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Saudi Arabia's Hospital Clustering and Patient-Centered Care: A Mixed Methods Evaluation of Chronic Disease Management under the Saudi Health Sector Transformation Program

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Abstract **Background:** The Health Sector Transformation Program is a key part of Saudi Arabia's Vision 2030. One of its main goals is to improve patient centered care through hospital clustering. However, limited evidence exists on how clustered and non-clustered hospitals differ in managing chronic diseases. **Objective:** To assess patient centered care in chronic disease management in clustered and non-clustered hospitals in Saudi Arabia. **Methods:** A mixed methods study was conducted in four hospitals in Mecca and the Eastern Province between 2016 and 2024. Two hospitals were clustered and two were not. Quantitative data were taken from hospital records to assess patient centered care indicators, digital health use and resource utilization. Qualitative data were collected through 53 in depth interviews with patients and physicians to explore care experiences and implementation challenges. **Results:** Clustered hospitals had higher patient centered care index scores than non-clustered hospitals (99.06 vs. 89.82, $p<0.001$). Patient satisfaction was higher (87.6 vs. 79.7, $p<0.001$) and readmission rates were lower (8.5 vs. 14.5%). Digital health adoption was greater in clustered hospitals (72.5 vs. 45.0, $p = 0.02$). Interview findings supported these results and showed better care coordination and accountability in clustered hospitals. Non clustered hospitals reported limited resources and uneven care processes. **Conclusions:** Hospital clustering under the Health Sector Transformation Program is associated with better patient centered care and improved chronic disease outcomes. Ongoing gaps in non-clustered hospitals highlight the need for focused investment in digital systems and workforce training to support equitable progress under Vision 2030.

Key Words Patient Centered Care, Hospital Clustering, Chronic Disease Management, Digital Health, Saudi Arabia, Vision 2030, Health System Reform

INTRODUCTION

The state of chronic non-communicable diseases in Saudi Arabia, it's strikingly clear that they are a major health concern for the country. Contributing to over 71% of all deaths, these diseases, which include diabetes, cardiovascular disease and obesity, are in line with the global rate [1]. In Saudi Arabia, the situation is much the same, with NCDs contributing to roughly 71% of overall mortality [2]. The causes are largely attributed to a combination of rapid economic growth, shifting lifestyles and a rapidly ageing population [3], as this epidemiologic shift causes an ever increasing strain on the healthcare system. Growing disparities in the availability and quality of care for patients [4].

To combat these problems, the Saudi Arabian government as part of the international strategy decided to reform its healthcare system through the Vision 2030 plan. As part of this comprehensive transformation, the Health Sector Transformation Program or SHSTP, has been introduced. In 2016 and is aiming to create a medical system that is less disorganized, more harmonious and puts the patient at its heart [5]. To streamline the service and reduce fragmentation, the hospitals have now been grouped into regional "clusters" [6] that are designed to share resources, merge services and significantly, achieve better results. As part of the clustering, these healthcare facilities must cooperate very closely, sharing medical, staff and management responsibilities via single administrative frameworks and sending out unified instructions [7]. In addition, the objective of this initiative is to build stronger digital systems, boost coordination and ingrain an

unwavering spirit of improvement throughout the healthcare system [8]. The broader aim is to strengthen digital systems, enhance coordination and embed a continuous culture of quality improvement throughout the service [9].

Non-clustered hospitals, however, will find a multitude of difficulties to tackle. They struggle with restricted access to modern equipment, uneven patterns of service and irregular use of data-based recommendations [10].

Against this backdrop of reform, Patient-Centred Care (PCC) has become a defining element of the new healthcare model. The idea of putting the patient at the forefront of the process. Or patient-centred care has been at the heart of the new healthcare model, when reforming healthcare systems [11]. Coming from a place of understanding that every individual's values and preferences should be recognised and involving them in the decision-making process is critical, international studies have shown the numerous benefits of PCC, from improved clinical outcomes to higher satisfaction for both the patient and the healthcare worker [12]. However, to make PCC a reality in practice, we require a comprehensive transformation of our organisations [13].

