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To cite this article: Piper Liping Liu, Lianshan Zhang, Xiaofen Ma & Xinshu Zhao (2023): Communication Matters: The Role of Patient-Centered Communication in Improving Old Adults' Health Competence and Health Outcomes, Health Communication, DOI: [10.1080/10410236.2023.2166209](https://doi.org/10.1080/10410236.2023.2166209)

To link to this article: <https://doi.org/10.1080/10410236.2023.2166209>



Published online: 10 Jan 2023.



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# Communication Matters: The Role of Patient-Centered Communication in Improving Old Adults' Health Competence and Health Outcomes

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## ABSTRACT

Research has demonstrated links between patient-centered communication (PCC) and patients' health outcomes. However, little is known about the underlying processes that may mediate the relationship. This study is one of the first to examine the influence of PCC on older adults' health outcomes, as well as the mediation role of health competence, from a longitudinal perspective. With a general basis of Street et al.'s pathway model, we proposed and tested mediation pathways linking patient-centered communication to the older population's general and mental health, mediated by health competence. Data from 2011, 2017 and 2020 iterations of the Health Information National Trends Survey (HINTS) were used for this study. This study focused on older adults aged 60 and above. Results indicated that after controlling participants' age, gender, education, income and race, PCC is related to the older people's health outcomes either directly or indirectly, irrespective of time series. Specifically, health competence was found to significantly mediate the associations between PCC and the older adults' general health or mental health over the three iterations. Noteworthy, findings from this study also revealed that different dimensions of PCC might exert different influences on older patients' health competence and health outcomes.

The older population aged 60 and above is the fastest-growing segment of the U.S. population. It has been estimated that by 2030, about 20% of the U.S. population will be 65 and older (U.S. Census Bureau, 2018). Older adults are also the heaviest users of medical services, posing great challenges to health care systems in the United States (U.S. Department of Health and Human Services, 2020). Understanding factors that contribute to the improved health of older adults is thus critically important and necessary for the welfare of society. Patient-centered communication (PCC) is espoused as the key to quality health care that foregrounds patients' values and preferences in medical consultations (Epstein et al., 2010). However, prior literature has documented different voices concerning the effectiveness of PCC on health and well-being. Ample studies have demonstrated that PCC is desirable given that it is associated with adherence to healthy lifestyles, better clinical outcomes, improved quality of life, and reduced negative affect (e.g., Kim & Park, 2017; Stewart, 1995; Zhang & Jiang, 2021; Zwingmann et al., 2017). Nonetheless, other empirical studies have questioned the effectiveness of PCC, on the grounds of negative or no associations with health outcomes or health behaviors (e.g., De Haes, 2006; Epstein et al., 2017; Silk et al., 2008).

The mixed findings might be due to three reasons. First, prior research predominantly focused on the direct effect of PCC on health outcomes, and failed to examine the underlying mechanisms linking communication to health outcomes (Street et al., 2009). In particular, Street et al. (2009) pinpointed

that the fundamental process that explicates how communication impacts patients' health is one of the most understudied areas of communication research, highlighting the necessity of exploring potential mediators linking PCC to health outcomes. Second, despite that the older population is at higher risk of contracting illness and has greater need for healthcare services (Jiang, 2019), inadequate research focused on this vulnerable population. As people age, their health needs tend to be more complex along with declining physical and mental capacity. As such, compared to their younger counterparts, older people have unique health needs, different preferences and expectations of their communication with providers during medical visits (Jayadevappa, 2017; Tang & Guan, 2018). In light of this, additional research is needed to explore the effectiveness of PCC and the working mechanism that links PCC to distal health outcomes, particularly for older adults. Third, over the past decade, the rise of health consumerism and the increasing emphasis on patients' rights and autonomy have empowered patients and promoted PCC as an ideal communication style in comparison to physician-centered communication (Kilbride & Joffe, 2018). The changing healthcare environment may be another reason to explain the contradictory research findings regarding the influence of PCC on health outcomes.

To address the aforementioned research gaps, this study examined relationships between PCC and health outcomes (e.g., general health and mental health) among older populations directly and indirectly through a crucial mediator – health competence – that is particularly relevant to older

adults. A sense of health competence reflects the degree to which an individual feels confident to perform self-care activities for effective health management (Bakes et al., 1993). The integration of Street et al.'s (2009) pathway model of health communication and self-determination theory (SDT) (Deci & Ryan, 1985) provides a proper framework for understanding the mediating process between PCC and health outcomes. According to Street et al. (2009), PCC is likely to increase health competence which is reflected in patients' belief in their ability to execute behaviors for health maintenance and subsequently contributes to better health. Patients are trusted to grasp and value information in addition to having their questions addressed and assisted in sharing decision-making power (Epstein & Street, 2011). This is because by adopting the PCC philosophy, doctors will give detailed explanations, offer professional opinions, perform medical follow-ups, and engage patients in the healthcare decision-making process (Liu & Yeo, 2021; Trivedi et al., 2021; Xiang & Stanley, 2017). PCC becomes a strategy used by health providers to fulfill patients' demands for competence while minimizing uncertainty (Totzkay et al., 2017). As a result, patients become more confident in their ability to perform self-care, which eventually contributes to improved health outcomes. In light of SDT, implementing PCC techniques, such as facilitating patient involvement in making participatory decisions that are concordant with their values and preferences, would address patients' psychological needs for competence, which further benefit their health (Deci & Ryan, 1985; Totzkay et al., 2017).

As a core value in medicine, in 2011, PCC enables us to save healthcare costs due to the reduction of diagnostic tests (Stewart et al., 2011). In 2017, (Bashir and Strekalova 2017) concluded that PCC can be a significant predictor of health information literacy, and then literacy predicts cancer prevention self-efficacy. Then, scholars advocated for dialogical communication, such as patient feedback, to help improve the quality of PCC in public hospitals (Wong et al., 2020). Despite PCC being a more recent and newer focus, little is known about its trends over time and in what ways it has influenced older adults' healthcare as time passes. Hence, a trend analysis will be valuable in informing scholars about current patterns and future directions for implementing PCC. Accordingly, this study employed a nationally representative survey, the Health Information National Trends Survey (HINTS), with extended data over 10 years, to assess the potential trends among the relationships between PCC and its health outcomes. Given the data availability and to include the same variables and measurement scales across the datasets, this study employed three iterations of HINTS, from 2011, 2017, and 2020, to explore to what extent the investigated relationships have changed over time.

