

General Practitioners' Perceptions of their Practice of Evidence-based Chronic Disease Prevention Interventions: A Quantitative Study in Shanghai, China

Feng Fan

School of Medicine, Tongji University

Chen Chen

Pengpuxincun Community Health Service Center

Delei Shen

Fenglin Community Health Service Center

Zhaohu Yu

Navy 971 Hospital

Xin Liu

School of Medicine, Shanghai Jiaotong University

Huining Zhou

School of Medicine, Shanghai Jiaotong University

Zhaoxin Wang

Shanghai Jiao Tong University

Jianwei Shi (✉ shjianwei_amy@126.com)

Children's Hospital of Shanghai

Research article

Keywords: General practitioner, evidence-based, implementation, China

Posted Date: January 23rd, 2020

DOI: <https://doi.org/10.21203/rs.2.21694/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published on July 22nd, 2020. See the published version at <https://doi.org/10.1186/s12875-020-01212-y>.

Abstract

Background

Despite increasing calls internationally for the inclusion of evidence-based decision-making (EBDM) processes in chronic disease prevention and control programming and policymaking, there is relatively sparse research assessing the current capacity of physicians and the factors influencing that capacity in China.

Method

A total of 892 physicians were collected from community healthcare centers (CHCs) in Shanghai, China. The experience-based chronic disease prevention (EBCDP) evaluation tool assessed physicians' awareness, adoption, implementation and maintenance of EBCDP based on the RE-AIM framework. Linear regression analysis was used to assess associations between each EBCDP process and personal characteristics or organizational factors.

Result

Physicians from CHCs perceived their awareness (mean=4.90, SD=1.02) and maintenance (mean=4.71, SD=1.07) of EBCDP to be relatively low. Physicians with lower titles and monthly incomes >9,000 RMB per month tended to have relatively higher scores for the awareness, adoption, and implementation of EBCDP ($P<0.05$). Those who participated in one program were less likely to adopt ($b=-0.284$, $P=0.007$), implement ($b=-0.292$, $P=0.004$), and maintain ($b=-0.225$, $P=0.025$) EBCDP than those who participated in more programs. Physicians in general practice (Western medicine) had a lower level of awareness of EBCDP than those in other departments ($P<0.0001$). Those who were from the suburbs had lower scores regarding awareness ($b=-0.150$, $P=0.047$), implementation ($b=-0.171$, $P=0.029$), and maintenance ($b=-0.237$, $P=0.002$) compared with those from urban areas. Physicians in CHCs affiliated with universities had higher scores on all four EBCDP processes compared with those in CHCs not affiliated with a university.

Conclusions

This study provides evidence quantitatively illustrating the practice of EBCDP among physicians in CHCs with various personal and organizational characteristics. More solutions should be provided to increase their awareness of EBCDP to stimulate the use of EBCDP for chronic disease prevention and other public health priorities.

Background

The efficient global prevention and control of chronic disease has gradually become a focus for scholars [1–2]. Evidence-based chronic disease prevention (EBCDP) has emerged and become popularized as a scientific tool to increase the efficiency of preventing and controlling diseases in developed countries [3]. Evidence-based tools have been accessed and utilized by health practitioners in many countries. In the US, the web portal "Cancer Control P.L.A.N.E.T.", which is designed to support the planning of cancer control initiatives, provides good approaches to planning and developing evidence-based programs and policies [4–7]. In Australia, the widely accepted public health resource, "Health-Evidence.org" has been used by public health practitioners and the public [8]. Meanwhile, the Cochrane Collaboration is the commonly used repository of evidence from systematic reviews in these countries [9, 10].

Currently, studies have begun to assess the extent and possible influencing factors of the implementation and dissemination of EBCDP in the field of chronic disease prevention and control, which is a dynamic process that involves awareness, adoption, implementation and maintenance [11]. Hannon et al. found that US cancer control practitioners had strong preferences for cancer control programs, but only 48% of the practitioners had ever used evidence-based practice resources [12]. By interviewing New York state local health department leaders, Sosnowy et al found that although most people understood the concept, relatively few had substantial expertise and experience with EBP [13]. Qualitative studies have shown that possible influencing factors are strong leadership, workforce capacity (number and skills), resources, funding and program mandates, political support, and access to data and program models suitable for community conditions [11, 13]. In recent years, studies have quantitatively revealed a possible relationship between the application of evidence-based decision making (EBDM) and the factors influencing it, primarily based on analyses in the United States, Australia, and Canada [14–15]. These studies focused on personal and organizational-level barriers and facilitators of EBCDP. Common barriers to EBCDP include the lack of time, lack of skills and formal training, lack of incentives to use evidence when making decisions, lack of funding, and an unsupportive organizational culture [16–21]. In Budd et al.'s (2018) study, they conducted research on organizational and contextual factors affecting the uptake of evidence-based chronic disease interventions in the United States and in other countries [22].

