Keywords: Outcome and process evaluation; healthcare; healthcare costs; patient care; health services; patient care team

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Received:27-06-2026
Revised:05-08-2026
Accepted:10-08-2026
Doi:10.1922/ejprd.v34i7s.1753

European Journal of Prosthodontics and Restorative Dentistry (2026) 34 (7s), 1147–1156

Study of the Monthly Evolution of the Quadruple Aim in a Global Context

Abstract
The Quadruple Aim (QA) model is a strategic approach to increase value in the healthcare system by achieving better outcomes with the same or fewer resources. This model ensures universal access to timely, quality services for all individuals. This study of the Monthly Evolution of the Quadruple Aim in a Global Context Methods: The research was conducted at a private clinic in Barranquilla in 2021. A quantitative analysis of each component was performed using a database, which collected data every month. Sampling was conducted through census, which was selected consecutively using cluster indicators. Sources included data provided by the clinic, and statistical software was used for analysis and correlations. Results: Our findings showed that, during 2021, goal achievement varied as follows: healthcare experience increased from 83.81% to 92.88%, health outcomes from 87.12% to 93.70%, team satisfaction from 93.09% to 94.48%, and financial sustainability from 85.79% to 93.13%. Conclusions: These findings suggest that, despite fluctuations in QA goal achievement throughout the year, no statistically significant differences were found in the four aims during the measurement periods. Our results highlight the need for ongoing review and adjustments in implementing the QA model to optimize its effectiveness in enhancing medical care at the clinic under study.

1. Introduction

Globally, health is considered a fundamental right supported by organizations such as the Pan American Health Organization/ World Health Organization (WHO), which universally promote and protect this right for all citizens (1). In Colombia, the health system has been reformed to ensure equitable access to health services for the entire population (2). However, these reforms face challenges due to financial constraints and the need to balance quality of care with economic sustainability, as seen in the case of the Quadruple Aim (QA) model (3). The QA was proposed to improve the healthcare system in the United States and has been adopted in global health reforms, focusing on improving healthcare (4). Some of its components include improving patient experience, reducing costs, improving population health, and promoting the wellbeing of healthcare teams (5,6). These components have been essential since they promote self-care and establish success expectations for healthcare providers (7). The QA has embraced and emphasized this idea as crucial to achieving high-quality care. The shift from viewing patients as objects to recognizing them as subjects has transformed how healthcare is provided and is reflected in the evaluation of the outcomes of health interventions.

Several health institutions have implemented the QA strategy with positive results. For example, the Hospital Universitario de Torrejón in Madrid, Spain, transformed its secondary cardiovascular prevention model into a more proactive, preventive, productive, and efficient one through the implementation of the QA. The health project involved patient participation and regular review of cardiovascular risk factors, evaluating the results obtained. Improvements in cardiovascular risk control, patient experience, efficiency of healthcare expenditure, and satisfaction with healthcare providers were highlighted. The results suggest that the QA can reduce cardiovascular morbidity, mortality, and healthcare costs, improving patient experience and adherence to secondary prevention strategies (8).

From this perspective, efforts have focused on reducing healthcare costs to minimize the impact on the public budget by adopting the Triple Aim. Several studies have explored this strategy in different healthcare settings. For instance, a study evaluated compliance with the Triple Aim in the outpatient clinic of the Hospital General IESS in Babahoyo, Ecuador. This quantitative and descriptive study surveyed 383 participants, indicating that patients had a moderate health status. Deficiencies were identified in staff courtesy and willingness, as in the explanations provided by the physicians during consultations (9).

In Colombia, a study was conducted to examine QA implementation of the QA in healthcare organizations from Santiago de Cali. The findings showed that while all organizations identified elements of the QA, none achieved full implementation in their management practices. Despite a high level of technical knowledge, there were difficulties when balancing healthcare experience, health team satisfaction, cost per capita, and population health. In addition, the scarcity of scientific publications on this topic in Colombia was highlighted, underscoring the need for more research and dissemination (10). These findings highlight challenges and opportunities to improve QA application in Colombian healthcare.

Health auditing is recognized as an essential tool for evaluating and continuously improving the quality of medical services, ensuring satisfactory patient care results, and achieving QA objectives. Additionally, the roles of Law 100 of 1993, which establishes a comprehensive security system to protect human dignity, and Statutory Law 1751 of 2015, which guarantees effective and timely access to health services, have been strengthened (3).

