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Research Article

Trend analysis of hospitalizations for conditions sensitive to Primary Health Care in Governador Valadares, Minas Gerais and Brazil, 2012 to 2021

Tendência temporal das taxas de Internações por Condições Sensíveis à Atenção Primária à Saúde em Governador Valadares, Minas Gerais e Brasil, 2012 a 2021

Análisis de tendencias de hospitalizaciones por condiciones sensibles a la Atención Primaria de Salud en Governador Valadares, Minas Gerais y Brasil, 2012 a 2021

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Abstract

Introduction: Hospital admission rates for Primary Care Sensitive Conditions (*Internações por Condições Sensíveis à Atenção Primária* – ICSAP) allow for an indirect analysis of the quality of primary care, becoming an important indicator for the management of actions in Primary Health Care. **Objective:** To analyze the trends in ICSAP in Governador Valadares, Minas Gerais, and Brazil, from 2012 to 2021. **Methods:** An exploratory space-time ecological study was carried out using data provided by the Hospital Information System of the Unified Health System (*Sistema de Informações Hospitalares do Sistema Único de Saúde* – SIH-SUS) and the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE). Gross rates were calculated and later standardized by the estimated Brazilian population of 2021. Time series were analyzed using the Prais-Winsten method. **Results:** The trends in ICSAP due to inflammatory/infectious causes showed decreasing trends at the national, state, and municipal levels, with the greatest drop recorded in the municipality. Regarding chronic conditions of ICSAP, the trend was stationary in Governador Valadares and decreasing in Minas Gerais and Brazil. **Conclusions:** The trend of ICSAP rates was decreasing for the three federal entities in relation to inflammatory/infectious conditions. As for chronic conditions, the trend was stationary in Governador Valadares and decreasing in Minas Gerais and Brazil. Epidemiological analysis should always be in the focus of PHC professional, as morbidity indicators directly reflect on their work and on the health conditions of the enrolled community.

Keywords: Ambulatory Care Sensitive Conditions; Quality of health care; Hospitalization; Primary Health Care.

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Resumo

Introdução: As taxas de Internações por Condições Sensíveis à Atenção Primária (ICSAP) permitem analisar de forma indireta a qualidade dos cuidados primários em saúde, configurando-se um importante indicador para gestão das ações na Atenção Primária em Saúde. **Objetivo:** Analisar as tendências das taxas de ICSAP em Governador Valadares, Minas Gerais e Brasil, de 2012 a 2021. **Métodos:** Foi realizado um estudo ecológico espaço-temporal, de caráter exploratório, por meio de dados disponibilizados pelo Sistema de Informações Hospitalares do Sistema Único de Saúde (SIH-SUS) e pelo Instituto Brasileiro de Geografia e Estatística (IBGE). As taxas brutas foram calculadas e posteriormente padronizadas pela população brasileira estimada para 2021. As séries temporais foram analisadas pelo método de Prais-Winsten. **Resultados:** As tendências de ICSAP por condições inflamatórias/infecciosas apresentaram tendências decrescentes em níveis nacional, estadual e municipal, com maior queda registrada no município. Em relação às condições crônicas de ICSAP, a tendência foi estacionária em Governador Valadares e decrescente em Minas Gerais e no Brasil. **Conclusões:** A tendência das taxas de ICSAP foi decrescente para os três entes federativos em relação às condições inflamatórias/infecciosas. Já para as condições crônicas, a tendência foi estacionária em Governador Valadares e decrescentes em Minas Gerais e no Brasil. As análises epidemiológicas devem estar sempre no foco do profissional da Atenção Primária em Saúde, pois os indicadores de morbidades refletem diretamente em seu trabalho e nas condições de saúde da comunidade adscrita.

Palavras-chave: Condições sensíveis à Atenção Primária; Qualidade da assistência à saúde; Hospitalização; Atenção Primária à Saúde.

