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The pharmaceutical management cycle and the availability of essential medicines at public health facilities in Limpopo province, South Africa: A qualitative study

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Abstract

One of the pilot districts for the National Health Insurance pilot scheme in South Africa since 2014 is the Vhembe District, which aims to provide universal health coverage. However, medicine shortages and inefficiencies associated with the pharmaceutical management cycle (PMC) processes such as selection, procurement, including funding, storage, distribution, and the rational use of medicines have hindered the achievement of universal health coverage. This study explored the challenges related to the PMC framework and the availability of essential medicines at public health facilities. A qualitative research design using convenience sampling was employed to select participants. Data were collected through an interview guide, and data saturation was reached after interviewing thirteen professional nurses. The collected data were analyzed using thematic content analysis, with emergent themes and sub-themes summarized. The results revealed issues such as inappropriate selection processes, inefficient procurement practices, transportation and communication challenges, and irrational use of medicines by patients. A comprehensive understanding of the challenges associated with the PMC and effective planning of these processes are critical for ensuring a steady availability of essential medicines at public health facilities. Recommendations were made to policymakers and health planners to reduce stock-outs and shortages of essential medicines in public health systems.

Keywords: Essential medicines availability, National health insurance, Pharmaceutical management cycle, Procurement, Public health facilities, Selection, South Africa.

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1. Introduction

The World Health Organization (WHO) prescribed the use of the Essential Medicines List (EML) as a strategy to support progress towards universal health coverage (UHC), and it has remained an evidence-based policy [1]. According to the WHO, essential medicines are those that satisfy the priority healthcare needs of the population [2]. The stock-out of essential medicines at health facilities has become a global problem in high-, medium-, and low-income nations, regardless of economic status [3-5]. This shortage is attested to by Yenet et al. [6], who assert that the availability of medicines in Africa is still significantly below the WHO-defined goal, with availability not exceeding 65% and unaffordable purchasing costs [6].

South Africa's commitment to achieving UHC has been described by different authors [7-9]. This commitment has been exemplified by efforts to increase access to quality essential healthcare services and affordable essential medicines, including vaccines for all. The authors further posited that the implementation of the National Health Insurance (NHI) is a step towards UHC, underscoring the need for an EML to support Standard Treatment Guidelines (STGs) at health facilities. The criteria for essential medicine selection in South Africa are stipulated in the National Drug Policy, with the EML serving as the foundation for developing STGs to improve patient care [10, 11]. This is based on the evidence-based principles of efficacy, safety, and affordability concepts.

Medicine selection in the public healthcare sector is the responsibility of the National Essential Medicine Lists Committee (NEMLC) and the Pharmaceutical and Therapeutic Committees (PTCs) at the provincial and facility levels [8, 9]. Furthermore, the essential medicines concept is intended to be flexible, as its selection was based on the prevalence and burden of diseases and is adaptable by the provinces [12]. Given this, the National Department of Health of South Africa aims for every citizen to have access to good quality and affordable health care and access to medicines by ensuring the consistent availability of appropriate medicines cost-effectively [13]. By inference, the aim of the Department of Health emphasizes the importance of the consistent availability of essential medicines for citizens [14].

A service delivery inspection report by the Public Service Commission [15] on hospitals and clinics in Limpopo Province, an NHI pilot province, highlighted the challenges of medicine shortages at most inspected health facilities were highlighted [15]. This report supports the need to conduct an assessment of the pharmaceutical supply chain regarding the availability of essential medicines at primary healthcare (PHC) facilities, as other studies conducted in different provinces in South Africa corroborate the same findings of medicine shortages [8, 16]. Correspondingly, the availability of essential medicines has been described as depending on efficient supply chain systems, among other factors [9, 17].

