


Review

Contract Mechanisms for Value-Based Technology Adoption in Healthcare Systems

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Abstract

Although technological innovations are often intended to improve quality and efficiency, they can exacerbate systemic challenges when not aligned with the principles of value-based care. As a result, healthcare systems in many countries face persistent inefficiencies stemming from the overuse, underuse, misuse, and waste associated with the adoption of health technology. This narrative review examines the dual impact of healthcare technology and evaluates how contract mechanisms can serve as strategic tools for promoting cost-effective, outcome-oriented integration. Drawing from healthcare management, and supply chain literature, this paper analyzes various payment and contract models, including performance-based, bundled, cost-sharing, and revenue-sharing agreements, through the lens of stakeholder alignment. It explores how these mechanisms influence provider behavior, patient access, and system sustainability. The study contends that well-designed contract mechanisms can align stakeholder incentives, reduce inefficiencies, and support the delivery of high-value care across diverse healthcare settings. We provide concrete examples to illustrate how various contract mechanisms impact the integration of health technologies in practice.

Keywords: health technology adoption; healthcare inefficiency; overuse; underuse; misuse; waste; healthcare spending; value-based care; payment models; contract mechanisms



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1. Introduction

Health technologies are often seen as tools to enhance operational efficiency and care quality in healthcare systems. However, they may contribute to overuse; underuse; misuse; administrative waste; the delivery of low-value care; and, most notably, inflated prices. This double-edged nature of technology adoption underscores the need for more value-based evaluation frameworks [1–5].

In response to these challenges, this paper argues that appropriately structured contract mechanisms can serve as a foundation for the integration of technologies into healthcare operations. By linking payment with value and performance, such mechanisms offer a pathway to align stakeholder interests and support value-oriented outcomes [6].

Contract mechanisms are essential tools that define how financial and operational risks are distributed among stakeholders and determine the structure of pricing and payment [7]. They influence provider behavior, service utilization, and the overall efficiency of care delivery. They help align stakeholder goals toward value-based outcomes, encourage accountability through performance-based metrics, and promote cost control by discouraging low-value care [8]. Thus, contract mechanisms play a critical role in either

enabling or hindering the adoption of innovative technologies by determining whether such innovations are appropriately incentivized and reimbursed [9].

While contract mechanisms have been extensively explored in supply chain management literature [10,11], their application in healthcare management, particularly in enhancing operational efficiency and enabling value-based technology adoption, remains insufficiently addressed. Some traditional models, such as fee-for-service and subsidization models, have been widely studied within the healthcare context [12–14]. However, other mechanisms more commonly found in supply chain management, such as revenue-sharing [15], wholesale price [16], and cost-sharing [17] contracts, have seen limited application in healthcare [18]. Given their proven success in aligning stakeholders and minimizing inefficiencies in other industries, contract mechanisms warrant further investigation in the context of healthcare operations management. This paper seeks to bridge that gap by examining a broader range of contract models through the lens of healthcare operations and technology management.

Distinct from previous studies, this paper adopts a narrative review approach to examine common inefficiencies in healthcare operations, including overuse, underuse, misuse, administrative waste, inflated pricing, and low-value care, that can arise when technological innovations are not aligned with value-based care principles or fail to consider the perspectives of key stakeholders. Unlike much of the existing literature, this study focuses on contract mechanisms as actionable strategies to embed value more consistently across healthcare systems. It emphasizes the importance of stakeholder alignment among patients, providers, technology suppliers, and policymakers. Furthermore, this work draws on supply chain management literature to identify contract models that can inform policy and managerial decision-making in the application of technology within healthcare systems. In contrast to prior reviews, this study provides concrete examples of how to identify value in the context of healthcare technology integration. It demonstrates how contract design can be used to reduce inefficiencies and improve alignment with value-based care goals [6]. The contract mechanisms explored in this paper have not been collectively examined in a single study within the healthcare management literature, particularly in the context of value-based technology adoption with concrete examples. This distinction sets the present work apart from prior studies and provides valuable insights for healthcare managers and policymakers.

2. Methodology and Review Design

This paper adopts a narrative review approach [19,20] to examine the dual nature of technology adoption in healthcare systems, with a focus on the key inefficiencies it can generate, including overuse, underuse, misuse, administrative waste, low-value care, and inflated pricing. It then synthesizes the literature on contract mechanisms across managerial disciplines, particularly supply chain management, to explore how they can be utilized to control costs and improve operational efficiency. By doing so, the review integrates the contracting subject with healthcare-specific payment and service models to offer new insights into the value of technology adoption in a value-based context.

Narrative Reviews

A narrative review is especially suitable for this study due to its conceptual and integrative focus. The following features characterize narrative reviews.

- Aim to interpret, critique, and contextualize literature across broader themes;
- Use flexible and diverse methodologies (e.g., conceptual synthesis and expert judgment);
- Suited for exploring under-defined or complex issues where integration of ideas is critical;

- May involve subjective interpretation but offer deeper conceptual insights.

In this context, a narrative review is well-suited for synthesizing diverse bodies of literature on healthcare inefficiencies, technology adoption, and contract mechanisms. This approach supports conceptual integration and critical reflection, both of which are essential for addressing the complexity of healthcare reform. Specifically, it enables a synthesis of how operational inefficiencies intersect with the adoption of innovative health technologies and how contract mechanisms can be leveraged to support value-based improvements [20].

Scope and purpose

Unlike systematic reviews that focus on aggregating empirical findings within a narrowly defined question, this review is conceptual and integrative. It aims to

- Analyze the implications of adopting innovative health technologies and their potential to both mitigate and exacerbate inefficiencies;
- Explore inefficiencies in healthcare systems, including waste, overuse, underuse, misuse, and high spending;
- Examine various types of contract mechanisms and evaluate their potential to facilitate the integration of new technologies while minimizing operational inefficiencies.

As part of this narrative review, we clarify the application of contract mechanisms in healthcare, highlighting how they can preserve value and address deficiencies in the adoption of technology. We also critically examine the challenges associated with their implementation.

Source Selection

This review draws on a targeted and thematically grounded search of peer-reviewed journal articles, policy reports, expert opinions, and conceptual frameworks. As this is a narrative review, the selection of keywords was guided by expert opinions [1,2]. The research objective was to explore contract mechanisms that support the adoption of value-based technologies in healthcare systems. Keywords were predefined based on domain familiarity and aligned with thematic areas, including “value-based healthcare”, “contract mechanisms”, “technology adoption”, and “health system inefficiencies”. Searches were conducted primarily using Google Scholar, PubMed, and Scopus and were supplemented by a snowballing approach that traced keywords and references from highly cited papers.

Relevant journals were selected for their focus on health economics, healthcare operations, and policy. Examples include *Health Policy*, *Health Economics*, and the *Journal of Operations Management*. Similar to the selection of keywords, journal selection was guided by expert opinions [1,2] and the research objectives, without a fixed prioritization rule among the chosen journals. While not exhaustive, the review emphasizes recent literature from the past 45 years, with selective inclusion of foundational works that inform the conceptual development of the topic.

Limitations

As a narrative review, this paper does not aim to catalog all empirical studies on each topic comprehensively. Instead, it seeks to synthesize key insights and identify conceptual linkages across disciplines [21]. Unlike systematic reviews following PRISMA guidelines, where keywords are typically derived from existing literature and refined through pilot searches to ensure comprehensive coverage [22], this narrative review adopts a purposeful and interpretive approach. Search terms are defined based on conceptual framing, expert opinion, and the review’s thematic scope. While this introduces an element of subjectivity, it is balanced by a conceptual integration and policy applicability to the complex challenges of healthcare technology adoption.

Although a narrative review is not inherently biased, it is more prone to bias than systematic reviews if not carefully managed and controlled. This is because narrative reviews rely heavily on expert judgment to select, interpret, and synthesize literature, increasing the risk of selection and confirmation bias. Nevertheless, when review objectives are clearly articulated and methodological choices are transparently explained, the narrative approach remains both valid and valuable, particularly for conceptual synthesis.

Table 1 summarizes key methodological distinctions between systematic and narrative reviews, highlighting the rationale for the approach adopted in this study.

Table 1. Comparison of systematic and narrative reviews.

Aspect	Systematic Review	Narrative Review
Purpose	Comprehensive, reproducible search	Thematic, conceptual exploration
Keyword Selection	Data-driven: extracted from prior studies, pilot searches, and indexing terms	Author-driven: based on researcher expertise, guiding framework, and topic focus
Transparency	Requires an explicit search strategy (e.g., Boolean logic, databases, or inclusion/exclusion)	The reasoning must still be explained, even when flexibility and expert judgment are applied
Reviewer's Role	Minimal influence; aims to reduce bias	Interpretive: reviewers synthesize and interpret existing knowledge

3. Literature Review

Value in Healthcare Delivery

In healthcare, value is broadly defined as the health outcomes achieved relative to the cost of delivering care. This concept encompasses several managerial principles. A treatment may be considered cost-effective if it yields improved health outcomes per unit of expenditure, cost-efficient if it optimizes the use of limited resources, and cost-beneficial if its monetary benefits exceed its costs. Value increases when outcomes improve without additional cost; when costs are reduced without compromising outcomes; or, ideally, when both occur. Key dimensions of value include clinical results (such as survival, symptom relief, and functional improvement); patient experience (including satisfaction, accessibility, and communication quality); and efficient resource use, particularly through the avoidance of unnecessary services or hospitalizations [23–27].

Technology as a Double-Edged Sword

Health technology, as used in this paper, refers to both technological innovations and the digitalization of healthcare. It is intended to deliver value and is widely regarded as a key solution to inefficiencies and poor quality in healthcare systems. When well managed, digital tools and medical technologies can enhance value by improving provider performance, clinical outcomes, cost efficiency, and workflow integration. However, without rigorous evaluation and thoughtful integration, these technologies can also introduce significant challenges and diminish value. They may contribute to operational inefficiencies, including inflated costs, overuse, underuse, misuse, and waste. In some cases, they may even undermine the very outcomes they are designed to improve.

