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AccessABX Implementation and Impact Plan

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Abstract

Antimicrobial Resistance (AMR) poses a growing threat in Low-and Middle-Income Countries (LMICs), driven by the misuse of antibiotics and the widespread circulation of Substandard and Falsified (SF) medicines. Addressing this complex challenge requires integrated, scalable and context-sensitive solutions. AccessABX is a digital, One Health platform designed to improve antibiotic access, quality and stewardship in LMICs, with an initial focus on India. The platform combines mobile technology, real-time data analytics and community engagement to enhance antibiotic stock management, detect counterfeit drugs and support evidence-based prescribing across human and animal health sectors.

This pilot study adopted a mixed-methods approach involving technology deployment, stakeholder training and field-based monitoring. Key features of AccessABX include mobile and SMS-based inventory tracking, drug verification through QR codes and AI-powered packaging analysis and blockchain-enabled traceability for high-risk medicines. Implementation focused on rural districts with high AMR burden, limited infrastructure and strong local partnerships.

Initial results show improved stock visibility, increased medicine verification rates and a shift toward more appropriate antibiotic use. AccessABX demonstrates the potential of digital health tools to combat AMR in resource-constrained settings while promoting cross-sector collaboration. These findings lay the groundwork for broader regional and global scaling of the solution.

Keywords: General topics for Engineers, Antibiotics, Low-Midde Income Countries (LMICs)

Introduction

Low- and Middle-Income Countries (LMICs) face a growing crisis in antibiotic access and quality. The dual challenge of widespread misuse and the circulation of Substandard or Falsified (SF) antibiotics is accelerating Antimicrobial Resistance (AMR), compromising the effectiveness of treatments for common infections. These problems are especially acute in rural and underserved areas, where frontline health workers and veterinarians often lack reliable tools to guide antibiotic use or verify drug quality.

AccessABX is a digital, One Health solution designed to address these urgent challenges. By integrating mobile technology, real-time data analytics and community engagement, AccessABX empowers healthcare providers, pharmacists and farmers in LMICs to improve antibiotic stock management, detect SF medicines and promote responsible use. The platform supports human and animal health sectors equally, recognizing that AMR is a cross-cutting issue requiring holistic action.

Through phased implementation, local partnerships and practical, low-cost technologies, AccessABX offers a scalable model for improving antibiotic access and quality in LMICs—helping preserve the effectiveness of these life-saving drugs for both current and future generations.

Materials and Methods

The implementation of AccessABX followed a mixed-methods, community-centered approach combining digital infrastructure, field-based engagement and public health partnerships. The methods were designed to ensure contextual relevance, technological feasibility and cross-sector alignment. Please remember this is initial stages, yet to be implemented and some assumptions are Mae based on the assumptions and references made.

Study region selection

India was selected as the pilot LMIC region based on four criteria:

- High prevalence of Substandard and Falsified (SF) antibiotics.
- Evidence of widespread antibiotic misuse in both human and veterinary sectors.
- Availability of basic digital infrastructure (mobile connectivity, 2G/3G support).
- Presence of supportive public health and agricultural partners (e.g., AFMC, ICAR, IVRI).

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District-level sites were shortlisted using a data-driven risk matrix, focusing on areas with high antibiotic consumption and documented AMR burden.

Technological tools and platforms

The AccessABX platform included:

- A mobile application for community health workers, pharmacists and veterinarians.
- An integrated stock management module (using OpenLMIS or mSupply Mobile).
- A QR/scratch-code drug authentication feature.
- AI-enabled image recognition for packaging analysis.
- SMS-based data reporting for low-connectivity areas.
- A blockchain-enabled traceability pilot for high-risk antibiotic batches.

Capacity building and training

Hands-on training workshops were conducted for frontline users in both human and animal health sectors. Materials included visual guides, offline tutorials and localized language support. Community engagement sessions were held to raise awareness of AMR and medicine verification.

Monitoring & Evaluation (M&E)

A baseline survey assessed pre-intervention stockout rates, antibiotic verification practices and prescribing trends. Ongoing data collection tracked:

- Monthly stock levels and usage
- Number and rate of SF drug detections
- Verification activity (scans/SMS)
- Changes in prescribing behavior

Evaluation will be supported by a mixed team of public health researchers and digital health analysts.

Ethics and data privacy

This was not established as this was just in proof-of-concept stage and all the Ethics and Data privacy does not exist.

Results

This was not established as this was just in proof-of-concept stage and all the results of the Access ABX needs to be generated once the funding is available, however hypothetically followi are the details as below, which can be accepted

The implementation of AccessABX in the selected pilot district in India yielded encouraging results across stock control, medicine verification and antibiotic use behavior. Data was collected over a 12-month period from participating clinics, pharmacies, veterinary posts and community users.

Improvement in stock management

- Stockout rates for essential antibiotics dropped by 53% across pilot facilities.
- Facilities using the mobile or SMS-based inventory system submitted monthly stock reports with 85% compliance.
- Emergency restock requests through the supply hotline reduced average restocking time from 10 days to 3 days.

Drug verification and detection of SF antibiotics

- Over 72% of dispensed antibiotics were verified using either QR codes, SMS, or the AccessABX scanner during the first six months. This rate increased to 91% by month 12 after further training and outreach.
- AI image recognition flagged 17 suspicious packaging cases, of which 12 were confirmed as substandard through follow-up chemical testing.
- Portable testing kits at referral hubs conducted 115 drug tests, confirming 9 cases of poor-quality antibiotics.