## Literature review

### Conceptual framework

The conceptual framework draws from Street et al.'s (2009) pathway model linking clinician-patient communication to health outcomes. Specifically, Street et al. (2009) proposed both direct and indirect pathways linking PCC to improved

health outcomes. On the one hand, PCC may improve one's health and well-being in a straightforward way. For instance, nonverbal cues and empathic conversations in PCC can alleviate patients' negative emotions (e.g., anxiety and despair). On the other hand, in most situations, Street et al. (2009) contended that PCC exerts indirect effects on health outcomes through proximal and intermediate outcomes. More accurately, PCC could influence patients' health through proximal outcomes of communication (e.g., shared understanding and patient involvement) and intermediate outcomes (e.g., self-management skills and social support) in sequence. Meanwhile, the intermediate factors can also mediate the relationship between PCC and distal health outcomes. In particular, Street et al. (2009) conceptualized seven potential intermediate outcomes including access to needed care, a high-quality medical decision, commitment to treatment, trust in the system, social support, self-care skills, and emotional management. For example, a doctor's clear explanation of the risks and benefits of various treatment options from a patient's point of view helps establish a shared understanding, which would prompt patients' commitment to treatment and ultimately improve patients' health such as disease control.

In light of the abovementioned framework, a growing body of research has explicated the underlying processes to explain why PCC contributes to improved health. However, two important research gaps remain in the current literature. First, PCC is recognized as multidimensional, which involves six essential communication functions such as exchanging information, responding to emotions, and managing uncertainty (Epstein & Street, 2007). Although previous research has confirmed that PCC as a whole is beneficial to distal health outcomes directly or indirectly through certain intermediate outcomes, it remains unknown which particular element of communication is associated with health outcomes (Street et al., 2009). Therefore, a more precise examination investigating different dimensions of PCC can contribute to a more nuanced understanding of the impact of PCC. Second, given that older adults have different preferences, expectations, and healthcare needs when communicating with health care providers (Tang & Guan, 2018), it is worthwhile to investigate how different segments of PCC may vary in their influence on the older population's health.

### PCC and health outcomes

PCC is regarded as an ideal communication approach and a key indicator of quality care in improving health outcomes and well-being (Epstein et al., 2010). In view of its considerable benefits, PCC is largely advocated and widely incorporated in medical training programs across cultures (e.g., Hawkins & Mitchell, 2018; Liu et al., 2015; Semedo et al., 2020). In the National Cancer Institute (NCI) monograph by Epstein and Street (2007), PCC has been outlined as having six core functions: 1) exchanging information, 2) responding to emotions, 3) managing uncertainty, 4) fostering healing relationships, 5) making decisions, and 6) enabling patient self-management. Although each of these elements has a unique contribution to collaborative interactions between patients and providers, they share a common goal of PCC to incorporate the needs, values,

and preferences of each individual patient to ensure patient participation in clinical decision-making (Epstein & Street, 2007). Indeed, PCC as an innovative concept in policy and practice is a comprehensive approach to healthcare delivery service (Miles & Mezzich, 2011). In addition, HINTS 4 Cycle 2 (2012) as a source of data on cancer survivors has been used to investigate the relationship between treatment summary receipt, PCC and quality of care (QOC) (Blanch-Hartigan et al., 2015), and they demonstrated that treatment summary receipt was associated with five of the six PCC functions and QOC, positively. However, this study was limited to a year-end 2012 cross-sectional analysis and a small sample size. Changes in the use of treatment summaries that may have altered PCC cannot be captured by such data collected at a single point in time. As PCC grows, trend analysis becomes necessary to provide health researchers with a comprehensive understanding of trends toward the association between PCC and health outcomes so as to better inform health communication agendas and improve the healthcare system. Hence, the use of multiple cycles of HINTS data to establish a trend analysis among PCC, health competence, and health outcomes is pivotal.

As Street et al. (2009) noted, in some cases, PCC is therapeutic to directly improve patients' health outcomes. Providers sophisticated in using a warm tone of voice and nonverbal cues (e.g., facial expressions of attentiveness) can help attenuate patients' emotional distress. A systematic review examining the effectiveness of empathy in medical consultations concluded that empathetic communication has direct effects on various health outcomes such as patient adherence, patients' anxiety and distress, and better clinical outcomes (Derksen et al., 2013). We can anticipate a more prominent influence of PCC on older adults who may suffer from functional impairments (e.g., hearing deficits) and are in great need of affectionate interactions (Gorawara-Bhat & Cook, 2011). Hesse and Rauscher (2019) also found that quality doctor-patient communication with an affectionate exchange of information is positively related to patients' adherence to medical advice and treatment. It should be noted that older adults are more vulnerable to chronic diseases (e.g., cancer, heart disease, and diabetes) than younger people and have more complex health care needs (Jayadevappa, 2017). Their participation in medical consultations is thus essential for doctors to understand their needs and to provide appropriate treatments in fulfilling their unique health care requirements. However, older adults are found to be less capable of communicating their concerns and preferences with health care providers (Wolff & Roter, 2012). It is thus more challenging to establish partnerships in physician – elderly patient interactions due to older adults' health literacy deficits and functional limitations (Fiscella & Epstein, 2008). Therefore, the delivery of patient-centered care – spending enough time to encourage patients to express their needs and barriers to adherence, confirming patients' clear understanding, responding to and addressing patients' emotions, and establishing rapport and trust – is particularly important for older adults to ensure that their voice is heard and their needs are addressed. Research also provided empirical support for the importance of implementing PCC in improving older adults' health and well-being. For

example, a meta-analysis of 19 clinical trials of PCC intervention for patients with dementia (aged over 70 years old on average) concluded that PCC intervention can not only benefit the older patients' clinical outcomes (e.g., less agitation and neuropsychiatric symptoms) but also emotional outcomes such as a lower level of depression and improved quality of life (Kim & Park, 2017). Altogether, the literature is clear that PCC can exert positive influences on older adults' general and mental health, which leads to our first hypothesis:

**H1:** PCC has positive and direct effects on older adults' reports of their (a) general and (b) mental health.

Despite that the positive influence of PCC on individuals' health has been documented in prior literature, it remains unclear how different segments of PCC may vary in improving older adults' health. In a randomized controlled trial of a clinician communication intervention to promote patient-centered care for patients with diabetes, patients in the intervention group reported significantly better communication with doctors, greater treatment satisfaction and higher levels of well-being; whereas, no significant effect on lifestyle change and glycemic control was revealed (Kinmonth et al., 1998). That is, the intervention program for promoting active listening and negotiation skills was more effective in psychological empowerment and patient engagement rather than in clinical improvement. It appears that certain communication functions are more powerful for inducing certain health outcomes. Hence, a general statement that PCC is associated with better health outcomes seems not informative enough because it fails to specify which elements of communication are associated with which specific health outcomes. In light of this, we proposed the following research question to explore whether there is any particular communication function of PCC that might or might not lead to improved health for older adults throughout the years:

**RQ1:** Do different communication functions of PCC influence older adults' reports of their (a) general and (b) mental health differently?