Resumen

Introducción: Las tasas de Hospitalizaciones por Condiciones Sensibles a la Atención Primaria (HCSAP) permiten un análisis indirecto de la calidad de la Atención Primaria de Salud, convirtiéndose en un indicador importante para la gestión de acciones en la Atención Primaria de Salud. **Objetivo:** Analizar las tendencias de las tasas de HCSAP en Governador Valadares, Minas Gerais y Brasil, de 2012 a 2021. **Métodos:** Se realizó un estudio ecológico espacio-temporal exploratorio utilizando datos proporcionados por el Sistema de Información Hospitalaria del SUS y por el Instituto Brasileño de Geografía y Estadísticas. Las tasas brutas fueron calculadas y luego estandarizadas por la población brasileña estimada para 2021. Las series de tiempo fueron analizadas utilizando el método de Prais-Winsten. **Resultados:** Las tendencias en HCSAP para condiciones inflamatórias/infecciosas mostraron tendencias decrecientes a nivel nacional, estatal y municipal, registrándose la mayor caída en el municipio. En cuanto a las condiciones crónicas de HCSAP, la tendencia fue estacionaria en Governador Valadares y decreciente en Minas Gerais y Brasil. **Conclusiones:** La tendencia de las tasas de HCSAP fue decreciente para las tres entidades federativas con relación a las condiciones inflamatorias/infecciosas. En cuanto a las condiciones crónicas, la tendencia fue estacionaria en Governador Valadares y decreciente en Minas Gerais y Brasil. Los análisis epidemiológicos deben estar siempre en el foco de los profesionales de APS, ya que los indicadores de morbilidad se reflejan directamente en su trabajo y en las condiciones de salud de la comunidad inscrita.

Palabras clave: Condiciones sensibles a la Atención Ambulatoria; Calidad de la atención de salud; Hospitalización; Atención Primaria de Salud.

INTRODUCTION

The health system, traditionally hospital-centric and costly, has been reorganized to expand its services through Primary Health Care (PHC), enhancing accessibility, effectiveness, and care coordination.[1]

In Brazil, the Family Health Program (FHP), established in 1994, gradually became the central focus of PHC. In 2006, FHP was restructured under the National Primary Care Policy (*Política Nacional de Atenção Básica* – PNAB) into the Family Health Strategy (FHS).[2,3] Since then, PHC coverage and the population's demand for primary services through the FHS have expanded.[2]

The FHS is guided by the following principles: focus on the designated coverage area (territorialization); prioritization of preventive strategies (as a substitute for the disease-centered model); care coordination and intersectorality; programmatic and planning actions; and the promotion of citizenship.[2]

It is estimated that up to 80% of a community's health issues are resolved through PHC,[1] with resolution being a core principle of Family Practice.[4] This estimate is supported by studies on hospital admissions, following the logic that fewer hospitalizations indicate greater accessibility and effectiveness of the PHC system.[5] Information on hospital admissions is readily available in national databases, offering quick and reliable access for health management in a given region.[5] This allows for continuous evaluation of the PHC work process.

This approach to analyzing the quality of health services was first developed in the United States in 1990 with the concept of Ambulatory Care-Sensitive Conditions.[6,7] In Brazil, the Ministry of Health (MoH) introduced a list of the main causes of preventable hospitalizations, termed "Hospitalizations due to Primary Care-Sensitive Conditions" (*Internações por Condições Sensíveis à Atenção Primária* – ICSAP), adapting the terminology to reflect the organization of the national health system within primary health services.[6,7]

The use of ICSAP in evaluating PHC has certain limitations, as purely objective data may not fully capture the multifactorial nature of exemplary primary care.[8] Studies often focus solely on the relationship between PHC coverage (accessibility) and ICSAP rates, overlooking subjective factors such as care coordination and longitudinal monitoring, which also impact the quality of PHC.[8] Despite these limitations, ICSAP trends remain highly practical tools for this type of assessment.[8]

Some authors have conducted comparative analyses of ICSAP across major cities in Minas Gerais, focusing on regional health departments.[9,10] However, there is a lack of comparative studies examining trends in these causes of hospitalizations at the municipal, state, and national levels, which could help identify potential determinants of varying trends in the time series. Therefore, this study aimed to analyze ICSAP rate trends in Governador Valadares, Minas Gerais, and Brazil between 2012 and 2021.

METHODS

This exploratory, spatial-temporal ecological study was conducted in the territories of the municipality of Governador Valadares, the state of Minas Gerais, and Brazil, covering the period from 2012 to 2021.

In 2021, Governador Valadares had a population of 282,164[11] and was part of the eastern Minas Gerais health macro-region[12], serving as a hub city. The municipality was composed of 71 PHC units (61 FHS units and 10 PCt — Primary Care Team units).

