Original Research

The Path Analysis of Family Doctor's Gatekeeper Role in Shanghai, China: A Structural Equation Modeling (SEM) Approach

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Abstract

Studies globally have provided substantial evidence that PHC could conduct doctor-visiting behaviors, control medical expense, and improve population health. This study aimed to map how family doctor (FD) in Shanghai achieved gate-keeper goals including health management, medical expense control, and conducting ordered doctor-visiting behavior. A total of 2754 and 1995 valid questionnaires were collected in 2013 and 2016 respectively in Shanghai. The data were analyzed using structural equation modeling (SEM). Invariance analysis was also performed for 2 waves of data. We found that the coefficient of cognition on health management ($\beta_5 = 0.26$, $P < .05$) was larger than that of signing with FD ($\beta_4 = 0.06$, $P < .05$). SEM model also showed that first-contact at community health service center (CHSC) had a positive effect on health management ($\beta_6 = 0.30$, $P < .05$), and the latter also affected health management results positively ($\beta_8 = 0.39$, $P < .05$), suggesting that the path for FD was through first-contact and health management. Besides, the gate-keeper role of medical expense control was significant through the first-contact ($\beta_{10} = -0.12$, $P < .05$) mediation rather than health management ($\beta_9 = 0.03$, $P > .05$). The model fit was acceptable (RMSEA = 0.033). A "cognition-behavior-outcomes (health and medical expense)" path of FD's gate-keeper role was found. It is necessary to consolidate FD contracted services rather than reimbursement discount the latter of which is proved to be unsustainable.

Keywords

primary care, family doctor, gate-keeper, health management, medical expense

What do we already know about this topic
Family doctor achieved gate-keeper goals including health management, medical expense control, and conducting ordered doctor-visiting behaviors.

How does your research contribute to the field?
"cognition-behavior-outcomes" path was found for family doctor gatekeeper role in Shanghai of China, in which cognition had a greater effect on CHSC visiting and health management than contracting with a family doctor.

What are your research's implications towards theory, practice, or policy?
The path coefficients of SEM model varied over waves suggesting that reimbursement discount was not sustainable.

Background

Family Doctor (FD) system, a Chinese characterized mode of primary health care (PHC) had been initially established since the new round of medical reform in 2009, which was set to solve accessible and affordable problem.[1] Another significant measurement in the new reform was universal coverage.[2] Five years later, the central government launched another significant document, in which FD was set to be a key strategy to achieve an ordered medical treatment system, called hierarchical diagnosis treatment system. This system was based on the PHC system, in which FD attracted residents to first-visit community health service center (CHSC) and referred those severe patients to specialists in tertiary hospitals.[3] Almost ten

years later, FD system was set to be a key target to achieve "health for all" in the Healthy China 2030, in which health management was advocated and FD was respected as the main role to achieve health management for all.[4] Through the progress of PHC in China, we could capture the changes of policy goal from expense control, ordered visiting, to health for all. Indeed, World Health Organization has promoted PHC in early 1970s in Almaty Declaration.[5]

