

From Policy To Practice: Nurses' Experiences of Implementing PrEP in Primary Health Care Clinics in Gauteng, South Africa



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Abstract:

Introduction/objective: Oral pre-exposure prophylaxis (PrEP) implementation in South Africa primarily depends on nurses working in clinics. However, very little is known about how they interpret and apply PrEP guidelines in their daily practice. This study explored nurses' practices when implementing PrEP guidelines in clinics, employing the Donabedian framework.

Methods: A qualitative exploratory study was conducted among 19 purposively selected nurses providing PrEP services in four PHC clinics in the City of Johannesburg. Semi-structured interviews were conducted between March and May 2024, transcribed verbatim, and analysed thematically using Donabedian's framework.

Results: Structural barriers, including limited access to updated PrEP guidelines, inadequate mentorship, staff shortages, and supply-chain disruptions, contributed to non-standardised clinical practices, inconsistent documentation, and variable patient flow. These challenges affected PrEP initiation, continuation, and implementation fidelity. Peer support, NGO involvement, and flexible patient education strategies facilitated service delivery.

Discussion: The findings demonstrate that health system constraints continue to limit consistent implementation of national PrEP guidelines despite nurses' efforts to adapt their practices. Strengthening structural support is essential to improve implementation fidelity.

Conclusion: Improving guideline dissemination, mentorship, staffing, supply-chain management, and data systems is critical to strengthening and standardising PrEP implementation across PHC settings in South Africa.

Keywords: Oral pre-exposure prophylaxis (PrEP), Nurses, Primary healthcare, South Africa, HIV prevention, NGO.

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Cite as: Ntimani J, Phetlhu D, de Beer A. From Policy To Practice: Nurses' Experiences of Implementing PrEP in Primary Health Care Clinics in Gauteng, South Africa. Open Public Health J, 2026; 19: e187494453175. <http://dx.doi.org/10.2174/01187494453175260723070512>



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Received: February 15, 2026

Revised: June 01, 2026

Accepted: June 08, 2026

Published: July 27, 2026



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1. INTRODUCTION

In South Africa, HIV is one of the most serious public health challenges, notwithstanding progress in prevention and treatment programmes. Oral pre-exposure prophylaxis (PrEP) is an evidence-based biomedical intervention that is efficacious in substantially reducing HIV acquisition with consistent oral use [1]. To increase access within primary

healthcare (PHC) clinics, South African health services have adopted national PrEP guidelines, and nurses are the main implementers of these guidelines [2]. Given the rapid rollout of these guidelines, it is crucial that nurses understand this information and consider its implications for their everyday practice to enhance the provision of high-quality services.

While there are clear step-by-step guidelines from national guidelines for assessment, initiation, monitoring, and follow-up, it has been shown that facility-level resources, readiness of the health system, and provider capacity also influence the level of implementation [3, 4]. Sub-Saharan Africa and several provinces in South Africa have had similar challenges, including limited accessibility to updated guidelines, inadequate mentorship, staff shortages, infrastructure constraints, and disruptions to the supply chain [5-7]. Such structural constraints often contribute to non-standardised processes and a range of variability in PrEP delivery, impacting initiation, continuation, and programmatic outcomes [8, 9].

Although nurses play a central role in PrEP scale-up, not much research has investigated how they engage with and implement national PrEP guidelines during routine clinical practice at South African PHC clinics. Existing studies have focused mostly on client uptake, programme readiness, or demand-side barriers [10, 11], while fewer have examined the day-to-day practices of nurses implementing PrEP. Moreover, none of these studies from Johannesburg has systematically analysed these practices through the lens of Donabedian's structure, process, and outcome framework, which describes how health system conditions affect clinical practices and service outcomes in a systematic way.

Donabedian's framework assumes that the quality of healthcare relies upon structure, such as guidelines, staffing, training, and infrastructure; processes, such as clinical decision-making, workflows, and documentation; and outcomes, such as service quality, adherence to guidelines, and patient continuation [12]. Using this conceptual approach reveals how structural shortcomings, such as poor guideline dissemination, lack of mentorship, and stockouts, lead to uneven PrEP processes and inconsistent results in both South African and regional HIV prevention activities [13-15].