Data on ICSAP were collected from January 2012 to December 2021, covering a ten-year period. Although ICSAP were originally classified by the MoH into 19 disease groups;[7] this study reclassified the causes into two categories: infectious/inflammatory conditions and chronic conditions (Table 1). The purpose of this reclassification was to enable a grouped analysis of the conditions across the analyzed territories and to distinguish ICSAP rates between acute conditions — typically seen by PHC as spontaneous demand — and chronic conditions, which are usually addressed through scheduled demand.

ICSAP data were obtained from the Hospital Information System of the Unified Health System (*Sistema de Informações Hospitalares do Sistema Único de Saúde* – SIH-SUS), while population estimates were sourced from studies by the General Coordination of Epidemiological Information and Analysis of the Ministry of Health (*Coordenação-Geral de Informações e Análises Epidemiológicas do Ministério da Saúde* – CGIAE/MS). Both data sets are available through the SUS Information Technology Department (*Departamento de Informática do SUS* – DATASUS).[11]

ICSAP rates by location, year, and age group were calculated using the formula: number of ICSAP/population × 100,000. Rate standardization was performed using the direct method, based on age groups, with the Brazilian population estimate for 2021 from CGIAE/MS used as the standard.

The Prais-Winsten method was applied to analyze temporal trends, with log-transformed standardized ICSAP rates as the dependent variable (Y) and the calendar years of the study as the independent variable (X). A trend was deemed significant when $p<0.05$. Annual percentage changes (APC) in the rates were calculated using Principal Component Analysis (PCA), along with their respective confidence intervals.

The writing and critical review of this study followed the recommendations and guidelines of the STROBE checklist,[13] which was used as a standard for scientific reporting.

Finally, this study did not require review by the Research Ethics Committee, as it utilized secondary data from public sources, in accordance with Resolution No. 510/2016 of the National Research Ethics Committee.[14]

RESULTS

The analysis of the descriptive temporal behavior of standardized rates revealed lower ICSAP rates for infectious and inflammatory conditions in Governador Valadares since the start of the historical series (Figure 1). A significant decrease in ICSAP rates for these conditions was also noted from 2019 onward, with a more pronounced decline observed in Minas Gerais and Brazil (Figure 1).

The rates of ICSAP due to chronic conditions in Minas Gerais and Brazil decreased from 2012 to 2016, remained stable from 2016 to 2019, and decreased again from 2019 to 2021 (Figure 2).

Throughout the analyzed period, the standardized average rates of ICSAP due to infectious and inflammatory conditions were highest for Brazil, followed by Minas Gerais and Governador Valadares (Table 2). In contrast, the highest average rates for ICSAP due to chronic conditions were observed in Minas Gerais, followed by Brazil and Governador Valadares.

The trends in ICSAP rates were decreasing in Minas Gerais and Brazil for both infectious and inflammatory conditions and chronic conditions. In Governador Valadares, the trend in ICSAP rates for infectious conditions also showed a decline, while the rates for chronic conditions remained stable (Table 3).

Table 1. Reclassification of Admissions for Primary Care Sensitive Conditions into infectious/inflammatory and chronic conditions.

Infectious/Inflammatory Conditions	Chronic Conditions
Whooping cough (CID-10: A37)	
Diphtheria (CID-10: A36)	
Tetanus (CID-10: A33, A35)	
Epidemic parotitis (CID-10: B26)	
Rubella (CID-10: B06)	
Measles (CID-10: B05)	
Yellow fever (CID-10: A95)	Iron deficiency anemia (CID-10: D50)
Hepatitis B (CID-10: B18)	Malnutrition and sequelae (CID-10: E40, E46)
Bacterial meningitis (CID-10: G00)	Diabetes *mellitus* (CID-10: E11, E10)
Tuberculosis (CID-10: A15, A16, A17, A18, A18.1, A19, A15.8)	Epilepsy (CID-10: G40)
Syphilis (CID-10: A50, A51)	Cerebrovascular accident (CID-10: I64)
Malaria (CID-10: B50, B51, B52, B53, B54)	High blood pressure (CID-10: I10)
Gastroenteritis and dehydration (CID-10: A09)	Heart failure (CID-10: I50)
Acute rheumatic fever (CID-10: I01)	Asthma (CID-10: J45)
Otitis media (CID-10: H66)	Chronic obstructive pulmonary disease (CID-10: J44)
Acute pharyngitis and tonsillitis (CID-10: J02, J03)	Gastric and duodenal ulcer (CID-10: K25)
Upper respiratory infection (CID-10: J06)	
Bacterial pneumonia (CID-10: J15)	
Infections of skin and subcutaneous tissue (CID-10: L08)	
Salpingitis, oophoritis, and inflammatory disease of cervix uteri (CID-10: N70)	

Source: Elaborated by the authors.