Studies globally have provided substantial evidence that PHC could conduct doctor-visiting behaviors,[6] control medical expense,[7] and improve population health.[8] However, we lack a whole picture to show how we achieve those targets, and what the relationships are among those targets. Existing studies have provided evidence to contribute to this picture. Firstly, J Huang performed a longitudinal analysis based on 2 waves of survey and found that awareness of FD services was significant predictor of contracting with a FD, suggesting cognition was positively correlated with contraction behaviors of residents.[3] Secondly, their follow-up study focused on the effect of FD-contracted services and found that contracted residents were performed better in following an ordered doctor visiting behavior (first-contact CHSCs and referral to specialists via CHSCs), and performed better in health management behavior as well. Their study even suggested that contracted with a FD might have a positive effect on the health outcomes for diabetes and hypertension patients, but it was unclear for the work mechanism and paths.[9] Thirdly, Huang et al[10] further revealed that contracted residents were more likely to join non-communicable disease (NCD) focus group, which had a positive effect on self-management (including improved health knowledge, greater health awareness, more frequent engagement in health behavior, and, most importantly, greater practice of self-monitoring), and a positive effect on NCD control results. Current studies also suggested that FD contracted services could improve health by promoting health management behaviors including NCD management, health examination and exercise, though causal analysis was not performed.[11-13] Fourthly, current studies compared resources used by PHC practitioners and specialists, and found that patients of PHC providers have lower levels of use, such as fewer diagnostic tests and procedures, and lower costs of care.[14-16] For example, Maeseneer et al[17] examined the effect of continuing FD visiting behavior on total medical expense, and they found that provider continuity with a FD was one of the most important explanatory variables related to the total health care cost, providing evidence that first-contact and continually visit FD could control medical expense. Lastly, current studies consistently provided evidence suggesting that PHC could improve health outcomes and control medical cost at the same time. For example, international comparisons between industrialized countries suggested that the populations of countries with higher ratings of "primary care orientation" experienced better health outcomes and incurred lower health care costs than the populations of countries with lower degrees of PHC orientation.[18,19]

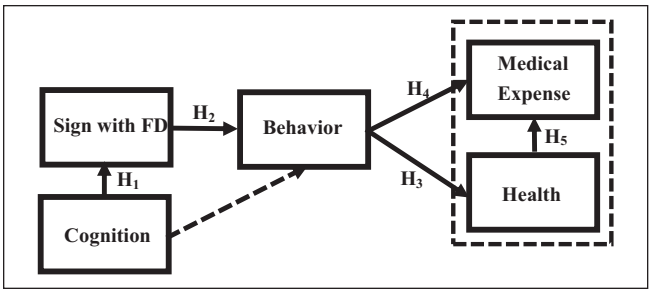

Figure 1. Theoretical model.

Following the current studies, we developed a theoretical model revealing the whole picture of how PHC achieved the gate-keeper role of health and medical expense management (see Figure 1). There are mainly 5 hypotheses based on previous studies: (1) Cognition is positively correlated with contraction behavior of residents; (2) contracted residents behave better in both doctor-visiting behavior and health managing behavior; (3) behave better in health management results; (4) and medical expense control; (5) better health could save medical expense. Besides, we supposed that there might be a

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positive relationship between cognition and behavior though existing studies did not provide direct evidence. Thus, our study aimed to integrate all these assumed factors in a coherent model that would reveal how primary care play the role in health and medical expense management.

Methods

Sampling

A longitudinal data was collected in 2013 and 2016 by questionnaire survey. The multi-stage random cluster sampling was performed to obtain 3040 individuals: in the first stage, we selected 4 neighborhood committees from each sub-street by probability-proportional-to-size sampling, 2 communities were extracted from each neighborhood committee using simple random sampling in the second stage, 38 households were selected from each community in the third stage, and we picked up 1 resident aged at least 18 years old as the ultimate participant via random drawing method of Kish table finally. A total of 2754 valid questionnaires were collected in the first wave in 2013, and the second we tracked 1995 valid individuals (72.44%) in 2016.

Measures

Cognition of FD and CHSC was measured by 3 items, including awareness the difference between CHSC and large hospitals, awareness of contact phone of the community FD, and awareness of FD contracted services. Behavior was categorized into 2 variables, that is, CHSC visiting behavior and health management behavior. The first 1 was measured by 6 items, including first-contact at CHSC preference, referral preference, referral back to CHSC, "1+1+1" group treatment, NCD visit at CHSC preference, and appointment preference before visiting CHSC. The latter was measured by 5 items, including NCD management by CHSC, self-management, NCD prevention and control services by CHSC, exercise regularly, and health examination. All items were measured on a five-point Likert scale from strongly disagree (1) to strongly agree (5). Besides, sign with FD was measured by 1 item, "have you signed with a FD? (1=yes, 0=no)," medical expense was measured by 1 item, "How much did you spent last year on medical treatment?," and NCD management was measured by 1 item "How do you score your health management result? (5=excellent, 4=good, 3=fair, 2=poor, 1=very poor)."