2. MATERIALS AND METHODS

2.1. Purpose of the Study

This study sought to explore nurses' practices when implementing South Africa's national PrEP guidelines in City of Johannesburg primary healthcare clinics and to map barriers and facilitators according to Donabedian's structure, process and outcome framework. This study adds to the evidence base to strengthen the design of programmes and adherence with existing guidelines, and further PrEP delivery and HIV prevention in South Africa.

2.2. Study Setting

The study took place in PHC facilities within sub-districts A and E of the City of Johannesburg (CoJ). Each of these sub-districts has eight fixed PHC facilities, giving a total of 16 clinics. From these, four facilities were purposively chosen as study sites because they serve many clients living with HIV. The clinics function as fixed-site PHC facilities, operating Monday to Friday from 07:00 to 16:00 and on Saturdays from 07:00 to 13:00 to respond to patient demand.

As of 2022, the CoJ, which is one of South Africa's largest metropolitan municipalities, had a population of about 6 million people. In the same year, the HIV prevalence rate among people aged 15 years and older was 12.9%, compared with the national average of 16.3%. This municipality is principally urban; however, it also includes a few peri-urban and semi-rural areas. Selected clinics in these regions receive additional technical and programmatic support from the Anova Health Institute, a donor-funded non-governmental organisation (NGO) that strengthens HIV and PrEP service delivery in the public sector.

2.3. Study Design and Theoretical Framework

The study adopted a qualitative exploratory design within an interpretive paradigm to generate new insights that may inform the implementation of PrEP guidelines in PHC settings. Donabedian's framework for assessing healthcare quality was used as the guiding theoretical lens [12]. This model examines healthcare delivery by looking at three related domains: the structural context of health facilities, the care processes that occur within that context, and the resulting outcomes. Using this framework, the way in which nurses implemented PrEP guidelines was examined systematically, illustrating how facility-level resources, clinical processes, and service outcomes overlap to influence the quality of care [16].

To enhance methodological rigour and transparency, the study adhered to the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist. The study considered interviewer characteristics and reflexivity by acknowledging the researcher's professional background and maintaining reflexive field notes throughout data collection and analysis. Purposive participant selection ensured the inclusion of nurses with direct experience in PrEP implementation across the selected clinics. The coding process involved systematic thematic analysis supported by an independent qualitative analysis specialist to enhance confirmability and dependability. Measures to ensure trustworthiness included credibility through prolonged engagement and verbatim transcription, dependability through consistent use of the interview guide, confirmability through consensus discussions during coding, and transferability through detailed contextual descriptions of the study setting and participants.

2.4. Participant Recruitment, Sample and Procedure

The study population comprised professional nurses based at the four selected clinics. A purposive sampling strategy was implemented so that nurses who were actively engaged in ART or PrEP services and had at least six months of work experience at the facility could be included. Nurses who were newly employed, had less than six months in post, were not directly involved in HIV prevention or treatment services, or were working in administrative roles were excluded. The researchers applied the sampling strategy such that it included nurses with varying professional qualifications, including diplomas, bachelor's degrees, and postgraduate diplomas,

and varying years of PrEP experience, therefore ensuring diversity in clinical seniority. The sample size was guided by the principle of information power and adequacy for qualitative inquiry, which proposes that the more relevant and information-rich the sample is in relation to the study aim, the fewer participants are required to achieve sufficient depth of understanding. Participants with direct experience in PrEP implementation were purposively selected across four clinics. Data collection continued until thematic saturation was achieved, meaning no new themes or insights emerged from the interviews. Saturation occurred at the 18th interview and was confirmed with the 19th participant. No eligible nurses declined participation, and no participants withdrew from the study.

2.5. Data Collection

A semi-structured interview guide was developed and structured in line with Donabedian's healthcare quality framework [12]. To address the study's objective, the interview guide was focused around a single open-ended central question and supported by pre-defined probing questions. The guiding question was: "What are nurses' daily routines to follow the PrEP guidelines?" Pre-defined probing questions guided the overall discussion, while specific probing questions were employed to enhance understanding, clarify responses, and encourage participants to elaborate on specific aspects of their experiences. This approach ensured consistency across interviews while maintaining the flexibility to explore nurses' perspectives in greater depth.

One-on-one, in-depth, face-to-face interviews were carried out between March and May 2024. Participants were interviewed in private offices at the clinics to ensure confidentiality, and interviews took about 30–45 minutes each. All interviews were conducted in English. Field notes were taken during each session, and, with participants' consent, discussions were audio recorded. Participant profiles were obtained through a brief demographic questionnaire. No non-participants were present during the interviews.