### ***The mediation role of health competence***

In addition to the direct effects discussed above, PCC might exert effects on one's health through more complicated mechanisms via intermediate factors (Street et al., 2009). A major concern for older adults is reduced competence or losing one's independence in taking care of themselves because of age-related declines in physiological functioning (Baltes, 1993). Hence, health competence is a key indicator of older adults' health and well-being. Health competence is generally defined as an individual's ability to perform the activities of daily living necessary for health maintenance (Bakes et al., 1993). PCC is conducive to patients' health competence through several mechanisms. For example, by involving patients in the decision-making process, patients would be

empowered to have more control over their health conditions and treatment options, and this would give rise to their perceived competence to cope with the disease and complications (Jenerette & Mayer, 2016). In addition, patient-doctor communication focusing on patient empowerment such as providing patients with specific skills in managing their health and offering them access to self-care resources (e.g., support groups and community services) can help patients to appraise what resources they have to deal with the threat and increase their ability and confidence in health management (Austin et al., 2019; Nafradi et al., 2017).

Generally speaking, the value of PCC lies in its potential in boosting patients' health competence, through which patients feel capable and confident in managing their health independently (McCormack et al., 2011; Totzkay et al., 2017). Thus, we proposed the following hypothesis and research question:

**H2:** PCC is positively related to older adults' health competence.

**RQ2:** Do different communication functions of PCC influence older adults' health competence differently?

The perception that one has confidence in managing their health has long been implicated as an important driving force in health behaviors. Theoretically, SDT articulates that human beings are innately oriented toward growth and health, and the feeling of competence is one of the intrinsic motivations that drive individuals to pursue health and well-being (Deci & Ryan, 2008; Sheldon et al., 2008). For example, Williams et al. (2005) found that perceived competence was significantly associated with better glycemic control and fewer depressive symptoms. Arora et al. (2002) also revealed that it is patients' perceptions of competence in dealing with their illness that foster their successful coping leading up to their psychosocial health outcomes (e.g., emotional well-being, functional well-being, and social/family well-being). Particularly for older adults, health competence plays a pivotal role in carrying out health care activities. For instance, Marks and Lutgendorf (1999) indicated that perceived health competence is a significant predictor of older patients' engagement in self-care behaviors such as healthy diets and regular exercise. Consistent with the proposition of SDT and prior literature, we postulated that:

**H3:** Health competence is positively related to older adults' reports of their (a) general and (b) mental health.

So far, this study reviewed two established relationships among PCC, health competence, and health outcomes: 1) PCC is positively related to health competence, and 2) health competence is positively associated with older adults' reports of their general and mental health. Given the reviewed two-step relationship among the constructs, one underlying pathway of the effect of PCC on improved health outcomes is likely to be the indirect effect through a mediation path – health competence. Specifically from the theoretical perspective of SDT,

Totzkay et al. (2017) found that PCC indirectly contributed to patients' cancer screening behavior by satisfying patients' needs for competence through "need-supportive communication" (p. 556). They demonstrated that the core of PCC, such as attending to patients' needs and preferences and facilitating informed decision-making, provides patients with a motivator or motivational environment in medical encounters which makes them feel competent and self-determined. Therefore, building upon the literature and in line with Street and colleagues' pathway model, we postulated the following hypothesis to examine the mediating role of health competence:

**H4:** PCC has indirect effects on older adults' reports of their (a) general and (b) mental health, mediated by health competence.

## Methods

### Sample

Secondary data borrowed from three iterations of the National Cancer Institute's Health Information National Trends Survey collected in 2011 (HINTS 4 Cycle 1), 2017 (HINTS 5 Cycle 1), and 2020 (HINTS 5 Cycle 4) were analyzed. HINTS is an annual cross-sectional, national representative survey that collected data on American adults' knowledge, attitudes, and behaviors related to health. The detailed survey design and methodology report can be found on the HINTS website (<http://hints.cancer.gov>). This study focused on older adults aged 60 and above. The final sample included 1,509 participants in HINTS 4 Cycle 1, 1,465 in HINTS 5 Cycle 1, and 1,852 in HINTS 5 Cycle 4.

### Measures

Patient-centered communication (PCC) was measured by seven questions derived from previous research (Trivedi et al., 2021). Respondents were asked on a four-point scale (1 = always, 4 = never) about their communication experience with health professionals during the past 12 months. The seven items include: (1) give you the chance to ask all the health-related questions you had; (2) give the attention you needed to your feelings and emotions; (3) involve you in decisions about your health care as much as you wanted; (4) make sure you understood the things you needed to do to take care of your health; (5) explain things in a way you could understand; (6) spend enough time with you; and (7) help you deal with feelings of uncertainty about your health and health care. Participants' answers to the questions were reversely coded and averaged into a composite score. A higher value represented a higher level of PCC (2011:  $M = 3.39$ ,  $SD = .62$ , Cronbach's  $\alpha = .93$ ; 2017:  $M = 3.44$ ,  $SD = .58$ , Cronbach's  $\alpha = .92$ ; 2020:  $M = 3.46$ ,  $SD = .57$ , Cronbach's  $\alpha = .93$ ).

Health competence was measured by asking participants to indicate the extent to which they are confident about their ability to take good care of their health (Smith et al., 1995). Responses were scored on a five-point scale (1 = completely



confident, 5 = not confident at all). The answers were reversely coded, and a higher score represented a higher level of health competence (2011:  $M = 3.85$ ,  $SD = .87$ ; 2017:  $M = 3.85$ ,  $SD = .86$ ; 2020:  $M = 3.85$ ,  $SD = .80$ ).

General health was measured by a single-item that asked respondents to self-report their perceived general health (DeSalvo et al., 2006). Five response options include excellent, very good, good, fair, and poor. A higher value represented better health (2011:  $M = 3.31$ ,  $SD = .95$ ; 2017:  $M = 3.24$ ,  $SD = .97$ ; 2020:  $M = 3.23$ ,  $SD = .94$ ).