Exploratory factor analysis (EFA) was performed and showed that 2 factors, 2 factors and 3 factors were extracted respectively for cognition, CHSC visiting and health management by principle components method (Figure 1). Then, confirmatory factor analysis was performed and showed that those structure model could be ideally supported by the investigation data.

Data analysis

We performed the measurement model first, and we deleted some observed variables whose factor loadings were below 0.45 suggested by Bentler and Wu.[20] We assured that all latent variables had at least 2 measurement variables, according to Kenny.[21] Reliability and Validity were then performed to make sure the item reliability and the convergent validity for each construct and the discriminant validity among constructs. Then the final SEM Model was completed which combined measurement model and construct model. We used indicators of chi-square test, GFI, AGFI, NFI, IFI, TLI, CFI, Standardized RMR, and RMSEA to examine the goodness of model fit. And invariance of multi-group confirmative factor analysis and multi-group structural equation model were also performed for 2 waves of data comparison. SPSS Amos was used for SEM in the dataset. All parameters were estimated using maximum likelihood.

Results

Data Description

Though we have 2 waves of data, the characteristics kept in stable. Thus, we pooled the data to describe the sample characteristics. Among the respondents, the average age was 55.13, 61.10% were females, 76.17% got married, 28.57% had a bachelor's degree, 95.82% had a Shanghai Hukou (household registration), and 93.56% were covered in social medical insurance schemes (Table 1).

Reliability and Validity

Composite reliability (CR), and average variance extracted (AVE) were used to assess convergent validity.[22] The CR values was around 0.60 as we used self-created items to construct latent variable, and values of AVE were greater than 0.40, which were not that reliable and convergent compared with early developed and repeatedly practice scales but also acceptable.[23] The discriminant validity showed that correlations among constructs were all below the square root of AVE for all construct suggesting a well discriminant validity. Thus, convergent validity and discriminant validity were supported (Tables 2 and 3).

Model Fit

After measurement model reliability and validity test, we constructed the structural model. The fit indices of the research model were calculated as GFI=0.993, AGFI=0.986, NFI=0.976, IFI=0980, TLI=0.966, CFI=0.980, SRMR=0.024 and RMSEA=0.033, which were all satisfied with experience value standard, suggesting this structural

model achieved an acceptable level, suggesting that this model could be supported by the total sample. The X^2/df was 6.314, which was a bit larger than 5.0, however, Iacobucci[24] suggested not to pay attention to X^2/df index too much (see Table 4).

Table 1. General Characteristics of the Sample.

Variable	Overall mean or N (SD or %)
Age	55.13 (±17.82)
Gender	
Male	1844 (38.90%)
Female	2896 (61.10%)
Marriage	
Single	531 (11.22%)
Married	3605 (76.17%)
Others	597 (12.61%)
Education	
Primary or below	501 (10.60%)
Middle school	1244 (26.31%)
High school	1632 (34.52%)
Bachelor's degree or above	1351 (28.57%)
Household registration	
Shanghai	4542 (95.82%)
Other provinces	198 (4.18%)
Social medical insurance	
Yes	4443 (93.56%)
No	306 (6.44%)

SEM Analysis

All factor loading parameters were larger than 0.45 and significant, and all error terms (1-SMC) were also significant as well. In the structural path model, we found cognition had a significant positive effect on sign with FD behavior ($\beta_1 = 0.67$, $P < .05$). Sign with FD had a positive effect on CHSC visiting ($\beta_2 = 0.16$, $P < .05$) while the cognition had the same effect ($\beta_3 = 0.16$). The effect of cognition on health management behavior was larger than that of sign with FD, the former standard regression weight of which was 0.26 ($P < .01$) while the latter was only 0.06 ($P = .02$). Finally, according with our hypothesis, we found CHSC visiting had a negative effect on medical expense ($\beta_4 = -0.12$, $P < .05$) suggesting the gate-keeper role of medical controlling was achieved to some degree. We further observed the mediator of those results and found CHSC visiting had a significantly positive effect on health management ($\beta_6 = 0.30$, $P < .05$) which was consistent with our research hypothesis, however, the effect of health management on medical expense was not significant ($\beta_9 = 0.03$, $P > .05$). An inspirational finding showed that health management by FD had a positive effect on the management result ($\beta_8 = 0.39$, $P < .05$), but