In Colombia, companies such as Sanitas (since 2017), SURA (since 2018), and Fundación Valle del Lili (since 2019) have adopted the QA to enhance health outcomes and the quality of care

(11). The private clinic in Barranquilla under study has implemented the QA by analyzing statistical indicators using a data matrix provided by the organization. The results indicate that objectives were met for several indicators, although not all were satisfactory. This study is significant as it promotes a patient-centered approach and value generation in healthcare, benefiting healthcare team satisfaction and overall wellbeing. In addition, it supports laws and regulations that ensure equitable access to effective and timely healthcare services for the entire population. Therefore, our study aimed to assess the monthly evolution of the QA in a global context.

Methods

This quantitative, descriptive, and cross-sectional research was conducted in a private clinic in Barranquilla in 2021. The population and sample size were determined through census, covering the entire universe of data from the clinic. Sample selection was consecutive, using indicators by clusters and specific periods (12).

Inclusion criteria consisted of the information from the data model of the private clinic in Barranquilla. The primary data source was the clinic's data model, which included data corresponding to the study period, while the secondary source was human resources, such as engineers and researchers, to determine the database. The information processing plan entailed collecting data through the business intelligence model (Planning and Control Area), which systematically collects monthly metrics to calculate indicators and evaluate aims (13). The analysis period was 2021. Additionally, the strategy indicators included four axes: health results, healthcare experience, team satisfaction, and financial sustainability. Each process is evaluated by means of achievement ranges: achievement target of 90%, poor <74%, good

75%–89%, and satisfactory 90%–100%. SPSS version 21 was used for data processing, analyzing quantitative variables by means of frequency, central tendency, and dispersion measures and categorical data by means of proportions. The results are presented in tables, which include cluster analyses containing the information pooled by clinic and indicator during the 12 months of follow-up. For the monthly QA indicators, an analysis of variance will be conducted through Friedman's test using the monthly aims to detect evidence of seasonality (14). In the second step, data will be evaluated using time series analysis techniques since a statistically significant monthly difference does not necessarily indicate a seasonal oscillatory periodic component. A time series will be constructed with the mean values of the achievement percentage for each monthly QA indicator.

In terms of ethical considerations, we considered the institution's authorization to provide the information, which stated that the researchers were responsible for data custody and confidentiality pursuant to the recommendations set forth in the habeas data law (15). Moreover, Ministry of Health Resolution No. 8430 of 1993 was considered, establishing the scientific, technical, and administrative rules for health research in Colombia, from which it was determined that this study represented a minimum risk for its participants (16). The Declaration of Helsinki (17) and the International Ethical Guidelines for Health-Related Research Involving Human Subjects of the Council for International Organizations of Medical Sciences and the WHO

(18) were also considered.

Results

In the first half of 2021, health outcomes achieved 80.77%, while healthcare experience reached 76.85%, with a notable drop to 73.72% in March. Team satisfaction was high at 91.42%, and financial sustainability showed poor achievement at 53.92%. Overall, the private healthcare institution maintained good performance most of the time, with an average monthly achievement of 75.74% (Table 1).

Table 1. Monthly global trends for each Quadruple Aim component for the 2021-1 period.

TARGET	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	AVERAGE 2021-1	TREND
HEALTH OUTCOMES	78.56 %	79.48 %	80.52%	78.86 %	79.74 %	87.46%	80.77%	
HEALTHCARE EXPERIENCE	75.22 %	76.53 %	73.72%	78.87 %	78,11 %	78.66%	76.85%	
TEAM SATISFACTION	97.00 %	98.07 %	88.66%	92.96 %	93.01 %	78.83%	91.42%	
FINANCIAL SUSTAINABILITY	6.50%	94.67 %	95.97%	37.75 %	40.04 %	48.59%	53.92%	
OVERALL MONTHLY VALUE	64.32 %	87.19 %	84.72%	72.11 %	72.72 %	73.38%	75.74%	

ACHIEVEMENT TARGET: (90%), SATISFACTORY: (90%–100%), GOOD: (75%–89%), POOR: (>74%)

Source: Own elaboration based on the database of a private clinic in Barranquilla.

