

ORIGINAL RESEARCH

Assessing Interprofessional Collaboration among Healthcare Professionals for Noncommunicable Disease Management in Primary Care: A Cross-Sectional Study



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Article Info

Article History:

Received: 19 September 2025

Revised: 25 June 2026

Accepted: 10 July 2026

Online: 31 August 2026

Keywords:

Community health centers;
interprofessional collaboration;
healthcare professionals;
noncommunicable diseases;
primary care

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Abstract

Background: Interprofessional collaboration (IPC) is critical for delivering comprehensive and coordinated care, particularly in managing complex noncommunicable diseases (NCDs). However, in primary care settings, collaboration among healthcare professionals remains fragmented. Evidence on how different health professions collaborate in Community Health Centers (CHCs) remains limited. This knowledge gap hampers efforts to strengthen team-based NCD management in primary care.

Purpose: This study aimed to assess IPC among healthcare professionals in primary care and identify domains that require strengthening for NCD management.

Methods: A cross-sectional study was conducted in 37 CHCs in Palembang City, South Sumatera Province, Indonesia. A total of 301 healthcare professionals, including nurses, medical doctors, midwives, and public health workers, were selected through simple random sampling. Data were collected using a sociodemographic questionnaire and the validated Indonesian version of the Collaborative Practice Assessment Tool (CPAT), which consists of 56 items across eight subscales. Descriptive statistics and Kruskal–Wallis tests were used to analyze the data.

Results: A total of 301 healthcare professionals participated. Overall CPAT scores were relatively similar across professions, with median (IQR) values of 292 (275.75–330.50) for nurses, 304 (278–329.50) for medical doctors, 292 (278.50–334) for midwives, and 287 (279–314) for public health workers. The highest scores across professions were observed in general role responsibilities and autonomy and team leadership, while the lowest were in community linkages and coordination of care and patient involvement. Only the communication and information exchange domain showed a significant difference among professions ($p = 0.039$).

Conclusion: IPC for NCD management in primary care demonstrated strengths in role clarity and autonomy, team leadership, and professional relationships, but remained weak in communication, patient involvement, and community linkages. Targeted interventions, including structured interprofessional education, patient-centered care approaches, and stronger community partnerships, are needed to strengthen collaboration.

How to cite: Sahar, J., Akbar, M. A., Rekawati, E., Rachmawati, U., & Chou, K. (2026). Assessing interprofessional collaboration among healthcare professionals for noncommunicable disease management in primary care: A cross-sectional study. *Nurse Media Journal of Nursing*, 16(2), 225–336. <https://doi.org/10.14710/nmjn.v16i2.77921>

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1. Introduction

Noncommunicable diseases (NCDs) have become the leading cause of morbidity and mortality worldwide, accounting for 7.3 trillion cases, 43.8 million deaths, and 1.73 billion disability-adjusted life years (Li et al., 2025; WHO, 2024). World Health Organization emphasizes that cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers represent the most significant global health threats in the twenty-first century (WHO, 2024). In low- and middle-income countries, the burden of NCDs is increasing rapidly, exacerbated by

demographic transitions, urbanization, and lifestyle changes (Akbar et al., 2025a; Ogechukwu Augustina et al., 2022). Indonesia faces a similar challenge, with national health surveys reporting steady increases in the prevalence of hypertension, diabetes, and other chronic conditions over the past decade (Arifin et al., 2022). This epidemiological transition demands a paradigm shift in healthcare systems from acute care to chronic disease management. Without strengthening primary care services, the rising NCD burden threatens to overwhelm the existing health infrastructure (Ahmed et al., 2024; Sahar et al., 2026)

Primary healthcare plays a vital role in the prevention, early detection, and long-term management of NCDs (Ahmed et al., 2024). It is recognized as the cornerstone of universal health coverage because of its ability to provide accessible, continuous, and comprehensive care. In managing chronic conditions, primary care is uniquely positioned to deliver patient-centered services that address both medical and psychosocial needs (Ahmed et al., 2022). However, the complexity of NCD management exceeds the capacity of any single profession, making teamwork an essential component of effective care. Collaborative approaches allow healthcare professionals to combine expertise, improve continuity of care, and enhance health outcomes (Keumalasari et al., 2025). Evidence indicates that Interprofessional Collaboration (IPC) at the primary care level improves patient adherence to treatment, reduces unnecessary hospitalizations, and enhances satisfaction with health services. Thus, strengthening collaboration within primary healthcare is critical to advancing NCD management (Denkyira et al., 2025).