Moreover, even when technologies yield short-term improvements in health outcomes, they can still contribute to inefficiencies in the long term [28,29]. This dual potential, offering both benefits and risks, underscores the need for careful, value-based approaches to the adoption of technology in healthcare.

Technology-Driven Spending and Its Consequences

In some countries, particularly the U.S., the adoption of advanced health technologies has significantly contributed to high healthcare spending. While the U.S. does not necessarily use more healthcare services than other countries, it pays substantially more for nearly every component of care, including hospital stays, diagnostic tests, medical procedures, and prescription drugs [1]. This pricing disparity reflects a broader pattern in which technology is adopted without adequate emphasis on cost-effectiveness or value alignment.

The consequences of this high spending are wide-ranging. For individuals, it often results in high out-of-pocket expenses, reduced access to necessary care, and increased financial strain, especially among the uninsured or underinsured. Firms that provide health benefits are burdened by rising premiums, which can limit their capacity to increase wages and may lead to greater cost-sharing for employees. At the national level, escalating healthcare expenditures consume an ever-growing share of GDP, limiting public investment in other sectors such as education, infrastructure, and social services [1].

Several healthcare systems continue to underperform on key health outcomes despite massive expenditures. For instance, a 2015 analysis of U.S. healthcare spending found that only USD 1.4 trillion to USD 2.86 trillion, representing 44% to 89% of total spending, provided direct patient benefits. The remaining expenditures were attributed to non-clinical costs, such as administrative overhead and overpriced services [30]. A comparative study of 12 developed nations revealed that Americans receive 40% less care per capita while paying significantly more, with the U.S. system operating at 27% lower efficiency overall [31]. According to the 2024 *Mirror*, *Mirror* report by the Commonwealth Fund, the U.S. health system ranks last in performance among ten high-income countries, despite spending significantly more per capita and as a share of GDP. This indicates that the longstanding pattern of high spending combined with poor system-level outcomes continues to persist [32]. These are examples highlighting the need for more value-driven approaches to technology implementation.

A similar pattern can be observed in India, where the emphasis on high-end technologies in areas such as pediatric cardiac care has increased treatment costs while limiting accessibility for most of the population. As R. Krishna Kumar (2011) notes, a focus on expensive interventions has excluded many from life-saving services, suggesting that lower cost, simpler innovations could improve outcomes more equitably [33].

It is worth noting that some other countries present a stark contrast. For instance, countries such as Sweden, the Netherlands, and Japan have demonstrated that carefully targeted, cost-effective technological adoption can yield better health outcomes relative to spending. Their experiences highlight that the value of technology lies not merely in its availability, but in how thoughtfully it is integrated into healthcare systems to support efficiency and equity [34].

Excessive healthcare spending can also lead to overuse, misuse, and waste, which are examined in the sections that follow.

Overuse in healthcare technology

Overuse in healthcare technology refers to the excessive or inappropriate use of digital health tools, leading to unnecessary medical consultations, tests, or treatments. The overuse of healthcare technology can strain healthcare systems by increasing the demand for services, potentially leading to longer wait times and resource allocation issues. It also raises concerns about the cost-effectiveness of care and the potential for unnecessary medical procedures [35].

Moral hazard as a driver of overuse

One key economic mechanism contributing to overuse is moral hazard, the tendency for patients and providers to overutilize healthcare services due to insurance coverage [36–40]. When individuals are insulated from the full cost at the point of care, demand may rise regardless of clinical necessity. On the supply side, fee-for-service payment models create financial incentives for providers to deliver more care, even when it offers limited value [1,41]. This dynamic can fuel the widespread use of low-value services, escalates expenditures [42], and contributes to inefficiencies such as overtreatment, elevated out-of-pocket costs, and inequitable access to essential care in the U.S. context [43,44].

Moreover, when insurance schemes fail to distinguish between necessary and discretionary services, they may inadvertently exacerbate disparities and strain public budgets [45]. These challenges should be considered in any reform plan for value-based insurance design to enhance both the efficiency and equity of healthcare delivery [46].

Supplier-induced demand and overuse

Another critical driver of overuse is supplier-induced demand, in which healthcare providers influence patients' use of services beyond what is clinically necessary, often due to financial or structural incentives [1]. This phenomenon stems from information asymmetry between patients and providers, as well as the agency relationship that defines medical decision-making. Richardson and Peacock (2006) argue that physicians may shape demand without acting unethically, given the inherent uncertainty in clinical choices [47].

In the U.S., this issue is compounded by entrenched clinical norms and systemic inertia. A comprehensive review by Korenstein et al. (2012) identified antibiotics for upper respiratory infections, coronary angiography, and carotid endarterectomy as among the most frequently overused services [48].

Importantly, the issue is not unique to the U.S. healthcare system. In Norway, Sørensen and Grytten (1999) found that increased competition among physicians under a fixed-fee system did not lead to more procedures per patient. In contrast, in Belgium and the Netherlands, fee-for-service payment models have been shown to encourage supplier-induced demand [49–51].

Supplier-induced demand has also been documented in other countries. For instance, in Iran, expansive insurance coverage has facilitated unnecessary procedures such as angiography [52,53]. In China, Shen et al. (2024) observed seasonal overutilization in hospitals, which is attributed to financial incentives embedded in the current hospital funding models [54]. Despite the global relevance of this issue, research on overuse remains limited and fragmented, particularly in terms of developing scalable and effective interventions to address it. Thus, addressing supplier-induced demand requires a multifaceted approach involving the reform of payment systems, strengthening of regulatory oversight, fostering of accountability, and shifting of clinical culture and education [55].

Misuse

According to the Institute of Medicine's 2001 report, *Crossing the Quality Chasm*, misuse is defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. In the context of healthcare, this refers to the provision of appropriate care that is poorly executed, leading to preventable complications, harm, or failure to achieve expected health outcomes [56]. Notably, the U.S. healthcare system exemplifies this imbalance, marked by the overuse of low-value services and the underuse of evidence-based care, twin failures that drive inefficiency and misuse without improving outcomes [1].

Waste

A significant share of healthcare spending in several countries is attributable to waste. According to Shrank et al. (2019), the U.S. system wastes between USD 760 billion and USD 935 billion annually, corresponding to approximately 25% of total spending, across categories such as overtreatment, failure of care delivery and coordination, pricing failures, and fraud [57]. A global scoping review by Olivares-Tirado and Zanga (2024) corroborates these findings, identifying administrative complexity and pricing failure, which are especially prevalent in the U.S., as some of the most systemic and avoidable sources of inefficiency [58]. The review highlights that the fragmented multi-payer system, burdensome bureaucracy, and lack of price regulation make the U.S. particularly vulnerable to excessive waste. Even conservative estimates place total waste at USD 600 to USD 900 billion, with upper-bound estimates as high as USD 1.9 trillion. These numbers underscore that reducing waste is not only a fiscal imperative but also an ethical necessity for advancing equity and improving health outcomes [1,2].

Administrative complexity and its consequences in operations management

The use of advanced technologies can introduce administrative complexity, which, alone, accounts for over USD 265 billion in avoidable waste annually. As a central challenge in healthcare operations management, it affects how resources are allocated, services are coordinated, and performance is monitored. Inefficient processes, such as redundant paperwork, fragmented information systems, and poorly designed workflows, increase administrative burdens and inflate costs without improving value. From an operations management perspective, tools such as workflow redesign, capacity planning, and process standardization provide pathways to reduce inefficiencies while supporting care delivery. Beyond financial losses, administrative complexity imposes substantial burdens on patients, as nearly one in four insured, nonelderly adults reports delaying or forgoing care due to difficulties with scheduling, billing, or navigating prior authorizations [59]. These obstacles disproportionately affect individuals with disabilities, lower incomes, or limited education, deepening existing inequities. In addition to targeting administrative waste, interventions addressing other inefficiencies could generate savings of USD 191 to USD 286 billion, making a compelling case for evidence-based, patient-centered reforms that enhance both efficiency and access [57].

Consequences of overuse, waste, and misuse in healthcare systems

Overuse, waste, and misuse represent a triad of inefficiencies that significantly undermine the value of healthcare. Kwiatkowski et al. documented how the overuse of laboratory tests coexisted with poor chronic disease control and limited clinical value [60]. At the same time, waste in healthcare systems leaves vulnerable populations without access to proven interventions. Misuses, such as diagnostic errors or inappropriate treatments, waste resources and directly compromise patient safety [61].

Together, these inefficiencies divert resources from high-need areas, erode public trust, and diminish the overall effectiveness of care. They reflect a broader systemic failure to allocate healthcare resources based on value and need. Addressing these issues systematically rather than in isolated policy or clinical silos, is essential for building a more equitable, efficient, and outcome-oriented healthcare system.

Underuse

Underuse is another type of inefficiency that occurs when patients fail to receive appropriate, recommended, or necessary care. This can result from barriers such as cost, limited access, lack of awareness, or systemic inefficiencies [1]. Underuse reflects the failure to deliver effective, evidence-based services, even when they offer clear clinical benefits,

leading to preventable harm, increased disease burden, and missed opportunities for public health improvement. In the U.S., many high-risk veterans missed timely COVID-19 antiviral treatments due to operational and communication failures [62].

The issue manifests in varied ways internationally. In China, the uptake of preventive services, such as cancer screening, is influenced by individual risk preferences and access to information [63]. In Germany, both general practitioners and patients report underuse in specialist and inpatient care due to systemic and guideline-related barriers [64]. Middle-income countries face similar challenges. Thailand, for example, struggles with access to migraine therapies due to cost and regulatory issues [65]. At the same time, the broader integration of artificial intelligence into clinical care remains hindered by infrastructural, legal, and cultural obstacles [66].