2.5.1. Researcher Positionality and Reflexivity

The interviews were conducted by the primary researcher, who is a female, a registered nurse, and a PhD candidate with experience in HIV and primary healthcare services. The researcher had prior knowledge of PrEP implementation within public healthcare settings, which assisted in understanding the clinical context of participants. To minimise potential bias, the researcher maintained reflexive field notes, used a semi-structured interview guide consistently across interviews, and engaged an independent qualitative analysis specialist during coding and theme development. The researcher had no supervisory relationship with the participants.

2.6. Data Analysis

Data analysis is a systematic process of organising, interpreting, and deriving meaning from qualitative data to address the research objectives [17]. Prior to analysis, all interviews were transcribed verbatim from the audio

recordings to ensure that participants' accounts were fully and accurately captured. This transcription process permitted the researcher to retain nuances of their discussions and provided a solid foundation for thematic analysis.

The analysis followed the principles of thematic analysis, a flexible method for identifying, analysing, and reporting patterns within qualitative data [18]. This approach enabled the researcher to immerse herself in the data through familiarisation, systematic coding, theme development, interpretation, and reporting. Both verbatim interview transcripts and descriptive field notes formed part of the analytic dataset.

Coding was conducted manually through repeated reading of transcripts, generation of initial codes, categorisation of related codes into themes and sub-themes, and interpretation of findings within Donabedian's framework. To enhance rigour, an independent qualitative analysis specialist with experience in qualitative health research conducted a separate review of the coding and thematic development process. Emerging codes, themes, and subthemes were subsequently discussed during consensus meetings with the researcher, and discrepancies were resolved through agreement to strengthen the dependability and confirmability of the findings.

2.7. Ethical Considerations

Prior to the study being initiated, ethics approval was obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/485/2023: PG), Johannesburg Health District Research Ethics Committee (NHRD REF. NO.: GP 202402_012), and relevant PHC facility managers. Potential participants were identified with the assistance of clinic staff, who helped the researcher approach individuals meeting the study's inclusion criteria. All potential participants were given information regarding the objectives, extent, and procedures of the study. Those interested were allowed to book an interview, after which they were required to provide written informed consent before the study began. This approach ensured that all willing participants had an equal opportunity to participate while reducing selection bias.

The following steps were taken to protect participants' rights and ensure that the study was conducted ethically. The participants' identities were kept confidential by assigning each one a code number, along with non-identifying information recorded on file. In addition, privacy was maintained by keeping the transcriptions and recordings in one file, which was password encrypted. Study participants were assured that they could willingly withdraw from the study at any time, without explanation, and that no penalty would be imposed on them, to preserve the participants' autonomy. There would be no need to provide a reason for withdrawal, and the extent of their participation would not influence their marks or any other negative outcomes [19]. The researcher and a qualified support staff member were available to provide debriefing if needed. Throughout the research process, the

principles of respect for persons, beneficence, and justice were upheld in accordance with current ethical guidelines for research involving human participants [20].

3. RESULTS

The information below presents the characteristics of participants and the themes that emerged during data analysis.

3.1. Characteristics of Participants

Nineteen registered nurses took part in the study. Participants' ages ranged from 24 to 64 years, with an average age of 35.3 years among male nurses and 40.6 years among female nurses. The majority of the study participants were women ($n = 16$; 84.2%), while male participants accounted for a smaller proportion ($n = 3$; 15.8%). All participants had completed training in Nurse-Initiated Management of Antiretroviral Therapy (NIMART). In addition, 17 of the nurses (89.5%) had also received specific training on PrEP (Table 1).