Governador Valadares exhibited the largest annual percentage reduction in ICSAP rates due to infectious and inflammatory conditions (-10.6%), compared to Minas Gerais and Brazil (-7.8% and -7%, respectively).

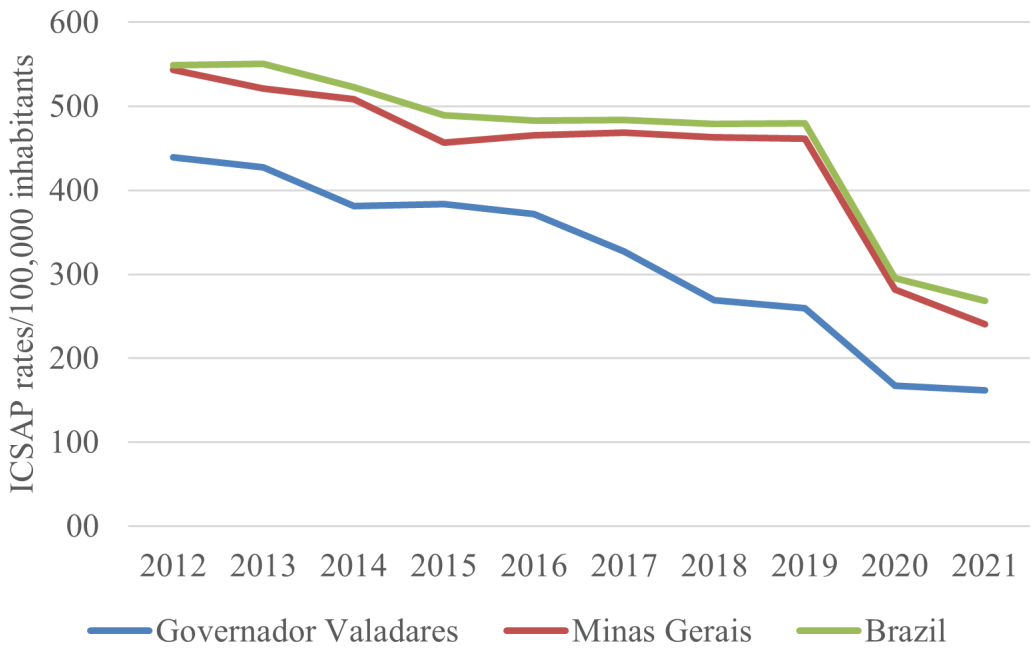
Among the territories with a decreasing trend, Brazil experienced the largest annual percentage reduction in ICSAP rates due to chronic conditions (-6.1%), with values closely matching the reduction observed in Minas Gerais (-5,6%).

DISCUSSION

The rates of hospitalizations for infectious and inflammatory conditions were lower in Governador Valadares compared to the state and the country. In contrast, the trend for hospitalizations due to chronic conditions in the municipality remained stationary. Meanwhile, both Minas Gerais and Brazil saw decreasing trends in hospitalizations for both conditions analyzed.

