

CASE STUDY

REVENUE CYCLE MANAGEMENT IN HEALTHCARE



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Use of AI strategies to improve healthcare revenue cycle management

THE CONTEXT

What represents Revenue Cycle Management in healthcare, its actors, their viewpoints, and challenges.

Healthcare revenue cycle management (H-RCM, or simply noted here as RCM) is a process that helps optimize the collection of revenue for a given practice by efficiently managing every step of the patient's journey.

The RCM process starts when patients are admitted to the service provider facility and provide their insurance information. It finishes when the practice (by itself or through an intermediary) submits the appropriate claims to the insurance companies for remittance collection and receives the corresponding payments for the services provided.

Applying artificial intelligence (AI) strategies and tools, supplementing first level automation, can help alleviate common pain points in most steps of an RCM process.



FIG. 1: AN OVERVIEW OF THE RCM STEPS

Healthcare Claim Management cycle actors

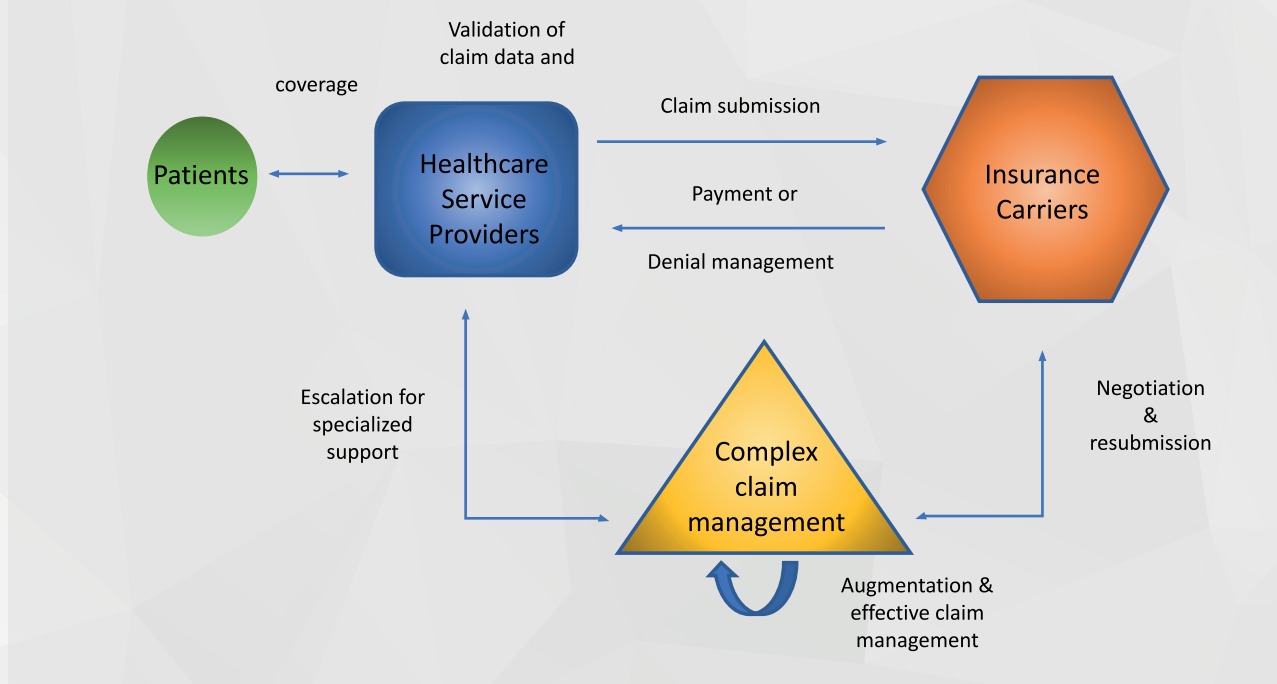


FIG. 2: ACTORS IN THE RCM

Common Actors in the RCM and Their KPIs

We identified four classes of actors involved in this process:

Patients: person under preventive, diagnostic, or procedural care. They usually seek to maximize their policy coverage.