Table 2. Reliability and Convergent Validity.

Construct	Items	Factor loading	CR	AVE
Cognition	FD phones	0.668	0.596	0.425
	FD contracted services	0.635		
CHSC visiting	First-contact	0.436	0.578	0.428
	NCD visit	0.816		
Health management	NCD management	0.764	0.674	0.415
	Self-management	0.494		
	Prevention	0.646		

Table 3. Discriminant Validity.

Variables	AVE	Cognition	CHSC visiting	Health management
Cognition	0.425	0.652		
CHSC visiting	0.428	0.266	0.654	
Health management	0.415	0.176	0.245	0.646

Table 4. Model Fit Indexes.

Model	X^2/df	GFI	AGFI	NFI	IFI	TLI	CFI	Standardized RMR	RMSEA
Experience value	2.0-5.0	>0.90	>0.90	>0.90	>0.90	>0.90	>0.90	<0.05	<0.08
Model R_T	6.314	0.993	0.986	0.976	0.980	0.966	0.980	0.024	0.033

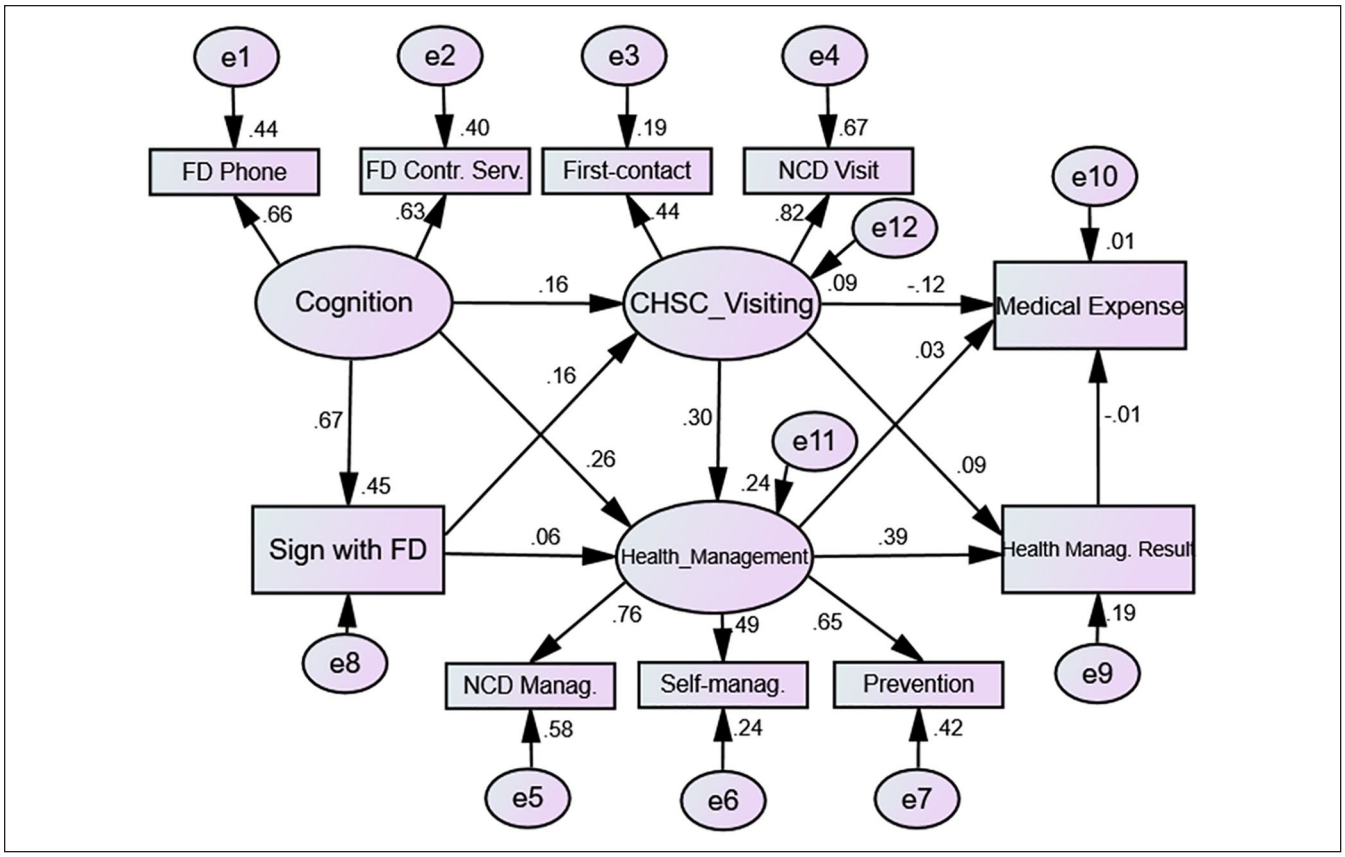

Figure 2. The SEM model of FD gate-keeper role path.

the effect of health management results on medical expense was also not significant ($\beta_{11} = -0.01$, $P > .05$). (see Figure 2)

Invariance Analysis

We compared 2 waves of survey data with the same SEM model, and found the measurement weights seemed consistent except for the effect of sign with FD on health management, of CHSC visiting on health management, and of health management on medical expense (Table 5). The path loadings were not significant in 2016 anymore. And we further performed 6 models to conduct the invariance analysis. The Model fit indexes were all acceptable (Table 6), however, the significant *P*-value of multigroup invariance suggested that the measurement weights, the structural weights, the error terms, the variance and covariance were not invariant for 2 SEM models.

Discussion

