A game-theoretical analysis of the hospital reform

From volume incentives to strategic uncertainty

The hospital reform fundamentally realigns inpatient care in Germany. Provision-based remuneration, service groups and new planning mechanisms are intended to reduce economic disincentives and strengthen quality and specialization.[1] Whether these goals are achieved depends on how hospitals and federal states respond to the new rules of the game. This article aims to translate the reform's complex incentive structures into basic strategic decision situations using game theory. Game theory is one of the most influential approaches in modern economics and has been recognized with several Nobel Prizes.[2] By simplifying complex interactions, it allows an analysis of which behaviors appear rational to the players involved and which developments are highly likely to emerge under the given rules. The analysis is based on the statutory provisions introduced by the Hospital Care Improvement Act (KHVVG)[3] and supplemented by the Hospital Reform Adjustment Act (KHAG)[4], as in force at the time of writing (August 2026). The resulting strategic incentive structures are analyzed using game-theoretical concepts.

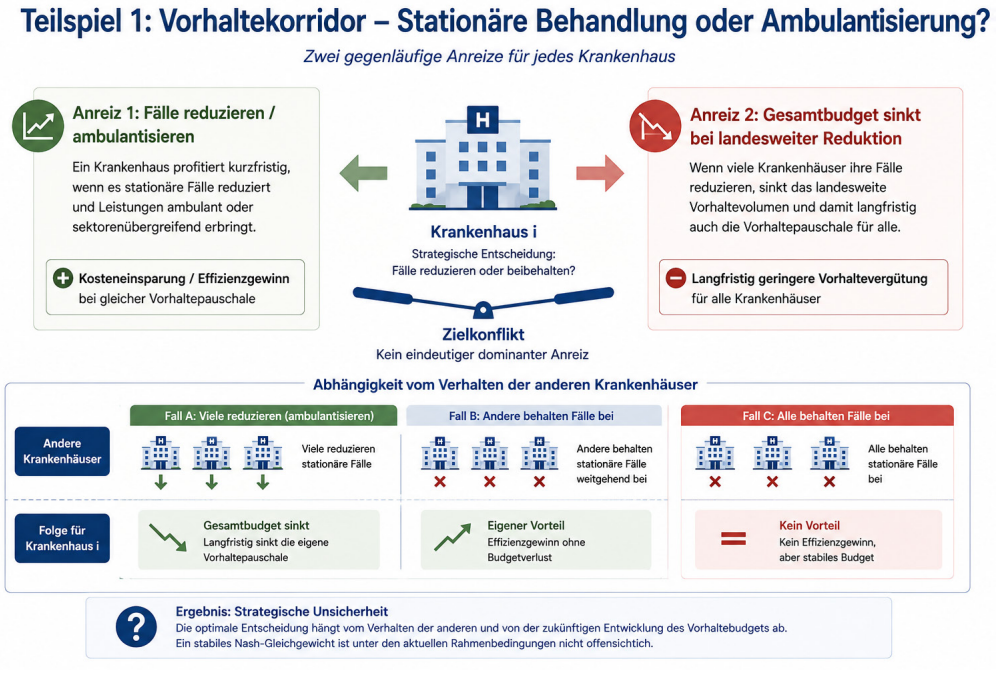
Subgame 1

Provision corridor – inpatient treatment or outpatient shift

>> With provision-based remuneration (Vorhaltevergütung), phased in from 2028, the hospital reform seeks to weaken the existing incentive within the DRG system to expand inpatient services. Since a substantial share of remuneration within the provision corridor will in future be paid regardless of the volume of services actually delivered, an economic incentive arises for the first time to provide services on an outpatient basis or in cross-sectoral care settings rather than on an inpatient basis.

For the individual hospital, the 20% threshold laid down in Section 37(2) KHG is particularly relevant. When the provision-based lump sum is periodically recalculated, the previously applied case volume is generally carried forward. An adjustment is made only if it deviates by more than 20 percent from the case volume previously used. The state-wide provision volumes for 2028 and 2029 are determined on the basis of 2024 service data.

