen JLW, *et al.* Prevention of diabetic foot complications. *Singapore Med J*
20
21 445 2018;**59**:291–4. doi:10.11622/smedj.2018069
22
23
24
25 446 22 Mayfield JA, Reiber GE, Nelson RG, *et al.* Do foot examinations reduce the risk of diabetic
26
27 447 amputation? *J Fam Pract* 2000;**49**:499–504.
28
29
30 448 23 Skaggs JB, Zhang X, Olson DJ, *et al.* Screening for Diabetic Retinopathy: Strategies for Improving
31
32 449 Patient Follow-up. *N C Med J* 2017;**78**:121–3. doi:10.18043/ncm.78.2.121
33
34
35
36 450 24 Taber JM, Leyva B, Persoskie A. Why do People Avoid Medical Care? A Qualitative Study Using
37
38 451 National Data. *J Gen Intern Med* 2015;**30**:290–7. doi:10.1007/s11606-014-3089-1
39
40
41 452 25 Schäfer WLA, Boerma WGW, Schellevis FG, *et al.* GP Practices as a One-Stop Shop: How Do Patients
42
43 453 Perceive the Quality of Care? A Cross-Sectional Study in Thirty-Four Countries. *Health Serv Res*
44
45 454 2018;**53**:2047–63. doi:10.1111/1475-6773.12754
46
47
48
49 455 26 Stumm J, Thierbach C, Peter L, *et al.* Coordination of care for multimorbid patients from the
50
51 456 perspective of general practitioners – a qualitative study. *BMC Fam Pract* 2019;**20**:160.
52
53 457 doi:10.1186/s12875-019-1048-y
54
55
56
57
58
59
60

- 1
2
3 458 27 Østbye T, Yarnall KSH, Krause KM, *et al.* Is There Time for Management of Patients With Chronic
4
5 459 Diseases in Primary Care? *Ann Fam Med* 2005;**3**:209–14. doi:10.1370/afm.310
6
7
8 460 28 Margolius D, Wong J, Goldman ML, *et al.* Delegating Responsibility from Clinicians to
9
10 461 Nonprofessional Personnel: The Example of Hypertension Control. *J Am Board Fam Med*
11
12 462 2012;**25**:209–15. doi:10.3122/jabfm.2012.02.100279
13
14
15
16 463 29 Levensgood TW, Peng Y, Xiong KZ, *et al.* Team-Based Care to Improve Diabetes Management: A
17
18 464 Community Guide Meta-analysis. *Am J Prev Med* 2019;**57**:e17–26.
19
20 465 doi:10.1016/j.amepre.2019.02.005
21
22
23
24 466 30 Schmittiel J, Bodenheimer T, Solomon NA, *et al.* BRIEF REPORT: The Prevalence and Use of Chronic
25
26 467 Disease Registries in Physician Organizations. *J Gen Intern Med* 2005;**20**:855–8. doi:10.1111/j.1525-
27
28 468 1497.2005.0171.x
29
30
31
32 469 31 Stroebel RJ, Scheitel SM, Fitz JS, *et al.* A randomized trial of three diabetes registry implementation
33
34 470 strategies in a community internal medicine practice. *Jt Comm J Qual Improv* 2002;**28**:441–50.
35
36 471 doi:10.1016/s1070-3241(02)28044-x
37
38
39
40 472 32 Hoque DME, Kumari V, Hoque M, *et al.* Impact of clinical registries on quality of patient care and
41
42 473 clinical outcomes: A systematic review. *PLoS ONE* 2017;**12**. doi:10.1371/journal.pone.0183667
43
44
45 474 33 Thomas KG, Thomas MR, Stroebel RJ, *et al.* Use of a Registry-generated Audit, Feedback, and Patient
46
47 475 Reminder Intervention in an Internal Medicine Resident Clinic—A Randomized Trial. *J Gen Intern*
48
49 476 *Med* 2007;**22**:1740–4. doi:10.1007/s11606-007-0431-x
50
51
52
53 477 34 Gottschalk A, Flocke SA. Time Spent in Face-to-Face Patient Care and Work Outside the Examination
54
55 478 Room. *Ann Fam Med* 2005;**3**:488–93. doi:10.1370/afm.404
56
57
58
59
60

- 1
2
3 479 35 Schellevis FG, Van de Lisdonk EH, Van der Velden J, *et al.* Consultation rates and incidence of
4
5 480 intercurrent morbidity among patients with chronic disease in general practice. *Br J Gen Pract*
6
7 481 1994;**44**:259–62.
8
9
10
11 482 36 Barnes CS, Ziemer DC, Miller CD, *et al.* Little Time for Diabetes Management in the Primary Care
12
13 483 Setting. *Diabetes Educ* 2004;**30**:126–35. doi:10.1177/014572170403000120
14
15
16 484 37 Willcocks SG. Leadership: a challenge for GPs? *Br J Health Care Manag* 2010;**16**:468–73.
17
18
19 485 38 Storey J, Holti R, Hartley J, *et al.* Devolving healthcare services redesign to local clinical leaders: does
20
21 486 it work in practice? *J Health Organ Manag Bradf* 2019;**33**:188–203.
22
23 487 doi:http://dx.doi.org.libproxy1.nus.edu.sg/10.1108/JHOM-05-2018-0144
24
25
26
27 488 39 Weaver RR. Seeking high reliability in primary care: Leadership, tools, and organization. *Health Care*
28
29 489 *Manage Rev* 2015;**40**:183–92. doi:10.1097/HMR.0000000000000022
30
31
32
33 490 40 Spehar I, Sjøvik H, Karevold KI, *et al.* General practitioners' views on leadership roles and challenges
34
35 491 in primary health care: a qualitative study. *Scand J Prim Health Care* 2017;**35**:105–10.
36
37 492 doi:10.1080/02813432.2017.1288819
38
39
40
41 493 41 Swanwick T, Varnam R. Leadership development and primary care. *BMJ Lead* 2019;**3**.
42
43 494 doi:10.1136/leader-2019-000145
44
45
46 495 42 Hargett CW, Doty JP, Hauck JN, *et al.* Developing a model for effective leadership in healthcare: a
47
48 496 concept mapping approach. *J Healthc Leadersh* 2017;**9**:69–78. doi:10.2147/JHL.S141664
49
50
51
52 497 43 Kjaer NK, Steenstrup AP, Pedersen LB, *et al.* Continuous professional development for GPs:
53
54 498 experience from Denmark. *Postgrad Med J* 2014;**90**:383–7. doi:10.1136/postgradmedj-2012-131679
55
56
57
58
59
60

- 1
2
3 499 44 Raza A, Coomarasamy A, Khan KS. Best evidence continuous medical education. *Arch Gynecol*
4
5 500 *Obstet* 2009;**280**:683–7. doi:10.1007/s00404-009-1128-7
6
7
8 501 45 Vuong Q-H, Ho T-M, Nguyen H-K, *et al.* Healthcare consumers' sensitivity to costs: a reflection on
9
10 502 behavioural economics from an emerging market. *Palgrave Commun* 2018;**4**:1–10.
11
12 503 doi:10.1057/s41599-018-0127-3
13
14
15
16 504 46 Chan CQH, Lee KH, Low LL. A systematic review of health status, health seeking behaviour and
17
18 505 healthcare utilisation of low socioeconomic status populations in urban Singapore. *Int J Equity*
19
20 506 *Health*
21
22 507 2018;**17**.<http://link.gale.com/apps/doc/A547114199/AONE?u=nuslib&sid=zotero&xid=9fa856fd>
23
24 508 (accessed 18 Mar 2020).
25
26
27
28 509 47 Chow WL, Wang VW, Low YS, *et al.* Factors that influence the choice of seeking treatment at
29
30 510 polyclinics. *Singapore Med J* 2012;**53**:109–15.
31
32
33
34 511 48 Parliament: Six new polyclinics by 2023, with up to six more by 2030. Straits Times.
35
36 512 2019.[https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-](https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030)
37
38 513 [more-by-2030](https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030) (accessed 19 Mar 2020).
39
40
41
42 514 49 MOH to build up to 8 new polyclinics by 2030. CNA.
43
44 515 [https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-](https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-2030-10022706)
45
46 516 [2030-10022706](https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-2030-10022706) (accessed 9 Apr 2020).
47
48
49 517 50 Tan KB, Lee CE. Integration of Primary Care with Hospital Services for Sustainable Universal Health
50
51 518 Coverage in Singapore. *Health Syst Reform* 2019;**5**:18–23. doi:10.1080/23288604.2018.1543830
52
53
54
55
56
57
58
59
60

1
2
3 519 51 Lim M-K. Shifting the burden of health care finance: a case study of public–private partnership in
4
5 520 Singapore. *Health Policy* 2004;**69**:83–92. doi:10.1016/j.healthpol.2003.12.009
6
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21 526 Primary Care Team.
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24 527 **Authors' contributions**

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27 528 GK, DM, JC, TCH, FCD, SS and EH contributed to the conception and design of the research; FCD, SS and
28
29 529 EH carried out the literature search; FCD and SS collected and analysed the data; FCD drafted the
30
31 530 manuscript and other authors revised it; DM acquired the grant to carry out this study. All authors read
32
33 531 and approved the final manuscript. All authors agree to be accountable for all aspects of the work.
34
35

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37
38
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44
45 536 Center (Funding Number: NMRC/CG/C026/2017_NUHS). The funding organisations had no role in the
46
47 537 study design, data collection and analysis, interpretation of the data, writing the paper and the decision
48
49 538 to submit the paper for publication.
50
51