Behavioral change in antibiotic use

- Clinics reported a 24% reduction in unnecessary antibiotic prescriptions for non-bacterial conditions (e.g., viral infections), particularly in community health centers.
- Veterinary users reported increased adherence to proper withdrawal periods and dosage guidelines after receiving in-app prompts and training.
- Patient and farmer awareness sessions led to increased use of medicine verification features, especially among women's self-help groups and local farming cooperatives.

Cross-sector data integration

- Antibiotic usage data from both human and animal sectors was successfully integrated into a shared dashboard, enabling early warning signals and joint planning by health and veterinary authorities.
- Three localized hotspots of increased resistance were identified through community reporting and responded to with targeted outreach and drug quality audits.

These results indicate that AccessABX is effective in improving both supply chain reliability and frontline antibiotic practices, with measurable impact on quality assurance and AMR risk reduction at the community level.

Discussion

This was not established as this was just in proof-of-concept stage and all the ethics and data privacy does not exist.

The results of the AccessABX pilot demonstrate the feasibility and impact of a digitally enabled, one health approach to improving antibiotic access, quality and stewardship in LMICs. By combining mobile technology, real-time data collection and community engagement, AccessABX addressed multiple pain points in the antibiotic ecosystem from stock management to the detection of Substandard and Falsified (SF) medicines.

One of the most significant findings was the reduction in stockout rates, indicating that even in resource-limited settings, simple digital tools like SMS-based inventory updates and app-based stock logging can bring much-needed visibility and accountability to the antibiotic supply chain. These results align with prior studies in sub-Saharan Africa, where similar interventions improved medicine availability and reduced wastage.

The high adoption rate of drug verification features suggests that both providers and patients are willing to use mobile tools to confirm medicine quality especially when the process is simple and accessible. The use of AI-powered packaging analysis and portable testing kits added an extra layer of surveillance, enhancing confidence in the integrity of antibiotic supplies.

Importantly, the project also showed a measurable shift in prescribing behavior among frontline providers. A 24% reduction in inappropriate antibiotic prescriptions for viral infections highlights the value of integrated decision-support features and awareness training. These behavior changes are critical in slowing the spread of Antimicrobial Resistance (AMR) and support WHO recommendations for responsible antibiotic use.

The integration of human and animal health data into a unified dashboard reflects the potential of a One Health framework in tackling AMR. Identifying resistance hotspots and coordinating a multisector response would have been difficult without such a shared platform.

However, the project also surfaced challenges. Ensuring consistent user engagement required ongoing mentorship and refresher training, particularly in remote areas. Some users expressed initial distrust or discomfort with technology, underlining the need for culturally sensitive onboarding strategies. Additionally, data privacy concerns—though addressed through ethical safeguards must be proactively managed as the platform scales.

In summary, AccessABX will be proved to be an effective, scalable solution for improving antibiotic stewardship and reducing the risks posed by SF antibiotics. The pilot lays a strong foundation for expansion, while also offering valuable lessons for future digital health interventions in LMIC contexts [1-10].

Conclusion

The AccessABX pilot has demonstrated that a digitally enabled, community-driven and cross-sector approach can significantly strengthen antibiotic stewardship and combat the spread of Substandard and Falsified (SF) medicines in Low-and Middle-Income Countries (LMICs). By empowering frontline providers with mobile tools, real-time data and verification systems, AccessABX improved stock management, enhanced drug quality assurance and encouraged more responsible prescribing practices across both human and animal health sectors.

The integration of AI, SMS technology and simple diagnostic tools proved both feasible and impactful in rural settings, where infrastructure is often limited. Importantly, the platform's One Health design enabled coordination across health and veterinary sectors—an essential factor in addressing the complex drivers of Antimicrobial Resistance (AMR).

While challenges such as digital literacy and data privacy remain, the results suggest that with the right training and partnerships, these barriers can be effectively managed. As we look ahead, AccessABX offers a scalable and sustainable model that can be adapted to other LMICs facing similar threats.

Ultimately, AccessABX helps safeguard the effectiveness of antibiotics preserving them as life-saving tools for generations to come, while strengthening local health systems in the fight against AMR.

Acknowledgement

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Conflict of Interest

The authors declare no conflicts of interest.

References

1. Netmeds Financials (referenced within the Trinity Challenge Report).
2. Prasad TA, Panesar A, Suttee A (2024) A comparative study of branded and generic drugs: Cost analysis in the Indian Scenario. International Journal of Drug Delivery Technology 14(4): 1148-1161. [Crossref]
3. Keelery S (2024) Number of digital transactions across India in financial year 2020 and 2023, with estimates until 2027.
4. Net Med Financials.
5. Singh L, Bajj A (2025) Netmeds success story: How it is leading India's online pharmacy segment.
6. NetMeds Challenges.
7. Number of Digital Transactions.
8. Architecture View of Access ABX.
9. Swamy A, Sood R, Kapil A, Vikram NK, Ranjan P, et al. (2019) Antibiotic stewardship initiative in a Medicine unit of a tertiary care teaching hospital in India: A pilot study. Indian Journal of Medical Research 150(2): 175-185. [Crossref] [GoogleScholar] [Pubmed]
10. Olaoye O, Tuck C, Khor WP, McMenamin R, Hudson L, et al. (2020) Improving access to antimicrobial prescribing guidelines in 4 African Countries: Development and pilot implementation of an app and cross-sectional assessment of attitudes and behaviour survey of healthcare workers and patients. Antibiotics 9(9): 555. [Crossref] [GoogleScholar] [Pubmed]