Service providers: health professionals and small practices, hospitals, and larger healthcare systems. They typically want to increase their financial results by getting paid on time.

Claims processors, brokers, or collection agencies: intermediaries providing expertise to handle complex claims scenarios.

Health insurance companies: administrators of their policyholders' health benefits, ensuring compliance with the contracted coverage and negotiated rates.

Actors viewpoints and interests

These actors might have different interests and viewpoints regarding the RCM process. However, from a perspective of optimization, their goals all share common performance indicators:

Increase the **process effectiveness**: fewer errors and rework.

Reduce the **effort** while carrying out all the actions to complete the cycle.

Accelerate the **velocity** to propagate claims across different stages towards the remittance collection.

THE MOTIVATION

Multiple public domain sources agree on the imperative need for applying automation, migrating to electronic workflow and predicting outcomes more efficiently to avoid rework

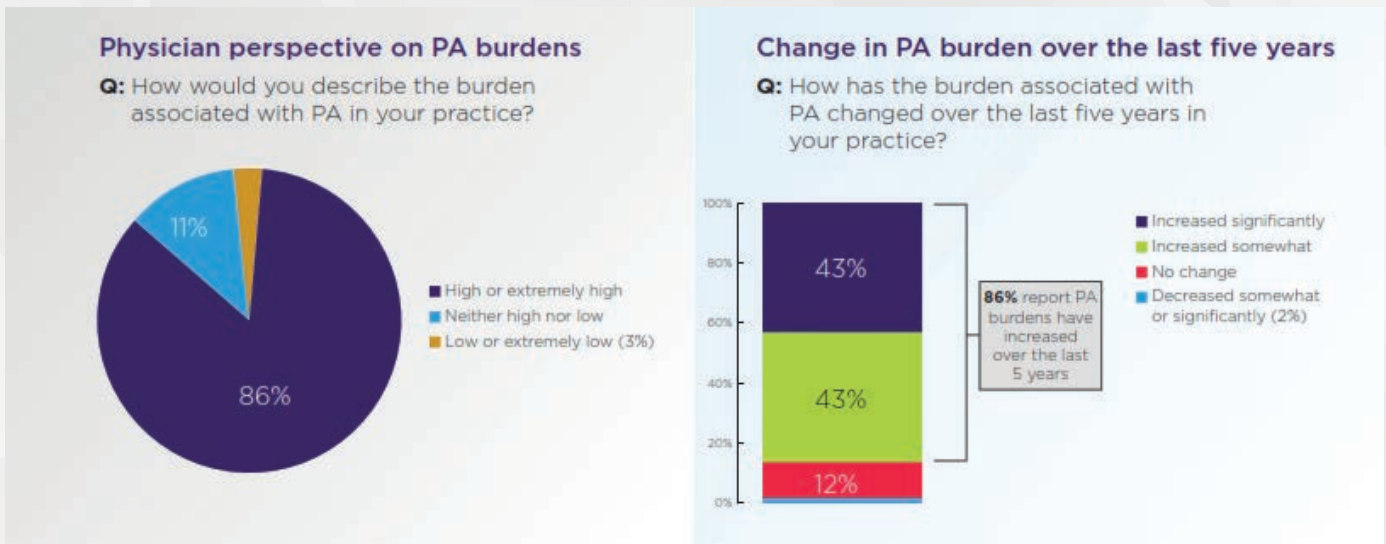


FIG. 3: PRIOR AUTHORIZATION BURDEN, SOURCE: 2019 AMA PRIOR AUTHORIZATION (PA) PHYSICIAN SURVEY

Triggered by our customers' indication of hindered margins, and perception of a highly manual and ineffective process, we started first an internal research process. After a thorough analysis, we identified that pre-authorization, along with the overall claims denial management process, was consuming too many resources and was clearly an area of opportunity for friction reduction.

