

A Comparative Analysis of Healthcare Supply Chain Models: Insights from the United Kingdom's NHS and China's Volume-Based Procurement System

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Abstract. The healthcare procurement systems are crucial for achieving financial efficiency and clinical effectiveness in national health services. The paper includes a comparative evaluation of two major health care procurement systems: the procurement system of the United Kingdom based on the National Health Service (NHS), and the theoretically based system of procurement in China, which is the National Volume-Based Procurement (NVBP). The research includes a comprehensive literature review and policy analysis of their organizational structure, operation, cost-efficiencies, and governing mechanisms. The findings indicate that, on average, China has achieved relevant cost savings in pharmaceuticals and devices through centralized buying and competitive bidding. The NHS system, however, has been reporting good performance in terms of quality assurance, transparency, and involvement of stakeholders, whereby the governance is partially decentralized but coordinated. According to the comparative analysis, China's adapted model excels in achieving high cost-containment on a large scale; however, the NHS's adapted model prioritizes quality, accountability, and sustainability. Both systems provide curative lessons: NVBP focuses on the benefits of centralization and volume guarantees, and NHS focuses on the necessity to engage the clinics and make purchasing decisions on an evidence-based basis. The paper concludes that hybrid solutions, including cost-effectiveness, governance, and quality standards, may be the most suitable solutions in health care systems in the world. These lessons are included in the general discourse of global healthcare supply chain management and can be used to inform future policy-making in providing cheap, innovative, and quality services.

Keywords: Health care procurement, supply chain management, National Health Service (NHS), National Volume-Based Procurement (NVBP), comparative analysis.

1. Introduction

The procurement in healthcare has been made one of the most valuable aspects that determine the health system outcomes, not only in terms of the financial viability of the healthcare services, but also the quality of the patient care and its availability. As the pressure on government spending on international healthcare accumulates, governments and health authorities are mounting pressure on the government to ensure that procurement practices are optimally valuable without affecting clinical standards. The classical supply chain systems were also revealed as weak due to the COVID-19 pandemic. It revealed the necessity to have resilient, flexible, and open procurement models that can respond to market shocks as well as the unforeseen emergence of threats to public health [1]. It is here that the reform and streamlining of healthcare procurement have been a primary concern, aiming to provide cost-efficiency, quality assurance, and equal access to healthcare products across various healthcare systems.

The research article will focus on a comparative analysis of two prevalent models of national healthcare procurement: the procurement system of the National Health Service (NHS) of the United Kingdom and the National Volume-Based Procurement (NVBP) of China. This study compares two contrasting healthcare procurement models: the NHS's decentralized, clinician-involved, evidence-based approach versus China's centralized NVBP system with competitive bidding for price reductions. This study will analyse the structure of both systems, their performance, and governance to find out the best practices through systematic literature review and policy analysis. It assesses the

cost, quality, stakeholder involvement, and innovation and offers policy suggestions on how to balance between cost-control and sustainability.

2. Literature Review

2.1. Theoretical Framework of Healthcare Procurement

Procurement systems in health care operate in very complex organizations and economies where multiple theoretical strategies are needed. The supply chain management theory offers the principles of achieving efficiency, quality and sustainability [2]. Transaction cost economics is the theory of how the governance structures and contracts affect the procurement result such as the quality and reliability of products. The organizational buying behaviour literature reveals the principles of the decision-making process, the impact of the relationship between a stakeholder and information flows as well as the impact of institutions on procurement results [3]. These theoretical backgrounds enable us to compare the NHS and the Chinese VBP systems in an integrated way and find out their advantages and disadvantages in achieving cost effectiveness versus quality assurance and sustainable health care delivery.

2.2. NHS Procurement System: Procurement System and Development

In the past decade, NHS procurement has been undergoing tremendous changes. It was once decentralized, but it has become more coordinated with the implementation of the NHS New Operating Model in 2018. The centralized supply chain management hopes to achieve better savings through greater coordination and standardization of NHS Trusts [4]. The centralized purchasing power is balanced by the local flexibility to respond to the needs particular to the trust, which focuses on the management of strategic supplier relationships, demand, and quality assurance by NHS Supply Chain, which is the leading procurement authority in England.