These examples underscore how underuse contributes not only to avoidable morbidity and mortality but also to growing healthcare inequities, necessitating reforms in education, financing, and system design [67–70].

The impact of payments on inefficiencies in healthcare technology adoption

Several studies have shown that the amount and, more importantly, the structure of healthcare payments significantly influence stakeholder behavior, contributing to inefficiencies such as overuse, underuse, waste, and excessive spending in healthcare technology adoption [1]. Addressing payment distortions is essential to unlocking the full potential of healthcare technologies.

Payment reform through contract mechanisms for value-oriented technology adoption

Following the preceding discussion, payment reform is often a foundational requirement for value-oriented technology adoption in healthcare systems. Contracts define both the amount and structure of payments. They play a central role in shaping and distributing risk among stakeholders. When thoughtfully designed around desired health outcomes, contract mechanisms can align stakeholder goals with social utility and even foster collaboration between public and private actors to strengthen the healthcare system [71].

Fernández-Salido et al. (2024) emphasize that payment reform requires more than financial realignment between stakeholders; it also demands modern infrastructure to ensure data transparency and accountability [72]. Similarly, Rooke-Ley et al. (2024) highlight the importance of regulatory compliance among stakeholders [73]. These enablers can be established through formal contract mechanisms, underscoring their strategic importance in shaping the adoption of healthcare technology.

Fee for service as the most common payment model driving inefficiencies in healthcare systems

Fee for service remains the most prevalent contract model for incorporating technology into healthcare delivery. Conventional fee-for-service models continue to reward volume over value, encouraging unnecessary or low-impact interventions. Cielo et al. (2024) report that such models led to increased inefficiencies, reduced payment transparency, and weakened the purchasing power of public insurers [74]. This model contrasts with value-based payment models that seek to align reimbursement with care quality, coordination, and measurable outcomes. However, as Parikh et al. (2022) caution, even value-based systems can perpetuate overuse or misaligned incentives if poorly designed, especially when technology adoption is not explicitly tied to clinical benefit [75].

Stakeholder risks and inefficiencies in technology use under fee for service

Under the fee-for-service model, technology adoption often shifts risk unevenly across stakeholders [76]. Patients face unnecessary costs due to overuse; providers are incentivized to increase service volume rather than value; technology suppliers may benefit from

higher sales but risk reputational harm if technologies are misused; and the government bears the long-term financial burden of rising costs without guaranteed improvements in outcomes. This misalignment weakens the push toward value-driven healthcare. Consequently, the fee-for-service model contributes to widespread inefficiencies, including the overuse and misuse of medical technologies; inflated healthcare spending; administrative waste; and, in some cases, underuse of high-value preventive tools that are not financially rewarded under volume-based reimbursement [6].

It should be noted that contract mechanisms must be evaluated in light of sector-specific goals and incentives to ensure they promote efficiency and long-term performance. For example, fee-for-service contracts may reduce direct costs in supply-driven sectors like lithium sourcing, where they offer flexibility and limit fixed cost exposure [77]. In contrast, in healthcare, the fee-for-service model often drives overuse, fragmented care, and higher system-level costs. Despite clear unit pricing, the model misaligns payment with outcomes, making it increasingly viewed as cost-increasing and inefficient in health systems.

Case example: artificial intelligence-based diagnostic tools and value realization in practice

To ground the discussion in a concrete context, we focus on the case of artificial intelligence (AI)-based diagnostic tools (e.g., for sepsis [78,79], stroke [80], and radiology [81]). When used appropriately, these technologies can deliver substantial value, including early detection of life-threatening conditions; reduced cognitive burden among clinicians; and faster, evidence-based decision-making. However, they also pose risks of inefficiency, such as overuse in low-evidence contexts, misuse due to over-reliance on algorithmic outputs, waste resulting from poor system integration, and high implementation and licensing costs.

Under a fee-for-service contract structure, the provider is reimbursed by the payer for each performed AI-supported test or interpretation, while paying the technology supplier a fee per use or license (e.g., per scan read). Patients typically receive the service without knowing whether AI was involved, and there is usually no direct contract between payers and tech suppliers. This model creates limited incentive to ensure that AI improves outcomes and often leads to inefficiencies, including overuse, waste from under-integrated tools, and escalating costs driven by volume-based incentives.

The fee-for-service model imposes high risk on patients and payers, as it incentivizes unnecessary service use and increases overall costs. Providers and suppliers face relatively low risk due to volume-based reimbursement.

Transitioning from fee-for-service to value-based payments through alternative contract mechanisms

Alternative contract mechanisms can help to move away from fee-for-service structures by aligning stakeholders' goals with value rather than volume. These approaches also promote the adoption of technologies that enhance outcomes without driving up inefficiencies and costs. However, their success hinges on a broad perspective that considers the interaction and goals of stakeholders [82].

In the following sections, we expand on this example by examining contract mechanisms other than the fee-for-service model and analyzing their implications for key healthcare stakeholders, including patients, providers, technology suppliers, and government or payers. In this paper, providers refer to healthcare delivery organizations such as hospitals, physicians, or clinics. At the same time, technology suppliers denote companies that develop or distribute health technologies, including AI-based diagnostic tools. The analysis highlights how different contract models can either exacerbate or mitigate inefficiencies in health technology use.

Performance-based contracting to align incentives with value

Performance-based contracting links reimbursement to outcomes rather than service volume, encouraging evidence-based, cost-effective care and reducing unnecessary technology use [83]. This model realigns incentives across stakeholders, with providers focusing on results, suppliers developing outcome-driven innovations, and payers gaining cost control with greater accountability. Research increasingly supports its role in promoting value-oriented healthcare [1,2,84–92].

Case example: performance-based contracts for AI-driven diagnostics

In a performance-based contract model for AI-based diagnostics, the provider is reimbursed by the payer based on measurable outcome improvements, such as increased diagnostic accuracy or reduced clinical errors attributable to AI use. The technology supplier is compensated only if the AI tool contributes to the achievement of these goals, aligning incentives across stakeholders. In some cases, payers may directly share savings with vendors. Patients benefit indirectly through higher quality care. This model supports value-based care by promoting effective, outcome-oriented use of AI, though overly rigid or poorly defined performance metrics may risk underuse or discourage innovation.

Technology suppliers bear high risk under this model, since payment depends on outcome delivery. Providers face moderate risk, while patients and payers benefit from lower exposure to poor performance.

Promoting high-value care through population- and episode-based payments

Population-based payment provides healthcare providers with a fixed per person payment to manage the full spectrum of care for a defined population. This model encourages preventive and coordinated care while discouraging low-value services [93–95]. Episode-based payments (also known as bundled payments) offer a single payment for all services related to a specific condition or treatment episode, promoting efficiency, outcome-driven care, and cost control. Both models shift financial risk to providers and support value-based care, aiming to reduce fragmentation, overuse, and administrative inefficiency [96–102].

Case example: population-based contracts for AI-driven diagnostics

In a population-based payment model, the provider receives a fixed per capita payment to manage the health of a defined population, incorporating AI-based diagnostics within that budget. Technology adoption is often constrained by cost efficiency, and AI use is typically targeted toward high-risk patients, while low-risk individuals may receive fewer or no AI-driven interventions. Though payers rarely contract directly with tech suppliers, public payers may subsidize broader AI implementation. This model encourages preventive, long-term care and improves value by reducing overuse and misuse, though it may lead to underuse if providers ration services to stay within budget limits.

In population-based payment, providers take on high financial risk due to fixed per capita payments. Patients and suppliers share moderate risk, while payers have relatively low risk due to budget predictability.

Case example: episode-based contracts for AI-driven diagnostics

In an episode-based (bundled) model, the provider receives a fixed payment for the entire episode of care, such as stroke diagnosis and recovery, and must manage all associated costs, including AI tools, within that budget. The patient benefits from integrated, coordinated services, while tech suppliers are paid by providers under cost constraints. There is typically no direct contract between payers and tech suppliers. This model promotes efficient and outcome-oriented AI use, helping to reduce overuse and waste; however, it may lead to underuse if providers avoid higher-cost technologies, even when they are clinically beneficial.

In episode-based (bundled) payment, providers face high risk managing total episode costs, while patients benefit from low risk through coordinated care. Payers and suppliers carry moderate risk based on case complexity and cost distribution.

Stakeholder perspectives on technology use under cost-sharing contracts

Cost-sharing contracts split expenses between parties, supporting joint innovation in areas like vaccine development and digital health. They accelerate patient access to new technologies, reduce financial risk for providers, and motivate suppliers to invest in impactful solutions. For governments, they lower upfront costs and foster partnerships aligned with public health goals, minimizing inefficiencies from fragmented or duplicative efforts [103].

Case example: cost-sharing contracts for AI-driven diagnostics

In a cost-sharing model, the financial burden of AI implementation is distributed across stakeholders. Providers and tech suppliers may split upfront costs, with suppliers offering discounts or deferred payments. Payers typically reimburse only part of the AI-related expenses and, in some cases, may co-fund pilot programs with vendors. Patients might also share costs through co-pays. This model can facilitate AI adoption in resource-limited settings, but it carries a risk of underuse if shared costs deter providers or patients. Its effectiveness largely depends on equitable design and sufficient institutional support.

In this contract, suppliers bear high risk from shared financial responsibility and uncertain uptake. Patients face low risk, while providers and payers experience moderate exposure depending on contract design.

Differentiated payment mechanisms for sustainable technology adoption

Differentiated payment mechanisms vary reimbursement based on clinical value, service type, or patient need and/or income, prioritizing high-impact technologies while limiting support for low-value care [104,105]. This approach improves access for underserved groups, encourages providers to use technology thoughtfully, and drives suppliers to focus on cost-effective innovations. For governments and payers, it enables strategic resource allocation and reduces inefficiencies tied to fee-for-service models and supports more sustainable healthcare spending [1,2].

