Robotic Process Automation (RPA) Us Case: Automating Claims, Eligibility, Claim Status, and Remittance Advice Healthcare with AI Agents Supported Public Blockchain

JAN 27, 2025 • PAID

The healthcare revenue cycle management (RCM) process, involving claims submission, eligibility verification, claim status inquiries, and remittance advice (ERA) reconciliation, is labor-intensive and error-prone. Robotic Process Autom (RPA), enhanced by AI agents and supported by public blockchain technology, o transformative solution to automate and streamline these interactions between providers and payers.

Use Case Description: End-to-End Claims Automation

Scenario Overview

A hospital submits claims for reimbursement to various insurance payers. Befor submission, the hospital must:

1. Verify the patient's eligibility for coverage.

2. Submit claims with accurate information.

3. Continuously track claim statuses.

4. Process remittance advice to reconcile payments and denials.

By combining **AI-powered RPA bots** and a **public blockchain infrastructure**, thi process can be automated, ensuring greater transparency, accuracy, and efficienc

Key Components of the Solution

1. Eligibility Verification

• **Challenge**: Providers often face delays when verifying patient eligibility due to payer-specific systems and response times.

• **RPA + AI Solution**:

• **AI-powered RPA bots** query payers via standardized APIs or EDI (Electronic I Interchange) for real-time eligibility verification.

• AI agents interpret responses, extract data (e.g., coverage details, copays, deductibles), and update the patient's record in the hospital's system.

• **Public Blockchain Support**:

• The blockchain maintains an immutable record of eligibility checks, including timestamps and payer responses.

• Smart contracts on the blockchain enforce that only authorized providers acce information, ensuring compliance with HIPAA.

2. Claims Submission

• **Challenge**: Manually entering claims into multiple payer systems increases err and delays.

• **RPA + AI Solution**:

• Bots extract patient and encounter data from the hospital's EHR system and pı scrub claims using machine learning models trained to detect coding errors or missing information.

• After validation, bots submit claims directly to payers via secure APIs or clearinghouses.

• **Public Blockchain Support**:

• Claims are registered on the blockchain with cryptographic hashes, creating a tamper-proof record of submission.

• Providers and payers can use these records to resolve disputes or verify submis history.

3. Claim Status Inquiry

• **Challenge**: Tracking claims across multiple payers is time-consuming, especial unresolved claims.

• **RPA + AI Solution**:

• RPA bots periodically query payers for claim statuses using EDI 276/277 transactions.

• AI agents prioritize claims requiring intervention based on payer feedback (e.g denial reasons, requests for additional documentation).

• **Public Blockchain Support**:

• Blockchain maintains a transparent log of claim statuses, enabling both provid and payers to access a shared, real-time source of truth.

• Smart contracts trigger automatic notifications for unresolved claims after a predefined time frame.

4. Remittance Advice and Payment Reconciliation

• **Challenge**: Reconciling electronic remittance advice (ERA) with payments is pr to errors, particularly when dealing with partial payments or denials.

• **RPA + AI Solution**:

• AI-powered bots parse ERA files (EDI 835) to match payments with correspond claims.

• Bots flag discrepancies (e.g., underpayments, denied charges) and initiate work for resolution or appeals.

• **Public Blockchain Support**:

• ERA data is hashed and stored on the blockchain for traceability, ensuring all payment transactions are auditable.

• Blockchain smart contracts automate payment reconciliation and trigger notifications for discrepancies.

Workflow Diagram

1. **Eligibility Verification**:

• RPA bot queries the payer → AI agent validates response → Blockchain logs q and response.

2. **Claims Submission**:

• Bot extracts and validates claim data → AI pre-scrubs for errors → Bot submit claim → Blockchain logs submission and timestamp.

3. **Claim Status Inquiry**:

• Bot queries payer → AI prioritizes claims requiring action → Blockchain logs updates.

4. **Remittance Advice**:

• Bot parses ERA → AI matches payments → Blockchain logs reconciliation and disputes.

Benefits of the Solution

1. Increased Efficiency

• RPA eliminates manual, repetitive tasks, significantly reducing administrative overhead.

• AI ensures high accuracy in claims preparation and submission, reducing deni rates.

2. Enhanced Transparency and Trust

• Blockchain provides an immutable, shared ledger of interactions between prov and payers.

• Both parties can independently verify claim submissions, eligibility checks, an payments, reducing disputes.

3. Faster Reimbursement Cycles

• Automating claim status inquiries and reconciliation accelerates the reimburs process.

• Smart contracts enforce timely payer responses, ensuring claims are not unnecessarily delayed.

4. Regulatory Compliance

• Blockchain's audit trails ensure compliance with HIPAA and CMS regulations

• AI agents validate that all data interactions meet predefined security and priva standards.

Technical Architecture

1. **RPA Layer**:

• Bots implemented using tools like **UiPath**, **Automation Anywhere**, or **Blue Pr** handle structured workflows.

2. **AI Layer**:

• Natural language processing (NLP) models for interpreting unstructured EDI messages.

• Machine learning models for claims scrubbing and denial prediction.

3. **Blockchain Layer**:

• **Ethereum** or **Hyperledger Fabric** used as the blockchain infrastructure.

• Smart contracts enforce rules for eligibility, claims submission, and payment timelines.

4. **Integration Layer**:

• APIs and FHIR interfaces to connect RPA, AI, and blockchain components wit EHRs, payer systems, and clearinghouses.

Challenges and Mitigation

1. Interoperability with Payer Systems

• **Challenge**: Variability in payer systems can hinder automation.

• **Solution**: Implement FHIR standards and modular APIs for seamless integrati

2. Data Privacy Concerns

• **Challenge**: Storing sensitive patient data on a public blockchain may raise compliance issues.

• **Solution**: Use **off-chain storage** for sensitive data, with only cryptographic has stored on-chain.

3. Scalability

• **Challenge**: High transaction volumes on public blockchains like Ethereum can increase costs.

• **Solution**: Leverage Layer 2 scaling solutions (e.g., Polygon) to reduce transactio and improve throughput.

Conclusion

This integrated RPA, AI, and blockchain solution represents a paradigm shift in healthcare RCM by automating claims, eligibility verification, claim status inqui and remittance advice reconciliation. By reducing inefficiencies, enhancing transparency, and accelerating reimbursement cycles, this approach can transfor how providers and payers interact, driving value for both stakeholders and ultim improving patient outcomes.

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