The PHC is the entry point where community members come in contact with quality health care [18]. Therefore, stock-outs of essential medicines should not be experienced at the primary healthcare (PHC) facilities. At the PHC facility, professional nurses order medicines from district hospitals and dispense them to patients. In addition, they have the critical role of keeping records and ensuring that medicines are stored adequately to prevent the deterioration of active ingredients. The Management Science for Health (MSH) states that the pharmaceutical management cycle, sustained with appropriate management support services, rational policy, and legal framework, will significantly improve the consistent availability of essential medicines at health facilities. Similarly, the role of the pharmaceutical management cycle in improving the availability of essential medicines in the healthcare system has been corroborated by studies conducted in different provinces in South Africa [9, 19, 20]. A similar finding of poor quality of health services, including medicines stock-outs at public health facilities, was reported from a survey conducted in the Capricorn District, another district in Limpopo Province, the same province as the current study [21].

For this study, essential medicines refer to vaccines for children and the medicines used by adults for the treatment of communicable diseases, including tuberculosis and AIDS, and the management of chronic conditions such as diabetes and hypertension.

1.1. Study Rationale

A healthcare index for an NHI pilot district such as Vhembe District should reflect a consistent availability of essential medicines at PHC facilities. This study focused on supply chain challenges associated with the PM cycle and the shortage of essential medicines at PHC facilities, as measures of progress toward universal health coverage. Understanding systemic challenges such as logistics, selection and procurement procedures, and funding amidst scarce resources in resource-constrained settings is crucial to achieving the consistent availability of essential medicines at health facilities, improving therapeutic outcomes, and cannot be overemphasized. The shortage of medicines at health facilities diverts healthcare providers' attention from direct patient care services.

2. Theoretical Framework

The theoretical framework, PMC, described by Vriesendorp et al. [22] in Management Sciences for Health (MSH) [22] guided this study. The operation of an efficient supply chain impacts the availability of essential medicines through four main processes: selection, procurement, distribution, and use of medicines. In addition to these four processes, there are interlinked management support and a policy and legal background. The PM cycle is illustrated in Figure 1.

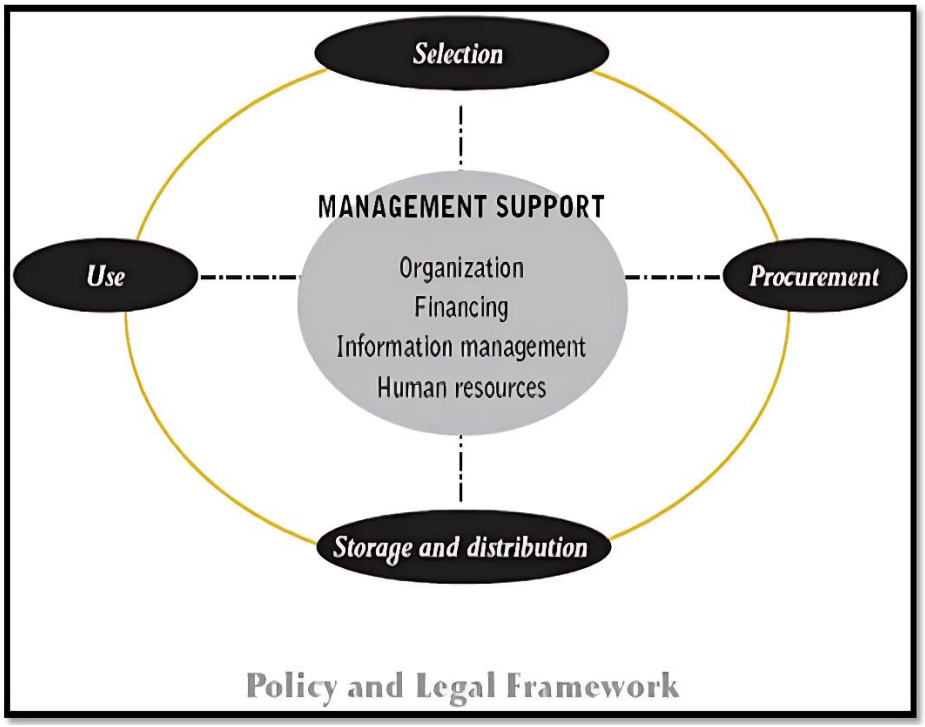

Figure 1.
Framework of pharmaceutical management cycle (Adopted from: Vriesendorp et al. [22]).

