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Article

Game Theory Perspectives on Physician-Patient Interaction and Relational Lock-in

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Abstract: Path dependence in clinical decision-making manifests not only through cognitive biases and institutional structures but also through strategic interactions between physicians and patients. This article examines the relational dimension of path dependence through game theory frameworks, analyzing how repeated clinical encounters create self-reinforcing equilibrium states that become resistant to change. We identify three key mechanisms: signaling games during initial encounters that establish interaction patterns, the evolution of cooperation norms in long-term relationships, and relationship-specific investments that create switching costs for both parties. The analysis reveals how incomplete information, strategic positioning, and mutual expectations can lock physician-patient dyads into suboptimal but stable interaction patterns. We propose intervention strategies including structured decision aids as neutral third parties, peer review mechanisms, and deliberate renegotiation protocols. By understanding physician-patient relationships as strategic games, healthcare systems can design interventions that facilitate cooperative equilibria rather than adversarial standoffs, ultimately transforming relational lock-in from a barrier to change into a foundation for collaborative care adaptation.

Keywords: game theory; physician-patient relationship; relational lock-in; signaling games

1. Introduction

When physicians and patients meet in the clinical setting, they engage in far more than a simple exchange of medical information. They participate in a complex strategic interaction that embodies all the essential elements of game theory: incomplete information, interdependent payoffs, and expectations about future interactions [1]. From this perspective, path dependence in medical decision-making emerges not merely from individual cognitive biases or institutional constraints, but as an equilibrium strategy formed through repeated strategic interactions.

The physician-patient relationship exhibits a unique characteristic-it simultaneously embodies elements of both cooperative and non-cooperative games. While both parties share the fundamental goal of patient health, they often hold divergent understandings of how to achieve this goal, at what cost, and how to allocate responsibility. This structure of aligned yet differentiated interests creates fertile ground for the emergence and persistence of relational lock-in.

This paper analyzes physician-patient interactions through a game-theoretic lens to examine how self-reinforcing decision patterns emerge and how these patterns might be disrupted. We focus on three critical mechanisms: signaling games under conditions of incomplete information, the dynamic process of trust development, and lock-in effects arising from relationship-specific investments. By framing clinical encounters as strategic games, we can better understand why certain interaction patterns become entrenched and

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how healthcare systems might design interventions to facilitate more adaptive, cooperative equilibria.

The clinical implications of this analysis are substantial. When physicians and patients become locked in inefficient interaction patterns, both clinical outcomes and healthcare economics suffer. Patients may receive care that fails to align with their values or clinical needs, while physicians may practice in ways that compromise professional satisfaction and clinical effectiveness. Understanding these interactions as strategic games provides a framework for designing systems that support productive collaboration rather than reinforcing adversarial dynamics.

The following sections will develop this game-theoretic analysis systematically. We begin by examining initial clinical encounters as signaling games, then analyze how long-term relationships evolve through repeated interactions, and finally explore how relationship-specific investments create switching costs that sustain lock-in. Throughout, we will draw on insights from both classic game theory and behavioral economics to develop practical implications for improving clinical relationships and healthcare delivery.

2. Initial Encounters: Signaling Games and Trust Formation

The first meeting between physician and patient establishes patterns that often define all subsequent interactions. During this initial phase, both parties engage in a subtle yet significant signaling game, attempting to assess each other's capabilities and intentions amidst substantial information asymmetry.

2.1. The Physician's Signaling Dilemma

Physicians face a classic signaling problem: how to demonstrate competence and authority while avoiding both excessive paternalism and defensive detachment [2,3]. Experienced clinicians often adopt what might be termed "tempered authority"-displaying expertise without condescension, expressing empathy while maintaining professional distance. Research on clinical communication suggests that physicians who successfully convey both competence and caring in initial encounters establish stronger therapeutic alliances and better patient adherence to treatment recommendations.

However, in environments characterized by high malpractice risk and administrative pressures, many physicians default to defensive signaling strategies. These include exhaustive documentation practices, ordering additional tests beyond clinical necessity, and avoiding clear commitments regarding diagnosis or prognosis. While such behaviors may reduce immediate legal vulnerability, they frequently communicate unintended messages to patients-suggesting either a lack of confidence in clinical judgment or an implicit distrust of the patient's reliability. This defensive signaling can undermine the very trust it seeks to protect, creating a paradoxical situation where risk mitigation strategies exacerbate relationship risks.

