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Coordination, Comprehensiveness and Continuity as the Quality Measures of Remote Primary Healthcare in Poland

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ABSTRACT

Objective: The purpose of this article is to examine the quality of remote primary healthcare in Poland measured through three dimensions: coordination, comprehensiveness, and continuity (3Cs) and examine the relationship between them.

Research Design & Methods: The 3Cs were measured using a proprietary questionnaire to measure the quality of primary healthcare in a teleconsultation setting. The survey was conducted among 98 patients in primary healthcare facilities nationwide in 2021. Structural equation modelling was used in the data analysis.

Findings: The survey results showed that coordination and continuity are one common dimension of quality of primary healthcare. In Poland, patients distinguish only between continuity of care and comprehensiveness. Coordination can be considered part of continuity because it requires a long-term relationship between the patient and the general practitioners. We found that continuity positively affects the comprehensiveness of primary healthcare.

Implications/Recommendations: This study is the first of its kind in primary healthcare in Poland, and its results may be of particular value to general practitioners and healthcare managers wishing to improve the quality of teleconsultation services.

Contribution: The evidence can help develop appropriate strategies for improving the quality of 3Cs-based care. Validated research tools provide basic metrics that can be used for future research to see to what extent the development of the telehealth system improves the continuity, coordination and comprehensiveness of remote primary healthcare.

Article type: original article.

Keywords: comprehensiveness, continuity, coordination, quality of primary healthcare.

JEL Classification: I10.

1. Introduction

During the COVID-19 pandemic, many individuals were reluctant to visit healthcare facilities due to concerns about potential exposure to the virus. In response, the adoption of remote primary healthcare to support patients in managing non-emergency procedures became a widely accepted solution (Latifi & Doarn, 2020; Maria, Serra & Heleno, 2022). Remote primary healthcare, a key technology, enables healthcare professionals – particularly general practitioners (GPs) – to deliver health services remotely (Garattini, Badinella Martini & Mannucci, 2021). GPs play a critical role in maintaining patient health (Hu *et al*., 1999). This approach leverages information and communication technology (ICT) to facilitate the exchange of information for diagnosis, treatment, and disease prevention, as well as for testing, assessment, and the ongoing education of healthcare professionals (Bokolo, 2020). Remote primary healthcare offers several benefits, including convenience, affordability, and improved access to health-related information via the Internet and related

technologies (Kalaivani *et al*., 2015). The integration of ICT in primary healthcare can empower patients by promoting greater involvement in their healthcare plans and fostering enhanced autonomy. Moreover, remote primary healthcare has the potential to significantly improve health outcomes, particularly in areas with limited access to primary and specialist care (Mold *et al*., 2019). This technology seeks to expand healthcare access for all individuals, irrespective of geographic location, while minimising the need for face-to-face consultations (Khairat *et al*., 2019). Given the pivotal role of remote primary healthcare in improving healthcare delivery, particularly during the COVID-19 pandemic, it is essential to assess the quality of these services. Poor-quality remote primary healthcare is widely recognised as a major barrier to achieving effective healthcare across many systems globally. Evaluation of remote primary healthcare quality (QPHC) from the patient's perspective should focus on three core dimensions: coordination, comprehensiveness, and continuity (3Cs) (Bodenheimer *et al*., 2014; Hashemi *et al*., 2020). These dimensions are rooted in the definition of primary healthcare, which is described as first-contact, coordinated, comprehensive, and continuous care provided to individuals and populations, regardless of age, gender, disease, or organ system (Peckham, 2006). The 3Cs form the foundation of many frameworks for primary healthcare. In the context of QPHC, these critical elements are associated with improved service quality, reduced healthcare disparities, and better health outcomes for populations. Previous studies have confirmed that remote healthcare facilitates the initial contact between a GP and a patient by improving availability (Kludacz-Alessandri *et al*., 2021). Moreover, effective communication between patients and GPs is linked to positive health outcomes, with evidence suggesting that in select cases, teleconsultations are not inferior to in-person consultations in terms of patient satisfaction and clinical results (Orlandoni *et al*., 2016). However, for telemedicine services to become a sustainable option, further research is needed on patient experiences with this technology across other dimensions of primary healthcare quality. To date, the quality of primary healthcare has not been thoroughly examined in relation to the three core pillars of care – coordination, comprehensiveness, and continuity. Thus, this article seeks to explore this important issue.

2. Literature Background

Coordination is one of the most recognisable dimensions of primary healthcare quality, and its features have been highlighted in several reviews, particularly in relation to the healthcare of patients with chronic diseases. In the current health context, characterised by specialisation and an overload of information, coordination refers to the ability of GPs to coordinate the use of other levels of healthcare and to the extent to which information from various sources is taken into account by the GP in the care of the patient (Starfield, Shi & Macinko, 2005). Coordination for this

