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Measuring the preference toward patient-centered communication among physicians and patients in clinical settings with the Chinese-revised Patient–Practitioner Orientation Scale

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Abstract

Objectives: The study aimed to explore the preference toward patient-centered communication among physicians and patients with the Chinese-revised Patient–Practitioner Orientation Scale (CR-PPOS).

Setting: Participants were recruited in clinical settings from eight medical institutes, including four community hospitals and four general hospitals, in Shanghai, China.

Design and participants: Questionnaire-based surveys were conducted among a total of 1018 physicians and patients, in two successive stages in the year of 2015.

Outcome measurements: Analysis mainly probed (1) psychological properties of the original Chinese-translated PPOS version versus the CR-PPOS (2) participants' scores on the CR-PPOS and the influential factors.

Results: Compared with the original PPOS, the 11-item CR-PPOS obtained better reliability and validity indicators. Furthermore, it also showed good discriminative power. Physicians and patients scored significantly differently on each subscale, as well as the total scale of CR-PPOS. Scores of patients were more likely to be influenced by various factors, such as age and education, compared with those of physicians.

Conclusions: The CR-PPOS is a better instrument in the Chinese context than the original translated version. The congruence and divergence in the extent to which patient-centered communication was preferred among Chinese physicians and patients should be noted. Adapting physicians' communication strategy to patients' preference based on their personal features can be an approach to improve clinical efficiency.

Keywords: Patient-centered communication, Clinical setting, Chinese, Scale

Article summary: Strengths and limitations of this study

- Psychometric properties of PPOS were systematically assessed in Chinese context, with common indicators of reliability, validity and discriminative power.
- Preference toward patient-centered communication among Chinese physicians was simultaneously measured with that of patients using adapted PPOS, which made it possible to make comparisons and find differences between both sides.
- The association between broader variables and participants' preference toward patient-centered communication was explored, such as burnout for physicians and health literacy for patients.
- Due to feasibility, the participants in this study were only drawn from eight clinical units in Shanghai, and sampling was not exact random, which both brought the issue on selection bias and limited generalization validity.
- It might be problematic to directly compare scores measured by CR-PPOS and scores measured by other versions of PPOS because we developed the CR-PPOS from the original PPOS mainly based on statistical approach, without any supplementary items being added to keep the amount of items constant.

Introduction

Since its first introduction by Balint in 1969[1], patient-centeredness has been one of the most frequently discussed principles in medical practices over the past few decades[2]. It has also been regarded as one of the six core components of high-quality medical care[3]. Enhancing patient-centeredness is eagerly highlighted to improve the quality of health care delivery[4].

Without a uniform definition[5], various conceptual models were raised to illustrate

patient-centeredness[6,7]. Epstein[8]further determined that patient-centeredness could be fulfilled from three levels: interpersonal behaviors, technical intervention, and health system innovation. As a key element in interpersonal behaviors between physicians and patients, patient-centered communication has been a highly recommended model, enabling practitioners to offer care that is concordant with the patient's values, needs, and preferences, and that allows patients to become actively involved in decision making regarding their health[9,10]. Patient-centered communication contributes to building a partnership between physicians and patients, instead of the traditional paternalism[11]. Patient-centered communication has also been reported to improve a variety of patients' clinical outcomes in diverse settings, and enhance their adherence to prescription medications and other types of treatment[12,13].

However, considering the cultural and contextual differences, patient-centered communication may not be universally applicable despite the benefits it offers[14].Thus it is suggested that physicians learn patients' communication preference and then incorporate identified communication strategies into their communication style[15]. However, available instruments that aim to measure the preference toward patient-centered communication remain sparse. Originally developed by Edward Krupat[16], the Patient–Practitioner Orientation Scale (PPOS), embracing the four elements model of patient-centeredness, has been translated into various languages and has gained worldwide popularity in measuring the preference toward patient-centered communication among physicians, medical students, and patients [17-20].

In China, accounts of patient–physician communication have been hotspots in the new healthcare era, as patient-centeredness is increasingly highlighted in clinical practice. Ting[21] conducted a survey to detect patients' preferences toward patient-centered communication in a hospital in the southwest part of China, which was the only known attempt to apply PPOS in China. Despite the innovativeness, there were several limitations within this study. For example, as an instrument introduced from

abroad, the psychometric properties, such as reliability and validity, of PPOS in the Chinese context have not been well tested. Secondly, the preference toward conducting patient-centered communication among physicians has not yet been explored. Finally, for a country with vast territory and a population in the billions, a single survey conducted in a specific medical unit may not be adequately representative. Thus it is not clear yet how this instrument works in other regions and surroundings.

We conducted this research in Shanghai, which was among the most developed cities in China and possessed abundant high-quality medical resources, aiming to adapt PPOS to Chinese (Mandarin) context and assess its psychometric properties systematically. Furthermore, patients' as well as physicians' preferences toward patient-centered communication were measured using the Chinese-revised PPOS (CR-PPOS). In addition, factors that might exert influence on physicians' and patients' preferences toward patient-centered communication were further explored.

Methods

Description of the instrument

Currently, PPOS has evolved to a version containing 18 items in two dimensions, Caring and Sharing[22]. The nine-item Caring subscale reflects the degree to which physicians care about providing warmth and emotional support and regard patient as a whole person. The nine-item Sharing subscale reflects the degree to which physicians should share decision making information and power with the patients [16]. A higher PPOS total score as well as subscale scores indicates a higher preference toward patient-centered style in clinical communication. Conversely, a low Caring score indicates a tendency toward disease-centered style, while a low Sharing score indicates a tendency toward doctor-centered style.

Translation and cultural adaption

Obtaining the permission to translate and develop PPOS in the Chinese context by the original author, scholars with academic backgrounds in medicine, public health, journalism, and communication, Chinese and English languages, respectively, were invited to translate the PPOS to Chinese(Mandarin).Afterward, the bilingual PPOS versions were sent separately to another five advanced health practitioners for further suggestions and modifications. The Chinese PPOS(C-PPOS) was then back-translated into English and sent back to the original author for confirmation.

For this C-PPOS, we strove to fit every item to its original version, except for item 17 due to noticeable culture difference. Thus, it was replaced by "A friendly manner is a major ingredient in the doctor's treatment of the patients", according to the results of a prior study in Nepal[23]. Additionally, item 2 was back-translated as "Compared with centering on individual patients in the past, focusing on the comprehensive quality of medical services nowadays is more valuable for propelling medical development", which differed from the original item "Although health care is less personal these days, this is a small price to pay for medical advances" in expression but was mostly consistent in meaning. Finally, 12 physicians and 18 patients were enrolled in cognitive interviews to further enhance the comprehensibility of the scale in the Chinese cultural context.

Pilot study design

A pilot study was conducted in eight clinical settings in Shanghai, including four community hospitals and four general hospitals. As a minimum sample size of 5 to 10 times the number of scale items for exploratory factor analysis (EFA) and 10 to 20 times for confirmative factor analysis[24]was required, as well as taking the probable invalid responses into consideration, we included 400 interviewees. It was assumed that physicians should comprise at least 20% of the total sample. Physicians and patients were randomly recruited from the outpatient department of each hospital. Every eligible participant was requested to complete an anonymous short questionnaire containing the C-PPOS. Retrieved questionnaires were carefully

checked, and those with bad quality were removed from the dataset, including those with missing item scores or with the same item score throughout the entire scale.

Psychometric properties assessment

In this study, we assessed the psychometric properties via reliability, validity, and discriminative power tests, based on which the C-PPOS was revised to the CR-PPOS.

Internal consistency and test–retest reliability are the most widely tested indicators for reliability, thus we performed both in this study. In the test–retest survey, 60 participants completed the C-PPOS again after 2 to 4 weeks.

Hereby we performed EFA and confirmatory factor analysis (CFA) to assess construct validity. In addition, content validity was assessed by testing the correlation of the score of each item and the score of the subscale the item belonged to, as well as the score of the total scale.

Discriminative power reflects the extent to which an item can distinguish different levels of target variables. We tested discriminative power by comparing the critical value (CR) of each item.

Formal study design

The formal survey was launched 1 month later, in the same settings where the pilot study was conducted. As a cross-sectional study, the sample size was calculated to be 664 according to the formula provided by Raosoft, Inc.[25], with a total population size of 24,000,000 (the estimated population of Shanghai) and a confidence level of 99%. It was then expanded to 750 to guarantee adequate valid responses. Physician and patient participants were randomly recruited in a similar way as that in the pilot study. After confirming the informed consent, participants were asked to complete a questionnaire containing CR-PPOS, general information (gender, age, education, marriage status, socioeconomic status, self-reported health condition, etc.), and some other well-validated instruments, such as the Patient Confidence in Communication

Scale (PCCS)[26], Hospital Anxiety and Depression Scale (HADS), the Rapid Health Literacy Scale[27] for patients, and the Maslach Burnout Inventory-General Survey (MBI-GS) and Medical Communication Competence Scale (MCCS)[28] for physicians.

Statistical analysis

We utilized Epidata 3.1 and Excel 2007 software for dataset establishment. IBM SPSS 20.0 and AMOS 21.0 were employed to perform data cleaning and analysis.

Cronbach's α coefficient was tested as the indicator of internal consistency and reliability. Normally, a Cronbach's α of no less than 0.6 is deemed acceptable for an instrument with a relatively small number of items (i.e. no more than 6)[29]. Test–retest reliability was assessed as the indicator of interclass correlation coefficient (ICC). Test–retest reliability was considered poor if the ICC value was lower than 0.4 and/or the correlation was not statistically significant ($P<0.05$).

For EFA, data were subjected to a principal component analysis with extraction of eigenvalues (greater than 1) for subscales (EFA round 1) and fixed two factors for the total scale (EFA round 2). In EFA round 1, items were removed if a) their factor loadings under either dimension were greater than 0.4, b) their factor loadings under any two dimensions were close (the absolute value difference was less than 0.1), and c) they were the only item under one dimension[30].

CFA was performed by maximum likelihood analysis to verify the main adjustment indices of the model, including chi-squared/degree of freedom(χ^2/df), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed-fit index (NFI), incremental fit index (IFI), and comparative fit index (CFI). The recommended χ^2/df ratio is 1 to 3, and RMSEA value <0.08 and GFI, AGFI, NNFI, IFI, and CFI >0.9 suggest ideal model fit[31].

Respondents with the highest (top 27%) and lowest (bottom 27%) total scale scores

were divided into two groups, after which their CR values of each item were compared to determine their discriminative power[32]. The items without significantly distinct CRs were eliminated as they lacked competency to distinguish high scores and low scores.

For single factor analysis, we performed the t-test and analysis of variance (ANOVA) for parameter testing, and the Mann–Whitney U test for non-parameter testing. Multiple linear regression (MLR) was utilized in processing multifactor analysis. Statistical significance was set at $P<0.05$.

Ethnical consideration

This study obtained approval from the Institutional Review Board (IRB) of the Fudan University School of Public Health. Informed consent was provided by all the participants before the survey.

Results

Pilot study

Participants

Three hundred and sixty-two eligible questionnaires were included in the pilot study from 395 participants, with a valid response rate of 91.65%. The mean age of the respondents was 47.41 ± 18.42, and approximately half of them had graduated from college (Table 1).

Table 1

Demographic characteristics of the pilot study sample (n=362)

Demographic characteristics	Physicians (n=71)	Patient (n=291)
Mean age (range)	39.39 (24–64)	49.43 (20–96)
Gender, n (%)		
Male	33	123 (42.3%)

	38	165 (56.6%)
Education, n (%)		
College and above	67 (94.4%)	112 (38.5%)
Senior school	4 (5.6%)	83 (28.5%)
Junior school	0	72 (24.7%)
Primary school and below	0	12 (4.1%)
Setting, n (%)		
Community hospital	42 (59.2%)	130 (44.7%)
General hospital	29 (40.8%)	161 (55.3%)

Confirmatory factor analysis of the C-PPOS

The CFA of the C-PPOS indicated poor model fit (Table 2), which called for further revision.

Table 2

Goodness-of-fit indices of the CFA of the CR-PPOS and the original C-PPOS

Model fit indicator	Two factors (18 items)	Two factors (11 items)	Reference value
χ^2/df	5.04	1.85	<3
P-value	<0.001	<0.001	>0.05
RMSEA	0.11	0.06	<0.08
GFI	0.76	0.94	>0.90
AGFI	0.70	0.90	>0.90
NFI	0.52	0.81	>0.90
IFI	0.58	0.90	>0.90
CFI	0.57	0.90	>0.90

Revision of the C-PPOS

The Cronbach's α of each subscale of C-PPOS was tested as the first step of item reduction. The Cronbach's α of C-PPOS was 0.668, with a Caring subscale score of 0.493 and a Sharing subscale of 0.575, showing poor internal consistent reliability. Hence, items were eliminated in a stepwise manner for each subscale separately until elimination of another item would lead to a decrease in the Cronbach's α of its corresponding dimension. Finally, five out of nine items were retained in the Caring subscale, and eight out of nine items (except for C-PPOS9) were retained in the Sharing subscale.

In EFA, the Bartlett's sphericity test reported a Chi-square value of 112.364 ($p<0.001$) for the Caring subscale and 146.846 ($p<0.001$) for the Sharing subscale. The Kaiser–Meyer–Olkin (KMO) indices for the two subscales were 0.727 and 0.694, respectively. For EFA round 1, all five of the retained items of the Caring subscale were under one principal component, which had an eigenvalue greater than 1 (2.197), explaining 43.949% of the total variance. In the Sharing subscale, C-PPOS4 and C-PPOS10 were removed as they met exclusion criteria. Afterward, EFA was performed again on the retained six items of the Sharing subscale. This time all six items loaded under one principal component (eigenvalue=2.247), which explained 37.448% of the total variance. Subsequently, a fixed two-factor EFA was performed to verify the construct of the merged 11-item scale. The result indicated that the five items of the Caring subscale and the six items of the Sharing subscale were well separated, explaining 41.67% of the total variance.

CFA was performed with the 11-item revised C-PPOS (CR-PPOS), according to the prior model, indicating a more acceptable and greatly improved model fit compared with the original scale (Table 2).