The proponents of this framework assert that the PM cycle's functionality is supported by related management support systems for planning and organizing services, securing adequate financing, managing human resources, and handling information management. The four main processes of this PM cycle, according to these authors, are described briefly below:

2.1. Selection

In this phase, essential medicines are selected based on national morbidity patterns, according to WHO standards, using the EML for each country as a guide.

2.2. Procurement

Here, the proper assessment of medicine needs, using cost-effective bid and tender systems and pooled purchasing for effective procurement, is carried out. Thus, an active procurement process with clear policies and guidelines, approval processes on spending limits, and supplier risk management is a prerequisite for effective procurement and the availability of essential medicines.

2.3. Storage, Including Distribution

According to this framework, an effective distribution management process comprises three major procedures: inventory management and stock control, transportation, and storage, with a component of providing supportive supervision to health facility staff.

2.4. Use

This stage of the PM cycle refers to the rational use of medicine, which entails diagnosis, prescription, dispensing, and proper consumption of prescribed medicines by patients. This stage of the cycle provides patients with appropriate information about their medicines.

3. Materials and Methods

A qualitative research design was employed, with one-on-one in-depth interviews conducted in the participants' offices, where essential medicines are dispensed and ordered daily. A qualitative research design uses a questioning approach that allows for a deeper understanding of the subject matter and phenomenon to obtain rich and narrative data, often occurring in a natural setting [23, 24]. Information was collected from participants using an interview guide. Interviews continued until data saturation was reached.

3.1. Study Setting

Thulamela B Municipality, Vhembe District, Limpopo Province.

3.2. Target Population

The target population consisted of professional nurses working at all primary health care (PHC) facilities within Thulamela B Municipality, Vhembe District. Purposive sampling was employed to select health facilities and participants

from local areas within the district. The selection of PHC facilities was based on patient headcounts recorded between May and August 2015. Although 20 participants were initially anticipated, data collection continued until data saturation was achieved with the 13th participant.

Inclusion Criteria: Registered professional nurses working at selected health facilities with no less than two years of working experience.

Exclusion Criteria: Pharmacists and pharmacy assistants working at the selected health facilities.

The selected PHC facilities and distribution of participants, professional nurses are listed in Table 1.

Table 1.
Selected PHC facilities.

S/N	PHC facility	Local Area	Patient Headcount	Locality description	Number of participants
1	Clinic A	Shayandima	14.521	Rural-urban	3
2	Clinic B	William Eadie	5.122	Rural-rural	3
3	Health Centre, HC C	Sibasa	31.374	Rural-urban	3
4	Health Centre, HC D	William Eadie	11.058	Rural-rural	2
5	Clinic E	Shayandima	6.791	Rural-rural	2
Total					13

3.3. Data Collection

The principal researcher collected data over two weeks in June 2016 using an interview guide with open-ended questions, written in English. The in-depth interviews lasted no more than 45 minutes per participant and were held during lunch in the nurses' lounge. The principal researcher audio-recorded the interviews.

3.4. Data Analysis

The collected data was analyzed using thematic analysis. The principal researcher transcribed the interviews. The processes of the PM cycle guided the identification of emergent themes. An independent coder reviewed the transcripts to confirm the accuracy of the data collected. The researcher and the independent coder held discussions to agree on the themes and sub-themes presented in the report.

3.5. Trustworthiness

Credibility was ensured through a comprehensive contextual description, peer briefing with an experienced qualitative researcher, and member checking, allowing participants to review and confirm the findings. These measures of trustworthiness were carried out in this qualitative study.

Table 2.
Participants' demographic profile.

Characteristics	Category	Frequency	Percentage
Age	26 – 35	4	31
	36 – 45	4	31
	46 - 55	5	38
Gender	Male	3	23
	Female	10	77
Work experience (years)	1 - 9	2	15
	10 – 19	9	70
	20 - 29	2	15

4. Results

The majority of participants were females (n = 10; 77%), and over 60% were under 46 years old, with more than 50% having work experience of over a decade.

