Abstract

An autonomous inventory-management platform is disclosed for hospital Automated Dispensing Cabinets (ADCs). The system comprises: (i) edge-connected ADCs that stream real-time transaction and stock data to a central server; (ii) a dynamic inventory optimizer that continuously recalculates per-medication PAR (min/max) levels from usage forecasts and expiry profiles, automatically issuing restock or redeployment tasks to a pharmacy carousel; (iii) a reconciliation engine that, within seconds, trip-matches each ADC dispense/return with the patient's eMAR entry and ADT status, instantly flagging undocumented or disallowed removals; (iv) an AI anomaly module that scores discrepancies and either auto-closes low-risk count variances or escalates high-risk events for diversion investigation; (v) a self-healing API layer that buffers and retries messages to external systems to ensure uninterrupted data flow; and (vi) an immutable ledger that hashes every critical event, enabling one-click generation of digitally-signed DEA/board-compliance packets. The integrated architecture eliminates manual PAR reviews, reduces stock-outs and expiries, streamlines discrepancy resolution, and provides tamper-evident regulatory reporting.