2.2. The Patient's Signal Interpretation Biases

Patients approach initial clinical encounters with their own interpretive frameworks shaped by prior experiences, health literacy levels, and emotional states [4]. Faced with complex medical terminology, unfamiliar diagnostic procedures, and uncertain prognoses, patients must navigate a dense semiotic landscape with limited expertise. In this process, cognitive biases systematically influence how medical information is received and interpreted.

Confirmation bias plays a particularly significant role in patient signal interpretation. Patients tend to notice and remember information that aligns with their existing health beliefs or anxieties while discounting or ignoring contradictory evidence. A patient worried about cancer, for instance, may interpret a physician's cautious language about "ruling out possibilities" as confirmation of their fears rather than as standard clinical

caution. This interpretive tendency becomes especially problematic when patients arrive with preconceived diagnoses gathered from online sources or social networks.

Equally important is how patients navigate their evolving "patient identity" during initial encounters. These consultations serve not only to address immediate health concerns but also to establish relational roles and expectations. Patients implicitly ask themselves: Should I present as a compliant "good patient", an actively engaged "partner", or a skeptical "informed consumer"? This identity choice, often made unconsciously during early interactions, establishes behavioral patterns that can persist throughout the clinical relationship, creating what sociologists term "illness career" trajectories that follow predictable social scripts.

2.3. The Feedback Dynamics of Initial Signaling

The signaling exchange in initial encounters creates powerful feedback loops that reinforce specific interaction patterns. When physicians adopt defensive postures, patients may respond with increased anxiety or adversarial questioning, which in turn validates the physician's defensive stance. Conversely, when physicians successfully establish early rapport and clear communication, patients typically respond with greater trust and cooperation, reinforcing collaborative patterns.

These initial signaling dynamics have lasting economic implications. Research indicates that physician-patient relationships characterized by poor initial communication result in significantly higher subsequent healthcare utilization, including more diagnostic tests, specialty referrals, and emergency department visits. The costs of these relationship failures extend beyond immediate clinical inefficiencies to include long-term impacts on chronic disease management, preventive care adherence, and overall healthcare system strain.

The strategic nature of these initial encounters becomes particularly evident when considering the time constraints of modern clinical practice. With typical primary care appointments lasting 15-20 minutes, both physicians and patients must make rapid assessments and decisions about how to approach their relationship. This time pressure often leads both parties to default to familiar interaction scripts rather than engaging in the more time-consuming process of establishing genuinely collaborative relationships. These default patterns, once established, become increasingly difficult to modify as the relationship continues, creating what game theorists would recognize as path-dependent equilibrium states that are stable precisely because deviating from them requires coordinated effort that neither party has sufficient incentive to initiate alone.

3. Relationship Development: Cooperation and Equilibrium in Repeated Games

When physician-patient relationships extend beyond initial encounters-as in chronic disease management or long-term care-the strategic interaction transforms into a repeated game. According to game theory, repeated interactions can foster cooperation but may also entrench suboptimal equilibria that are resistant to change.

3.1. Establishment and Solidification of Cooperative Norms

In successful long-term clinical relationships, physicians and patients gradually develop a set of informal "cooperative norms" [5]. These unwritten rules might include: physicians considering patients' financial constraints before prescribing medications, patients consulting their doctors before adjusting treatment regimens, and both parties avoiding complex discussions during time-pressured visits.

These norms enhance interaction efficiency but simultaneously create new forms of path dependence. When circumstances change-such as when new treatment options emerge or patients' health status undergoes significant shifts-both parties often struggle to modify these established interaction patterns. Altering norms requires renegotiating the fundamental terms of the relationship, a process that entails substantial emotional and

cognitive costs. This explains why even when evidence clearly supports changing treatment approaches, both physicians and patients may unconsciously resist abandoning familiar interaction routines.

3.2. Punishment Mechanisms and Relationship Maintenance

Game theory emphasizes that cooperation in repeated games is sustained by the threat of future retaliation against defection. In physician-patient relationships, these punishment mechanisms manifest in more subtle forms. Patients may "punish" physicians they perceive as unsatisfactory through medication non-adherence, seeking second opinions, or providing negative evaluations in satisfaction surveys. Physicians, in turn, may respond to "difficult" patients by shortening consultation times, reducing explanatory efforts, or limiting additional service recommendations.