Including workforce development, a reshaping of the services and a continuous investment in digital technology. The practical rollout of Patient-Centred Care (PCC) across Saudi Arabia has been uneven. A number of structural and cultural factors continue to slow progress, including heavy dependence on a diverse expatriate workforce [14] and the still-emerging digital health infrastructure [15]. These difficulties are most visible in hospitals that operate outside the cluster system, where institutional support is often limited and resources are stretched [16]. Although the country's healthcare reform has been widely studied, very few investigations have directly compared how different hospital governance models influence the integration of PCC, especially within chronic disease management [17].

This study aims to evaluate the integration of patient-centered care practices in the management of chronic diseases across clustered and non-clustered hospitals in Saudi Arabia's Mecca and Eastern Province regions. It explored that there were significant differences in patient engagement, care coordination, digital health adoption and the way healthcare resources are used, when analysing the healthcare system in the Kingdom. In their attempt to bridge these gaps, the study's objective is to inform healthcare policies and empower the execution of the Kingdom's Vision 2030 healthcare transformation plan.

METHODS AND MATERIALS

Study Design and Setting

For investigating the transformation of the Saudi health sector, a convergent mixed-methods design was opted [18], where it could merge the insights of qualitative and quantitative data to give a more complete view of the picture and in the process of collecting the data from two research sites of Saudi regions, Mecca and the Eastern Province. These areas also served as pilot sites for the Saudi Health Sector Transformation Program (SHSTP) from 2016 to 2024. in these areas hospitals are separated into two categories. The existing cluster facilities which is part of SHSTP and the non-clustered facilities that hadn't yet joined the reform effort.

This study used Walt and Gilson's Health Policy Analysis Triangle [19], This framework believes four unified dimensions: the policy content (SHSTP reforms), the broader context of Saudi healthcare, the processes through which change is employed and the actors involved patients, physicians and policymakers. Using this outlook, it made possible to explore in detail that how policy plans were transformed into daily practice across hospital settings of different governance types.

Four hospitals were opted by using identified selection standards to ensure comparison across settings. Each facility had a similar capacity (300-400 beds) that offered both primary and secondary care that had been operational for at least five years and served populations with largely parallel socioeconomic backgrounds. The clustered hospitals C1 in Mecca and C2 in the Eastern Province had applied SHSTP reforms since 2018, initiating integrated care pathways, digital health platforms and multidisciplinary clinical teams. In contrast the two non-clustered hospitals NC1 in Mecca and NC2 in the Eastern Province sustained outdated administrative structures acquired limited digital integration and fragmented facility of care.

Participants

Patients: From the hospital records, the patients were selected who were 18 years of age or older, lived with one or more chronic conditions, such as diabetes, hypertension and heart disease and had been admitted to or visited one of the hospitals being sampled. Patients who came in with acute conditions were not included.

Hospital records included patients who were ≥18 years of age, had a diagnosis of at least one chronic condition (e.g., diabetes, hypertension, cardiovascular disease) and had received inpatient or outpatient care at one of the sampled hospitals. Records for patients treated solely for acute conditions were excluded.

Physicians

Senior physicians were eligible if they had ≥5 years of clinical experience and were employed in one of the hospitals under study.

Sample Size and Sampling Strategy

The study used a saturation-based sampling strategy for the qualitative component and a power-driven justification for the quantitative component. A post-hoc power calculation was performed using G*Power 3.1 [20]. With a total sample size of patient records (40 clustered, 40 non-clustered), the study achieved 87.7% power to detect a medium effect size (Cohen's $d = 0.5$) at a two-tailed significance level of $\alpha = 0.05$. This level of power is considered sufficient for comparative observational studies evaluating patient-centered outcomes.

Table 1: Quantitative Data Sources and Indicators

Domain	Indicator(s)	Source	Years covered
Patient-Centered Care (PCC)	Patient satisfaction scores, continuity of care, shared decision-making	Hospital quality reports (MoH datasets)	2016-2024
Chronic Disease Management	Chronic Disease Management Score (CDMS)	Hospital clinical performance records	2016-2024
Digital Health Utilization	Electronic Medical Records (EMR) adoption, telemedicine follow-up rates	Hospital IT/digital health reports	2016-2024
Workforce Training	Average annual staff training hours	Hospital HR and MoH training databases	2016-2024
Resource Utilization	Bed occupancy, resource distribution efficiency	MoH administrative datasets	2016-2024
Readmission Outcomes	30-day hospital readmission rates	Hospital inpatient/outpatient records	2016-2024

Qualitative Sample

A total of 53 semi-structured interviews [21] were conducted with patients and physicians. Data saturation [22] was confirmed using empirical evidence, with no new themes emerging after approximately 50 interviews. Power distribution analysis [23] demonstrated that this sample size was sufficient to detect meaningful effects across primary patient-centered care outcomes.