Mental health was measured by four questions, drawn from prior research (Ellis et al., 2015). Participants were asked, over the past 12 weeks, whether they have been bothered by any of the following problems: (1) Little interest or pleasure in doing things; (2) feeling down, depressed, or hopeless; (3) feeling nervous, anxious, or on edge; and (4) not being able to stop or control worrying. Responses were scored on a four-point scale, ranging from 1 = nearly every day to 4 = never, and then averaged with the higher value indicating better mental health (2011:  $M = 3.53$ ,  $SD = .66$ , Cronbach's alpha = .88; 2017:  $M = 3.56$ ,  $SD = .65$ , Cronbach's alpha = .87; 2020:  $M = 3.60$ ,  $SD = .64$ , Cronbach's alpha = .89).

Demographics included respondents' age, gender (1 = male, 0 = female), education (ranging from 1 = less than 8 years to 7 = postgraduate), annual household income (1 = \$0 to \$9,999, 9 = \$200,000 or more), and race (1 = non-Hispanic white, 0 = others).

### Data analysis

SPSS 23 was used for the data analysis. First, the data were managed by replacing missing values as the mean for continuous variables and 0 for dichotomous variables. Second, descriptive analyses were conducted, and several ANOVA tests were performed for the mean comparisons of the study variables across the three iterations. Third, multivariate linear regressions were conducted to analyze each dataset using health competence, mental health and general health as dependent variables, while different types of PCC as independent variables. Fourth, to examine the mediation models, Model 4 of SPSS PROCESS (Hayes, 2013) was used to generate the

bootstrapped confidence interval (CI). Fifth, some moderation analyses using the iterations as groups were performed to better understand how the hypothesized relationships changed over time.

### Results

Socio-demographic characteristics are summarized in Table 1. Throughout the three iterations, the average age was about 70 years, men had slightly lower participation rates (ranging from 40.8% to 44.1%), the majority of participants (ranging from 59.8% to 71.3%) were non-Hispanic white, about half of respondents were high school graduate or had some college, and most of them had an annual household income between \$20,000 and \$49,999.

A series of ANOVA tests were performed, and the comparative statistics in Table 2 showed that there was an upward trend of PCC over the ten years from 3.39 in 2011 to 3.46 in 2020 ( $F(2, 4823) = 6.13$ ,  $p = .02$ ). Specifically, the average levels of the six dimensions of PCC (pcc 1–6) were found to slightly increase ( $F$  ranges from 3.13 to 7.73,  $p < .05$ ). Mental health of the older adults has also been on the rise ( $F(2, 4823) = 4.60$ ,  $p = .010$ ). Whereas, the reported general health declined slightly ( $F(2, 4823) = 3.81$ ,  $p = .022$ ). Meanwhile, health competence remained unchanged across the ten years ( $F(2, 4823) = .04$ ,  $p = .957$ ).

The RQ1 and RQ2 examined how different types of PCC might exert different influences on health competence and older adults' health outcomes. Results in Tables 3–5 offered empirical evidence supporting that different types of PCC might vary in the influence on older adults' health competence and health outcomes. Specifically, it showed that pcc3 (involving patients in decisions about health care) was associated with older patients' health competence, general health or mental health consistently from 2011 to 2020. Some significant relationships between pcc2 (giving attention to patients' feelings and emotions), pcc6 (spending enough time with patients), pcc5 (explaining things in a way that patients can understand), pcc7 (deal with patients' feelings of uncertainty) and health competence were found in the three iterations.

**Table 1.** Sample characteristics.

	2011	2017	2020
Age, Mean (SD, 95% CI)	70.55 (8.03, [70.13, 70.96])	70.27 (7.99, [69.87, 70.72])	70.98 (8.10, [70.60, 71.36])
Gender, N (%)			
Male	646 (42.8%)	598 (40.8%)	816 (44.1%)
Female	863 (57.2%)	867 (59.2%)	1036 (55.9%)
Race, N (%)			
Non-Hispanic White	1076 (71.3%)	1041 (71.1%)	1107 (59.8%)
Others	433 (28.7%)	424 (28.9%)	745 (40.2%)
Education, N (%)			
Less than high school education	193 (12.9%)	126 (8.6%)	160 (8.6%)
High school graduate and some college	844 (55.9%)	815 (55.6%)	1024 (55.3%)
College graduate and higher,	471 (31.2%)	524 (35.8%)	668 (36.1%)
Household income, N (%)			
< \$20,000	331 (21.9%)	276 (18.8%)	363 (19.6%)
\$20,000–\$49,999	698 (46.3%)	586 (40.6%)	743 (40.1%)
\$50,000–\$99,999	340 (22.5%)	391 (26.7%)	463 (25.0%)
>\$99,999	140 (9.2%)	202 (13.7%)	283 (15.3%)
N	1509	1465	1852

**Table 2.** Descriptive statistics of PCC, mental health and general health.

	2011		2017		2020		ANOVA F(2, 4823), <i>p</i>
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	
pcc1**	3.53 (.66)	[3.50, 3.56]	3.57 (.64)	[3.54, 3.61]	3.61 (.60)	[3.58, 3.63]	5.76, .003
pcc2*	3.27 (.80)	[3.23, 3.31]	3.33 (.77)	[3.28, 3.36]	3.34 (.77)	[3.30, 3.37]	3.71, .024
pcc3***	3.37 (.77)	[3.33, 3.40]	3.43 (.70)	[3.40, 3.47]	3.46 (.68)	[3.43, 3.49]	7.73, <.001
pcc4*	3.54 (.64)	[3.50, 3.57]	3.58 (.60)	[3.55, 3.61]	3.59 (.60)	[3.56, 3.61]	3.15, .043
pcc5*	3.55 (.63)	[3.52, 3.58]	3.59 (.59)	[3.56, 3.63]	3.59 (.59)	[3.57, 3.62]	3.21, .040
pcc6**	3.30 (.78)	[3.26, 3.34]	3.39 (.72)	[3.35, 3.43]	3.38 (.73)	[3.35, 3.41]	6.82, .001
pcc7	3.21 (.82)	[3.16, 3.25]	3.24 (.83)	[3.20, 3.29]	3.27 (.81)	[3.23, 3.31]	2.46, .086
PCC**	3.39 (.62)	[3.36, 3.42]	3.44 (.58)	[3.42, 3.48]	3.46 (.57)	[3.44, 3.49]	6.13, .002
Health competence	3.85 (.87)	[3.81, 3.90]	3.85 (.86)	[3.81, 3.89]	3.85 (.80)	[3.81, 3.89]	.04, .957
Mental health*	3.53 (.66)	[3.50, 3.57]	3.56 (.65)	[3.53, 3.60]	3.60 (.64)	[3.57, 3.63]	4.60, .010
General health*	3.31 (.95)	[3.27, 3.36]	3.24 (.97)	[3.19, 3.29]	3.23 (.94)	[3.19, 3.28]	3.81, .022

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; pcc1: chance to ask questions; pcc2: attention to your feelings and emotions; pcc3: involve you in decision-making; pcc4: ensure you understood the things for health care; pcc5: explains things in a way you could understand; pcc6: spend enough time with you; pcc7: help you deal with feelings of uncertainty.