The problem lies in the imprecision of these punishment mechanisms. They often penalize behaviors that shouldn't be punished while failing to deter genuinely opportunistic conduct. More troublingly, once a punishment cycle begins, it can escalate into mutual blame and relationship breakdown, leaving both parties worse off. Research on clinical communication breakdowns shows that once adversarial patterns emerge, they tend to become self-reinforcing, with each party's defensive behaviors validating the other's negative expectations.

3.3. The Shadow of the Future and Relational Investment

The "shadow of the future"-the expectation of continued interaction-profoundly influences behavior in repeated games. In clinical relationships, this shadow manifests through relational continuity. Patients who anticipate long-term relationships with their physicians demonstrate higher treatment adherence and greater willingness to disclose sensitive health information. Physicians, recognizing the value of enduring relationships, invest more time in patient education and preventive care when they expect continued clinical responsibility.

This forward-looking perspective creates what economists term "relational capital"-accumulated trust and mutual understanding that facilitates more efficient future interactions. However, this same capital can become a source of inertia when change becomes necessary. Both physicians and patients may resist altering successful interaction patterns simply because "this has worked for us before", even when new circumstances demand different approaches.

3.4. Information Asymmetry and Adaptive Learning

Repeated interactions theoretically allow for gradual reduction of information asymmetry through learning. Over time, physicians better understand patients' values, lifestyles, and treatment responses, while patients develop more accurate understandings of medical possibilities and limitations. This mutual learning should, in principle, lead to increasingly personalized and effective care.

In practice, however, learning is often incomplete or biased. Physicians may develop fixed perceptions of patients based on early interactions, while patients may misinterpret clinical setbacks as physician incompetence rather than disease complexity. These misperceptions become embedded in relationship patterns, creating what psychologists call "transference" and "countertransference" dynamics that distort objective decision-making.

The strategic implications are significant: when learning is imperfect, relationships may converge not to optimal cooperation but to locally stable equilibria that represent the best available compromise given mutual misunderstandings. Breaking out of these suboptimal equilibria requires deliberate effort to challenge established perceptions-effort that both parties may avoid due to the cognitive and emotional costs involved.

3.5. The Role of External Shocks in Relationship Evolution

Game theory recognizes that external shocks can disrupt established equilibria. In clinical relationships, health crises, changes in insurance coverage, or new diagnostic information can serve as catalysts for relationship reevaluation. These shocks create what might be termed "renegotiation opportunities"-moments when the costs of maintaining existing patterns temporarily decrease relative to the costs of change. Healthcare systems can intentionally create such renegotiation opportunities through structured checkpoints in chronic disease management or transitional care programs. By institutionalizing relationship review processes, systems can help physicians and patients escape inefficient equilibria without waiting for crises to force change. This approach transforms relationship maintenance from reactive adaptation to proactive co-evolution, potentially improving both clinical outcomes and relational satisfaction.

4. Relationship-Specific Investments and Lock-in Effects

At the heart of relational lock-in in healthcare lies the mechanism of relationship-specific investment. When physicians and patients dedicate time, effort, and cognitive resources that are tailored to and dependent on their particular relationship, they create mutual dependencies that make change difficult-even when alternative arrangements might offer better outcomes.

4.1. Patients' Investment in the Relationship

Patients invest substantially in clinical relationships in ways that are not easily transferable. They devote significant effort to communicating their medical history, symptoms, and concerns to a specific physician, often over multiple visits. They learn to interpret that physician's communication style and clinical approach, adapting their own way of discussing health matters accordingly. This process creates what can be called a "relational understanding" that facilitates more efficient communication but becomes a form of capital that is largely lost if the relationship ends [6]. Beyond information exchange, patients make emotional investments in clinical relationships. They develop comfort levels, trust patterns, and expectations that are specific to particular physicians. Starting over with a new clinician requires not only repeating factual information but also rebuilding psychological comfort and communication rapport-a process that involves both time and emotional energy.

4.2. Physicians' Investment in Patient Understanding

Physicians similarly invest in understanding individual patients beyond general medical knowledge. They learn each patient's unique health history, treatment responses, communication preferences, and personal circumstances. This patient-specific knowledge enables more efficient consultations and more personalized care, but it represents an investment that has limited value outside that particular relationship. This specialized understanding operates on two levels: the general medical knowledge applicable to many patients, and the specific insights about how a particular patient experiences illness and responds to treatment. While physicians can transfer their general expertise to new relationships, the patient-specific insights they develop represent a form of capital that diminishes significantly if the clinical relationship ends.