Despite increasing calls internationally for the inclusion of EBDM processes in public health programming and policymaking [13, 23–26], few studies have systematically examined dynamic EBCDP practices and the factors influencing them. In lower- and middle- income countries, little quantitative information is available about the status of and factors related to these practices in primary care health institutions. For instance, in Shanghai, there have been various intervention programs targeting the prevention of chronic diseases, including diabetes, hypertension, and stroke, as required by public health plans in Shanghai [28]. However, there have been few studies exploring the ways in which public health practitioners have implemented these programs and the possible factors influencing various processes involved in EBCDP.

By studying physicians from community healthcare centers (CHCs) in Shanghai, this study quantitatively measured the implementation and dissemination of evidence-based chronic disease prevention and control programs in Shanghai and explored possible factors influencing the various processes involved in EBCDP from the perspective of the physicians. In China, primary care health institutions bear the responsibility for chronic disease prevention and control [7]. Therefore, we focused on physicians in CHCs in this study.

Methods

Source

In this study, a multistage stratified cluster random sampling method was used to obtain a representative sample of physicians from CHCs in Shanghai. To make the sample comparable, CHCs were first collected randomly from 246 CHCs in Shanghai in 2019. Using a random number generator, 39 rural and 39 suburban centers were chosen. Then, we asked the administrations in these centers to assist with the survey. Ultimately, 36 centers in the urban area and 39 in the suburban area agreed to assist with the questionnaire for a total of 75 centers. In each center, according to the proportional distribution of physician titles in Shanghai, we then randomly selected 6 junior physicians, 6 mid-level physicians, and 1 senior physician in each CHC. Finally, 975 questionnaires were sent out; however, only 892 effective questionnaires were collected from 2019.04 to 2019.07.

Measurement

EBCDP status

In this study, to analyze the status of EBCDP practice and the factors influencing it in CHCs in China, we used Dreisinger et al.'s (2012) analytic framework [29, 30, 31]. According to this framework, decisions to adopt, accept and utilize an innovation result from the following dynamic process [11]: (1) awareness, which involves defining the actions taken to make target audiences aware of the innovative programs across sites and settings[30]; (2) adoption, which is the absolute number, proportion, and representativeness of institutions and practitioners who deliver a program; (3) implementation, which is the extent to which an innovation is completely carried out, accounting for adaptation and costs [32]; and (4) maintenance, the extent to which a program becomes institutionalized or part of routine organizational practices and policies [30].

We used a survey tool that was developed by the Prevention Research Center in St. Louis and the Missouri Foundation for Health as a means of assisting in the dissemination of prevention interventions across the state of Missouri [29]. All the items are measured on a 7-point Likert scale, with "1" to "7" representing "strongly disagree" to "strong agree". We examined the reliability and validity of this evaluation tool and modified the tool according to the test results. The coefficient of one item (the community served by the intervention considers certain disease to be a problem) on the overall scale was below 0.30. Therefore, this item was deleted, and 19 items remained. We found that the reliability and validity of the scale were acceptable. The Cronbach's α of the total scale was 0.981, and the Spearman-Brown coefficient was 0.924. In terms of the subscales, the Cronbach's α values were 0.865, 0.959, 0.965 and 0.970, and the Spearman-Brown coefficients were 0.631, 0.950, 0.957 and 0.918 for the subscales of awareness, adoption, implementation, and maintenance, respectively. All these results indicated that the scale had satisfactory applicability for physicians from CHCs in China.

Possible Influencing Factors

We included personal and organizational characteristics as the primary factors in this study. The personal factors consisted of sex, age, education, position, working years, and monthly income. Organizational factors included the number of programs for chronic disease prevention and control, department, area of the CHCs, and whether CHCs were affiliated with the university. The included departments were general medicine (Western medicine), prevention and health care, general practice of traditional Chinese medicine, and other departments like medical technology and rehabilitation departments.

Statistical analysis

All statistics were performed using SAS 9.0. Descriptive analysis was used to describe participants' characteristics and factors that possibly influenced the practice of EBCDP. T tests and ANOVA were used to analyze the differences the factors affecting various EBCDP processes. To determine the association between each EBCDP process and selected factors, we used linear regression with adjustment for possible confounding variables.

Results

Demographics of participants

Table 1 provides descriptions of the physicians from the CHCs in this study. The percentages of males (49.10%) and females (50.90%) were similar. The largest proportion of physicians were in the 31–40 age group (46.97%). The majority of the participants had a bachelor's degree (77.69%). Most of them had junior (46.63%) and mid-level (45.74%) titles and had worked for ≤ 5 years (36.38%). The largest proportion of them (43.16%) had incomes of 6,001–9,000 RMB. Regarding the number of chronic disease prevention and control programs, 33.63% had participated in 1 program, and 19.73% had taken part in ≥ 5 programs. Concerning their affiliated department, most physicians were in the general medicine (Western medicine) department (53.59%). More physicians were from CHCs located in urban areas (54.26%), and a small proportion were from CHCs affiliated with a university (21.30%).