Reliability of the CR-PPOS

The Cronbach's α of the entire CR-PPOS was 0.735, with 0.709 in the Caring subscale and 0.644 in the Sharing subscale. Furthermore, the scores of the two

subscales were significantly correlated to the total scale, with Spearman coefficients of 0.744 (Caring) and 0.840 (Sharing), which were higher than that of these two subscales (0.312). The ICC was 0.787 for the CR-PPOS, 0.911 for the Caring subscale, and 0.602 for the Sharing subscale. The ICC for the 11 single items ranged from 0.481 to 0.812. The correlations were all statistically significant ($p<0.001$), indicating satisfactory test–retest reliability.

Validity of the CR-PPOS

The construct validity was well verified through EFA and CFA (see above). As for content validity, the 11 items' scores and their corresponding subscales' scores were all significantly correlated ($p<0.01$), with Spearman coefficients ranging from 0.452 to 0.717.

Discriminative power of the CR-PPOS

The CR values of the 11 items were all less than 0.01, reaching statistically significant levels. Thus, the items retained in the CR-PPOS had good discriminative power.

Formal study

Participants

Six hundred and fifty-six eligible questionnaires out of 792 participants were retrieved in this stage, with a valid response rate of 82.83%. One hundred and sixteen physicians and 540 patients were included. Respondents' demographic information is partly shown in Tables 3 and 4.

Table 3

Physicians' demographic characteristics (partly) and CR-PPOS scores

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total

* p<0.05

Table 4 Patients' demographic characteristics (partly) and CR-PPOS scores

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total
Gender				
Male	43 (37.1%)	4.75±0.95	2.81±0.79	3.62±0.62
Female	73 (62.9%)	4.68±0.74	3.01±0.77	3.68±0.57
P value		0.666	0.166	0.648
Age (Group)				
–35	50 (43.1%)	4.78±0.96	2.89±0.71	3.69±0.61
–50	52 (44.8%)	4.69±0.63	2.92±0.85	3.63±0.52
51–	10 (8.7%)	4.74±0.36	3.33±0.66	3.90±0.41
P value		0.827	0.247	0.363
Education				
Senior school or below	2 (1.7%)	4.20±0.00	3.00±0.17	3.41±0.14
College	71 (61.2%)	4.69±0.87	3.04±0.76	3.69±0.64
Postgraduate	42 (36.2%)	4.78±0.75	2.75±0.80	3.61±0.51
P value		0.572	0.161	0.672
Marriage status				
Married	89 (76.7%)	4.69±0.76	2.91±0.77	3.64±0.53
Unmarried	26 (22.4%)	4.88±0.82	3.08±0.74	3.82±0.61
P value		0.270	0.318	0.149

Gender				
Male	195 (36.1%)	4.11±0.95	3.17±0.74	3.49±0.71
Female	330 (61.1%)	4.07±0.96	3.09±0.77	3.44±0.69
P value		0.574	0.295	0.468
Age (Group)				
–35	175 (32.4%)	4.24±0.91	3.32±0.68	3.59±0.67
–50	102 (18.9%)	4.00±1.00	3.02±0.83	3.37±0.75
–65	129 (23.9%)	3.93±1.02	3.00±0.76	3.35±0.72
66–	107 (19.8%)	4.14±0.86	3.12±0.77	3.50±0.64
P value		0.034*	0.001*	0.009*
Education				
Primary school or below	39 (7.2%)	3.93±1.00	2.97±0.81	3.29±0.78
Junior school	112 (20.7%)	3.89±0.95	2.99±0.77	3.29±0.67
Senior school	162 (30.0%)	4.06±0.95	3.12±0.71	3.46±0.69
College or above	203 (37.6%)	4.26±0.93	3.23±0.80	3.59±0.70
P value		0.007*	0.030*	0.002*
Personal income (CNY)				
<1500	23 (4.3%)	3.91±0.93	2.96±0.83	3.27±0.61
–3000	105 (19.4%)	3.83±1.02	2.96±0.83	3.23±0.77
–5000	192 (35.6%)	4.14±0.95	3.16±0.79	3.51±0.71
–10000	115 (21.3%)	4.17±0.94	3.13±0.68	3.54±0.63
10000–	70 (13.0%)	4.11±0.97	3.26±0.73	3.48±0.73

P value		0.048*	0.086	0.006*
Experience as medical staff				
Yes	27 (5.0)%	3.67±1.07	2.84±0.76	3.12±0.80
No	241 (44.6%)	4.05±1.00	3.22±0.75	3.46±0.75
P value		0.071	0.013*	0.028*

*p<0.05

Comparison of physicians' and patients' CR-PPOS scores

The physicians received an average CR-PPOS score of 3.66±0.59, and the patients' average score was significantly lower (3.46±0.70). The physicians scored higher in Caring (4.71±0.82 vs. 4.08±0.95), while the patients scored higher in Sharing (3.13±0.76 vs. 2.94±0.78). The differences were all statistically significant (p<0.05).

Demographic characteristics and CR-PPOS scores

The scores of physicians and patients with distinct demographic characteristics were compared, as partly listed in Tables 3 and 4. Both patients' age and education level were significantly associated with their scores on the Caring subscale(p<0.05), the Sharing subscale(p<0.001) and the total CR-PPOS(p<0.01). While patients' income was only significantly associated with the Caring subscale score(p<0.05) and the total CR-PPOS score(p<0.01). Besides, patients' experience as medical staff was likely to gain their scores on the Sharing subscale(p<0.05) and the total CR-PPOS(p<0.05). However, no associations of such were traced among physicians.

Physicians' burnout and CR-PPOS scores

The burnout level of physicians was measured by the MBI-GS. According to the data,

the group of "relatively severe" (scoring 3–5) and the group of "extremely severe" (scoring 5 or above) were merged as a "severe" group (scoring 3 or above), compared with the "light" group (scoring 3 or below). Physicians who reported "severe" burnout scored significantly lower in both the Caring subscale and the total scale than those reporting "light" burnout.

Physicians' medical communication competency and CR-PPOS scores

Ninety-nine percent of physicians completed the MCCS, which aimed to assess the medical communication competency of both physicians and patients. Although physicians were normally assessed by their patients using MCCS, we transformed this into a self-reported scale for physicians in this study. The results indicated that, although the scores of the four dimensions within MCCS were related, no correlation was found between the MCCS scores and the CR-PPOS scores as well as its subscales.

Patients' anxiety and depression and CR-PPOS scores

Five hundred and two patients finished the HADS, an instrument for rapidly screening anxiety and depressive symptoms among clinic physicians and patients. Patients got a mean score of 11.57 in the anxiety subscale and 11.77 in the depression subscale. Three hundred nine patients (57.2%) were determined to be anxiety-positive, and two hundred and seventy seven (51.3%) were determined as depression-positive.

As anxiety and depressive symptoms were highly comorbid, which was also proven in our study (r_s=0.520), a two-way ANOVA was performed as the first stage to explore whether an interaction effect existed. It turned out that there was no interaction effect of anxiety and depression. Anxiety was found to lead to a decrease in patients' scores on both the Caring subscale($p<0.05$) and the total CR-PPOS($p<0.05$). However, patients' scores on neither the total scale nor the subscales seemed to be influenced by their depressive symptoms.

Patients' health literacy, PCCS, and CR-PPOS scores

Using the three-item Rapid Health Literacy Scale, no statistical difference was found in the total CR-PPOS score and the two subscale scores between the poor literacy group and the adequate literacy group, while patients' health literacy scores showed a significantly positive correlation with their Sharing subscale scores (r_s=0.112). Similarly, patients' confidence in medical communication measured by PCCS was inversely correlated with their scores on the Sharing subscale (r_s=-0.261). In the following partial correlation tests, the correlation between PCCS and the Sharing subscale score remained significant after controlling for the health literacy score, while no correlation existed between the health literacy score and the Sharing subscale score after controlling for PCCS.

Multivariable analysis

After testing the feasibility, MLR was employed to detect the factors that might exert influence on physicians' and patients' preferences toward patient-centered communication. The results showed that the total burnout level might be the influential factor for physicians in Caring and total CR-PPOS scores, and more factors impacted patients' preference toward patient-centered communication in different dimensions (Table 5).

Table 5

Variables influencing CR-PPOS scores

Dimension	Variables	B	95% CI	P
Physicians				
Caring subscale	Total burn-out	-0.417	(-0.801, -0.033)	0.034
Sharing subscale				
CR-PPOS total	Total burn-out	-0.341	(-0.611, -0.071)	0.014
Patients				

Caring subscale	Age (Group)	-0.292	(-0.499, -0.086)	0.006
	Education	0.251	(0.079, 0.423)	0.005
	Experience as medical staff	0.538	(0.046, 1.029)	0.032
Sharing subscale	Age (Group)	-0.202	(-0.361, -0.043)	0.013
	Education	0.169	(0.039, 0.299)	0.011
	Experience as medical staff	0.481	(0.109, 0.852)	0.012
	Marriage status	-0.336	(-0.666, -0.006)	0.046
	Confidence in medical communication	-0.298	(-0.451, -0.146)	<0.001
CR-PPOS total	Age (Group)	-0.242	(-0.396, -0.087)	0.001
	Education	0.222	(0.093, 0.350)	0.001
	Experience as medical staff	0.476	(0.111, 0.842)	0.011

Discussion

Although the PPOS has been widely used in various languages, only a few studies have systematically tested its psychometric property while applying it[33-35], and no related results have been reported in China yet. This study showed that neither the ICC of the overall 18-item C-PPOS nor its two subscales were above 0.7, which was comparable to the existing research but still not good enough. Deletion of items 9 and 17 improved the Cronbach's α, which is consistent with a study conducted in Sri Lanka[36]. After modifying, the two subscales of the 11-item PPOS were well separated in a fixed-factor EFA, with better indexes than prior similar studies, and the overall scale validity was reconfirmed by CFA. Taking into account the test–retest reliability and discriminative power, the 11-item CR-PPOS obtained better psychometric property than the original 18-item scale; thus it is considered to have

greater applicability in the Chinese population.

Using the 11-item CR-PPOS, physicians and patients indicated similar trends in the achieved scores. In the overall scale, they both obtained medium scores (around the median value of 3.5), and they both had relatively high Caring scores (over 4.0) and low Sharing scores (around 3.0 or below). This indicated that, although physicians and patients generally showed a medium level of patient-centeredness in clinical communication, they expressed higher preferences toward caring from a biopsychosocial perspective than shared information and involvement in decision making. Although the physicians' data is still absent in China, the 95% confidence interval of mean score of patients in this study slightly overlapped that of the prior study[21], which implied that Chinese patients might express similar preferences toward patient-centered communication, regardless of the regions they were living in. The differences between the scores of physicians and patients, however, may still prompt the gap in Chinese physicians and patients regarding their understanding and expectations in clinical communication. Comparing the data of this study with that from abroad, the majority showed a similar pattern that physicians were more patient-centered in Caring than in Sharing, but there were still two exceptions for the surveys conducted in Portugal and Australia, indicating opposite results[37,38], which may be due to the difference in physician training modes and local health systems. Thus, further research is needed to determine the reasons for such a distinction.

Preference toward patient-centered communication, as measured by the PPOS, is influenced by both personal characteristics and social environmental factors. This study made the first attempt to detect the potential influential factors of patient-centered communication among Chinese physicians. The results showed no association between PPOS scores and a series of factors, including gender, age, education level, career length, and type of setting. These results were consistent with several prior studies in other countries, except gender differences, for female physicians scored significantly higher than male colleagues in some studies [39,40]. Apart from these factors, which were frequently mentioned in the existing research,

we found that burnout level might exert impact on physicians' PPOS total score as well as their Caring subscale score, indicating that physicians with a higher total burnout level were generally less likely to be patient-centered in clinical communication. Although we assumed that poor communication ability may relate to a lower preference for patient-centeredness in communication, no link was found between physicians' medical communication competency measured by MCCS and their PPOS scores in this study.

Ting[20] reported that age and education mainly influence Chinese patients' overall preference on patient-centered communication. In this study, younger and/or better-educated patients also expressed a higher preference for patient-centered communication in both the Caring and Sharing dimensions. Although some studies have reported a gender difference[33,36,41,42], it seems that in case of Chinese patients, age and education level, rather than gender, contribute to the different preferences toward patient-centered communication. Meanwhile, the type of setting and social economic status are not considered as influential factors, which is controversial[42].It was found that experience as medical staff decreased the extent to which patients wanted a patient-centered communication style. One plausible explanation is that those who had worked as medical staff had obtained a more comprehensive understanding of how things were inside the hospital than those who had not. Thus, they subconsciously lowered their expectation of a patient-centered manner in communication, which might raise demand for physicians, due to their sympathy toward the doctor groups for their daily heavy workload. Additionally, although anxiety was detected as an influential factor in single factor analysis, the final regression model showed patients' PPOS scores were irrelevant to their anxiety and depression status. There is also a need to further probe the role of patient communication confidence, as well as its seeming mediation effect on the relationship between patients' health literacy and preference for shared information and decision making.

Conclusion

The 11-item C-PPOS was developed with systematical psychometric property revision in this study. Physicians and patients were generally more likely to be patient-centered in medical communication regarding overall biopsychosocial care than shared information and decision making, but there were still significant gaps between physicians and patients on the extent to which they prefer this type of communication. Relieving of burnout would be beneficial for physicians' health, as well as for an increase in patient-centered communication. Patients with young age, high education level, and medical staff experience are inclined to be more patient-centered overall in clinical communication.

Practice implications

The CR-PPOS is a well-tested instrument that can be applied to the Chinese context to measure the preference toward patient-centered communication of physicians and patients. Physicians should learn to recognize patients' preferences and expectations in clinical communication and adapt specific communication strategies to different individuals.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: Jie Wang had financial support from the China Postdoctoral Science Foundation for the submitted work, Fan Wang has received funds from Shanghai Health and Family Planning Commission; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work."

Ethics committee approval information: The study was approved by Fudan University School of Public Health Institutional Review Board (No. IRB#2015-12-0575).

Contributors: Jie Wang granted research funding, engaged in study design and data analysis, and was the main drafter of the Introduction and Discussion sections; Runyu

Zou led study design, data collection, data analysis, and drafted the Method, and Results sections of the manuscript; Hua Fu and Fan Wang were the co-principal investigators of this project, granting research funding and mentoring study design, data collection, and article revision. They also issued final approval for submission; Haihong Qian and Yueren Yan contributed to data collection and refining the article. All authors have approved the final version of this manuscript.

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Technical appendix, statistical code, and dataset available from the Dryad repository, DOI: [include DOI for dataset here].

Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information backs up the case the authors are making.