4.1. Emergent Themes and Sub-Themes

A major finding across all the PHC facilities was the shortage of essential medicines. A central opening question was asked: "What are the challenges associated with the processes of the pharmaceutical management cycle, and how do they affect the availability of essential medicines at public health facilities?"

The emergent themes from the collected data, with sub-themes for each theme, are presented in Table 3. The emergent themes were (1) supply chain challenges associated with the shortage of essential medicines at primary health care facilities and (2) suggestions to ensure the consistent availability of essential medicines at primary health care facilities.
A summary of the themes and sub-themes is contained in Table 3.

Table 3.
Emergent themes and sub-themes.

S/N	Emergent Themes	Emergent Sub-themes
1	Supply chain challenges associated with the Pharmaceutical Management Cycle result in shortages of essential medicines at health facilities.	1.1 Selection of the essential medicines
		1.2 Procurement and Funding concerns
		1.3 Storage & Distribution constraints
		1.4 Use – Dispensing and consumption practices
2	Suggestions to ensure the consistent availability of essential medicines at primary healthcare (PHC) facilities.	2.1 Training and workshops
		2.2 Improved logistics
		2.3 Pharmacy personnel recruitment
		2.4 Use of computers
		2.5 Public health campaigns
		2.6 Efficient & active procurement including funding procedures.

Participants' verbatim quotes for each theme and sub-themes are stated below.

Theme 1: Supply chain challenges associated with medicines availability using the Pharmaceutical Management Cycle

4.2. Sub-theme 1: Selection of essential medicines

Lack of and insufficient consultation with PHC staff during the selection process and in guiding therapy policy changes contribute to stock-outs of essential medicines at the facilities.

" In this facility, *we used to have "Coversyl" tablets here, but now they are phased out, but they are an effective medicine. The medicines are unavailable when we order from the depot*"…P008 from Clinic E.

"…*Eish!... Now, with policy changes, we don't have vaccines. We have changed from monovalent to bivalent, but the new vaccines remain. (exclaims with a disappointed look*)"…P003 from HC C.

4.3. Sub-theme 2: Procurement and Funding

Inefficient procurement practices, such as the use of tenders, and funding challenges including diversion of disbursed funds or misuse, were mentioned.

"*The people who win the tenders don't have the medicines, and it is after three years that they are changing them. Our people suffer when there is a stock-out*"…P001 from Clinic A.

"*Government must improve funding for medicines, the stock-out is too much and no one knows where the money goes*"…P005 from HC C.

4.4. Sub-theme 3: Storage and Distribution Constraints

Distribution challenges, including small storage capacity, inadequate transportation, and poor communication, were described by the participants.

"*The storage space is very small in our unit; the size is like four lockers. So we have to order a small quantity per time*"…P006 from HC D.

"*I will not lie, we struggle with storage space, so we receive small stock from the District hospital*" …P0012 from HC C.

"*The orders take so long before being supplied to us after requisition, even after the order is ready, there is no transport to deliver* "…P0013 from Clinic E.

Poor communication and geographical location contributed to shortages.

"There are no vaccines in stock, and they are not telling us anything" …P007 from Clinic B

"*This facility is far from the depot and our orders are not supplied on the scheduled days* " …P012 from HC D.

Additionally, participants spoke about manual ordering as a challenge. A participant said:

"After your normal work as a professional nurse, you still have to order medicine for the facility using medicine order forms and this is cumbersome" …P006 from Clinic B.

4.5. Sub-theme 4: Use - Dispensing and consumption practices

Irrational demand and use of medicine by patients who visit public health facilities were described by the participants.

"We experience *irrational requests often with the elderly patients."* P005 from HC D.

"There is *irrational prescribing with professional nurses. Staff do not want to be reported for non-dispensing to management. It is bad, but it happens,*" P009 from Clinic E.

Theme 2: Suggestions to enhance the availability of essential medicines

The participants recommended various suggestions to improve the availability of essential medicines based on their experience. The sub-themes identified under this theme are described.

Sub-theme 1: Training and workshops

The participants strongly believed that routine training, supervision, and organizing workshops on forecasting and documentation of received supplies would improve inventory management at the facilities.