The system is a system of multi-layered governance, which provides economically and clinically valid procurement decisions through clinical oversight, financial management, and regulatory compliance. Evidence-based decision-making considers cost alongside quality, safety, and long-term value. This shows NHS's commitment to quality of patient care and effectiveness of operations [2].

Performance evaluations on the effectiveness of NHS procurement revealed that while centralized strategies achieved efficiency gains, the UK National Audit Office reported that financial constraints meant that savings were limited to about £100 million of the £500 million target by 2026 [4]. These problems indicate the impossibility of implementing a significant procurement transformation to enable the existing healthcare systems. Although there have been hiccups along the way, the NHS procurement system has shown strength in the aspect of assurance of quality and involvement of stakeholders. The procurement system framework for clinical roles in procurement determination has led to improved clinical outcomes. Furthermore, accountability and continuous improvement processes have been enabled by the open procurement practices in the NHS.

2.3. Volume-Based Procurement System of China

The NVBP system is very different from previous methods of healthcare procurement in China. It is centralized model that consolidates the demand of all of China's healthcare system. NVBP was rolled out as a pilot in a few cities and will be expanded to the whole country. It is using competitive bidding to cut prices with considerable savings without reducing the level of supply [5]. The system's design principle is guaranteeing volume at an excellent price concession. Moreover, the NVBP system offers a strong incentive for low prices and market stability because, by promising pharmaceutical companies a guaranteed volume of access in the market, the system can offer pharmaceutical companies a strong incentive to lower prices. This approach has worked particularly well when there are multiple rival suppliers in the market and a developed capacity to supply.

2.4. Competitive Mechanisms and Market Dynamics

The NVBP system has improved competitive bidding systems in which there are many factors to consider apart from prices, for example, quality specification, supply capacity, and past performance. The system design assumes that market share distribution schemes rewarding the most competitive bidders and at the same time offering security in form of multiple suppliers schemes [6]. The NVBP system has greatly reshaped the trend of Chinese pharmaceutical industry, which compels the manufacturers to reconsider their pricing model [7]. The guarantees offered by the system on volume has forced the companies to focus on the improvement of efficiency and cost reduction which are adding more to the efficiency of the system.

2.5. Outcomes and Impact Assessment

NVBP system's achievements in China had been spectacular in terms of cost saving. It had offered average price cuts of 52 percent over previous pre-2018 levels, and even bigger cuts in certain categories. Price cuts of coronary stents had been achieved by 93 percent, and joint replacement devices by 82 percent at national tender levels [8]. So many savings had been made as massive savings to the health care systems, and as increased availability of medicines and medical devices to the patients. Through improving the availability of medicines to different groups of people is a part of overall health equity, and the quality standard is not sacrificed due to the existence of stringent evaluation systems [6]. However, the incentive to pharmaceutical innovation is a controversial issue with regard to the impact of NVBP system. While the NVBP may discourage investment in R&D and pharmaceutical innovation due to lowered profit margins, the stringent focus on quality and efficiency may, in fact, drive certain types of innovation [9, 10].

Existing studies on healthcare procurement systems have offered rich information on structural characteristics and operational experiences of both NHS and NVBP systems as well as cost saving, governance reform and efficiency gains achieved by these two models, but there are still many research gaps. The previous studies had effectively documented cost saving, governance reform and efficiency gains achieved by these two models, but they often treated them as single cases rather than comparable objects of transnational cross-national comparison. So little is known about how different governance logics, centralized versus decentralized, shape long-term outcomes such as incentive to innovation, sustainability of suppliers and quality assurance. Furthermore, most of the existing literature focuses on short-term financial outcomes, and pays limited attention to qualitative outcomes such as stakeholder engagement, institutional adaptation and policy transferability between contexts. The limitations mentioned above have set up the limitation for the existence of more integrative and comparative study that not only focuses on economic efficiency, but also governance performance and system sustainability. And this paper tries to bridge the gap by comparing and contrasting structural forms of NHS and NVBP models in terms of their operational processes and policy implications. It adds to the information that is already available about effective procurement reform in international systems.