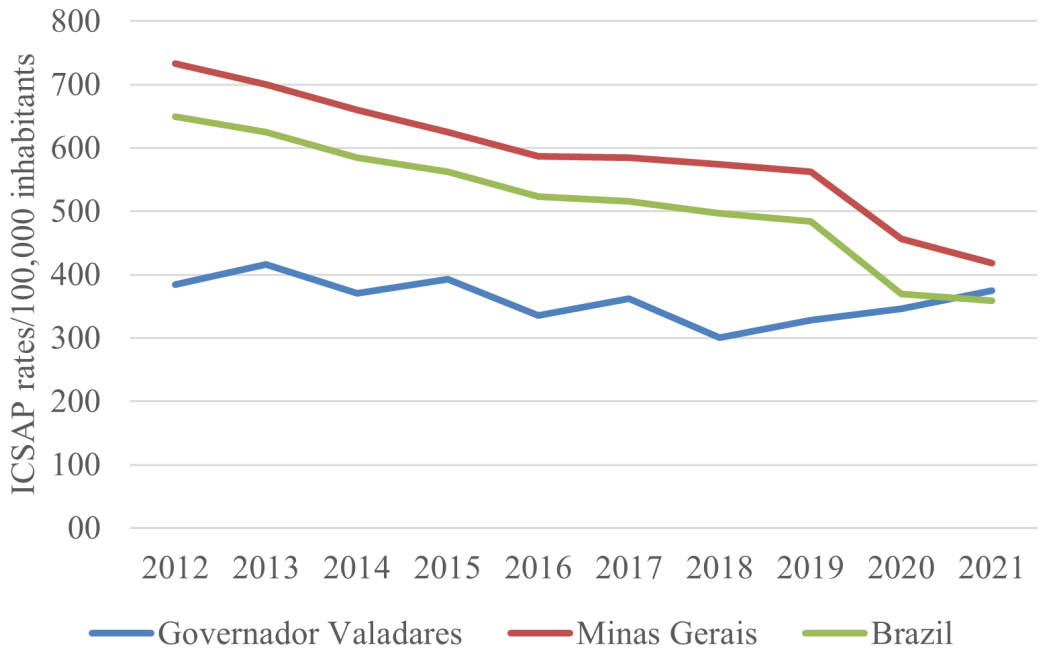
In analyzing macro-regions in Minas Gerais, it was observed that the trend of reduction in ICSAP rates has been decreasing in recent years, as evidenced by this study. However, the reduction occurred unevenly among the regional health superintendencies.[10] Between 2011 and 2015, the macro-region of Governador Valadares ranked among the worst in the state for ICSAP rates, alongside other macro-regions in the Northeast, Vale do Jequitinhonha, East, and South-East of the state.[10]

Lower income distribution and limited access to basic sanitation and health services appear to have impacted the performance of these regions in Minas Gerais regarding ICSAP rates.[10] In contrast, regions with better outcomes, such as the Northwest, Center, and South of the state, have implemented more policies to strengthen and invest in PHC,[10] which may explain the observed differences in performance.



ICSAP: Hospitalizations due to primary care-sensitive conditions.
Source: Elaborated by the authors.

Figure 1. Descriptive temporal behavior of Hospital Admission Rates for Primary Care Sensitive Conditions due to infectious and inflammatory causes, standardized in Governador Valadares, Minas Gerais, and Brazil, from 2012 to 2021.



ICSAP: Hospitalizations due to primary care-sensitive conditions.
Source: Elaborated by the authors.

Figure 2. Descriptive temporal behavior of Hospital Admission Rates for Primary Care Sensitive chronic conditions standardized in Governador Valadares, Minas Gerais, and Brazil, 2012 to 2021.

Table 2. Mean Rates of Hospitalizations for Primary Care Sensitive Conditions by infectious/inflammatory and chronic conditions, standardized by age, in Governador Valadares, Minas Gerais, and Brazil, between 2012 and 2021.

	Infectious/inflammatory conditions (per 100,000 inhabitants)	Chronic conditions (per 100,000 inhabitants)
Governador Valadares	318.7	360.9
Minas Gerais	441.0	589.9
Brazil	459.6	516.8

Source: Elaborated by the authors.

Table 3. Temporal Trends and annual percentage changes in Hospitalization Rates for Primary Care Sensitive Conditions due to infectious/inflammatory and chronic causes, standardized for Governador Valadares, Minas Gerais, and Brazil, from 2012 to 2021.

	Trend	APC (%)	Min CI	Mas CI	p-value
Governador Valadares Infectious/inflammatory conditions	Decreasing	-10.6	-14.4	-6.7	0.000
Chronic conditions	Stationary	-1.8	-3.8	0.2	0.082*
Minas Gerais Infectious/inflammatory conditions	Decreasing	-7.8	-13.2	-2.1	0.014
Chronic conditions	Decreasing	-5.6	-7.5	-3.8	0.000
Brazil Infectious/inflammatory conditions	Decreasing	-7.0	-11.7	-2.0	0.012
Chronic conditions	Decreasing	-6.1	-8.0	-4.2	0.000

APC: annual percentage changes; min CI: minimum confidence interval; max CI: maximum confidence interval; *statistically non-significant p-value (p>0.05), demonstrating a stationary temporal trend.
Source: Elaborated by the authors.