Several factors hinder the establishment of strong collaborative practices in primary care. Professional hierarchies often prioritize one profession's decision-making authority, leaving limited space for other healthcare professionals to contribute meaningfully (Djaharuddin et al., 2023). Communication breakdowns between professionals reduce care coordination and fragment service delivery (Vaseghi et al., 2022). Limited access to joint IPC training further exacerbates disparities in understanding and practice among different health professions (Deckers & van Zaalen, 2024). Additionally, the absence of supportive organizational structures and policies can weaken teamwork and prevent professionals from aligning their efforts toward shared goals (Longhi et al., 2024). These barriers collectively undermine the quality of care for patients with NCDs, highlighting the need for systematic evaluation of collaborative practice in primary healthcare settings (Ahmed et al., 2024)

Effective care in NCD management requires sustained patient engagement, coordinated follow-up, integration of community-based interventions, and IPC (Rashid et al., 2023). Collaboration among healthcare professionals ensures effective delivery of prevention, treatment, and rehabilitation strategies. Strong IPC enables a more holistic approach that incorporates medical, behavioral, and social determinants of health (Longhi et al., 2024). Conversely, weak collaboration can lead to fragmented care, reduced patient adherence, and poorer health outcomes (Wiarsih et al., 2023). For this reason, evaluating collaborative practice in primary care teams is not only academically important but also has direct implications for health policy and practice (Slater et al., 2023).

While global evidence demonstrates the benefits of IPC, studies in Indonesia remain limited. Most available research has focused on hospital settings (Yulia et al., 2023), leaving a gap in understanding how collaboration is enacted at the community and primary healthcare level (Wiarsih et al., 2023), particularly in the context of NCD management in primary care. Moreover, little is known about how different professions perceive their roles and interactions within primary care teams. This knowledge gap hinders the development of targeted interventions to strengthen collaboration and improve service delivery. A systematic assessment of IPC at the primary care level is therefore essential (Watanabe et al., 2023), particularly for NCD management in Indonesia, given the rising burden of chronic conditions, the complexity of long-term care, and ongoing challenges in cross-professional coordination. Therefore, this study aimed to assess IPC among healthcare professionals in primary care and identify domains that require strengthening for NCD management.

2. Methods

2.1 Research design

This study employed a cross-sectional design to assess IPC among healthcare professionals in primary care settings. The independent variable was the professional group, consisting of nurses, medical doctors, midwives, and public health workers, while the dependent variables were

the eight subscales of the Collaborative Practice Assessment Tool (CPAT): mission, meaningful purpose and goals; general relationships; team leadership; general role responsibilities and autonomy; communication and information exchange; community linkages and coordination of care; decision-making and conflict management; and patient involvement (Schroder et al., 2011). The respondents completed the CPAT by reflecting on their routine interprofessional interactions during non-communicable disease management, including Prolanis (*Program Pengelolaan Penyakit Kronis* [Chronic Disease Management Program]) services, in their primary care setting. Sociodemographic characteristics, including age, gender, education level, years of experience working at CHCs, years of experience managing NCDs, and participation in IPC training, were also collected to provide contextual information. The reporting of this study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparency and methodological rigor.

2.2 Setting and samples

The study was conducted in CHCs in Palembang City, South Sumatra Province, Indonesia, from August to September 2025. The target population consisted of healthcare professionals, including nurses, medical doctors, midwives, and public health workers. In this study, the public health worker group referred to health promotion staff. These professionals were registered under the Palembang City Health Office across 37 CHCs with Paripurna (full accreditation) status. These four professions were selected based on preliminary interviews and a situational assessment in Palembang, which revealed that they consistently participate in NCD management at the primary care level and are present in every CHC. Only CHCs with Paripurna accreditation status were included, as this level of accreditation ensures compliance with the highest standards of service quality and organizational structure, thereby ensuring comparability across facilities. Furthermore, only health centers that implemented the Prolanis program were eligible, since this program is a key national strategy for NCD management and requires IPC for implementation. A final criterion was the availability of the required human resources (nurses, medical doctors, midwives, and public health workers), as including all four professions was essential to capture the full scope of IPC.

