

# The Relationship Between Continuity of Care and Enhancement of Clinical Outcomes Among Patients with Chronic Conditions

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**Background:** Continuity of care is one of the main principles of family medicine, described as a relationship with a single provider that extends beyond a single illness episode. This retrospective study, conducted at King Saud University Family Medicine Center in Riyadh, Saudi Arabia, aimed to investigate the impact of having a regular primary care provider on clinical outcomes and preventive service delivery for patients with diabetes and/or hypertension.

**Methods:** The study, spanning 2017 to 2019, included 400 patients diagnosed with diabetes and/or hypertension for at least six months before the 6-month pre-attachment period to regular family medicine physicians in 2018. Data before and after attachment for at least six months were compared using electronic health records.

**Results:** The mean age of the patients was 60.9, with a predominant female representation (66.8%) and 90.7% Saudis. Results indicated a significant improvement in glycated hemoglobin (HbA1c) levels ( $p = 0.005$ ) and systolic blood pressure ( $p = 0.014$ ) post-attachment. Preventive service delivery saw notable enhancements, with increased colon cancer screening ( $p = 0.03$ ), breast cancer screening ( $p < 0.001$ ), and retinal screening ( $p < 0.001$ ) post-attachment.

**Conclusion:** This study's findings underscore the importance of continuity of care in chronic disease management and provide valuable and promising insights into the Saudi healthcare context, aligning with the Saudi Ministry of Health's vision for universal access to regular primary care providers.

**Keywords:** continuity of patient care, primary health care, diabetes mellitus, essential hypertension, healthcare quality

## Introduction

Continuity of care is a cornerstone principle of family medicine; it is described as a relationship with a single provider that extends beyond a single episode of illness.<sup>1</sup> Having a regular family practitioner has been associated with substantial advantages, including improved patient satisfaction, increased trust in one's physician, improved adherence to screening protocols, and lower healthcare costs.<sup>2–5</sup> Furthermore, maintaining primary care continuity has been linked to a noteworthy reduction in hospital admissions and mortality rates.<sup>6–8</sup>

In some countries, such as France, Germany, the Netherlands, and Norway, 90% of the population report having an established primary care provider.<sup>9</sup> Conversely, in Saudi Arabia, the process of patient attachment is still in its developmental stages. The Saudi Ministry of Health<sup>10</sup> is actively striving to enhance the integrity and continuity of care within the domain of family medicine, focusing on both therapeutic and preventive services. A notable initiative in this regard occurred at King Khalid University Hospital in Riyadh, where King Saud University (KSU) staff underwent

a distribution among primary care providers in 2018. Each staff member and their respective families were linked to a single-family care provider.

The pronounced impact of maintaining a regular primary care provider becomes particularly noticeable when managing chronic illnesses such as diabetes and hypertension. These conditions necessitate a multidisciplinary approach, a facet significantly bolstered by enduring relationships with regular primary care providers. In Saudi Arabia, where diabetes and hypertension collectively accounted for a prevalence of 15.9% in the population as of 2017, the imperative for a structured and continuous care model is increasingly evident.<sup>11</sup> Furthermore, a recent systematic review in 2022 underscored the gravity of the obesity challenge in the region, reporting a maximum prevalence of 35.6%.<sup>12</sup>

In Chan et al's<sup>13</sup> study, the positive association between a higher continuity of care and improved quality of care among patients with diabetes mellitus was notable, including more HbA1c testing and eye or foot examinations. In the realm of preventative care, patients with regular doctors exhibited a notable propensity for engaging in preventative medical visits, a likelihood that tripled compared to those lacking consistent medical relationships over the preceding year. This trend extended to lower-income patients, among whom the presence of regular doctors was associated with a remarkable 50% reduction in reported substance misuse behaviors.<sup>14</sup> Moreover, another study revealed that adults receiving ongoing care from a regular family doctor were more likely to have their blood pressure (BP) monitored regularly than those without regular doctors.<sup>15</sup> This level of trust in one's regular primary care physician even translated into early detection in patients with colon and breast cancer.<sup>16</sup> However, studies that have examined colon cancer screening outcomes have yielded mixed results.<sup>16,17</sup>

Despite these insights from other countries, there is a notable gap in the literature regarding the impact of having a regular primary care provider in Saudi Arabia. In this context, this study aimed to determine whether having a regular primary care provider is associated with enhanced control of diabetes and hypertension and examine the impact of preventive interventions on patients with chronic conditions. By achieving these objectives, this study seeks to provide a comprehensive understanding of the role of continuity of care in clinical outcomes and preventive service delivery within the Saudi healthcare context.