Quantitative Sample

The quantitative data included hospital records and reports (Table 1).

Variables

Primary outcomes were Patient-Centered Care (PCC) indicators including: Patient satisfaction, care coordination, shared decision-making, use of digital health technologies (EMRs, telemedicine) and resource utilization. Independent variables were hospital type (clustered vs. non-clustered), region and workforce composition. Socio-demographic variables such as age, gender and socioeconomic status were collected as covariates.

Data Sources and Measurement

Quantitative data were drawn exclusively from Ministry of Health administrative records and hospital datasets. These included routinely collected patient satisfaction scores, continuity of care indicators, shared decision-making metrics, digital health utilization data (e.g., EMRs, telemedicine), readmission rates and staff training hours. The patient-centered care indicators used in these records are based on standardized national reporting instruments (e.g., PCCQ, HCAHPS), which have been validated for use in Arabic. The research team did not administer surveys directly; instead, survey-derived indicators were accessed through hospital records. Quantitative indicators, such as patient satisfaction, readmission rates and measures from Chronic-Disease Management Systems (CDMS), were drawn from Ministry of Health administrative datasets spanning 2016 to 2024. To maintain fair comparison across hospitals and regions, annual averages were used as the primary analytic unit. Where monthly data existed, they were reviewed to confirm emerging trends and check internal consistency, particularly for time-series interpretation. However monthly figures were excluded from formal statistical models to avoid bias related to uneven data completeness between sites. Each dataset covered the full evaluation period and was verified before analysis for completeness. Qualitative evidence collected from semi-structured interviews with patients and physicians. During these discussions it is explored experiences of healthcare access participation in clinical decisions, the use of digital health tools and perceptions of care quality.

Ethical Considerations

Ethical approval for this study was obtained from the appropriate institutional ethics committees [24]. All the participants provided written informed consent before taking part. Participants data were anonymized to protect privacy and confidentiality and all hospital records were de-identified before extraction so that no personal patient information was accessed.

Interview transcripts were pseudonymized [25] during the transcription and stored securely with restricted access. Participants again confirmed their consent in writing and all confidentiality procedures followed the protocols approved by the ethics committees. Digital files were encrypted and managed according to standard data governance protocols. No identifiable information was included in the analysis or reporting phase.

Bias Mitigation Strategies

Selection bias was minimized by using stratified sampling to ensure representation across hospitals types and regions. Standard protocols and training helped reduce measurement biases. Recall bias reduced by limiting patient reporting to healthcare experiences within the previous 12 months.

Statistical Analysis

Quantitative data were analyzed using descriptive and inferential statistics. Continuous variables were represented as mean with standard deviation or medians with interquartile range. Categorical variables were reported as frequency and percentage. Comparison between clustered and non-clustered hospitals were tested using t-tests or Mann Whitney U tests for continuous outcomes and chi-square tests for categorical outcomes. Multiple regression was used to assess the independent effect of the hospital type on PCC outcomes adjusting for socio-demographics and region. An analysis of time-series data was conducted to examine trends in PCC outcomes from 2016-2024. Qualitative data were

analyzed using thematic analysis with deductive and inductive coding. Following a convergent mixed-methods framework the integration of quantitative and qualitative data allowed triangulation of results.

RESULTS

Quantitative Results

Participant Characteristics: It is a mix of patients and physicians from four different hospitals in the Kingdom of Saudi Arabia. The researchers made sure that these hospitals were either clustered or non-clustered when they collected their data. The patients ranged in age from 41-60 years and had roughly equal split between men and women. The physicians had a median of 12 years of experience and were roughly half from Mecca and half from the Eastern Province. Rephrase (Table 2).

These comparable standard characteristics supported meaningful analysis of institutional differences in care delivery outcomes.