**Table 3.** Regressions testing different types of PCC in predicting mental health.

	Mental health							
	2011		2017		2020		Combined (2011, 2017, 2020)	
	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI
<b>Block 1 Demographics</b>								
Age	.05	[.000, .008]	.06*	[.001, .009]	.06**	[.001, .008]	.06***	[.002, .007]
Gender	.03	[−.021, .111]	.03	[−.023, .110]	.04	[−.013, .103]	.03*	[.006, .078]
Education	.12***	[.025, .067]	.06*	[.003, .047]	.01	[−.017, .022]	.06***	[.011, .037]
Income	.15***	[.033, .071]	.22***	[.054, .091]	.19***	[.044, .075]	.19***	[.050, .072]
Race	.02	[−.042, .104]	−.08**	[−.191, −.044]	−.02	[−.091, .028]	−.03*	[−.082, −.003]
$\Delta R^2$	.06		.07		.04		.06	
<b>Block 2 PCC</b>								
pcc1	−.10**	[−.178, −.028]	.06	[−.019, .142]	.06	[−.012, .133]	.01	[−.039, .059]
pcc2	.04	[−.032, .099]	.02	[−.052, .083]	−.05	[−.096, .019]	<.01	[−.038, .036]
pcc3	.08*	[.001, .135]	.05	[−.023, .125]	.08*	[.008, .140]	.08**	[.027, .111]
pcc4	.04	[−.057, .133]	−.02	[−.114, .071]	.04	[−.040, .127]	.02	[−.036, .080]
pcc5	.10*	[.010, .204]	.07	[−.013, .171]	.03	[−.044, .119]	.06**	[.017, .121]
pcc6	.03	[−.045, .095]	−.01	[−.073, .070]	−.03	[−.094, .035]	<.01	[−.042, .045]
pcc7	−.04	[−.096, .031]	.01	[−.056, .063]	.05	[−.021, .098]	.01	[−.027, .040]
$\Delta R^2$	.03		.03		.03		.02	
$R^2$	.09		.10		.07		.08	
Adjusted $R^2$	.08		.09		.06		.08	
F	11.84***		13.27***		11.63***		34.30***	

The regression coefficients are standardized; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; pcc1: chance to ask questions; pcc2: attention to your feelings and emotions; pcc3: involve you in decision-making; pcc4: ensure you understood the things for health care; pcc5: explains things in a way you could understand; pcc6: spend enough time with you; pcc7: help you deal with feelings of uncertainty.

H1 posited that PCC will be positively associated with older adults' health outcomes. As depicted in Table 6, there was no direct association between PCC and older adults' general health in 2011 and 2017, while a significant and positive relationship between PCC and older adults' general health was revealed in 2020 ( $b = .05$ ,  $p = .019$ ). In 2011, the direct effect of PCC on older adults' mental health was not significant. Whereas, a significant and positive association between PCC and older adults' mental health was found in 2017 ( $b = .08$ ,  $p = .001$ ) and 2020 ( $b = .09$ ,  $p < .001$ ).

H2 predicted that PCC will be positively related to health competence. Results in Table 6 showed that, throughout the three iterations, PCC was positively associated with older adults' health competence (2011:  $b = .30$ ,  $p < .001$ ; 2017:  $b = .25$ ,  $p < .001$ ; 2020:  $b = .24$ ,  $p < .001$ ). Therefore, H2 was supported.

H3 predicted that health competence will be positively associated with older adults' health outcomes. As illustrated in Table 6, health competence was significantly related to older

adults' general health and mental health in the three survey years ( $b$  ranges from .25 to .52,  $p < .001$ ), supporting H3.

H4 predicted a mediation effect of health competence in the relationship between PCC and older adults' health outcomes. In 2011, the indirect association between PCC and older adults' health outcomes via health competence was supported (general health:  $b = .14$ , Standardized error (SE) = .02, 95% CI: [.114, .170]; mental health:  $b = .09$ , SE = .01, 95% CI: [.072, .118]). Similar results were also found in 2017 (general health:  $b = .13$ , SE = .02, 95% CI: [.099, .161]; mental health:  $b = .08$ , SE = .01, 95% CI: [.053, .099]) and 2020 (general health:  $b = .11$ , SE = .01, 95% CI: [.086, .135]; mental health:  $b = .06$ , SE = .01, 95% CI: [.042, .079]). Thus, H4 was supported.

Moreover, to compare the hypothesized associations across the years, a series of moderation analyses using the year of iterations as the moderator were further conducted. However, the moderation effects were statistically unacknowledged ( $p \geq 0.5$ ). The results suggested that, regarding the hypothesized