Table 1. Characteristics of the participants.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	16	84.2
	Male	3	15.8
Age (years)	20-29	3	15.8
	30-39	5	26.3
	40-49	5	26.3
	50-64	6	31.6
PrEP Experience (years)	0-3	3	15.8
	4-6	6	31.6
	7-8	10	52.6
PrEP training	Trained	17	89.5
	Not trained	2	10.5
NIMART training	Trained	19	100
Qualifications	Diploma in Nursing Sciences	11	57.9
	Bachelor of Nursing Sciences	2	10.5
	PGDip in Primary Healthcare	6	31.6

3.2. Presentation of Themes and Subthemes using Donabedian Framework Domains

Donabedian's framework was used to identify themes and subthemes with a focus on the structure, process, and outcome domains. As such, eleven interrelated subthemes were identified across three major domains that address the ways nurses use PrEP guidelines in PHC settings. The Structure domain encompassed system-level enablers and constraints, evident in four themes: guideline availability, training and mentorship, human resources, and infrastructure and supplies. The Process domain illustrated how structural conditions shaped everyday clinical

actions. Four themes emerged: clinical practice, patient flow and service integration, data capturing, and patient recruitment and education. The Outcome domain reflected the impact of structural and process-related gaps on service quality. Three themes were identified: service delivery outcomes, programme dependency, and implementation fidelity (Table 2).

Table 2. Mapping of donabedian framework domains, themes, and subthemes.

Donabedian Domain	Theme	Sub-theme
Structure	Guideline availability	Limited guideline access; outdated versions; reliance on memory
	Infrastructure and supplies	Stockouts (HIV test kits, blood tests); inadequate space
	Training and mentorship	PrEP training gaps; absence of mentorship; peer support
	Human resources	Staff shortages; workload; role of PrEP champions
Process	Clinical practice	Non-standardised PrEP initiation; use of NIMART processes
	Patient flow and integration	Varying service models; inconsistent integration into clinic streams
	Data capturing	Incomplete files; inconsistent Tier.Net updates
	Patient recruitment and education	NGO support; opportunistic testing; youth-focused approaches
Outcome	Service delivery outcomes	Variability in initiation and continuation; follow-up challenges
	Programme dependency	Reliance on PrEP champions; vulnerability to staff absences
	Implementation fidelity	Gaps in adherence to national guidelines

3.2.1. Structure

The structural elements of the health system that shaped the PrEP delivery are presented below:

3.2.1.1. Availability of PrEP Guidelines and Job Aids

PrEP guidelines are available to ensure consistent, standardised service delivery, but nurses reported major challenges accessing updated formats in their institutions. Participants from three of the four clinics reported that printed PrEP guidelines were either unavailable or outdated. Twelve participants reported relying on memory, prior training, or peer support because updated guidelines were not consistently available. This lack of readily accessible guidance created gaps in confidence and contributed to variability in clinical decision-making. The following quotations illustrate how limited guideline availability influenced nurses' implementation of PrEP services:

"We don't really have the guidelines; sometimes we share one copy as a clinic." (P12, Professional nurse, Female, 31 years, 4 years of experience)

"I last saw the PrEP guideline during training, but in the facility, I've never used it." (P7, Nurse clinician, PGDip PHC, Female, 45 years, 9 years of experience)

3.2.1.2. Training and Mentorship

Seventeen of the nineteen nurses reported receiving initial PrEP training; however, thirteen participants indicated limited ongoing mentorship and absence of refresher training to reinforce and update their knowledge on PrEP implementation. Without established guidance or ongoing professional support, nurses would typically rely on personal judgment or prior HIV-related training, especially NIMART, to navigate PrEP delivery. Such gaps led to uncertainty, inconsistent protocol application, and variations in provider confidence. The following excerpts show how lacking routine mentorship influenced nurses' experiences with PrEP implementation:

"They taught us the basics, but there's no follow-up or someone to guide us when new things come." (P3, Nurse clinician, PGDip PHC, Female, 49 years, 8 years of experience)

NIMART training was frequently used as a substitute for PrEP-specific competencies:

"I cannot say I was prepared; with my NIMART knowledge I just took over the service." (P19, Nurse clinician, PGDip PHC, Female, 49 years, 9 years of experience)

3.2.1.3. Human Resources and Workload

Human resource constraints emerged as a significant factor influencing PrEP delivery. Fifteen of the nineteen participants described persistent staff shortages and uneven workload distribution of responsibilities, which placed additional pressure on nurses and limited the time available for comprehensive PrEP counselling, initiation, and follow-up. These workload challenges often forced nurses to prioritise competing clinical demands, resulting in fragmented or delayed PrEP services. The following quotations illustrate how staffing limitations shaped nurses' ability to deliver PrEP effectively:

"Some days I am alone in the consulting room, so PrEP becomes an extra burden." (P10, Professional nurse, Female, 31 years, 3 years of experience)