3. Analytical Comparison Framework

3.1. Structural Differences and Organizational Models

Systemic distinctions between the Chinese NVBP and the NHS system are found in differences in their attitudes to healthcare governance and market structure. The NHS system is usually calculated on the model of a mixed economy, in which the interaction of the state sector and competition in the market has provided a balance. The NVBP model, in turn, is founded upon the centralization of state power to provide market results based on the decision to make a joint purchase. These architectural differences are colossal factors in the flexibility, involvement of the stakeholders, and adjustability of the system. The NHS decentralized model is more responsive to the local needs and is also more

localist. On the contrary, the Chinese model of centralization is more standardized in nature, with centralized authority being held by the central government [11].

3.2. Performance Metrics and Evaluation Criteria

Cost-effectiveness, performance by quality, stakeholder satisfaction, and system sustainability can be listed as some of the dimensions of performance that are to be compared with the healthcare procurement systems. The two systems have been used in different areas, as explained in the literature, particularly, the NVBP system in China has managed to be competent in cost-cutting reduction, whereas the NHS system has shown merits in quality assurance and stakeholder engagement indicators. The cross-system comparison is not an easy task as well because it implies the utilization of new measures and evaluation criteria. System adaptability, long-term sustainability, and innovation impact are the qualitative indicators, which are hard to compare. On the contrary, quantitative indicators, such as cost savings and price discounts, are more readily analysed. The table 1 below simply show the differences.

Table 1. Framework and Evaluation Dimensions for Comparative Analysis

Dimension	NHS Procurement System (UK)	NVBP System (China)	Key Reference
Governance Structure	Decentralized with coordinated oversight via NHS Supply Chain	Centralized under state-led procurement consortium	[4,5]
Market Orientation	Mixed economy with public–private interaction	State-dominated procurement with competitive bidding	[11]
Procurement Mechanism	Strategic supplier partnerships, framework agreements	Volume-based tendering, guaranteed supply contracts	[6]
Primary Objective	Quality assurance, long-term sustainability	Rapid cost reduction and access expansion	[12]
Performance Focus	Quality, safety, stakeholder engagement	Price efficiency, supply security	[13]

4. Comparative Analysis and Discussion

The section gives a comparative review of the United Kingdom NHS procurement system and the NVBP system in China, in terms of their performance on significant aspects of healthcare supply chain management. It has been classified based on discussion, in terms of five analysis themes, which are cost effectiveness and financial performance, quality assurance and patient safety, stakeholder impact and market dynamics, innovation and long-term sustainability, and governance and implementation complexity. Both themes rely on evidence, based on the literature available, official reports and empirical assessments to point out the similarities and differences in system design and results. Specific focus is placed on the effects of a centralization or decentralization choice of structure as it determines performance trade-offs in efficiency, quality, and sustainability.

4.1. Financial Performance and Cost Effectiveness

The comparative cost-effectiveness analysis reveals that there exist dramatic differences between the approach and outcome of the two systems. The NVBP system in China has achieved considerable healthcare system savings through active competitive bidding processes. The NVBP system has led to an average price reduction of 52 percent across different product categories, a considerable amount of money saved for the NHS in China [6]. For example, since the launch of the NVBP program in China in 2018, the average cost of pharmaceuticals and medical devices has dropped by around 52% for pharmaceuticals and medical devices. The cost of coronary stents dropped by as much as 93

percent, and joint replacement devices dropped by around 82 percent [6]. In contrast, the NHS procurement system has achieved smaller but more sustainable savings through its relationships with suppliers. The process improvements. The NHS has not been as vocal as China on price reduction but created more value over the years by improving quality, innovation alliances, and sustainable relationships with suppliers. This is a \$500 million saving figure, as envisaged by the NHS (although delayed in implementation), which is a significant achievement in the context of a mature healthcare system in which supplier relationships have been developed [4]. These various strategies have implications on the economic feasibility that should be given as much weight as possible. The negative pricing policy of China could lead to certain short-term cost saving, but it will jeopardize the sustainability of the suppliers and long-term innovations. NHS is able to take a more moderate line of action more susceptible to the maintenance of long-lasting relationships with suppliers and further innovation, although at the price of higher short-term spending.