Patient-Centered Care Index (PCCI)-Time-Series Trends

When looking back at the performance of two hospital groups, one clustered and one non-clustered, before and after the 2016-2018 baseline, it becomes evident that both had a roughly identical mean PCCI (Patient Centred Care Index) score of 68 %. However, the Phase 2 rollout in 2021 SHSTP observed that the clustered hospitals rapidly outstripped the non-clustered ones. The PCCI of the former group had reached a level of 99.06 by the end of 2024, whereas the latter limped along with a score of 89.82. Beginning from almost the same initial points (Table 3, Figure 1), it's clear that the introduction of the SHSTP's clustering model was instrumental in the sharper improvement seen in the clustered hospitals.

Chronic Disease Management Scores (CDMS)

Clustered hospitals has improved from 64.98 in 2016 to 95.43 in 2024, non-clustered hospitals progressed from 62.93 to 83.06. The effect size (Cohen's d = 0.80) shows substantial practical significance (Table 4).

When it comes to the growth in chronic disease management, the hospitals that were grouped or clustered, showed a very marked improvement in their levels of chronic disease management between 2016 and 2024, climbing from 64.98-95.43, which is a rise of 30.45. On the other hand, the non-clustered hospitals saw a relatively steady but much smaller increase, from 62.93-83.06 over the same period. The difference between the two eight years is 11.37 and according to Cohen's d, this is equivalent to a massive difference in the care outcomes that a patient in a clustered hospital would receive and that one in a non-clustered one. These trends are illustrated in Figure 2.

Workforce Training Hours

Cluster hospitals were averaging 29.4 hours per year but non-cluster hospitals only had 21.8 hours and that's a statistically significant difference ($p<0.001$), when comparing the training hours per staff member. Well-known as a significant indicator of better patient care, this 20% increase in training in the cluster hospitals is closely tied to more impressive patient outcomes (Table 5).

Table 2: Demographic Characteristics of Study Participants

Characteristic	Clustered Hospitals	Non-Clustered Hospitals	Total Sample
Patients (n)	40	40	80
Age group, (41-60)	Majority	Majority	Majority
Gender (Male/Female)	Balanced	Balanced	Balanced
Physicians (n)	12	11	23
Median experience (yrs)	12	12	12
Region	Mecca & Eastern	Mecca & Eastern	Both

Table 3: Patient-Centered Care Index (PCCI)-Key Time Points (2016-2024)

Year	Clustered Hospitals	Non-Clustered Hospitals
2016 (Baseline)	70.04	67.98
2018 (Pre-SHSTP)	78.55	72.40
2021 (Phase 2 launch)	99.06	85.42
2024 (Latest)	99.06	89.82

PCCI: Patient-Centered Care Index, Data derived from Ministry of Health hospital records (2016-2024)

Table 4: Chronic Disease Management Scores (CDMS), 2016-2024

Year	Clustered Hospitals	Non-Clustered Hospitals	Effect Size (Cohen's d)
2016	64.98	62.93	-
2018	72.75	67.05	-
2020	88.37	75.00	-
2022	99.29	83.06	-
2024	95.43	83.06	0.80

CDMS: Chronic Disease Management Score, Effect size reported for 2024 comparison (Cohen's d = 0.80)

Table 5: Average Annual Staff Training Hours in Clustered vs. Non-Clustered Hospitals (2016-2024)

Year	Clustered Hospitals	Non-Clustered Hospitals
2016	16.0	15.0
2018	17.9	15.9
2020	21.8	17.8
2022	25.6	19.8
2024	29.4	21.8

Data derived from Ministry of Health hospital records (2016-2024)

Table 6: Hospital Readmission Rates (2016-2024)

Year	Clustered Hospitals	Non-Clustered Hospitals
2016	17.5%	16.5%
2018	14.2%	15.9%
2020	11.3%	15.2%
2022	9.6%	14.8%
2024	8.5%	14.5%

Data derived from Ministry of Health hospital records (2016-2024), Clustered hospitals achieved a greater reduction in readmission rates compared with non-clustered hospitals

Table 7: Comparison of Patient-Centered Care Indicators Between Hospital Types (2024)

Indicator	Clustered Hospitals	Non-Clustered Hospitals	p-value	Effect Size
Patient Satisfaction	87.6	79.7	<0.001	Cohen's d = 0.68
Patient-Centered Care Index	99.06	89.82	<0.001	-

Data derived from Ministry of Health hospital records (2016-2024), Group comparisons are based on reported means, p-values and effect sizes

