

Supply chain management and health services research: Aligning strange bedfellows

1 | INTRODUCTION

As an evolving field, health services research has worked to define its parameters as a multidisciplinary field about access, quality, cost, and the well-being of populations.¹ And while there is a sense of the importance of the impact of health technologies, our review of the health services research literature revealed little attention to supply chains in general, including their policy, management, cost, and impact on outcomes. Importantly, our review also revealed virtually no mention of the preparedness of the system to deal with supply device and supply policy inadequacies such as those experienced during COVID-19.

We believe that infusing a supply chain management lens into health services research provides investigators with access to a nexus of theoretical frameworks that integrate interorganizational relationships, micro and macroeconomics, regulation, intermediation, and even a sociological component. Thus, we are grateful for the article in this issue by Grennan, Kim, McConnell, and Swanson,² which studies an essential and often overlooked component of health services: the medical devices supply chain. While COVID-19 has accelerated interest in the supply chain, especially around the device sector and its management, inquiry into this area precedes the virus's arrival.³ This commentary is grounded in our review of the Grennan et al. paper regarding its contribution to understanding variation in medical device prices, our experiences in research that bridges the gap between supply chain and health services research,⁴ and our belief that a supply chain perspective can improve health services in the post-COVID environment.

2 | THE MEDICAL DEVICES SUPPLY CHAIN IN CARDIAC CARE

Because health care supply expenses are the second-largest expense category (after labor), effectively managing costly medical supplies, such as implantable devices, bears significant value to the health system.⁵ While prior research recognized the variation in medical device prices,⁶ and their substantial variation,⁷ Grennan and colleagues' cardiac unit scrutiny, with a focus on both costs and management, is especially relevant in the effort to untangle the reasons for high levels of cost variation among some cardiac products and relatively little variation in others.

The importance of a focus on cardiology device costs and cost variance is reflected in the growth of the global interventional cardiology market, which was 14 billion US Dollars in 2019 and is expected

to reach 16.2 billions in 2027.⁸ As technology advanced between 2006 and 2014, we witnessed important changes in the price of stents, one set of categories considered by Grennan et al., with bare-metal stent prices dropping from approximately \$1000 to just over \$600 and drug-eluting stents, which became a standard of care, having prices drop from approximately \$2300 to \$1400.⁹ Their research reveals that the price variance of stents is significantly lower than many other cardiac devices.

Gannon et al. contribute to our understanding of the factors underlying such variation. They bring to the forefront the role of management in cost reduction in addition to a number of factors, including volume committed purchasing through group purchasing organizations (GPOs), physician integration, standardization as it associates with the reduction of the supplier base, effective value analysis processes that bring clinicians together to agree on products and commit to a brand, and so forth. Their finding that the quantity of the same device purchased from the same vendor at the same hospital is important for savings attests to the importance of appropriate supplier base reduction, a foundational concept of supply chain management. This suggests the importance of incorporating into study design, not just generic management practices but practices that have been associated by supply chain researchers with the strategic management progressive practices—practices that can drive a more effective medical device supply chain.³ In the following sections, we elaborate upon a number of these practices, which, if incorporated into study design, will aid health services researchers bring clarity to this much-needed area of inquiry—not just for cardiology, but for other high supply cost growth areas such as orthopedics and spine.

Their contention that better management practices are but one of several mechanisms to “chip away at the large potential savings in hospital purchasing”² and that investments in management practices may be appropriate to achieve future savings opens up the door for future health services and management research into the mix of value-added management practices and provides a reason for further consideration for supply chain management investment by hospital leadership.