In the second semester of 2021, health outcomes stood out, with a high achievement percentage of 93.70%. Healthcare experience notably improved, reaching 83.81%, with significant improvements in August and September. As for team satisfaction remained consistently high at 93.09%, although there were considerable variations during September. Financial sustainability showed a marked improvement, with 93.13% increasing monthly. Overall, the private healthcare institution improved its performance, reaching a satisfactory average of 90.93% (Table 2).

Table 2. Monthly global trends for each Quadruple Aim component for the 2021-2 period.

TARGET	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	AVERAGE 2021-2	TREND
HEALTH OUTCOMES	93.67%	94.20%	94.05%	95.21%	93.57%	91.52%	93.70%	
HEALTHCARE EXPERIENCE	78.91%	81.36%	84.94%	82.47%	87.53%	87.66%	83.81%	
TEAM SATISFACTION	94.57%	97.40%	79.43%	99.21%	98.64%	89.28%	93.09%	
FINANCIAL SUSTAINABILITY	68.30%	98.97%	97.74%	97.87%	97.87%	98.02%	93.13%	
OVERALL MONTHLY VALUE	83.86%	92.98%	89,04%	93.69%	94.40%	91.62%	90.93%	

ACHIEVEMENT TARGET: (90%), SATISFACTORY: (90%–100%), GOOD: (75%–89%), POOR: (>74%)

Source: Own elaboration based on the database of a private clinic in Barranquilla.

The healthcare experience showed high levels of achievement in areas such as feeding, cleaning, clothing, and scheduled surgery, with average scores of 98.29% and 99.96%, respectively (Table 3). However, there was variability in the timelines of diagnostic imaging reading and emergency care, with average values of 29.72% and 72.11%, respectively. Satisfaction, based on international standards, remained high with an average of 98.74%, while total complaints and net recommendation rate averaged 3.26% for every 1,000 users within 97.26%, respectively, evidencing areas for improvement and consistency in other key aspects of care.

Table 3. Monthly trend for the healthcare experience indicator in 2021.

HEALTHCARE EXPERIENCE												NOVEMBER		
% achievement in FCC toward third parties	90	99.28	99.76	99.07	98.72	99.08	97.42	97.51	96.66	97.39	95.9	99.09	99.56	98.29
% achievement in the timeliness of hospital diagnostic imaging reading	95	22.3	28.4	26.7	23.3	22.7	24.2	25.2	27.5	29.4	31	43.1	52.81	29.72

% achievement in the timeliness of outpatient appointments scheduling	85	91.61	87.59	78.79	86.47	88.89	89.06	79.7	79.1	92.33	83.43	91.5	89.12	86.32
% achievement in the timeliness of care provided in the emergency/priority unit	90	65.63	71.07	53.88	46.63	66.97	69.17	71.72	84.57	93.46	93.84	95.24	87.5	72.11
% achievement in the timeliness of test result delivery and access	85	-	-	-	-	-	-	-	-	-	-	-	-	-
% achievement in the timeliness of scheduled surgery	95	100	100	100	100	100	100	100	99.86	100	99.86	99.85	100	99.96
% achievement in the timeliness of complaint response	85	11.11	11.54	9.38	57.5	27.08	30	37.04	46.58	54.79	50	64.62	65.38	42.41
Satisfaction according to international standards	95	97.74	98.72	98.08	99.35	99.29	98.71	99.31	99.33	98.63	99.11	98.68	97.62	98.74
Overall complaint rate for every 1000 users/active activities	4.5	2.47	1.9	1.78	1.93	2.58	4.2	4.26	4.31	4.08	4.92	3.49	2.75	3.26
Net recommendation rate	85	89.29	91.65	97.59	97.89	98.94	99.35	99.72	98.64	98.44	99.09	95.7	96.9	97.26

a.FCC: Feeding, cleaning, clothing

b.Source: Own elaboration based on the database of a private clinic in Barranquilla.

Team satisfaction revealed several highlights (Table 4). There was variability in the achievement of scientific publications, with peaks in March and December reaching 66.67%. Work absenteeism remained low, at 3.37%. The proportion of temporary employees fluctuated,

reaching its highest values in April and May, but decreasing toward the end of the year. The turnover rate was generally low, averaging 0.64%, although there was a notable increase in November. These indicators underscore the importance of effectively managing work attendance and maintaining team stability.