Physicians from CHCs scored the lowers on their perception of their maintenance of EBCDP (mean = 4.71, SD = 1.07), representing slightly agree. The score for their awareness of EBCDP was also relatively low (mean = 4.90, SD = 1.02). Comparatively, the score for adoption (mean = 5.05, SD = 1.10, representing moderately agree) and implementation (mean = 5.00, SD = 1.07, representing moderately agree) were higher. The overall EBCDP score was 4.869, representing "slightly agree".

Table 1
Demographics and participants' perception of various processes involved in EBCDP (n = 892)

Variable	Classification	n	%
Sex			
	Male	438	49.10
	Female	454	50.90
Age (year)			
	≤ 30	194	21.75
	31–40	419	46.97
	41–50	240	26.91
	> 50	39	4.37
Education			
	Associate's degree or below	89	9.98
	Bachelor's degree	693	77.69
	Master's degree or more	110	12.33
Position			
	Junior	416	46.63
	Mid-level	408	45.74
	Senior	68	7.62
Working years (years)			
	≤ 5	322	36.38
	6–10	232	26.21
	11–15	153	17.29
	> 15	178	20.11
Income (RMB, ¥)			
	≤ 6,000	344	38.57
	6,001–9,000	385	43.16
	> 9,000	163	18.27
Number of chronic disease prevention and control programs			
	1	300	33.63
	2	131	14.69
	3	155	17.38
	4	130	14.57
	≥ 5	176	19.73
Department			
	General medicine (Western medicine)	478	53.59
	Prevention and health care	228	25.56
	General practice (Chinese medicine)	91	10.20
	Other departments	95	10.65
Area			
	Urban	484	54.26
	Suburb	408	45.74
Affiliated with a university			
	Yes	190	21.30

Variable	Classification	n	%
	No	702	78.70
Awareness (X ± S)		4.902	1.022
Adoption (X ± S)		5.048	1.097
Implementation (X ± S)		4.995	1.073
Maintenance (X ± S)		4.711	1.066
Overall status of EBCDP (X ± S)		4.869	0.998

Effects of the characteristics of physicians on EBCDP processes

Table 2 shows the distribution of the scores for the elements of EBCDP stratified by physician characteristics. With regard to the sex and age groups, there were no significant differences between the subgroups in their scores for various elements of EBCDP. Concerning education, physicians with an Associate's degree or below were more likely to have a relatively higher score for maintenance ($P = 0.046$). Regarding the level of physician, compared with mid-level and senior physicians, junior physicians had higher scores for awareness ($P = 0.018$), adoption ($P = 0.044$), and implementation ($P = 0.016$). Regarding the number of programs, the results showed that those who participated in one program had significantly lower scores for adoption than those who participated in more programs (mean = 4.939, $P = 0.042$). In addition, there were no significant differences between subgroups for the variables of working years and income.

The organizational factors showed stronger effects in our study. Regarding the department, physicians from general medicine (Western medicine) departments had the lowest scores for awareness (mean = 4.816, $P = 0.0001$), adoption (mean = 4.932, $P < 0.0001$), implementation (mean = 4.865, $P < 0.0001$), and maintenance (mean = 4.567, $P < 0.0001$). In terms of the location of the CHC, in contrast to those in the suburban area, physicians in the urban area had higher scores on all these four processes. For instance, the scores were 4.997 vs. 4.788 (urban VS suburb, $P = 0.002$) for awareness, 5.169 vs 4.904 ($P = 0.0003$) for adoption, 5.124 vs. 4.842 ($P < 0.0001$) for implementation, and 4.867 vs. 4.526 ($P < 0.0001$) for maintenance. Lastly, the results indicated that physicians who were in CHCs affiliated with a university had relatively higher scores for of awareness ($P = 0.020$), adoption ($P = 0.001$), implementation ($P = 0.001$), and maintenance ($P < 0.0001$) compared to those who were not affiliated with a university.

Table 2
Possible factors affecting the awareness, adoption, implementation and maintenance of EBCDP by