3 | FACTORS THAT INFLUENCE THE HEALTH CARE SUPPLY CHAIN

3.1 | Medical device innovation

Over the last decade, the rate of innovation in many areas of cardiology has decreased while hospitals and payors increased their

attention toward costs. Kruger and Kruger¹⁰ point out that several cardiac implant categories have seen significant declines in pricing in recent years. And while there was a commoditization of bare-metal stents in favor of drug-eluting stents, the introduction of the significantly higher priced biodegradable stents has led to great cost escalation. A discussion of the differences between “commoditized products” (those with few differences and multiple sources) versus those where there is clinician contention as to the appropriate product and fewer choices might well have helped to explain gaps in prices. Future research across medical device categories such as orthopedics and spine that scrutinizes pricing and technology adoption rates by practitioners is much needed. It is also important to understand that it is not all about price—but that innovations, such as those providing for noninvasive procedures, may well change practice and the value that is brought to the patient and consequently changes in volumes purchased and pricing.

3.2 | Regulation and cost reduction strategies

Bundled payments and gainsharing arrangements are designed to impact device costs for supply-intensive procedures. Some products are “pass-throughs,” not included in global reimbursement programs. Scrutiny of how these factors are integrated into the hospital and the impact of altering incentives will clarify policy evaluation and its development. The early work on drug-eluting stent utilization, which demonstrated that gainsharing reduced costs for coronary stent patients while leaving quality and access unharmed, provided an important model for researchers seeking to understand the benefits of incentive-based schemes.¹¹

3.3 | Value analysis and comparative effectiveness research

Health care organizations have become increasingly disciplined in assessing new products and product variation. Yet, there is a lack of research on equivalent products within a category, as well as a lack of price transparency.⁷ However, the research into the performance of implantable devices, such as stents, is increasingly robust and may contribute to the demonstration of product equivalencies, resulting in the ability for buyers to go into the market with commitments to high volumes with resultant leverage for negotiating lower pricing.¹² Research on value-based purchasing and purchasing innovation provide important foundations for future health service research into the impact of evidence-based purchasing and its impact on cost.^{13,14}

3.4 | Clinician incentives and preferences

Physicians, particularly ones in supply-intensive disciplines such as cardiology and orthopedics, have been described as surrogate buyers who apply their professional expertise and autonomy to select the

products on behalf of hospitals and patients.¹⁵ Physicians take great care in choosing the appropriate medical devices and acknowledge the importance of cost as a selection criterion. However, they also exhibit limited knowledge and attention to prices in their supply selection efforts.¹⁶ Much of the tension between the procurement and clinical realms in health care results from the limited formal education and limited information transparency that physicians receive about supply chain management, both during training and once in practice.¹⁷ Using AHA survey data as a proxy, by assigning physicians on the basis of their being in “high-integration” affiliated organizations, Grennan et al.’s study considers the impact of physician integration on cost. Our research suggests that such a proxy may merely scratch the surface regarding the presence in a high-integration system as incentivizing physicians to consider their product selections’ cost and procurement implications.⁴ As we have suggested, participating in gainsharing and other incentives may have a strong impact on physician utilization of costly products.

4 | THE SUPPLY CHAIN PERSPECTIVE FOR A POSTPANDEMIC HEALTH SERVICES RESEARCHER

In this COVID-19 era, no industry lacks a supply chain discussion, from electronics, automobiles, agriculture, imported goods, and vaccines to a simple commodity like toilet paper. Health care is no exception. And while there has never been a shortage of opportunities and research questions in health care’s “ailing supply chain,”¹⁸ the past 2 years have pushed supply chain issues to the forefront of the agendas and minds of health care executives and policy makers across the globe. Perhaps a launching point for progress is expanding the focus from the supply chain’s triple aim of cost, quality, and outcomes to include supply chain resilience and preparedness, as discussed below, in the mission statements for organizations in an industry characterized by high resource dependency.