52 53 539 **Data sharing statement**

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3 540 Transcripts will not be shared to protect the anonymity of the GPs. Readers who wish to gain access to
4
5 541 the data can write to the corresponding author; data may be granted upon reasonable request.
6
7

8 542 **Ethics approval and consent to participate**
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10
11 543 Ethics approval was obtained from the National University of Singapore, Institutional Review Board (NUS-
12
13 544 IRB) before starting the study. The NUS-IRB reference code is S-19-005. A full explanation of the purpose
14
15 545 and procedure of the study was provided to participants prior to obtaining their written informed consent.
16
17 546 All demographic data and quotes used in this study were de-identified to maintain the anonymity of
18
19 547 participants.
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23 548 **Competing interests**
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25

26 549 The authors declare that they have no competing interests.
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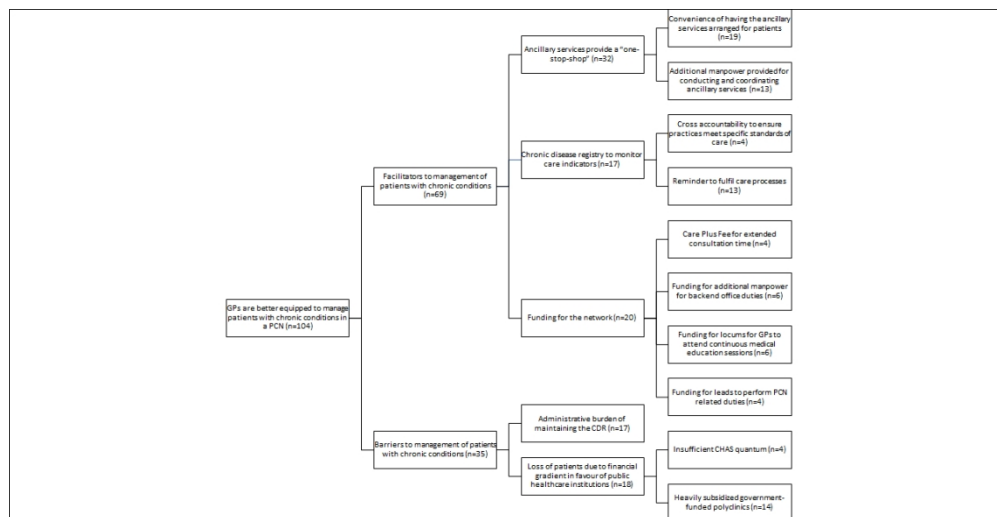


Fig. 1 Coding tree developed based on the data analysis process

Supplemental material 1. Topic guide

Section I: Introductory questions

1. To start, can you tell me more about yourself?
 - Can you share more about your professional background? Current role/roles and job scope?
 - Can you describe the organisation/s and capacities of the PCN? (prompt: composition, structure and history of the organisation/entity)
 - Can you share about your educational background (i.e. Graduate Diploma in Family Medicine, Master of Medicine in Family Medicine, the Collegiate Membership of the College, Fellowship of the College, etc.)?

Section II: Current Status of Primary Care in Singapore

2. What is your definition of primary care?
3. How does the functioning of the PCN facilitate primary care in Singapore?
4. How did the current primary care schemes such as PCN come about?
5. What do you think are the major advantages of the current primary care system with regards to the PCN? Why? (prompts: funding, ancillary services, administrative support, team-based care etc.)
6. What do you think are the major disadvantages of the current primary care system with regards to the PCN? Why?

Section III: Future of Primary Care in Singapore

7. How do you think primary care will evolve over the next few years? (*prompt: What do you think will change? What forces will drive the change?*)
8. What do you hope primary care will look like over the next 5 to 10 years?

Closing questions and remarks

9. Before we end, do you have any final thoughts to share?
10. We have come to the end of the interview. Do you have any other questions?

Checklist. COREQ Checklist

No. Item	Reported on Page #
DOMAIN 1: RESEARCH TEAM AND REFLEXIVITY	
<i>Personal characteristics</i>	
1. Interviewer/facilitator	CD and SS (CD would conduct the interview while SS took down the fieldnotes). Page 6.
2. Credentials	CD and SS both hold a Master of Public Health from the National University of Singapore and have been conducting qualitative research for more than two years. Page 6.
3. Occupation	CD and SS are Research Associates.
4. Gender	CD, Male and SS, Female.
5. Experience and training	CD and SS had prior qualitative training and have been conducting qualitative research for more than two years. Page 6.
<i>Relationship with participants</i>	
6. Relationship established	The research team had no prior relationship with any of the participants. Page 6.
7. Participant knowledge of the interviewer	The research team had no prior relationship with any of the participants. Page 6.
8. Interviewer characteristics	CD and SS both hold a Master of Public Health from the National University of Singapore and have been conducting qualitative research for more than two years. Page 6.
DOMAIN 2: STUDY DESIGN	
<i>Theoretical framework</i>	
9. Methodological orientation and theory	Qualitative approach using data obtained from semi-structured in-depth interviews. Page 6.
<i>Participant selection</i>	
10. Sampling	Purposive and snowball sampling. Page 6.
11. Method of approach	Purposive and snowball sampling. Page 6.
12. Sample size	Total of 30 participants, 28 were recruited using purposive sampling while two were recruited by snowball sampling. Page 6-8.
13. Non-participation	7 refused participation citing insufficient time to be interviewed. Page 6.
<i>Setting</i>	
14. Setting of data collection	Place of participants' convenience (their office or a meeting room which is conducive). Page 6.
15. Presence of non-participants	Not present.

No. Item	Reported on Page #
16. Description of sample	Participants were practising GPs enrolled in a PCN who had provided their signed informed consent prior to participating in our study. Page 8.
Data collection	
17. Interview guide	The interview guide had been pilot tested with 4 GPs prior to implementations. The guide is attached as supplemental material. Page 6.
18. Repeat interviews	No repeat interviews were conducted.
19. Audio/visual recording	Audio recording was performed with the participants signed agreement.
20. Field notes	Field notes were collected for every interview conducted to guide the reflexive process during our data analysis of the audio transcripts. Page 6.
21. Duration	Interviews ranged from 40 to 90 minutes. Page 6.
22. Data saturation	Data saturation was achieved whereby no new themes emerged from our data after multiple rounds of iterative feedback from the research team to ensure that all themes, subthemes and codes were comparable and aligned. Page 7.
23. Transcripts returned	Member checking was offered to all our participants but none of the participants took up the offer to edit their transcripts. Page 7.
DOMAIN 3: ANALYSIS AND FINDINGS	
Data analysis	
24. Number of data coders	CD and SS were the main coders while the rest of the research team offered iterative feedback on the themes, subthemes and codes that emerged from the data analysis process.
25. Description of the coding tree	The themes, subthemes and codes are summarised in tables 1 and 2. We also have our coding tree with the number of individual data units generated attached as supplemental material.
26. Derivation of themes	We employed a six-step thematic analysis protocol set forth by Braun and Clark and ensured that the protocol was followed throughout the process of deriving the themes to ensure optimal inter-rater reliability. Page 7.
27. Software	QSR NVIVO version 12. Page 7.

No. Item	Reported on Page #
28. Participant checking	Member checking was offered to all our participants but none of the participants took up the offer to edit their transcripts. Page 7.
Reporting	
29. Quotations presented	Pages 8 – 17
30. Data and findings consistent	Pages 8 – 17
31. Clarity of major themes	Pages 8 – 17
32. Clarity of minor themes	Pages 8 – 17

For peer review only

BMJ Open

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

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Complete List of Authors:	<p>Foo, Chuan De; National University Singapore Saw Swee Hock School of Public Health, Surentran, Shilpa; National University Singapore Saw Swee Hock School of Public Health Tam, Chen Hee; National University Singapore Saw Swee Hock School of Public Health Ho, Elaine; National University Singapore Saw Swee Hock School of Public Health Matchar, David; Duke University, Internal Medicine; Duke-NUS Medical School, Health Services and Systems Research Car, Josip; Nanyang Technological University, Health Services and Outcomes Research Programme, Lee Kong Chian School of Medicine; Imperial College London, Global eHealth Unit, Department of Primary Care and Public Health, School of Public Health Koh, Choon Huat, Gerald; National University of Singapore, Saw Swee Hock School of Public Health; National University Singapore Yong Loo Lin School of Medicine</p>
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Keywords:	PRIMARY CARE, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Change management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Clinical governance < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH

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4 1 **Title: Perceived facilitators and barriers to chronic disease management in**
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6 2 **primary care networks of Singapore: a qualitative study**
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2
3 20 **Abstract**
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6 21 **Objective:** The increasing chronic disease burden has placed tremendous strain on tertiary healthcare
7
8 22 resources in most countries, necessitating a shift in chronic disease management from tertiary to primary
9
10 23 care providers. The Primary Care Network (PCN) policy was promulgated as a model of care to organise
11
12 24 private general practitioners (GPs) into groups to provide GPs with resources to anchor patients with
13
14 25 chronic conditions with them in the community. As PCN is still in its embryonic stages, there is a void in
15
16 26 research regarding its ability to empower GPs to manage patients with chronic conditions effectively. This
17
18 27 qualitative study aims to explore the facilitators and barriers for the management of patients with chronic
19
20 28 conditions by GPs enrolled in PCN.
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24 29 **Design:** We conducted 30 semi-structured interviews with GPs enrolled in a PCN followed by a thematic
25
26 30 analysis of audio transcripts until data saturation was achieved.
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30 31 **Setting:** Singapore
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33 32 **Results:** Our results suggest that PCNs facilitated GPs to more effectively manage patients through 1)
34
35 33 provision of ancillary services such as diabetic foot screening, diabetic retinal photography and nurse
36
37 34 counselling to permit a “one-stop-shop”, 2) systematic monitoring of process and clinical outcome
38
39 35 indicators through a chronic disease registry (CDR) to promote accountability for patients’ health
40
41 36 outcomes and 3) funding streams for PCNs to hire additional manpower to oversee operations and to
42
43 37 reimburse GPs for extended consultations. Barriers include high administrative load in maintaining the
44
45 38 CDR due to the lack of a smart electronic clinic management system and financial gradient faced by
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47 39 patients seeking services from private GPs which incur higher out-of-pocket expenses than public primary
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49 40 healthcare institutions.
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3 41 **Conclusion:** PCNs demonstrate great promise in empowering enrolled GPs to manage patients with
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5 42 chronic conditions. However, barriers will need to be addressed to ensure the viability of PCNs in
6
7 43 managing more patients in the face of an ageing population.
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13 45 **Strengths and limitations of this study**
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- 16 46 - This is the first qualitative study on the PCN as a model of primary care due to this recent
17
18 47 implementation; thus, this study addresses a gap in research.
19
20
21 48 - There is a need to understand the facilitators and barriers that this model of care brings to the
22
23 49 private GPs in terms of improving chronic disease management to assess its potential to scale up.
24
25 50 - We interviewed a total of 30 GPs, who represent 8 out of the 10 PCNs that are in operation. As a
26
27 51 similar contractual backbone bound each PCN, the results are generalisable to all networks.
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30 52 - There might be some level of self-selection bias during the recruitment process as GPs who had a
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32 53 positive experience with the PCN might be more inclined to participate in our study.
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60 Introduction

61 As the global population ages at an alarming pace, the number of patients with chronic conditions is set
62 to rise in tandem. This surge in demand for healthcare results in higher bed occupancy rates and
63 emergency department presentations, which impose substantial expenditures on the healthcare system
64 [1–3]. Singapore, a developed city-state with a healthcare system accessible through an extensive network
65 of hospital, step-down and primary care providers, is no exception. Singapore’s primary care sector is
66 divided between privately and publicly run entities. The private primary care sector is dominated by
67 private general practitioners (GPs) who predominantly run as solo practices without the provision of much
68 ancillary services if any. On the other hand, public primary care institutions known as polyclinics, are
69 government-funded, with subsidised consultations, medications, diagnostic investigations and various
70 ancillary services available for patients.

71 At present, polyclinics and specialist outpatient clinics at government hospitals are faced with high patient
72 loads from Singapore’s population of roughly 5.8 million [4]. From 2010 to 2019, polyclinic attendances
73 had seen an overall increase from approximately 4.3 million to 6.7 million and 4 million to 5.3 million at
74 specialist outpatient clinics [5]. Furthermore, in 2020, the Singapore government was estimated to have
75 spent \$18.4 billion on healthcare which is forecasted to swell to \$50 billion by 2029 due to chronic
76 conditions emerging from a rapidly ageing population [6]. Therefore, there is an urgent need to shift
77 patients with stable chronic conditions away from these public healthcare institutions to the private
78 primary care space. The private primary care sector accounts for 80% of all primary care utilisation, yet
79 only 20% of patients turn to them for chronic disease management, while polyclinics meet 52% of chronic
80 attendances and the remaining is met by government hospitals [7]. To more effectively harness this pool
81 of untapped resources and lessen the burden placed on public healthcare institutions, a model of care
82 that promotes the anchorage of patients with chronic conditions with private GPs is imperative.

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3 83 To tackle the imbalance in chronic care attendances, Singapore's Ministry of Health undertook a large
4
5 84 coordinating role to utilise the capabilities of private GPs. This shift came in the form of the Primary Care
6
7 85 Network (PCN) which organises private GPs into groups de novo, a move touted by Singapore's Ministry
8
9 86 of Health and its statutory board the Agency of Integrated Care as a vehicle to enhance chronic disease
10
11 87 management for enrolled GPs. The Agency of Integrated Care oversees the policy direction and funding
12
13 88 for the PCN and will be referred to as the PCN oversight agency for the rest of this article. The PCN is a
14
15 89 model of care that emphasises on the delivery of team-based primary health services, through a team of
16
17 90 physicians, nurses, care coordinators, and administrative assistants [8]. Such networks have been
18
19 91 established in Canada, New Zealand and Germany since the early 2000s, and have produced improved
20
21 92 patient access to primary care and quality of care for the general population and in particular, patients
22
23 93 with chronic conditions [9–11]. In Germany, PCNs have displayed positive results in the management of
24
25 94 chronic diseases such as diabetes by serving as a model of care that focuses on improving access to care
26
27 95 and chronic disease self-management practices through the use of multidisciplinary teams [11,12]. PCNs
28
29 96 in Alberta had also demonstrated their capacities in reducing presentations to emergency departments
30
31 97 and hospital days for non-elective acute care, further emphasising the significance of team-based care at
32
33 98 the primary care interface [13,14]. Furthermore, PCNs facilitate sharing of resources, allowing for greater
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35 99 bargaining power when tendering for services, sharing expertise between parties and reducing the
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37 100 organisational workload of practices [15].
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44 101 As of August 2020, a total of 527 private GP practices have been enrolled in the ten existing PCNs in
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46 102 Singapore, each headed by two GP leaders and furnished with a certain level of resources which will be
47
48 103 further elaborated in the results section [8]. But briefly, each PCN is equipped to provide a set of mandated
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50 104 ancillary services such as diabetic retinal photography, diabetic foot screening and nurse counselling, all
51
52 105 of which can prevent the progression of diabetes and its complications. Additionally, GP practices enrolled
53
54 106 in a PCN are required to maintain a chronic disease registry. This registry collects process and clinical
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3 107 outcome indicators that are central to ensuring high-quality care for patients with chronic conditions if
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5 108 monitored religiously. Historically, Singapore's private GP sector was devoid of these key elements which
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7 109 are enabling features for chronic disease management.
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10 110 To our knowledge, only two quantitative studies were conducted to evaluate the effectiveness of
11
12 111 PCN in Singapore, both exclusively for diabetes management [16,17]. In both studies, diabetic
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14 112 patients were found to have better control over their disease condition and featured
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16 113 improvements in clinical parameters such as HbA1C levels. However, there are no qualitative
17
18 114 studies investigating how the PCN facilitates or challenges the management of chronic diseases
19
20 115 from the providers' perspective, which is a crucial step to undertake to explore its scalability as a
21
22 116 viable model of primary care. Therefore, this study aims to understand the experiences of GPs
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24 117 enrolled in PCNs and explore the facilitators and barriers of PCN in helping GPs manage patients
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26 118 with chronic diseases.
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34 120 **Method**

37 121 **Study Design**

40 122 Our study employed a qualitative research design [18] using data collected from semi-structured in-depth
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42 123 interviews conducted with participants who met the inclusion criteria of being a private GP enrolled in a
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44 124 PCN at the time of the interview. The consolidated criteria for reporting qualitative research (COREQ)
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46 125 criteria was applied throughout the research process (research checklist) [19].
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50 126 **Recruitment**

53 127 Purposive and snowball sampling strategies were used to recruit eligible participants. Firstly, for purposive
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55 128 sampling, we contacted eligible GPs based on a list made available on a publicly assessable government-
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3 129 run website designated for PCN and went through the list in a sequential order for each PCN. Secondly,
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5 130 snowball sampling was also employed whereby GPs whom we had finished interviewing had referred us
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7 131 to other GPs who met the inclusion criteria to take part in our study. A total of 37 eligible GPs were
8
9 132 contacted by email or telephone to take part in our study, 28 were recruited by purposive sampling and
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11 133 2 were recruited by snowball sampling, which resulted in 30 GPs willing to participate (81% response rate).
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13 134 Seven GPs whom we had approached declined participation, citing insufficient time to be interviewed.
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17 135 **Data collection**

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20 136 The semi-structured in-depth interviews were conducted face-to-face at a place of the participants'
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22 137 convenience. The interviews ranged from 40 to 90 minutes and occurred from January 2019 to January
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24 138 2020. The team was trained in qualitative research, had no prior relationship with the participants and
25
26 139 had a profound knowledge of the Singapore healthcare system.
27
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29

30 140 The topic guide used was designed with questions on the primary care landscape and how the PCN had
31
32 141 shaped the way GPs manage patients with chronic conditions (attached as supplementary material). The
33
34 142 questions created starting points to dive deeper into aspects salient to the research questions by further
35
36 143 probing participants based on their initial responses. The topic guide was pilot tested with four GPs before
37
38 144 implementation. As the interviews were semi-structured, there were no restrictions to conversation flow,
39
40 145 but the interviewers facilitated the conversation to elicit responses that could answer the research
41
42 146 question. Fieldnotes were also collected to provide contextual information during data analysis. After the
43
44 147 interviews, the audio recordings and subsequently, audio transcripts were de-identified to ensure
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46 148 anonymity.
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50 149 **Data analysis**