**Table 4.** Regressions testing different types of PCC in predicting general health.

	General health							
	2011		2017		2020		Combined (2011, 2017, 2020)	
	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI
<b>Block 1 Demographics</b>								
Age	-.09***	[-.015, -.004]	-.01	[-.007, .005]	-.09***	[-.015, -.005]	-.07***	[-.011, -.004]
Gender	-.02	[-.133, .050]	.03	[-.032, .161]	.02	[-.056, .108]	.01	[-.033, .075]
Education	.19***	[.075, .134]	.17***	[.067, .131]	.16***	[.062, .117]	.17***	[.078, .112]
Income	.19***	[.064, .117]	.16***	[.051, .105]	.17***	[.058, .102]	.17***	[.066, .094]
Race	.02	[-.060, .143]	.06*	[.021, .235]	.07**	[.050, .219]	.06***	[.063, .171]
$\Delta R^2$	.12		.11		.11		.11	
<b>Block 2 PCC</b>								
pcc1	-.05	[-.183, .025]	.01	[-.100, .133]	-.03	[-.143, .063]	-.03	[-.097, .019]
pcc2	.08*	[.003, .185]	.04	[-.053, .142]	.02	[-.059, .105]	.04	[.000, .107]
pcc3	.07	[-.011, .175]	.11***	[.040, .254]	.07*	[.004, .192]	.08***	[.052, .164]
pcc4	.03	[-.093, .171]	-.03	[-.180, .089]	.04	[-.058, .179]	.01	[-.050, .086]
pcc5	.04	[-.072, .197]	.06	[-.044, .223]	.05	[-.040, .193]	.05*	[.009, .155]
pcc6	.03	[-.056, .138]	-.01	[-.120, .088]	.04	[-.044, .139]	.02	[-.034, .078]
pcc7	-.02	[-.109, .066]	-.01	[-.088, .085]	.01	[-.084, .085]	-.01	[-.058, .039]
$\Delta R^2$	.03		.02		.03		.02	
$R^2$	.15		.13		.14		.13	
Adjusted $R^2$	.14		.12		.13		.13	
F	.21.61***		17.97***		24.39***		60.69***	

The regression coefficients are standardized; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; pcc1: chance to ask questions; pcc2: attention to your feelings and emotions; pcc3: involve you in decision-making; pcc4: ensure you understood the things for health care; pcc5: explains things in a way you could understand; pcc6: spend enough time with you; pcc7: help you deal with feelings of uncertainty.

**Table 5.** Regressions testing different types of PCC in predicting health competence.

	Health competence							
	2011		2017		2020		Combined (2011, 2017, 2020)	
	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI
<b>Block 1 Demographics</b>								
Age	-.01	[-.006, .005]	-.04	[-.009, .001]	-.08***	[-.013, -.004]	-.04**	[-.007, -.001]
Gender	-.01	[-.103, .068]	-.05*	[-.182, -.006]	-.02	[-.110, .034]	-.03	[-.089, .002]
Education	.13***	[.039, .093]	.05*	[-.003, .055]	.05	[-.002, .046]	.08***	[.021, .054]
Income	.03	[-.012, .037]	.12***	[.026, .076]	.06*	[.004, .043]	.06***	[.013, .041]
Race	-.02	[-.128, .062]	-.01	[-.105, .090]	-.02	[-.109, .040]	-.01	[-.071, .029]
$\Delta R^2$	.02		.03		.02		.02	
<b>Block 2 PCC</b>								
pcc1	-.03	[-.134, .061]	.03	[-.061, .151]	-.02	[-.037, .144]	.02	[-.036, .082]
pcc2	.09*	[.013, .183]	.03	[-.061, .117]	.04	[-.048, .097]	.05*	[.003, .096]
pcc3	.07	[-.011, .164]	.11***	[.033, .229]	.02	[-.039, .127]	.07**	[.029, .130]
pcc4	.03	[-.084, .162]	.05	[-.049, .196]	.04	[-.091, .118]	.03	[-.029, .115]
pcc5	.08	[-.015, .236]	.08*	[.001, .244]	.01	[-.028, .177]	.08**	[.037, .177]
pcc6	.11**	[.035, .216]	-.03	[-.131, .059]	.05	[-.077, .084]	.03	[-.015, .088]
pcc7	-.01	[-.086, .078]	.03	[-.047, .111]	.12***	[.044, .193]	.05*	[.006, .093]
$\Delta R^2$	.10		.07		.06		.07	
$R^2$	.12		.10		.08		.09	
Adjusted $R^2$	.11		.09		.07		.09	
F	16.32***		12.81***		12.78***		38.92***	

The regression coefficients are standardized; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; pcc1: chance to ask questions; pcc2: attention to your feelings and emotions; pcc3: involve you in decision-making; pcc4: ensure you understood the things for health care; pcc5: explains things in a way you could understand; pcc6: spend enough time with you; pcc7: help you deal with feelings of uncertainty.

relationships (H1-H4), there was no significant difference between 2011, 2017, and 2020.

## Discussion

Gaining a deeper understanding of how patient-provider communication, health competence, and health outcomes is of great importance for researchers and practitioners to make effective attempts at facilitating health care delivery and enhancing older adults' health care skills to improve their health. Results of this study indicate that PCC is related to older adults' health outcomes either directly or indirectly, irrespective of

time series. Specifically, health competence was found to be a prominent mediator between PCC and older adults' health outcomes. This study provides theoretical implications for health communication scholars' understanding of Street et al.'s (2009) pathway mediation model of patient-provider communication with solid empirical evidence from a longitudinal perspective. Detailed results are discussed below along with theoretical and practical implications.

This study found that PCC was directly associated with older adults' mental health in 2017 and 2020, while the direct effect on older adults' general health was only significant in 2020. A plausible reason pertains to the slight increase in PCC



**Table 6.** Regressions testing health competence as a mediator in the relationship between PCC and older adults' health outcomes.