4.1 | Management of supply risk

A firm that manages and monitors supply chain risk across numerous industries reported that supply chain disruptions were 67% higher in 2020 than in 2019.¹⁹ We are experiencing a paradigm shift, in health care and other industries, from a focus on supply chain efficiency (i.e., cost reduction) toward one of supply chain resiliency and contingency planning. It has been revealed that supply chains are more delicate than previously understood, and other considerations must rise above cost reduction. Pervasive ambitions in Lean Management, Six Sigma, and similar programs that reduce inventory and costs over the past few decades have left many medical devices to supply chains vulnerable to disruptions. Today, discussions about safety stock and business continuity planning are ongoing at all levels of organizational governance, from departmental units up to the highest levels of the federal government. The role of the Strategic National Stockpiles

continues to be cast as a backup with recent proposals for engagement of local entities developing shared safety stocks.^{20,21} It is clear that the health sector, which embraced just-in-time (JIT) inventory and reliance on suppliers and intermediaries, must incorporate into their planning, preparedness and its financing for future disruptions.

4.2 | Recognizing the dangers of resource dependency

The resource dependency for health care products interacts significantly with the dependence on other industries. There are anticipated shortages and resultant price increases in medical devices dependent on semiconductors. In October 2021, the Wall Street Journal reported the shortage of chips for pacemakers, ultrasound companies, and other device makers.²² In November 2021, the Advanced Medical Technologies Association (AdvaMed), which represents distributors of medical devices, urged the Department of Commerce to act on the semiconductor industry to “ensure that it does not cause supply chain disruption that affects the delivery of healthcare in the United States.”²³

4.3 | Supply chain integration

The long-time focus on integration in health care systems overlooks a much researched and important area of supply chain management integration, which breaks down to integration with suppliers, peers, intermediaries, customers, or between units within the organization.^{24,25} Buyer-supplier integration with suppliers and intermediaries such as GPOs focuses on deemed strategic partners to the hospital to facilitate innovation, clinical research, and support new services and procedures.²⁶ The physician-hospital integration can represent a form of supply chain integration, such as when physician incentives drive supply selection decisions.²⁷ A strong case for horizontal supply chain integration to improve performance can generally be made with decentralized health systems or recently merged systems. Still, many cases demonstrate that executing on said integration is challenging. Supply chain management can be among the most problematic areas to integrate. Many merged systems maintain disjointed procurement operations years into the merger (e.g., separate procurement departments, multiple supply information systems, multiple GPOs, and overlapping contracts). Others, through the development of pools and consolidated service centers, have been able to incorporate disparate intermediaries.²⁸ Health services research could bring much clarity to this important area.

5 | CONCLUSION

With supply chain management being such an essential aspect in health care quality, costs, patient outcomes, and preparedness, surprisingly little about this discipline is discussed in the health services literature. Searching the Health Services Research journal for terms

such as “supplies,” “supply chain,” “materials management,” or “medical devices” produced almost no relevant results. The health care supply chain remains relatively invisible by a health services research community that already has its hands full with topics that include quality of care, policy, modes of health delivery, a myriad of clinical considerations, payment/reimbursement, and so on. Similarly, the National Academy of Medicine provides rich research agendas in cutting-edge topics such as A.I.-driven analytics, care integration, performance measurement, and more.²⁹ However, it provides no mention of the evolving world of procurement, supply chains, and management of medical equipment and devices so critical to delivering care.

Work in this area by Lawton Burns,¹⁷ Jamie Robinson,^{6,14} and our own work,^{3,4,27} have extended the knowledge of the health care supply chains, buyer-supplier relationships, and price economics of medical devices, all of which ultimately drive availability, cost, and quality of health care services. Nonetheless, we believe that supply chain research questions and opportunities in this domain are emerging faster than ever before, requiring greater attention from the broader health services community. Grennan et al.'s article is a great step in that direction.

When humming along efficiently and adequately, health care supply chains are hardly noticeable, but disrupting their rhythm reveals how severe of an operational bottleneck they can be. The absence of masks and gowns was just as devastating to the health care sector as the continuing shortage of semiconductors paralyzing the automobile industry and costing over 200 billion US Dollars.³⁰ Interestingly, these are products that, in many ways, had become commodities.

The supply chain can be a facilitator for excellence or a system's Achilles heel. Hopefully, this commentary stimulates an interest in essential questions raised by supply chain management and strategy scholars and will promote inquiry, by health services researchers, into this critical area.

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