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53 150 All audio recordings were transcribed verbatim, and the transcripts were analysed thematically with QSR
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55 151 NVivo software (version 12) following an iterative six-step process outlined by Braun and Clarke [20].
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3 152 As such, we first familiarised ourselves with the transcripts, coded aspects that were salient to our
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5 153 research question and organised the codes into themes, while simultaneously referring back to the
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7 154 fieldnotes to enhance the reflexive process. Subsequently, the research team discussed the
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9
10 155 definitions assigned for each theme to ensure that the themes accurately represented the
11
12 156 experiences of the participants. Final themes were agreed among all the authors after multiple
13
14 157 iterative rounds of feedback. Additionally, to ensure inter-rater reliability, we followed a similar protocol
15
16 158 when analysing the data until the agreement was high on the comparison of codes. Data analysis ended
17
18 159 after achieving thematic saturation, whereby no new themes emerged.
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22 160 **Patient and public involvement**

23
24 161 There was no patient involvement, and all participants were private GPs who had provided us with
25
26 162 informed consent before participating in our study. The chance to edit their transcript as a form of
27
28 163 member checking was also offered but not taken up by any participant.
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32 164

35 165 **Results**

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38
39 166 A total of 30 interviews were conducted. We interviewed participants from a total of eight out of ten
40
41 167 PCNs, and all participants recruited at that point of time were involved in the delivery of chronic care in a
42
43 168 PCN.
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46 169 **Participant characteristics**

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48
49 170 During the recruitment process, 28 participants were recruited by purposive sampling while two were
50
51 171 recruited by snowball sampling. The average age of our participants was 49 years of age (range 31-68
52
53 172 years old), and their average duration spent in primary care was 18 years (range 3-35 years). In fact, most
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3 173 participants had been in their own practice for a relatively long duration averaging 14 years (range 1-35
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5 174 years). Our sample comprised of 27 male and three female private GPs. As participants were once in the
6
7 175 general pool of private GPs prior to enrolment in PCN, their demographic characteristics are expected to
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10 176 be similar to that of the general pool.

11 12 13 177 **Main findings**

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16 178 Three themes were identified as facilitators and two themes as barriers to the management of chronic
17
18 179 conditions. The facilitators are theme 1: ancillary services to provide a “one-stop-shop”, theme 2: chronic
19
20 180 disease registry (CDR) to monitor care indicators and theme 3: funding for the network. The barriers are
21
22 181 theme 4: administrative burden of maintaining the CDR and theme 5: loss of patients due to financial
23
24 182 gradient in favour of public healthcare institutions.

25 26 27 28 183 **Theme 1: Ancillary services to provide a “one-stop-shop”**

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30
31 184 Every PCN is outfitted with wrap-around ancillary services which included diabetic retinal photography,
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33 185 diabetic foot screening and nurse counselling. These ancillary services enabled private practices which
34
35 186 were traditionally too small to sustain or arrange for such services an opportunity to provide more holistic
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37
38 187 and preventive care for their patients. The individual practices are also supported by a team of nurses and
39
40 188 care coordinators, expanding the time for patient care by the entire primary care team.

41 42 43 189 **Subtheme 1.1. Convenience of having the ancillary services arranged for patients**

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45
46 190 Traditionally, private GPs would have to refer their patients to the polyclinics or government hospitals for
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48 191 ancillary services. However, the PCN enables each clinic to provide ancillary services to their patients when
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50 192 the services of a roving team are employed. Therefore, patients will not only be able to see the same
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52 193 doctor but also have the ancillary services conducted at the same location. As most patients reside near

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3 194 the clinic, this “one-stop-shop” enables a higher level of convenience and lowers the perceived barriers
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5 195 to attend ancillary services.
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8 196 *“[...] eye screening and nurse education [services available at polyclinics], but whereas in primary*
9
10 197 *GP clinics, we are unable to offer that. So, the current workflow is that we need to refer patients*
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12 198 *back to even polyclinic or back to other service centres for eye screenings. These extra referrals or*
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15 199 *extra effort for the patient is not an optimal workflow for the patient and that will reduce the*
16
17 200 *uptake on a lot of services. So PCN with our own ancillary and even mobile services, hopefully, will*
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19 201 *provide more convenience to the patient.” (R26)*
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22 202 **Subtheme 1.2. Additional manpower provided for conducting and coordinating ancillary services**

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25 203 The lack of ancillary service support and busy clinic hours raise the challenge of counselling patients on
26
27 204 disease-modifying behaviours, diabetic eye and foot examinations for independent GPs. Having additional
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29
30 205 manpower in the form of nurses hired by the PCN contributes towards the practices in carrying out these
31
32 206 essential ancillary services to prevent avoidable complications in patients. PCNs can either employ and
33
34 207 train their own nurses or outsource the services to external vendors that provide a roving team of nurses
35
36 208 to conduct ancillary services at their clinics.
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39 209 Furthermore, PCNs are provided with additional manpower to arrange for ancillary services and remind
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41 210 patients to attend the arranged services which alleviate the workload for clinic assistants and improve
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44 211 patient attendance. This task is fulfilled by primary care coordinators, but they can also be assigned other
45
46 212 PCN related tasks such as the consolidation of patient data for maintenance of the CDR (elaborated in
47
48 213 theme 2).
49
50

51 214 *“[...] CAs [clinic assistants] or my doctors will just have to register the patient, and then the PCCs*
52
53 215 *[primary care coordinators] will then follow up with patients on their appointments, and then*
54
55
56 216 *they will book, and then they will then get their appointments, work with the patients to get*
57
58

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2
3 217 *their appointments and then bring the provider [roving ancillary services team] to provide their*

4
5 218 *service in our clinic." (R46)*

6
7
8 219 *"The DRP [Diabetic Retinal Photography], DFS [Diabetic Foot Screening] believe is done by*

9
10 220 *Diabetic Society [external vendor]. Their nurses will be running the services inside the van. [Name*

11
12 221 *of PCN] has their own roving nurse, so I understand that they will be providing the nurse*

13
14 222 *counselling and also maybe helping with some of the DRP, DFS." (R21)*

15 16 17 18 223 **Theme 2: Chronic disease registry to monitor care indicators**

19
20
21 224 The CDR is a platform that enables the systematic tracking of care components for patients. Data is

22
23 225 tabulated into an excel spreadsheet which comprises over 200 fields, from basic sociodemographic data,

24
25 226 date of clinical diagnosis and screening attendances to clinical parameters for chronic conditions in

26
27 227 accordance with local clinical practice guidelines. CDR data is submitted to the PCN oversight agency to

28
29 228 ensure required care components are fulfilled before Care Plus Fee (elaborated in subtheme 3.1) is

30
31 229 dispersed by the PCN oversight agency to the PCN. Thus, the CDR gives GPs and the PCN oversight agency

32
33 230 a dashboard view of the quality of care provided, allowing for the identification of opportunities to refine

34
35 231 existing management practices using quantitative parameters by improving processes and outcomes.

36 37 38 39 232 **Subtheme 2.1. Cross accountability to ensure practices meet specific standards of care**

40
41 233 Most solo GP practices work in silos, and a certain level of accountability is needed to ensure that practices

42
43 234 not only follow guidelines but provide the best care for their patients. Therefore, anonymised results of

44
45 235 performance indicators from the CDR of all practices are made available during implementation and

46
47 236 review sessions every quarter to perform benchmarking to reduce the variation in performance and

48
49 237 improve quality of care for patients.

1
2
3 238 *"[...] my understanding of the CDR, is that they want to benchmark, they want to benchmark the*
4
5 239 *care of the patient, that means, for example, within the PCN, let's say, everybody [PCN GPs] HbA1c*
6
7 240 *for diabetic, you know is let's say 8, and for my clinic, all my patients are 9, then they will say that*
8
9 241 *I am below average. So there is a benchmarking [...]" (R39)*

242 **Subtheme 2.2. Reminder to fulfil care processes**

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

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

248 **Theme 3: Funding for the network**

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

253 **Subtheme 3.1. Care Plus Fee for extended consultation time**

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

1
2
3 260 *"The Care Plus Fees are incentives for all members of the PCN [...] who are managing complex*
4
5 261 *chronic cases. They will receive a financial incentive per patient because it takes longer and more*
6
7 262 *time resource to manage these patients. So per year, they are given a quantum of 100 dollars [per*
8
9 263 *chronic disease case], but of course, you must satisfy all the criteria [CDR requirements] stipulated*
10
11 264 *to prove that you are managing a complex patient." (R15)*
12
13
14

15 265 **Subtheme 3.2. Funding for additional manpower for backend office duties**

16
17
18 266 Funding is provided for PCNs to employ primary care coordinators to coordinate ancillary services, track
19
20 267 patients, remind patients to attend ancillary services and to consolidate data for the CDR as most solo
21
22 268 practices do not have the manpower to conduct non-clinical duties. Funding for primary care coordinators
23
24 269 come in the form of full-time equivalents which is furnished by the PCN oversight agency based on the
25
26 270 PCN's load of patients with chronic conditions.
27
28

29
30 271 *"Primary care coordinators if I am not mistaken [...] is one FTE [full-time equivalent] to 3000*
31
32 272 *patients [...]" (R36)*
33
34

35 273 **Subtheme 3.3. Funding for locums for GPs to attend continuing medical education sessions**

36
37
38 274 Funding is provided for PCN GPs to hire locums when they attend continuing medical education sessions.
39
40 275 The availability of locums motivated GPs to attend continuing medical education sessions while
41
42 276 maintaining clinic services in the interim.
43
44

45 277 *"[...] I know that specifically there is funding for them to employ locum, so if they have to employ*
46
47 278 *locum to go for this [continuing medical education sessions], there is funding to pay for their*
48
49 279 *locum." (R48)*
50
51

52 280 **Subtheme 3.4. Funding for GP leads to perform PCN-related duties**

281 Funding for PCN leaders is used to backfill time lost at their practice when performing PCN-related duties.

282 Duties include developing working relationships with leaders of other PCNs, providing strategic and

283 clinical leadership and spearheading quality improvement over member practices.