China implemented FD system since 2009, a Chinese mode of PHC, and ambitious goals were set by the government, that is, to conduct ordered doctor-visiting behaviors, to achieve health for all by health management, and to control medical expense. Ten years have passed, it is still unclear whether FD has achieved these goals and how. We collected data since 2013 in Shanghai, the pilot city to practice FD in China, and performed SEM to test our research question in the conceptual model.

We found cognition was a significant predictor of FD-contraction behavior which also affected residents' doctor visiting behavior and health management behavior significantly. Previous studies provided evidence that cognition was the most significant predictor of signing behavior. Huang et al[9] examined the effect of cognition on signing with a FD, and found that those with high awareness of FD contract services were 21.674 times that of the low awareness ones to sign with a FD based on multivariate analysis. The effect of cognition on health behavior was also widely discussed. Kiviniemi et al[25] presented a framework and empirical evidence for complex relations between cognition in predicting health behavior, and found that interplay between affect and cognition drives health behavior. One opinion is that health education is an effective and efficient method to improve health knowledge. Zhu et al[26] provided empirical evidence that health education has overall positive effects on changing exercise behavior. The other opinion argues that education, 1 significant measure of socioeconomic status,[27] is the structural factor affecting health knowledge, cognition and behavior. Johnston et al[28] found that the mediating

Table 5. Parameter Estimates of SEM Model among 2 Wave-Samples.