Variable	Classification	Awareness				Adoption				Implementation				
		X	S	F/t value	P value	X	S	F/t value	P value	X	S	F/t value	P value	X
Sex														
	Male	4.871	1.002	-0.890	0.372	5.016	1.107	-0.850	0.395	4.967	1.086	-0.760	0.445	4.693
	Female	4.932	1.041			5.079	1.088			5.022	1.061			4.729
Age (years)														
	≤ 30	5.029	1.002	1.600	0.189	5.108	1.037	0.360	0.779	5.105	1.027	1.190	0.311	4.867
	31–40	4.853	1.007			5.021	1.103			4.956	1.065			4.649
	41–50	4.865	1.049			5.033	1.133			4.950	1.104			4.670
	> 50	5.017	1.079			5.128	1.120			5.128	1.182			4.849
Education														
	Associate's degree or below	5.022	1.134	1.420	0.241	5.221	1.235	1.880	0.153	5.189	1.235	2.720	0.066	4.906
	Bachelor's degree	4.906	1.005			5.046	1.089			4.996	1.068			4.714
	Master's degree or above	4.779	1.029			4.918	1.020			4.833	0.942			4.531
Title														
	Junior	4.986	0.974	4.010	0.018	5.127	1.069	3.130	0.044	5.074	1.051	4.190	0.016	4.784
	Mid-level	4.859	1.025			5.008	1.083			4.967	1.058			4.668
	Senior	4.642	1.222			4.799	1.299			4.682	1.237			4.522
Working years (years)														
	≤ 5	4.980	0.980	1.450	0.226	5.113	1.084	0.780	0.504	5.078	1.065	1.990	0.114	4.771
	6–10	4.819	1.067			4.981	1.072			4.891	1.071			4.656
	11–15	4.924	1.013			5.059	1.117			5.064	1.064			4.753
	> 15	4.830	1.051			4.998	1.152			4.906	1.096			4.631
Income (RMB, ¥)														
	≤ 6,000	4.873	1.045	1.690	0.184	5.011	1.086	1.300	0.274	4.942	1.080	0.980	0.376	4.710
	6,001–9,000	4.871	1.038			5.029	1.136			5.006	1.092			4.689
	> 9,000	5.035	0.923			5.172	1.023			5.082	1.013			4.769
Number of chronic disease prevention and control programs														
	1	4.846	1.045	0.840	0.499	4.939	1.111	2.490	0.042	4.870	1.107	2.220	0.065	4.586
	2	4.883	0.867			5.127	1.023			5.026	0.974			4.827
	3	4.903	1.044			4.955	1.084			4.995	1.074			4.689
	4	4.887	1.081			5.079	1.099			5.018	1.109			4.737
	≥ 5	5.021	1.024			5.233	1.118			5.168	1.041			4.837
Department														

		Awareness				Adoption				Implementation				
	General medicine (Western medicine)	4.816	0.985	6.830	0.0001	4.932	1.066	7.520	<.0001	4.865	1.005	8.310	<.0001	4.567
	Prevention care	4.924	0.995			5.077	1.064			5.092	1.123			4.808
	General medicine (Traditional Chinese medicine)	4.853	1.122			5.110	1.211			4.985	1.140			4.721
	Other departments	5.326	1.074			5.502	1.103			5.427	1.097			5.192
Area														
	Rural	4.997	1.012	3.060	0.002	5.169	1.098	3.610	0.0003	5.124	1.058	3.940	<.0001	4.867
	Suburb	4.788	1.023			4.904	1.079			4.842	1.072			4.526
Affiliated with a university														
	Yes	5.054	1.093	2.330	0.020	5.281	1.131	3.320	0.001	5.220	1.096	3.270	0.001	5.022
	No	4.860	0.998			4.985	1.080			4.934	1.059			4.627

Regression analysis of EBCDP processes and personal and organizational factors

Linear regression was used to analyze the differences in the four processes of EBCDP based on various personal and organizational factors (Table 3). The result indicated that compared with the group aged ≤ 30 years, physicians aged 31–40 years were less likely to maintain EBCDP ($b=-0.218$, $P = 0.036$). There were no significant differences based on education level or years of work. Interestingly, lower level physicians had higher scores for the awareness, adoption, and implementation of EBCDP ($P < 0.05$). Compared with those who had a monthly income of 9,000 RMB per month, physicians with a monthly income $\leq 6,000$ RMB (awareness: $b=-0.255$, $P = 0.011$; adoption: $b=-0.217$, $P = 0.042$; implementation: $b=-0.229$, $P = 0.027$) and 6,001–9,000 RMB (awareness: $b=-0.247$, $P = 0.011$; adoption: $b=-0.204$, $P = 0.049$; overall: $b=-0.187$, $b = 0.045$) had lower scores. Compared with physicians who participated in more than five programs, those who participated in one program had lower scores for adoption ($b=-0.284$, $P = 0.007$), implementation ($b=-0.292$, $P = 0.004$), maintenance ($b=-0.225$, $P = 0.025$) and the overall status of EBCDP ($b=-0.244$, $P = 0.010$).

In terms of department, interestingly, we found that compared with general practice (Western medicine) physicians, those in other departments had higher scores for awareness ($b = 0.505$, $P < 0.0001$), adoption, implementation, maintenance and overall ($P < 0.0001$). Concerning the area in which the CHCs were located, compared with urban ones, physicians from the suburbs had lower scores for awareness ($b=-0.150$, $P = 0.047$), implementation ($b=-0.171$, $P = 0.029$), maintenance ($b=-0.237$, $P = 0.002$), and overall ($b=-0.192$, $P = 0.008$). Physicians in CHCs affiliated with a university had higher scores for adoption ($b=-0.241$, $P = 0.011$), implementation ($b=-0.224$, $P = 0.015$), maintenance ($b=-0.321$, $P = 0.0001$) and overall ($b=-0.257$, $P = 0.003$).