4.2. Quality Control and Patient Safety Systems

The other way that is different between the two systems is quality assurance where both systems are largely different in the strategies and capabilities they use. NHS procurement system involves overall quality assessment systems that are clinically oriented, evidenced-based system of decision-making and constant monitoring on the supply performance. The strategy is a signifier of the NHS's institute-wide commitment to high-quality patient care, coupled with efforts to improve efficiency. Quality assurance under the NVBP system in China involves establishing quality assurance measures in its competitive bidding system, which requires suppliers to meet specific quality requirements to qualify for the competition. The ability of the system to sustain quality standards in the face of stiff price competition has however been the subject of some apprehension among some researchers, especially in the case of complex medical equipment and special pharmaceuticals [5]. It is indicated in the literature that both systems have delivered satisfactory quality results in their respective situations albeit in varying processes. The quality assurance of the NHS, which focuses on clinical participation and backed by evidence-based assessment, and the quality assurance of China, which is based on the standardization of specification and guaranteed by the volume, introduce motivations to suppliers to ensure quality to remain accessible to the market.

4.3. Stakeholder Effect and Market Process

The stakeholder impact analysis indicates a large variation in the effect on the various market participants of the two systems. The focus on the engagement of stakeholders and clear processes in the NHS system has continued to have good relations with the suppliers, clinicians and patients. The collaborative nature of the system has helped share knowledge and form entrepreneurial alliances but there are instances where the suppliers have raised concerns regarding the complexity and the cost of the procurement process. The NVBP system has had more theatrical stakeholder effects in China where the system has brought significant benefits to both the patients and the healthcare systems in the form of increased affordability and accessibility. Nonetheless, the system has exerted a lot of strain on pharmaceutical firms and distributors, compelling them to make major changes in their business model and reduce profit margins [8]. The various stakeholder effects indicate the various policy goals and the policy implementation strategies of the systems. The NHS system is focused more on the stakeholder consensus and sustainable relationships, whereas the NVBP system in China is oriented on swift cost-cutting and accessibility that is ready to accept greater market disturbance to reach these goals.

4.4. Innovation Implications and Long-term Sustainability

The impact of procurement policies on health innovation. NHS's value-based procurement incentivises R&D and attracts suppliers despite pressing prices. The steep prices of NVBP by China discourages innovation that is incrementally different but encourages efficiency in manufacturing. In addition, the cooperation in which the NHS engages promotes long-term R&D and supplier

relationships. China's approach is effective in the short-run, but may harm market interests in the long-run. Both represent a trade-off between short-term cost saving and long-term innovation in which the sustainability of innovation depends on market-based logic and the survival of suppliers.

4.5. Governance and Implementation Complexity

The two systems are equally useful for optimisation. The NVBP in China will see a 52 percent price cut through the power of central purchasing and market competition, and is not necessarily suited to systems with limited budgets, although this also means that the supply chain is not threatened. The NHS has been able to ensure quality, participation and stable supplier management with clinical involvement and evidence-based evaluations. The transferable elements of VBP are thus assured volume in price negotiations, quality with a stable requirement, and coordinated unity. The transferable elements of the NHS are an inclusive stakeholder engagement participation process, and the transferable evaluation system based on evidence and the balanced scorecard measures.

4.6. Implementation Requirements and Adaptation Issues

For the transfer of procurement practices to be successful, the institutional, economic and political environments must be assessed. The success of Chinese NVBP depends on the variables of market structure, supplier competition, manufacturing and avoidance mechanisms. The NHS collaboration characteristics mean that a consistent, transparent process, evidence-based decision making and institutional ability to engage with stakeholders is required, which is not possible without strong institutional support. This study has suggested the combination of the two methods to create a hybrid system that will be able to provide the best solutions to different health care settings.