Model	U-model		MWI-model		SWI-model		SCI-model		SRI-model		MRI-model	
	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016
Parameter	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.
β_1	0.667***	0.693***	0.708***	0.517***	0.711***	0.514***	0.702***	0.605***	0.701***	0.605***	0.658***	0.658***
β_2	0.182***	0.114*	0.166***	0.155***	0.153***	0.157***	0.14***	0.151***	0.136***	0.158***	0.151***	0.151***
β_3	0.199***	0.182*	0.220***	0.146**	0.224***	0.165***	0.218***	0.202***	0.21***	0.209***	0.195***	0.195***
β_4	0.111***	−0.056	0.090*	0.070	0.062**	0.081**	0.046	0.063	0.052*	0.06*	0.059*	0.059*
β_5	0.249***	0.362***	0.276***	0.268***	0.295***	0.282***	0.287***	0.337***	0.302***	0.301***	0.288***	0.288***
β_6	0.272***	0.305***	0.267***	0.324***	0.259***	0.334***	0.259***	0.327***	0.277***	0.278***	0.285***	0.285***
β_7	0.114***	0.061	0.116***	0.105***	0.117***	0.105***	0.117***	0.106***	0.108***	0.091***	0.094***	0.094***
β_8	0.346***	0.481***	0.401***	0.274***	0.398***	0.277***	0.394***	0.284***	0.392***	0.33***	0.393***	0.393***
β_9	0.08**	−0.051	0.065**	0.034**	0.07**	0.037**	0.068***	0.038**	0.062**	0.04**	0.027	0.027
β_{10}	−0.137***	−0.104***	−0.148***	−0.101***	−0.149***	−0.102***	−0.148***	−0.103***	−0.146***	−0.095***	−0.12***	−0.12***
β_{11}	0.036	−0.017	0.045*	−0.055*	0.006	0.004	0.006	0.005	0.005	0.004	−0.008	−0.008
λ_1	0.697***	0.582***	0.697***	0.562***	0.696***	0.558***	0.661***	0.629***	0.661***	0.629***	0.662***	0.662***
λ_2	0.693***	0.504***	0.64***	0.644***	0.642***	0.641***	0.576***	0.674***	0.576***	0.675***	0.625***	0.625***
λ_3	0.799***	0.696***	0.814***	0.623***	0.813***	0.629***	0.81***	0.64***	0.796***	0.7***	0.76***	0.76***
λ_4	0.642***	0.296***	0.588***	0.48***	0.586***	0.485***	0.58***	0.495***	0.544***	0.521***	0.507***	0.507***
λ_5	0.839***	0.768***	0.829***	0.768***	0.828***	0.764***	0.825***	0.766***	0.844***	0.744***	0.803***	0.803***
λ_6	0.447***	0.434***	0.45***	0.437***	0.45***	0.437***	0.448***	0.442***	0.455***	0.425***	0.442***	0.442***
λ_7	0.728***	0.556***	0.722***	0.54***	0.718***	0.543***	0.712***	0.553***	0.697***	0.606***	0.65***	0.65***
ζ1	0.555***	0.520***	0.499***	0.733***	0.494***	0.736***	0.508***	0.634***	0.509***	0.634***	0.568***	0.568***
ζ2	0.879***	0.925***	0.873***	0.931***	0.878***	0.921***	0.890***	0.899***	0.897***	0.891***	0.900***	0.900***
ζ3	0.753***	0.752***	0.744***	0.749***	0.756***	0.719***	0.776***	0.675***	0.748***	0.746***	0.752***	0.752***
ζ4	0.837***	0.743***	0.790***	0.891***	0.793***	0.887***	0.798***	0.881***	0.802***	0.859***	0.808***	0.808***
ζ5	0.982***	0.980***	0.980***	0.987***	0.981***	0.991***	0.981***	0.991***	0.982***	0.992***	0.987***	0.987***
δ1	0.514***	0.661***	0.515***	0.684***	0.516***	0.689***	0.563***	0.604***	0.563***	0.604***	0.561***	0.561***
δ2	0.519***	0.746***	0.590***	0.585***	0.588***	0.589***	0.668***	0.545***	0.668***	0.544***	0.610***	0.610***
δ3	0.800***	0.812***	0.798***	0.809***	0.798***	0.809***	0.799***	0.805***	0.793***	0.820***	0.805***	0.805***
δ4	0.296***	0.410***	0.313***	0.411***	0.314***	0.416***	0.319***	0.413***	0.288***	0.446***	0.355***	0.355***
δ5	0.362***	0.515***	0.337***	0.612***	0.339***	0.605***	0.344***	0.591***	0.366***	0.511***	0.423***	0.423***
δ6	0.587***	0.912***	0.654***	0.770***	0.657***	0.765***	0.663***	0.755***	0.704***	0.728***	0.743***	0.743***
δ7	0.470***	0.690***	0.479***	0.708***	0.485***	0.705***	0.493***	0.695***	0.514***	0.633***	0.578***	0.578***