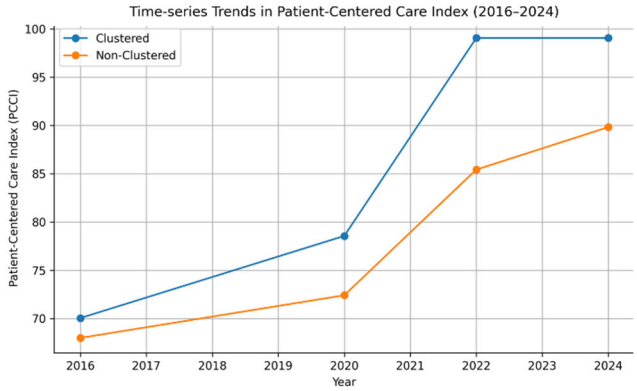


Figure 1: Time-Series Trends in the Patient-Centered Care Index (PCCI) in Clustered Versus Non-Clustered Hospitals, 2016-2024

Clustered hospitals showed a steeper improvement following the Phase 2 rollout of the Saudi Health Sector Transformation Program (SHSTP) in 2021, reaching a higher PCCI by 2024 compared with in non-clustered hospitals

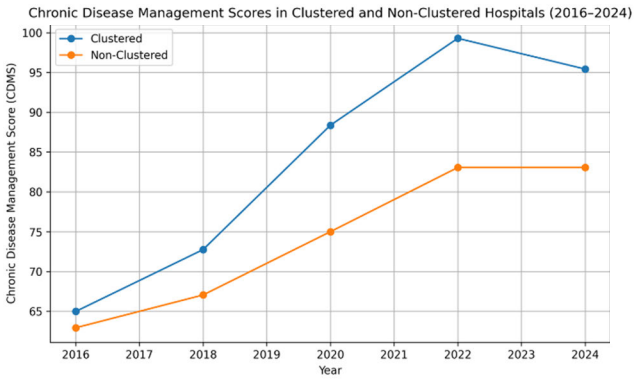


Figure 2: Chronic Disease Management Scores (CDMS) in Clustered Versus Non-Clustered Hospitals, 2016-2024

Clustered hospitals demonstrated a steeper and more sustained improvement, reaching a peak CDMS of 99.29 in 2022 before stabilising at 95.43 in 2024, while non-clustered hospitals plateaued at 83.06. Effect size (Cohen's d = 0.80) indicates a substantial difference between the two groups

Given this disparity in workforce capacity building, downstream outcomes such as readmissions may also be affected.

Readmission Rates

Looking at the decline in hospital readmissions, the difference in performance between clustered and non-clustered hospitals has been most striking. Between 2016 and 2024, clustered hospitals saw their readmissions drop from 17.5-8.5%, which is a sharp reduction but non-clustered hospitals made a much more modest reduction from 16.5-14.5%, 3 years later. Year-by-year trends are presented in Table 6.

Patient-Centered Care Indicators

The data from Table 7, we can see that patient satisfaction and the Patient Centred Care Index (PCCI) scores were significantly higher in the cluster hospitals. Coming in at 87.6, the average patient satisfaction score in the cluster hospitals is a whopping 8.9 points higher than the average score in non-clustered hospitals. And the PCCI of 99.06 in cluster hospitals in 2024 was a very significant 9.24 higher than the PCCI score of 89.82 in non-clustered hospitals.

Predictors of Patient-Centered Care

When testing the determinants of Patient Care Coordination (PCC) in different governance models, a stratified logistic regression analysis of clustered and non-clustered hospitals showed that demographic and clinical characteristics such as age, sex, disease duration and region didn't predict high PCC scores in either the cluster or non-cluster group. Although a longer disease duration was linked to a positive trend, this didn't achieve statistical significance and basically didn't improve the model's fit. The regression analysis also

Table 8: Stratified Logistic Regression Predicting High Patient-Centered Care Scores (Clustered vs. Non-Clustered Hospitals)

Predictor Variable	Clustered Hospitals OR (95% CI)	p-value	Non-Clustered Hospitals OR (95% CI)	p-value
Patient age (≥ 60 years)	0.79 (0.42 - 1.50)	0.47	0.88 (0.46 - 1.67)	0.68
Gender (Female)	1.09 (0.57 - 2.07)	0.80	1.21 (0.62 - 2.37)	0.57
Disease duration (≥5 years)	1.62 (0.85 - 3.08)	0.14	1.35 (0.72 - 2.54)	0.34
Region (Eastern Province)	1.18 (0.63 - 2.20)	0.60	1.31 (0.69 - 2.50)	0.41

