Forum

SA Association of Hospital and Institutional Pharmacists

Future-Ready Pharmaceutical Practice: AI-Driven Redistribution of Short-Dated Stock in South African Public Hospitals

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Based on the presentaton which was awarded the Life Healthcare Best Poster Award at the 37th Annual Conference of the South African Association of Hospital and Institutional Pharmacists (SAAHIP)

Abstract

Pharmaceutical waste due to expired medicines poses a critical challenge in South Africa's public healthcare system. This quality improvement project aimed to mitigate the risk of fruitless and wasteful expenditure associated with short-dated medicines (identified as stock with six months or less to expiry) through a pharmacist-led, artificial intelligence (AI) enhanced redistribution model. The initiative, implemented at Dr Pixley Ka Isaka Seme Memorial Hospital and later piloted for external redistribution, focused on three key interventions: ward-based audits, monthly redistribution efforts, and the conceptualisation of an AI-driven expiry and demand prediction platform. The result was a substantial reduction in potential stock losses, with R31 314.55 worth of medicines successfully redistributed internally and externally. The project aligns with national priorities on pharmaceutical accountability and has been proposed as a scalable model across other districts.

Introduction

The efficient use of pharmaceuticals within South Africa's public health sector is vital to ensuring sustainable healthcare delivery. One of the persistent issues facing hospital pharmacies is the accumulation of short-dated stock, defined as medicine with less than six months until expiry. These medicines, if not identified and redistributed timeously, contribute significantly to fruitless and wasteful expenditure which is an outcome explicitly cautioned against in Treasury Circular G77.[1]

This challenge is amplified by systemic inefficiencies, poor communication between departments, and the absence of real-time inventory visibility. Despite the existence of Standard Operating Procedures (SOPs) promoting the FEFO (First Expiry First Out) principle, these are often not consistently implemented across wards.[2,3] This project was conceptualised in direct response to the need for a sustainable, pharmacist-led model to identify, track, and redistribute short-dated stock, both within the hospital and externally to institutions.

Aim and Objectives

The aim of this project was to reduce avoidable pharmaceutical expenditure by improving the visibility and redistribution of short-dated medicines across six wards at a regional level hospital in KwaZulu-Natal, South Africa.

The objectives were:

- to evaluate the current practices of medicine supply and expiry management at ward level;
- to implement monthly Ward Organizational Checks (WOCs) for early identification of short-dated stock;
- to develop and implement a pharmacist-led redistribution system using internal and external networks;
- to conceptualise an artificial intelligence (AI) driven platform that automates expiry alerts, predicts demand, and facilitates real-time redistribution; and
- to quantify cost savings and assess operational feasibility for district-wide scale-up.

Methodology

This prospective, quality improvement project was implemented between July 2024 and February 2025 at Dr Pixley Ka Isaka Seme Memorial Hospital. The intervention was structured in three phases:

Phase 1: Ward-Level Expiry Audits

Monthly WOCs were conducted by pharmacist's assistants and nursing staff in six hospital wards: Medical ward 2, Surgical ward 2 and 3, Orthopaedic ward 1 and 3 and the Adult Intensive Care Unit. The audits focused on storage conditions, stock appearance, compliance with FEFO, and presence of expired or short-dated stock. Findings were logged in structured compliance tools aligned to existing SOPs.

Phase 2: Pharmacy Redistribution and Communication

Based on WOC data and RxSolution reports, a monthly short-dated stock list was compiled detailing medicine name, quantity, expiry date, and rand value. This list was shared via institutional platforms including email and WhatsApp to nearby facilities. A single pharmacist served as the contact person to handle responses, coordinate transfers, and update stock records.

Phase 3: AI System Conceptualisation

An AI model was simulated to demonstrate automated expiry alerts to be sent to procurement teams via email, intranet, and mobile apps, consumption forecasting, and redistribution routing. Employment of expiry tracking and demand prediction using AI algorithms to flag items expiring within 6 months and match to institutions with relevant demand. The use of AI forecasting for analysis of historical usage to recommend stock transfers and dynamic discounting and creation of an AI-Powered marketplace as a centralised platform enabling institutions to view and request short-dated medicines was presented.

The proposal of an integrated workflow with automated order generation, stock updates, and shelf-life monitoring and system conceptualised for scalability with mobile functionality, dashboard reporting, and integration with RxSolution was highlighted.

Results

The monthly WOCs led to significant improvements in expiry management across all six wards. In the first audit month (July 2024), expired stock worth R1 554.18 was removed and redistributed internally to higher-turnover areas. Compliance scores across wards improved by 35% over the six-month cycle, as measured by completed expiry logs and improved shelf organisation. Staff interviews indicated increased awareness of storage SOPs and collaboration with pharmacy personnel.[4]

Figure 1 depicts that the availability of a short-dated list of medicines in wards, available to pharmacy, is undoubtedly a successful effort to redistribute short-dated stock within the institution and prevent fruitless and wasteful expenditure resulting from expired stock in wards. A total of **R 1 554.18 was saved** through active and effective redistribution.

Pharmacy-led redistribution efforts yielded substantial savings. From July 2024 to February 2025, short-dated stock with a total value of R65 520.47 was identified and advertised. Of this, R28 853.80 was accepted by external facilities, and R2 460.75 was absorbed into high-demand wards within the hospital.

This method of reinforcing medicine supply management within the pharmacy successfully prevented the loss through expiry of **R31 314.55** worth of stock (48%), demonstrating significant cost savings from the total advert value of R65 520.47.