284 *"[...] PCN leads are given 0.4 FTE [full-time equivalent] [...] for a GP because it is an opportunity*

285 *cost to be taken away from his clinic. That money goes directly into his pocket. That is to*

286 *compensate him for the time lost because he could be otherwise seeing his patients."* (R36)

287 **Theme 4: Administrative burden of maintaining the CDR**

288 The maintenance of the CDR requires consolidation of data regarding the process and clinical indicators

289 by both GPs and clinic assistants. Despite having additional administrative support from primary care

290 coordinators to consolidate registry data, routine documentation proved highly laborious for practices

291 overstretched by other administrative duties and lean manpower structure, leading to more man-hours

292 or overtime duties. Clinics also face difficulty in extracting data from their clinic management system due

293 to the lack of a smart extraction tool that aligns with CDR requirements.

294 *"Fortunately, our staff are understanding, but you cannot say it's the same for other solo*

295 *practices. The technical staff may not actually want to do paperwork, and if it falls on the onus of*

296 *the doctors to do it, I don't think they have the time also beyond their clinical time."* (R18)

297

298 *"For those clinics using Clinic Assist [a brand of clinic management system] with the CMS [clinic*

299 *management system] that is linked to PCN yes, that will be easier. You just need to key in your*

300 *numbers and click submit [smart extraction tool function], but for a lot of other clinics not using*

301 *Clinic Assist and integrated with PCN, what do we do? We need to manually write it down or*

302 *manually key in individual patient clinical indicators for both MOH [Ministry of Health] and PCN.*

1
2
3 303 *With the busy clinic, the doctor has no time to do it, the staff has no time to do it, so we need to*
4
5 304 *OT [overtime] to submit all these." (R26)*
6
7

8 305 **Theme 5: Loss of patients due to financial gradient in favour of public healthcare**
9
10
11 306 **institutions**
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13
14 307 Perceptions of the affordability of healthcare affect the uptake of medical services. The high levels of
15
16 308 government subsidies offered at public healthcare institutions such as the polyclinics and specialist
17
18 309 outpatient clinics are highly attractive to price-conscious patients. Thus, the Community Health Assist
19
20 310 Scheme, a portable medical subsidy that enables patients to enjoy a finite quantum by the government
21
22 311 to offset medical expenses when seeking treatment at private primary care facilities was launched [22].
23
24 312 This subsidy scheme referred to as private healthcare subsidy for the rest of this article is intended to
25
26 313 alleviate the stress placed on the public healthcare sector resulting from the huge volume of patients
27
28 314 drawn to their subsidised services and medicines.
29
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33 315 **Subtheme 5.1. Insufficient quantum for private healthcare subsidies**
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36 316 Complex chronic conditions require multiple visits to the clinic and long-term medication. Participants
37
38 317 reflected that the quantum is usually sufficient for patients with simple chronic conditions but insufficient
39
40 318 for patients with complex chronic conditions, as more medications need to be prescribed. Therein lies the
41
42 319 possibility that care for multimorbid patients provided by their private GP might discontinue after the
43
44 320 finite quantum of private healthcare subsidies has been exhausted.
45
46

47
48 321 *"The CHAS [private healthcare subsidies] subsidies help, but it is for simple chronic illness, for*
49
50 322 *simple cases [...] But when it comes to more medication [...] it makes it very difficult, even with*
51
52 323 *the CHAS [private healthcare subsidies] subsidy." (R48)*
53
54

55 324 **Subtheme 5.2. Heavily subsidised government-funded polyclinics**
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3 325 The adverse financial gradient between private primary care and polyclinics promotes specific health-
4
5 326 seeking behaviour. Being price-sensitive, patients turn to the largely government-funded polyclinics to
6
7 327 obtain subsidised medications and enjoy lower consultation fees, promoting the severance in care
8
9
10 328 continuity with their private GP.

11
12
13 329 *"You cannot fight with the polyclinic because they are subsidised, so you cannot compare. We*
14
15 330 *have no subsidies for drugs. We have no subsidies for consultation." (R48)*

16
17
18 331
19
20
21 332 *"I would say that we have been able to keep a certain number of chronic patients within the*
22
23 333 *registry. But of course, the challenge is keeping them in [...] they did not come back after one visit*
24
25 334 *since last year. So for this group of patients, I would assume that they have kind of withdrawn*
26
27 335 *themselves from the system [...] Sometimes, they are, for example, going back to the polyclinic.*
28
29
30 336 *Most of the time it is cost issues." (R20)*

31 32 33 337 **Discussion**

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35
36 338 The provision of human and financial resources to upkeep the day-to-day operations of the PCN which
37
38 339 includes the wrap-around ancillary services increase the accessibility of team-based care to patients with
39
40 340 chronic conditions and the use of the CDR to optimise care components are central in driving this care
41
42 341 model forward. Ironically, the CDR, which is an enabler, also poses an administrative challenge for
43
44 342 practices. Legacy issues regarding the financial gradient between private GP practices and polyclinics is
45
46 343 another complex policy dilemma that requires further examination. Hereinafter the facilitators and
47
48 344 barriers will be discussed in detail.

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51
52 345 Ancillary services not traditionally offered by solo practices are now available through the PCN. The roving
53
54 346 services provide diabetic retinal photography, diabetic foot screening and nurse counselling, which are

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2
3 347 proven to be catalysts for preventing avoidable amputations and blindness [23–25]. The inconvenience
4
5 348 caused to patients in making extra trips to polyclinics where ancillary services are offered, which resulted
6
7 349 in missed attendances, was alleviated through roving teams that conduct the services at clinics [26]. Thus,
8
9
10 350 our findings support the results by studies conducted by Luo et al. (2018) and Chua et al. (2015) which
11
12 351 evaluated the effectiveness of diabetes management in a pilot PCN in Singapore, showing that the
13
14 352 provision of ancillary services at GP clinics which increased accessibility had resulted in improvements to
15
16 353 HbA1c levels and better control of LDL-C and blood pressure overall [16,17]. Furthermore, a study by
17
18 354 Schäfer et al. (2017) indicated that one-stop-services provided at GP clinics improved accessibility,
19
20 355 continuity and comprehensiveness of care [27]. As GPs are usually burdened by assuming organisational
21
22 356 and administrative tasks while providing medical care, assigning the responsibility of arranging and
23
24 357 conducting ancillary services to designated staff allowed GPs to focus on the medical care for their
25
26 358 patients [28–30]. This team-based care approach as studied through a meta-analysis by Levngood et al.
27
28 359 (2019) established that team-based diabetes management improved overall clinical indicators for
29
30 360 diabetes patients, health services utilisation, diabetes-related morbidity and mortality [31].
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35 361 Our participants supported the concept of the CDR, which allows for a certain level of benchmarking with
36
37 362 other practices within the same PCN and track the process and clinical outcome indicators for their
38
39 363 patients. The pilot PCN studies by Luo et al. (2018) and Chua et al. (2015) had also briefly mentioned the
40
41 364 use of a CDR but did not go into details as to how the CDR enabled better diabetes management [16,17].
42
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44 365 Our findings support both quantitative studies by elucidating how the CDR led practices to conform to
45
46 366 clinical guidelines. In this case, GPs were prompted to fulfil evidence-based process and clinical indicators
47
48 367 such as the tracking of ancillary service attendances, HbA1c, LDL-C and blood pressure readings to monitor
49
50 368 the disease condition of patients optimally throughout their patient journeys. Our qualitative findings thus
51
52 369 corroborate with the quantitative improvements in diabetes status as stated in the pilot PCN studies
53
54 370 [16,17]. Moreover, as defined by Schmitt diel et al. (2015), disease registries can serve to generate
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3 371 performance feedback reports on clinical outcomes; identify patients out of therapeutic range; create
4
5 372 point-of-care reminders and decision support; and create "high-risk lists" that target patients who require
6
7 373 more intensive management [32]. Other studies on electronic healthcare registries have suggested that
8
9 374 disease documenting platforms if utilised in one or more of these ways as suggested by Schmittiel et al.
10
11 375 (2015), can improve care delivery for patients with diabetes [33–35].
12
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14

15 376 Despite the advantages brought about by CDR, some barriers hinder its implementation. As reflected by
16
17 377 our participants, the management of CDR is administratively burdensome, particularly for practices not
18
19 378 supported by a clinic management system. Even for practices with a clinic management system, there is
20
21 379 no smart extraction tool devoted to the exporting of CDR mandated fields. As a result, the GPs or clinic
22
23 380 assistants would have to key in the required CDR fields manually, resulting in additional man-hours or
24
25 381 "overtime". In addition, the need for increased documentation of care and coordination planning for
26
27 382 patients also reduces face-to-face time GPs have with patients [36].
28
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30