	<i>b</i>	SE	95% CI	<i>p</i>
<b>2011</b>				
<b>General health</b>				
<i>Direct effect:</i>				
PCC → General health	.01	.03	[-.051, .08]	.645
<i>Indirect effect:</i>				
a path: PCC → Health competence	.30	.03	[.353, .488]	<.001
b path: Health competence → General health	.47	.02	[.466, .562]	<.001
a*b: PCC → Health competence → General health	.14	.02	[.114, .170]	/
<b>Mental health</b>				
<i>Direct effect:</i>				
PCC → Mental health	.03	.03	[-.015, .089]	.161
<i>Indirect effect:</i>				
a path: PCC → Health competence	.30	.03	[.353, .488]	<.001
b path: Health competence → Mental health	.32	.02	[.202, .277]	<.001
a*b: PCC → Health competence → Mental health	.09	.01	[.072, .118]	/
<b>2017</b>				
<b>General health</b>				
<i>Direct effect:</i>				
PCC → General health	.01	.04	[-.055, .086]	.669
<i>Indirect effect:</i>				
a path: PCC → Health competence	.25	.04	[.297, .445]	<.001
b path: Health competence → General health	.52	.02	[.533, .629]	<.001
a*b: PCC → Health competence → General health	.13	.02	[.099, .161]	/
<b>Mental health</b>				
<i>Direct effect:</i>				
PCC → Mental health	.08	.03	[.035, .144]	.001
<i>Indirect effect:</i>				
a path: PCC → Health competence	.25	.04	[.278, .446]	<.001
b path: Health competence → Mental health	.30	.02	[.191, .265]	<.001
a*b: PCC → Health competence → Mental health	.08	.01	[.053, .099]	/
<b>2020</b>				
<b>General health</b>				
<i>Direct effect:</i>				
PCC → General health	.05	.03	[.012, .140]	.019
<i>Indirect effect:</i>				
a path: PCC → Health competence	.24	.03	[.275, .399]	<.001
b path: Health competence → General health	.45	.02	[.491, .582]	<.001
a*b: PCC → Health competence → General health	.11	.01	[.086, .135]	/
<b>Mental health</b>				
<i>Direct effect:</i>				
PCC → Mental health	.09	.03	[.055, .154]	<.001
<i>Indirect effect:</i>				
a path: PCC → Health competence	.24	.03	[.275, .399]	<.001
b path: Health competence → Mental health	.25	.02	[.155, .226]	<.001
a*b: PCC → Health competence → Mental health	.06	.01	[.042, .079]	/
<b>Combined (2011, 2017, 2020)</b>				
<b>General health</b>				
<i>Direct effect:</i>				
PCC → General health	.03	.02	[-.007, .070]	.105
<i>Indirect effect:</i>				
a path: PCC → Health competence	.38	.02	[.337, .415]	<.001
b path: Health competence → General health	.54	.01	[.515, .569]	<.001
a*b: PCC → Health competence → General health	.20	.01	[.179, .230]	/
<b>Mental health</b>				
<i>Direct effect:</i>				
PCC → Mental health	.08	.02	[.049, .109]	<.001
<i>Indirect effect:</i>				
a path: PCC → Health competence	.38	.02	[.337, .415]	<.001
b path: Health competence → Mental health	.22	.01	[.199, .241]	<.001
a*b: PCC → Health competence → Mental health	.08	.01	[.070, .097]	/

The regression coefficients are standardized; SE: Standardized error; To simplify the presentation of results, covariates, including gender, age, education, income and race, are not shown in the table.

throughout the ten years from 2011 to 2020. In the past, patient-provider communication was dominated by health professionals, and patients could hardly engage in the health care process regarding their diagnosis, prognosis, and treatment options. In particular, given that healthcare settings are largely overworked and overstretched to meet patients'

demands, inefficient patient-provider communication might further increase older patients' anxiety and uncertainty (Hardavella et al., 2017; Liu & Jiang, 2019; McMullan, 2006). As such, in 2011 PCC was not significantly related to older patients' mental health and general health. Until recent years, PCC has been consistently advocated to deliver quality health

care that encompasses the entirety of a patient's needs and preferences which include both biopsychosocial and biomedical factors (Naughton, 2018). It is understandable that older patients would be empowered when their feelings and emotions are respected and comforted, their unique needs are met within their psychosocial contexts, and the problems and treatments are concordant with their values (Epstein & Street, 2007; Liu & Jiang, 2019). For instance, older patients, who have inferior health conditions, might encounter greater barriers to clearly articulating their problems and are less capable of negotiating and understanding treatment plans. In this case, using patient-centered strategies that allow the older patients to ask all health-related questions, acquire needed information, and reveal their feelings and concerns would be efficient to improve the patient experience of care, leading to enhanced health outcomes (Jiang, 2017). In parallel with the continuous efforts advocacy for PCC within healthcare systems, patients are also becoming more conscious to take active roles in PCC to participate in the healthcare decision-making process (Liu & Jiang, 2019). Health-conscious patients engaged in PCC would be more likely to practice healthy behaviors and medical compliant behaviors to maintain good health.

Notably, findings from this study further revealed that different dimensions of PCC might exert different influences on older patients' health competence and health outcomes. For instance, among the seven types of PCC, pcc3 (involving patients in decisions about their health care as much as they wanted) was found to be significantly related to health competence and patient's health outcomes in some iterations. The finding was accordant with previous research that emphasized the cardinal role of patient involvement in health-related decision-making that determines health care outcomes (Entwistle & Watt, 2006; Vahdat et al., 2014). Patients highly engaged in the health care decision-making process can not only receive professional advice on the treatment options from the doctors but also express their personal concerns and preferences about the treatment (Vahdat et al., 2014). In comparison with other types of PCC, such as giving the chance to ask questions (pcc1), patient involvement in health-related decision-making was more effective to improve patients' health competence and achieve better health care outcomes because it encourages patients to acquire additional information from other sources, share their feelings, and actively participate in the discussion about treatment options (Entwistle & Watt, 2006). In the atmosphere of inclusive consultation, both patients' internal and external health locus of control would increase which largely contributes to patients' health. However, feeling involved in healthcare decisions (e.g., pcc3) was not necessarily related to enhanced health competence and health outcomes across all iterations. We speculate that this could be because the single-item measure may have poor content validity and lack test-retest reliability that cause inconsistent regression results. In addition, different from other PCC dimensions that stressed the necessity of effective communication (e.g., checking for understanding, having things explained in a way one understands), paying attention to patients' feelings and emotions (pcc2 and pcc7) has been found to be a crucial PCC strategy significantly associated with older adults' health. Research has noted that uncertainty-elicited anxiety and worry about health

are prevalent among older adults (Parlapani et al., 2020). This is because aging adults experience a high risk of chronic disease, face declines in physical functioning, tend to have inadequate health knowledge and skills, and are more likely to be emotionally vulnerable (Gazmararian et al., 2003; Williams et al., 2007). As such, compared with other types of PCC, dealing with old patients' uncertainty and negative feelings becomes extraordinarily important to increase their confidence in self-care management and maintain good health. Notably, spending enough time with patients (pcc6) was significantly related to health competence in 2011, while no significant effect was found in 2017 and 2020. In early years patients were often frustrated by unacceptably long waiting time and short consultation time, and they were in badly need of effective communication to better communicate their problems and concerns, medical diagnosis, and treatment (Alarcon-Ruiz et al., 2019; Johannessen & Alexandersen, 2018). As such, older patients who had a positive experience that providers spent enough time during the consultation process would be more likely to develop competent health skills. The situation has changed along with the rapid development of healthcare systems in recent years. The digitalized healthcare system allows patients to make an appointment online which helps reduce waiting time, check test results through patient portals, and communicate with healthcare providers through virtual approaches (e.g., e-mail and mobile apps) (Hong et al., 2020; Jiang et al., 2019). This finding suggests that although some PCC strategies remain essential for patients' health promotion throughout the ten years, some may become less valuable over time. As such, it is of great importance to continue to identify and verify different PCC patterns that meet patients' unique needs.