Table 3
Regression analysis of differences in various EBCDP processes

Variable	Classification		Awareness		Adoption		Implementation		Maintenance		Overall
			B	P value	B	P value	B	P value	B	P value	B
Sex	Male	Reference									
	Female		0.029	0.670	0.029	0.695	0.021	0.770	0.003	0.963	0.016
Age(years)	≤ 30	Reference									
	31–40		-0.123	0.225	-0.034	0.755	-0.114	0.278	-0.218	0.036	-0.147
	41–50		-0.051	0.695	0.051	0.714	-0.051	0.710	-0.132	0.325	-0.069
	> 50		0.185	0.376	0.223	0.320	0.205	0.347	0.103	0.630	0.162
Education	Associate's degree or below	Reference									
	Bachelor's degree		0.052	0.691	-0.006	0.965	-0.009	0.949	0.038	0.777	0.021
	Master's degree or above		-0.122	0.469	-0.180	0.320	-0.227	0.196	-0.178	0.306	-0.182
Title	Senior	Reference									
	Junior		0.466	0.026	0.545	0.015	0.468	0.031	0.321	0.134	0.418
	Middle		0.323	0.043	0.345	0.043	0.394	0.018	0.199	0.224	0.293
Working years (year)	≤ 5	Reference									
	6–10		-0.122	0.347	-0.101	0.466	-0.221	0.101	-0.091	0.493	-0.131
	11–15		0.013	0.939	0.012	0.948	-0.041	0.814	0.057	0.742	0.017
	> 15		0.031	0.869	0.088	0.665	-0.054	0.784	0.020	0.918	0.013
Income (RMB, ¥)	> 9000	Reference									
	≤ 6000		-0.255	0.011	-0.217	0.042	-0.229	0.027	-0.146	0.154	-0.196
	6001–9000		-0.247	0.011	-0.204	0.049	-0.159	0.113	-0.175	0.078	-0.187
Number of programs	≥ 5	Reference									
	1		-0.173	0.079	-0.284	0.007	-0.292	0.004	-0.225	0.025	-0.244
	2		-0.102	0.387	-0.067	0.597	-0.107	0.383	0.046	0.706	-0.036
	3		-0.081	0.473	-0.237	0.050	-0.132	0.261	-0.099	0.392	-0.127
	4		-0.103	0.387	-0.112	0.375	-0.104	0.398	-0.041	0.739	-0.078
Department	General medicine (Western medicine)	Reference									
	Preventive care		0.113	0.191	0.138	0.134	0.229	0.011	0.217	0.014	0.191
	General medicine (Traditional Chinese medicine)		0.066	0.576	0.217	0.086	0.161	0.190	0.175	0.148	0.161
	Other departments		0.505	<.0001	0.562	<.0001	0.551	<.0001	0.588	<.0001	0.561
Area	Rural	Reference									
	Suburban		-0.150	0.047	-0.148	0.066	-0.171	0.029	-0.237	0.002	-0.192

Variable	Classification		Awareness		Adoption		Implementation		Maintenance		Overall
Affiliated with a university	Yes	Reference									
	No		-0.156	0.077	-0.241	0.011	-0.224	0.015	-0.321	0.0001	-0.257

Discussion

Over the past several years, many efforts have been devoted to developing EBDM and promoting its implementation among public health practitioners in developed countries. It has been found that among the U.S. and European public health practitioners, 56%-64% of chronic disease prevention interventions currently in use are evidence-based [33, 34], while quantitative estimates of the use of EBCDP and possible factors influencing that use in lower- and middle-income countries are rare [35]. In this study, we evaluated physicians' EBCDP practice and possible personal and organizational factors affecting that practice in Shanghai, China.

The results showed physicians perceived their adoption and implementation of EBCDP to be strong. However, they had relatively lower levels of awareness and maintenance of this scientific method. This is in accordance with Shi et al.'s (2019) qualitative study in China, showing that physicians integrate evidence into chronic disease prevention practices poorly [27], as suggested by the lack of a well-developed evidence base and low levels of physician awareness, adoption, implementation, and adequate maintenance of EBCDP; similar results have been observed in other Asian and developing countries [36, 37]. For instance, Jirawattanapaisal et al compared healthcare data collection, sharing, and use in Thailand, mainland China, South Korea, Taiwan, Japan, and Malaysia, and they found that much of the data remain unused. It can be speculated that obtaining persuasive evidence and the accessibility of data are important issues to be solved in developing countries [37]. Realizing the importance of using evidence, China has gradually implemented evidence-based approaches to target some common chronic diseases, in part by making the data more available. The health department has issued a series of technical guidance manuals for the prevention and treatment of diseases in CHCs, including cardiovascular diseases, type II diabetes, chronic hepatitis B, and tumors [38–39]. Additionally, we found that the maintenance of EBCDP, which means the extent to which a program becomes institutionalized as part of routine organizational practices and policies, was not a particular problem in China, unlike in other developing and developed countries [18, 19].