In the long term, however, the reform creates an opposing incentive. If inpatient services are reduced from 2030 onward, the provision volume of a federal state, which forms the basis for funding the provision-based lump sums, also declines over time. Short-term efficiency gains from shifting care to outpatient settings may thus be partly lost again in the long run. From the



1: Bundesministerium für Gesundheit (BMG) (2026): Krankenhausreform: Neuordnung der Krankenhausversorgung. Berlin: Bundesministerium für Gesundheit. www.bundesgesundheitsministerium.de/themen/krankenhaus/krankenhausreform (abgerufen am 18.08.2026)
2: Lindbeck A. (2007): The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1969–2007. NobelPrize.org. www.nobelprize.org/prizes/themes/the-sveriges-riksbank-prize-in-economic-sciences-in-memory-of-alfred-nobel-1969-2007 (abgerufen am 18.08.2026).
3: Gesetz zur Verbesserung der Versorgungsqualität im Krankenhaus und zur Reform der Vergütungsstrukturen (Krankenhausversorgungsverbesserungsgesetz – KHVVG) (2024): BGBl. 2024 I Nr. 400 vom 5.12.2024.
4: Gesetz zur Anpassung der Krankenhausreform (Krankenhausreformanpassungsgesetz – KHAG) (2026): BGBl. 2026 I Nr. 98 vom 9.4.2026.

perspective of an individual hospital, the strategic question therefore arises whether reducing inpatient cases might even worsen its own economic position in the long term.

In game-theoretical terms, this means there is no clearly dominant strategy. The optimal decision depends both on the behavior of the other hospitals and on the future development of the state-wide provision budget. Shifting care to outpatient settings can make economic sense if all hospitals act similarly and the freed-up resources remain permanently within the healthcare system. If, however, hospitals expect declining provision budgets to outweigh the short-term efficiency gains in the long run, retaining inpatient services appears rational from an individual perspective.

A stable Nash equilibrium is therefore not readily apparent under current conditions. Uncertainty about the future behavior of the other hospitals and about the long-term development of provision budgets makes reliable strategic decisions difficult. The hospital reform thus replaces the previously dominant strategy of volume expansion not with a new dominant strategy, but, for now, with strategic uncertainty.

Game theory diagnoses incentive problems; mechanism design reverses the perspective and asks how rules must be designed so that self-interest and healthcare objectives align.[5] This conflict of objectives could be defused, for example, if the savings achieved by reducing inpatient services remained in the respective federal state and were reinvested specifically in the hospital landscape – for instance in modern infrastructure, digitalization or medical technology. Hospitals would then have a direct incentive: fewer inpatient cases would no longer be perceived as an economic loss, but as an investment in their own future. Individual self-interest and the societal goal of more efficient care would thus, for the first time, consistently point in the same direction.

Subgame 2

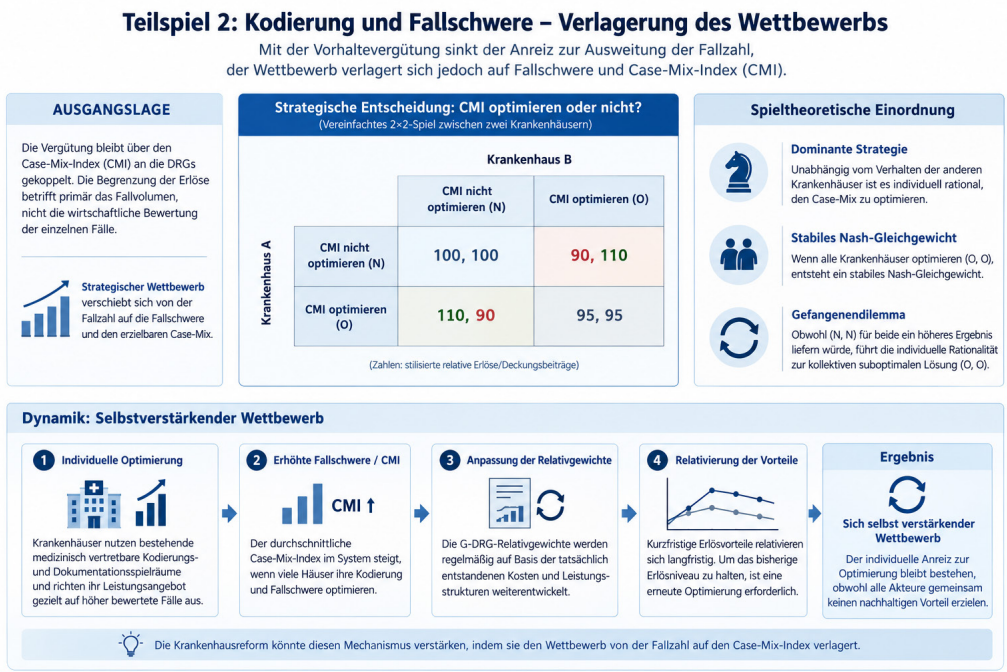
Coding and case severity – competition shifts