Participants from two clinics explained that designated 'PrEP champions' helped coordinate PrEP-related activities and continuity of care:

"We have a PrEP champion who drives the program; it helps because she focuses on it daily." (P7, Nurse clinician, PGDip PHC, Female, 45 years, 9 years of experience)

In two of the four facilities, nurses identified as "PrEP champions" received additional mentorship and informal peer-support responsibilities related to PrEP services. These nurses were generally selected because of their extensive experience in HIV management and preventive care services. Despite the absence of a formal institutional role designation, they frequently supported colleagues in clinical decision-making, patient education, and PrEP-related documentation.

3.2.1.4. Supplies, Space, and Infrastructure

Infrastructure issues and supply chain disruptions also limited PrEP service provision. Eleven participants reported regular stockouts of HIV test kits and creatinine testing supplies and a lack of a designated consultation space within clinics. These constraints hampered patient flow, delayed initiation, and negatively affected nurses' capacity to deliver comprehensive PrEP interventions. The following quotes illustrate the impact of the supply and infrastructure constraints on PrEP implementation in daily practice:

"Sometimes we run out of HIV test kits, and you can't initiate without testing." (P5, Professional nurse, Female, 27 years, 5 years of experience)

"the clinic is very small, and HIV testing and counselling are done in debilitated containers." (P11, Professional nurse, Female, 24 years, 5 years of experience)

"we do not have enough consultations rooms; even if we can have enough staff, the clinic is very small." (P10, Professional nurse, Female, 31 years, 3 years of experience)

3.2.2. Process

Structural conditions influenced the clinical and administrative processes that nurses carried out as presented below:

3.2.2.1. Non-Standardised Clinical Practices

Due to a lack of accessible, up-to-date guidelines and insufficient mentorship, 14 participants reported inconsistencies in PrEP initiation and follow-up practices across facilities. Left without standardised guidance, nurses relied on their own judgement, previous experiences with HIV management, or informal information from peers

when assessing clients, initiating PrEP, and providing follow-up care. Fourteen participants described differing approaches to counselling, eligibility assessment, and follow-up practices. The following quotes from participants demonstrate gaps in the guidance that contributed to variability in clinical practice:

"Each nurse does PrEP in their own way; there's no uniform approach." (P4, Professional nurse, Female, 36 years, 7 years of experience)

"We do not have the guidelines, so I use my knowledge acquired from NIMART training to see patients." (P19, Nurse clinician, PGDip PHC, Female, 44 years, 9 years of experience)

3.2.2.2. Patient Flow and Service Integration

PrEP services were implemented to accommodate different clinics' systems, with clinics adjusting their approaches based on space, staffing, and the number of patients needing treatment. Participants from two clinics reported integrating PrEP into chronic care streams, whereas participants from the remaining clinics described youth-focused or mixed-service models. These discrepancies led to variability in patient flow, accessibility, and continuity of care, often because of who was available to provide the service on a given day. The following quotes describe how varied integration models affected the performance of nurses in delivering streamlined and coordinated PrEP services:

"PrEP is everywhere, depending on who is available that day." (P11, Professional nurse, Female, 32 years, 5 years of experience)

"For our adults patients, they get PrEP at the chronic stream (ART), and for youth we have a dedicated nurse who provide that service, including PrEP." (P18, Professional nurse, Female, 31 years, 4 years of experience)

3.2.2.3. Data Capturing and Reporting

While accurate documentation is necessary for monitoring PrEP uptake, programme continuation, and overall Programme performance, participants noted major inconsistencies in recording and capturing PrEP data. Thirteen participants reported incomplete patient files and delays in updating Tier.Net records; these gaps not only jeopardized data accuracy but also led to missed follow-ups and underreporting of PrEP outcomes. The following quotes illustrate where inconsistencies in documentation and Tier.Net use influenced the delivery of the service:

"We capture on paper, but not everything makes it to Tier.Net." (P8, Professional nurse, Male, 31 years, 6 years of experience)

"Most patients' files are not captured on Tier.Net. I do not know if the problem is with the data captures or if the system itself does not update after capturing." (P6, Professional nurse, Female, 60 years, 7 years of experience)