Case example: differentiated payment contracts for AI-driven diagnostics

In a differentiated payment model, providers receive higher reimbursement for using AI-based diagnostics when applied to high-risk patients or when evidence thresholds are met, encouraging more targeted use. Licensing costs from tech suppliers may also vary by patient group or clinical context. Payers might incentivize deployment in specific settings, such as rural hospitals. Patients benefit by receiving advanced diagnostics when clinically justified. This model supports high-value, impact-driven AI use while helping reduce overuse and misuse, though it may introduce added administrative complexity.

By varying payment based on clinical value, this model creates high risk for suppliers, particularly in lower-value segments. Patients remain low-risk, while providers and payers assume moderate risk due to administrative complexity.

Stakeholder perspectives on technology use under firm fixed-price contracts

Firm fixed-price contracts set a non-negotiable payment for defined services, promoting cost control and efficiency, especially for standardized care. Patients benefit from transparency, though access to complex or personalized care may be limited. Providers and suppliers are incentivized to reduce costs and streamline technology use, potentially discouraging innovation. For payers, this model supports budgeting but requires precise service definitions to avoid underuse or quality issues [106,107].

Case example: firm fixed-price contracts for AI-driven diagnostics

In a firm fixed-price model, the provider pays the tech supplier a set fee for the AI tool, regardless of how often it is used. This offers cost predictability and simplifies budgeting, though the payer may or may not reimburse based on that fixed arrangement. Patients experience no direct change in care delivery but benefit from more stable access to the technology. While the model ensures financial stability, it may lead to underuse if providers limit use to avoid sunk costs or to waste if the tool is underutilized despite being paid for.

This model places high risk on both providers and suppliers, who must operate within rigid price constraints. Patients face a moderate risk, while payers benefit from cost stability and low exposure.

Stakeholder perspectives on technology use under fixed-price contracts with an incentive fee

Fixed-price contracts with an incentive fee offer a base payment plus performance bonuses, rewarding efficiency, quality, and improved outcomes. Patients benefit from higher quality, outcome-focused care. Providers and suppliers are motivated to use resources and technologies effectively, aligning with value-based goals. For payers, this model balances cost control with incentives for innovation and accountability [107,108].

Case example: fixed-price contracts with an incentive fee for AI-driven diagnostics

In a fixed-price model with an incentive fee, the provider pays the tech supplier a base fee for the AI tool, with additional bonuses tied to performance metrics such as improved diagnostic accuracy. Payers may also link provider reimbursement to outcomes and even, in some cases, coordinate incentive structures with suppliers in public–private partnerships. Patients benefit indirectly through higher quality diagnostics. This model sends a clear performance signal to both suppliers and providers, promoting value while reducing misuse, waste, and moral hazard.

In this contract, stakeholder risk is moderate for providers and suppliers, who are incentivized but not guaranteed bonuses. Patients and payers experience low risk, gaining value from performance-based rewards.

Stakeholder perspectives on technology use under fixed-price contracts with economic price adjustment

Fixed-price contracts with economic price adjustment set a stable base payment but allow for price changes based on inflation or cost shifts, making them suitable for long-term healthcare agreements. This model supports care continuity, protects providers and suppliers from cost volatility, and enables sustained investment in technology. For payers, it offers cost control with flexibility, reducing inefficiencies tied to rigid pricing [107,109].

Case example: fixed-price contracts with economic price adjustment for AI-driven diagnostics

In a fixed-price model with economic adjustment, the provider pays the tech supplier a set base price for the AI tool, with allowances for modifications based on inflation, regulatory changes, or system upgrades. Payments from payers to providers may also adjust slightly to reflect changing cost environments. While there is no direct link between payers and suppliers, patients benefit from consistent care quality with reduced risk of service disruption. This model helps maintain long-term value amid market volatility and protects against underuse that might result from unexpected cost increases.

In such contracts, moderate risk applies to providers and suppliers, particularly if cost adjustments lag market conditions. Patients and payers maintain low risk through pricing flexibility and continuity of care.

Stakeholder perspectives on technology use under time and materials contracts

Time and materials contracts pay based on actual work and resources used, offering flexibility for piloting and customizing health technologies. They support innovation and real-time problem solving but may lack cost transparency and efficiency incentives. For payers, the model enables early-stage experimentation but requires strong oversight to prevent overspending and inefficiencies [107].

Case example: time and materials contracts for AI-driven diagnostics

In a time and materials model, the provider compensates the tech supplier based on the time and resources spent on tasks such as integration, maintenance, and training of AI-driven diagnostics. These support costs are often not fully reimbursed by payers, and direct contracts between payers and suppliers are rare. Patients may experience delays in benefiting from the technology due to extended implementation timelines. While this model is useful during pilot or testing phases, it carries a risk of inefficiency if not carefully monitored, as it may incentivize prolonged work to increase billable hours.

In such contracts, payers face high risk due to uncertain and variable costs. Patients and suppliers bear moderate risk, while providers have low risk, as they pay only for what is needed.

Stakeholder perspectives on technology use under indefinite delivery, indefinite quantity contracts

Indefinite delivery, indefinite quantity contracts enable flexible, on-demand procurement of services or technologies, ideal for scalable initiatives like telehealth or emergency response. They enhance care access and adaptability for patients and providers, support responsive innovation from suppliers, and give payers strategic flexibility. However, without clear performance metrics, they may risk variability and oversight issues [107,110,111].

Case example: indefinite delivery, indefinite quantity contracts for AI-driven diagnostics

In an indefinite delivery, indefinite quantity model, the provider contracts with the tech supplier to pay per use of the AI tool within a flexible time frame and spending cap. Payers reimburse providers only when services are delivered, promoting cost control. Occasionally, payers and suppliers may collaborate on scalable programs, particularly in innovation-driven settings. Patients benefit from flexible access to AI tools as needed. This model supports agile deployment and reduces waste, though underuse may occur if usage remains below contractual thresholds.

In such contracts, all stakeholders share moderate risk due to demand unpredictability and flexible delivery terms. Patients generally have a low risk, benefiting from scalable access.

Stakeholder perspectives on technology use under wholesale price contracts

Wholesale price contracts set a fixed unit price per product or service, enabling bulk purchasing of standardized tools. They offer pricing transparency and procurement efficiency for providers and suppliers but may encourage overuse or misaligned adoption without value-based safeguards. For payers, the model supports cost control but requires oversight to ensure appropriate use and quality care [107,112,113].

Case example: wholesale price contracts for AI-driven diagnostics

In a wholesale price model, the provider purchases the AI tool in bulk or via an annual license, securing a lower per unit cost from the tech supplier. Payers typically continue to reimburse on a per use basis, regardless of the provider's wholesale savings, and there is no direct interaction between payers and suppliers. Patients are not directly affected but may benefit if providers pass on cost savings. While this model can improve provider margins

and potentially lower costs, it also risks overuse if low per use pricing is not accompanied by usage oversight.

In this contract, providers benefit from low risk, but payers carry moderate risk if overuse occurs. Suppliers and patients also face low to moderate risk, depending on usage oversight.

Stakeholder perspectives on technology use under repurchase contracts

Repurchase contracts let sellers buy back unused services, reducing financial risk and discouraging overprocurement. This promotes targeted, evidence-based technology use; supports provider experimentation; and encourages suppliers to align products with clinical needs. For payers, it limits waste and enables more flexible, value-driven resource allocation [107,114].

Case example: repurchase contracts for AI-driven diagnostics

In a repurchase model, the tech supplier agrees to buy back unused AI licenses or upgrade outdated software, reducing financial risk for the provider. Payers typically reimburse only for diagnostics that are actually used, while some may support repurchase arrangements through policy incentives. Patients benefit from more reliable and up-to-date tools. This model enhances provider confidence in adopting new technologies, increases investment trust, and helps reduce waste and the risk of underutilization.

In such contracts, suppliers bear high risk by committing to buybacks or upgrades. This reduces risk for providers, patients, and payers, who are better protected from underuse or obsolete tools.

Stakeholder perspectives on technology use under revenue-sharing contracts

Revenue-sharing contracts divide healthcare profits among providers, suppliers, and investors, aligning incentives around performance and value. They encourage efficient, outcome-driven care and shared accountability, though they risk overuse if poorly managed. For payers, this model reduces upfront costs but requires strong oversight to ensure value-based care [115].

Case example: revenue-sharing contracts for AI-driven diagnostics

In a revenue-sharing model, the tech supplier earns income only when the provider uses the AI tool successfully or generates billable services, aligning supplier compensation with actual usage and outcomes. From the payer's perspective, billing remains standard, with the cost of the technology embedded in the service fee. Patients benefit indirectly through more innovative and outcome-focused care. While payers may be unaware of the arrangement unless involved in a public-private initiative, this model helps reduce underuse and waste while promoting adoption by aligning incentives across stakeholders.

In such contracts, suppliers face high risk, since income depends on provider-generated revenue. Patients, providers, and payers share moderate risk, especially if service demand is uncertain or variable.

Stakeholder perspectives on technology use under quantity flexibility contracts

Quantity flexibility contracts let buyers adjust order volumes within set limits, offering adaptability in response to shifting healthcare demands. This improves patient access, helps providers avoid overstocking, and encourages suppliers to offer scalable solutions. For payers, it balances cost control with responsiveness, reducing inefficiencies from demand uncertainty [116].

Case example: quantity flexibility contracts for AI-driven diagnostics

In a quantity flexibility model, the provider has the option to adjust the volume of AI licenses based on clinical demand, paying the tech supplier only for what is needed. Payers

reimburse based on actual usage, and there is no direct relationship between payers and suppliers. For patients, this ensures that AI tools are available when necessary, without excess capacity. This approach enhances value by enabling scalable adoption and reduces inefficiencies such as overstock-related waste and underuse due to rigid contract volumes.