31 383 A lack of adequate compensation for the coordination of tasks hinders GPs from giving optimal care to
32
33 384 their patients [28]. Therefore, funding for manpower to complete back-office tasks such as the
34
35 385 coordination of ancillary services and consolidation of data fields for the CDR was allocated. Extra
36
37 386 manpower such as having primary care coordinators perform data retrieval and entry for the CDR would
38
39 387 also translate to more face-to-face time for GPs with patients, resulting in better patient understanding
40
41 388 and thus treatment of the condition. However, to our knowledge, there are other challenges to this, such
42
43 389 as providing a space in the clinic for primary care coordinators to work and the unwillingness of practices
44
45 390 to grant access to patient data due to confidentiality issues.
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50 391 Another facilitator that motivates GPs to manage more patients with chronic conditions is the Care Plus
51
52 392 Fee. Patients with chronic conditions typically require a longer consultation and more face-to-face time
53
54 393 than GPs customarily expend in routine practice [29,37]. If not compensated appropriately, these patients
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3 394 might not receive adequate consultation time, resulting in the omission of important standard-of-care
4
5 395 items, reduced attention to patients' psychosocial concerns, and limited discussion of management
6
7 396 options [38]. As private practices are profit-oriented entities, the compensation for additional time spent
8
9
10 397 on a patient with chronic conditions is appropriate to offset the potential reduction in acute cases seen.
11
12 398 However, our participants revealed the highly contingent nature of this funding model, where the Care
13
14 399 Plus Fee was disbursed only after the fulfilment of CDR requirements by religiously completing the
15
16 400 necessary process and clinical outcome indicators. To our knowledge, the Care Plus Fee had only been
17
18 401 distributed once since PCN's inception due to unspecified delays from the PCN oversight agency. We could
19
20 402 only surmise that auditing of the fulfilment of CDR criteria took many man-hours at the PCN oversight
21
22 403 agency's end as well. Nonetheless, the Care Plus Fee is seen as augmentation for both the GP in terms of
23
24 404 reimbursement for their time and the patient who is ensured of evidence-based chronic disease care.
25
26
27
28 405 Given that PCNs group GPs practices together de novo, it is imperative for a strong leader to helm the
29
30 406 network. Clinician leadership has been shown to be important in driving policy direction, strategic
31
32 407 planning by operating across organisation boundaries, and improving the practices within the network
33
34 408 [39–41]. However, GPs might feel a strain taking on dual capacities, both as network leader and provider
35
36
37 409 in their own practice. A study by Sephar et al. (2017) emphasised the challenges that GPs face between
38
39 410 the clinical and leadership roles and a lack of formal training and preparation to assume the role of leader
40
41 411 [42]. Thus, the reimbursement for their time in conducting duties as a PCN leader was paid accordingly,
42
43 412 and the lack of leadership, management and financing skills of the GPs can be nurtured through a national
44
45 413 health leadership model embedded into continuing medical education curriculum [43,44].
46
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48
49 414 Continuing medical education is essential for GPs to keep abreast of the latest chronic disease
50
51 415 management practices and serve as a platform to exchange experiences with their colleagues [45]. In
52
53 416 addition, PCN leaders are no longer only the captain of their practice but gatekeeper of the entire network.
54
55
56 417 Thus, continuing professional development in clinical, business and financial leadership should be
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1
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3 418 cornerstones for the development of PCN leaders [46]. In both instances, GPs are provided with funding
4
5 419 to hire locums to fill their duties when attending continuing medical education courses. This motivates
6
7 420 GPs to improve pre-existing levels of competence while having the manpower to cover their duties during
8
9
10 421 their clinical absence.

11
12 422 Perceptions of the affordability of medical care undoubtedly affect the uptake of chronic care treatment
13
14 423 [47]. In Singapore, the Community Health Assist Scheme, referred here as private healthcare subsidies
15
16 424 was introduced as a portable medical subsidy to improve access to private primary healthcare where
17
18 425 recipients can seek subsidies for treatment at private GP clinics. In fact, this private healthcare subsidies
19
20 426 scheme was enhanced in November 2019 to motivate more patients to adhere to management plans and
21
22 427 seek appropriate care [48]. Despite these enhancements to encourage Singaporeans to shift their care
23
24 428 from polyclinics to private GPs, our participants reflected that the quantum for private healthcare
25
26 429 subsidies remains insufficient to drive that behaviour. This is especially true for patients requiring multiple
27
28 430 medications due to their complex conditions. All our participants had voiced that the high cost of
29
30 431 unsubsidised medicines at private GPs had pushed patients to seek care at the heavily subsidised
31
32 432 polyclinics. This financial gradient between private and public primary healthcare institutions had long
33
34 433 been the reason for patients sticking to polyclinics, especially in a healthcare system where services are
35
36 434 mainly paid out-of-pocket and patients are free to choose their primary care provider [49].
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42 435 Currently, there are 20 polyclinics in Singapore, with the number set to increase to 30 by 2030 [50,51].
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44 436 Despite the introduction of private healthcare subsidies, polyclinics continue to be confronted with high
45
46 437 patient volumes [52,53]. Affordability, convenience of travel and onsite laboratory facilities influence
47
48 438 patients' choice of seeking treatment at polyclinics [49]. Increasing the convenience of onsite ancillary
49
50 439 services at GP clinics will encourage more patients to seek services from their regular private GPs. Thus,
51
52 440 the inconvenience resulting from the lack of co-located ancillary services was resolved through the
53
54 441 provision of roving ancillary services teams by the PCN. However, the adverse financial gradient with
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3 442 polyclinics remains. With the emergence of more polyclinics, private GPs will find it increasingly difficult
4
5 443 to compete for patients with chronic conditions who are price sensitive. This prevailing policy dilemma
6
7 444 warrants further study. For now, we can only postulate that the increasing chronic burden might be too
8
9 445 much for the consortia of private GPs alone to absorb, creating the need for more polyclinics.

10
11
12 446 To our knowledge, this is the first qualitative study conducted on the newly implemented PCN that
13
14 447 explores the characteristics which make it a good model for chronic care management, in light of a
15
16 448 growing ageing population with increased utilisation of primary care services. We also managed to recruit
17
18 449 participants from eight out of ten PCNs. Therefore, we believe that our findings are transferrable to all
19
20 450 PCNs in Singapore as perspectives across PCNs should be similar, given the same contractual backbone
21
22 451 for implementation and funding. In addition, we recognise the limitations of snowball sampling in our
23
24 452 recruitment process but feel that our study results are unaffected as only two participants were recruited
25
26 453 by snowballing. We also recognise potential self-selection bias, whereby participants who had positive
27
28 454 experiences with the PCN might be more inclined to be interviewed. Despite the potential one-sidedness
29
30 455 in experiences, a range of views was demonstrated.

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32
33 456 Moving forward, the next step is to evaluate the cost-effectiveness of PCN in managing chronic conditions
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35 457 compared to polyclinics and conduct studies on facilitators and barriers of PCN from the patients'
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37 458 perspective.

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44 45 46 460 **Conclusion**

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49 461 The PCN initiative offers immense potential for the management of chronic diseases. The funding for
50
51 462 streamlining back-office functions and increased manpower capacities to deliver a range of ancillary
52
53 463 services to patients is a huge enabler for solo practices, who are now able to tap on more resources.

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3 464 Moreover, the CDR which tracks the patients' care delivery advances evidence-based care management.
4
5 465 The challenges surrounding the administrative burden of maintaining the CDR need to be prioritised, and
6
7 466 financial gradient between private and public primary care systems partially surmounted through
8
9 467 enhancements to private healthcare subsidies remain to be addressed.
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16 469 **References**

- 17
18 470 1 Sampson MJ, Dozio N, Ferguson B, *et al.* Total and excess bed occupancy by age, specialty and
19
20 471 insulin use for nearly one million diabetes patients discharged from all English Acute Hospitals.
21
22 472 *Diabetes Res Clin Pract* 2007;**77**:92–8. doi:10.1016/j.diabres.2006.10.004
23
24
25
26 473 2 Donnan PT, Leese GP, Morris AD, *et al.* Hospitalizations for people with type 1 and type 2 diabetes
27
28 474 compared with the nondiabetic population of Tayside, Scotland: a retrospective cohort study of
29
30 475 resource use. *Diabetes Care* 2000;**23**:1774–9. doi:10.2337/diacare.23.12.1774
31
32
33
34 476 3 Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic
35
36 477 conditions in the elderly. *Arch Intern Med* 2002;**162**:2269–76. doi:10.1001/archinte.162.20.2269
37
38
39 478 4 Singapore Population (2021) - Worldometer. [https://www.worldometers.info/world-](https://www.worldometers.info/world-population/singapore-population/)
40
41 479 [population/singapore-population/](https://www.worldometers.info/world-population/singapore-population/) (accessed 8 Mar 2021).
42
43
44
45 480 5 Attendances at Accident & Emergency Departments, Specialist Outpatient Clinics, Polyclinics and
46
47 481 Public Sector Dental Clinics. Data.gov.sg. [https://data.gov.sg/dataset/attendances-at-accident-](https://data.gov.sg/dataset/attendances-at-accident-emergency-departments-specialist-outpatient-clinics-and-polyclinics)
48
49 482 [emergency-departments-specialist-outpatient-clinics-and-polyclinics](https://data.gov.sg/dataset/attendances-at-accident-emergency-departments-specialist-outpatient-clinics-and-polyclinics) (accessed 8 Mar 2021).
50
51
52
53 483 6 Singapore healthcare market set to grow to S\$29.8b this year: Fitch Solutions, Government &
54
55 484 Economy - THE BUSINESS TIMES. <https://www.businesstimes.com.sg/government->

