



Complexity is at its peak – and it's time to embrace it!

Managing complexity in healthcare has never been more challenging. For example, existing processes used to monitor claim payment accuracy and correct coding are strained and fractured, requiring constant attention to maintain service levels within desired tolerances. The present analytical efforts used to identify improper or mispaid claims are constrained to rules, filters, and heuristics. This approach lulls private and government payers into believing all mispaid or improper claims have been identified. Unfortunately, this (outdated) 1990s approach to payment anomaly detection falls significantly short in addressing the complex, ever-evolving, and adapting "behaviors" of the US healthcare reimbursement system.

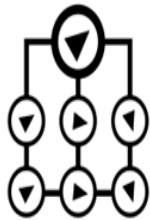
Let's consider the "science and art" of paying claims accurately. We posit that accurately paying a claim has become a series of *mathematical partial complements* consisting of:

- provider contractual intents,
- provider network design and contracts,
- the interpretation of medical policies,
- variability in provider medical coding,
- aggressive revenue optimization by private sector vendors,
- patient-provider reimbursement gaming behaviors and
- eligible covered benefits.

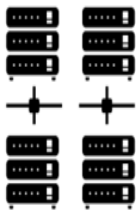
Unfortunately, the problem of detecting mispaid, miscoded, or improper claims cannot be solved with the same old thinking.



variability



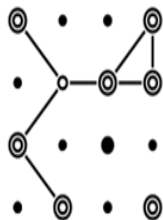
ambiguity



volume



variety



complexity



plurality
of sources

If we are to succeed at identifying all improper claims, we need to treat this challenge as a Complex Systems problem. Complex Systems can be defined in terms of being ⁽¹⁾:

- **Non-linear and dynamic** and do not inherently reach fixed-equilibrium points, resulting in the appearance of random and chaotic behaviors.
- **Composed of independent agents** (e.g., a provider, coder, biller, claim adjuster, software developer, or consultant) whose behaviors are based on inadequate technology, workflows, or social rules rather than demands of system dynamics.
- **Influenced by the billing agent's knowledge** and resourcefulness. As they experiment and gain experience, billing agents learn and change their claims submission behaviors accordingly (think revenue optimization vendors). Thus, overall system behavior inherently changes over time.
- **Constantly adapting and learning**, which tends to result in self-organization. Behavior patterns emerge rather than being designed into the system. The nature of emergent behaviors may range from valuable innovations to unfavorable anomalous behavior.

As stated, one cannot control the state of health, knowledge levels, or preferences of those seeking or delivering healthcare; one cannot assume they will be able and willing to manage the system's complexity.

Consequently, healthcare design and administration should focus on managing complexity by providing unique, creative machine-learning techniques for monitoring and influencing the system state, performance, and stakeholders' behaviors.

Because complex adaptive systems, self-organize, no one can impose a single organizational design.

Thus, we need feedback loops for key behaviors which allow stakeholders to change their incorrect billing while deploying techniques to prove these modified behaviors clearly and holistically consistently improved. We will need to analyze and design the systemic nature of healthcare delivery and not continue to let it evolve (or devolve?) to see whether one idea works.

New techniques must be adopted to enhance payment accuracy, coding appropriateness and incentivize behaviors that drive improved member outcomes.

Applying diagnostic, causal, and anomaly detection modeling in complex healthcare systems represents innovative techniques to improve systems of care billing behaviors and payments that improve affordability while enhancing member outcomes. Additionally, employing these capabilities provides the situational awareness required to implement future state tools to detect and recover inaccurate payments that don't align with optimal patient care.

Given the availability of cloud computing resources and advances in machine learning, we recommend that payer clients leverage the following approaches to improving affordability, enhancing clinical reviews, coding accuracy, and adherence to community reimbursement standards.

- **Payment Integrity** – This service line typically includes pre-pay, in-line claims editing, and post-pay activities. Many current market offerings focus on using rules-based statements and deterministic logic. While these techniques render fast and accurate findings, they do not "find" undetected, previously unknown billing or coding anomalies. To address this gap, Cogitativo recommends detection techniques to find outliers or unexpected patterns in data. Supervised and unsupervised learning methods, including isolation forest, one-class support vector machine, autoencoders, and Gaussian mixture models, should be used.
- **Medical Chart Reviews** – To reduce the cost and improve the accuracy of manual record review, we recommend the use of natural language processing (NLP) combined with machine learning, which can be used to train a model that predicts the probability of finding improper coding or invoicing before undertaking manual review of claims. This approach enhances findings, lowering costs while reducing false positives.
- **Continuity of Care Review (CCR)** – Present efforts for managing CCR activities require payers to apply a unique set of seasoned nurses and senior claims adjusters to establish and monitor standard healthcare reimbursement activities. At Cogitativo, we assert the Generative AI sequence-to-sequence techniques can be used for more complex demand relationships where simpler regression models may lack the sensitivity or sophistication to capture the complexity and dynamic relationships required for establishing multi-location, multi-specialty healthcare service standards and reimbursement processes. For example, Generative AI sequence-to-sequence transformer architecture could find local payment CCR optimization

solutions for all geographic catchments and their various healthcare service idiosyncrasies. This approach is a concept borrowed from the breakthroughs in NLP models. This architecture excels in understanding sequences, and by analogy, we can apply it to the healthcare domain to predict the sequence of services needed or demanded by patients. The model's encoder processes the historical context of a patient's health records. At the same time, the decoder anticipates future services, akin to predicting the next word in a sentence or decision in chained reasoning.

In summary, complex adaptive systems, such as claims payment processing, require sophisticated and sometimes subtle analyses and designs, which will no doubt require experts in a wide range of disciplines, including various areas of data science techniques. We believe the use of ML and AI begins the dialogue toward approaching healthcare as a Complex Systems problem and serves as a framework for future "design and management" endeavors.

For more information go to www.cogitativo.com.

(1) Rouse, W.B> 2000. Managing complexity, disease control as a complex adaptive systems. Information-Knowledge-Systems Management