Reference

1 Balint E, Ball D, Hare M. Training medical students in patient-centered medicine, *Compr Phychiatry*1969;10:249-58.

2 Hirono I, Hideki H, Takahiro K. The evolving concept of “patient-centeredness” in patient-physician communication research, *Soc Sci Med*2013;96:147-53.

3 Institute of Medicine. Crossing the quality chasm: a new health system for the 21st

century. Washington (DC):National Academies Press 2001:39-40.

4 Mohammed A, Mannan F, Chaudhry Z, et al. Quality of care in university hospitals in Saudi Arabia: a systematic review. *BMJ Open*2016;6(2):e008988.

5 Catro EM, van Regenmortel T, Vanhaecht K, et al. Patient empowerment, patient participation and patient-centeredness in hospital care: A concept analysis based on a literature review. *Patient Educ Couns*2016;99:1923-39.

6 Stewart M, Brown JB, Weston WW, et al. Patient-centered medicine: transforming the clinical method, 2nd edn. United Kinddom: Radcliffe Medical Press 2003:5-16.

7 Hudon C, Fortin M, Haggerty JL, et al. Measuring patients' perceptions of patient-centered care: a systematic review of tools for family medicine. *Ann Fam Med*2011;9:155-64.

8 Epstein RM, Franks P, Fiscella K, et al. Measuring patient-centered communication in patient-physician consultations: theoretical and practical issues. *Soc Sci Med*2005;61:1516-28.

9 Bensing JM, Verhaak PF, van Dulmen AM, et al. Communication: the royal pathway to patient-centered medicine. *Patient Educ Couns*2000;39:1-3.

10 Mead N, Bower P. Patient-centeredness: a conceptual framework and review of the empirical literature. *Soc Sci Med*2000;51:1087-10.

11 Taylor K. Paternalism, participation and partnership-the evolution of patient-centeredness in the consultation. *Patient Educ Couns*2009;74:150-55.

12 Greenfield S, S. Kaplan, J. Ware, E.M. Yano, H. Frank, Patients' participation in medical care. *J Gen Intern Med*1988;88:448–57.

13 Marinker M. From compliance to concordance: achieving shared goals in medicine taking. *Brit Med J*1997;314:747–8.

14 Schiavo R. Health Communication: From Theory to Practice, 2nd edn. United States: Jossay-Bass 2013:195-96.

15 Morris MA, Clayman ML, Peters KJ, et al. Patient-centered communication strategies for patients with aphasia: discrepancies between what patients want and what physicians do. *Disabil Health J*2015;8:208-15.

16 Krupat E, Hiam CM, Fleming MZ, et al. Patient-centeredness and its correlates

among first year medical students. *Int J Psychiatry Med*1999;29:347-56.

17 Kim J. Differences in attitude toward patient-centeredness in patients and physicians. *Korean J Med Educ*2013;25:149-56.

18 Ishikawa I, Eto M, Kitamura K, et al. Resident physicians' attitudes and confidence in communicating with patients: A pilot study at a Japanese University hospital. *Patient Educ Couns*2014;96:361-66.

19 Tsimtsiou Z, Kirana PS, Hatzichristou D. Determinants of patients' attitudes toward patient-centered care: A cross-sectional study in Greece. *Patient Educ Couns*2014;97:391-95.

20 Dockens AL, Bellon-Harn ML, Manchaiah V. Preference to patient-centeredness in pre-service speech and hearing sciences students: a cross-sectional study. *J Audiol Otol*2016;20:73-9.

21 Ting X, Yong B, Yin L, et al. Patient perception and the barriers to practicing patient-centered communication: A survey and in-depth interview of Chinese patients and physicians. *Patient Educ Couns*2016;99:364-69.

22 Krupat E, Rosenkranz SL, Yeager CM, et al. The practice orientations of physicians and patients: the effect of doctor-patient congruence on satisfaction. *Patient Educ Couns*2000;39:49-59.

23 Moore M. What does patient-centered communication mean in Nepal? *Med Educ*2008;42:18-26.

24 Hair Jr JF, Black WC, Babin BJ, et al. Multivariate Data Analysis, 7th edn. Beijing: China Machine Press 2011:100-123.

25 Raosoft Inc. Sample size calculation [online]. www.raosoft.com/samplesize.html.

26 Tran A, Haidet P, Street R, et al. Empowering communication: a community-based intervention for patients. *Patient Educ Couns*2004;52:113-21.

27 Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med*2004;36:588-94.

28 Cegala DJ, Coleman MT, Warisse J. The development and partial test of the Medical Communication Competence Scale (MCCS). *J Health Commun*1998;10:261-88.

29 Ponterotto JG, Ruckdeschel DE. An overview of coefficient alpha and a reliability matrix for estimating adequacy of internal consistency coefficients with psychological research measures. *Percept Mot Skills*2007;105:997-1014.

30 Osborne JW, Costello AB. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract Assess Res Eval* 2005;10:1-9.

31 Brown TA. Confirmatory factor analysis for applied research, 2nd edn. New York: The Guilford Press 2015:67-73.

32 Backhoff E, Larrazolo N, Rosas M. The level of difficulty and discrimination power of Basic Knowledge and Skill Examination (EXHCOBA). Revista Electrónica de Investigación Educativa 2000;2(1). www.researchgate.net/publication/266332601_The_Level_of_Difficulty_and_Discrimination_Power_of_the_Basic_Knowledge_and_Skills_Examination_EXHCOBA.htm (accessed 7 Mar 2017).

33 Krupat E, Yeager CM, Putnam S. Patient role orientations, doctor-patient fit, and visit satisfaction. *Psychol Health*2000;15:707-19.

34 Pereira CM, Amaral CF, Ribeiro MM, et al. Cross-cultural validation of the Patient-Practitioner Orientation Scale. Patient Educ Couns2013;91:37-43.

35 Kiessling C, Fabry G, Rudolf Fisher M, et al. German translation and construct validation of the Patient-Provider Orientation Scale(PPOS-D12). *Psychother Psychsom Med Psychol*2014;64:122-27.

36 Mudiyanse RM, Pallegame RW, Jayalath T, et al. Translation and validation of the Patient-Practitioner Orientation Scale in Sri Lanka. *Educ Health(Ablingdon)* 2015;28:35-40.

37 Laplante-Levesque A, Hickson L, Grenness C. An Australian survey of audiologists' preferences for patient-centeredness. *Int J Audiol*2014;53:S76-82.

38 Manchiaih V, Gomersall PA, Tome D, et al. Audiologists' preferences for patient-centeredness: a cross sectional questionnaire study of cross-cultural differences and similarities among professionals in Portugal, India and Iran. *BMJ Open*2014;4:e005915.

39 Abiola T, Udofia O, Abdullahi AT. Patient-doctor relationship: the practice orientations of doctors in Kano. *Niger J Clin Pract*2014;17:241-47.

40 Mann KJ, Hoffman A, Miller D, et al. The effect of a patient- and family-centered care curriculum on pediatric residents' patient-centeredness. *J Grad Med Educ*2013;5:36-40.

41 Krupat E, Hsu J, Irish J, et al. Matching patients and practitioners based on beliefs about care: Results of a randomized controlled trial. *Am J Manag Care* 2004;10:814-22.

42 Lau SR, Christensen ST, Andreason JT. Patients' preferences for patient-centered communication: a survey from an outpatient department in rural Sierra Leone. *Patient Educ Couns*2013;93:312-18.

43 Little P, Everitt H, Williamson I, et al. Preferences of patients for patient-centered approach to consultation in primary care: observational study. *BMJ*2001;322:468-72.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5,6,7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6.7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	7,
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	8
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9,12
		(b) Give reasons for non-participation at each stage	9,12
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9,10,12,13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	9-17
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	19
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	18,21
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Measuring the preference toward patient-centered communication with the Chinese-revised Patient-Practitioner Orientation Scale: A study among physicians and patients in clinical settings in Shanghai, China

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Secondary Subject Heading:	Patient-centred medicine, Health services research
Keywords:	Patient-centered communication, Clinical setting, Chinese, Scale

Measuring the preference toward patient-centered communication with the Chinese-revised Patient-Practitioner Orientation Scale: A study among physicians and patients in clinical settings in Shanghai, China

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Abstract

Objectives: The study aimed to explore the preference toward patient-centered communication among physicians and patients with the Chinese-revised Patient–Practitioner Orientation Scale (CR-PPOS).

Setting: Participants were recruited in clinical settings from eight medical institutes, including four community hospitals and four general hospitals, in Shanghai, China.

Design and participants: Questionnaire-based surveys were conducted among a total of 1018 physicians and patients, in two successive stages in the year of 2015.

Outcome measurements: Analysis mainly probed (1) psychological properties of the original Chinese-translated PPOS version versus the CR-PPOS (2) participants' scores on the CR-PPOS and the influential factors.

Results: Compared with the original PPOS, the 11-item CR-PPOS obtained better reliability and validity indicators. Furthermore, it also showed good discriminative power. Physicians and patients scored significantly differently on each subscale, as well as the total scale of CR-PPOS. Scores of patients were more likely to be influenced by various factors, such as age and education, compared with those of physicians.

Conclusions: The CR-PPOS is a better instrument in the Chinese context than the original translated version. The congruence and divergence in the extent to which patient-centered communication is preferred among Chinese physicians and patients should be noted. Adapting physicians' communication strategy to patients' preference based on their personal features can be an approach to improve clinical efficiency.

Keywords: Patient-centered communication, Clinical setting, Chinese, Scale

Article summary: Strengths and limitations of this study

- Psychometric properties of PPOS were systematically assessed in Chinese context, with common indicators of reliability, validity and discriminative power.
- Preference toward patient-centered communication among Chinese physicians was simultaneously measured with that of patients using the CR- PPOS, which made it possible to make comparisons and find differences between both sides.
- The association between broader variables and participants' preference toward patient-centered communication was explored, such as burnout for physicians and health literacy for patients.
- Due to feasibility, the participants in this study were only drawn from eight clinical units in Shanghai, and sampling was not exact random, which both brought the issue on selection bias and limited generalization validity.
- Caution should be used when directly comparing scores measured by the CR-PPOS and the original PPOS, as we developed the CR-PPOS from the PPOS following a standardized statistical process, without the constraint of keeping the number of items constant.

Introduction

In 1969, Balint[1] was greatly influential in the development of patient-centeredness, which has been one of the most frequently discussed principles in medical practices over the past few decades[2]. It has also been regarded as one of the six core components of high-quality medical care[3]. Enhancing patient-centeredness is eagerly highlighted to improve the quality of health care delivery[4].

Patient-centeredness, however, is hard to be uniformly defined[5]. And it is not for sure that patient-centeredness can be considered as a set of gestures (a combination of

setting, language, paralanguage. and so on), or a state of mind. Furthermore, it is uncertain whether it exists as a yearning inside the head of the physician or the patient, whether it is a set of things to do or things to think, or a compendium of things to say[6].

Despite these conundrums, various conceptual models have been raised to illustrate patient-centeredness for the positive effects it brings to medical care [7,8]. And Epstein[9] further indicated that patient-centeredness could be fulfilled from three levels: interpersonal behaviors, technical intervention, and health system innovation. As a key element in interpersonal behaviors between physicians and patients, patient-centered communication has been a highly recommended model, enabling practitioners to offer care that is concordant with the patient's values, needs, and preferences, and that allows patients to become actively involved in decision making regarding their health[10,11]. Patient-centered communication contributes to building a partnership between physicians and patients, instead of the traditional paternalism[12]. Patient-centered communication has also been reported to improve a variety of patients' clinical outcomes in diverse settings, and enhance their adherence to prescription medications and other types of treatment[13,14].

However, considering the cultural and contextual differences, patient-centered communication may not be universally applicable despite the benefits it offers[15].Thus it is suggested that physicians learn patients' communication preference and then incorporate identified communication strategies into their communication style[16]. However, available instruments that aim to measure the preference toward patient-centered communication remain sparse. Originally developed by Krupat[17], the Patient–Practitioner Orientation Scale (PPOS), embracing the four elements model of patient-centeredness, has been translated into various languages and has gained worldwide popularity in measuring the preference toward patient-centered communication among physicians, medical students, and patients [18-21].

In China, accounts of patient–physician communication have been hotspots in the new healthcare era, as patient-centeredness is increasingly highlighted in clinical practice. Ting[22] conducted a survey to detect patients' preferences toward patient-centered communication in a hospital in the southwest part of China, which was the only known attempt to apply PPOS in China. Despite the innovativeness, there were several limitations within this study. For example, as an instrument introduced from abroad, the psychometric properties, such as reliability and validity, of PPOS in the Chinese context have not been well tested. Secondly, the preference toward conducting patient-centered communication among physicians has not yet been explored. Finally, for a country with vast territory and a population in the billions, a single survey conducted in a specific medical unit may not be adequately representative. Thus it is not clear yet how this instrument works in other regions and surroundings.

We conducted this research in Shanghai, which was among the most developed cities in China and possessed abundant high-quality medical resources, aiming to adapt PPOS to Chinese (Mandarin) context and assess its psychometric properties systematically. Furthermore, patients' as well as physicians' preferences toward patient-centered communication were measured using the Chinese-revised PPOS (CR-PPOS). In addition, factors that might exert influence on physicians' and patients' preferences toward patient-centered communication were further explored.

Methods

Description of the instrument

Currently, PPOS has evolved to a version containing 18 items in two dimensions, Caring and Sharing[23]. The nine-item Caring subscale reflects the degree to which physicians care about providing warmth and emotional support and regard patient as a whole person. The nine-item Sharing subscale reflects the degree to which physicians should share decision making information and power with the patients [17]. A higher

PPOS total score as well as subscale scores indicates a higher preference toward patient-centered style in clinical communication. Conversely, a low Caring score indicates a tendency toward disease-centered style, while a low Sharing score indicates a tendency toward doctor-centered style.

Translation and cultural adaption

Obtaining the permission to translate and develop PPOS in the Chinese context by the original author, scholars with academic backgrounds in medicine, public health, communication, Chinese and English languages, respectively, were invited to translate the PPOS to Chinese(Mandarin).Afterward, the bilingual PPOS versions were sent separately to another five advanced health practitioners for further suggestions and modifications. The Chinese PPOS(C-PPOS) was then back-translated into English and sent back to the original author for confirmation.