3.2.2.4. Patient Recruitment and Education

Patient recruitment and education strategies varied significantly across clinics, likely reflecting differences in resources, partnerships, and service integration models. Nine participants reported using opportunistic HIV testing as an entry point for PrEP education, while others described youth-focused outreach and NGO-supported recruitment strategies. Such diverse approaches display creativity and inconsistency in how PrEP awareness and uptake were promoted within facilities. NGO-supported HIV Testing Services counsellors assisted with patient education, risk screening, and recruitment for PrEP services, thereby reducing some of the administrative and counselling burden experienced by nurses in overcrowded clinics. The following quotations illustrate how nurses engaged patients using varied recruitment and education strategies:

"We educate during HIV testing; that's when clients agree to start." (P14, Professional nurse, Female, 29 years, 3 years of experience)

"Majority of our patients are recruited by HTS counsellors after testing HIV negative and risk assessment." (P6, Professional nurse, Female, 60 years, 7 years of experience)

3.2.3. Outcome

The service delivery outcomes that resulted from the interplay of these structures and processes are presented below:

3.2.3.1. Variability in PrEP Initiation and Continuation

Outcomes of service delivery varied widely across locations, reflecting the structural constraints and procedural inconsistencies that nurses faced in their work. Variations in access to the guidelines, staffing, mentorship, patient flow, and data quality led to variable PrEP initiation, follow-up, and continuation. These differences highlight that systemic issues shape the quality and consistency of PrEP services. These quotes show how those barriers translated into various outcomes amongst the clinics:

"Some clients start but don't return for follow-up; we try to call them, but many numbers don't work." (P16, Professional nurse, Female, 31 years, 6 years of experience)

"patients do not return to clinic for continuation of the service." (P15, Nurse clinician, PGDip PHC, Male, 43 years, 7 years of experience)

3.2.3.2. Reliance on Individual Champions

The presence of a PrEP champion at each facility was instrumental in influencing service delivery. Clinics with a designated champion, often a nurse who assumed responsibility for PrEP activities, experienced enhanced uptake, more continuity of patient care, and more consistent implementation of procedures. Yet this dependence was also a vulnerability for the programme, as the quality of the service could be compromised if the champion was absent or reassigned. The following quotations illustrate how reliance on individual champions both strengthened and constrained PrEP delivery within clinics:

"If our champion is off, PrEP slows down because other nurses are busy with other services." (P2, Professional nurse, Female, 27 years, 3 years of experience)

"I used to be a champion for the youth services focusing on PrEP; the challenge was when I was on leave or sick leave." (P17, Professional nurse, Female, 28 years, 4 years of experience).

3.2.3.3. Gaps in Implementation Fidelity

Participants highlighted how structural barriers, including limited access to guidelines, inadequate staffing, frequent stockouts, and disjointed clinical processes, contributed to non-adherence to national PrEP guidelines. Such systemic barriers prevented nurses from consistently providing services as prescribed; in the long run, there were gaps between the way expectations for such policies were set and the actual work carried out. The subsequent quotations provide evidence of how structural and process constraints contributed to differences in implementation fidelity and quality of the overall service:

"We try our best, but without standard guidelines and proper support, you can't deliver PrEP the way it's meant to be." (P9, Professional nurse, Male, 32 years, 6 years of experience)

4. DISCUSSION

This study examined nurses' understanding and enactment of South Africa's PrEP guidelines in PHC clinics in the CoJ, applying Donabedian's structure, process and outcome framework. Findings reveal that structural constraints, including limited guideline availability, insufficient mentorship, staffing shortages and supply interruptions, impact the quality and consistency of PrEP delivery processes. These structural limitations subsequently influence outcomes such as PrEP initiation, follow-up, retention, and documentation. Although informal facilitators like peer support, "PrEP champions" and NGO partnerships supported service delivery, such mechanisms were not adequate to fill systemic gaps. These findings are consistent with the broader literature, which recognises that successful PrEP scale-up depends on strong health system support, including adequate training, mentorship, guideline availability, and sufficient health system resources to support healthcare providers in delivering PrEP services [21, 22].

The predominance of female participants in this study reflects the broader gender distribution within the South African nursing workforce, where women constitute the majority of professional nurses in primary healthcare settings. Although the study did not specifically explore the influence of provider gender on PrEP uptake among male clients, participants did not explicitly indicate that the gender imbalance negatively affected the recruitment of male patients. However, this remains an important area for future research, particularly regarding how gender dynamics may influence HIV prevention communication, engagement, and PrEP uptake among men.