While the hospital reform weakens the economic incentive to expand inpatient cases, remuneration remains linked to the DRGs via the case-mix index. The cap on revenues thus relates primarily to case volume, but not to the economic weighting of individual cases. From the perspective of hospital management, strategic competition therefore shifts from the number of patients treated to their case severity and the achievable case mix.

This effect can arise in different ways. First, it may become economically more attractive to deliberately attract more complex, higher-weighted patients or to align certain service offerings accordingly. Second, there remains an incentive to fully exploit existing documentation and coding potential and to code all medically justifiable secondary diagnoses, provided these lead to a higher cost weight. That DRG-based remuneration can create such coding incentives has been described empirically both for Germany and internationally.[6] The increasing use of AI could further intensify this optimization race. Such learning systems make it possible to systematically identify compliant leeway in coding and decision-making and to exploit the maximum potential for billing.[7] Third, additional diagnostic or therapeutic procedures may be economically attractive if they result in the patient being assigned to a higher-paying DRG or increase the cost weight.[8] Economic optimization thus shifts from case volume to the case-mix index (CMI).

If some hospitals pursue this strategy, those that deliberately refrain from doing so face economic disadvantages. The individually rational decision is therefore to exhaust all medically permissible options for improving the case mix.

From a game-theoretical perspective, a dominant strategy emerges once again: regardless of the behavior of the other hospitals, consistently optimizing case severity, coding and DRG assignment appears economically rational. If all hospitals pursue this strategy, a stable Nash equilibrium re-



5: Hurwicz L. Optimality and informational efficiency in resource allocation processes. In: Arrow KJ, Karlin S, Suppes P, eds. Mathematical Methods in the Social Sciences. Stanford University Press; 1960.
6: Jürges H, Köberlein J. What explains DRG upcoding in neonatology? The roles of financial incentives and infant health. Journal of Health Economics. 2015;43:13–26; Crespin DJ, Dworsky M, Levin J, Ruder T, Whaley CM. Upcoding Linked to Up to Two-Thirds of Growth in Highest-Intensity Hospital Discharges in 5 States, 2011–19. Health Affairs. 2024;43(12):1619–1627.
7: Bickert E. Was bleibt von der Krankenhausrechnungsprüfung im Zeitalter der KI? Lernende Systeme verändern die Prüfung stationärer Abrechnungen grundlegend. Observer Gesundheit. 12.08.2026. Abruf am 13.08.2026 von https://www.observer-gesundheit.de/was-bleibt-von-der-krankenhausrechnungsprufung-im-zeitalter-der-ki.
8: Reifferscheid A, Pomorin N, Wasem J. Ausmaß von Rationierung und Überversorgung in der stationären Versorgung. Ergebnisse einer bundesweiten Umfrage in deutschen Krankenhäusern. Dtsch Med Wochenschr. 2015;140(13):e129–e135. doi:10.1055/s-0041-102550.

sults. In game-theoretical terms, this is a prisoner's dilemma, because no hospital gains a lasting competitive advantage if all market participants optimize their coding and case severity to the same extent. Since the cost weights and relative weights in the G-DRG system are regularly recalibrated on the basis of actual costs and service structures, short-term revenue advantages erode again in the long run.[9] To maintain or further increase their revenue levels, hospitals are forced to optimize their coding and documentation yet again.