The inclusion criteria for individual respondents were as follows: (1) having more than one year of work experience at the CHC, (2) having basic digital literacy to complete the online questionnaire using Google Forms, and (3) being actively involved in non-communicable disease or Prolanis management. These criteria ensured that participants had relevant professional experience, could complete the survey independently, and were directly involved in interprofessional practice related to non-communicable disease care.

The sample size was determined using Slovin's formula because the total population was known. Based on a population of 1,199 healthcare professionals and a 5% margin of error, the required sample size was 301 respondents. The respondents were selected from 37 CHCs across Palembang City using simple random sampling. The sampling process used a web-based randomization tool applied to the official list of healthcare professionals obtained from the Palembang City Health Office. This method ensured that each eligible healthcare professional had an equal chance of being selected for the study.

2.3 Measurement and data collection

Data were collected using two self-administered questionnaires. The first was a sociodemographic questionnaire that captured participants' name, age, gender, profession, education level, years of experience working at CHCs, years of experience managing NCDs, and participation in IPC training. The second instrument was the Collaborative Practice Assessment Tool (CPAT) originally developed by Schroder et al. (2011), which consists of 56 items grouped into eight subscales: mission, meaningful purpose, and goals (8 items); general relationships (8 items); team leadership (9 items); general role responsibilities and autonomy (10 items); communication and information exchange (6 items); community linkages and coordination of care (4 items); decision-making and conflict management (6 items); and patient involvement (5 items). Each item was rated on a six-point Likert scale ranging from 1 (not applicable) to 6 (strongly agree), with a total possible score ranging from 56 to 336. The Indonesian version of CPAT, translated by Yusra et al. (2019), validated and adapted for healthcare professionals, demonstrated excellent construct validity as shown by an exploratory factor analysis (KMO =

0.923, MSA = 0.728–0.965, Bartlett's Test $p < 0.001$) and strong internal consistency reliability (Cronbach's alpha = 0.916). Prior permission to use the Indonesian version of the CPAT was obtained. All variables were measured using self-administered questionnaires. The same instruments and procedures were applied across all professional groups, ensuring comparable measurement among nurses, medical doctors, midwives, and public health workers.

Data collection was carried out between July and August 2025 following official approval from the Palembang City Health Office to access eligible CHCs and respondents. Sample allocation per health center was determined in coordination with the NCD program officers. Participants were invited through their respective health centers, and informed consent was obtained before the questionnaire distribution. Questionnaires were administered via Google Forms because it provides a practical, efficient way to collect data from a relatively large sample, minimizes manual data-entry errors, and enables faster data aggregation for analysis. Moreover, online data collection platforms such as Google Forms are widely recognized in health research for enhancing accessibility, reducing administrative burden, and ensuring data security, particularly when respondents are dispersed across multiple locations (Chen & Tu, 2024).

Before completing the questionnaires, participants were informed of the study's title, objectives, and eligibility criteria. They were assured that participation was voluntary, that their personal information would remain confidential, and that they retained the right to withdraw at any time before completion. The minimal risk involved in participating was also emphasized to ensure participants' comfort and willingness to contribute reliable data.

2.4 Data analysis

No missing data were encountered because the online questionnaire required complete responses before submission. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 21. Descriptive statistics summarized respondents' sociodemographic characteristics. Categorical variables, including gender (male, female); profession (nurse, medical doctor, midwifery, public health worker); education (diploma, bachelor, master's degree); years of experience working at CHCs (1–5 years, >5–10 years, >10 years); years of experience managing NCDs (1–5 years, >5–10 years, >10 years); and IPC training (yes, no), were presented as frequency distributions and percentages. Age was initially collected as a continuous measure but was categorized into four groups (20–30, 31–40, 41–50, and >50 years) to facilitate interpretation and comparison across professional groups.

Eight CPAT subscale scores (mission and goals, general relationships, team leadership, role responsibilities and autonomy, communication and information exchange, community linkages and coordination of care, decision-making and conflict management, and patient involvement) were treated as continuous variables. Depending on the data distribution, they were summarized as means with standard deviations and as medians with interquartile ranges. Normality tests for CPAT subscale scores were conducted using the Kolmogorov–Smirnov and Shapiro–Wilk tests, which indicated that the data were not normally distributed ($p < 0.05$). Given the non-normal distribution of CPAT subscale scores, nonparametric tests were used in the inferential analysis. The Kruskal–Wallis test was used to examine differences in IPC scores across professional groups (nurses, medical doctors, midwives, and public health workers). The test compared scores for each of the eight CPAT subscales across the four professions. A p -value of < 0.05 was considered statistically significant.