- 1
2
3 485 economy/singapore-healthcare-market-set-to-grow-to-s298b-this-year-fitch-solutions (accessed 8
4
5 486 Mar 2021).
- 6
7
8
9 487 7 MOH | Primary Care Survey 2014 Report. [https://www.moh.gov.sg/resources-](https://www.moh.gov.sg/resources-statistics/reports/primary-care-survey-2014-report)
10 488 [statistics/reports/primary-care-survey-2014-report](https://www.moh.gov.sg/resources-statistics/reports/primary-care-survey-2014-report) (accessed 28 Mar 2020).
- 11
12
13
14 489 8 Primary Care Network (PCN). [https://www.primarycarepages.sg/practice-management/primary-](https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn))
15 490 [care-model/primary-care-network-\(pcn\)](https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn)) (accessed 30 May 2020).
- 16
17
18
19 491 9 Hutchison B, Levesque J-F, Strumpf E, *et al*. Primary health care in Canada: systems in motion.
20 492 *Milbank Q* 2011;**89**:256–88. doi:10.1111/j.1468-0009.2011.00628.x
- 21
22
23
24
25 493 10 Cumming J. Integrated care in New Zealand. *Int J Integr Care*
26 494 2011;**11**.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3226018/> (accessed 9 Apr 2020).
- 27
28
29
30 495 11 Ose D, Kamradt M, Kiel M, *et al*. Care management intervention to strengthen self-care of
31 496 multimorbid patients with type 2 diabetes in a German primary care network: A randomized
32 497 controlled trial. *PloS One* 2019;**14**:e0214056. doi:10.1371/journal.pone.0214056
- 33
34
35
36
37
38 498 12 Schlette S, Lisac M, Blum K. Integrated primary care in Germany: the road ahead. *Int J Integr Care*
39 499 2009;**9**.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2691944/> (accessed 21 Mar 2020).
- 40
41
42
43
44 500 13 McAlister FA, Bakal JA, Green L, *et al*. The effect of provider affiliation with a primary care network
45 501 on emergency department visits and hospital admissions. *CMAJ* 2018;**190**:E276–84.
46 502 doi:10.1503/cmaj.170385
- 47
48
49
50
51 503 14 Manns BJ, Tonelli M, Zhang J, *et al*. Enrolment in primary care networks: impact on outcomes and
52 504 processes of care for patients with diabetes. *CMAJ Can Med Assoc J* 2012;**184**:E144–52.
53 505 doi:10.1503/cmaj.110755

- 1
2
3 506 15 Mills J, Oyedotun L, Ridout J, *et al.* The opportunities for economies of scale in primary care.
4
5 507 *InnovAiT* 2019;**12**:476–8. doi:10.1177/1755738018761501
6
7
8
9 508 16 Luo M, Poh Z, Koh G, *et al.* Diabetes management in a Primary Care Network (PCN) of private
10
11 509 general practitioners in Singapore. *Medicine (Baltimore)* 2018;**97**.
12
13 510 doi:10.1097/MD.00000000000012929
14
15
16 511 17 Chua LKL, Chong CK, Hwee-Lin W, *et al.* Primary Care Network (PCN) As A Model Of Care For GP
17
18 512 Chronic Disease Management. *Singap Fam Physician* 2015;**41**:61–4.
19
20
21
22 513 18 Tracy SJ. Qualitative Quality: Eight “Big-Tent” Criteria for Excellent Qualitative Research: *Qual Inq*
23
24 514 Published Online First: 1 October 2010. doi:10.1177/1077800410383121
25
26
27 515 19 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-
28
29 516 item checklist for interviews and focus groups. *Int J Qual Health Care J Int Soc Qual Health Care*
30
31 517 2007;**19**:349–57. doi:10.1093/intqhc/mzm042
32
33
34
35 518 20 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;**3**:77–101.
36
37 519 doi:10.1191/1478088706qp063oa
38
39
40 520 21 MOH | News Highlights. <https://www.moh.gov.sg/news-highlights/details/primary-care-networks->
41
42 521 [for-better-patient-care-in-the-community](https://www.moh.gov.sg/news-highlights/details/primary-care-networks-) (accessed 23 Feb 2020).
43
44
45
46 522 22 CHAS. <https://www.chas.sg/> (accessed 15 Oct 2020).
47
48
49 523 23 Nather A, Cao S, Chen JLW, *et al.* Prevention of diabetic foot complications. *Singapore Med J*
50
51 524 2018;**59**:291–4. doi:10.11622/smedj.2018069
52
53
54
55
56
57
58
59
60

- 1
2
3 525 24 Mayfield JA, Reiber GE, Nelson RG, *et al.* Do foot examinations reduce the risk of diabetic
4
5 526 amputation? *J Fam Pract* 2000;**49**:499–504.
6
7
8 527 25 Skaggs JB, Zhang X, Olson DJ, *et al.* Screening for Diabetic Retinopathy: Strategies for Improving
9
10 528 Patient Follow-up. *N C Med J* 2017;**78**:121–3. doi:10.18043/ncm.78.2.121
11
12
13
14 529 26 Taber JM, Leyva B, Persoskie A. Why do People Avoid Medical Care? A Qualitative Study Using
15
16 530 National Data. *J Gen Intern Med* 2015;**30**:290–7. doi:10.1007/s11606-014-3089-1
17
18
19 531 27 Schäfer WLA, Boerma WGW, Schellevis FG, *et al.* GP Practices as a One-Stop Shop: How Do Patients
20
21 532 Perceive the Quality of Care? A Cross-Sectional Study in Thirty-Four Countries. *Health Serv Res*
22
23 533 2018;**53**:2047–63. doi:10.1111/1475-6773.12754
24
25
26
27 534 28 Stumm J, Thierbach C, Peter L, *et al.* Coordination of care for multimorbid patients from the
28
29 535 perspective of general practitioners – a qualitative study. *BMC Fam Pract* 2019;**20**:160.
30
31 536 doi:10.1186/s12875-019-1048-y
32
33
34
35 537 29 Østbye T, Yarnall KSH, Krause KM, *et al.* Is There Time for Management of Patients With Chronic
36
37 538 Diseases in Primary Care? *Ann Fam Med* 2005;**3**:209–14. doi:10.1370/afm.310
38
39
40 539 30 Margolius D, Wong J, Goldman ML, *et al.* Delegating Responsibility from Clinicians to
41
42 540 Nonprofessional Personnel: The Example of Hypertension Control. *J Am Board Fam Med*
43
44 541 2012;**25**:209–15. doi:10.3122/jabfm.2012.02.100279
45
46
47
48 542 31 Levensgood TW, Peng Y, Xiong KZ, *et al.* Team-Based Care to Improve Diabetes Management: A
49
50 543 Community Guide Meta-analysis. *Am J Prev Med* 2019;**57**:e17–26.
51
52 544 doi:10.1016/j.amepre.2019.02.005
53
54
55
56
57
58
59
60

- 1
2
3 545 32 Schmittziel J, Bodenheimer T, Solomon NA, *et al*. BRIEF REPORT: The Prevalence and Use of Chronic
4
5 546 Disease Registries in Physician Organizations. *J Gen Intern Med* 2005;**20**:855–8. doi:10.1111/j.1525-
6
7 547 1497.2005.0171.x
8
9
10
11 548 33 Stroebel RJ, Scheitel SM, Fitz JS, *et al*. A randomized trial of three diabetes registry implementation
12
13 549 strategies in a community internal medicine practice. *Jt Comm J Qual Improv* 2002;**28**:441–50.
14
15 550 doi:10.1016/s1070-3241(02)28044-x
16
17
18 551 34 Hoque DME, Kumari V, Hoque M, *et al*. Impact of clinical registries on quality of patient care and
19
20 552 clinical outcomes: A systematic review. *PLoS ONE* 2017;**12**. doi:10.1371/journal.pone.0183667
21
22
23
24 553 35 Thomas KG, Thomas MR, Stroebel RJ, *et al*. Use of a Registry-generated Audit, Feedback, and Patient
25
26 554 Reminder Intervention in an Internal Medicine Resident Clinic—A Randomized Trial. *J Gen Intern*
27
28 555 *Med* 2007;**22**:1740–4. doi:10.1007/s11606-007-0431-x
29
30
31
32 556 36 Gottschalk A, Flocke SA. Time Spent in Face-to-Face Patient Care and Work Outside the Examination
33
34 557 Room. *Ann Fam Med* 2005;**3**:488–93. doi:10.1370/afm.404
35
36
37 558 37 Schellevis FG, Van de Lisdonk EH, Van der Velden J, *et al*. Consultation rates and incidence of
38
39 559 intercurrent morbidity among patients with chronic disease in general practice. *Br J Gen Pract*
40
41 560 1994;**44**:259–62.
42
43
44
45 561 38 Barnes CS, Ziemer DC, Miller CD, *et al*. Little Time for Diabetes Management in the Primary Care
46
47 562 Setting. *Diabetes Educ* 2004;**30**:126–35. doi:10.1177/014572170403000120
48
49
50 563 39 Willcocks SG. Leadership: a challenge for GPs? *Br J Health Care Manag* 2010;**16**:468–73.
51
52
53
54
55
56
57
58
59
60