Concerning the specific factors influencing EBCDP practice, we analyzed the effect of physician demographics. First, physicians who were younger and had junior titles were more likely to practice EBCDP. This may be explained by the popularity of evidence-based concepts and training courses, as this population may have had more opportunities to access EBCDP. Additionally, these groups of physicians were relatively new to the role and were usually more likely than their colleagues with longer tenure to acquire new knowledge and methods. Second, it was found that those who participated in only one program were less inclined to adopt, implement and maintain EBCDP, reflecting that the programs issued by the government can directly increase physician consciousness and practice of EBCDP. This is consistent with Hannon PA's (2010) study that showed that participating in a program can successfully change practitioners' behaviors [12].

First, with respect to organizational barriers, it was interesting that general practitioners had lower levels of awareness of EBCDP than other physicians. In China, the training of GPs is different from that of public healthcare physicians and physicians working in medical technology and rehabilitation departments. This indicated that the standardized and on-the-job training courses for GPs should include more evidence-based elements in China. Additionally, in China, it is common that although they are required to take responsibility for chronic disease prevention and control, many GPs focus more on disease treatment [40]. Second, in this study, physicians from CHCs in urban areas had greater awareness of EBCDP than those in suburban areas. This may be influenced by organizational management practices and policy factors. In Budd et al.'s study, they confirmed that the organizational culture greatly influences EBCDP [22]. Meanwhile, EBCDP practice was strongly influenced by the incentive policy of the local health government. In urban areas, there may be more investment in training programs or chronic disease prevention programs involving EBCDP [22]. Third, the results indicated that if CHCs are affiliated with a university, physicians may be able to access more evidence-based resources and have more opportunities to cooperate with researchers; thus, they have greater awareness of EBCDP. In China, especially in large cities, many CHCs have established cooperative relationships with universities with regard to academic and clinical issues. This also suggests that to increase physicians' practice of EBCDP practice, more training should be provided. In the US, EBDM training courses have been conducted in both Kansas and Mississippi to address gaps in competencies among public health practitioners. Evidence-based public health trainings have been found to be effective methods of integrating new knowledge and skills into the public health workforce [34, 41]. These can include training programs focused on specific EBDM skills or on incentives and policies that could affect the organizational culture in a workplace [42].

Limitation

There were several limitations in this study that are worth noting. First, the data collected were based on self-reports, which may result in bias due to the limitations of a participant's ability to recall and/or report the information. Survey respondents were provided with a standard definition of EBDM before answering the questionnaire, but the results should still be interpreted with caution given that they were self-reported. Second, as the sample was chosen from CHCs in Shanghai, China, the survey may not be representative of other cities. Third, since the scope of this study focused on personal and organizational-level barriers, additional research on the political and sociocultural barriers that influence EBCDP is needed.

Conclusion

The present study provides robust quantitative evidence regarding the practice of EBCDP by physicians from CHCs with various personal and organizational characteristics. Further research on individual, organizational and political and sociocultural barriers should be conducted to determine their impact on the

practice of EBCDP and to reduce the inequities that exist among physicians in CHCs who are involved in chronic disease prevention and control. This study has taken an important step in this direction and identified some potential avenues for future research.

Declarations

Ethical approval and consent to participate

Ethical approval was obtained from the Research Ethics Committee of the School of Medicine, Tongji University (ref: LL-2016-ZRKX-017). Written consent was allowed according to the Ethics committee. The data were collected anonymously from the participants, and written consents were obtained from each participant.

Availability of data and materials

The dataset supporting the conclusions of this article is available from the corresponding author on reasonable request.

Funding

The design of this study involving some previous investigation was supported by Shanghai Excellent Young Talents Project in Health System (2018YQ52). Data extraction was financially funded by the [Natural Science Foundation of China](#) (71603182, 71774116). The analysis and interpretation of the data guided by the [statisticians](#) were funded by the supported by grants from the National Key R&D Program of China (2018YFC2000700). The writing and revision, including the language improvement, were sponsored by Shanghai Pujiang Program (2019PJC072).

Consent for publication

Not applicable.

Authors' contributions

Conceived and designed the experiments: FF, ZXW and JWS. Analyzed the data: FF and CC. Contributed reagents/materials/analysis tools: CC, DLS, ZHY, XL, and HNZ. Wrote the paper: FF and JWS. All Authors have read and approved the manuscript in the "Authors' Contributions" section.

Competing interests

The authors have declared that no conflict of interest exists.

Acknowledgements

We sincerely acknowledge and appreciate the assistance of community healthcare centers in Shanghai for their help in collecting the data.