Table 4. Monthly trend for the team satisfaction indicator in 2021.

SATISFACTION OF OUR TEAMS											OCTOBER			
% achievement in scientific publications	85	-	-	66.67	-	-	33.33	-	-	22.22	-	-	66.67	66.67
Overall work absenteeism	5	2.5	1.54	3.55	3.38	2.5	3.29	5.69	4.65	3.76	2.36	1.76	4.97	3.37

Temporary staff proportion	20	15.63	14.21	17.3	27.15	27.73	23.9	20.24	13.23	8.26	8.24	10.61	13.55	17.18
Staff turnover rate	3	0.5	0.25	1.49	0.74	0.49	0.73	0.6	0.15	0.75	0	1.34	0.59	0.64

Source: Own elaboration based on the database of a private clinic in Barranquilla.

Financial sustainability showed significant challenges and achievements (Table 5). Compliance with the Earnings Before Taxes budget fluctuated considerably, with notable peaks and valleys, reaching its highest point in August and its lowest in April. On the other hand, compliance with the Earnings Before Interest, Taxes, Depreciation, and Amortization budget also showed marked variations, especially in November, with 11,485.71, an exceptionally high figure. The pending invoice percentage showed a downward trend for most of the year, evidencing an improvement in revenue management. These indicators reflect the importance of sound and adaptable financial management strategies to ensure long-term sustainability.

Table 5. Monthly trend for the financial sustainability indicator in 2021.

FINANCIAL SUSTAINABILITY														
% compliance with the EBT budget	100	190.88	127.8	141.9	403.41	61.58	208.15	42.08	1.723.39	261.93	169.14	103.8	126.75	149.35
% compliance with the EBITDA budget	100	243.83	321.98	448.46	33.85	27.5	62.35	67.98	368.16	158.63	554.32	11.485.71	116.92	154.27
% pending monthly invoices	7	80.51	15.98	12.09	20.58	7.38	16.59	5.16	3.08	6.79	6.39	6.39	5.93	5.93

a.EBT: Earnings Before Taxes

b.EBITDA: Earnings Before Interest, Taxes, Depreciation, and Amortization. Source: Own elaboration based on the database of a private clinic in Barranquilla.

The indicators reflected variations in the institutional aims. Health outcomes were maintained

with an average of 87.12%. Healthcare experience decreased slightly from 92.88% to 83.81%, while team satisfaction remained high with averages of 94.48% and 93.09%, respectively. Financial sustainability improved significantly from 85.79% to 93.13%. Overall, the institution showed consistency, with an average of 90.06% throughout the year, as supported by the Friedman test (P = 0.392).

Table 6. Overall results of the Quadruple Aim components.

TARGET	AVE RAGE 2021-1	AVE RAGE 2021-2	TREND	Pa
HEALTH OUTCOMES	87.12%	93.70%		
HEALTHCARE EXPERIENCE	92.88%	83.81%		
TEAM SATISFACTION	94.48%	93.09%		
FINANCIAL SUSTAINABILITY	85.79%	93.13%		
OVERALL MONTHLY VALUE	90.06%	90.93%		0.392

Source: Own elaboration based on the database of a private clinic in Barranquilla.

Discussion

In the first half of 2021, the results of the health QA were good for the whole semester, which is consistent with what was expressed by Botero et al., who stated that Colombia needs a health system that can be sustained over time and that balances the expectations of citizens with its financial capacity (19) (Table 1). To achieve this, people must be at the center of the system. Some good healthcare institutions have shown that the best results in terms of costs are obtained when achieving better health outcomes, greater patient satisfaction, and greater healthcare team satisfaction.

Regarding the healthcare experience component, there was good achievement over several months, although poor performance was observed in March. According to a study conducted by Molina et al. on users' perception regarding the healthcare experience in an outpatient healthcare institution, 22.3% reported a lack of punctuality in care, 94.6% highlighted the courtesy and respect of the healthcare staff, and 86% reported adequate explanation of procedures and treatments (20).