2.5 Ethical consideration

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Nursing, Universitas Indonesia (No. KET-236/UN2.F12.D1.2.1/PPM.00.02/2025). All respondents provided written informed consent before participation. Participation was voluntary, and respondents could withdraw at any time without penalty. The study maintained participant anonymity and confidentiality by storing data in password-protected files with access limited to the primary researcher. The data were used only for research and scientific publication purposes.

3. Results

3.1 Characteristics of the participants

A total of 301 healthcare professionals were selected through simple random sampling; all met the eligibility criteria and agreed to participate in the study. No participants declined or failed

to complete the questionnaire. [Table 1](#) presents the demographic and professional characteristics of the respondents included in this study. Most healthcare professionals were in the productive age group of 31–40 years (47.2%) and predominantly female (92.7%), with nurses (40.5%) and midwives (33.6%) comprising the largest professional groups, while physicians (15%) and public health workers (11%) were less represented. Educational attainment was relatively balanced between diploma holders (47.5%) and bachelor's degree holders (48.2%), with only a small proportion holding a master's degree (4.3%), reflecting limited access to advanced education in primary care settings. In terms of work experience at CHCs, the majority had worked for >5–10 years (39.5%) or more than 10 years (31.6%), although specific experience in managing NCDs was relatively recent, with most reporting only 1–5 years (82.7%). Furthermore, only 14.3% of respondents had attended IPC training, underscoring a critical gap in capacity building for collaborative practice in primary healthcare services.

Table 1. Characteristics of healthcare professionals participating in the study (n = 301)

Characteristics	f	%
Age group (Years)		
20-30	63	20.9
31-40	142	47.2
41-50	75	24.9
>50	21	7
Gender		
Male	22	7.3
Female	279	92.7
Profession		
Nurses	122	40.5
Medical doctors	45	15
Midwives	101	33.6
Public health workers	33	11
Education		
Diploma	143	47.5
Bachelor	145	48.2
Master	13	4.3
Years of experience working at CHC		
1-5	87	28.9
>5-10	119	39.5
>10	95	31.6
Years of experience managing NCD		
1-5	249	82.7
>5-10	45	15
>10	7	2.3
IPC training		
Yes	43	14.3
No	258	85.7

3.2 Comparison of CPAT subscale scores among healthcare professions in primary care

[Table 2](#) presents respondents' scores across the CPAT domains. Respondents reported the highest CPAT subscale scores in general role responsibilities and autonomy. The lowest subscale scores were found in community linkages and coordination of care, and patient involvement. A significant difference among professions emerged only in communication and information exchange ($H = 8.393$, $p = 0.039$), whereas no significant differences were found in the other subscales ($p > 0.05$). The overall CPAT scores were relatively similar across professions, with median (IQR) values of 292 (275.75–330.50) for nurses, 304 (278–329.50) for medical doctors, 292 (278.50–334) for midwives, and 287 (279–314) for public health workers, and the difference was not statistically significant ($H = 1.813$, $p = 0.612$). These results suggest that while role clarity, leadership, and professional relationships are well established among healthcare professionals, patient involvement, communication, and community linkages remain underdeveloped.

Table 2. Comparison of CPAT subscale scores among healthcare professions in primary care (n = 301)