Abbreviations

EBDM: Evidence-based decision-making

CHCs: Community healthcare centers

EBCDP: Evidence-based chronic disease prevention

References

- [1] Allen P, O'Connor JC, Best LA, Lakshman M, Jacob RR, Brownson RC. Management practices to build evidence-based decision-making capacity for chronic disease prevention in Georgia: A case study. *Prev Chronic Dis*. 2018; 15:E92. doi: 10.5888/pcd15.170482.
- [2] Parks RG, Tabak RG, Allen P, Baker EA, Stamatakis KA, Poehler AR, et al. Enhancing evidence-based diabetes and chronic disease control among local health departments: A multi-phase dissemination study with a stepped-wedge cluster randomized trial component. *Implement Sci*. 2017; 18;12(1):122. doi: 10.1186/s13012-017-0650-4.
- [3] Allen P, Sequeira S, Jacob RR, Hino AA, Stamatakis KA, Harris JK, et al. Promoting state health department evidence-based cancer and chronic disease prevention: A multi-phase dissemination study with a cluster randomized trial component. *Implement Sci*. 2013; 8:141. doi: 10.1186/1748-5908-8-141.
- [4] Zaza S, Briss PA, Harris KW, Eds., *The Guide to Community Preventive Services: What Works to Promote Health?* Oxford University Press, New York, NY, USA, 2005.
- [5] Briss PA, Brownson RC, Fielding JE, Zaza S. Developing and using the guide to community preventive services: Lessons learned about evidence-based public health. *ANNU REV PUBL HEALTH*. 2004; 25:281-302.
- [6] Kerner JF, Guirguis-Blake J, Hennessy KD, Brounstein PJ, Vinson C, Schwartz RH, Myers BA, et al. Translating research into improved outcomes in comprehensive cancer control. *Cancer Causes & Control*. 2005;16 (Supplement 1):27-40.

- [7] Shi J, Shi L, Geng J, Liu R, Gong X, Bo X, et al. Status of evidence-based chronic diseases prevention implementation in Shanghai, China: A qualitative study. *Int J Health Plann Manage*. 2019 Jul; 34(3):912-925.
- [8] Health Evidence. <https://www.healthevidence.org/>. Accessed Nov 31, 2018.
- [9] Cochrane. <http://www.cochrane.org/>. Accessed Nov 31, 2018.
- [10] Cochrane Public Health Group. <http://www.ph.cochrane.org/>. Accessed Nov 31, 2018.
- [11] Jacobs JA, Clayton PF, Dove C, Funchess T, Jones E, Perveen G, et al. A survey tool for measuring evidence-based decision making capacity in public health agencies. *BMC Health Serv Res*. 2012; 12:57. doi: 10.1186/1472-6963-12-57.
- [12] Hannon PA, Fernandez ME, Williams RS, Mullen PD, Escoffery C, Kreuter MW, et al. Cancer control planners' perceptions and use of evidence-based programs. *J Public Health Manag Pract*. 2010; 16: E1-8. doi: 10.1097/PHH.0b013e3181b3a3b1.
- [13] Sosnowy CD, Weiss LJ, Maylahn CM, Pirani SJ, Katagiri NJ. Factors affecting evidence-based decision making in local health departments. *Am J Prev Med*. 2013 Dec;45(6):763-8.
- [14] Poehler AR, Parks RG, Tabak RG, Baker EA, Brownson RC. Factors facilitating or hindering use of evidence-based diabetes interventions among local health departments. *J Public Health Manag Pract*. 2019 Nov 4. doi: 10.1097/PHH.0000000000001094.
- [15] Mazzucca S, Parks RG, Tabak RG, Allen P, Dobbins M, Stamatakis KA, et al. Assessing organizational supports for evidence-based decision making in local public health departments in the United States: Development and psychometric properties of a new measure. *J Public Health Manag Pract*. 2019; 25(5):454-463.
- [16] Armstrong R, Waters E, Dobbins M, Anderson L, Moore L, Petticrew M, et al. Knowledge translation strategies to improve the use of evidence in public health decision making in local government: Intervention design and implementation plan. *Implement. Sci*. 2013;8:1–10.
- [17] Leeman J, Teal R, Jernigan J, Reed JH, Farris R, Ammerman A. What evidence and support do state-level public health practitioners need to address obesity prevention. *Am J Health Promot*. 2014;28: 189–96.
- [18] Jacobs JA, Dodson EA, Baker EA, Deshpande AD, Brownson R. Barriers to evidence-based decision making in public health: A National Survey of chronic disease practitioners. *Public Health Rep*. 2010; 125: 736-42.
- [19] Dodson EA, Baker E, Brownson R. Use of evidence-based interventions in state health departments: a qualitative assessment of barriers and solutions. *J Public Heal Manag Pr*. 2010;16: E9–15.
- [20] Armstrong R, Pettman T, Burford B, Doyle J, Waters E. Tracking and understanding the utility of Cochrane reviews for public health decision-making. *J Public Heal (United Kingdom)*. 2012;34:309-13.
- [21] Pettman TL, Armstrong R, Pollard B, Evans R, Stirrat A, Scott I, et al. Using evidence in health promotion in local government: Contextual realities and opportunities. *Heal Promot J Aust*. 2013;24: 72–5.
- [22] Budd EL, deRuyter AJ, Wang Z, Sung-Chan P, Ying X, Furtado KS, et al. A qualitative exploration of contextual factors that influence dissemination and implementation of evidence-based chronic disease prevention across four countries. *BMC Health Serv Res*. 2018;18(1):233. doi: 10.1186/s12913-018-3054-5.
- [23] Australian Health Promotion Association. Core competencies for health promotion practitioners. [<http://www.healthpromotion.org.au/images/stories/pdf/core%20competencies%20for%20hp%20practitioners.pdf>].
- [24] Health Protection Agency. 2010 annual report and accounts. [http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1274093575390].
- [25] Institute of Public Health in Ireland: IPH annual review: 2010. [<http://www.publichealth.ie/sites/default/files/documents/files/IPH%20Annual%20Review%202010.pdf>].
- [26] Public Health Agency of Canada: Strategic plan 2007-2012. [http://www.phac-aspc.gc.ca/publicat/2007/sp-ps/pdfs/PHAC_StratPlan_E_WEB.pdf].
- [27] Shi J, Jiang C, Tan D, Yu D, Lu Y, Sun P, et al. Advancing Implementation of Evidence-Based Public Health in China: An Assessment of the Current Situation and Suggestions for Developing Regions. *Biomed Res Int*. 2016;2016:2694030. doi: 10.1155/2016/2694030. Epub 2016 Aug 14.
- [28] Shanghai Health and Family Planning Commission. Three-year Action Plan for strengthening the Construction of Public Health system in Shanghai (2015-2017). <http://www.shanghai.gov.cn/nw2/nw2314/nw2319/nw12344/u26aw45010.html>. Accessed 2019-09-21.
- [29] Dreisinger ML, Boland EM, Filler CD, Baker EA, Hessel AS, Brownson RC. Contextual factors influencing readiness for dissemination of obesity prevention programs and policies. *Health Educ Res*. 2012;27(2): 292-306.
- [30] Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89(9):1922-1927.