The result is self-reinforcing competition in which the individual incentive to optimize persists, even though the players collectively gain no lasting advantage. The hospital reform could even reinforce this mechanism by shifting competition from case volume to the case-mix index.

Subgame 3

Service groups and specialization – cooperation and trust

By introducing service groups, the hospital reform aims to concentrate complex medical services more strongly and to promote regional specialization among hospitals. From the perspective of the overall system, such a division of labor can offer considerable advantages. Duplicate capacities are reduced, medical expertise is concentrated at specialized sites and scarce staff resources can be deployed more efficiently.

For individual hospital management, the situation is considerably more complex. Voluntarily giving up certain service areas may, in the short term, mean a loss of revenue, market share or medical standing. The decision to specialize is therefore economically attractive only if other hospitals are at the same time willing to concentrate on complementary service areas and to steer patients accordingly.

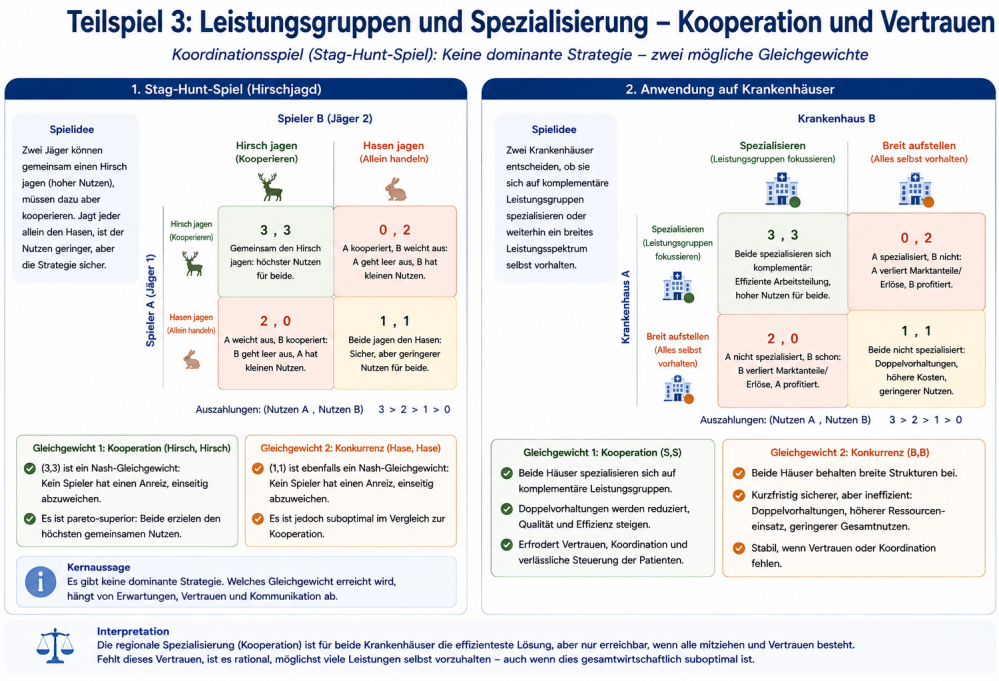
In game-theoretical terms, this is a coordination game (stag hunt). Unlike the prisoner's dilemma, there is no dominant strategy.