CPAT Subscales	Nurses		Medical Doctors		Midwife		Public Health Workers		Kruskal-Wallis H	p-value
	Mean±SD	Median (Q1-Q3)	Mean±SD	Median (Q1-Q3)	Mean±SD	Median (Q1-Q3)	Mean±SD	Median (Q1-Q3)		
1. Mission, meaningful purpose, goals	43.91±3.59	44 (40-48)	44.53±3.88	46 (41.50-48)	42.02±6.33	43 (40-48)	42.94±3.95	42 (40-47.50)	3.761	0.288
2. General relationships	44.48±4.13	47 (40-48)	45.42±4.04	48 (42-48)	43.90±6.41	47 (40-48)	44.55±3.68	46 (40-48)	3.299	0.348
3. Team leadership	46.57±5.51	45 (42-52)	46.47±6.80	45 (42-54)	46.66±7.54	45 (43-54)	44.64±5.72	44 (42-49)	4.245	0.236
4. General role responsibilities, autonomy	52.80±5.63	52 (49-59.25)	53.53±5.72	53 (50-60)	52.94±8.09	52 (50-60)	51.33±5.75	50 (48-56.50)	5.571	0.134
5. Communication and information exchange	32.70±3.06	32,50 (30-36)	33.56±3.64	36 (30-36)	32.17±4.75	31 (30-36)	31.52±3.42	30 (30-36)	8.393	0.039*
6. Community linkages and coordination of care	21.73±2.11	21 (20-24)	22.29±2.53	24 (20-24)	21.47±3.18	21 (20-24)	21.36±2.14	20 (20-24)	7.410	0.060
7. Decision-making and conflict management	29.33±5.22	30 (26-35.25)	27.51±6.16	26 (22-34.50)	29.46±6.13	30 (26-36)	28.48±5.07	29 (26-31)	5.678	0.128
8. Patient involvement	26.64±3.04	25 (25-30)	27.62±2.94	30 (25-30)	26.23±4.24	25 (25-30)	26.24±2.67	25 (25-29)	5.412	0.150
Total	298.14 ±27.65	292 (275.75-330.50)	300.93 ±30.06	304 (278-329.50)	295.84 ±43.46	292 (278.50-334)	291.06 ±27.09	287 (279-314)	1.813	0.612

Notes. Values are presented as mean ± standard deviation (SD) and median (interquartile range, Q1-Q3). CPAT = Collaborative Practice Assessment Tool; *P*-values are derived from unadjusted Kruskal–Wallis tests comparing scores across professional groups (*p*-value < 0.05).

Figure 1 presents the overall scores for each CPAT subscale, aggregated across all professional groups. This figure provides an overview of relative strengths and weaknesses across IPC domains in the context of NCD management.

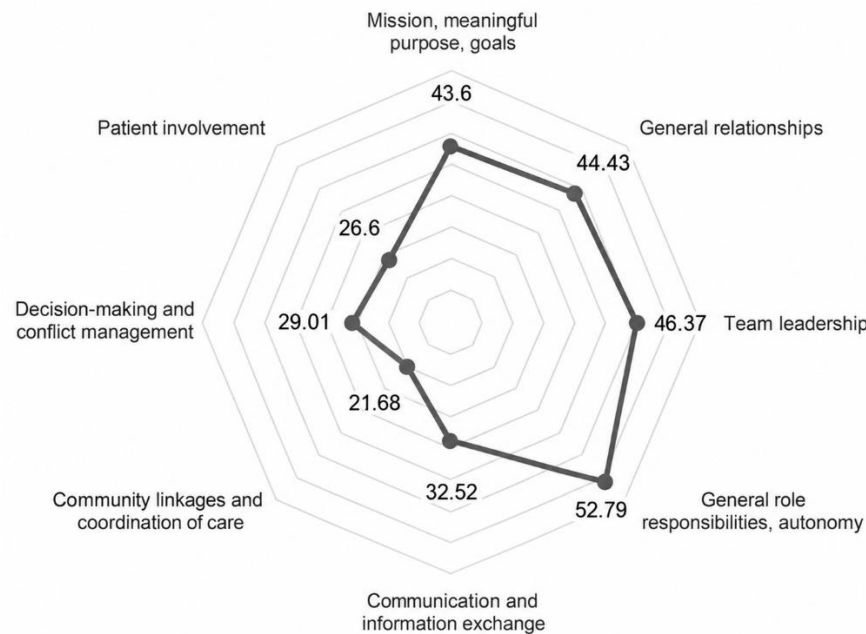


Figure 1. Overall CPAT subscales among healthcare professions in primary care

As illustrated in Figure 1, the CPAT subscale scores showed that the highest value was in general role responsibilities and autonomy ($M = 52.79$; $SD = 6.58$), followed by team leadership ($M = 46.37$; $SD = 6.47$) and general relationships ($M = 44.43$; $SD = 4.96$), reflecting well-established role clarity, leadership, and interpersonal relationships among healthcare professionals. In contrast, the lowest scores were observed in community linkages and coordination of care ($M = 21.68$; $SD = 2.58$) and patient involvement ($M = 26.60$; $SD = 3.64$), indicating limited collaboration with community stakeholders and suboptimal patient engagement. The communication and information exchange domain ($M = 32.52$; $SD = 3.85$) also recorded relatively low values compared with other domains, consistent with the significant interprofessional differences reported in Table 2. These findings highlight that while role responsibilities, leadership, and relationships are relatively strong, urgent efforts are needed to strengthen communication, community linkages, and patient involvement to advance IPC in primary care.