We found that external data was also supporting these conclusions. As an example, according to the 2019 [survey](#) by the American Medical Association (AMA), 86% of physicians report that prior authorization burdens have increased over the last five years, as seen in the figure above.

ACCORDING TO THE 2019 CAQH INDEX, A FULLY ELECTRONIC WORKFLOW CAN LEAD TO A SAVINGS OPPORTUNITY OF \$4.12 FOR ONE TRANSACTION ALONE.

NARROWING OPTIONS TOWARDS A SOLUTION

Focusing on the RCM steps where the provider submits a claim which is initially reject or denied by insurance company and the corresponding opportunities



FIG. 4: HIGH LEVEL (SIMPLIFIED) H-RCM STAGES

We focused our analysis on the scenario where the health service provider resubmits a previously adjusted claim leveraging the help of a claim processing company. The claim processor acts as an intermediary, assessing, validating, and enhancing the quality of the claim in order to increase the probabilities of acceptance of the new resubmission by the insurance company.

The reader can appreciate this as an alternative flow, where the strategies discussed here can apply either to the participation of the processor as well as an eventual improvement of the direct denial management flow of the service provider.

Mechanics of the scenario and proposed improvements

- Provider submits a claim to the processor.
- Processor uses an expert system to score the claims in terms of quality.
- Processor validates the claim content based on the adjustment and triggers corrective actions or disposal/return of the claims (through a self-serve portal).
- Processor assesses the approval probability and extends the contextual information with patient and contract data.

- Processor updates the claim and the supporting documents to make adjustments and to solve any issues.
- Processor checks the third-party liability and referral requirements.
- The claim is resubmitted for remittance.

The Challenges

In the case of our client, a renowned healthcare institution, specific tasks in their RCM were hurting their margins. As their technology partners, we helped them discover some key reasons driving these inefficiencies:

- The extra time it took to perform repetitive tasks.
- The common errors at the front-end of the claim lifecycle, which led to rejections. For example, the lack of mandatory information or inadequate validation, leading to otherwise easily identifiable mistakes.
- The lack of embedded rules, preventing them from spotting the probability of denial early in the game due to eligibility reasons or patient and institutional contract limitations.
- The burden of denial management, by which every unpaid claim needs to be investigated to find the most common reasons and trends to handle denials effectively.

AREAS OF SOLUTIONS

Ideating solutions based on academic background, architecture knowhow, data mindset, and heuristics, to find opportunities with sensible business benefit

H-RCM Process Flow – Challenges/Opportunities

Opportunities, enabling technologies and business benefits / outcomes

	Claims Intake	Member Eligibility	Referrals and Authorization	Provider Contract Pricing	Liability Assessment	Post Adjudication
Opportunities	Ensure claim ingestion continuity. Validate for incorrect or missing critical information. Classify for completeness.	Automation of patient coverage verification. Augmentation of claims with metadata to improve approvability.	Detect referrals and authorizations. Compliance verification.	Direct integration with Insurance and Provider. Intelligent semantic scrubbing of terms.	Direct integration with Patient and Provider.	Improve and factualize interaction with Insurance Carriers.
Enabling Technologies	Data Ingestion tools / Predictive Analytics / ML / Self serve portals.	ML models / prescriptive analytics / Data mining.	Correlation of claim & patient information. RPA for completion.	Descriptive analytics / adapt flows to market and segment variations.	Self Serve portal for fast response and compliance.	Integration enhancements, Payment, A/R improved mechanics
Business Process Automation / Cloud Native + Serverless / Microservices / Data Normalization / Omni-Channel / Observability						
Business Benefits	Re-focus resources on valuable tasks. Early detection of common mistakes. Expert system for auto-correction. Maximize entry criteria effectiveness.	Leverage historical and enhanced context to strengthen the case for approvability.	Anticipate detection of edge scenarios and improve Provider compliance.	Detect anomalies through segmentation and recommend benchmarking. Directed reading for	Anticipate detection of edge scenarios and improve Provider compliance.	Higher conversion. Traceability to support the legal teams. Fast Business process re-adjustments.