Stag hunt games are coordination games in which cooperation yields the highest joint payoff but succeeds only if everyone involved takes part. The term goes back to the French philosopher Jean-Jacques Rousseau. He describes a group of hunters who could jointly bring down a stag – a prey that offers the greatest benefit to all, but can only be caught through cooperation. If one of the hunters spots a hare instead, he can catch it on his own. Although the payoff is lower, this strategy appears safer. As soon as one hunter chases the hare, however, the joint stag hunt fails.[10]

Applied to the hospital reform, this means that regional specialization of hospitals would be the most efficient solution for everyone involved. However, it requires that all hospitals can trust the others to concentrate their services accordingly as well. Without this trust, it seems more rational to continue providing as many services as possible themselves. There are thus two Nash equilibria: mutual cooperation with regional specialization, and mutual competition with existing service structures largely preserved.

The problem is further exacerbated by future hospital planning. Since current case volumes can indirectly influence the allocation of service groups and future care mandates, an intertemporal strategic game arises. Hospitals must assess their current decision not only in economic terms, but must also consider how specialization or relinquishing services will affect their long-term position in the healthcare system. Planned case volumes thus intensify competition for future market positions and can work against cooperative specialization.

It is precisely here that a key limitation of the hospital reform becomes apparent. Although it sets cooperation as a goal, it does not ensure that the cooperative equilibrium actually prevails. Without long-term contracts, mutual trust or additional incentive mechanisms, there remains a risk that hospitals, fearing future competitive disa-



9: GKV-Spitzenverband: DRG-Entwicklung, Kalkulation und Falldaten. Berlin.
10: Osborne MJ. An Introduction to Game Theory. Oxford University Press; 2004.

dvantages, will decide against cooperation and specialization.

Subgame 4

Hospital planning – when the rule-maker is also a player

A further strategic subgame arises at the level of hospital planning. Unlike the first three subgames, this game is played not at the level of healthcare providers, but at the level of the rule-makers. By assigning service groups and planned case volumes, the federal states gain considerable scope in shaping the future distribution of inpatient services. In game-theoretical terms, this is a strategic game between the federal states, each of which represents the interests of its own hospital landscape.

This conflict of objectives becomes particularly evident in border regions. From a societal perspective, it could be efficient to concentrate highly specialized services at a few sites – including across state borders. For the individual federal state, however, there is an incentive to keep as many services, as much value creation and as much medical infrastructure as possible within its own territory. Without balancing mechanisms, the dominant strategy from the perspective of a federal state would therefore be to secure as many service groups as possible for itself. If all states make this rational decision, a Nash equilibrium emerges in which duplicate structures persist and cross-state specialization is hampered, even though it would be more efficient for society as a whole. Legislators already address potential conflicts at state borders: if a hospital is of significant importance for the care of the population of another state, hospital planning must be coordinated between the states concerned under Section 6(2) KHG. Whether this duty to coordinate suffices to fully resolve the states' conflicting strategic interests, however, remains a matter of practical implementation.

In addition, strategic disincentives may arise because some federal states are at the same time owners or operators of certain hospitals – particularly university hospitals – and thus, alongside their role as planning authority, partly also represent their own economic interests.[11]

From a game-theoretical perspective, the weakness thus lies in the very design of the game: a player who co-determines the allocation of strategically relevant resources while potentially having its own interest in that allocation requires clear institutional limits and independent control mechanisms. The rules of the game themselves must ensure that potential self-interest does not distort the conditions of competition.

Implications for reform design

The hospital reform is one of the largest structural reforms of the German healthcare system in decades. Given the considerable financial and organizational effort involved, its success will ultimately be measured by whether it actually contributes, in the long term, to greater efficiency, higher quality of care and sustainable use of scarce resources.

The game-theoretical analysis shows that the new statutory provisions do not replace existing disincentives with clear, care-oriented incentives. Instead, the locus of economic optimization is shifted and strategic uncertainty increases.