4.1. Structural Influences on Implementation

One of the major structural barriers was insufficient access to the national PrEP guideline at facility level. Nursing staff frequently relied on memory or outdated guideline versions, a challenge similarly reported in KwaZulu-Natal and Gauteng provinces in South Africa, where dissemination of updated PrEP guidelines remained limited despite national roll-out [3, 5]. Although participants described inconsistencies in clinical practice associated with reliance on memory and outdated guidelines, no specific adverse clinical events or patient harms were directly reported during the interviews. In Kenya, Uganda and Zambia, as well, there are reports of similar access gaps in the guideline, with frontline providers being unable to locate or interpret updated PrEP protocols [4, 6].

Training gaps were also a structural barrier. Although most participants reported the receipt of PrEP training, some complained of a lack of ongoing mentorship and supportive supervision. Evidence from South Africa and other African settings indicates that initial training alone is insufficient to encourage sustained fidelity to implementation; ongoing mentorship, refresher sessions and clinical supervision contribute to practitioner confidence and adherence to protocols [13, 14]. Nurses' reliance on NIMART experience is consistent with

evidence from studies that show PrEP is frequently added to ongoing HIV workloads with insufficient role clarity or specialist support [23]. Although NIMART training strengthened HIV treatment competencies, participants indicated that it did not adequately prepare nurses for PrEP-specific counselling regarding adherence, side effects, eligibility assessment, and risk-reduction strategies.

Shortages of human resources were also a barrier to implementing PrEP. Unbalanced task allocation, limited clinic staff, and high patient numbers also contributed to uneven service delivery. This has been similar across South Africa, Kenya and Malawi, where staffing constraints constrained providers' capacity to execute detailed forms of PrEP counselling, risk assessment and follow-up [11, 22]. Facilities with an assigned "PrEP champion" showed improved continuity, which is in line with research that reported task specialization to increase PrEP utilization and retention [1].

Infrastructure and supply chain challenges, including **stockouts** of HIV test kits, limited availability of **blood sample collection** services, and inadequate consulting rooms, further limited PrEP services. These concerns map onto national anxieties regarding instability in the HIV program supplies and the trend in sub-Saharan Africa in which logistical problems are frequent barriers to initiating and reviewing PrEP [7, 23].

4.2. Process-Level Variations and their Implications

Structural gaps led to significant process inconsistencies. Nurses reported non-standardised clinical practice, which involved nurses using NIMART-based, rather than PrEP-focused, procedures for patient care. In similar settings, process variability has also been reported through PrEP implementation studies conducted in the Eastern Cape, Uganda, and Kenya, where providers modified HIV treatment workflows to PrEP because of confusion over the guidelines [24, 25].

Patient flow models varied across facilities, with PrEP services integrated into chronic care clinics in some facilities and delivered through dedicated youth-friendly services in others. Although integration may lead to increased access, different models can lead to confusion and duplication, as seen in Botswana, Lesotho and Nigeria [26, 27]. PrEP integration works well with well-defined algorithms and a consistent clinic workflow.

Data quality problems were identified as a significant process barrier. Incomplete paper files, irregular Tier.Net updates, and documentation gaps were responsible for errors in programme information. Recommended interventions include routine synchronisation of electronic and paper-based records, strengthening digital infrastructure, regular training of data capturers, and improved monitoring systems to enhance continuity of care and accuracy of PrEP reporting. Studies conducted in other countries throughout South Africa, Uganda and Eswatini have found similar problems with PrEP data that impact monitoring and evaluation [28, 29].

The collaboration with NGOs improved patient recruitment and education processes, consistent with findings from the DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored and Safe) initiative, a multi-sectoral HIV prevention programme targeting adolescent girls and young women in high HIV-burden settings, as well as other South African community-based programmes where NGOs significantly improved PrEP uptake among key populations and youth [8, 10].

Community outreach approaches implemented by NGOs, including opportunistic HIV testing, peer education, youth-focused mobilisation, and community awareness campaigns, could be formally integrated into Department of Health outreach programmes to strengthen PrEP awareness and reduce workload pressures experienced by nurses.