study was defined as the extent to which the GP collaborates with other physicians, health professionals, and healthcare providers to provide remote primary healthcare for optimising patient health. Comprehensiveness is the direct or indirect provision of a full range of services to meet patients' healthcare needs. This includes health promotion, prevention, diagnosis and treatment of common conditions, referral to other clinicians, management of chronic diseases, rehabilitation, palliative care and, in some models, social services (Donelan *et al*., 2019). This study defines comprehensiveness as the direct or indirect provision of a full range of health services to meet the patient's needs. Continuity refers to long-term patient-centred care over time (Macinko, Starfield & Shi, 2003). Continuity is often viewed as a sequence of visits to the same GP. Continuity was defined for the study as a lasting relationship between the patient and the GP, providing the patient with a sense of treatment consistency, which enables the gathering of more and more knowledge about the patient and the use of information about past medical events in order to adapt ongoing care to the patient's needs. The continuity of care has already been a subject of many studies, with many scholars highlighting its significant role in QPHC and the whole healthcare system. Shin *et al*. (2014) added that continuity of care leads to faster recognition of health problems and that the patients who have continuity of care with the same physician tend to adopt better self-management behaviours and increase adherence to medication recommendations. Maarsingh *et al*. (2016) noted that the old patients are the ones who benefit the most from continuity of primary healthcare, as they are likely to have multiple chronic conditions. Finally, we shall note that the results obtained by several scholars indicate lower mortality rates associated with increased continuity of primary healthcare.

During the literature review, we encountered a problem with the broad conceptualisation of the 3Cs (Jimenez *et al*., 2021). While conceptually, each dimension of the 3Cs should be fully considered in the analysis of the QPHC, there are inherent trade-offs and complementarities between them. Some dimensions may be an element of others, depending on the organisation and capabilities of primary care facilities and the needs of patients. For example, the possibilities resulting from comprehensiveness also relate to the GP's ability to coordinate care with other providers (coordination), thanks to which they can take care of patients throughout their lives (continuity) (O'Malley *et al*., 2015). The literature analysis shows that coordination, comprehensiveness and continuity do not work independently and that several overlapping elements exist between them. Coordination and continuity have the potential to be tightly linked if the patient's experience of coordination is that it is personal. The patient may see coordination as enhancing continuity. Thus, when designing interventions for strengthening primary healthcare, it may be helpful to focus on ensuring that the person or team members know the patient personally (Jimenez *et al*., 2021). While studying the interrelationship between coordination,

comprehensiveness and continuity, arguments about the ability to compensate for the lower efficiency of some features with the high efficiency of others (substitution effect) occur. In contrast, other features must coexist at high levels to achieve the goals of each function (i.e., synergistic effect) (Jimenez *et al*., 2021). In some cases, one feature may replace another, and in others, they may have a combined or synergistic effect. That is why it is important to consider the interrelationship of these dimensions (Jimenez *et al*., 2021).

The aim of this article is to examine the quality of remote primary healthcare in Poland measured by three dimensions: coordination, comprehensiveness, and continuity and investigate the relationship between them. In order to achieve the objective of the study, we employ a literature review and empirical studies. The article is organised as follows. This section presents the literature review, focusing on three core dimensions of primary healthcare: coordination, comprehensiveness and continuity. The second section presents the research methodology. The third section gives the results obtained in a study on coordination, comprehensiveness and continuity of primary healthcare. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are used to select the final variables for measuring the analysed 3Cs factors of QPHC. The third section also comments on the impact of healthcare continuity on its comprehensiveness. The fourth section includes a discussion of the results taking into account the restrictions of this study. The article ends with conclusions.

3. Methods

3.1. Questionnaire Preparation

The research conducted in this study is a part of the project aimed at creating a model for assessment of remote work for healthcare facilities ensuring continuous healthcare in conditions of limited social mobility. This research consisted of the development and application of a questionnaire in a survey of primary care patients. The questionnaire and procedure for conducting the research were assessed from an ethical perspective by the Warsaw University of Technology Senate Committee for Professional Ethics that has issued a Certificate of Ethics Approval (certificate dated January 15, 2021).

The questionnaire consisted of two parts: a part regarding the dimensions of QPHC and an informative part with questions characterising the respondents. The aim was to obtain patients' opinions regarding the QPHC provided by GPs during remote consultations. Each question was scored on a five-point Likert scale. Based on the analysis of the literature six indicators have been proposed to measure the coordination of primary healthcare, seven to measure comprehensiveness, and five to measure continuity. Data was collected in 2021, and the research

was conducted using the computer assisted telephone interview method. From the database provided by the PHC clinics, patients over 18 years of age who had had at least two prior teleconsultations since November 2020 were selected randomly. As care coordination is usually considered the most appropriate for patients who receive medical care more than once and in more than one location, we included in our analyses only patients who had two medical appointments and had authorised referrals issued after the first visit to the electronic data system. We assumed that patients who were referred for diagnostic tests or to a specialist at the first visit and required repeated teleconsultations are better equipped to assess the coordination, continuity and comprehensiveness of medical care. A total of 105 responses were collected; only 98 records were used for analysis, as the others were incomplete and unsuitable for valid statistical analysis.

3.2. Data Analysis

The number of observations was sufficient for further EFA and CFA. Based on the EFA, the preliminary factor model has been prepared. Then the CFA method confirmed the reliability and validity of the model. This study uses the structural equation modelling method (SEM). All analyses were conducted using Statistica v. 13.3, SPSS v. 27, AMOS v. 27 and Excel v. 365.