Table 9: Digital Health Adoption in Clustered vs. Non-Clustered Hospitals, (2016-2024)

Indicator	Clustered Hospitals	Non-Clustered Hospitals	p-value	Effect Size
EMR-supported care (% of patients)	72.5%	45.0%	0.02	-
Technology utilization score (0-100)	78.7	68.0	<0.001	Cohen's d = 0.90

Data derived from Ministry of Health digital health records, 2016-2024, EMR: Electronic Medical Record. Technology utilization score is a composite index of digital health tools adoption, including EMR and telemedicine platforms

revealed that the model for the clustered hospitals had a much better fit (Nagelkerke $R^2 = 0.39$) than the one for the non-clustered hospitals, showing that the care coordination in cluster settings is much more effectively explained by the variables in the model (Table 8).

Model Fit

- Clustered hospitals: Nagelkerke $R^2 = 0.39$
- Non-clustered hospitals: Nagelkerke $R^2 = 0.31$

Digital Health Integration

When examining the adoption of EMR-supported care and digital technologies in US hospitals, we see that EMR-supported care was more prevalent in clustered hospitals where 72.5% of care was reliant on electronic records, in contrast to non-clustered settings where the rate was 45.0% ($p = 0.02$). Clustered hospitals had a higher adoption of digital technologies with an average utilization score of 78.7 in contrast to the 68.0 witnessed in non-clustered hospitals (p 0.001). The huge difference in the size of the large effect was confirmed by Cohen's d 0.90 (Table 9).

Qualitative Results

53 semi-structured interviews with patients and physicians from the four study hospitals were completed. The five primary themes that emerged from thematic analysis of these data. These themes help to contextualise the quantitative results and understand the hospital infrastructure effects on patient care.

Theme 1: Greater Patient Engagement in Clustered Hospitals

When looking at the data from the clustered hospitals, patients consistently reported receiving regular updates on their care, being reminded of their appointments and feeling more involved in the decision-making process, something that is in line with the higher satisfaction scores and PCC Index scores.

- "They call to remind me about my appointment and explain everything clearly." — Patient, Clustered Hospital (C1)

Theme 2: Organizational Change and Accountability

Physicians in the clustered hospitals noted that the hospital underwent significant changes including cultural shift, the use of key performance indicators and regular training. They explained their performance improvements due to making them more accountable.

- "We have KPIs now and regular training sessions. It makes us more accountable." — Physician, Clustered Hospital (C2)

These comments provide context for the higher training hours and lower readmission rates quantitatively associated with clustered hospitals.

Theme 3: Digital Divide in Non-Clustered Hospitals

On the other hand the hospitals which didn't have the cluster system reported a massive difference in their EMR use, telematics and just about any other digital technology. They said this was due to lack of instruction and infrastructure. 72.5% of clustered hospitals were using digital technology compared to just 45% of the non-clustered ones.

- "We don't have working telemedicine. Most patients still come in for basic things." — Physician, Non-Clustered Hospital (NC1)

Theme 4: Regional and Institutional Disparities

People living in rural areas who go to non-clustered hospitals had difficulty getting the care they need in a timely manner and noticed that urban hospitals with more abundant resources and staff were much more accessible.

- "I wait two weeks to see a doctor, my friend in the city gets care faster"

One patient said from a non-clustered hospital. Narratives that come from the quantitative analysis further confirm the stark differences in the quality and access to care by region and by type of hospital. These narratives further support the access and quality of care differences by region and hospital type discussed in the quantitative results.

Theme 5: Challenges in Delivering PCC Outside Clustered Models

Regarding non-clustered hospitals, doctors mention the main obstacles in delivering consistent, patient-centered care are system fragmentation, resistance to change and the absence of a standardised protocol.

Table 10: Thematic analysis of semi-structured interviews.