Multiple variables can influence the number of ICSAP in a given location, including the percentage of the population covered by FHS and private health plans; the quality of PHC; the size of the municipality and its social vulnerability indices; and the percentage of at-risk age groups (children and the aged).[15,16] Studies specifically analyzing national PHC quality have shown that cities with better results in the National Program for Improving Access and Quality of Primary Care (*Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica* – PMAQ-AB) had, on average, 21.2% fewer ICSAP compared to municipalities with lower levels of quality.[15,16]

Among the factors influencing the number of ICSAP, PHC financing is particularly significant. A study conducted in the state of Pernambuco found that municipalities with higher net revenue had lower ICSAP rates, as they invested more in PHC and relied less on state and national transfers.[17]

When a location exhibits high rates of ICSAP, its ability to allocate funds effectively to PHC and reduce such hospitalizations diminishes, as hospital costs are significantly higher than those of PHC.[17,18] In Minas Gerais, spending on ICSAP accounted for 15.72% of hospitalization expenses in 2014 and 16.31% in 2019, indicating an increase in avoidable spending on tertiary services above the national average.[18]

Several policies successfully reduced the total number of ICSAP in Brazil between 2014 and 2017, resulting in savings of 27.88 million reais.[19] Notably, the *Mais Médicos* Program played a significant role by deploying professionals to PHC in municipalities with staffing challenges and enhancing its impact on sensitive conditions.[18] However, since 2016, there has been a gradual dismantling of PHC, marked by the suspension of the PMAQ-AB, reduction in federal transfers for health services, cessation of funding for the Expanded Family Health Center (*Núcleo Ampliado de Saúde da Família* – NASF), and the weakening of the *Mais Médicos* Program itself.[19]

This study also observed a less pronounced reduction in ICSAP rates between 2015 and 2019 compared to the period from 2012 to 2015 across all analyzed locations. This trend may be linked to the national economic crisis and the implementation of fiscal austerity policies and spending freezes, particularly with Constitutional Amendment No. 95, which restricted federal spending to increases only in line with inflation.[19]

This study has limitations related to the quality of the secondary data collected, particularly from Hospital Admission Authorizations (HAA). In some instances, the diagnosis of sensitive conditions at the time of admission may not be definitive or may not be reported in the AIH, potentially leading to underreporting of SIH-SUS data.

Despite these limitations, the findings of this study offer valuable insights into evaluating PHC in the studied territories. To gain a deeper understanding of the determinants and conduct a more thorough evaluation, it is essential to perform analytical studies directly within the Primary Health Care Units of the municipality, focusing on the factors influencing the quality of care for chronic conditions.

CONCLUSION

The reduction in rates of hospitalizations for infectious/inflammatory conditions was more pronounced in Governador Valadares compared to Minas Gerais and Brazil, suggesting that the municipality may be better equipped to address acute illness demands. However, health systems designed primarily to manage acute conditions are often more costly and may have less long-term impact on reducing morbidity and mortality.

Compared to Minas Gerais and Brazil as a whole, Governador Valadares has shown less progress in reducing ICSAP rates for chronic conditions. This may indicate a prolonged lack of access to quality

primary care for the population, as chronic conditions, such as cardiovascular diseases, can develop over years before necessitating hospitalization.

This paper highlights the impact that macroeconomic policies and demographic factors can have on PHC. Despite substantial evidence (and experience) indicating that structuring the health system around primary units is the most effective approach to providing healthcare, there has been a progressive dismantling of SUS in Brazil.

Finally, by understanding the epidemiological dynamics of causes sensitive to primary care, the family and community physician plays a crucial role within their community. They help structure the PHC unit to address both chronic and acute demands. It is important to remember that the quality of care in PHC should not only focus on preventing ICSAP but also be guided by strengthening the relationship with the community and practicing person-centered medicine.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

KPA: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Writing – Original Draft, Writing – Review & Editing. IRM: Data Curation, Formal Analysis, Investigation, Writing – Review & Editing. APVBW: Conceptualization, Investigation, Writing – Review & Editing. LCN: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Writing – Review & Editing.

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