4. Results

4.1. Descriptive Statistics

The descriptive statistics regarding the *KR*1–*KR*6 variables used to assess the coordination dimension are shown in Table 1.

Table 1. Descriptive Statistics of Coordination Dimension Variables

Variable	Mean	Median	Standard Deviation	Variance	Skewness	Kurtosis
*KR*1	4.337	5	0.994	0.989	–1.366	1.174
*KR*2	2.878	3	1.229	1.511	–0.034	–0.616
*KR*3	4.510	5	0.790	0.624	–1.316	0.362
*KR*4	3.735	4	1.297	1.681	–0.648	–0.651
*KR*5	3.816	4	1.246	1.554	–0.785	–0.453
*KR*6	3.051	3	1.509	2.276	0.004	–1.441

Source: the authors.

Patients most appreciate their GPs taking into account the results of their diagnostic tests (*KR*3: $\bar{x} = 4.5$) and the diagnoses of specialist doctors (*KR*1: $\bar{x} = 4.3$). Coordination of medical care from other doctors and institutions (*KR*4: $\bar{x} = 3.7$)

and continuous monitoring of health during and after treatment (*KR*5: $\bar{x} = 3.8$) were perceived worse. The worst perception was GPs' willingness to consult other specialists about patients' health status (*KR*2: $\bar{x} = 2.9$). Respondents believe that remote healthcare coordination should be improved. The distribution of answers is presented in Figure 1.

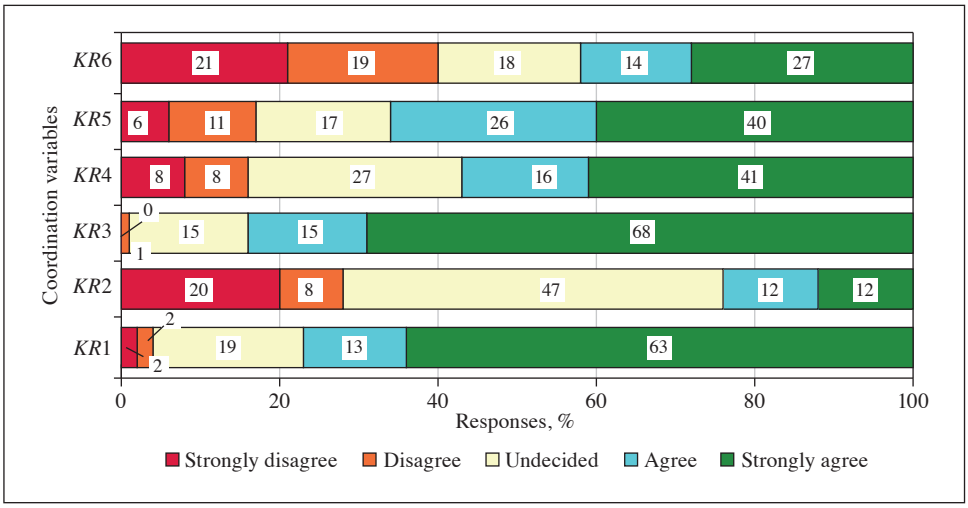

Fig. 1. Distribution of Coordination Responses

Source: the authors.

Descriptive statistics of comprehensiveness variables *KP*1–*KP*7 are presented in Table 2.

Table 2. Descriptive Statistics of Comprehensiveness Dimension Variables

Variable	Mean	Median	Standard Deviation	Variance	Skewness	Kurtosis
*KP*1	3.888	4	1.291	1.668	–0.960	–0.198
*KP*2	4.582	5	0.836	0.699	–2.315	5.769
*KP*3	4.786	5	0.542	0.294	–2.492	5.114
*KP*4	4.561	5	0.813	0.661	–1.964	3.760
*KP*5	3.969	5	1.388	1.927	–1.054	–0.268
*KP*6	3.520	4	1.480	2.190	–0.567	–1.152
*KP*7	4.133	5	1.172	1.374	–1.361	0.898

Source: the authors.

Most patients rate teleconsultations very highly in terms of their comprehensiveness. Patients rating highest the possibility of getting prescriptions for the medications they need (*KP*3: $\bar{x} = 4.8$), getting referrals to the appropriate specialist doctor (*KP*2: $\bar{x} = 4.6$) and getting referrals for the diagnostic tests (*KP*4: $\bar{x} = 4.6$). GPs' advice on how to get specialised treatment (*KP*1: $\bar{x} = 3.9$), GPs' recommendations for preventive tests (*KP*5: $\bar{x} = 4.0$), and GPs' advising what to do to prevent future health problems (*KP*7: $\bar{x} = 4.1$) were rated as average. The worst opinion was given to the possibility of dealing with the patient's health requirements (*KP*6: $\bar{x} = 3.5$). Unfortunately, almost 30% of respondents disagreed with the statement that the healthcare facility is able to meet all their health needs. The distribution of answers is presented in Figure 2.