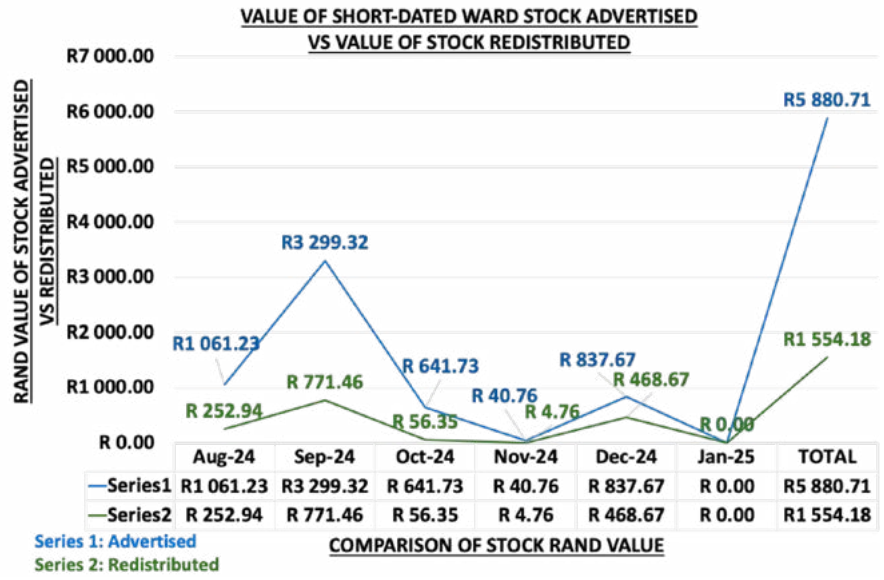

Figure 1. The Rand value of short-dated ward stock advertised per month in July 2024 against the Rand value of stock redistributed per month

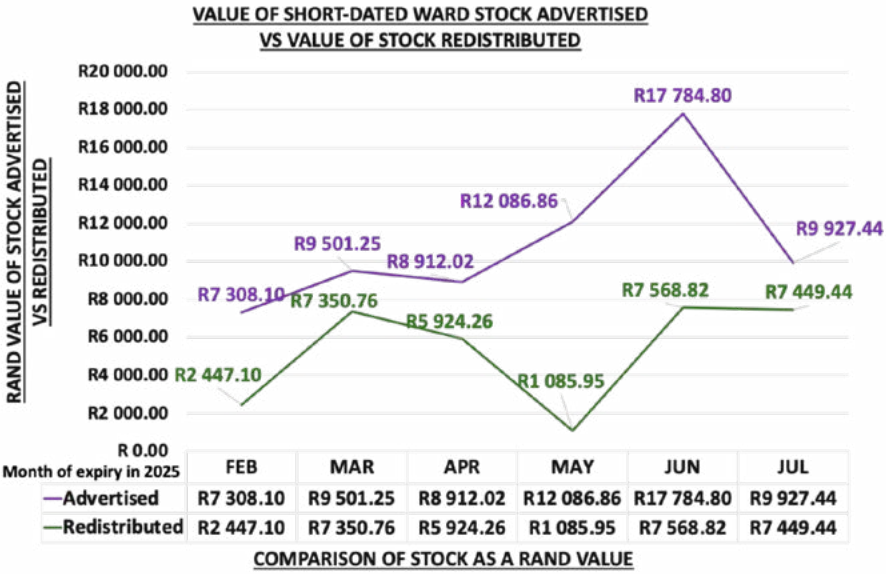

Figure 2. The Rand value of short-dated ward stock advertised per month in February 2025 against the Rand value of stock redistributed per month

The AI prototype demonstrated predictive functionality through mock expiry dashboards. Simulated outputs can generate alerts for soon-to-expire stock, map out high-consumption facilities based on historic RxSolution data and offer demand-based redistribution suggestions.

Discussion

This initiative illustrates the power of decentralised pharmacist-led interventions supported by modern technology.[5] Monthly WOCs provided the visibility necessary to track expiry trends in real time, allowing for timely redistribution. Importantly, the audit process strengthened nurse-pharmacist collaboration, leading to a culture of shared accountability.

Pharmacy redistribution, although resource-intensive, created a new workflow for medicine salvage. The use of platforms like WhatsApp and shared spreadsheets enabled low-cost, high-impact communication. Establishing a single point of contact ensured continuity and prevented fragmentation. However, transportation delays and reluctance from receiving hospitals to accept near-expiry stock remained challenges.

The AI component, though still in conceptual form, represents a future-ready tool that aligns with health system digitisation.[6] Its ability to integrate expiry alerts, usage forecasting, and redistribution pathways into a single platform could greatly reduce human error and administrative load. However, its success will depend on data accuracy, system interoperability, and change management among pharmacy personnel.[7]

Recommendations

Based on the project outcomes, the following recommendations were made:

- rolling out the WOC and redistribution model to other hospitals within the district; establishing a central stock-sharing communication channel between institutions;
- training pharmacists and pharmacist's assistants on pro-active expiry management;
- piloting the AI platform in one high-volume district before full-scale implementation; and
- developing electronic expiry logs for integration into RxSolution systems.

Conclusion

This quality improvement project successfully addressed the issue of short-dated medicine wastage through a pharmacist-led and simulated AI-supported model. The combined use of manual audits and redistribution not only prevented substantial financial losses but demonstrated the feasibility of scalable solutions in low-resource environments. The project's success highlights the critical role of pharmacists in safeguarding pharmaceutical resources and advancing health system resilience in South Africa.

References

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