This model ensures low risk for patients and providers, who can adjust orders based on need. Suppliers assume moderate risk due to demand variability, while payers remain low-risk.

Stakeholder perspectives on technology use under refund contracts

Refund contracts reimburse costs for ineffective or returned technologies, shifting risk to suppliers and promoting accountability. They protect patients from low-value care, encourage provider adoption of innovations, and push suppliers to ensure clinical effectiveness. For payers, this model prevents wasteful spending and supports outcome-based procurement [117].

Case example: refund contracts for AI-driven diagnostics

In a refund model, the tech supplier agrees to reimburse the provider partially or fully if the AI tool fails to meet predefined performance benchmarks, such as excessive false positives. Payers typically only reimburse for effective and validated AI use, while their direct involvement with suppliers is limited. Patients benefit through enhanced safety and quality assurance. This model strengthens trust in technology adoption and discourages misuse or ineffective deployment, thereby promoting value and reducing inefficiencies.

In such contracts, suppliers take on high risk by guaranteeing refunds for under-performance. This reduces risk for patients, providers, and payers, supporting safer technology adoption.

Stakeholder perspectives on technology use under quantity reduction contracts

Quantity reduction contracts let buyers lower volume commitments with minimal penalties, adding flexibility in uncertain healthcare settings. This supports more appropriate care, reduces waste, and encourages suppliers to compete on value. For payers, it promotes fiscal responsibility and adaptability, helping avoid overuse and misaligned procurement [116].

Case example: quantity reduction contracts for AI-driven diagnostics

In a quantity reduction model, the provider is allowed to scale down AI tool purchases without financial penalties, offering flexibility as demand changes. Payers benefit from reduced financial exposure, and there is no direct involvement between payers and tech suppliers. For patients, this model helps prevent service disruptions that might occur under rigid minimum purchase agreements. It supports cautious, needs-based expansion of technology and reduces waste associated with overcommitment or underutilization.

In such contracts, suppliers face moderate risk due to order reductions, while providers and patients face low risk from overcommitment. Payers also benefit from lower exposure to unused inventory.

Stakeholder perspectives on technology use under service-level agreements

Service-level agreements set defined performance standards and accountability measures, ensuring reliability in digital health and outsourced services. They enhance patient trust, support provider efficiency, and hold suppliers accountable for quality. For payers, service-level agreements help enforce standards, reduce service disruptions, and protect digital health investments [118].

Case example: contracts with service-level agreements for AI-driven diagnostics

In a service-level agreement model, the provider and tech supplier establish clear contractual terms regarding system uptime, user training, support services, and acceptable error rates. These performance metrics may also inform payer reimbursement or penalties, especially in value-based contracts. In some public programs, payers may monitor supplier compliance directly. Patients benefit from more reliable and timely care, while providers gain operational assurance. This model enhances value by promoting accountability, minimizing misuse and downtime, and reducing provider fatigue.

In this contract, suppliers are highly accountable, assuming high risk tied to performance guarantees. Providers carry moderate risk for operational compliance, while patients and payers face low risk due to built-in safeguards.

Table 2 summarizes the stakeholder risk by contract mechanism.

Table 2. Stakeholder risk summary by contract mechanism.

Contract Mechanism	Patient Risk	Provider Risk	Technology Supplier Risk	Government/Payer Risk
Fee for Service	High	Low	Low	High
Performance-Based	Low	Moderate	High	Low
Population-Based Payment	Moderate	High	Moderate	Low
Episode-Based (Bundled) Payment	Low	High	Moderate	Moderate
Cost Sharing	Low	Moderate	High	Moderate
Differentiated Payment	Low	Moderate	High	Moderate
Firm Fixed Price	Moderate	High	High	Low
Fixed Price with Incentive Fee	Low	Moderate	Moderate	Low
Fixed Price with Economic Adjustment	Low	Moderate	Moderate	Low
Time and Materials	Moderate	Low	Moderate	High
Indefinite Delivery, Indefinite Quantity	Low	Moderate	Moderate	Moderate
Wholesale Price	Moderate	Low	Low	Moderate
Repurchase	Low	Low	High	Low
Revenue Sharing	Moderate	Moderate	High	Moderate
Quantity Flexibility	Low	Low	Moderate	Low
Refund	Low	Low	High	Low
Quantity Reduction	Low	Low	Moderate	Low
Service-Level Agreement	Low	Moderate	High	Low

Other Reform Strategies

As previously discussed, implementing well-designed contract mechanisms to support reforms, such as transitioning from fee-for-service to value-based payment models, can help control expenditures and enhance the value delivered by health services. Additional long-term strategies include adopting global budgets and regulating provider prices, both of which have shown potential to contain costs [119]. However, the success of these approaches depends on physician engagement, sustained policy commitment, and a broader shift in public and media narratives from individual responsibility toward systemic accountability [120].

A variety of strategies have been proposed to slow the growth of healthcare spending in the U.S. without sacrificing quality. A major area of focus is the small proportion of patients, approximately 10%, who account for nearly 70% of total healthcare costs, often due to multiple chronic conditions or frequent hospitalizations [121]. Disease management programs targeting conditions like heart failure and diabetes have proven effective in

improving outcomes and reducing rehospitalizations. Other promising reforms include expanding access to primary care, which is linked to lower emergency department usage, and enhancing care coordination to reduce medical errors [121].

The adoption of technologies in healthcare systems should prioritize evidence-based innovation and promote shared decision-making between patients and providers to avoid the delivery of low-value services [121,122].

4. Conclusions and Future Work

The key insight from this study is that the value of healthcare technology is not inherent but contingent on how it is integrated into the healthcare system and how its use is incentivized. Technologies—even those with transformative potential—can lead to inefficiencies, such as overuse, underuse, and administrative waste, when they are misaligned with system-level incentives. Contract mechanisms are powerful tools to shape this alignment. By linking payment structures to performance, quality, and outcomes, well-designed contracts can promote the responsible and value-based adoption of innovations.

Policymakers and healthcare leaders must prioritize the development and implementation of contract models that reflect the complexity of healthcare delivery. This includes moving beyond traditional fee-for-service arrangements and adopting differentiated payment mechanisms, such as bundled payments, performance-based contracts, and shared-risk agreements, that balance the interests of patients, providers, payers, and technology suppliers. A systems-level perspective is essential to ensure that contract design addresses the interdependencies across stakeholders and mitigates unintended consequences.

As healthcare systems face growing financial pressures and rapidly evolving technological landscapes, aligning economic incentives with health outcomes is not merely a strategic choice; it is a necessity. Contract mechanisms that are transparent, flexible, and grounded in value-based principles offer a practical path forward for sustainable, equitable, and efficient healthcare reform.

It is worth noting that, while contract mechanisms offer several advantages, their implementation presents practical challenges. For example, the literature highlights the complexities of differentiated pricing in healthcare. Although such mechanisms can improve social utility by expanding access for lower-income or high-need populations, they depend on accurate identification of eligibility, often requiring reliable data on income or health status, which may be incomplete or unavailable. This opens the door to misuse, where individuals may attempt to access lower rates unfairly. Moreover, differentiated pricing introduces administrative burdens, requiring robust systems for monitoring, verification, and oversight. Without careful design and governance, these mechanisms may undermine both equity and efficiency, inadvertently excluding those most in need or distorting incentives within the system. More broadly, reimbursement mechanisms for differentiated pricing are not easily implemented in practice [104].

Future work

Overuse, underuse, misuse, waste, and medical errors frequently coexist, reflecting deeper systemic dysfunctions within healthcare delivery. As multiple studies have shown [1,60,61,123], these issues rarely occur in isolation and often interact in complex ways. Future research should adopt a systems dynamics perspective to evaluate technology adoption, with an emphasis on empirical studies that assess the impacts across stakeholders and care settings. In particular, future efforts should focus on modeling the interdependencies among overuse, underuse, misuse, and waste.

This study presents a conceptual framework grounded in literature-based insights and illustrated with examples of contract mechanisms specifically applied to value-based technology adoption in AI-driven diagnostics. Since implementation outcomes may vary

across technology types, health systems, and regulatory environments, future work should validate and refine the findings, considering these and other contextual factors.