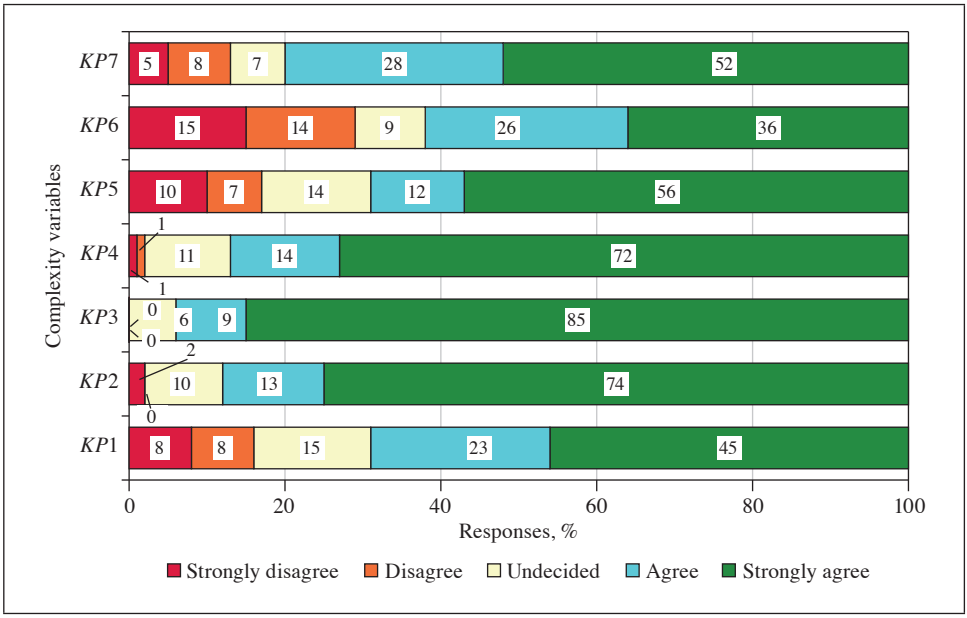

Fig. 2. Distribution of Comprehensiveness Responses

Source: the authors.

The continuity dimension got the worst marks of all presented in this study. Descriptive statistics of continuity variables *C*1–*C*5 are shown in Table 3.

Patients rated the continuity of information best. Patients agree that their GPs have access to information on their entire treatment history (*C*2: $\bar{x} = 4.5$). It is compulsory to enter data regarding patients' treatment into the system. 2% of respondents said during the interview that they had not provided complete documentation to their current primary healthcare facility. Therefore, these persons

Table 3. Descriptive Statistics of Continuity Dimension Variables

Variable	Mean	Median	Standard Deviation	Variance	Skewness	Kurtosis
*C*1	3.765	5	1.604	2.573	–0.862	–0.950
*C*2	4.469	5	0.922	0.850	–1.884	3.310
*C*3	3.939	4	1.283	1.646	–1.080	0.045
*C*4	2.980	3	1.705	2.907	–0.057	–1.720
*C*5	2.755	2	1.805	3.259	0.257	–1.781

Source: the authors.

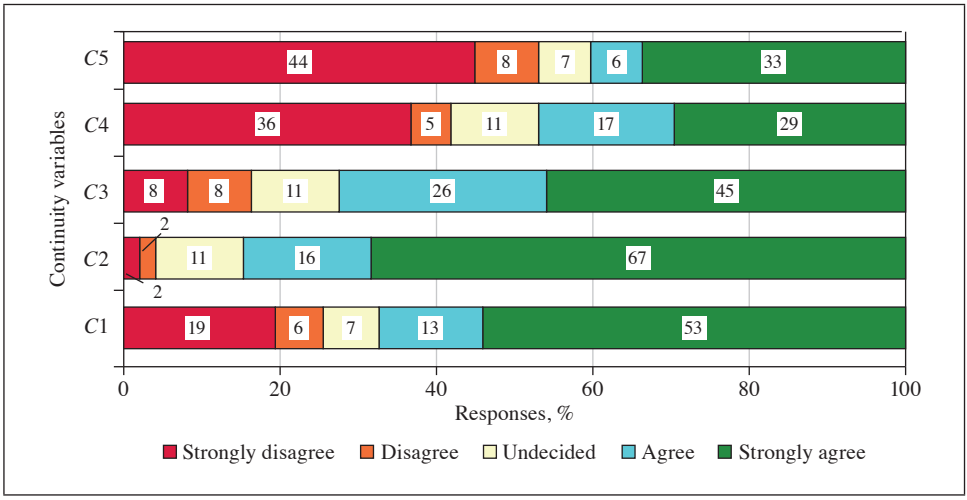

Fig. 3. Distribution of Continuity Responses

Source: the authors.

reported that the lack of information continuity was their own fault. Longitudinal and relational continuity were assessed at an average level. Patients rated as medium the possibility of consulting the same doctor during their treatment (*C*1: $\bar{x} = 3.8$) and the GP's understanding of the patient's needs (*C*3: $\bar{x} = 3.9$). 25% of the respondents had remote consultations with different GPs. When assessing relational continuity, the patients adopted two contradictory attitudes. Some of them believed that they did not feel the need for constant contact with the same GP. Others, on the other hand, complained that the facility, due to staff turnover, could not ensure the continuity of their relationship with one GP and emphasised that it was an inconvenience for them. Family continuity was assessed as worst by the respondents. Patients are not convinced that doctors know their families (*C*4: $\bar{x} = 3.0$). They also do not think

it is possible for all family members to be treated by the same doctor (*C*5: $\bar{x} = 2.8$). The distribution of answers is presented in Figure 3.