- [31] Rogers EM. Diffusion of innovations. New York: Free Press; 2003.
- [32] Kessler RS, Purcell EP, Glasgow RE, Klesges LM, Benkeser RM, Peek CJ. What does it mean to “employ” the RE-AIM model? *Eval Health Prof.* 2013; 36:44-66. doi:10.1177/0163278712446066.
- [33] Gibbert WS, Keating SM, Jacobs JA, Dodson E, Baker E, Diem G, et al. Training the workforce in evidence-based public health: An evaluation of impact among US and international practitioners. *Prev Chronic Dis.* 2013; 10:E148. doi: 10.5888/pcd10.130120.
- [34] Dreisinger M, Leet TL, Baker EA, Gillespie KN, Haas B, Brownson RC. Improving the public health workforce: Evaluation of a training course to enhance evidence-based decision making. *J Public Heal Manag Pr.* 2008;14:138-143. doi: 10.1097/01.PHH.0000311891.73078.50.
- [35] Budd EL, Ying X, Stamatakis KA, deRuyter AJ, Wang Z, Sung P, et al. Developing a survey tool to assess implementation of evidence-based chronic disease prevention in public health settings across four countries. *Front Public Health.* 2019 Jun 11;7:152. doi: 10.3389/fpubh.2019.00152. eCollection 2019.
- [36] Lee EJ. Needs assessment for the computer-interpretable hypertension guideline at public health centers in Korea. In: Kuhn KA, Warren JR, Leong TY, eds. *Medinfo. 2007. Proceedings of the 12th World Congress on Health (Medical) Informatics-Building Sustainable Health Systems.* Amsterdam: IOS Press; 2007:1455.
- [37] Jirawattanapaisal T, Kingkaew P, Lee TJ, Yang MC. Evidence-based decision-making in Asia-Pacific with rapidly changing health-care systems: Thailand, South Korea, and Taiwan. *Value Health.* 2009;12(Suppl 3):S4-S11. doi:10.1111/j.1524-4733.2009.00620.x.
- [38] Wang ZX, Jiang CH, Liu R, Zhang LJ, Zhang Y, Chen MX, et al. Analysis of necessity about evidence-based concepts into chronic disease prevention and control. *Chinese Medicine (Chinese Journal).* 2013, 16(8A): 2627-2629.
- [39] Liang Y. Study on the Government's Responsibility in the management of the chronic non-communicable diseases in China. Shandong University, 2014.
- [40] Jiang B. Enlightenment and suggestion on epidemic characteristics and prevention and treatment of stroke in China for general medical service. *Chinese General Medicine (Chinese Journal).* 2019; 30:3653-3661.
- [41] Franks AL, Brownson RC, Bryant C, Brown KM, Hooker SP, Pluto DM, et al. Contributions to updating the public health workforce through training. *Prev Chronic Dis* 2005, 2(2):A26.
- [42] Aarons G, Horowitz J, Dlugosz L, Ehrhart M. The role of organizational processes in dissemination and implementation research. In *Dissemination and Implementation Research in Health: Translating Science to Practice.* Edited by: Brownson RC, Colditz GA, Proctor EK. New York: Oxford University Press; 2012.