For this C-PPOS, we strove to fit every item to its original version, except for item 17 due to noticeable culture difference. Thus, it was replaced by "A friendly manner is a major ingredient in the doctor's treatment of the patients", according to the results of a prior study in Nepal[24]. Additionally, item 2 was back-translated as "Compared with centering on individual patients in the past, focusing on the comprehensive quality of medical services nowadays is more valuable for propelling medical development", which differed from the original item "Although health care is less personal these days, this is a small price to pay for medical advances" in expression but was mostly consistent in meaning. Finally, 12 physicians and 18 patients were enrolled in cognitive interviews to further enhance the comprehensibility of the scale in the Chinese cultural context.

Pilot study design

A pilot study was conducted in eight clinical settings in Shanghai, including four community hospitals and four general hospitals. As a minimum sample size of 5 to 10 times the number of scale items for exploratory factor analysis (EFA) and 10 to 20

times for confirmative factor analysis[25] was required, as well as taking the probable invalid responses into consideration, we included 400 interviewees. It was assumed that physicians should comprise at least 20% of the total sample. Physicians and patients were recruited from the outpatient department of each hospital. Every eligible participant was requested to complete an anonymous short questionnaire containing the C-PPOS. Retrieved questionnaires were carefully checked, and those with bad quality were removed from the dataset, including those with missing item scores or with the same item score throughout the entire scale.

Psychometric properties assessment

In this study, we assessed the psychometric properties via reliability, validity, and discriminative power tests, based on which the C-PPOS was revised to the CR-PPOS.

Internal consistency and test–retest reliability are the most widely tested indicators for reliability, thus we performed both in this study. In the test–retest survey, 60 participants completed the C-PPOS again after 2 to 4 weeks.

Hereby we performed EFA and confirmatory factor analysis (CFA) to assess construct validity. In addition, content validity was assessed by testing the correlation of the score of each item and the score of the subscale the item belonged to, as well as the score of the total scale.

Discriminative power reflects the extent to which an item can distinguish different levels of target variables. We tested discriminative power by comparing the critical value (CR) of each item.

Formal study design

The formal survey was launched 1 month later, in the same settings where the pilot study was conducted. As a cross-sectional study, the sample size was calculated to be 664 according to the formula provided by Raosoft, Inc.[26], with a total population size of 24,000,000 (the estimated population of Shanghai) and a confidence level of 99%.

It was then expanded to 750 to guarantee adequate valid responses. Physician and patient participants were recruited in a similar way as that in the pilot study. After confirming the informed consent, participants were asked to complete a questionnaire containing CR-PPOS, general information (gender, age, education, marriage status, socioeconomic status, self-reported health condition, etc.), and some other well-validated instruments, such as the Patient Confidence in Communication Scale (PCCS)[27], Hospital Anxiety and Depression Scale (HADS), the Rapid Health Literacy Scale[28] for patients, and the Maslach Burnout Inventory-General Survey (MBI-GS) and Medical Communication Competence Scale (MCCS)[29] for physicians.

Statistical analysis

We utilized Epidata 3.1 and Excel 2007 software for dataset establishment. IBM SPSS 20.0 and AMOS 21.0 were employed to perform data cleaning and analysis.

Cronbach's α coefficient was tested as the indicator of internal consistency and reliability. Normally, a Cronbach's α of no less than 0.6 is deemed acceptable for an instrument with a relatively small number of items (i.e. no more than 6)[30]. Test–retest reliability was assessed as the indicator of interclass correlation coefficient (ICC). Test–retest reliability was considered poor if the ICC value was lower than 0.4 and/or the correlation was not statistically significant ($P<0.05$).

For EFA, data were subjected to a principal component analysis with extraction of eigenvalues (greater than 1) for subscales (EFA round 1) and fixed two factors for the total scale (EFA round 2). In EFA round 1, items were removed if a) their factor loadings under either dimension were greater than 0.4, b) their factor loadings under any two dimensions were close (the absolute value difference was less than 0.1), and c) they were the only item under one dimension[31].

CFA was performed by maximum likelihood analysis to verify the main adjustment indices of the model, including chi-squared/degree of freedom(χ^2/df), root mean

square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed-fit index (NFI), incremental fit index (IFI), and comparative fit index (CFI). The recommended χ^2/df ratio is 1 to 3, and RMSEA value <0.08 and GFI, AGFI, NNFI, IFI, and CFI >0.9 suggest ideal model fit[32].

Respondents with the highest (top 27%) and lowest (bottom 27%) total scale scores were divided into two groups, after which their CR values of each item were compared to determine their discriminative power[33]. The items without significantly distinct CRs were eliminated as they lacked competency to distinguish high scores and low scores.

For single factor analysis, we performed the t-test and analysis of variance (ANOVA) for parameter testing, and the Mann–Whitney U test for non-parameter testing. Multiple linear regression (MLR) was utilized in processing multifactor analysis. Statistical significance was set at P<0.05.

Ethnical consideration

This study obtained approval from the Institutional Review Board (IRB) of the Fudan University School of Public Health. Informed consent was provided by all the participants before the survey.

Results

Pilot study

Participants

Three hundred and sixty-two eligible questionnaires were included in the pilot study from 395 participants, with a valid response rate of 91.65%. The mean age of the respondents was 47.41 ± 18.42, and approximately half of them had graduated from college (Table 1).

Table 1

Demographic characteristics of the pilot study sample (n=362)

Demographic characteristics	Physicians (n=71)	Patient (n=291)
Mean age (range)	39.39 (24–64)	49.43 (20–96)
Gender, n (%)		
Male	33(46.5%)	123 (42.3%)
Female	38(53.5%)	165 (56.6%)
Education, n (%)		
College and above	67 (94.4%)	112 (38.5%)
Senior school	4 (5.6%)	83 (28.5%)
Junior school	0	72 (24.7%)
Primary school and below	0	12 (4.1%)
Setting, n (%)		
Community hospital	42 (59.2%)	130 (44.7%)
General hospital	29 (40.8%)	161 (55.3%)

Confirmatory factor analysis of the C-PPOS

The CFA of the C-PPOS indicated poor model fit (Table 2), which called for further revision.

Table 2

Goodness-of-fit indices of the CFA of the CR-PPOS and the original C-PPOS

Model fit indicator	Two factors (18 items)	Two factors (11 items)	Reference value
χ^2/df	5.04	1.85	<3
P-value	<0.001	<0.001	>0.05
RMSEA	0.11	0.06	<0.08
GFI	0.76	0.94	>0.90

AGFI	0.70	0.90	>0.90
NFI	0.52	0.81	>0.90
IFI	0.58	0.90	>0.90
CFI	0.57	0.90	>0.90

Revision of the C-PPOS

The Cronbach's α of each subscale of C-PPOS was tested as the first step of item reduction. The Cronbach's α of C-PPOS was 0.668, with a Caring subscale score of 0.493 and a Sharing subscale of 0.575, showing poor internal consistent reliability. Hence, items were eliminated in a stepwise manner for each subscale separately until elimination of another item would lead to a decrease in the Cronbach's α of its corresponding dimension. Finally, five out of nine items were retained in the Caring subscale, and eight out of nine items (except for C-PPOS9) were retained in the Sharing subscale.

In EFA, the Bartlett's sphericity test reported a Chi-square value of 112.364 ($p<0.001$) for the Caring subscale and 146.846 ($p<0.001$) for the Sharing subscale. The Kaiser–Meyer–Olkin (KMO) indices for the two subscales were 0.727 and 0.694, respectively. For EFA round 1, all five of the retained items of the Caring subscale were under one principal component, which had an eigenvalue greater than 1 (2.197), explaining 43.949% of the total variance. In the Sharing subscale, C-PPOS4 and C-PPOS10 were removed as they met exclusion criteria. Afterward, EFA was performed again on the retained six items of the Sharing subscale. This time all six items loaded under one principal component (eigenvalue=2.247), which explained 37.448% of the total variance. Subsequently, a fixed two-factor EFA was performed to verify the construct of the merged 11-item scale. The result indicated that the five items of the Caring subscale and the six items of the Sharing subscale were well separated, explaining 41.67% of the total variance.

CFA was performed with the 11-item revised C-PPOS (CR-PPOS, see supplementary appendix), according to the prior model, indicating a more acceptable and greatly improved model fit compared with the original scale (Table 2).

Reliability of the CR-PPOS

The Cronbach's α of the entire CR-PPOS was 0.735, with 0.709 in the Caring subscale and 0.644 in the Sharing subscale. Furthermore, the scores of the two subscales were significantly correlated to the total scale, with Spearman coefficients of 0.744 (Caring) and 0.840 (Sharing), which were higher than that of these two subscales (0.312). The ICC was 0.787 for the CR-PPOS, 0.911 for the Caring subscale, and 0.602 for the Sharing subscale. The ICC for the 11 single items ranged from 0.481 to 0.812. The correlations were all statistically significant ($p<0.001$), indicating satisfactory test–retest reliability.

Validity of the CR-PPOS

The construct validity was well verified through EFA and CFA (see above). As for content validity, the 11 items' scores and their corresponding subscales' scores were all significantly correlated ($p<0.01$), with Spearman coefficients ranging from 0.452 to 0.717.

Discriminative power of the CR-PPOS

The CR values of the 11 items were all less than 0.01, reaching statistically significant levels. Thus, the items retained in the CR-PPOS had good discriminative power.

Formal study

Participants

Six hundred and fifty-six eligible questionnaires out of 792 participants were retrieved in this stage, with a valid response rate of 82.83%. One hundred and sixteen physicians and 540 patients were included. Respondents' demographic information is

partly shown in Tables 3 and 4.

Table 3

Physicians' demographic characteristics (partly) and CR-PPOS scores

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total
Gender				
Male	43 (37.1%)	4.75±0.95	2.81±0.79	3.62±0.62
Female	73 (62.9%)	4.68±0.74	3.01±0.77	3.68±0.57
P value		0.666	0.166	0.648
Age (Group)				
–35	50 (43.1%)	4.78±0.96	2.89±0.71	3.69±0.61
–50	52 (44.8%)	4.69±0.63	2.92±0.85	3.63±0.52
51–	10 (8.7%)	4.74±0.36	3.33±0.66	3.90±0.41
P value		0.827	0.247	0.363
Education				
Senior school or below	2 (1.7%)	4.20±0.00	3.00±0.17	3.41±0.14
College	71 (61.2%)	4.69±0.87	3.04±0.76	3.69±0.64
Postgraduate	42 (36.2%)	4.78±0.75	2.75±0.80	3.61±0.51
P value		0.572	0.161	0.672
Marriage status				
Married	89 (76.7%)	4.69±0.76	2.91±0.77	3.64±0.53

*	Unmarried	26 (22.4%)	4.88±0.82	3.08±0.74	3.82±0.61
p<0.0	P value		0.270	0.318	0.149
5					

Table 4

Patients' demographic characteristics (partly) and CR-PPOS scores

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total
Gender				
Male	195 (36.1%)	4.11±0.95	3.17±0.74	3.49±0.71
Female	330 (61.1%)	4.07±0.96	3.09±0.77	3.44±0.69
P value		0.574	0.295	0.468
Age (Group)				
–35	175 (32.4%)	4.24±0.91	3.32±0.68	3.59±0.67
–50	102 (18.9%)	4.00±1.00	3.02±0.83	3.37±0.75
–65	129 (23.9%)	3.93±1.02	3.00±0.76	3.35±0.72
66–	107 (19.8%)	4.14±0.86	3.12±0.77	3.50±0.64
P value		0.034*	0.001*	0.009*
Education				
Primary school or below	39 (7.2%)	3.93±1.00	2.97±0.81	3.29±0.78
Junior school	112 (20.7%)	3.89±0.95	2.99±0.77	3.29±0.67
Senior school	162 (30.0%)	4.06±0.95	3.12±0.71	3.46±0.69
College or above	203 (37.6%)	4.26±0.93	3.23±0.80	3.59±0.70

P value		0.007*	0.030*	0.002*
Personal income (CNY)				
<1500	23 (4.3%)	3.91±0.93	2.96±0.83	3.27±0.61
–3000	105 (19.4%)	3.83±1.02	2.96±0.83	3.23±0.77
–5000	192 (35.6%)	4.14±0.95	3.16±0.79	3.51±0.71
–10000	115 (21.3%)	4.17±0.94	3.13±0.68	3.54±0.63
10000–	70 (13.0%)	4.11±0.97	3.26±0.73	3.48±0.73
P value		0.048*	0.086	0.006*
Experience as medical staff				
Yes	27 (5.0)%	3.67±1.07	2.84±0.76	3.12±0.80
No	241 (44.6%)	4.05±1.00	3.22±0.75	3.46±0.75
P value		0.071	0.013*	0.028*

*p<0.05

Comparison of physicians' and patients' CR-PPOS scores

The physicians received an average CR-PPOS score of 3.66±0.59, and the patients' average score was significantly lower (3.46±0.70). The physicians scored higher in Caring (4.71±0.82 vs. 4.08±0.95), while the patients scored higher in Sharing (3.13±0.76 vs. 2.94±0.78). The differences were all statistically significant (p<0.05).

Demographic characteristics and CR-PPOS scores

The scores of physicians and patients with distinct demographic characteristics were compared, as partly listed in Tables 3 and 4. Both patients' age and education level

were significantly associated with their scores on the Caring subscale($p<0.05$), the Sharing subscale($p<0.001$) and the total CR-PPOS($p<0.01$). While patients' income was only significantly associated with the Caring subscale score($p<0.05$) and the total CR-PPOS score($p<0.01$). Besides, patients' experience as medical staff was likely to gain their scores on the Sharing subscale($p<0.05$) and the total CR-PPOS($p<0.05$). However, no associations of such were traced among physicians.

Physicians' burnout and CR-PPOS scores

The burnout level of physicians was measured by the MBI-GS. According to the data, the group of "relatively severe" (scoring 3–5) and the group of "extremely severe" (scoring 5 or above) were merged as a "severe" group (scoring 3 or above), compared with the "light" group (scoring 3 or below). Physicians who reported "severe" burnout scored significantly lower in both the Caring subscale and the total scale than those reporting "light" burnout.

Physicians' medical communication competency and CR-PPOS scores

Ninety-nine percent of physicians completed the MCCS, which aimed to assess the medical communication competency of both physicians and patients. Although physicians were normally assessed by their patients using MCCS, we transformed this into a self-reported scale for physicians in this study. The results indicated that, although the scores of the four dimensions within MCCS were related, no correlation was found between the MCCS scores and the CR-PPOS scores as well as its subscales.