- 1
2
3 564 40 Storey J, Holti R, Hartley J, *et al.* Devolving healthcare services redesign to local clinical leaders: does
4
5 565 it work in practice? *J Health Organ Manag Bradf* 2019;**33**:188–203.
6
7 566 doi:<http://dx.doi.org.libproxy1.nus.edu.sg/10.1108/JHOM-05-2018-0144>
8
9
10
11 567 41 Weaver RR. Seeking high reliability in primary care: Leadership, tools, and organization. *Health Care*
12
13 568 *Manage Rev* 2015;**40**:183–92. doi:10.1097/HMR.0000000000000022
14
15
16 569 42 Spehar I, Sjøvik H, Karevold KI, *et al.* General practitioners' views on leadership roles and challenges
17
18 570 in primary health care: a qualitative study. *Scand J Prim Health Care* 2017;**35**:105–10.
19
20 571 doi:10.1080/02813432.2017.1288819
21
22
23
24 572 43 Swanwick T, Varnam R. Leadership development and primary care. *BMJ Lead* 2019;**3**.
25
26 573 doi:10.1136/leader-2019-000145
27
28
29 574 44 Hargett CW, Doty JP, Hauck JN, *et al.* Developing a model for effective leadership in healthcare: a
30
31 575 concept mapping approach. *J Healthc Leadersh* 2017;**9**:69–78. doi:10.2147/JHL.S141664
32
33
34
35 576 45 Kjaer NK, Steenstrup AP, Pedersen LB, *et al.* Continuous professional development for GPs:
36
37 577 experience from Denmark. *Postgrad Med J* 2014;**90**:383–7. doi:10.1136/postgradmedj-2012-131679
38
39
40 578 46 Raza A, Coomarasamy A, Khan KS. Best evidence continuous medical education. *Arch Gynecol*
41
42 579 *Obstet* 2009;**280**:683–7. doi:10.1007/s00404-009-1128-7
43
44
45
46 580 47 Vuong Q-H, Ho T-M, Nguyen H-K, *et al.* Healthcare consumers' sensitivity to costs: a reflection on
47
48 581 behavioural economics from an emerging market. *Palgrave Commun* 2018;**4**:1–10.
49
50 582 doi:10.1057/s41599-018-0127-3
51
52
53
54 583 48 Chan CQH, Lee KH, Low LL. A systematic review of health status, health seeking behaviour and
55
56 584 healthcare utilisation of low socioeconomic status populations in urban Singapore. *Int J Equity*
57
58
59
60

- 1
2
3 585 *Health*
4
5 586 2018;**17**.<http://link.gale.com/apps/doc/A547114199/AONE?u=nuslib&sid=zotero&xid=9fa856fd>
6
7 587 (accessed 18 Mar 2020).
8
9
10
11 588 49 Chow WL, Wang VW, Low YS, *et al*. Factors that influence the choice of seeking treatment at
12
13 589 polyclinics. *Singapore Med J* 2012;**53**:109–15.
14
15
16 590 50 hermes. Parliament: Six new polyclinics by 2023, with up to six more by 2030. Straits Times.
17
18 591 2019.[https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-](https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030)
19
20 592 [more-by-2030](https://www.straitstimes.com/singapore/health/six-new-polyclinics-by-2023-with-up-to-six-more-by-2030) (accessed 19 Mar 2020).
21
22
23
24 593 51 MOH to build up to 8 new polyclinics by 2030. CNA.
25
26 594 [https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-](https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-2030-10022706)
27
28 595 [2030-10022706](https://www.channelnewsasia.com/news/singapore/moh-to-build-up-to-8-new-polyclinics-by-2030-10022706) (accessed 9 Apr 2020).
29
30
31
32 596 52 Tan KB, Lee CE. Integration of Primary Care with Hospital Services for Sustainable Universal Health
33
34 597 Coverage in Singapore. *Health Syst Reform* 2019;**5**:18–23. doi:10.1080/23288604.2018.1543830
35
36
37 598 53 Lim M-K. Shifting the burden of health care finance: a case study of public–private partnership in
38
39 599 Singapore. *Health Policy* 2004;**69**:83–92. doi:10.1016/j.healthpol.2003.12.009
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3 **606 Authors' contributions**
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6 607 GK, DM, JC, TCH, FCD, SS and EH contributed to the conception and design of the research; FCD, SS and
7
8 608 EH carried out the literature search; FCD and SS collected and analysed the data; FCD drafted the
9
10 609 manuscript and other authors revised it; DM acquired the grant to carry out this study. All authors read
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13 610 and approved the final manuscript. All authors agree to be accountable for all aspects of the work.
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27 616 study design, data collection and analysis, interpretation of the data, writing the paper and the decision
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30 617 to submit the paper for publication.
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33 **618 Data sharing statement**
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36 619 Transcripts will not be shared to protect the anonymity of the GPs. Readers who wish to gain access to
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38 620 the data can write to the corresponding author; data may be granted upon reasonable request.
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41 **621 Ethics approval and consent to participate**
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44 622 Ethics approval was obtained from the National University of Singapore, Institutional Review Board (NUS-
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46 623 IRB) before starting the study. The NUS-IRB reference code is S-19-005. A full explanation of the purpose
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48 624 and procedure of the study was provided to participants prior to obtaining their written informed consent.
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50 625 All demographic data and quotes used in this study were de-identified to maintain the anonymity of
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53 626 participants.
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56 **627 Competing interests**
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628 The authors declare that they have no competing interests.

For peer review only

Supplemental material 1. Topic guide

Section I: Introductory questions

1. To start, can you tell me more about yourself?
 - Can you share more about your professional background? Current role/roles and job scope?
 - Can you describe the organisation/s and capacities of the PCN? (prompt: composition, structure and history of the organisation/entity)
 - Can you share about your educational background (i.e. Graduate Diploma in Family Medicine, Master of Medicine in Family Medicine, the Collegiate Membership of the College, Fellowship of the College, etc.)?

Section II: Current Status of Primary Care in Singapore

2. What is your definition of primary care?
3. How does the functioning of the PCN facilitate primary care in Singapore?
4. How did the current primary care schemes such as PCN come about?
5. What do you think are the major advantages of the current primary care system with regards to the PCN? Why? (prompts: funding, ancillary services, administrative support, team-based care etc.)
6. What do you think are the major disadvantages of the current primary care system with regards to the PCN? Why?

Section III: Future of Primary Care in Singapore

7. How do you think primary care will evolve over the next few years? (*prompt: What do you think will change? What forces will drive the change?*)
8. What do you hope primary care will look like over the next 5 to 10 years?

Closing questions and remarks

9. Before we end, do you have any final thoughts to share?
10. We have come to the end of the interview. Do you have any other questions?

Checklist. COREQ Checklist

No. Item	Reported on Page #
DOMAIN 1: RESEARCH TEAM AND REFLEXIVITY	
<i>Personal characteristics</i>	
1. Interviewer/facilitator	CD and SS (CD would conduct the interview while SS took down the fieldnotes).
2. Credentials	CD and SS both hold a Master of Public Health from the National University of Singapore and have been conducting qualitative research for more than two years.
3. Occupation	CD and SS are Research Associates.
4. Gender	CD, Male and SS, Female.
5. Experience and training	CD and SS had prior qualitative training and have been conducting qualitative research for more than two years.
<i>Relationship with participants</i>	
6. Relationship established	The research team had no prior relationship with any of the participants.
7. Participant knowledge of the interviewer	The research team had no prior relationship with any of the participants.
8. Interviewer characteristics	CD and SS both hold a Master of Public Health from the National University of Singapore and have been conducting qualitative research for more than two years.
DOMAIN 2: STUDY DESIGN	
<i>Theoretical framework</i>	
9. Methodological orientation and theory	Qualitative approach using data obtained from semi-structured in-depth interviews.
<i>Participant selection</i>	
10. Sampling	Purposive and snowball sampling.
11. Method of approach	Purposive and snowball sampling.
12. Sample size	Total of 30 participants, 28 were recruited using purposive sampling while two were recruited by snowball sampling.
13. Non-participation	7 refused participation citing insufficient time to be interviewed.
<i>Setting</i>	
14. Setting of data collection	Place of participants' convenience (their office or a meeting room which is conducive).
15. Presence of non-participants	Not present.

No. Item	Reported on Page #
16. Description of sample	Participants were practising GPs enrolled in a PCN who had provided their signed informed consent prior to participating in our study.
Data collection	
17. Interview guide	The interview guide had been pilot tested with 4 GPs prior to implementations. The guide is attached as supplemental material.
18. Repeat interviews	No repeat interviews were conducted.
19. Audio/visual recording	Audio recording was performed with the participants signed agreement.
20. Field notes	Field notes were collected for every interview conducted to guide the reflexive process during our data analysis of the audio transcripts.
21. Duration	Interviews ranged from 40 to 90 minutes.
22. Data saturation	Data saturation was achieved whereby no new themes emerged from our data after multiple rounds of iterative feedback from the research team to ensure that all themes, subthemes and codes were comparable and aligned.
23. Transcripts returned	Member checking was offered to all our participants but none of the participants took up the offer to edit their transcripts.
DOMAIN 3: ANALYSIS AND FINDINGS	
Data analysis	
24. Number of data coders	CD and SS were the main coders while the rest of the research team offered iterative feedback on the themes, subthemes and codes that emerged from the data analysis process.
25. Description of the coding tree	Not available as data is summarised as themes and subthemes in the main text for clarity.
26. Derivation of themes	We employed a six-step thematic analysis protocol set forth by Braun and Clark and ensured that the protocol was followed throughout the process of deriving the themes to ensure optimal inter-rater reliability.
27. Software	QSR NVIVO version 12.
28. Participant checking	Member checking was offered to all our participants but none of the participants took up the offer to edit their transcripts.
Reporting	

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No. Item	Reported on Page #
29. Quotations presented	Pages 9 – 16
30. Data and findings consistent	Pages 9 – 16
31. Clarity of major themes	Pages 9 – 16
32. Clarity of minor themes	Pages 9 – 16

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