4. Discussion

This study assessed IPC among primary care healthcare professionals and identified domains that require strengthening for NCD management. The findings highlight an imbalance in IPC, with internal team structures such as role clarity, autonomy, leadership, and professional relationships appearing stronger than external dimensions such as communication, patient engagement, and community linkages. This pattern suggests that while primary care teams operate effectively within their professional boundaries, they face persistent challenges when interacting with patients and community stakeholders. These gaps may reflect limited interprofessional training, hierarchical professional cultures, and insufficient organizational support for cross-sector collaboration. Addressing these weaknesses is essential to enhance the integration of community-based strategies and patient-centered approaches in NCD management.

Strong performance in general role responsibilities and autonomy indicates that healthcare professionals in CHCs have a clear understanding of their tasks and decision-making authority. Role clarity is essential for IPC because it reduces overlap, improves efficiency, and fosters

accountability within teams (White-Williams & Shirey, 2022). Prior studies emphasize that well-defined roles support joint decision-making and improve overall team performance (Gagnon et al., 2024). In this study, the high score suggests that organizational structures in Indonesian primary care support role differentiation. However, this internal clarity does not necessarily translate into stronger engagement with patients and communities, which remained weak in this study. This discrepancy points to the need for intervention models that bridge internal role clarity with external collaborative practices (Waltz et al., 2023).

High scores in team leadership and general relationships reflect effective leadership structures and positive interpersonal relationships within health teams. Strong leadership fosters a collaborative climate and encourages open communication, while trust-based relationships enhance cohesion and cooperation (Kanno et al., 2023). Evidence from prior studies in the United States highlights that collaborative leadership significantly improves service delivery by facilitating inclusivity and promoting shared accountability (Slater et al., 2023). Yet, despite these strengths, the current findings revealed weaknesses in formal communication processes among professionals. This paradox suggests that although team leadership and relationships are strong, structured communication mechanisms are lacking (Vaseghi et al., 2022). Therefore, leadership must extend beyond managing internal dynamics and actively promote robust interprofessional communication frameworks (Hu & Broome, 2020).

The significant difference identified in the communication and information exchange subscale is a crucial finding. It shows that perceptions of communication quality vary across professions, creating potential barriers to coordination. Communication is consistently recognized as the foundation of IPC, particularly in managing chronic conditions such as NCDs (Denkyira et al., 2025). In primary care settings, differences in communication perceptions may stem from diverse educational backgrounds, professional roles, and limited exposure to interprofessional training. The fact that only 14.3% of respondents had participated in IPC training supports the conclusion that communication skills remain underdeveloped. Without effective communication, role clarity and leadership cannot ensure successful collaboration (Yulia et al., 2023). Structured interprofessional communication training in primary care is urgently needed (Kechichian et al., 2023).

Low scores in community linkages and coordination of care further demonstrate limited integration of community resources and intersectoral collaboration in primary care settings. A Study by Denkyira et al. (2025) in Ghana similarly reported that communication is a central and often uneven dimension of IPC in chronic disease management. This weak performance may stem from resource constraints, limited intersectoral programs, and underdeveloped partnerships with community organizations (Akbar et al., 2025b). International evidence underscores that community integration is critical for sustainable NCD programs. Without it, preventive and promotive strategies will be less effective (Shanmuganathan et al., 2022). Stronger linkages with community stakeholders and better care coordination should be prioritized to strengthen IPC in Indonesia's primary care system (Sentika et al., 2024).

Equally important, the low scores in patient involvement highlight the persistent dominance of paternalistic models of care in CHCs. Limited patient engagement in decision-making processes indicates that healthcare delivery continues to be provider-driven rather than patient-centered (Pascucci et al., 2021). Yet, a study in Canada consistently shows that shared decision-making enhances adherence, satisfaction, and long-term clinical outcomes (Dahlke et al., 2020). Factors such as cultural norms, patient education, and perceptions of professional authority may contribute to limited patient involvement (Pascucci et al., 2021). This low level of patient involvement underscores the need to shift toward patient-centered care models that actively engage patients in planning and managing their health. Limited patient ownership of care processes may continue to constrain efforts to improve non-communicable disease outcomes without such transformation (Mathur et al., 2022).