The real challenge for future healthcare reforms is therefore not to introduce ever new remuneration or planning instruments, but to develop consistent rules of the game that align the self-interest of all players with a common goal. Population-based and regional remuneration models, for example, show what this could look like: if players are held accountable not primarily for individual services but for the health and economic outcomes of a defined population, and share in the efficiency gains achieved, their strategic incentives change. Cooperation, prevention,

Teilspiel 4: Krankenhausplanung – Strategischer Wettbewerb zwischen Bundesländern

Auszahlungsmatrix (ordinaler Nutzen)

		Land B	
		Länderübergreifend koordinieren (K)	Eigene Strukturen sichern / Leistungsgruppen im eigenen Land halten (E)
Land A	Länderübergreifend koordinieren (K)	3 / 3	1 / 4
	Eigene Strukturen sichern / Leistungsgruppen im eigenen Land halten (E)	4 / 1	2 / 2

= Nutzen Land A = Nutzen Land B Werte: relativer Nutzen (ordinal)

Annahme: ohne hinreichend wirksamen Ausgleichs- bzw. Koordinationsmechanismus zwischen den Ländern.

Interpretation: Unter der Annahme, dass jedem Land ein eigenes Interesse daran besteht, Leistungsgruppen, medizinische Infrastruktur und Wertschöpfung im eigenen Land zu sichern, ist „eigene Strukturen sichern (E)" die dominante Strategie.

➡ **Nash-Gleichgewicht:** (E, E) = (2 / 2) – beide Länder sichern eigene Strukturen, obwohl eine länderübergreifende Koordination (K, K) mit (3 / 3) für das Gesamtsystem vorteilhafter wäre.

Der Gesetzgeber adressiert dieses Problem durch die Abstimmungspflicht nach § 6 Abs. 2 KHG. Entscheidend ist, ob dieser Mechanismus die Nutzenstruktur so verändert, dass Kooperation auch für das einzelne Land attraktiv wird.

11: Bundesministerium für Gesundheit (BMG) (2025): Krankenhäuser – Wissenswertes zu ihren Aufgaben, Unterschieden und zur Krankenhaussuche. gesund.bund.de. Abruf am 10.08.2026.

outpatient care and cross-sectoral management can then become economically attractive from an individual perspective as well. Such approaches range from population-based payment and virtual regional budgets to regional health consortia.[12]

The four subgames thus reveal a central challenge of the reform: new rules of the game do not change the players' self-interest, but the strategies with which they pursue it. When designing remuneration and hospital planning, the federal legislator and the states must therefore systematically anticipate how hospitals and other players will respond rationally and which equilibrium will result. Such a strategic incentive analysis should become an integral part of the regulatory impact assessment of future healthcare reforms. For good health policy does not merely define the desired outcome – it designs the rules of the game so that rational self-interest leads as closely as possible to that outcome. <<

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Abstract

Introduction: The German hospital reform aims to reduce misguided economic incentives and strengthen the quality of healthcare. Whether it succeeds depends on the incentives created by the new rules and how stakeholders respond to them.
Methods: This article analyses the reform from a game-theoretical perspective, a field of research recognised by Nobel Prizes for its contributions to the analysis of strategic decision-making. The new framework is divided into four subgames, which are examined in terms of their incentives and equilibria.
Results: The reform does not eliminate economic incentives for optimization but shifts them. Incentives to reduce inpatient case volumes through capacity-based payments are counteracted by potential long-term effects on state-level capacity-payment volumes. Economic optimisation increasingly shifts towards the case-mix index and may take the form of a prisoner's dilemma, as subsequent adjustments of DRG cost weights erode initial revenue advantages. Regional specialization constitutes a coordination game (Stag Hunt) with two equilibria. At the federal-state level, the rule-maker becomes a player in the game: the states shape hospital planning while also acting as hospital owners.
Discussion: Complex and conflicting incentives make strategic outcomes increasingly uncertain. Mechanism design approaches, such as retaining savings within the respective federal state or population-based regional budgets, could align individual interest with system-level objectives. Strategic incentive analyses should therefore form part of the design of future healthcare reforms.

12: Hildebrandt H, Stuppardt R (Hrsg.). Zukunft Gesundheit – regional, vernetzt, patientenorientiert. 1. Aufl. Heidelberg: medhochzwei Verlag; 2021. ISBN 978-3-86216-845-3.