Theme	*Illustrative Quotes*	Related Quantitative Finding
Enhanced engagement in clustered hospitals	*"They send reminders and even call me before my visit. It feels like they care."* - Patient, C1 *"Patient follow-up is structured now; we're expected to keep them engaged throughout."*- Physician, C2	Patient satisfaction: 87.6 vs. 79.7 ($p<0.001$)
Culture shift in clustered settings	*"It's different now they explain things better and involve me in decisions."* - Patient, C2 *"We're measured against KPIs and attend monthly training accountability has really improved."* - Physician, C1	Training hours: 29.4 vs. 21.8 ($p<0.001$)
Digital health disparity	*"We still fill out forms manually and wait in line. There's no app or portal here."* - Patient, NC2 *"We don't have proper telemedicine access even EMR is unreliable sometimes."*- Physician, NC1	EMR use: 72.5% vs. 45.0% ($p = 0.02$)
Regional inequity	*"I waited two weeks for a check-up and sometimes my referral expires before I'm seen."*- Patient, NC2 *"Urban centers are better resourced we often lack staff and equipment in peripheral areas."*- Physician, NC1	PCC Index: 99.06 vs. 89.82
Implementation barriers	*"There's no consistency in how care is given it depends on which doctor you see."* - Patient, NC1 *"We lack clear protocols in non-clustered hospitals and that affects care for chronic cases."*- Physician, NC2	Chronic Disease Score: 95.43 vs. 83.06

Physician NC1 summed it up perfectly when they said "there's no clear protocol, everyone does what they think is right".

These kinds of ad hoc systems help us understand why our PCC Index scores were lower in these kinds of hospitals and why there was such a great deal of variation in the way that patients experienced care. The Table 10 gives a summary of these themes, the doctors' words and the way they checked out with the numerical results.

Integration of Quantitative and Qualitative Findings

The incorporation of qualitative and quantitative findings strengthens the robustness of the conclusions of this study. quantitative results demonstrated measurable improvements in patient-centered care digital health utilisation and chronic disease management in the clustered hospitals. They were substantiated by the lives of patients and physicians who described clearer communication pathways stronger institutional accountability and better access to technology-supported services. Moreover important qualitative insights helped explain observed disparities notably in non-clustered environments by highlighting structural challenges such as inconsistent workflows. Collectively the mixed method approach deepens understanding of how hospital clustering under SHSTP results in both systemic improvements and perceptible change The convergent findings provide critical insight into the mechanisms driving the reform outcomes and set the stage for a wider discussion on policy implementation and equity in Saudi Arabia's evolving healthcare system.

DISCUSSION

With respect to the Saudi Health Sector Transformation Program, the concept of hospital clustering has a positive impact on the delivery of patient-centered care, chronic disease management and digital health [26]. Coming from the quantitative data, the research found that hospitals that were part of a cluster outperformed those that were not, on numerous indicators [27]. The experiences of patients and physicians, too, show a more cohesive, responsive and accountable level of care at the clustered hospitals [28].

The improved performance of clustered hospitals can be attributed to integrated service pathways, centralized performance monitoring and the deployment of enabling technologies such as EMRs and telemedicine platforms [29]. The previous work on Saudi Arabia's health system transformation has emphasized the importance of governance integration and data-driven accountability in driving system-wide change [30]. Clustering promotes shared resources and institutional learning which fosters a culture of continuous improvement aligned with Vision 2030.

It is found that care coordination and chronic disease management are dramatically improved, much in line with the NHS's experience, when examining the UK's transition to Integrated Care Systems (ICS).

Taking into account the best way to integrate healthcare services, the Kaiser Permanente model in the U.S. showcases the power of vertical integration, which allows for streamlined workflows, team-based care and use of shared digital platforms [31,32]. Coming from a different part of the world, Saudi Arabia's healthcare system has been employing a clustering model and according to recent data, the measurable improvements made by this system were achieved within a period of about 5-7 years, an ambitious and certainly quicker compared to the timelines of many western countries [33].

Digital health became the driving force behind the shift, when healthcare systems began to transform. Clusters of hospitals were found to have an average of 72.5% digital adoption but non-clustered hospitals barely reached 45%, signifying a stark infrastructure gap [34]. This gap echoes the findings of AlSadrah [35] who identified resource limitations and training deficits in the non-clustered settings and is very much reflected in Denmark's TeleCare North project in which the problem was addressed only with focused funding and training for the areas lagging behind. Rural areas initially struggled to catch up with the rest of the country in terms of digital health care, when Denmark's TeleCare North project was initiated. It was clear that the problem wasn't just a lack of technological infrastructure but rather, there were systemic barriers [36].