## Materials and Methods

### Study Design and Setting

This research was a retrospective study of the medical records of patients following up at the University Family Medicine Center (UFMC) at KSU, Riyadh, Saudi Arabia, spanning the period 2017 to 2019. In 2018, KSU employed random stratified sampling to assign its 34,000 staff members to various primary care providers, ensuring that each individual had a regular primary care provider. Our inclusion criteria were patients 18 years of age or older diagnosed with diabetes and/or hypertension for at least six months prior to the 6-month pre-attachment period. Essentially, these patients had electronic medical records for at least six months before the 6-month pre-attachment period, including two visits with different primary care providers in the 6 months before being attached to a regular family medicine physician in May 2018. Subsequent monitoring extended for a minimum of six months postattachment to a personal family medicine physician. Patients who left or died and those not registered at KSU were excluded.

### Sample Size Determination

A total of 34,000 KSU staff are following up at UFMC. A pilot study of 50 patients was conducted to ensure clarity and accuracy in the subsequent analysis. Employing a standard sample size equation, we determined that 380 patients would provide a confidence level of 95%, with a margin of error of 5%. In alignment with these parameters, we enrolled a random sample of 400 patients based on the above-mentioned inclusion and exclusion criteria.

### Study Variables

The study variables include the following patient characteristics: gender, age, nationality, and smoking status. Moreover, the clinical outcomes included in the study are HbA1c, BP, low-density lipoprotein (LDL), glomerular filtration rate

(GFR), and preventive services such as influenza vaccination, colon cancer screening (via colonoscopy or fecal occult blood test), breast cancer screening (via mammogram), and retinal screening.

## Data Extraction

Electronic health records formed the basis of our data extraction. Patient names and sensitive information were strictly excluded to guarantee the anonymity of participants.

## Statistical Analysis

The data were analyzed using the software program Statistical Packages for Software Sciences version 26 (Armonk, New York, IBM Corporation, USA). Descriptive statistics were given as numbers and percentages for all categorical variables, while the mean and standard deviation were calculated to present all continuous variables. Between comparisons of variables, independent sample and chi-square tests were applied. A paired sample *t*-test was also performed to determine the differences between pre- and postvariables. Values were considered significant with a *p*-value of less than 0.05.

## Ethical Consideration

The Institutional Review Board at KSU reviewed and approved this study in February 2023 (No. E-23-7567). Patient consent was obtained electronically, ensuring compliance with patient data confidentiality and the Declaration of Helsinki.

## Results

A sample of 400 patients was included in this study. As described in Table 1, the patients' mean age was 60.9 (SD 10.4), with females being dominant (66.8%). Patients who were smokers constituted 4%. In addition, 90.7% were Saudis. In addition, 65% of the patients were hypertensive and 75% were diabetic. This study indicated a significant improvement in HbA1c ( $p = 0.005$ ) and systolic blood pressure (SBP;  $p = 0.014$ ) postattachment, while diastolic BP, LDL, and GFR were consistent ( $p > 0.05$ ; Table 2). Table 3 indicates a significant increase in colon cancer ( $p = 0.03$ ), breast cancer ( $p < 0.001$ ), and retinal screening ( $p < 0.001$ ) postattachment. Table 4 shows the older age group ( $p = 0.002$ ) was more associated with

**Table 1** Patient Demographic Characteristics (n=400)

Study data	N (%)
Age in years (mean $\pm$ SD)	60.9 $\pm$ 10.4
Gender	
• Male	133 (33.3%)
• Female	267 (66.8%)
Smoking status	
• Smoker	16 (04.0%)
• Non-smoker	147 (36.8%)
• Ex-smoker	10 (02.5%)
• Unknown	227 (56.8%)
Nationality	
• Saudi	363 (90.7%)
• Non-Saudi	37 (09.3%)
Hypertension	
• Yes	260 (65%)
• No	140 (35%)
Diabetes	
• Yes	300 (75%)
• No	100 (25%)

**Table 2** Improvement in Hypertension and Diabetes Indicators Pre- and Postattachment (n=400)

Parameters	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	P-value <sup>§</sup>
HbA1c	7.22 $\pm$ 1.68	7.05 $\pm$ 1.49	0.005 **
SBP	141.3 $\pm$ 17.5	138.9 $\pm$ 15.6	0.014 **
DBP	77.2 $\pm$ 11.3	76.5 $\pm$ 11.2	0.258
LDL	2.58 $\pm$ 0.84	2.57 $\pm$ 0.91	0.922
GFR	86.3 $\pm$ 22.1	86.2 $\pm$ 22.5	0.809

**Notes:** <sup>§</sup>P-values were calculated using independent sample t-tests.

\*\*Significant at p< 0.05 level.