From a policy perspective, the findings reinforce the need for systematic interventions to strengthen interprofessional capacity in primary care. Respondents' limited participation in IPC training represents a missed opportunity for workforce development (Chetty et al., 2020). Evidence from other contexts demonstrates that structured interprofessional education programs not only improve communication skills but also foster better role coordination and patient engagement (van Diggele et al., 2020). Countries that have adopted interprofessional education-based training have reported improved quality of care (Patel et al., 2025). National strategies that

expand access to interprofessional education for primary care professionals in Indonesia have strong empirical justification. Gaps in communication and patient engagement are unlikely to be resolved without strong policy support (Akbar et al., 2025b).

In summary, this study highlights that although role clarity, autonomy, and leadership are relatively strong among healthcare professionals in primary care, significant challenges remain in communication, patient involvement, and community linkages. These findings emphasize that IPC is not defined solely by internal team dynamics but also depends on external connections with patients and community systems. Strategies to strengthen IPC should prioritize patient-centered care, structured communication mechanisms, and intersectoral coordination. Continuity across these dimensions will be essential to improve the effectiveness, sustainability, and public health impact of non-communicable disease management in primary care.

5. Implications and limitations

The findings of this study have several important implications for practice, policy, and future research. At the practice level, strengthening IPC in CHCs requires targeted interventions to improve communication, patient involvement, and community linkages, which were identified as the weakest domains of collaboration. From a policy perspective, the results highlight the need for structured interprofessional education and training programs that equip healthcare professionals with the necessary skills to work effectively in multidisciplinary teams, particularly in managing NCDs in primary care. Organizational leaders and health authorities should also prioritize supportive institutional structures, including leadership development, role clarity, and mechanisms for systematic care coordination, to foster a collaborative culture across professions.

This study has several limitations that should be acknowledged. The cross-sectional design does not allow causal inferences, as the associations observed between professional groups and IPC scores reflect a single point in time; although random sampling was employed, the study was conducted only in CHCs in Palembang City, which may limit the representativeness of the findings. Taken together, the results should be interpreted with caution, as they underscore the need for targeted interventions to strengthen weaker domains of collaboration while recognizing that the conclusions remain tentative and require validation through further research. Moreover, the generalisability of the findings is subject to certain constraints, as the study was conducted in an urban setting with relatively strong institutional capacity, making the results most applicable to similar primary healthcare environments. The findings may not be directly transferable to rural or under-resourced regions in Indonesia, where organizational structures, health professional availability, and community engagement differ considerably. Nonetheless, this study provides important contextual evidence that may inform broader efforts to enhance IPC in NCD management.

6. Conclusion

This study concludes that IPC in primary care demonstrates relative strengths in role clarity, autonomy, leadership, and professional relationships, but significant challenges persist in communication, patient involvement, and community linkages. The variation across professions in communication and information exchange underscores the urgent need for targeted interventions to strengthen this domain, as effective communication is central to team-based care. Limited patient involvement and weak community coordination further highlight the need to move beyond provider-centered models towards more inclusive and integrated approaches to managing NCDs. Based on these findings, primary care systems should implement structured interprofessional education and training programs to enhance communication and collaborative skills among healthcare professionals. In addition, policies should prioritize strategies that foster patient-centered care and build stronger community partnerships, ensuring that IPC extends beyond internal team dynamics to effectively address broader determinants of health.

Acknowledgments

The authors would like to thank all participants for their valuable cooperation and involvement in this study.

Author contribution

All authors (JS, MAA, ER, UA, and KRC) contributed substantially to the study design, data collection, analysis, and interpretation of results. All authors drafted and revised the article, approved the published version, and agreed to take responsibility for all aspects of the work.

Conflict of interest

Regarding this study, the authors' authorship of this article, and/or its publication, the authors declare that they have no potential conflicts of interest.

Funding

This research was funded by the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia through the Fundamental Research Scheme 2025, grant number PKS-473/UN2.RST/HKP.05.00/2025.

Declaration of Generative Artificial Intelligence (AI)

The authors declare that they did not use generative artificial intelligence (AI) tools for preparing, writing, editing, or revising this manuscript.

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