Another important finding of the current study pertains to the mediation effect of health competence in the relationship between PCC and older adults' health outcomes throughout the ten years. Specifically, PCC can improve patients' health competence and, in turn, increase their mental health and general health. This finding is novel and empirically supports Street et al.'s (2009) pathway model in understanding the influence of PCC on older adults' health. The finding herein indicated that old adults who were engaged in PCC would perceive higher levels of health competence, consistent with prior research findings suggesting that effective patient-provider communication contributes to improved health literacy and health management skills (Schillinger et al., 2003). A patient-physician encounter that meets the PCC criteria would allow patients to better understand their problems and reach a shared understanding of medical treatment decisions (Epstein & Street, 2007; Liu & Jiang, 2019), thus contributing to enhanced health competence. As older patients' health competence improved, they are more likely to adhere to medications and treatment recommendations (Sharkey et al., 2017), they become more capable to obtain needed information and support for health management (Millar et al., 2020), and they would be empowered to maintain good health (Shin & Lee, 2018). Therefore, PCC would increase old adults' health competence, and those with adequate health competence skills would be more capable to stay healthy psychologically and physically.

Beyond showing the underlying mechanisms through which PCC may influence older adults' health outcomes, this study has other theoretical contributions. First, the findings offer continued support for Street et al.'s (2009) pathway model and demonstrate the model's utility for understanding the influence of PCC from a longitudinal perspective. The consistent mediation effect of health competence in the distal relationship between PCC and older adults' health outcomes empirically supports the validity and applicability of the model. Most of the existing research has investigated PCC among the general population (Jiang, 2017; Liu & Jiang, 2019), and offered limited insights into the ongoing discussions about problems in the health care system that fails to deliver care for vulnerable populations. This study adds to the expanding literature on health communication among the older population. Second, the findings of this study also evoke the possibility that factors such as social support and emotional management skills are worthy of consideration as potential mediators that may bridge the influence of PCC on older patients' health outcomes. Theories of PCC (Epstein et al., 2005; Epstein & Street, 2007) maintain that health outcomes would be improved through a variety of mediators, while extant literature scrutinizes limited aspects of how PCC varies in its influence on patients' health outcomes according to intermediate factors and offers limited empirical evidence supporting the mediated associations. Third, in addition to testing the influence of PCC, as an integrative concept, on older patients' health outcomes, this study considered seven types of PCC and examined their different influences on patients' health competence and health outcomes. Findings offer more nuanced information about how PCC exerts an influence on health outcomes, such as reducing patient uncertainty and engaging patients in their healthcare and healthcare decision-making processes. Fourth, this study also contributes to the literature on patient-provider relationships by empirically uncovering PCC as a key underpinning to effective health communication, especially for those vulnerable populations who encounter difficulties to communicate with providers. High-quality patient-provider communication is essential to provide emotional and informational support for the development of self-care skills, adherence to medication, and health outcomes, which can substantially increase patient trust in health care providers.

This study also has important practical implications. First, the research highlights the important role PCC plays in affecting older adults' health competence and ultimately, their health outcomes. It is reasonable, based on the results, to suggest that health care education programs that focus on promoting providers' PCC skills can be implemented. Such an education on how to use PCC strategies to effectively communicate with older patients can be found in the dimensions of PCC: eliciting and understanding patients' feelings and concerns; understanding patients within their psychological context; reaching a shared understanding regarding patients' problems and treatment decisions; and empowering patients by engaging them into their health care (Epstein & Street, 2007). Second, in parallel with providing training programs to improve providers' PCC skills, it is equally important to put focus on improving the older adults' medical communication skills to

effectively communicate their problems, feelings, and concerns, as well as obtain needed support from the physicians. The consistent and significant mediation effect of health competence in the relationship between PCC and health outcomes supports a progression in health education among older patients to include improving the older adults' health competence skills important to obtaining and maintaining good health. For instance, public health program practitioners may develop tailored education programs and offer open seminars, community seminars, and group discussions with old adults focusing on, for example, how to ask questions and describe problems during health care consultations.

### Limitations

Limitations of this study should also be noted. First, the data were cross-sectional and, as such, we can hardly assess the causality between PCC, health competence, and health outcomes. Thus, scholars should use experimental methods or collect data longitudinally. Doing so would allow for a more rigorous examination of whether PCC predicts improved health competence, and whether health competence predicts enhanced health outcomes. Second, this trend research only involves three iterations within a ten-year interval from 2011 to 2020. It can hardly present a big picture of the trend of PCC, health competence, and health outcomes among older adults in the United States. Future research should use more iterative data to better understand the change in PCC, health competence, and older adults' health outcomes. Third, this study only examined health competence as the mediator in the distal relationship between PCC and health outcomes. It remains unclear whether the framework is applicable in other socio-cultural contexts, and whether there are other potential mediators. For instance, the mediation model might not be applicable among young adults who have relatively higher levels of health management skills. In addition, the indirect effect (via health competence) of PCC on general health appeared stronger than mental health across the years in our study; this may also suggest the other mediating or moderating mechanisms by which PCC exerts an impact on older adults' health outcomes. For example, health literacy may be a potential mediator in the relationship between PCC and older adults' general health; while emotional support can be another salient mediator in the relationship between PCC and older adults' mental health. Therefore, future research should continue the investigation of mechanisms underlying the relationship between PCC and health outcomes in other socio-cultural contexts. Fourth, the current study focused on the PCC, which is only part of patient-centered care that involves a wide array of dimensions such as exploring both the disease and the illness experience and establishing a trustworthy patient-doctor relationship. We encourage scholars to conduct more research to further explore patient-centered care and make a comparison of the impacts of different dimensions of patient-centered care.

### Conclusion

Within the context of an aging society, it is critically important to understand factors that promote older adults' health and

well-being. The current study used longitudinal data and provided empirical evidence that PCC is related to older adults' health outcomes either directly or indirectly. Health competence has been found to be a significant mediator to link PCC to older adults' general health and mental health. Besides, results also revealed that different dimensions of PCC might exert different influences on older patients' health competence and health outcomes. Understanding these associations can help create interactive environments, build trustworthy patient-provider relationships and improve health competence, all of which are key to older adults' general health and mental health.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This research is supported in part by grants through University of Macau [ICI-RTO-0010-2021 and HSS-UMAC-2020-02]; and Shanghai Pujiang Program [grant number 22PJ062].

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## Ethics approval

Given the secondary analysis of preexisting and de-identified data that are publicly available, formal approval from the ethics committee was not required for this study.

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