4.2. Exploratory Factor Analysis

Each construct: continuity, comprehensiveness, and coordination, were measured with multiple survey statements prepared based on literature analysis. However, assessing whether they are reliable measures of each dimension's factor is required. The variables are eligible for factor analysis because the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) equals 0.854 > 0.6. The result of Bartlett's test of sphericity is significant (Table 4).

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin measure of sampling adequacy		0.854
Bartlett's test of sphericity	approx. chi-square	751.042
	df	153
	Sig.	< 0.0001

Source: the authors.

In order to prepare the final dimensions and variables for analysis, EFA was performed. EFA was performed several times, assuming 2–3 factors. Finally, we identified the two-factor solution as the best approximation of the data. Both factors in Figure 4 explain 59.8% of the variance (Table 5).

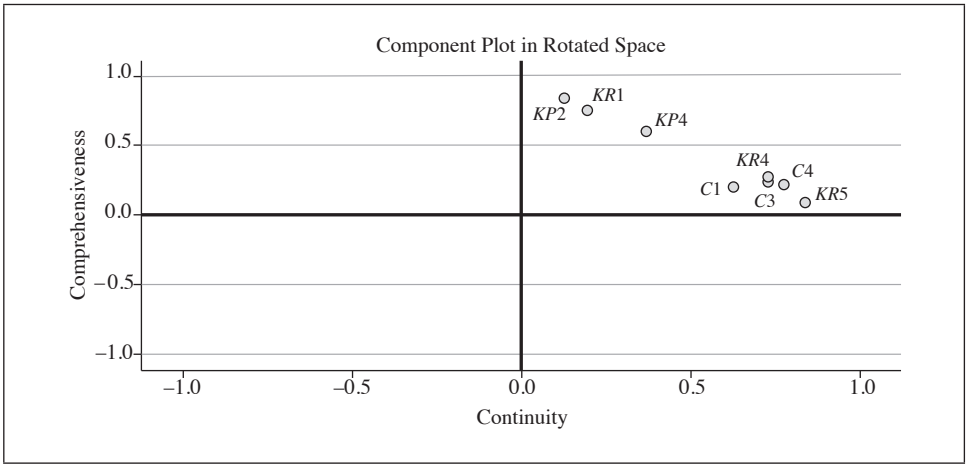

Fig. 4. Continuity and Comprehensiveness Factors Identified as a Result of the EFA Analysis
Source: the authors.

Table 5. Total Variance Explained. Extraction Method: Principal Component Analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.726	46.572	46.572	3.726	46.572	46.572	2.911	36.383	36.383
2	1.057	13.211	59.784	1.057	13.211	59.784	1.872	23.401	59.784
3	0.749	9.362	69.146	–	–	–	–	–	–
4	0.691	8.635	77.781	–	–	–	–	–	–
5	0.623	7.786	85.568	–	–	–	–	–	–
6	0.449	5.614	91.182	–	–	–	–	–	–
7	0.408	5.098	96.280	–	–	–	–	–	–
8	0.298	3.720	100.000	–	–	–	–	–	–

Source: the authors.

Finally eight variables clearly load on only two factors: continuity (Cronbach's alpha = 0.817 > 0.7) and comprehensiveness (Cronbach's alpha = 0.655 > 0.6). The remaining variables were removed from the final factors due to low factor loadings or a lack of fit to the model. The results of EFA are presented in Table 6.

Table 6. Rotated Component Matrix. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation

Variable	Factor	
	1	2
*KR*1	–	0.767
*KR*4	0.725	–
*KR*5	0.834	–
*KP*2	–	0.834
*KP*4	–	0.586
*C*1	0.618	–
*C*3	0.724	–
*C*4	0.772	–

Source: the authors.

EFA indicated that factor continuity covers five variables *C*1, *C*3, *C*4, *KR*4 and *KR*5. *KR*4 and *KR*5 could be included in variable continuity since they relate to the uninterrupted medical care from the GP. The remaining variables (*KR*1, *KP*2, *KP*4)

reflect the scope of medical care by the GP. They were therefore included in the dimension of comprehensiveness.

4.3. Confirmatory Factor Analysis

CFA confirmed the EFA model with eight variables. Model fit indices are presented in Table 7.

Table 7. Model Fit Indices

Measure	Estimate
CMIN	26.197
df	19
X^2/df	$1.379 \in \langle 1, 3 \rangle$
CFI	$0.969 > 0.95$
SRMR	$0.056 < 0.08$
RMSEA	$0.062 \in \langle 0.05, 0.08 \rangle$
pClose	$0.332 > 0.05$

Source: the authors.

Model fit values are excellent. $X^2 = 26.197$; $df = 19$; $\frac{X^2}{df} = 1.379 \in \langle 1, 3 \rangle$. Absolute model fit values $SRMR = 0.056 < 0.08$ (excellent), $RMSEA = 0.062 \in \langle 0.06, 0.08 \rangle$ which is acceptable. However, $pClose = 0.332 > 0.05$ is insignificant, which means excellent. The relative fit measure, $CFI = 0.969 > 0.95$ is also excellent. Model validity measures are presented in Table 8.