Patients' anxiety and depression and CR-PPOS scores

Five hundred and two patients finished the HADS, an instrument for rapidly screening anxiety and depressive symptoms among clinic physicians and patients. Patients got a mean score of 11.57 in the anxiety subscale and 11.77 in the depression subscale. Three hundred nine patients (57.2%) were determined to be anxiety-positive, and two

hundred and seventy seven (51.3%) were determined as depression-positive. Meanwhile, it should be noticed that HADS can only be used for screening purpose, thus the positive results cannot be equal to the anxiety/depression with clinical significance.

As anxiety and depressive symptoms were highly comorbid, which was also proven in our study (r_s=0.520), a two-way ANOVA was performed as the first stage to explore whether an interaction effect existed. It turned out that there was no interaction effect of anxiety and depression. Anxiety was found to lead to a decrease in patients' scores on both the Caring subscale($p<0.05$) and the total CR-PPOS($p<0.05$). However, patients' scores on neither the total scale nor the subscales seemed to be influenced by their depressive symptoms.

Patients' health literacy, PCCS, and CR-PPOS scores

Using the three-item Rapid Health Literacy Scale, no statistical difference was found in the total CR-PPOS score and the two subscale scores between the poor literacy group and the adequate literacy group, while patients' health literacy scores showed a significantly positive correlation with their Sharing subscale scores (r_s=0.112). Similarly, patients' confidence in medical communication measured by PCCS was inversely correlated with their scores on the Sharing subscale (r_s=-0.261). In the following partial correlation tests, the correlation between PCCS and the Sharing subscale score remained significant after controlling for the health literacy score, while no correlation existed between the health literacy score and the Sharing subscale score after controlling for PCCS.

Multivariable analysis

After testing the feasibility, MLR was employed to detect the factors that might exert influence on physicians' and patients' preferences toward patient-centered communication. The results showed that the total burnout level might be the influential factor for physicians in Caring and total CR-PPOS scores, and more factors

impacted patients' preference toward patient-centered communication in different dimensions (Table 5).

Table 5

Variables influencing CR-PPOS scores

Dimension	Variables	B	95% CI	P
Physicians				
Caring subscale	Total burn-out	-0.417	(-0.801, -0.033)	0.034
Sharing subscale				
CR-PPOS total	Total burn-out	-0.341	(-0.611, -0.071)	0.014
Patients				
Caring subscale	Age (Group)	-0.292	(-0.499, -0.086)	0.006
	Education	0.251	(0.079, 0.423)	0.005
	Experience as medical staff	0.538	(0.046, 1.029)	0.032
Sharing subscale	Age (Group)	-0.202	(-0.361, -0.043)	0.013
	Education	0.169	(0.039, 0.299)	0.011
	Experience as medical staff	0.481	(0.109, 0.852)	0.012
	Marriage status	-0.336	(-0.666, -0.006)	0.046
	Confidence in medical communication	-0.298	(-0.451, -0.146)	<0.001
CR-PPOS total	Age (Group)	-0.242	(-0.396, -0.087)	0.001
	Education	0.222	(0.093, 0.350)	0.001
	Experience as medical staff	0.476	(0.111, 0.842)	0.011

Discussion

Although the PPOS has been widely used in various languages, only a few studies have systematically tested its psychometric property while applying it[34-36], and no related results have been reported in China yet. This study showed that neither the ICC of the overall 18-item C-PPOS nor its two subscales were above 0.7, which was comparable to the existing research but still not good enough. Deletion of items 9 and 17 improved the Cronbach's α, which is consistent with a study conducted in Sri Lanka[37]. After modifying, the two subscales of the 11-item PPOS were well separated in a fixed-factor EFA, with better indexes than prior similar studies, and the overall scale validity was reconfirmed by CFA. Taking into account the test–retest reliability and discriminative power, the 11-item CR-PPOS obtained better psychometric property than the original 18-item scale; thus it is considered to have greater applicability in the Chinese population.

Using the 11-item CR-PPOS, physicians and patients indicated similar trends in the achieved scores. In the overall scale, they both obtained medium scores (around the median value of 3.5), and they both had relatively high Caring scores (over 4.0) and low Sharing scores (around 3.0 or below). This indicated that, although physicians and patients generally showed a medium level of patient-centeredness in clinical communication, they expressed higher preferences toward caring from a biopsychosocial perspective than shared information and involvement in decision making. Although the physicians' data is still absent in China, the 95% confidence interval of mean score of patients in this study slightly overlapped that of the prior study[22], which implied that Chinese patients might express similar preferences toward patient-centered communication, regardless of the regions they were living in. The differences between the scores of physicians and patients, however, may still prompt the gap in Chinese physicians and patients regarding their understanding and expectations in clinical communication. Comparing the data of this study with that from abroad, the majority showed a similar pattern that physicians were more patient-centered in Caring than in Sharing, but there were still two exceptions for the surveys conducted in Portugal and Australia, indicating opposite results[38,39], which

may be due to the difference in physician training modes and local health systems. Thus, further research is needed to determine the reasons for such a distinction.

Preference toward patient-centered communication, as measured by the PPOS, is influenced by both personal characteristics and social environmental factors. This study made the first attempt to detect the potential influential factors of patient-centered communication among Chinese physicians. The results showed no association between PPOS scores and a series of factors, including gender, age, education level, career length, and type of setting. These results were consistent with several prior studies in other countries, except gender differences, for female physicians scored significantly higher than male colleagues in some studies [40,41]. Apart from these factors, which were frequently mentioned in the existing research, we found that burnout level might exert impact on physicians' PPOS total score as well as their Caring subscale score, indicating that physicians with a higher total burnout level were generally less likely to be patient-centered in clinical communication. Although we assumed that poor communication ability may relate to a lower preference for patient-centeredness in communication, no link was found between physicians' medical communication competency measured by MCCS and their PPOS scores in this study.

As Ting[22] reported, age and education mainly influenced Chinese patients' overall preference on patient-centered communication. In this study, younger and/or better-educated patients also expressed a higher preference for patient-centered communication in both the Caring and Sharing dimensions. Although some studies have reported a gender difference[34,37,42,43], it seems that in case of Chinese patients, age and education level, rather than gender, contribute to the different preferences toward patient-centered communication. Meanwhile, the type of setting and social economic status are not considered as influential factors, which is controversial[44].It was found that experience as medical staff decreased the extent to which patients wanted a patient-centered communication style. One plausible explanation is that those who had worked as medical staff had obtained a more comprehensive

understanding of how things were inside the hospital than those who had not. Thus, they subconsciously lowered their expectation of a patient-centered manner in communication, which might raise demand for physicians, due to their sympathy toward the doctor groups for their daily heavy workload. Additionally, although anxiety was detected as an influential factor in single factor analysis, the final regression model showed patients' PPOS scores were irrelevant to their anxiety and depression status. There is also a need to further probe the role of patient communication confidence, as well as its seeming mediation effect on the relationship between patients' health literacy and preference for shared information and decision making.

Though we are far away from disentangling the patient-centered conundrum[6], considering the deteriorating physician-patient relationship in current Chinese society, this study still has significant practice implications. As a valid instrument, the CR-PPOS can be applied to better measure both physicians' and patients' preference toward patient-centered communication in China. On one hand, the divergence in communication preference between physicians and patients can be discovered. On the other hand, it will be possible and reasonable to link certain personal characteristics with individuals' preference toward clinical communication, and in China it is particularly true for patients according to this study. Based on these findings, specific training can be developed and offered to physicians, guiding them how to recognize patients with different communication preferences and adopt corresponding communication strategies afterwards. In this way not only patients' expectations are better fulfilled, but also the communication efficiency is enhanced, both contributing to reduced complaints in clinical communication, and improved physician-patient relationship[45].

Conclusion

The CR-PPOS was developed as an applicable instrument to measure the preference toward patient-centered communication of physicians and patients in Chinese context.

Physicians and patients were generally more patient-centered in medical communication regarding overall biopsychosocial care than shared information and decision making, but there were still significant gaps between physicians and patients on the extent to which they prefer this type of communication. Relieving of burnout could help physicians to be more patient-centered in communication. Patients with young age, high education level, and medical staff experience tended to have higher preference toward patient-centered communication.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: Jie Wang had financial support from the China Postdoctoral Science Foundation for the submitted work, Fan Wang has received funds from Shanghai Health and Family Planning Commission; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work."

Ethics committee approval information: The study was approved by Fudan University School of Public Health Institutional Review Board (No. IRB#2015-12-0575).

Contributors: Jie Wang granted research funding, engaged in study design and data analysis, and was the main drafter of the Introduction and Discussion sections; Runyu Zou led study design, data collection, data analysis, and drafted the Method, and Results sections of the manuscript; Hua Fu and Fan Wang were the co-principal investigators of this project, granting research funding and mentoring study design, data collection, and article revision. They also issued final approval for submission; Haihong Qian and Yueren Yan contributed to data collection and refining the article. All authors have approved the final version of this manuscript.

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Data Sharing Statement: Extra data from this study could be accessed by contacting the corresponding author Fan Wang via wangfan512@126.com.

Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information backs up the case the authors are making.

Reference

1 Balint E, Ball D, Hare M. Training medical students in patient-centered medicine, *Compr Phychiatry*1969;10:249-58.

2 Hirono I, Hideki H, Takahiro K. The evolving concept of "patient-centeredness" in patient-physician communication research, *Soc Sci Med*2013;96:147-53.

3 Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington (DC):National Academies Press 2001:39-40.

4 Mohammed A, Mannan F, Chaudhry Z, et al. Quality of care in university hospitals in Saudi Arabia: a systematic review. *BMJ Open*2016;6(2):e008988.

5 Catro EM, van Regenmortel T, Vanhaecht K, et al. Patient empowerment, patient participation and patient-centeredness in hospital care: A concept analysis based on a literature review. *Patient Educ Couns*2016;99:1923-39.

6 Skelton J. Language and Clinical Communication: this bright Babylon. Oxford: Radcliffe Publishing 2008:93-98.

7 Stewart M, Brown JB, Weston WW, et al. Patient-centered medicine: transforming the clinical method, 2nd edn. United Kinddom: Radcliffe Medical Press 2003:5-16.

8 Hudon C, Fortin M, Haggerty JL, et al. Measuring patients' perceptions of patient-centered care: a systematic review of tools for family medicine. *Ann Fam Med*2011;9:155-64.

9 Epstein RM, Franks P, Fiscella K, et al. Measuring patient-centered communication in patient-physician consultations: theoretical and practical issues. *Soc Sci Med*2005;61:1516-28.

10 Bensing JM, Verhaak PF, van Dulmen AM, et al. Communication: the royal pathway to patient-centered medicine. *Patient Educ Couns*2000;39:1-3.

11 Mead N, Bower P. Patient-centeredness: a conceptual framework and review of the empirical literature. *Soc Sci Med*2000;51:1087-10.

12 Taylor K. Paternalism, participation and partnership-the evolution of patient-centeredness in the consultation. *Patient Educ Couns*2009;74:150-55.

13 Greenfield S, S. Kaplan, J. Ware, E.M. Yano, H. Frank, Patients' participation in medical care. *J Gen Intern Med*1988;88:448–57.

14 Marinker M. From compliance to concordance: achieving shared goals in medicine taking. *Brit Med J*1997;314:747–8.

15 Schiavo R. Health Communication: From Theory to Practice, 2nd edn. San Francisco: Jossay-Bass 2013:195-96.

16 Morris MA, Clayman ML, Peters KJ, et al. Patient-centered communication strategies for patients with aphasia: discrepancies between what patients want and what physicians do. *Disabil Health J*2015;8:208-15.

17 Krupat E, Hiam CM, Fleming MZ, et al. Patient-centeredness and its correlates among first year medical students. *Int J Psychiatry Med*1999;29:347-56.

18 Kim J. Differences in attitude toward patient-centeredness in patients and physicians. *Korean J Med Educ*2013;25:149-56.

19 Ishikawa I, Eto M, Kitamura K, et al. Resident physicians' attitudes and confidence in communicating with patients: A pilot study at a Japanese University hospital. *Patient Educ Couns*2014;96:361-66.

20 Tsimtsiou Z, Kirana PS, Hatzichristou D. Determinants of patients' attitudes toward patient-centered care: A cross-sectional study in Greece. *Patient Educ Couns*2014;97:391-95.

21 Dockens AL, Bellon-Harn ML, Manchaiah V. Preference to patient-centeredness in pre-service speech and hearing sciences students: a cross-sectional study. *J Audiol Otol*2016;20:73-9.

22 Xu T, Bao Y, Liang Y, et al. Patient perception and the barriers to practicing patient-centered communication: A survey and in-depth interview of Chinese patients and physicians. *Patient Educ Couns*2016;99:364-69.

23 Krupat E, Rosenkranz SL, Yeager CM, et al. The practice orientations of physicians and patients: the effect of doctor-patient congruence on satisfaction. *Patient Educ Couns*2000;39:49-59.

24 Moore M. What does patient-centered communication mean in Nepal? *Med Educ*2008;42:18-26.

25 Hair Jr JF, Black WC, Babin BJ, et al. Multivariate Data Analysis, 7th edn. Beijing: China Machine Press 2011:100-123.

26 Raosoft Inc. Sample size calculation [online]. www.raosoft.com/samplesize.html.

27 Tran A, Haidet P, Street R, et al. Empowering communication: a community-based intervention for patients. *Patient Educ Couns*2004;52:113-21.

28 Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med*2004;36:588-94.

29 Cegala DJ, Coleman MT, Warisse J. The development and partial test of the Medical Communication Competence Scale (MCCS). *J Health Commun*1998;10:261-88.

30 Ponterotto JG, Ruckdeschel DE. An overview of coefficient alpha and a reliability matrix for estimating adequacy of internal consistency coefficients with psychological research measures. *Percept Mot Skills*2007;105:997-1014.

31 Osborne JW, Costello AB. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract Assess Res Eval* 2005;10:1-9.

32 Brown TA. Confirmatory factor analysis for applied research, 2nd edn. New York: The Guilford Press 2015:67-73.

33 Backhoff E, Larrazolo N, Rosas M. The level of difficulty and discrimination power of Basic Knowledge and Skill Examination (EXHCOBA). Revista Electrónica de Investigación Educativa 2000;2(1). Retrieved on December 20, 2016 from: http://redie.uabc.mx/vol2no1/contents-backhoff.html

34 Krupat E, Yeager CM, Putnam S. Patient role orientations, doctor-patient fit, and visit satisfaction. *Psychol Health*2000;15:707-19.