Note. (1) *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$; (2) β_1 cognition -> sign with FD; β_2 sign with FD -> CHSC visiting; β_3 cognition -> CHSC visiting; β_4 sign with FD -> health management; β_5 cognition -> health management; β_6 CHSC visiting -> health management; β_7 CHSC visiting -> health management results; β_8 health management -> health management results; β_9 health management -> medical expense; β_{10} CHSC visiting -> medical expense; β_{11} health management results -> medical expense; λ_1 cognition -> FD phone; λ_2 cognition -> FD contracted services; λ_3 health management -> NCD management; λ_4 health management -> self-management; λ_5 CHSC visiting -> NCD visit; λ_6 CHSC visiting -> first-contact; λ_7 health management -> prevention; ζ_1 Sign with FD; ζ_2 CHSC visiting; ζ_3 health management; ζ_4 NCD management results; ζ_5 medical expense; δ_1 FD phone; δ_2 FD contracted services; δ_3 first-contact; δ_4 NCD visit; δ_5 NCD management; δ_6 self-management; δ_7 prevention.

Table 6. Multigroup Invariance Test on Model R among 2 Samples of Waves.

	Goodness of fit of SEM model of 2 waves					Multigroup invariance				
Model	X^2 (*P* value)	NFI	TLI	CFI	RMSEA	ΔX^2 (*P*-value)	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Unconstrained model	319.041 (*P*=.000)	0.959	0.942	0.965	0.032	–	–	–	–	–
Measurement weights invariance model	573.690 (*P*=.000)	0.926	0.904	0.933	0.041	254.649 (*P*=.000)	0.033	0.033	0.037	0.038
Structural weights invariance model	588.901 (*P*=.000)	0.924	0.911	0.932	0.040	15.211 (*P*=.019)	0.002	0.002	−0.007	−0.007
Structural covariance invariance model	641.472 (*P*=.000)	0.917	0.904	0.925	0.041	52.571 (*P*=.000)	0.007	0.007	0.007	0.007
Structural residuals invariance model	677.650 (*P*=.000)	0.912	0.901	0.921	0.042	36.178 (*P*=.000)	0.005	0.005	0.003	0.003
Measurement residuals invariance model	1692.263 (*P*=.000)	0.781	0.768	0.789	0.064	1014.612 (*P*=.000)	0.131	0.133	0.131	0.132

effects of health behaviors accounted in the short run for around a quarter and in the long run for around a third of the entire effect of education on health. And substantial evidence showed that health behavior was the mediator between cognition and health outcomes.[29,30]