Table 8. Model Validity Measures

Factor	*CR*	AVE	MSV	MaxR(H)	*C*	*KP*
C	0.828	0.493	0.507	0.837	Square root of AVE 0.702	*HTMT* 0.722
KP	0.661	0.393	0.507	0.661	0.712	Square root of AVE 0.627

Notes: *C* – continuity, *KP* – comprehensiveness.

Source: the authors.

Convergent validity and factor reliability is supported based on the composite reliability measure $CR = 0.828 > 0.7$ for the continuity factor and $CR = 0.661 > 0.6$ for the comprehensiveness factor. Discriminant validity, the correlative distance

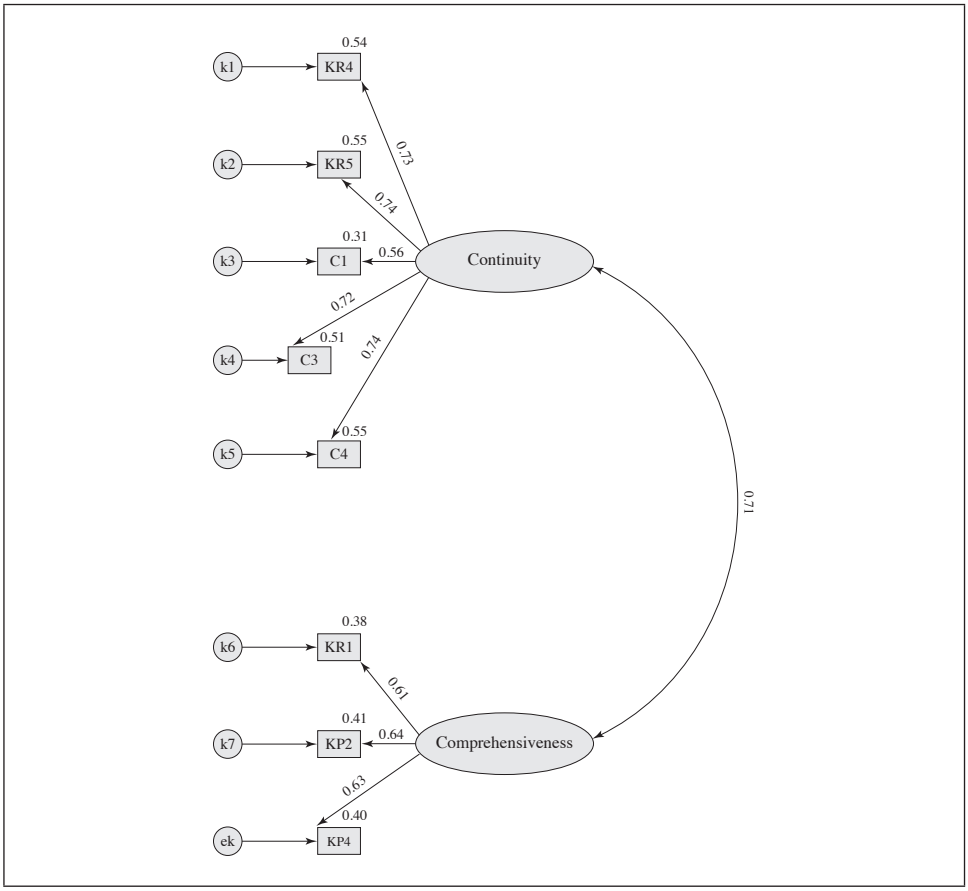

Fig. 5. Standardised Solution of the CFA Model

Source: the authors.

between factors is also established since the square roots of the AVEs are greater than correlation between factors and heterotrait measure *HTMT* = = 0.722 < 0.85. In Figure 5 a standardised solution of the CFA model is presented.

4.4. Regression Analysis

Aside from the CFA model, a regression analysis was also conducted (Fig. 6). Two dimensions were calculated based on the CFA model. Two hypotheses were proposed:

H0. Continuity does not affect comprehensiveness.

H1. Continuity affects comprehensiveness.

Standardised and unstandardised regression model path loadings are presented in Table 9.