5. Policy Implications and Transferable Insights

5.1. Best Practice and Model Strengths

These are two valuable systems. The NVBP of China has achieved a 52% decrease in price through bulk buying and performing in competitive markets and they are broke so the NHS can do the same thing. The NHS is very good at quality assurance, stakeholder involvement and sustainable supplier management in relation to these systems as evidenced by the clinical and evidence-based assessments. Examples of good practice to replicate are the volume of NVBP that allows centralisation, involvement of NHS stakeholders and use of the balanced score card.

5.2. Implementation Considerations and Adaptation Requirements

In addition, the institutional, economic and political settings should help facilitate the transfer of procurement practices into a health system. The issues relating to market structure (particularly the degree of rivalry between suppliers and their production capacity) and regulatory mechanisms are the two key factors that have made the Chinese NVBP system successful. Health systems that adopt a similar pattern should explore the existence of those requirements in their markets. Equally, the NHS collaborative approach requires openness and evidence-based decision making and the institutional capacity to engage with stakeholders. Perhaps, a practical approach may not exist in health systems with weak institutions. Screening may be an option; in systems which display elements of both the two systems, it may offer the most suitable solution to a large proportion of healthcare settings. That is, introducing China-based approaches to volume-based negotiation techniques to a NHS style purchasing organization, or more quality assurance on NHS style basis to a more centralized purchasing organization.

5.3. Risk Mitigation and Success Factors

These two systems have shown how it is possible to reduce the following risks in healthcare procurement reform: securing supply security through different types of supplier systems and volume

guarantees; securing quality through standardized specifications and performance monitoring in the NVBP system; engagement of stakeholders and gradual implementation in the NHS system, to reduce the risks of disruption and to increase the flexibility to deal with unplanned situations. And the NHS system's focus on the use of evidence and constant monitoring as to how the system is performing, as the mechanisms for recognizing and responding to new risks. A number of success factors were identified in both systems, such as a strong political support of the reform, more resources to carry out the reform, intense communication with stakeholders, and a well-developed monitoring and evaluation system. Hence, it is important to recognize that an effective procurement reform will take several years, spanning over several years, and that strategies need to be adaptable in light of new evidence and changing circumstances.

6. Future Research Directions and Limitations

6.1. Research Gaps and Opportunities

The comparative studies identified several gaps in knowledge that would be advanced by further research on the optimization of healthcare procurement. Long-term effect studies into the sustainability of cost savings and quality results would extend the knowledge base on the longevity of different approaches to procurement. Research into the implications for innovation of different models of procurement might help inform the policy debate over how much focus to give to reducing costs versus continuing technological development. Cross-cultural research into the adaptability of different procurement systems across health care settings and institutions would help clarify the extent to which effective practices in one setting can be applied in others. This research could explore the impact of cultural, political, and economic factors on the success of different procurement approaches.

6.2. Methodological Considerations and Limitations

However, dependence on published research may result in publication bias towards positive results and may not reflect all relevant implementation challenges and outcomes. Further, the two systems have different approaches to, and standards for, measurement making them difficult to directly quantitatively compare. Both systems are dynamic and findings based on them may quickly become obsolete as the two systems evolve and adapt. Both systems have been recently significantly reformed so the availability of data for sustainability and long-term effectiveness analysis is limited.

7. Conclusion

This research paper employs a comprehensive comparative analysis of the procurement system of National Health Service (NHS) in the United Kingdom and the National Volume-Based Procurement (NVBP) system in China to explore the impacts of different governance and operating mindsets on healthcare supply chain performance. The results show that the NVBP system used in China has tremendous potential for fast and large-scale cost savings, with an average of 52 percent across product groups, but it is facing challenges in the sustainability of the long-term suppliers and the incentives for innovation. In contrast, the NHS procurement system, which is relatively less aggressive in cost savings, turns out to be more effective in ensuring quality, interactions with stakeholders and governance transparency. The results of this study show the effectiveness of a procurement model in reducing spending and achieving balance between efficiency, quality and sustainability. The overall finding of this research suggests that hybrid approaches, which incorporate the strengths of the Chinese NVBP centralized purchasing system in cost savings and quality-based and participatory governance systems of NHS, would be an ideal way for health systems to achieve financial sustainability and clinical quality.