35 Pereira CM, Amaral CF, Ribeiro MM, et al. Cross-cultural validation of the Patient-Practitioner Orientation Scale. Patient Educ Couns2013;91:37-43.

36 Kiessling C, Fabry G, Rudolf Fisher M, et al. German translation and construct validation of the Patient-Provider Orientation Scale(PPOS-D12). *Psychother Psychsom Med Psychol*2014;64:122-27.

37 Mudiyanse RM, Pallegame RW, Jayalath T, et al. Translation and validation of the Patient-Practitioner Orientation Scale in Sri Lanka. *Educ Health(Ablingdon)* 2015;28:35-40.

38 Laplante-Levesque A, Hickson L, Grenness C. An Australian survey of audiologists' preferences for patient-centeredness. *Int J Audiol*2014;53:S76-82.

39 Manchiaih V, Gomersall PA, Tome D, et al. Audiologists' preferences for patient-centeredness: a cross sectional questionnaire study of cross-cultural differences and similarities among professionals in Portugal, India and Iran. *BMJ Open*2014;4:e005915.

40 Abiola T, Udofia O, Abdullahi AT. Patient-doctor relationship: the practice orientations of doctors in Kano. *Niger J Clin Pract*2014;17:241-47.

41 Mann KJ, Hoffman A, Miller D, et al. The effect of a patient- and family-centered care curriculum on pediatric residents' patient-centeredness. *J Grad Med Educ*2013;5:36-40.

42 Krupat E, Hsu J, Irish J, et al. Matching patients and practitioners based on beliefs about care: Results of a randomized controlled trial. *Am J Manag Care* 2004;10:814-22.

43 Lau SR, Christensen ST, Andreason JT. Patients' preferences for patient-centered communication: a survey from an outpatient department in rural Sierra Leone. *Patient Educ Couns*2013;93:312-18.

44 Little P, Everitt H, Williamson I, et al. Preferences of patients for patient-centered approach to consultation in primary care: observational study. *BMJ*2001;322:468-72.

45 Liu X, Rohrer W, Luo A, et al. Doctor-patient communication skills training in mainland China: A systematic review of the literature. Patient Educ Couns2015;98:3-14.

Appendix

The CR-PPOS (English version)

Caring subscale

During clinical process, doctors will be suspected of prying the privacy of patients when they ask patients a lot about personal backgrounds.

If a doctor's diagnosis and treatment levels are high enough, the way of his/her communication with patients is not so important.

If a doctor spends too much honesty and enthusiasm in the doctor-patient communication, he/she wouldn't have made great achievements.

Most patients in clinics want to leave the doctors' office as soon as possible(so as to reduce the time communicating with doctors)

For doctors, knowing the patient's culture and backgrounds is not very important for treating illness.

Sharing subscale

During clinical process, doctors should be the ones who dominate the conversation.

Patients should rely on doctor's professional skills during clinical process and should not try to find out the answers to their medical conditions by themselves.

Many patients keep asking questions to doctors, although they are not necessarily getting more new information.

During the clinical process, if a patient does not agree with the opinions of a doctor, then it means that the doctor doesn't get the patient's respect and trust.

During clinical process, patients should always be aware that doctors are dominant.

It is usually not very helpful if patients search for medical information on their own-instead, they could be even more confused.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6-8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7,8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	6,7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8,9
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9,12
		(b) Give reasons for non-participation at each stage	9,12
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9,10,12-17
		(b) Indicate number of participants with missing data for each variable of interest	13,14,16
Outcome data	15*	Report numbers of outcome events or summary measures	15
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	18
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	19
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	23

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Measuring the preference toward patient-centered communication with the Chinese-revised Patient-Practitioner Orientation Scale: A cross-sectional study among physicians and patients in clinical settings in Shanghai, China

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Measuring the preference toward patient-centered communication with the Chinese-revised Patient-Practitioner Orientation Scale: A cross-sectional study among physicians and patients in clinical settings in Shanghai, China

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Abstract

Objectives: To adapt the Patient-Practitioner Orientation Scale (PPOS) a Chinese context and explore the preference toward patient-centered communication among physicians and patients with the Chinese-revised Patient–Practitioner Orientation Scale (CR-PPOS).

Design: A cross-sectional questionnaire-based study.

Setting: Clinical settings from eight medical units, including four community hospitals and four general hospitals, in Shanghai, China.

Participants: 1018 participants, including 187 physicians and 831 patients, completed this study in two successive stages.

Outcome measurements: Psychometric properties of the CR-PPOS, and participants' score on the CR-PPOS.

Results: Compared with the original PPOS, the 11-item CR-PPOS obtained better psychometric indices. Physicians and patients scored differently on both the total CR-PPOS and its two subscales. Compared with physicians, the scores of patients were more influenced by their personal characteristics, such as age and education.

Conclusions: The CR-PPOS is a better instrument in a Chinese context than the original translated version. The divergence in the extent to which patient-centered communication is preferred among Chinese physicians and patients should be noted. Adapting physicians' communication strategy to patients' preferences based on their personal characteristics can be a viable approach toward improving clinical efficiency.

Keywords: Patient-centered communication, Clinical setting, Chinese, Scale

Article summary: Strengths and limitations of this study

- It is the first study to systematically assess the psychometric properties of the PPOS in a Chinese context.
- Preference toward patient-centered communication among Chinese physicians and patients was simultaneously measured using the CR- PPOS, which made it possible to make comparisons between the two groups.
- The association between broader factors and participants' preference toward patient-centered communication was explored.
- For the sake of convenience, the participants in this study were sampled only from eight clinical units in Shanghai, which might lead to limited external validity.
- Caution should be used when directly comparing scores measured by the CR-PPOS and the PPOS, as the number of items they contain are not consistent.

Introduction

In 1969, Balint[1] was greatly influential in the development of patient-centeredness, which has been one of the most frequently discussed principles in medical practice over the past few decades[2]. It has also been regarded as one of the six core components of high-quality medical care[3]. Enhancing patient-centeredness is seen as vital in improving the quality of health care delivery[4].

Patient-centeredness, however, has not been uniformly defined[5]. It is not clear whether patient-centeredness should be considered as a set of gestures (a combination of setting, language, paralanguage, etc.), or a state of mind. Furthermore, it is uncertain whether patient-centeredness exists as a yearning inside the mind of the physician or the patient, whether it consists of a series of behaviors, or a mindset, or a

compendium of things to say[6].

Despite these conundrums, various conceptual models have been created to demonstrate patient-centeredness for the positive effects it brings to medical care [7,8]. Epstein[9] has indicated that patient-centeredness could be fulfilled at three levels: interpersonal behavior, technical intervention, and health system innovation. As a key element in interpersonal behavior between physicians and patients, patient-centered communication has been a highly recommended model, enabling practitioners to offer care that is concordant with the patient's values, needs, and preferences, and that allows patients to become actively involved in decision that affect their health[10,11]. Patient-centered communication contributes to building a partnership between physicians and patients, instead of the traditional paternalism[12]. Patient-centered communication has also been reported to improve a variety of clinical outcomes in diverse settings, and to enhance patients' adherence to prescription medication directions and other types of treatment[13,14].

However, considering the cultural and contextual differences that exist in the practice of medicine, patient-centered communication may not be universally applicable despite the benefits it offers[15].Thus it is suggested that physicians learn patients' communication preference and then incorporate them into their own communication style[16]. However, available instruments for measuring the preferences in patient-centered communication remain sparse. Originally developed by Krupat[17], the Patient–Practitioner Orientation Scale (PPOS), which embraces the four element model of patient-centeredness, has been translated into various languages and gained worldwide popularity in measuring the preferences toward patient-centered communication among physicians, medical students, and patients [18-21].

In China, accounts of patient–physician communication have been prominent in the new healthcare era, as patient-centeredness is increasingly highlighted in clinical practice. Ting[22] conducted a survey to identify patients' preferences toward patient-centered communication in a hospital in the southwest part of China, the only

known attempt to apply PPOS in China. Despite its innovativeness, there were several limitations affecting this study. For example, as an instrument introduced from abroad, PPOS' psychometric properties, such as reliability and validity, have not been well tested in the Chinese context. Secondly, the preference of physicians in conducting patient-centered communication has not yet been explored. Finally, for a vast country with a population in the billions, a single survey conducted in a specific medical unit can hardly be considered representative. It is thus unclear how well this instrument would work in other regions and surroundings.

We conducted this research in Shanghai, which is among the most developed cities in China and possesses abundant high-quality medical resources. Our goal was to adapt PPOS to a Chinese (Mandarin) context and assess its psychometric properties systematically. Preferences of both patients and physicians toward patient-centered communication were measured using the Chinese-revised PPOS (CR-PPOS). In addition, factors that might exert influence on physicians' and patients' preferences concerning patient-centered communication were further explored.

Methods

Description of the instrument

Currently, PPOS has evolved into a version containing 18 items in two dimensions, Caring and Sharing[23]. The nine-item Caring subscale reflects the degree to which physicians care about providing warmth and emotional support and regard the patient as a whole person. The nine-item Sharing subscale reflects the degree to which physicians believe they should share decision making information and power with the patients [17]. A higher PPOS total score, as well as subscale scores, indicates a greater preference toward patient-centered style in clinical communication. Conversely, a low Caring score indicates a tendency toward a disease-centered style, while a low Sharing score indicates a tendency toward a doctor-centered style.

Translation and cultural adaption

Having obtained from the original author permission to translate and develop the PPOS in a Chinese context, scholars with academic backgrounds in medicine, public health, and communication, as well as the Chinese and English languages, were invited to translate the PPOS into Chinese(Mandarin).Afterward, the bilingual PPOS versions were sent separately to five other advanced health practitioners for further suggestions and modifications. The Chinese PPOS(C-PPOS) was then re-translated into English and sent back to the original author for confirmation as to its accuracy.

For this C-PPOS, we strove to fit every item from the original version, except for item 17 due to noticeable culture difference. Thus, it was replaced by "A friendly manner is a major ingredient in the doctor's treatment of the patients", which had been used in a prior study in Nepal[24]. Additionally, item 2 was back-translated as "Compared with centering on individual patients in the past, focusing on the comprehensive quality of medical services nowadays is more valuable for propelling medical development," which differed from the original item, rendered as "Although health care is less personal these days, this is a small price to pay for medical advances" in expression but was mostly consistent in meaning. Finally, 12 physicians and 18 patients were enrolled in cognitive interviews to further enhance the comprehensibility of the scale in the Chinese cultural context.

Pilot study design

A pilot study was conducted in eight clinical settings in Shanghai in 2015. To reduce selection bias, four community hospitals and four general hospitals located in various areas were selected to cover a broad population. As a minimum sample size of 5 to 10 times the number of scale items for exploratory factor analysis (EFA) and 10 to 20 times for confirmative factor analysis[25] was required, and allowing for a number of probable invalid responses, we included 400 interviewees. It was assumed that physicians should comprise at least 20% of the total sample. Physicians and patients were recruited using a convenient sampling approach from the outpatient department of each hospital. Every eligible participant was requested to complete an anonymous

short questionnaire containing the C-PPOS. Retrieved questionnaires were carefully checked, and those of poor quality were removed from the dataset, including those with missing item scores or with the same item score used throughout the entire scale.

Psychometric properties assessment

In this study, we assessed the psychometric properties via reliability, validity, and discriminative power tests, based on which the C-PPOS was revised to the CR-PPOS.

Internal consistency and test–retest reliability are the most widely used indicators for reliability; thus we performed both in this study. In the test–retest survey, 60 participants completed the C-PPOS again after 2 to 4 weeks.

We performed EFA and confirmatory factor analysis (CFA) to assess construct validity. In addition, content validity was assessed by testing the correlation of the score of each item and the score of the subscale the item belonged to, as well as the score of the total scale.

Discriminative power reflects the extent to which an item can distinguish different levels of target variables. We tested discriminative power by comparing the critical value (CR) of each item.

Formal study design

The formal survey was launched 1 month later, in the same settings where the pilot study was conducted. As a cross-sectional study, the sample size was calculated to be 664 according to the formula provided by Raosoft, Inc.[26], within a total population size of 24,000,000 (the estimated population of Shanghai) and a confidence level of 99%. It was then expanded to 750 to guarantee sufficient valid responses. Physician and patient participants were recruited with a convenience sampling strategy. After confirming the informed consent, participants were asked to complete a questionnaire containing the CR-PPOS, general information (gender, age, education, marriage status, socioeconomic status, etc.), and some other well-validated instruments, such as the

Patient Confidence in Communication Scale (PCCS)[27], Hospital Anxiety and Depression Scale (HADS), the Rapid Health Literacy Scale[28] for patients, and the Maslach Burnout Inventory-General Survey (MBI-GS) and Medical Communication Competence Scale (MCCS)[29] for physicians.

Statistical analysis

We utilized Epidata 3.1 and Excel 2007 software for dataset establishment. IBM SPSS 20.0 and AMOS 21.0 were employed to perform data cleaning and analysis.

Cronbach's α coefficient was tested as the indicator of internal consistency and reliability. Normally, a Cronbach's α of no less than 0.6 is deemed acceptable for an instrument with a relatively small number of items (i.e. no more than 6)[30]. Test–retest reliability was assessed as the indicator of interclass correlation coefficient (ICC). Test–retest reliability was considered poor if the ICC value was lower than 0.4 and/or the correlation was not statistically significant ($P<0.05$).

For EFA, data were subjected to a principal component analysis with extraction of eigenvalues (greater than 1) for subscales (EFA round 1) and fixed two factors for the total scale (EFA round 2). In EFA round 1, items were removed if a) their factor loadings under either dimension were greater than 0.4, b) their factor loadings under any two dimensions were close (the absolute value difference was less than 0.1), or c) they were the only item under one dimension[31].

CFA was performed by maximum likelihood analysis to verify the main adjustment indices of the model, including chi-squared/degree of freedom(χ^2/df), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed-fit index (NFI), incremental fit index (IFI), and comparative fit index (CFI). The recommended χ^2/df ratio is 1 to 3, and RMSEA value <0.08 and GFI, AGFI, NNFI, IFI, and CFI >0.9 suggest ideal model fit[32].

Respondents with the highest (top 27%) and lowest (bottom 27%) total scale scores

were divided into two groups, after which their CR values of each item were compared to determine their discriminative power[33]. The items without significantly distinct CRs were eliminated as they lacked the ability to distinguish high scores and low scores.