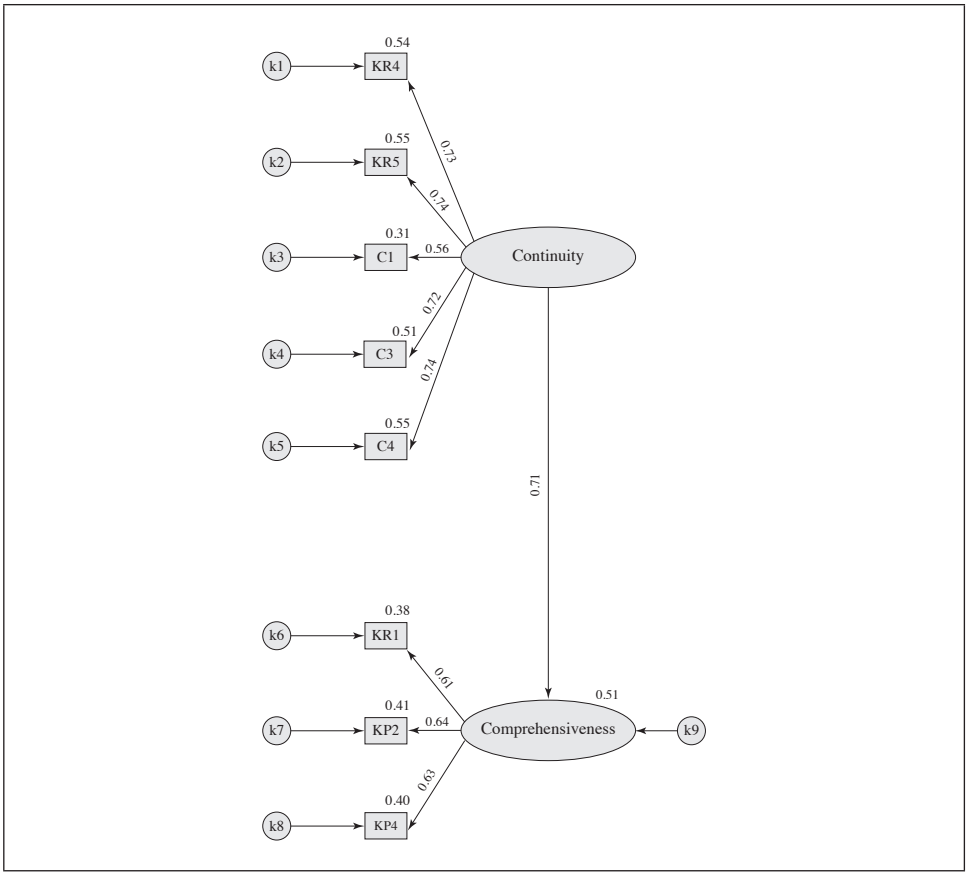

Fig. 6. Regression Model for the Continuity and Comprehensiveness Dimensions (Standardised Estimates)

Source: the authors.

Table 9. Standardised and Unstandardised Regression Model Path Loadings

Variable		Dimensions	Unstandardised Estimate	Standard Error	Critical Ratio	*P*	Standardised Estimate
C	←	*KP*	0.456	0.108	4.212	< 0.001	0.712
*KR*4	←	*C*	1.000	–	–	–	0.734
*KR*5	←	*C*	0.967	0.146	6.627	< 0.001	0.739
*C*1	←	*C*	0.939	0.190	4.948	< 0.001	0.558

Table 9 cnt'd

Variable		Dimensions	Unstandardised Estimate	Standard Error	Critical Ratio	*P*	Standardised Estimate
*C*3	←	*C*	0.967	0.154	6.296	< 0.001	0.718
*C*4	←	*C*	1.330	0.199	6.696	< 0.001	0.743
*KR*1	←	*KP*	1.000	–	–	–	0.613
*KP*2	←	*KP*	0.874	0.199	4.398	< 0.001	0.637
*KP*4	←	*KP*	0.843	0.214	3.950	< 0.001	0.632

Notes: C – continuity, KP – comprehensiveness.

Source: the authors.

The null hypothesis H0 was rejected in favour of the alternative hypothesis H1. The latent factor continuity had a significant influence on comprehensiveness. The structural coefficient on the path between both variables (0.71) points out the rate of change of the dependent variable from the independent variable. The model explained 50.7% of the comprehensiveness variance.

5. Discussion

This article investigates the relationship between coordination, comprehensiveness and continuity of primary healthcare delivered via teleconsultations in Poland. The literature research was aimed at proposing appropriate initial sets of indicators for their evaluation. Then they were used in the primary healthcare quality survey.

Patients gave an average rating regarding the coordination dimension. Most of the patients expressed their confidence that their GPs take into account the results of their diagnostic tests and the diagnosis of specialist doctors. Almost 60% of patients also believe that their GPs coordinate the care they receive from other doctors or in other institutions. However, many patients complain that their GPs do not monitor their health during or after treatment. In studies conducted in other countries, coordination did not receive the best assessment. For example, in the studies conducted among GPs from 31 European countries, Australia, New Zealand and Canada, coordination was considered the poorest dimension of the QPHC (Pavlič *et al*., 2015). Comprehensiveness was the best-assessed element of the three analysed dimensions (3Cs) of the QPHC. Most of the patients rated teleconsultations very highly in terms of comprehensiveness. More than 70% of patients did not experience problems with being referred for diagnostic tests, to specialists and receiving recommendations for prevention. Some patients, however, complained that the healthcare facility could not meet all their health needs. An excellent assessment of comprehensiveness was also made in studies conducted among family doctors from Sweden, New Zealand,

England, Norway and the Netherlands. The reverse was the case in Cyprus, Slovakia, the Czech Republic, Turkey and Italy (Pavlič *et al*., 2015).

The research shows that the assessment regarding the continuity of medical care is low. Family continuity was rated the worst. Over 50% of patients declare that their family members are under the supervision of another doctor or belong to another primary healthcare facility. Over 40% of patients believe their GP does not know their family situation. The highest-rated type of continuity was information continuity. More than 80% of patients assess as good or very good the access of the GP to information on their entire treatment history.