The impact of cognition on health management ($\beta_5 = 0.26$, $P < .05$) was surprisingly larger than that of signing with a FD ($\beta_4 = 0.06$, $P < .05$). On the one hand, it shows that the role of cognition is significant as discussed above, but on the other hand, it also shows that the health management role of FDs is still relatively small. There are some common problems of FD system. Health workforce shortage is one of the major obstacles to strengthen China's primary healthcare services,[31] and the lack of incentive measures affects recruitment and turnover to a large extent.[32] According to Hung et al,[33] a significant gap remained between desired and actual income for primary care workers, and benefits were generally lacking, especially for village doctors in China. On the other hand, primary care workers are facing unprecedented numbers of visits and workloads especially in Shanghai, one of the metropolitan cities where the FD policy was first implemented.[34] One study listed 32 detailed FD-contracted services provided by FD team in Shanghai, including health evaluations, health management, health record updates, extended prescriptions, long prescriptions for patients with NCD, data collection and reports, family inpatient services, physical health examinations for the elderly, and follow-up management of patients with NCD or the disabled.[35] Therefore, in the case of insufficient human resources but a sharp increase in workload, the FD team is currently focusing on the health management of people with chronic diseases. Current study provided empirical evidence that FDs had played significant role in NCD patients management, especially in self-management behavior among NCD patients.[36] Thus, there is long way to go to achieve population health management for FD system. In the setting of Shanghai, China, the effect of FD on conducting ordered-doctor-visiting behavior and health management was smaller than cognition, and we recommend calculating the number of primary health care personnel based on the number of permanent residents, and adopting policies to ensure the income and welfare of primary health care workers.

SEM model also showed that first-contact at CHSC had a positive effect on health management by FDs ($\beta_6 = 0.30$, $P < .05$), which resulting in positive health management results ($\beta_8 = 0.39$, $P < .05$), suggesting the path for FD affected health was through first-contact and health management. The data from Organization for Economic Cooperation and Development Countries showed that the primary care system was negatively associated with all-cause mortality, all-cause premature mortality, and cause-specific premature mortality.[37] Other studies conducted in other countries including developing countries also showed that primary care generally was associated with improved health outcomes.[38] And our study further mapped the path in setting of Shanghai, China, which was echoed by current studies. Recent studies conducted in Shanghai showed that contacted residents (with a FD) were more likely to participate in focus-group (self-management group conducted by a FD), and more likely to perform better in health outcomes.[10]

The gate-keeper role of medical expense control was significant in first-contact ($\beta_{10} = -0.12$, $P < .05$), rather than health management ($\beta_9 = 0.03$, $P > .05$). In order to attract more residents to first-contact CHSCs, the government implemented a series of policies including preferential payment policy. One study conducted in Zhejiang Province revealed that 1 of top 3 needs of the residents for contracted services was increasing the proportion of medical insurance reimbursements (80.06%).[39] However, such attraction oriented by reimbursement was not sustainable, which could be proved by our study. We found that the path coefficients of primary care on achieving health management, medical expense and conducting an ordered doctor visiting behavior varied over years, especially the significant path coefficients of sign with FD on health management, CHSC visiting on health management results and health management on medical expense had disappeared over years. B Starfield, L Shi, and J Macinko summarized 6 mechanisms which might account for beneficial impact of primary care on population health, including greater access to needed services, better quality of care, a greater focus on prevention, early management of health problems, the cumulative effect of the main primary care delivery characteristics, and the role of primary care in reducing unnecessary and potentially harmful specialist care,[18] suggesting we have a long way to go to consolidate FD contracted services rather than reimbursement attraction.

Limitation

There are some limitations of this study. Firstly, a theoretical model is lacked, as the path of FD's gate-keeper role has never been mapped by evidence-based model in Shanghai, China. Instead, we constructed a conceptual model based on existing studies. Secondly, some variable is not accurate in this study especially the medical expense variable. We used self-reported medical expense variable as it is difficult to get access to official dataset from the government.

Conclusion

We mapped the path of how FDs in Shanghai achieved the gate-keeper goals in Shanghai, China for the first time by SEM. The conceptual model was tested and showed a "cognition-behavior-outcomes (health and medical expense)" path of FD's gate-keeper role on health management, medical expense control and ordered doctor-visiting behavior conducting. Our study also suggested that we have a long way to go to consolidate FD contracted services rather than reimbursement discount.

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Ethics Approval and Consent to Participate

This study was approved by the Academic Ethics Committee of Shanghai Pudong Institute for Health Development (approved number is PDWSL2013-1). All participants were asked to provide written consent before participating in this survey. Data were stored and processed anonymously.

Declaration of Conflicting Interests

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