Several implications and future directions can be drawn from this research. First, policymakers should adapt these two procurement models in a context-sensitive way to avoid compromising innovation capacity and supplier sustainability in the name of saving costs. Second, health systems

in developing countries may adopt centralized negotiation approaches of NVBP to save costs while enhancing quality engagement and participation of NHS. Future research may explore the sustainability of cost savings in the long term and the dynamic effects of procurement reform on innovation system and draw cross-national comparative cases to explore how the institutional context would affect implementation outcomes. Given the increasing importance of resilient and adaptive procurement in the post-pandemic world, it is imperative to continuously evaluate and respond to evidence. By drawing lessons from both NHS and NVBP, health systems can design procurement strategies that are not only cost-effective but also equitable, innovative, and sustainable.

References

- [1] Parmar, D., Mathauer, I., Bloom, D., Dkhimi, F., Abuosi, A.A., Chen, D., Chukwuma, A., de Claro, V., Comsa, R., Domingo, A.F. and Doroshenko, O. Adjustments in purchasing arrangements to support the COVID-19 health sector response: evidence from eight middle-income countries. *Health policy and planning*, 2024, 39(2), pp.213-223.
- [2] Sanderson, J., Lonsdale, C., Mannion, R. and Matharu, T. Towards a framework for enhancing procurement and supply chain management practice in the NHS: lessons for managers and clinicians from a synthesis of the theoretical and empirical literature. *Health Services and Delivery Research*, 2015, 3(18), pp.1-134.
- [3] Hinrichs, S., Jahagirdar, D., Miani, C., Guerin, B. and Nolte, E. Learning for the NHS on procurement and supply chain management: a rapid evidence assessment. *Health and Social Care Delivery Research*, 2014, 2(55), pp.1-132.
- [4] Sanchez-Graells, A. Centralisation of procurement and supply chain management in the English NHS: some governance and compliance challenges. *N. Ir. Legal Q.*, 2019, 70, p.53.
- [5] Chang, Q., Tian, Y., Gao, L. and Xia, N. Challenges and countermeasures for China's centralised volume-based procurement policy in healthcare. *The International Journal of Health Planning and Management*, 2024, 39(5), pp.1330-1349.
- [6] Zhu, Z., Wang, Q., Sun, Q., Lexchin, J. and Yang, L. Improving access to medicines and beyond: the national volume-based procurement policy in China. *BMJ Global Health*, 2023, 8(7), p.e011535.
- [7] Chen, Y., Ji, X., Xiao, H., Unger, J.M., Cai, Y., Mao, Z. and Yeung, K. Impact of the pilot volume-based drug purchasing policy in China: Interrupted time-series analysis with controls. *Frontiers in Pharmacology*, 2021, 12, p.804237.
- [8] Xing, Q., Tang, W., Li, M. and Li, S. Has the volume-based drug purchasing approach achieved equilibrium among various stakeholders? Evidence from China. *International Journal of environmental research and public health*, 2022, 19(7), p.4285.
- [9] Li, X. and Xu, J. Does China's national volume-based drug procurement policy promote or hinder pharmaceutical innovation?. *Frontiers in Pharmacology*, 2024, 15, p.1392239.
- [10] Hu, Y., Chen, S., Qiu, F., Chen, P. and Chen, S. Will the volume-based procurement policy promote pharmaceutical firms' R&D investment in China? An event study approach. *International Journal of Environmental Research and Public Health*, 2021, 18(22), p.12037.
- [11] Geropoulos, N., Voultsos, P., Geropoulos, M., Tsolaki, F. and Tagarakis, G. Hybrid model: a promising type of public procurement in the healthcare sector of the European Union. *Frontiers in Public Health*, 2024, 12, p.1359155.
- [12] Bowden, N., Figueroa, J.F. and Papanicolas, I. Bridging borders: Current trends and future directions in comparative health systems research. *Health services research*, 2024, 59(6), p.e14385.
- [13] National Audit Office. NHS Supply Chain and efficiencies in procurement. NAO Report, 2024.