"*Definitely, training will assist with stock control and inventory management to prevent stock-outs*"…P011 from Clinic E.

"*Facility managers ought to check the files of patients seen by the professional nurses daily*"…P004 from Clinic B.

Sub-theme 2: Improved logistics

The participants stated that improved transportation will reduce lead times and contribute to enhancing the availability of essential medicines at the PHC facility.

"*A dedicated transport will assist us in collecting our orders from the hospital on time*," P007 from HC D.

Sub-theme 3: Pharmacy personnel recruitment

The need for increased recruitment and posting of pharmacy assistants (PAs) to health facilities to address human resource shortages was described.

"*A pharmacy assistant is more knowledgeable about medicines and has time to order; we need them posted to work with us*"…P004 from HC C.

"*We currently do not have a PA posted to work here because the patient headcount is low…* …P002 from Clinic B.

Sub-theme 4: Use of computers

The participants suggested using computers to capture orders and make medicine requests. Participants' comments include:

"….definitely, *using computers will improve ordering of medicines from the hospital*"…P 002 from Clinic B.

"*… no doubt with electronic ordering of medicines, we will get our orders faster, and with computerized patient information, medicine shopping from one facility to another will be difficult for patients*"…P012 from Clinic E.

Sub-theme 5: Public health campaigns

Routine public health campaigns to educate the community on the dangers of self-medication, medicine shopping, and multiple consultations in different health facilities are recommended.

"*Community awareness is necessary to discourage specific demand for medicines. The government must organize health campaigns*"…P008 from Clinic B.

"*Self-prescribing is a challenge with our patients, so I think the Department of Health should sensitize the community on the dangers of irrational use and shopping of treatments from one PHC to another by patients* "…P007 from HC C.

Sub-theme 6: Efficient & active procurement including funding procedures.

Improved funding strategies and active procurement processes are recommended to enhance the availability of essential medicines at primary health care facilities.

"*Wena! The Department of Health must make a plan to make these medicines available. With more funding and the use of efficient procurement methods, the availability of medicines will improve*." …P004 from HC C.

"*The government has to improve procurement of unavailable vaccines and medicines using competitive and active tender processes*"…P007 from HC D."

5. Discussion

Theme 1: Supply chain challenges associated with medicines availability using the Pharmaceutical Management Cycle.

Sub-theme 1: Selection of essential medicines

The inappropriate selection reported in this study indicated a lack of, and at times, insufficient consultation with professional nurses during the decision-making process of medicine selection. Similar poor selection outcomes and non-adherence to STGs and EML were reported in studies conducted in Gauteng and Mpumalanga provinces in South Africa [19, 25]. This current study asserts that professional nurses with many years of experience should be included as members of the PTC to support the medicine selection process, and this aligns with a recommendation by authors who argued that the PTC must be expert-led, with years of experience, and must adhere to STGs and EML following the prevalent disease burdens [25].

Sub-theme 2: Procurement practices.

The use of tenders as an inefficient procurement method due to underperforming contractors was a challenge described by the participants. Collaboratively, underperforming suppliers have been identified as contributing to medicine shortages in hospitals and primary healthcare facilities [25]. Similarly, a lack of accountability in procurement practices renders the process susceptible to leakage of funds and medicines in public health facilities, underscoring the critical role of government responsibilities in improving healthcare services overall [6, 26, 27].

Sub-theme 3: Storage and Distribution.

This study found that poor inventory management at health facilities was part of an inefficient and ineffective distribution system. The participants criticized manual record-keeping as an inventory management tool for monitoring

stock levels of medicines and health commodities. In a Kenyan study, poor distribution contributed to medicine shortages at health facilities [28]. Studies conducted in other South African provinces align with the lack of electronic inventory management systems and poor forecasting methods as contributors to the shortage of essential medicines [16, 29, 30]. Transportation and communication challenges are described as contributors of effective and efficient distribution practices are also described by different authors.