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References

1. Chernew, M. *Health Care Economics*; Harvard Online: Cambridge, MA, USA, 2025. Available online: <https://www.harvardonline.harvard.edu/course/health-care-economics> (accessed on 1 April 2025).
2. Shaw, S.Y. *Digital Health*; Harvard Online: Cambridge, MA, USA, 2025. Available online: <https://www.harvardonline.harvard.edu/course/digital-health> (accessed on 1 April 2025).
3. Ginsburg, P.B. High Rising Health Care Costs: Demystifying U.S. Health Care Spending. *Res. Synth. Rep.* **2008**, *16*, 35368.
4. Hartman, M.; Martin, A.B.; Benson, J.; Catlin, A.; The National Health Expenditure Accounts Team. National Health Care Spending in 2018: Growth Driven by Accelerations in Medicare and Private Insurance Spending. *Health Aff.* **2020**, *39*, 8–17. [[CrossRef](#)]
5. Homer, J.; Milstein, B.; Hirsch, G.B.; Fisher, E.S. Combined regional investments could substantially enhance health system performance and be financially affordable. *Health Aff.* **2016**, *35*, 1435–1443. [[CrossRef](#)]
6. Teymourifar, A. Structural Inefficiencies in the U.S. Healthcare System. *Preprint* **2025**. [[CrossRef](#)]
7. Kaya, O. Outsourcing vs. in-house production: A comparison of supply chain contracts with effort dependent demand. *Omega* **2011**, *39*, 168–178. [[CrossRef](#)]
8. Jiang, H.; Pang, Z.; Savin, S. Performance-based contracts for outpatient medical services. *Manuf. Serv. Oper. Manag.* **2012**, *14*, 654–669. [[CrossRef](#)]
9. Selder, A. Physician reimbursement and technology adoption. *J. Health Econ.* **2005**, *24*, 907–930. [[CrossRef](#)] [[PubMed](#)]
10. Qian, Q.; Zhuang, W. Tax/subsidy and capacity decisions in a two-tier health system with welfare redistributive objective. *Eur. J. Oper. Res.* **2017**, *260*, 140–151. [[CrossRef](#)]
11. Taleizadeh, A.A.; Alizadeh-Basban, N.; Sarker, B.R. Coordinated contracts in a two-echelon green supply chain considering pricing strategy. *Comput. Ind. Eng.* **2018**, *124*, 249–275. [[CrossRef](#)]
12. Rashad, A.S.; Sharaf, M.F. Who benefits from public healthcare subsidies in Egypt? *Soc. Sci.* **2015**, *4*, 1162–1176. [[CrossRef](#)]
13. Wolk, A.; Ebling, C. Multi-channel price differentiation: An empirical investigation of existence and causes. *Int. J. Res. Mark.* **2010**, *27*, 142–150. [[CrossRef](#)]
14. Kaya, O.; Teymourifar, A.; Ozturk, G. Public and private healthcare coordination: An analysis of contract mechanisms based on subsidy payments. *Comput. Ind. Eng.* **2020**, *146*, 106526. [[CrossRef](#)]
15. Cachon, G.P.; Lariviere, M.A. Supply chain coordination with revenue-sharing contracts: Strengths and limitations. *Manag. Sci.* **2005**, *51*, 30–44. [[CrossRef](#)]
16. Pasternack, B.A. Optimal pricing and return policies for perishable commodities. *Mark. Sci.* **2008**, *27*, 133–140. [[CrossRef](#)]
17. Chick, S.E.; Mamani, H.; Simchi-Levi, D. Supply chain coordination and influenza vaccination. *Oper. Res.* **2008**, *56*, 1493–1506. [[CrossRef](#)]
18. Teymourifar, A. Analysis of Public Healthcare Policies to Improve Social Utility Using Stochastic Models. Ph.D. Thesis, Eskişehir Technical University, Eskişehir, Turkey, 2019.
19. Umscheid, C.A.; Margolis, D.J.; Grossman, C.E. Key concepts of clinical trials: A narrative review. *Postgrad. Med.* **2011**, *123*, 194–204. [[CrossRef](#)]
20. Greenhalgh, T.; Thorne, S.; Malterud, K. Time to challenge the spurious hierarchy of systematic over narrative reviews? *Eur. J. Clin. Investig.* **2018**, *48*, e12931. [[CrossRef](#)]
21. Pae, C.U. Why systematic review rather than narrative review? *Psychiatry Investig.* **2015**, *12*, 417. [[CrossRef](#)]
22. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Moher, D. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. [[CrossRef](#)]
23. Porter, M.E. What is value in health care? *N. Engl. J. Med.* **2010**, *363*, 2477–2481. [[CrossRef](#)]
24. Porter, M.E. Value-based health care delivery. *Ann. Surg.* **2008**, *248*, 503–509. [[CrossRef](#)]

25. Drummond, M.F.; Sculpher, M.J.; Claxton, K.; Stoddart, G.L.; Torrance, G.W. *Methods for the Economic Evaluation of Health Care Programmes*; Oxford University Press: Oxford, UK, 2015.
26. Neumann, P.J.; Sanders, G.D.; Russell, L.B.; Siegel, J.E.; Ganiats, T.G. (Eds.) *Cost-Effectiveness in Health and Medicine*; Oxford University Press: Oxford, UK, 2016.
27. Gold, M.R. (Ed.) *Cost-Effectiveness in Health and Medicine*; Oxford University Press: Oxford, UK, 1996.
28. Centers for Medicare & Medicaid Services (CMS). *National Health Expenditure Projections 2023–2032*; CMS: Baltimore, MD, USA, 2024.
29. Congressional Budget Office. *Technological Change and the Growth of Health Care Spending*; Congressional Budget Office: Washington, DC, USA, 2008.
30. Fredell, M.N.; Kantarjian, H.M.; Shih, Y.T.; Ho, V.; Mukherjee, B. How much of US health care spending provides direct care or benefit to patients? *Cancer* **2019**, *125*, 1404–1409. [[CrossRef](#)] [[PubMed](#)]
31. Wu, L. Drivers of high US healthcare spending: An international comparative study. *Int. J. Comp. Manag.* **2020**, *3*, 208–229. [[CrossRef](#)]
32. Schneider, E.C.; Tikkanen, R.; Shah, A.; Mossialos, E.; Osborn, R. *Mirror, Mirror 2024: Comparing Performance of Health Care Systems in 10 Countries*; The Commonwealth Fund: New York, NY, USA, 2024.
33. Kumar, R.K. Technology and healthcare costs. *Ann. Pediatr. Cardiol.* **2011**, *4*, 84–86. [[CrossRef](#)]
34. Anderson, G.F.; Frogner, B.K.; Johns, R.A.; Reinhardt, U.E. Health care spending and use of information technology in OECD countries. *Health Aff.* **2006**, *25*, 819–831. [[CrossRef](#)]
35. Zhong, L.; Cao, J.; Xue, F. The paradox of convenience: How information overload in mHealth apps leads to medical service overuse. *Front. Public Health* **2024**, *12*, 1408998. [[CrossRef](#)]
36. Lagarde, M.; Blaauw, D. Overtreatment and benevolent provider moral hazard: Evidence from South African doctors. *J. Dev. Econ.* **2022**, *158*, 102917. [[CrossRef](#)]
37. Koohi Rostamkalaee, Z.; Jafari, M.; Gorji, H.A. A systematic review of strategies used for controlling consumer moral hazard in health systems. *BMC Health Serv. Res.* **2022**, *22*, 1260. [[CrossRef](#)]
38. Huțu, D.; Cumpăt, C.M.; Grădinaru, A.; Rusu, B. The impact of moral hazard on healthcare utilization in public hospitals from Romania: Evidence from patient behaviors and insurance systems. *Healthcare* **2024**, *12*, 2519. [[CrossRef](#)]
39. Yuan, H.; Han, J.; Luo, R. The moral dilemma of healthcare service utilization: A perspective from the consolidation of urban and rural resident health insurance policy in China. *Health Econ. Rev.* **2025**, *15*, 10. [[CrossRef](#)]
40. Lavaste, K. Overuse of medical imaging and effects of payer-provider integration: Quasi-experimental evidence from Finland. *Health Econ. Rev.* **2025**, *15*, 4. [[CrossRef](#)]
41. Baker, L.C. The effect of HMOs on fee-for-service health care expenditures: Evidence from Medicare. *J. Health Econ.* **1997**, *16*, 453–481. [[CrossRef](#)]
42. Barati, M.; Azami, F.; Nagdi, B.; Foladi, M.; Hajimaghsoodi, M.; Asadi, S.A. Moral hazards in providing health services: A review of studies. *Evid. Based Health Policy Manag. Econ.* **2018**, *2*, 61–69.
43. Zhang, N.; Dong, Y.; Li, Y.; Guo, M. Moral hazard in physician prescribing behavior: Evidence from China’s zero-markup policy. *Appl. Econ.* **2024**, 1–14. [[CrossRef](#)]
44. Zweifel, P.; Manning, W.G. Moral hazard and consumer incentives in health care. *Handb. Health Econ.* **2000**, *1A*, 409–459.
45. Singh, V. Publicly funded health insurance schemes and demand for health services: Evidence from an Indian state using a matching estimator approach. *Health Econ. Policy Law* **2024**, *19*, 429–445. [[CrossRef](#)] [[PubMed](#)]
46. Graf, M.; Baumgardner, J.R.; Neumann, U.; Brewer, I.P.; Chou, J.W.; Fendrick, A.M. Economic evidence on cost sharing and alternative insurance designs to address moral and behavioral hazards in high-income health care systems: A systematic review. *J. Mark. Access Health Policy* **2024**, *12*, 342–368. [[CrossRef](#)] [[PubMed](#)]
47. Richardson, J.R.J.; Peacock, S.J. Supplier-induced demand: Reconsidering the theories and new Australian evidence. *Appl. Health Econ. Health Policy* **2006**, *5*, 87–98. [[CrossRef](#)]
48. Korenstein, D.; Falk, R.; Howell, E.A.; Bishop, T.; Keyhani, S. Overuse of health care services in the United States: An understudied problem. *Arch. Intern. Med.* **2012**, *172*, 171–178. [[CrossRef](#)] [[PubMed](#)]
49. Sørensen, R.J.; Grytten, J. Competition and supplier-induced demand in a health care system with fixed fees. *Health Econ.* **1999**, *8*, 497–508. [[CrossRef](#)]
50. Van de Voorde, C.; Van Doorslaer, E.; Schokkaert, E. Effects of cost sharing on physician utilization under favourable conditions for supplier-induced demand. *Health Econ.* **2001**, *10*, 457–471. [[CrossRef](#)]
51. Van Dijk, C.E.; Van den Berg, B.; Verheij, R.A.; Spreeuwenberg, P.; Groenewegen, P.P.; De Bakker, D.H. Moral hazard and supplier-induced demand: Empirical evidence in general practice. *Health Econ.* **2012**, *22*, 340–352. [[CrossRef](#)]
52. Mohammadshahi, M.; Emamgholipour, S.; Olyaemanesh, A.; Sakha, M.A.; Akbari Sari, A.; Yazdani, S. Physician induced demand: The empirical evidence of angiography for suspected coronary artery disease. *Iran. J. Public Health* **2024**, *53*, 228–237. [[CrossRef](#)]