**Table 3** Screening Pre and Post-Attachment (n=400)

Factor	Pre N (%)	Post N (%)	P-value <sup>§</sup>
Colon cancer screening *			
• Yes	20 (05.2%)	32 (08.3%)	0.003 **
• No	364 (94.8%)	352 (91.7%)	
Breast cancer screening †			
• Yes	18 (6.7%)	58 (21.7%)	<0.001 **
• No	249 (93.3%)	209 (78.3%)	
Influenza vaccine delivery			
• Yes	05 (01.3%)	05 (01.3%)	1.000
• No	395 (98.8%)	395 (98.8%)	
Retinal screening			
• Yes	133 (33.3%)	201 (50.2%)	<0.001 **
• No	267 (66.8%)	199 (49.8%)	

**Notes:** \*Patients 40 years or below were excluded from the analysis. †Patients 40 years or below and male gender were excluded from the analysis. <sup>§</sup>P-value has been calculated using the McNemar test. \*\*Significant at p<0.05 level.

**Table 4** Post Attachment According to Age (n=400)

Factor	Age $\leq$ 60 years Mean $\pm$ SD	Age >60 years Mean $\pm$ SD	P-value <sup>§</sup>
HbA1c	6.73 $\pm$ 1.47	7.20 $\pm$ 1.46	0.002 **
SBP	139.7 $\pm$ 15.8	138.3 $\pm$ 15.3	0.395
DBP	80.6 $\pm$ 10.3	73.1 $\pm$ 10.7	<0.001 **
LDL	2.73 $\pm$ 0.87	2.47 $\pm$ 0.94	0.006 **
GFR	91.2 $\pm$ 19.3	82.2 $\pm$ 23.7	<0.001 **
	N (%)	N (%)	P-value <sup>‡</sup>
Colon cancer screening *			
• Yes	11 (06.7%)	21 (09.6%)	0.305
• No	154 (93.3%)	198 (90.4%)	
Influenza vaccine delivery			
• Yes	04 (02.2%)	01 (0.50%)	0.180
• No	177 (97.8%)	218 (99.5%)	

(Continued)

**Table 4** (Continued).

Factor	Age ≤60 years Mean ± SD	Age >60 years Mean ± SD	P-value §
Retinal screening			
• Yes	68 (37.6%)	133 (60.7%)	<0.001 **
• No	113 (62.4%)	86 (39.3%)	

**Notes:** \*Patients 40 years or below were excluded from the analysis. §P-value has been calculated using independent sample t-test. † P-value has been calculated using Chi-square test. \*\*Significant at  $p < 0.05$  level.

a higher mean HbA1c value, while the younger age group was more associated with higher mean values for diastolic BP ( $p < 0.001$ ), LDL ( $p = 0.006$ ), and GFR ( $p < 0.001$ ). In addition, the prevalence of patients who underwent retinal screening was statistically significantly higher for the older age group ( $p < 0.001$ ). However, SBP, LDL, colon screening and influenza vaccine delivery were not statistically significant compared to the postattachment age group ( $p > 0.05$ ).

## Discussion

In 2018, KSU implemented an approach that was novel in Saudi Arabia by assigning its staff to one of the primary care providers, ensuring each individual had a regular primary care provider. This study's results are intriguing demonstrating some improvement in healthcare parameters, including HbA1c levels, SBP, and the efficient delivery of preventive services among patients with diabetes and/or hypertension following the attachment to a regular provider. This positive outcome can be attributed to enhanced patient trust, satisfaction, and adherence to the treatment plan, aligning with findings in existing literature.<sup>18–20</sup>

However, the broader discussion in the literature reveals a nuanced debate on whether having a regular healthcare provider genuinely enhances diabetes control. A study conducted at the Medical University of South Carolina presented a contrasting viewpoint, indicating that patients with regular providers exhibited only marginal improvements in diabetes control compared to those without providers in the same location.<sup>21</sup> Conversely, O'Connor's et al's<sup>22</sup> research in Minneapolis suggested that patients with a designated regular provider demonstrated better glycemic control than those without such continuity of care.