FIG. 5: OPPORTUNITIES, ENABLING TECHNOLOGIES, AND BUSINESS OUTCOMES.

Areas of Solution

Through experimentation, interviews, process discovery, demos, and initial piloting, the team identified opportunities and the corresponding application of existing technologies for achieving them.

Rather than just throwing an arsenal of cool technologies and tools into the solution mix, the team spent considerable time in reserching and validating those that could provide the most impactful and fastest results.

These lead us to a combined application of dynamic business process management architecture, adoption of agile implementation and the leveraging of AI strategies to trigger real time process adaptations and to dynamically modulate the flows in order to achieve improvements in conversion, effort and flexibility. The focus was put on the front end of the lifecycle process (Claim ingest scoring and evaluation and augmentation at coverage eligibility assessment).

THE SOLUTION PATH

A combination innovative AI strategies governed by solid enterprise architecture design patterns to create effective and sustainable solutions

The Solution - Overarching approach

To avoid customizations and to provide our client with sustained results, our team decided to approach the process automation from a horizontal perspective. As such, we pursued the following overarching principles:

- Provision a flexible architecture that would adapt to changing scenarios.
- Focus on automation of repetitive, highly manual activities.
- Identification of expected scenarios through the application of predictive analytics and artificial intelligence techniques.

The Solution - The Artificial Intelligence Strategy

Meaningful information was extracted from large portions of raw data and patterns that would be missed by the human eye were identified.

Cognitive technology (semantic networks and deep learning) was used to adapt the data dynamically to existing or new situations.

Claims were scored based on approvability, identification of errors, and correction recommendations.

The Solution - The Artificial Intelligence Implementation Paths

- A data-driven approach was used when applicable, to extract features from claims data and other sources to define payers' response predictive models.
- A rule-based system approach that exploits expert knowledge available in Current Procedural Terminology (CPT) ontologies to anticipate rejections and denials.
- A mixed approach combining the previous two approaches by applying data mining to discover rules from data. The extracted rules can preemptively screens new claims to detect irregularities that may help anticipate rejections and denials.

Each of these approaches poses several challenges:

- the need to predict and explain potential claim rejections and denials.
- the scarcity of labeled information.
- patient data sparsity.
- the need to extract features from instructed or semi-structured data.
- and the lack of statistically relevant data to builds robust model.

CONCLUSION AND NEXT STEPS

A combination innovative AI strategies governed by solid enterprise architecture design patterns to create effective and sustainable solutions

Inicial results

Initial claims scoring classification showed a predicted opportunity of around 20% of claims not achieving the entry criteria for process continuation as-is. This verified hypothesis is triggering:

- The implementation of a self serve claim completion portal in order to share the load between the claim processor and the service provider through collaborative optimization.
- The re-assignment of 15% of the current workforce to other friction-prone areas.
- The identification of further validation scenarios at the patient admission stage.
- Adherence to standardization of customer information sharing across partners.
- The addition of contextual information (patient-based, contractual, geostatistical, seasonal, etc) augmenting the information provided by the claim, is proving to provide valuable features for improving claim approval rates and/or triggering guided or self correcting strategies.
- Semantic analysis of contracts and related documents are being explored and tested as augmented aids for analyst analysis (i.e. directed reading for coverage and exceptions keywords, automatic confirmation of referrals, secondary insurance requirements, etc).

NEXT STEPS

The team is working on further research in the areas of medical ontologies, deriving enhanced set of rules that complement the experience from human analysts that have been working in the area for years. The application of some of the presented AI strategies, their combinations and the introduction of further studies on experienced-based reasoning are being developed and compiled on an upcoming paper.

IF YOU FIND THIS TOPIC INTERESTING OR FOR FURTHER INFORMATION PLEASE CONTACT US @:

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