53. Seyedin, H.; Afshari, M.; Esfahani, P.; Rakhshan, A.; Hasanzadeh, E.; Taherimirghaed, M. Main factors leading to supplier-induced demand in Iran: A comprehensive review. *Health Scope* **2020**, *9*, e96366. [[CrossRef](#)]
54. Shen, C.; Deng, Q.; Lai, S.; Yang, L.; Zhao, D.; Zhao, Y.; Zhou, Z. New evidence on supplier-induced demand in China's public tertiary hospitals: Is the cost of hospitalization higher in the off-season? *Eur. J. Health Econ.* **2024**, *25*, 951–962. [[CrossRef](#)] [[PubMed](#)]
55. Czerniak, L.L.; Lavieri, M.S.; Daskin, M.S.; Byon, E.; Renius, K.; Sweet, B.V.; Leja, J.; Tupps, M.A. The benefits (or detriments) of adapting to demand disruptions in a hospital pharmacy with supply chain disruptions. *Health Care Manag. Sci.* **2024**, *27*, 525–554. [[CrossRef](#)] [[PubMed](#)]
56. Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*; National Academies Press: Washington, DC, USA, 2001.
57. Shrank, W.H.; Rogstad, T.L.; Parekh, N. Waste in the US health care system: Estimated costs and potential for savings. *JAMA* **2019**, *322*, 1501–1509. [[CrossRef](#)]
58. Olivares-Tirado, P.; Zanga, R. Waste in health care spending: A scoping review. *Int. J. Healthc. Manag.* **2024**, *17*, 330–342. [[CrossRef](#)]
59. Kyle, M.A.; Frakt, A.B. Patient administrative burden in the US health care system. *Health Serv. Res.* **2021**, *56*, 755–765. [[CrossRef](#)]
60. Kwiatkowski, L.R.; Jolles, D.R.; Edwards, C. Overuse, underuse, and misuse: Improving effective primary care at a Federally Qualified Health Center. *Nurs. Forum* **2022**, *57*, 703–709. [[CrossRef](#)]
61. Orszag, P.R. *The Overuse, Underuse, and Misuse of Health Care*; Congressional Budget Office Testimony: Singapore, 2008; pp. 1–14.
62. Monach, P.A.; Anand, S.T.; Fillmore, N.R.; La, J.; Branch-Elliman, W. Underuse of antiviral drugs to prevent progression to severe COVID-19, Veterans Health Administration, March, September 2022. *MMWR Morb. Mortal. Wkly. Rep.* **2024**, *73*, 57–61. [[CrossRef](#)]
63. Lu, J.; Dong, Y.; Zhang, X.; Wang, Y.; Zhou, Z. The relationship between public risk preference and the underuse or overuse of preventive health services in the information age. *Prev. Med. Rep.* **2024**, *41*, 102727. [[CrossRef](#)] [[PubMed](#)]
64. Warkentin, L.; Scherer, M.; Kühlein, T.; Pausch, F.; Lühmann, D.; Muche-Borowski, C.; Hueber, S. Evaluation of the German living guideline “Protection against the Overuse and Underuse of Health Care”—An online survey among German GPs. *BMC Prim. Care* **2024**, *25*, 414. [[CrossRef](#)] [[PubMed](#)]
65. Rattanawong, W.; Anukoolwittaya, P.; Hiransuthikul, A.; Ongpitakmetha, T.; Trisataya, A.; Thanprasertsuk, S.; Rapoport, A. Medication underuse in real-life practice: The impact of galcanezumab towards achieving very low frequency episodic migraine in a Southeast Asian middle-income nation. *J. Headache Pain* **2025**, *26*, 13. [[CrossRef](#)] [[PubMed](#)]
66. Pagallo, U.; O'Sullivan, S.; Nevejans, N.; Holzinger, A.; Friebe, M.; Jeanquartier, F.; Jean-Quartier, C.; Miernik, A. The underuse of AI in the health sector: Opportunity costs, success stories, risks and recommendations. *Health Technol.* **2024**, *14*, 1–14. [[CrossRef](#)]
67. Sebastião, M.; Pesch, J.; Kühlein, T.; Hueber, S. “The health care system is more like a business”—Medical overuse from the patients' perspective in Germany: A qualitative study. *BMJ Open* **2024**, *14*, e084065. [[CrossRef](#)]
68. Khazaal, F.M.; Bin Aboud, M.S.S.; Althobaiti, M.W.H.; Alkhiyari, M.S.E.; Al-Qarni, M.A.M.; Alharajin, W.M.M.; Alasiri, A.M.S.; Alsadah, S.A.; Alosaimi, R.H.M.; Alsayyali, S.S. An analysis of the overuse and underuse of laboratory testing by skilled medical professionals when assessing patients for thrombotic and bleeding problems. *J. Int. Crisis Risk Commun. Res.* **2024**, *7* (Suppl. S6), 457–470.
69. Glasziou, P.; Straus, S.; Brownlee, S.; Trevena, L.; Dans, L.; Guyatt, G.; Elshaug, A.G.; Janett, R.; Saini, V. Evidence for underuse of effective medical services around the world. *Lancet* **2017**, *390*, 169–177. [[CrossRef](#)]
70. Wu, A.W.; Tase, M.; Walsh, K.E.; Sheridan, S. Patient reports of patient safety: An underused technology. *NEJM Catal.* **2024**, *29*, 72–73. [[CrossRef](#)]
71. Teymourifar, A.; Kaya, O.; Ozturk, G. A data-driven approach to pricing models for balanced public–private healthcare systems. *Healthc. Anal.* **2025**, *7*, 100385. [[CrossRef](#)]
72. Fernández-Salido, M.; Alhambra-Borrás, T.; Casanova, G.; Garcés-Ferrer, J. Value-based healthcare delivery: A scoping review. *Int. J. Environ. Res. Public Health* **2024**, *21*, 134. [[CrossRef](#)]
73. Rooke-Ley, H.; Song, Z.; Zhu, J.M. Value-based payment and vanishing small independent practices. *JAMA* **2024**, *332*, 871–872. [[CrossRef](#)]
74. Cielo, B.; Santillan, M.; de Claro, V. Effect of a case-capped, fee-for-service payment mechanism on accessibility and affordability of health care. *Health Aff. Sch.* **2024**, *2*, qxae004. [[CrossRef](#)]
75. Parikh, R.B.; Helmchen, L.A. Paying for artificial intelligence in medicine. *Npj Digit. Med.* **2022**, *5*, 63. [[CrossRef](#)] [[PubMed](#)]
76. Zuvekas, S.H.; Cohen, J.W. Fee-for-service, while much maligned, remains the dominant payment method for physician visits. *Health Aff.* **2016**, *35*, 411–414. [[CrossRef](#)] [[PubMed](#)]
77. Teymourifar, A. Managing the lithium supply chain: A contract-enabled approach across global shoring strategies. *Supply Chain. Forum Int. J.* **2025**, 1–13. [[CrossRef](#)]
78. Li, F.; Wang, S.; Gao, Z.; Qing, M.; Pan, S.; Liu, Y.; Hu, C. Harnessing artificial intelligence in sepsis care: Advances in early detection, personalized treatment, and real-time monitoring. *Front. Med.* **2025**, *11*, 1510792. [[CrossRef](#)]