4.3. The Switching Cost Barrier

The combined investments from both parties create substantial switching costs-the practical and psychological expenses of changing clinical relationships. These costs include the time required to transfer medical information, the risk of important details being lost or misunderstood, and the need to establish new communication patterns and trust levels. These switching costs create powerful inertia in clinical relationships. Patients may remain with physicians even when dissatisfied because the perceived costs of change

outweigh the potential benefits. Similarly, physicians may continue relationships that are less than optimal because starting over with new patients requires significant investment of time and effort before reaching comparable efficiency levels.

4.4. The Hold-Up Problem in Practice

Relationship-specific investments create what economists term a "hold-up" situation-once investments are made, each party has leverage over the other because the investments' value depends on the relationship's continuation. In clinical settings, this manifests when patients hesitate to voice concerns because they fear damaging relationships they've invested in, or when physicians avoid suggesting treatment changes that might challenge established patterns and potentially strain the relationship. This mutual dependency can create a form of bilateral monopoly where both parties have limited outside options despite potentially suboptimal current arrangements. The result is often maintenance of the status quo even when evidence suggests that different approaches might yield better health outcomes.

4.5. Systemic Reinforcement of Lock-in

Modern healthcare systems inadvertently reinforce relational lock-in through their structure and technology. Electronic health records often embed physician-specific documentation patterns that make continuity with familiar clinicians more efficient than establishing new relationships. Insurance networks and referral patterns create administrative barriers to changing providers. Clinical workflows become organized around established relationships, making individual changes disruptive to coordinated care processes. These systemic features transform what might otherwise be manageable switching costs into substantial barriers to relationship change, effectively institutionalizing path dependence at the relational level.

4.6. Economic and Clinical Implications

The economic implications of relational lock-in are significant. Clinical relationships maintained primarily due to switching costs rather than therapeutic effectiveness can lead to higher healthcare utilization through communication inefficiencies and mistrust. They may also result in delayed adoption of new treatment approaches when these require changing established relationship patterns. Perhaps most importantly, high switching costs reduce competitive pressure for relationship quality improvement. When patients tolerate suboptimal relationships rather than incur transition costs, physicians have reduced incentive to continuously enhance their relational effectiveness.

Understanding these lock-in mechanisms provides important insights for healthcare system design. Rather than attempting to eliminate relationship-specific investments-which often contribute positively to care quality-systems should focus on reducing unnecessary switching costs while creating structured opportunities for relationship assessment and renewal. This balanced approach acknowledges the value of continuity while preventing it from becoming a barrier to care optimization.

5. Third-Party Interventions: Breaking Inefficient Equilibria

Game theory suggests that when parties become trapped in suboptimal equilibria, third-party interventions can provide pathways to better outcomes [7]. In physician-patient relationships, such interventions can take various forms that alter the strategic landscape without undermining relational autonomy.

5.1. Decision Support Tools as Neutral Third Parties

Structured decision aids can function as de facto neutral parties within clinical encounters. By presenting balanced information, clarifying treatment alternatives, and helping articulate patient values, these tools transform the interaction framework from

potential physician-patient conflict toward collaborative decision-making. Importantly, these tools must be carefully designed to avoid strategic manipulation by either party. If physicians perceive them as constraints on clinical judgment, or patients view them as biased toward institutional interests, their effectiveness diminishes significantly.

5.2. Peer Review and Oversight Mechanisms

Peer review and supervision systems provide another form of third-party intervention [8]. When physicians know their decisions may undergo peer evaluation, they often demonstrate greater adherence to evidence-based pathways rather than defaulting to habitual patterns. The key lies in ensuring such oversight remains supportive rather than punitive, as defensive approaches typically reinforce rather than reduce path-dependent behaviors. For patients, support groups and patient advocacy organizations can offer independent perspectives that enhance their capacity to articulate preferences and concerns within clinical relationships. These external resources provide what might be called "relational counterweights"-alternative viewpoints that help patients navigate clinical relationships with greater confidence and agency.

5.3. Transition Support and Relationship Mediation

Healthcare systems can develop formal mechanisms for relationship assessment and, when necessary, supported transitions. Rather than leaving patients to navigate relationship difficulties alone or persist in unsatisfactory arrangements, systems can provide structured processes for addressing relational concerns. These might include facilitated conversations with neutral mediators, temporary consultation arrangements with alternative providers, or formal relationship "reset" protocols that allow both parties to renegotiate interaction patterns without ending the relationship entirely.