For single factor analysis, we performed the t-test and analysis of variance (ANOVA) for parameter testing, and the Mann–Whitney U test for non-parameter testing. Multiple linear regression (MLR) was utilized in processing multifactor analysis. Only cases with complete data were included in the analysis. Statistical significance was set at $P<0.05$.

Results

Pilot study

Participants

Three hundred and sixty-two eligible questionnaires were included in the pilot study from 395 participants, with a valid response rate of 91.65%. The mean age of the respondents was 47.41 ± 18.42, and approximately half of them had graduated from college (Table 1).

Table 1

Demographic characteristics of the pilot study sample (n=362)

Demographic characteristics	Physicians (n=71)	Patient (n=291)
Mean age (range)	39.39 (24–64)	49.43 (20–96)
Gender, n (%)		
Male	33(46.5%)	123 (42.3%)
Female	38(53.5%)	165 (56.6%)
Education, n (%)		
College and above	67 (94.4%)	112 (38.5%)

	4 (5.6%)	83 (28.5%)
	0	72 (24.7%)
	0	12 (4.1%)
Setting, n (%)		
Community hospital	42 (59.2%)	130 (44.7%)
General hospital	29 (40.8%)	161 (55.3%)

Confirmatory factor analysis of the C-PPOS

The CFA of the C-PPOS indicated poor model fit (Table 2), which called for further revision.

Table 2

Goodness-of-fit indices of the CFA of the CR-PPOS and the original C-PPOS

Model fit indicator	Two factors (18 items)	Two factors (11 items)	Reference value
χ^2/df	5.04	1.85	<3
P-value	<0.001	<0.001	>0.05
RMSEA	0.11	0.06	<0.08
GFI	0.76	0.94	>0.90
AGFI	0.70	0.90	>0.90
NFI	0.52	0.81	>0.90
IFI	0.58	0.90	>0.90
CFI	0.57	0.90	>0.90

Revision of the C-PPOS

The Cronbach's α of each subscale of C-PPOS was tested as the first step of item reduction. The Cronbach's α of C-PPOS was 0.668, with a Caring subscale score of

0.493 and a Sharing subscale of 0.575, showing poor internal consistent reliability. Hence, items were eliminated in a stepwise manner for each subscale separately until elimination of another item would lead to a decrease in the Cronbach's α of its corresponding dimension. Finally, five out of nine items were retained in the Caring subscale, and eight out of nine items (except for C-PPOS9) were retained in the Sharing subscale.

In EFA, the Bartlett's sphericity test reported a Chi-square value of 112.364 ($p<0.001$) for the Caring subscale and 146.846 ($p<0.001$) for the Sharing subscale. The Kaiser–Meyer–Olkin (KMO) indices for the two subscales were 0.727 and 0.694, respectively. For EFA round 1, all five of the retained items of the Caring subscale were under one principal component, which had an eigenvalue greater than 1 (2.197), explaining 43.949% of the total variance. In the Sharing subscale, C-PPOS4 and C-PPOS10 were removed as they met exclusion criteria. Afterward, EFA was performed again on the six retained items of the Sharing subscale. This time all six items grouped under one principal component (eigenvalue=2.247), which explained 37.448% of the total variance. Subsequently, a fixed two-factor EFA was performed to verify the construct of the merged 11-item scale. The result indicated that the five items of the Caring subscale and the six items of the Sharing subscale were well separated, explaining 41.67% of the total variance.

CFA was performed with the 11-item revised C-PPOS (CR-PPOS, see supplementary appendix), according to the prior model, indicating a more acceptable and greatly improved model fit compared with the original scale (Table 2).

Reliability of the CR-PPOS

The Cronbach's α of the entire CR-PPOS was 0.735, with 0.709 in the Caring subscale and 0.644 in the Sharing subscale. Furthermore, the scores of the two subscales were significantly correlated to the total scale, with Spearman coefficients of 0.744 (Caring) and 0.840 (Sharing), which were higher than those of these two

subscales (0.312). The ICC was 0.787 for the CR-PPOS, 0.911 for the Caring subscale, and 0.602 for the Sharing subscale. The ICC for the 11 single items ranged from 0.481 to 0.812. The correlations were all statistically significant ($p<0.001$), indicating satisfactory test–retest reliability.

Validity of the CR-PPOS

The construct validity was well verified through EFA and CFA (see above). As for content validity, the 11 items' scores and their corresponding subscales' scores were all significantly correlated ($p<0.01$), with Spearman coefficients ranging from 0.452 to 0.717.

Discriminative power of the CR-PPOS

The CR values of the 11 items were all less than 0.01, reaching statistically significant levels. Thus, the items retained in the CR-PPOS had good discriminative power.

Formal study

Participants

Six hundred and fifty-six eligible questionnaires out of 792 participants were retrieved in this stage, with a valid response rate of 82.83%. One hundred and sixteen physicians and 540 patients were included. Respondents' demographic information is partly shown in Tables 3 and 4.

Table 3

Physicians' demographic characteristics (partly) and CR-PPOS scores

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total
Gender				
Male	43 (37.1%)	4.75±0.95	2.81±0.79	3.62±0.62

*		Female	73 (62.9%)	4.68±0.74	3.01±0.77	3.68±0.57
p<0.05		P value		0.666	0.166	0.648
		Age (Group)				
Table 4 Patients' demographic characteristics (partly) and CR-PPOS scores		–35	50 (43.1%)	4.78±0.96	2.89±0.71	3.69±0.61
		–50	52 (44.8%)	4.69±0.63	2.92±0.85	3.63±0.52
		51–	10 (8.7%)	4.74±0.36	3.33±0.66	3.90±0.41
		P value		0.827	0.247	0.363
		Education				
		Senior school or below	2 (1.7%)	4.20±0.00	3.00±0.17	3.41±0.14
		College	71 (61.2%)	4.69±0.87	3.04±0.76	3.69±0.64
		Postgraduate	42 (36.2%)	4.78±0.75	2.75±0.80	3.61±0.51
		P value		0.572	0.161	0.672
		Marriage status				
		Married	89 (76.7%)	4.69±0.76	2.91±0.77	3.64±0.53
		Unmarried	26 (22.4%)	4.88±0.82	3.08±0.74	3.82±0.61
		P value		0.270	0.318	0.149

Demographic characteristics	Number (percentage)	Caring subscale	Sharing subscale	CR-PPOS total
Gender				
Male	195 (36.1%)	4.11±0.95	3.17±0.74	3.49±0.71
Female	330 (61.1%)	4.07±0.96	3.09±0.77	3.44±0.69

P value		0.574	0.295	0.468
Age (Group)				
–35	175 (32.4%)	4.24±0.91	3.32±0.68	3.59±0.67
–50	102 (18.9%)	4.00±1.00	3.02±0.83	3.37±0.75
–65	129 (23.9%)	3.93±1.02	3.00±0.76	3.35±0.72
66–	107 (19.8%)	4.14±0.86	3.12±0.77	3.50±0.64
P value		0.034*	0.001*	0.009*
Education				
Primary school or below	39 (7.2%)	3.93±1.00	2.97±0.81	3.29±0.78
Junior school	112 (20.7%)	3.89±0.95	2.99±0.77	3.29±0.67
Senior school	162 (30.0%)	4.06±0.95	3.12±0.71	3.46±0.69
College or above	203 (37.6%)	4.26±0.93	3.23±0.80	3.59±0.70
P value		0.007*	0.030*	0.002*
Personal income (CNY)				
<1500	23 (4.3%)	3.91±0.93	2.96±0.83	3.27±0.61
–3000	105 (19.4%)	3.83±1.02	2.96±0.83	3.23±0.77
–5000	192 (35.6%)	4.14±0.95	3.16±0.79	3.51±0.71
–10000	115 (21.3%)	4.17±0.94	3.13±0.68	3.54±0.63
10000–	70 (13.0%)	4.11±0.97	3.26±0.73	3.48±0.73
P value		0.048*	0.088	0.006*
Experience as medical staff				

Yes	27 (5.0)%	3.67±1.07	2.84±0.76	3.12±0.80
No	241 (44.6%)	4.05±1.00	3.22±0.75	3.46±0.75
P value		0.071	0.013*	0.028*

*p<0.05

Comparison of physicians' and patients' CR-PPOS scores

The physicians received an average CR-PPOS score of 3.66±0.59, and the patients' average score was significantly lower (3.46±0.70). The physicians scored higher in Caring (4.71±0.82 vs. 4.08±0.95), while the patients scored higher in Sharing (3.13±0.76 vs. 2.94±0.78). The differences were all statistically significant (p<0.05).

Demographic characteristics and CR-PPOS scores

The scores of physicians and patients with distinct demographic characteristics were compared, as partly listed in Tables 3 and 4. Both patients' age and education level were significantly associated with their scores on the Caring subscale(p<0.05), the Sharing subscale(p<0.001) and the total CR-PPOS(p<0.01). Patients' income was only significantly associated with the Caring subscale score(p<0.05) and the total CR-PPOS score(p<0.01). Furthermore, patients' experience as medical staff was likely to improve their scores on the Sharing subscale(p<0.05) and the total CR-PPOS(p<0.05). However, no associations of such were found among physicians.

Physicians' burnout and CR-PPOS scores

The burnout level of physicians was measured by the MBI-GS. According to the data, the group of "relatively severe" (scoring 3–5) and the group of "extremely severe" (scoring 5 or above) were merged as a "severe" group (scoring 3 or above), compared with the "light" group (scoring 3 or below). Physicians who reported "severe" burnout scored significantly lower in both the Caring subscale and the total scale than those

reporting “light” burnout.

Physicians’ medical communication competency and CR-PPOS scores

Ninety-nine percent of physicians completed the MCCS, which was used to assess the medical communication competency of both physicians and patients. Although physicians were normally assessed by their patients using MCCS, we transformed this into a self-reported scale for physicians in this study. The results indicated that, although the scores of the four dimensions of MCCS were related, no correlation was found between the MCCS scores and the CR-PPOS scores as well as its subscales.

Patients’ anxiety and depression and CR-PPOS scores

Five hundred and two patients finished the HADS, an instrument for rapidly screening anxiety and depressive symptoms among clinic physicians and patients. With the cut-off point of 11, 309 patients (57.2%) were determined to be anxiety-positive, and 277 (51.3%) were determined as depression-positive. Meanwhile, it should be noticed that HADS can only be used for screening purposes[34], so the positive results cannot be equal to the anxiety/depression with clinical significance.

As anxiety and depressive symptoms were highly comorbid[35], a two-way ANOVA was performed as the first stage to explore whether an interaction effect existed. It turned out that there was no interaction effect between anxiety and depression. Anxiety was found to lead to a decrease in patients’ scores on both the Caring subscale ($p<0.01$) and the total CR-PPOS ($p<0.05$). However, patients’ scores on neither the total scale nor the subscales seemed to be influenced by their depressive symptoms.

Patients’ health literacy, PCCS, and CR-PPOS scores

Using the three-item Rapid Health Literacy Scale, no statistical difference was found in the total CR-PPOS score and the two subscale scores between the poor literacy group and the adequate literacy group, while patients’ health literacy scores showed a

significantly positive correlation with their Sharing subscale scores (r_s=0.112, p=0.011). Similarly, patients' confidence in medical communication, as measured by PCCS was inversely correlated with their scores on the Sharing subscale (r_s=-0.261, p<0.001). In the following partial correlation tests, the correlation between PCCS and the Sharing subscale score remained significant after controlling for the health literacy score (r_s=-0.232, p<0.001), while no correlation existed between the health literacy score and the Sharing subscale score after controlling for PCCS.

Multivariable analysis

After testing the feasibility, MLR showed that the total burnout level might be an influential factor for the physicians in Caring and total CR-PPOS scores, and more factors were associated with the CR-PPOS scores of the patients (Table 5).

Table 5

Variables influencing CR-PPOS scores

Dimension	Variables	B	95% CI	P
Physicians				
Caring subscale	Total burn-out	-0.417	(-0.801, -0.033)	0.034
Sharing subscale	-	-	-	-
CR-PPOS total	Total burn-out	-0.341	(-0.611, -0.071)	0.014
Patients				
Caring subscale	Age (Group)	-0.292	(-0.499, -0.086)	0.006
	Education	0.251	(0.079, 0.423)	0.005
	Experience as medical staff	0.538	(0.046, 1.029)	0.032
Sharing subscale	Age (Group)	-0.202	(-0.361, -0.043)	0.013

	Education	0.169	(0.039, 0.299)	0.011
	Experience as medical staff	0.481	(0.109, 0.852)	0.012
	Marriage status	-0.336	(-0.666, -0.006)	0.046
	Confidence in medical communication	-0.298	(-0.451, -0.146)	<0.001
CR-PPOS total	Age (Group)	-0.242	(-0.396, -0.087)	0.002
	Education	0.222	(0.093, 0.350)	0.001
	Experience as medical staff	0.521	(0.154, 0.887)	0.006

Discussion

Although the PPOS has been widely used in various languages, only a few studies have systematically tested its psychometric property [36-38], and no related results have been reported in China to date. This study showed that neither the ICC of the overall 18-item C-PPOS nor its two subscales were above 0.7, which was comparable to the existing research. Deletion of items 9 and 17 improved the Cronbach's α, which is consistent with a study conducted in Sri Lanka[39]. After modification, the two subscales of the 11-item PPOS were well separated in a fixed-factor EFA, with better indexes than prior similar studies, and the overall scale validity was reconfirmed by CFA. Taking into account the test–retest reliability and discriminative power, the 11-item CR-PPOS obtained better psychometric property than the original 18-item scale. Thus, the CR-PPOS is considered to have greater applicability in the Chinese context.

Using the 11-item CR-PPOS, physicians and patients indicated similar trends in the achieved scores. In the overall scale, they both obtained medium scores (around the median value of 3.5), and both had relatively high Caring scores (over 4.0) and low Sharing scores (around 3.0 or below). This indicated that, although physicians and

patients generally showed a medium level of patient-centeredness in clinical communication, they expressed higher preferences toward caring from a biopsychosocial perspective than shared information and involvement in decision making. Although the physicians' data is still absent in China, the 95% confidence interval of the mean score of patients in this study slightly overlapped with that of the prior study[22], which implied that Chinese patients might express similar preferences toward patient-centered communication, regardless of the regions they were living in. The differences between the scores of physicians and patients, however, may still prompt the gap in Chinese physicians and patients regarding their understanding and expectations in clinical communication. Comparing the data of this study with that from abroad, the majority showed a similar pattern that physicians were more patient-centered in Caring than in Sharing, but there were still two exceptions; the surveys conducted in Portugal and Australia indicated opposite results[40,41], which may be due to the difference in physician training modes and local health systems. Thus, further research is needed to determine the reasons for such a distinction.