79. Bhargava, A.; López-Espina, C.; Schmalz, L.; Khan, S.; Watson, G.L.; Urdiales, D.; Lincoln Updike, B.S.; Niko Kurtzman, M.D.; Alon Dagan, M.D.; Amanda Doodlesack, M.D.; et al. FDA-authorized AI/ML tool for sepsis prediction: Development and validation. *NEJM AI* **2024**, *1*, AIoa2400867. [[CrossRef](#)]
80. van Leeuwen, K.G.; Meijer, F.J.; Schalekamp, S.; Rutten, M.J.; van Dijk, E.J.; van Ginneken, B.; Govers, T.M.; de Rooij, M. Cost-effectiveness of artificial intelligence aided vessel occlusion detection in acute stroke: An early health technology assessment. *Insights Imaging* **2021**, *12*, 133. [[CrossRef](#)]
81. Lawrence, R.; Dodsworth, E.; Massou, E.; Sherlaw-Johnson, C.; Ramsay, A.I.; Walton, H.; O'Regan, T.; Gleeson, F.; Crellin, N.; Herbert, K.; et al. Artificial intelligence for diagnostics in radiology practice: A rapid systematic scoping review. *EClinicalMedicine* **2025**, *83*. [[CrossRef](#)]
82. de Silva Etges, A.P.B.; Liu, H.H.; Jones, P.; Polanczyk, C.A. Value-based reimbursement as a mechanism to achieve social and financial impact in the healthcare system. *J. Health Econ. Outcomes Res.* **2023**, *10*, 100. [[CrossRef](#)] [[PubMed](#)]
83. Rynes, S.L.; Gerhart, B.; Parks, L. Personnel psychology: Performance evaluation and pay for performance. *Annu. Rev. Psychol.* **2005**, *56*, 571–600. [[CrossRef](#)] [[PubMed](#)]
84. Rittler, A. *How Benefits Based on Performance Will Reshape Healthcare Payment*; eVigils: Menlo Park, CA, USA, 2023. Available online: <https://evigils.com/how-benefits-based-on-performance-will-reshape-healthcare-payment/> (accessed on 1 April 2025).
85. Hsieh, H.-M.; Wang, Y.-H.; Chen, H.-F. Associations between participation in a diabetes pay-for-performance program and health outcomes and healthcare utilization among people with comorbid schizophrenia and type 2 diabetes in Taiwan. *Gen. Hosp. Psychiatry* **2025**, *94*, 99–107. [[CrossRef](#)] [[PubMed](#)]
86. Slawomirski, L.; Hensher, M.; Campbell, J.; deGraaff, B. Pay-for-performance and patient safety in acute care: A systematic review. *Health Policy* **2024**, *143*, 105051. [[CrossRef](#)]
87. Rhee, C.; Strich, J.R.; Chiotos, K.; Classen, D.C.; Cosgrove, S.E.; Greeno, R.; Heil, E.L.; Kadri, S.S.; Kalil, A.C.; Gilbert, D.N.; et al. Improving sepsis outcomes in the era of pay-for-performance and electronic quality measures: A joint IDSA/ACEP/PIDS/SHEA/SHM/SIDP position paper. *Clin. Infect. Dis.* **2024**, *78*, 505–513. [[CrossRef](#)]
88. Barber, S.L.; Mathauer, I.; Rosenberg, M.; Larrain, N.; Liu, Y.; Long, Q.; Smith, A.; Nappoe, S.A.; Lorenzoni, L. Purchasing primary care services for quality chronic care: Capitation with performance payments in four countries. *Int. J. Health Plan. Manag.* **2025**, *40*, 1007–1012. [[CrossRef](#)]
89. Ryan, A.M.; Burgess, J.F.; Pesko, M.F.; Borden, W.B.; Dimick, J.B. The early effects of Medicare's mandatory hospital pay-for-performance program. *Health Serv. Res.* **2015**, *50*, 81–97. [[CrossRef](#)]
90. Koukounas, K.G.; Kim, D.; Patzer, R.E.; Wilk, A.S.; Lee, Y.; Drewry, K.M.; Mehrotra, R.; Rivera-Hernandez, M.; Meyers, D.J.; Shah, A.D.; et al. Pay-for-performance incentives for home dialysis use and kidney transplant. *JAMA Health Forum* **2024**, *5*, e242055. [[CrossRef](#)]
91. Kristensen, S.R.; Meacock, R.; Turner, A.J.; Boaden, R.; McDonald, R.; Roland, M.; Sutton, M. Long-term effect of hospital pay for performance on mortality in England. *N. Engl. J. Med.* **2014**, *371*, 540–548. [[CrossRef](#)]
92. Sutton, M.; Nikolova, S.; Boaden, R.; Lester, H.; McDonald, R.; Roland, M. Reduced mortality with hospital pay for performance in England. *N. Engl. J. Med.* **2012**, *367*, 1821–1828. [[CrossRef](#)]
93. Remers, T.E.P.; Wackers, E.M.E.; van Dulmen, S.A.; Jeurissen, P.P.T. Towards population-based payment models in a multiple-payer system: The case of the Netherlands. *Health Policy* **2022**, *126*, 1151–1156. [[CrossRef](#)]
94. Nuti, S.V.; Johnson, A.K.; Long, T. Population-based payments to deliver health care to unhoused individuals. *JAMA Health Forum* **2025**, *6*, e250004. [[CrossRef](#)] [[PubMed](#)]
95. McWilliams, J.M.; Weinreb, G.; Ding, L.; Ndumele, C.D.; Wallace, J. Risk adjustment and promoting health equity in population-based payment: Concepts and evidence. *Health Aff.* **2023**, *42*, 105–114. [[CrossRef](#)] [[PubMed](#)]
96. Wilding, J.A.; Clifford, J.S.; Heron, D.E.; Jahraus, C.D.; McKittrick, J.; Benitez, C.M.; Thomas, T.O. General consensus on implementing an episode-based payment model: Results from the American College of Radiation Oncology (ACRO) Payment Reform Survey. *Cureus* **2025**, *17*, e81557. [[CrossRef](#)]
97. Patel, T.A.; Jain, B.; Vapiwala, N.; Chino, F.; Tringale, K.R.; Mahal, B.A.; Yamoah, K.; McBride, S.N.; Lam, M.B.; Hubbard, A.; et al. Trends in utilization and Medicare spending on short-course radiation therapy for breast and prostate cancer: An episode-based analysis from 2015 to 2019. *Int. J. Radiat. Oncol. Biol. Phys.* **2024**, *119*, 17–22. [[CrossRef](#)]
98. Navathe, A.S.; Liao, J.M.; Wang, E.; Isidro, U.; Zhu, J.; Cousins, D.S.; Werner, R.M. Association of patient outcomes with bundled payments among hospitalized patients attributed to accountable care organizations. *JAMA Health Forum* **2021**, *2*, e212131. [[CrossRef](#)]
99. Ryan, A.M.; Buxbaum, J.D.; Shashikumar, S.A.; Chopra, Z. It's time for a new season of episode-based payment. *Health Aff. Forefr.* **2023**. [[CrossRef](#)]
100. Shrank, W.H.; Chernew, M.E.; Navathe, A.S. Hierarchical payment models—A path for coordinating population- and episode-based payment models. *JAMA* **2022**, *327*, 423–424. [[CrossRef](#)]

101. Milstein, R.; Schreyögg, J. The end of an era? Activity-based funding based on diagnosis-related groups: A review of payment reforms in the inpatient sector in 10 high-income countries. *Health Policy* **2024**, *141*, 104990. [[CrossRef](#)]
102. Adida, E.; Mamani, H.; Nassiri, S. Bundled payment vs. fee-for-service: Impact of payment scheme on performance. *Manag. Sci.* **2017**, *63*, 1606–1624. [[CrossRef](#)]
103. Ghosh, D.; Shah, J. Supply chain analysis under green sensitive consumer demand and cost sharing contract. *Int. J. Prod. Econ.* **2015**, *164*, 319–329. [[CrossRef](#)]
104. Kaya, O.; Teymourifar, A.; Ozturk, G. Analysis of different public policies through simulation to increase total social utility in a healthcare system. *Socio-Econ. Plan. Sci.* **2020**, *70*, 100742. [[CrossRef](#)]
105. Teymourifar, A.; Trindade, M.A. A framework to design and evaluate green contract mechanisms for forestry supply chains. *Sustainability* **2023**, *15*, 7668. [[CrossRef](#)]
106. Sund, K.A.; Hausken, K. Fixed price contract versus incentive-based contract in the oil and gas industry. *Int. J. Glob. Energy Issues* **2012**, *35*, 371–410. [[CrossRef](#)]
107. Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 7th ed.; Project Management Institute: Newtown Square, PA, USA, 2021.
108. Ward, S.C.; Chapman, C.B. Evaluating fixed price incentive contracts. *Omega* **1995**, *23*, 49–62. [[CrossRef](#)]
109. Rotemberg, J.J. Aggregate consequences of fixed costs of price adjustment. *Am. Econ. Rev.* **1983**, *73*, 433–436.
110. Stanford, M.S.; Molenaar, K.R.; Sheeran, K.M. Application of indefinite delivery–indefinite quantity construction strategies at the federal level. *J. Manag. Eng.* **2016**, *32*, 04016011. [[CrossRef](#)]
111. Rueda-Benavides, J.A.; Gransberg, D.D. Indefinite delivery–indefinite quantity contracting: Case study analysis. *Transp. Res. Rec.* **2014**, *2408*, 17–25. [[CrossRef](#)]
112. Hwang, W.; Bakshi, N.; DeMiguel, V. Wholesale price contracts for reliable supply. *Prod. Oper. Manag.* **2018**, *27*, 1021–1037. [[CrossRef](#)]
113. Lu, F.; Zhang, J.; Tang, W. Wholesale price contract versus consignment contract in a supply chain considering dynamic advertising. *Int. Trans. Oper. Res.* **2019**, *26*, 1977–2003. [[CrossRef](#)]
114. Acharya, V.V.; Öncü, T.S. The repurchase agreement. In *Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance*; Acharya, V.V., Cooley, T.F., Richardson, M.P., Walter, I., Eds.; Wiley: Hoboken, NJ, USA, 2010; p. 319.
115. Bart, N.; Chernonog, T.; Avinadav, T. Revenue-sharing contracts in supply chains: A comprehensive literature review. *Int. J. Prod. Res.* **2021**, *59*, 6633–6658. [[CrossRef](#)]
116. Li, X.; Lian, Z.; Choong, K.K.; Liu, X. A quantity-flexibility contract with coordination. *Int. J. Prod. Econ.* **2016**, *179*, 273–284. [[CrossRef](#)]
117. Escobari, D.; Jindapon, P. Price discrimination through refund contracts in airlines. *Int. J. Ind. Organ.* **2014**, *34*, 1–8. [[CrossRef](#)]
118. Mirobi, G.J.; Arockiam, L. Service level agreement in cloud computing: An overview. In Proceedings of the 2015 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), Puducherry, India, 18–19 December 2015; IEEE: Piscataway, NJ, USA, 2015; pp. 753–758.
119. Bodenheimer, T. High and rising health care costs. Part 3: The role of health care providers. *Ann. Intern. Med.* **2005**, *142*, 996–1002. [[CrossRef](#)] [[PubMed](#)]
120. Kim, S.-H.; Tanner, A.H.; Foster, C.B.; Kim, S.Y. Talking about health care: News framing of who is responsible for rising health care costs in the United States. *J. Health Commun.* **2015**, *20*, 123–133. [[CrossRef](#)]
121. Bodenheimer, T. High and rising health care costs. Part 4: Can costs be controlled while preserving quality? *Ann. Intern. Med.* **2005**, *143*, 26–31. [[CrossRef](#)]
122. Bodenheimer, T. High and rising health care costs. Part 2: Technologic innovation. *Ann. Intern. Med.* **2005**, *142*, 932–937. [[CrossRef](#)]
123. Elshaug, A.G.; Rosenthal, M.B.; Lavis, J.N.; Brownlee, S.; Schmidt, H.; Nagpal, S.; Littlejohns, P.; Srivastava, D.; Tunis, S.; Saini, V. Levers for addressing medical underuse and overuse: Achieving high-value health care. *Lancet* **2017**, *390*, 191–202. [[CrossRef](#)]

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