Unlike some studies in the literature that compared disparate groups with varying sample sizes and different medical practices,<sup>21,22</sup> this research focused on the same group of patients at the same location. It evaluated diabetes management within a single group, both before and after attachment to a regular provider. This approach eliminated potential biases stemming from diverse patient groups. Moreover, this study acknowledges the crucial role of patient cooperation and awareness in diabetes management. By comparing the same patient group before and after attachment to a regular provider, the research aimed to address the potential influence of varying levels of patient attitudes and compliance on diabetes control, providing a more comprehensive understanding of the subject.<sup>23</sup>

The research findings revealed a noteworthy enhancement in SBP following the establishment of a relationship with a single primary care provider. While the study relied on office BP measurements as an indicator of BP control, it subtly alludes to the potential influence of continuity of care on BP outcomes. Recognizing that office BP readings may be influenced by various factors, the repetition of measurements at the office, as observed at UPMC, provides more precise measurements.<sup>24</sup>

A few studies in the literature have highlighted the impact of having personal providers for BP control. A retrospective study conducted by Wanchun Xu et al<sup>25</sup> in Hong Kong not only suggested a link between continuity of care and reduced cardiovascular disease risk but also indicated an overall decline in the mortality rate associated with hypertension. Moreover, a study in Colombia underscored the correlation between continuity of care and effective BP control within primary care services.<sup>26</sup>

This study demonstrated a significant enhancement in the administration of screenings for colon cancer, breast cancer, and retinal conditions for patients with diabetes following the establishment of a connection with a personal primary care provider. This notable improvement can be attributed to the strengthened rapport between physicians and patients, fostering more effective consultations and screening deliveries. Moreover, such rapport positively influences the patient's

responsiveness to the treatment plan. The pivotal role of a regular healthcare provider in facilitating these improvements aligns seamlessly with contemporary evidence from the literature. A noteworthy illustration is a cross-sectional study conducted in the United Kingdom that revealed a marked enhancement in the provision of preventive services when patients had a designated and consistent healthcare provider.<sup>27</sup>

This study indicated no improvement in the delivery of influenza vaccines postattachment to a regular provider. The lack of availability of the vaccine at UPMC may be crucial. Intriguingly, some patients are opting for a different approach, choosing the unconventional setting of hospital hallways, malls, and neighborhood primary care centers during vaccination campaigns. Adding a layer of complexity, physicians themselves may be contributing to the lack of progress. It seems they are more inclined to recommend influenza vaccinations outside the conventional medical center. Moreover, these off-site vaccinations might not even make it into the official documentation, further obscuring the actual impact.

Another study unfolded a contrasting narrative, with findings suggesting a significant improvement in influenza vaccine delivery among patients who stick to regular healthcare providers compared to their counterparts without such dedicated medical connections.<sup>21</sup> However, K. Tom Xu<sup>28</sup> noted that the distinction between having a regular doctor and a regular site may not be as crucial as previously thought with regard to administering flu shots.

## Limitations

Several limitations were identified during this study. First, the generalizability of the findings may be constrained by the specific characteristics of the practice environment under investigation, potentially limiting their applicability to other healthcare settings. Second, the relatively brief follow-up period of six months with regular primary care providers may restrict the ability to comprehensively assess the enduring impact on healthcare parameters. Furthermore, the absence of patient-reported measures, encompassing perceptions of attachment to a regular primary care provider, waiting times, ease of access, and other quality metrics, introduces a notable gap in the comprehensive evaluation of the subject. Lastly, the study's heavy reliance on electronic health records introduces a susceptibility to errors and omissions, emphasizing the need for cautious interpretation of the results.

## Conclusion

The Saudi Ministry of Health's 2030 Vision aims to ensure universal access to a regular primary care provider across the nation. The findings of this study provide promising support for this vision by suggesting improvements in health outcomes, specifically in terms of reduced HbA1c levels, improved SBP, and enhanced delivery of preventive services among individuals with diabetes and/or hypertension after establishing a connection with a regular family medicine doctor. To further advance the current understanding, future investigations should encompass a broader spectrum of medical practices, employ larger sample sizes, and incorporate comprehensive measures, including patient perceptions and various quality indicators. These endeavors will contribute valuable insights into the ongoing pursuit of optimizing healthcare delivery and patient experiences in alignment with national healthcare objectives.

## Abbreviations

KSU, King Saud University; UPMC, University Family Medicine Center.

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## Disclosure

The authors report no conflicts of interest in this work.

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