4.3. Outcome Effects: Implementation Fidelity and Client Continuation

At the outcome level, participants across the four facilities described considerable variability in PrEP initiation and continuation, reflecting the influence of structural and process-level factors on service delivery. Suboptimal retention patterns are also evident in the national and global literature because of inadequate follow-up systems, inconsistent counselling, and structural barriers causing low continuation [8, 9]. The dependence on single PrEP champions was associated with better outcomes among facilities. However, without champions, the model also revealed a vulnerability when the champions were absent, a trend also found in implementation studies in Kenya, Botswana and Tanzania, where programme efficacy was often contingent upon the roles performed by key personnel involved [15].

Facility-level policies should institutionalise PrEP responsibilities through formal mentorship structures, designated PrEP focal persons, standardised role allocation, and integration of PrEP duties into routine clinic workflows to reduce dependence on individual champions.

5. STRENGTH AND LIMITATIONS

This study provides a deeper understanding of nurses' experiences regarding the application of the national PrEP guidelines in primary health care clinics in the City of Johannesburg. An important strength was the use of Donabedian's structure-process-outcome framework, which shed light on ways in which health system factors affect clinical practice and service outcomes. Methodological rigor was supported by verbatim transcription, thematic analysis, inclusion of field notes, and independent review of codes and themes. However, the study was conducted in four purposively selected clinics in one metropolitan municipality and may have limited transferability to other provinces or rural areas. The results are reported from nurses' self-reported data; recall or social desirability bias may contribute to these results. In addition, the dominance of female nurses in this study reflects the current landscape of South African

nurses, while the study did not explore how nurses' gender influenced PrEP uptake among male patients. This is an area that remains unexplored and should be considered for future research. Future research should include the perspectives of other stakeholders, such as facility managers and PrEP clients, to provide a more comprehensive understanding of factors influencing guideline implementation.

CONCLUSION

Nurses are dedicated to delivering PrEP services despite persistent systemic and structural challenges that impede the consistent implementation of national guidelines. Structural barriers, including limited access to updated guidelines, inadequate mentorship, staffing shortages, and supply-chain disruptions, contributed to inconsistent clinical practices, documentation gaps, and variability in PrEP service delivery across facilities. Although nurses adopted adaptive strategies such as peer support, NGO collaboration, and reliance on PrEP champions, these informal mechanisms were insufficient to address broader health system weaknesses.

Health managers should prioritise routine dissemination of updated PrEP guidelines, institutionalised mentorship programmes, and continuous professional development focused on PrEP-specific counselling competencies. Policymakers should strengthen staffing allocation, supply-chain management, and integration of electronic and paper-based data systems to improve continuity of care and implementation fidelity. Future research should explore patient perspectives and evaluate implementation interventions aimed at standardising PrEP delivery across PHC settings.

AUTHORS' CONTRIBUTIONS

All authors have read and approved the manuscript. J.M.N.: Developed the protocol for the study and conducted the interviews; J.M.N., A.G.Md.B., and D.R.P.: Contributed to the conceptualization of the study and thematic analysis. All authors supported the drafting and development of the manuscript; therefore, they read and approved the final draft.

LIST OF ABBREVIATIONS

COJ	= City of Johannesburg
HIV	= Human Immuno-deficiency Virus
NGO	= Non-Government Organisation
PrEP	= Pre-Exposure Prophylaxis
PHC	= Primary Health Care
COREQ	= Criteria for Reporting Qualitative Research

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethics approval and consent to participate in the study were obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/

485/2023: PG), the Johannesburg Health District Research Ethics Committee, South Africa (NHRD REF. NO.: GP_202402_012), and facility managers.

HUMAN AND ANIMAL RIGHTS

The study was conducted in accordance with the Declaration of Helsinki. All other procedures involving human participants were conducted in accordance with the ethical standards of the institutional or research committees.

CONSENT FOR PUBLICATION

Written consent was obtained from the nurses who participated in this study.

STANDARDS OF REPORTING

COREQ guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data that supports the findings of this study are available upon reasonable request from the corresponding author [J.M.N.]. However, participants' personal data cannot be publicly shared due to privacy or ethical restrictions, including the Protection of Personal Information (POPI) Act of South Africa.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

The authors are grateful to Sefako Makgatho Health Sciences University for the opportunity to conduct research, to the Johannesburg Health District for granting us access to the participating facilities, and to all study participants.

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