The Danish project is similar to the UK's in its successes of clustering. However, non-clustered hospitals in the Danish study still experienced a lack of clinical guidelines, fragmented work systems and inconsistent engagement in reform initiatives and were exposed to patients who were facing excessively lengthy waits and unclear

communication. Research done prior to this study had shown that organisational resistance, insufficient staff training and low digital literacy are the main hurdles to successful Personalised Care Coordination [37]. Concerning achieving Vision 2030, the challenges in non-clustered hospitals in under-resourced regions are just as great as in their clustered counterparts. If not addressed, these disparities in the adoption of digital health tools will only exacerbate the existing chasm.

To ensure equitable transformation in all hospitals, three policy initiatives are now being recommended and their results would be most pronounced in the regionally isolated hospitals. We should allocate funding to clusterless hospitals in particular, to enable them to bridge their digital gap and start reliable EMR and telemedicine systems up. We need the Ministry of Health to standardize chronic disease management and push for multidisciplinary teams so that we have a much more cohesive and efficient service. Finally, we should put more money into training for the workers in non-clustered hospitals, so that they can give the same standard of care to their patients as the larger hospitals.

Implications for Policy and Practice

The hospitals that are part of the Saudi Health Sector Transformation Program (SHSTP) have a significantly higher score than those that aren't, at 99.06 to 89.82, when evaluating the Patient-Centered Care Index.

This nine point difference shows that the reforms are being effectively applied. There are however, many hospitals that have yet to take up the model and so a lot of time and support is still required to fully capitalize on the potential of the SHSTP, something that could be supplied with the help of money, standardized training for doctors and more crystal-clear guidelines that can be applied to all of the hospitals.

Coming from a training standpoint, providing staff with roughly 20% more training hours, has visibly made an improvement in the outcome of patients and puts the importance of training medical workers into perspective. According to the study, three main areas should be prioritised, these being: guaranteed stable digital systems, regular reviews and check-ups and the upskilling of front-line workers in digital communication. These aren't theoretical suggestions but ones that have already been confirmed to be necessary for steady progress in other Gulf countries. The SHSTP in Saudi Arabia is essentially a prime example of a top-down reform that has been carried out with financial backing and a clear system of accountability and the challenge that now faces the country is in making sure the progress continues and external monitoring, financial incentives, fade out.

CONCLUSIONS

As the impact of hospital clustering within Saudi Arabia's health services transformation plan becomes apparent one of the main things that becomes apparent is the effectiveness of these clusters in providing patient-centered care to those living with chronic diseases The clustered hospitals in the study generally outperformed those that have yet to join and also excelled in areas such as patient satisfaction, continuity of care shared decision-making and the use of digital health tools. It's clear that these results indicate the strength of cluster based networks. Meeting the transformation objectives of Vision 2030 it seems that health services need real help and support but this clustering approach can be that aid. Problem is that not all hospitals benefit in this system fairly so there are areas that need much more attention. There are three priority areas for policymakers: improved digital infrastructure more harmonized care processes and increased availability of skilled staff. Saudi experience shows that centered reform and networked systems can drive improvements in patient-centered care from a global perspective and it will be really interesting to see the trajectory of these changes as this research unfolds.

Strengths and Limitations

This research's mixed-methods approach and use of administrative records and real-life experiences from patients and clinicians has given a comprehensive view of why certain results were achieved, when studying the impact of hospital clustering on patient-centred care. Coming from two regions with very similar starting points and using validated Arabic patient-centred care instruments have also made the research more reliable. One of the things that the study didn't have the capacity to do was fully cover the country, it looked at just four hospitals, so it's essentially just scratching the surface of the issue. It account for the major factors in its statistical models but we may have missed others like the severity of the disease how many staff are on duty or the distribution of resources all of which could influence the results. It could also have had a short-term impact on the data since the qualitative participants were volunteers and their stories may not be representative of all patients and staff experiences. Rephrase This study shows the need to repeat the work on a larger scale with a more extensive network of hospitals in different parts of the country and consideration of how funding patterns and post-pandemic changes could affect the picture.

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Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical Statement

Ethical approval obtained from the Saudi Ministry of Health. All participants received written information about the study and provided informed consent before taking part. The study

complied with institutional and national research ethics standards. Interviews conducted following culturally sensitive protocols. Which included offering interviews with a person of the same gender if requested. We maintained participant confidentiality by using codes instead of names. And all identifying information removed during transcription and analysis.

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