6. Relationship Reconstruction: From Lock-in to Co-evolution

The ultimate goal in addressing relational lock-in is not to eliminate physician-patient relationships but to transform them from rigid, path-dependent arrangements into adaptive, co-evolving partnerships.

6.1. Establishing Deliberate Renegotiation Points

Long-term clinical relationships benefit from structured opportunities for reassessment and adjustment. Regular comprehensive evaluations-whether annually for chronic conditions or at major treatment transition points-provide natural occasions for both parties to reflect on relationship effectiveness. During these deliberate renegotiation points, physicians and patients can discuss what aspects of their interaction work well, what might need improvement, and how their collaborative approach might evolve to meet changing needs [9,10].

6.2. Developing Relational Metacognition

Both physicians and patients benefit from developing awareness of their relationship dynamics-what might be termed relational metacognition. This involves not just focusing on medical decisions themselves but also reflecting on how those decisions are made, whether current interaction patterns remain effective, and how communication processes might be enhanced. Training in clinical communication for physicians and shared decision-making skills for patients can foster this relational awareness, creating what psychologists call a "double-loop learning" capacity where relationships themselves become subjects of continuous improvement.

6.3. Creating Authentic Choice and Exit Options

Healthy clinical relationships require genuine alternatives. When patients feel trapped in unsatisfactory relationships, they should have feasible options for seeking

alternative care without excessive penalty. Similarly, physicians should have appropriate mechanisms for referring patients when maintaining the relationship becomes clinically or ethically problematic. The availability of these options-even if rarely exercised-alters the relational power dynamic, encouraging both parties to invest more actively in maintaining relationship quality. This is not to advocate for casual relationship dissolution but rather to recognize that the credible possibility of exit creates what economists term the "discipline of the market"-an incentive for continuous relationship quality maintenance that pure continuity arrangements sometimes lack.

6.4. Designing for Relational Resilience

Healthcare systems can intentionally design support structures that enhance relational resilience-the capacity of clinical relationships to adapt to changing circumstances without breaking down. This might include: Flexible communication channels that accommodate different preferences and circumstances; Continuity support systems that maintain relationship benefits even during necessary transitions; Conflict resolution protocols that address disagreements constructively rather than allowing them to damage relationships; Relational skill development as an ongoing component of professional education and patient support.

6.5. From Passive Lock-in to Active Co-creation

The most fundamental shift involves transforming physician-patient relationships from passively endured arrangements to actively co-created partnerships. In co-created relationships, both parties participate consciously in designing their interaction patterns, explicitly discussing preferences, boundaries, and collaborative approaches. This transforms path dependence from an unconscious constraint to a conscious choice-not the elimination of patterned interaction but the intentional design of those patterns to serve therapeutic goals.

This co-creation approach recognizes that some degree of relational patterning is inevitable and even desirable. The issue is not pattern existence but pattern quality and adaptability. Well-designed relational patterns enhance efficiency and effectiveness; poorly designed ones create rigidity and resistance to necessary change.

7. Conclusion

Viewing physician-patient relationships through game theory reveals that what appears as simple clinical encounters are actually complex strategic interactions. The path dependence that emerges in these relationships represents equilibrium outcomes-stable patterns where each party's behavior represents their best response to the other's expected actions, given the constraints and incentives they face.

Breaking inefficient equilibria requires recognizing these interactions as strategic and designing systems that support cooperation rather than conflict. This means reducing information asymmetry through better communication tools, providing credible commitment mechanisms through relationship agreements, and creating environments where value creation takes precedence over value claiming.

Ultimately, the most effective clinical relationships are not those without path dependence, but those where paths are consciously co-created rather than unconsciously fallen into. These relationships exhibit what might be called "adaptive interdependence"-mutual reliance that is flexible, revisable, and explicitly negotiated rather than rigid, fixed, and implicit.

In such relationships, dependence itself transforms from a potential vulnerability to a source of strength. Physicians and patients depend not on habitual patterns but on mutual commitment to collaborative adaptation. They depend not on avoiding conflict but on constructive conflict resolution. They depend not on maintaining the status quo but on continuous relationship improvement.

This transformation-from passive lock-in to active co-creation-represents perhaps the most promising avenue for improving both the experience and outcomes of healthcare. It acknowledges the strategic realities of clinical relationships while refusing to accept suboptimal equilibria as inevitable. In doing so, it points toward a future where physician-patient relationships become not constraints on medical progress but engines of therapeutic innovation and human connection.

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