Preference toward patient-centered communication, as measured by the PPOS, has been reported to be influenced by both personal characteristics and social environmental factors. This study represents the first attempt to detect the potential influential factors of patient-centered communication among Chinese physicians. The results showed no association between the CR-PPOS scores and physicians' gender, age, education level, career length, or type of setting. These results were consistent with several prior studies in other countries, though female physicians were found to score significantly higher than their male colleagues in some studies [42,43]. Apart from these factors, which were frequently mentioned in the existing research, we found that burnout level might exert impact on physicians' PPOS total score as well as their Caring subscale score, indicating that physicians with a higher total burnout level were generally less likely to be patient-centered in clinical communication. Although we assumed that poor communication ability might relate to a lower preference for patient-centeredness in communication, no link was found between physicians'

medical communication competency, as measured by MCCS and their PPOS scores in this study.

As Ting[22] reported, age and education mainly influenced Chinese patients' overall preference on patient-centered communication. In this study, younger and/or better-educated patients also expressed a higher preference for patient-centered communication in both the Caring and Sharing dimensions. Although some studies have reported a gender difference[36,39,44,45], it seemed that for Chinese patients, age and education level, rather than gender, contribute to the different preferences toward patient-centered communication. Meanwhile, the type of setting and socio- economic status are not considered as influential factors, which was controversial[46]. One interesting find was that possessing experience as medical staff decreased the extent to which patients wanted a patient-centered communication style. A plausible explanation is that those who had worked as medical staff had obtained a more comprehensive understanding of how hospitals function than those who had not. Thus, they subconsciously lowered their expectation of a patient-centered manner in communication, which might raise the demand for physicians, due to their sympathy toward the physicians for their heavy workload. Further, although anxiety seemed to be influential in single factor analysis, the association between the CR-PPOS score and anxiety disappeared in the multivariable analysis, implying that anxiety was more likely to be a confounder. Meanwhile, there is a need to further probe the role of patient communication confidence, as well as its seeming mediation effect on the relationship between patients' health literacy and preference for shared information and decision making.

The main limitation of this study lies in that, due to feasibility considerations, the participants were only recruited from a limited number of medical units, and a convenient sampling strategy was adopted. Hence, though we have made some efforts to reduce it, selection bias might still be a major issue, which could influence the external validity of the findings in this study. Namely, although the CR-PPOS itself can be well generalized to other studies aiming at a Chinese-speaking population, the

extent to which patient-centered communication is preferred and how it is influenced can be different. Another point to be noticed is, as the CR-PPOS was developed from the PPOS following a standardized statistical process, without any extra items being added to keep the numbers of items constant, it may be inappropriate to directly compare the scores measured by the CR-PPOS and the PPOS.

Considering the deteriorating physician-patient relationships in current Chinese society, this study has significant implications for medical practice. With the valid instrument CR-PPOS, on one hand, the divergence in communication preference between physicians and patients can be discovered. On the other hand, it will be possible and reasonable to link certain personal characteristics with individuals' preference toward clinical communication, and in China that is particularly true for patients according to this study. Based on these findings, specific training can be developed and offered to physicians, guiding them on how to recognize patients with different communication preferences and to adopt corresponding communication strategies afterwards. In this way not only patients' expectations are better fulfilled, but communication efficiency is also enhanced, both contributing to reduced complaints in clinical communication, and improved physician-patient relationships[47].

Conclusion

The CR-PPOS was developed as an applicable instrument to measure the preference toward patient-centered communication of physicians and patients in a Chinese context. Physicians and patients were generally more patient-centered in medical communication regarding overall biopsychosocial care than with respect to shared information and decision making, but there were still significant gaps between physicians and patients in the extent to which they prefer this type of communication. Relieving burnout could help physicians to be more patient-centered in communication. Patients of a young age, high education level, and with medical staff experience tended to have a higher preference toward patient-centered

communication.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: Jie Wang had financial support from the China Postdoctoral Science Foundation for the submitted work, Fan Wang has received funds from Shanghai Health and Family Planning Commission; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Ethics committee approval information: The study was approved by Fudan University School of Public Health Institutional Review Board (No. IRB#2015-12-0575).

Contributors: Jie Wang was granted research funding, engaged in the study design and data analysis, and was the main drafter of the Introduction and Discussion sections; Runyu Zou led the study design, data collection, and data analysis, and also drafted the Method, and Results sections of the manuscript; Hua Fu and Fan Wang were the co-principal investigators of this project, were granting research funding, and mentored in the study design, data collection, and article revision. They also issued the final approval for submission; Haihong Qian and Yueren Yan contributed to data collection and refining the article. All authors have approved the final version of this manuscript.

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Data Sharing Statement: Extra data from this study could be accessed by contacting the corresponding author Fan Wang via wangfan512@126.com.

Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information backs up the case the authors are making.

Reference

1 Balint E, Ball D, Hare M. Training medical students in patient-centered medicine, *Compr Phychiatry*1969;10:249-58.

2 Hirono I, Hideki H, Takahiro K. The evolving concept of "patient-centeredness" in patient-physician communication research, *Soc Sci Med*2013;96:147-53.

3 Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington (DC):National Academies Press 2001:39-40.

4 Mohammed A, Mannan F, Chaudhry Z, et al. Quality of care in university hospitals in Saudi Arabia: a systematic review. *BMJ Open*2016;6(2):e008988.

5 Catro EM, van Regenmortel T, Vanhaecht K, et al. Patient empowerment, patient participation and patient-centeredness in hospital care: A concept analysis based on a literature review. *Patient Educ Couns*2016;99:1923-39.

6 Skelton J. Language and Clinical Communication: this bright Babylon. Oxford: Radcliffe Publishing 2008:93-98.

7 Stewart M, Brown JB, Weston WW, et al. Patient-centered medicine: transforming the clinical method, 2nd edn. United Kinddom: Radcliffe Medical Press 2003:5-16.

8 Hudon C, Fortin M, Haggerty JL, et al. Measuring patients' perceptions of patient-centered care: a systematic review of tools for family medicine. *Ann Fam Med*2011;9:155-64.

9 Epstein RM, Franks P, Fiscella K, et al. Measuring patient-centered communication in patient-physician consultations: theoretical and practical issues. *Soc Sci Med*2005;61:1516-28.

10 Bensing JM, Verhaak PF, van Dulmen AM, et al. Communication: the royal pathway to patient-centered medicine. *Patient Educ Couns*2000;39:1-3.

11 Mead N, Bower P. Patient-centeredness: a conceptual framework and review of the empirical literature. *Soc Sci Med*2000;51:1087-10.

12 Taylor K. Paternalism, participation and partnership-the evolution of patient-centeredness in the consultation. *Patient Educ Couns*2009;74:150-55.

13 Greenfield S, S. Kaplan, J. Ware, E.M. Yano, H. Frank, Patients' participation in medical care. *J Gen Intern Med*1988;88:448–57.

14 Marinker M. From compliance to concordance: achieving shared goals in medicine taking. *Brit Med J*1997;314:747–8.

15 Schiavo R. Health Communication: From Theory to Practice, 2nd edn. San Francisco: Jossay-Bass 2013:195-96.

16 Morris MA, Clayman ML, Peters KJ, et al. Patient-centered communication strategies for patients with aphasia: discrepancies between what patients want and what physicians do. *Disabil Health J*2015;8:208-15.

17 Krupat E, Hiam CM, Fleming MZ, et al. Patient-centeredness and its correlates among first year medical students. *Int J Psychiatry Med*1999;29:347-56.

18 Kim J. Differences in attitude toward patient-centeredness in patients and physicians. *Korean J Med Educ*2013;25:149-56.

19 Ishikawa I, Eto M, Kitamura K, et al. Resident physicians' attitudes and confidence in communicating with patients: A pilot study at a Japanese University hospital. *Patient Educ Couns*2014;96:361-66.

20 Tsimtsiou Z, Kirana PS, Hatzichristou D. Determinants of patients' attitudes toward patient-centered care: A cross-sectional study in Greece. *Patient Educ Couns*2014;97:391-95.

21 Dockens AL, Bellon-Harn ML, Manchaiah V. Preference to patient-centeredness in pre-service speech and hearing sciences students: a cross-sectional study. *J Audiol*

*Otol*2016;20:73-9.

22 Xu T, Bao Y, Liang Y, et al. Patient perception and the barriers to practicing patient-centered communication: A survey and in-depth interview of Chinese patients and physicians. *Patient Educ Couns*2016;99:364-69.

23 Krupat E, Rosenkranz SL, Yeager CM, et al. The practice orientations of physicians and patients: the effect of doctor-patient congruence on satisfaction. *Patient Educ Couns*2000;39:49-59.

24 Moore M. What does patient-centered communication mean in Nepal? *Med Educ*2008;42:18-26.

25 Hair Jr JF, Black WC, Babin BJ, et al. Multivariate Data Analysis, 7th edn. Beijing: China Machine Press 2011:100-123.

26 Raosoft Inc. Sample size calculation [online]. www.raosoft.com/samplesize.html.

27 Tran A, Haidet P, Street R, et al. Empowering communication: a community-based intervention for patients. *Patient Educ Couns*2004;52:113-21.

28 Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med*2004;36:588-94.

29 Cegala DJ, Coleman MT, Warisse J. The development and partial test of the Medical Communication Competence Scale (MCCS). *J Health Commun*1998;10:261-88.

30 Ponterotto JG, Ruckdeschel DE. An overview of coefficient alpha and a reliability matrix for estimating adequacy of internal consistency coefficients with psychological research measures. *Percept Mot Skills*2007;105:997-1014.

31 Osborne JW, Costello AB. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract Assess Res Eval* 2005;10:1-9.

32 Brown TA. Confirmatory factor analysis for applied research, 2nd edn. New York: The Guilford Press 2015:67-73.

33 Backhoff E, Larrazolo N, Rosas M. The level of difficulty and discrimination power of Basic Knowledge and Skill Examination (EXHCOBA). Revista Electrónica de Investigación Educativa 2000;2:1-16. Retrieved on December 20, 2016 from:

http://redie.uabc.mx/vol2no1/contents-backhoff.html

34 Snaith RP. The hospital anxiety and depression scale. Health Qual Life Outcomes2003;1:29.

35 Wu Z, Fang Y. Comorbidity of depressive and anxiety disorders: challenges in diagnosis and assessment. Shanghai Arch Psychiatry2014;26:227-31.

36 Krupat E, Yeager CM, Putnam S. Patient role orientations, doctor-patient fit, and visit satisfaction. *Psychol Health*2000;15:707-19.

37 Pereira CM, Amaral CF, Ribeiro MM, et al. Cross-cultural validation of the Patient-Practitioner Orientation Scale. Patient Educ Couns2013;91:37-43.

38 Kiessling C, Fabry G, Rudolf Fisher M, et al. German translation and construct validation of the Patient-Provider Orientation Scale(PPOS-D12). *Psychother Psychsom Med Psychol*2014;64:122-27.

39 Mudiyanse RM, Pallegame RW, Jayalath T, et al. Translation and validation of the Patient-Practitioner Orientation Scale in Sri Lanka. *Educ Health(Ablingdon)* 2015;28:35-40.

40 Laplante-Levesque A, Hickson L, Grenness C. An Australian survey of audiologists' preferences for patient-centeredness. *Int J Audiol*2014;53:S76-82.

41 Manchiaih V, Gomersall PA, Tome D, et al. Audiologists' preferences for patient-centeredness: a cross sectional questionnaire study of cross-cultural differences and similarities among professionals in Portugal, India and Iran. *BMJ Open*2014;4:e005915.

42 Abiola T, Udofia O, Abdullahi AT. Patient-doctor relationship: the practice orientations of doctors in Kano. *Niger J Clin Pract*2014;17:241-47.

43 Mann KJ, Hoffman A, Miller D, et al. The effect of a patient- and family-centered care curriculum on pediatric residents' patient-centeredness. *J Grad Med Educ*2013;5:36-40.

44 Krupat E, Hsu J, Irish J, et al. Matching patients and practitioners based on beliefs about care: Results of a randomized controlled trial. *Am J Manag Care* 2004;10:814-22.

45 Lau SR, Christensen ST, Andreason JT. Patients' preferences for patient-centered

communication: a survey from an outpatient department in rural Sierra Leone. *Patient Educ Couns*2013;93:312-18.

46 Little P, Everitt H, Williamson I, et al. Preferences of patients for patient-centered approach to consultation in primary care: observational study. *BMJ*2001;322:468-72.

47 Liu X, Rohrer W, Luo A, et al. Doctor-patient communication skills training in mainland China: A systematic review of the literature. Patient Educ Couns2015;98:3-14.

Appendix

The CR-PPOS (English version)

Caring subscale

During clinical process, doctors will be suspected of prying the privacy of patients when they ask patients a lot about personal backgrounds.

If a doctor's diagnosis and treatment levels are high enough, the way of his/her communication with patients is not so important.

If a doctor spends too much honesty and enthusiasm in the doctor-patient communication, he/she wouldn't have made great achievements.

Most patients in clinics want to leave the doctors' office as soon as possible(so as to reduce the time communicating with doctors)

For doctors, knowing the patient's culture and backgrounds is not very important for treating illness.

Sharing subscale

During clinical process, doctors should be the ones who dominate the conversation.

Patients should rely on doctor's professional skills during clinical process and should not try to find out the answers to their medical conditions by themselves.

Many patients keep asking questions to doctors, although they are not necessarily getting more new information.

During the clinical process, if a patient does not agree with the opinions of a doctor, then it means that the doctor doesn't get the patient's respect and trust.

During clinical process, patients should always be aware that doctors are dominant.

It is usually not very helpful if patients search for medical information on their own-instead, they could be even more confused.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6,7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6,7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8,9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8,9
		(*b*) Describe any methods used to examine subgroups and interactions	9
		(*c*) Explain how missing data were addressed	7,9
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9,12
		(b) Give reasons for non-participation at each stage	9,12
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9,10,12-15
		(b) Indicate number of participants with missing data for each variable of interest	9,12-16
Outcome data	15*	Report numbers of outcome events or summary measures	10-12,15
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	17,18
		(*b*) Report category boundaries when continuous variables were categorized	16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	16
Discussion			
Key results	18	Summarise key results with reference to study objectives	18,19
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20,21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	21
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22,23

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.