5.1. Transportation

Participants described transportation issues as contributing to distribution and availability challenges. Study findings from Mozambique illustrated that the difficulties encountered with transport delays were common reasons for medicine stock-outs [31]. Correspondingly, different studies in other African contexts have described transportation delays and poor delivery challenges associated with the delivery of medicine orders [6, 16, 32]. According to Chandani et al. [33], logistics and supply chain management are factors that contributed to the availability of essential medicines in public health facilities conducted in Rwanda, Malawi, and Ethiopia [33].

5.2. Communication

Poor communication regarding medicine shortages and stock-outs in the facilities was reported by the current study. Likewise, poor communication and coordination between different levels of the supply chain made supply chain decisions difficult and contributed to the shortage of essential medicines at health facilities, adversely affecting the availability of essential medicines [33, 34].

Sub-theme 4: Use.

The participants reported demand for specific medicines by patients due to ignorance and lack of knowledge, which leads to misuse. The irrational use of medicines, including misuse and abuse, as a contributor to the shortage of medicines, was corroborated by Mekonnen et al. in a study, implying that the rational use of medicines plays a prominent role in avoiding preventable adverse drug effects, reducing hospitalizations, and maximizing therapeutic outcomes [35].

Theme 2: Recommendations to ensure the consistent availability of essential medicines at the PHC facilities.

The participants recommended various management strategies to overcome supply chain inefficiencies at the PHC facilities. The recommendations have been discussed using relevant literature.

Sub-theme 1: Training and workshops.

The participants stated that training will reduce irrational prescribing at the PHC facilities. In their opinion, effective supportive supervision will assist staff in translating teachings from training on using STG into practice with better therapeutic outcomes, instead of the fear of management hindering them from professional practice. In addition, it was suggested that supervisors should regularly audit records of daily activities to ensure monitoring and quality control. In line with this recommendation, regular in-service education of trained staff is crucial for keeping professionals abreast of current global practices, as suggested by other scholars [35].

Sub-theme 2: Improved logistics.

In line with current study findings, transportation challenges limited the availability of essential medicines in a study of African countries [33]. This calls for improved planning and deployment of logistics to support the increased availability of essential medicines at PHC facilities.

Sub-theme 3: Pharmacy personnel recruitment.

Current study findings showed that PAs contributed to the timely ordering of medicine from the district hospital. Shortage of pharmacy personnel was identified as a challenge, and adequate human resources for health contributed to reduced stock-outs at PHC facilities [16, 36, 37].

Sub-theme 4: Use of computers.

The study revealed that using computers at the facilities would improve the availability of essential medicines by replacing the manual ordering system at the PHC. Different authors have described the design and implementation of a computerized inventory program at health facilities, contributing to the availability of medicines [31, 38, 39].

Sub-theme 5: Public health campaigns.

This study recommends conducting public awareness campaigns to communicate the dangers of multiple consultations and irrational medicine consumption. In line with current study findings, educational initiatives to address misconceptions about the irrational use of medicine and the benefits to the community, including the government and healthcare systems, have been discussed [40, 41].

Sub-theme 6: Efficient and active procurement, including funding procedures.

Improved government funding and more proactive procurement practices are recommended by this study. In a similar vein, an improvement in the availability of essential medicines at health facilities, with strengthened financial systems, effective and efficient pharmaceutical supply chain management services, and efficient disbursement of budgets, has been discussed as critical factors for delivering consistent availability of essential medicines and the delivery of quality healthcare for all citizens [25, 42, 43].

5.3. Study Limitations

This study was conducted in a rural district of Limpopo Province, South Africa. The study setting was described in detail to facilitate reproducibility in other contexts. The participants were professional nurses; none were pharmacists or pharmacy assistants.

6. Conclusions and Recommendations

Supply chain inefficiencies associated with limited essential medicine availability at PHC facilities revolve around the components of the PM cycle and interlinked management support roles, including policy and legal frameworks that create an enabling environment for supply chain optimization processes of the PM cycle.

Strengthening of the pharmaceutical supply chain processes is essential for effective and efficient delivery within national public health systems to achieve universal health coverage. Relevant stakeholders, including government and non-governmental organizations, are urged to dedicate more attention, including policy initiatives and management support, to ensure improved availability of essential medicines at primary healthcare facilities.

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