Relational and longitudinal continuity was evaluated at an average level. Different results were obtained in international studies where GPs perceived continuity of care as the essential quality dimension (Pavlič *et al*., 2015). The best continuity results were obtained in New Zealand and England. Also, Belgium, Germany, Norway, Slovenia, Sweden, Switzerland, and Australia are distinguished by excellent continuity of care, with high results for all indicators used to measure it. Conversely, unfavourable results for continuity of care were obtained in Turkey, Greece, Malta, Cyprus and Slovakia (Schäfer *et al*., 2015).

When comparing the overall average score for each of the three 3C dimensions of primary healthcare, the patients reported the highest score regarding comprehensiveness, then coordination and the lowest for continuity. A similar ranking was obtained in studies conducted in India (Faujdar *et al*., 2020). The reverse results were obtained in China, where continuity was the best-assessed dimension and comprehensiveness was the worst-assessed (Kuang *et al*., 2015). In studies conducted in Hungarian PHC clinics, all 3C dimensions – continuity, comprehensiveness and coordination – were assessed at a similar satisfactory level (Rurik *et al*., 2021). In turn, Greece obtained low results in all assessed dimensions (Lionis *et al*., 2017). Differences between countries in terms of coordination and continuity of care, as well as, to a lesser extent, comprehensiveness of care, can be partially explained by the scope of GP services. This means that in some countries, patients perceive a better quality of care as GPs in these countries offer a more comprehensive range of services (Schäfer *et al*., 2018).

The second goal of our study was to investigate the relationship between the analysed 3Cs dimensions of the QPHC. As a result of the EFA and CFA, a 2-factor model was created, containing the dimension of continuity and comprehensiveness. The continuity dimension in our model includes three variables regarding relational and longitudinal continuity, which means continuity with the same practice over time and interpersonal continuity with the same clinician over time (Haggerty *et al*., 2003). In addition, two more variables previously assigned to the coordination dimension have been loaded into the continuity dimension. They concern the coordination by a GP of medical care which patients receive from other doctors

or in other institutions, and the monitoring of their health. It has already been noted in previous studies that care coordination is an element of continuity without which there is no responsible provider that coordinates care (O'Malley *et al*., 2015). The second dimension of QPHC in our model is comprehensiveness, which includes meeting the patient's health needs by providing diagnostic and specialised care. Such a definition of this dimension is also justified by other studies, in which most of the measures of complexity focused on the scope of services provided in practice and paid less attention to the depth and scope of the conditions treated (Starfield, Shi & Macinko, 2005; Kringos *et al*., 2013).

The relationship between the various dimensions of the 3Cs, and especially between continuity and comprehensiveness of care, has already been analysed in previous studies (Cabana & Jee, 2004). The literature review showed that the continuity of care might be associated with improving preventive benefits, health promotion and diagnostics (Worrall & Knight, 2006). Previous research has shown that more comprehensive care can increase patient continuity and facilitate care coordination while reducing care fragmentation (Kringos *et al*., 2013). In this way, a wide range of medical services can be provided, which can positively influence maintaining the continuity of the relationship (Freeman & Hughes, 2010). However, the question arises of whether a very comprehensive primary healthcare clinic with many service providers will not reduce the patient's sense of continuity of care (Kringos *et al*., 2010). Because of these doubts, we examined the inverse relationship assuming that comprehensive primary care requires a GP capable of dealing with the broad problems of patients. This study explored the direct impact of continuity on the comprehensiveness of medical care. It was found that continuity of care positively influences comprehensiveness and that this relationship is statistically significant. The analysed structural model explained 50.7% of the variance. In our opinion, the comprehensiveness of care depends on its continuity because the constant, intense relationship between the patient and the GP means that the doctor can better understand the patient's health problems, which is conducive to issuing appropriate referrals to specialists and diagnostic tests.

6. Conclusions

In this study, we considered a teleconsultation-based approach to QPHC assessment. We focused on three dimensions of the QPHC (3Cs). According to our results, Polish patients rated the quality of care high in terms of comprehensiveness, on average in terms of coordination and the lowest in terms of continuity. The key conclusion from the literature analysis was that, to a large extent, the 3Cs do not function independently and that several overlapping elements exist between them. Our results suggest that continuity and coordination constitute one common dimension. Coordination can be regarded as an element of continuity as it requires the

patient to have a long-term trust-based relationship with their GP. Exploratory factor analysis showed that the final 2-factor model adopted for further research was correct. We also found that continuity of care positively influences comprehensiveness and this relationship is statistically significant. The results of this study show the significance of a long-term, lasting, trust-based relationship between GP and patient in comprehensive treatment.

The combination of coordination and continuity in one dimension that affects the comprehensiveness of medical care indicates the need for a holistic approach to the primary healthcare system. The study develops a patient-based framework for assessing primary care continuity, coordination and comprehensiveness. Taking into account patients' opinions on the quality of medical services when receiving healthcare remotely can contribute to improving the overall healthcare provision in primary healthcare facilities responsible for most health needs. It is worth adding that the very concept of QPHC based on the 3Cs is oriented towards practical activities. This knowledge should constitute a significant push for the further digital transformation of primary healthcare entities.

Authors' Contribution

The authors' individual contribution is as follows: Each contributed a sixth.

Conflict of Interest

The authors declare no conflict of interest.

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