These findings highlight the importance of considering users' perceptions, which are influenced by factors such as geographic location and educational level. Additionally, it is essential to address the deficiencies identified by users to improve the patient experience and ensure quality care. In terms of team satisfaction, the achievement was satisfactory and good in 2021-

1. Conversely, different opinions were identified in a study on healthcare team satisfaction conducted at a university hospital (21). Although there were high satisfaction levels in areas such as job stability and initiative capacity, communication and recognition by superiors were areas of concern, with significant percentages of unsatisfactory responses. On the other hand, staff assessed their performance with a high average rating, which could indicate a positive self- assessment of their work. It is important to consider that team satisfaction in both settings may be influenced by different factors, including the type of institution and its organizational culture and human resource management policies. Therefore, the areas of improvement identified in each study should be addressed to improve the experience and wellbeing of health personnel in both settings.

As regards financial sustainability components, the achievement was poor in January, April, May, and June and satisfactory in February and March, so the overall performance was mostly poor. This is inconsistent with a study on financial sustainability conducted in a State-Owned Social Welfare Company, which shows that from 2008 to 2012, there was positive financial management characterized by a steady growth in sales of services and a reduction in operating expenses until 2011. In 2012, operational expenses increased due to the hiring of personnel to improve the provision of services. Operational income showed ups and downs, decreasing in the first year but with remarkable growth in 2011 and 2012 (22). This allowed financial expenses to be manageable within the company. Overall, the research highlights the importance of constantly monitoring financial sustainability and adapting to the changing challenges of the environment.

In the second semester of 2021, the private healthcare institution demonstrated satisfactory results in the health outcomes component, significantly improving compared to the previous period (Table 2). The healthcare maintained good compliance throughout the period. Team satisfaction remained between satisfactory and good. Financial sustainability was poor in July but satisfactory from August to December. Overall, the institution presented good and satisfactory achievements during this period, which aligned with the global aims of improving populational health, user experience, efficient use of resources, and healthcare team satisfaction. A study in Peru conducted by Cosavalente et al. highlighted the enactment of Law 30885, which improves healthcare through integrated health networks. This analysis shows how continuous health system improvement is a goal for both Peru and Colombia, suggesting that strategies focused on user experience and team satisfaction may be linked to improvements in health outcomes, as observed in Colombia (23).

Regarding the healthcare experience indicator for 2021, the private healthcare institution demonstrated outstanding performance, achieving satisfactory compliance of 98.29%, surpassing the target value of 90% (Table 3). This achievement evidences its commitment to excellence in medical care and continuous improvement in service quality. The institution demonstrates a patient-centered approach and effective policies to ensure positive experiences, reflecting an organizational culture dedicated to excellence. Research by Manary et al. highlights that patient satisfaction is closely linked to effective communication, empathy, and prompt response to patient needs (24), which are critical for positive healthcare experiences.

The 2022 results show a positive trend in team satisfaction. Stability in staff turnover and adequate management of temporary employees are noteworthy, as is the high academic productivity reflected in scientific publications (Table 4). However, although reduced,

absenteeism continues to be an area for improvement. Similarly, in a study by Orlandini, stress at work is a crucial factor that affects absenteeism and has significant economic implications since it results in losses due to low productivity (25).

The institution's financial sustainability showed a fluctuating trend (Table 5). The first half of the year was mostly poor in terms of achievement, generating concern and the need for action. However, in the second semester, the achievement percentage improved substantially, reaching a cumulative annual rate of 149.35, exceeding the established goal. This positive change results from effective corrective measures and a proactive and adaptive management strategy. Financial improvement highlights the importance of exploring the strategies that contributed to this success, applying them in the future, and continuing to improve financial sustainability, as mentioned by Guevara Sánchez in his research (26).

When conducting the Friedman test, which is a non-parametric alternative to the repeated measures analysis of variance (14), we found no statistically significant differences between the levels of achievement in the four targets during both measurement periods (2021-1 and 2021-2) (Table 6).

Although this finding might suggest stability in overall performance, a more detailed analysis shows a positive trend in goal achievement throughout the year. Despite the lack of statistically significant differences between measurement periods, improvements in several aim components were observed. This pattern suggests overall progress in the desired direction, albeit with specific variability in each component. It is essential to note that these variations indicate specific areas that could benefit from a more detailed and strategic approach to improve goal achievement. In summary, while the overall analysis revealed no significant differences, the improvement observed in individual components indicates the need for a more thorough and targeted review to optimize performance in all aims. This strategic approach may be

critical to ensure continuous and significant progress toward achieving goals over time.

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