

THE ROLE



OF DOCTORS



IN KUWAIT'S



HEALTHCARE



COSTS

Yousef Abdulsalam

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The Role of Doctors in Kuwait's Healthcare Costs

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Abstract

In healthcare supply management, the physician's role in supply selection, driven largely by their clinical expertise, directly impacts hospital cost performance. Previous research suggests physicians have limited regard to the cost implications of supplies they use or prescribe, even when it does not adversely impact clinical quality. The purpose of this study is to assess the perceived importance and attention that physicians give to the costs of medical supplies in a public healthcare system and compares between physician cost perceptions of pharmaceutical products and medical devices. Physicians working in Kuwait's public health sector were asked to estimate the cost of 18 common pharmaceutical products and medical devices. Estimates within 25 percent of the actual cost were considered accurate. One-hundred and four responses were gathered from physicians working in Kuwait's public health sector. On average, physicians accurately estimated only 22 percent of pharmaceutical products and 14 percent of medical devices. Physicians indicated cost should be an important supply selection criterion but generally indicated limited accessibility to cost information. Hospital administrators should consider increasing accessibility to cost information and involving physician leaders in procurement and supply rationalization initiatives. Education about supply management and cost containment may hold value for both physicians and the healthcare system.

Introduction

Healthcare delivery requires many components in order to be effective and efficient. An important and often overlooked component is the supply chain of medical supplies and equipment. Supply chain management is the discipline that manages the procurement, production, and logistics functions involved in moving goods and services to customers. Health sector supply chains form particularly complex networks with many players involved. A combination of several characteristics found in these supply chains distinguishes them from others: a high degree of intermediation, high level of regulation, the range and criticality of healthcare supplies, and the mission of healthcare organisations

Hospital supply expenses account for the second largest cost category at hospitals after salary expenses, with pharmaceuticals and medical devices accounting for most of the spend. Even after excluding non-medical supplies (food, equipment, linens, maintenance supplies, and so forth), pharmaceuticals and medical devices generally make up 15 percent of total hospital expenditure.¹ Many studies have identified ample opportunities to improve healthcare's supply chain performance, but the complex nature of this supply chain presents many challenges that hinder this pursuit.²

Supply expenses vary drastically across different patients and different treatment needs. Surprisingly, similar patients receiving the same treatment plan may each incur significantly different supply costs depending on the institution where patients are being treated and the physician that treats them. Many times, different treatment paths emanate from the nature of physicians' professional work, characterised by autonomy and knowledge intensity. Price differences for the same product at different hospitals may be a result of different contracts and negotiation with the manufacturers, who generally guard pricing information so hospitals and physicians cannot easily compare product costs.³ A recent study shows that medical device costs may be multiple times more expensive across countries.⁴ Significant price variations in supplies have also been observed across hospitals within the same city.⁵ This is particularly true in supply-intensive specialties such as

¹ Yousef Abdulsalam and Eugene Schneller, 'Hospital Supply Expenses: An Important Ingredient in Health Services Research', *Medical Care Research and Review*, 24 July 2017, <https://doi.org/10.1177/1077558717719928>.

² Vikram Bhakoo and Thomas Y. Choi, 'The Iron Cage Exposed: Institutional Pressures and Heterogeneity across the Healthcare Supply Chain', *Journal of Operations Management* 31, no. 6 (September 2013): pp. 432–49, <https://doi.org/10.1016/j.jom.2013.07.016>; Kathleen E. McKone-Sweet, Paul Hamilton, and Susan B. Willis, 'The Ailing Healthcare Supply Chain: A Prescription for Change', *The Journal of Supply Chain Management* 41, no. 1 (December 2005): pp. 4–17, <https://doi.org/10.1111/j.1745-493X.2005.tb00180.x>.

³ Mark V. Pauly and Lawton R. Burns, 'Price Transparency For Medical Devices', *Health Affairs* 27, no. 6 (1 November 2008): pp. 1544–53, <https://doi.org/10.1377/hlthaff.27.6.1544>.

⁴ Martin Wenzl and Elias Mossialos, 'Prices For Cardiac Implant Devices May Be Up To Six Times Higher In The US Than In Some European Countries', *Health Affairs* 37, no. 10 (1 October 2018): pp. 1570–77, <https://doi.org/10.1377/hlthaff.2017.1367>.

⁵ Reed Abelson, 'Pricing Power at Risk for Orthopedics Makers', *The New York Times*, 29 June 2006, sec. Business, <http://www.nytimes.com/2006/06/29/business/29place.html>; James C. Robinson et al., 'Variability in Costs Associated with Total Hip and Knee Replacement Implants', *The Journal of Bone and Joint Surgery. American Volume* 94, no. 18 (19 September 2012): pp. 1693–98, <https://doi.org/10.2106/>

cardiology and orthopedics, where the cost of supplies forms a significant portion of the total cost of patient treatment.⁶ Even with relatively low-cost pharmaceuticals, differences between branded drugs and generic drugs over a patient's treatment cycle may translate to thousands of dollars.⁷

A major player in the healthcare supply chain is the physician, who selects the supplies on behalf of the patient and sometimes directly administers them. Estimates suggest that physicians have direct influence over 60 percent of hospital supply expenditure.⁸ And while they hold a significant amount of knowledge about the properties and applications of medical supplies, physicians generally pay little attention to their costs and sourcing implications.⁹ It is unclear how aware physicians are about the costs of devices and pharmaceuticals they commonly select for use.

To gauge physician cost awareness, this study developed and administered a survey asking physicians practicing in Kuwait's public health sector to estimate the costs of highly recognised medical products. While physicians showed strong familiarity with the medical items presented, they conveyed limited cost knowledge.

Kuwait's health system provides a case study that can be generalised to public health systems that span a small-to-medium size metropolitan region. For example, Kuwait's system can be conceptualised as a self-contained Accountable Care Organization (ACO), a model (whereby a group of healthcare providers collaborate in the care and treatment of a pre-defined population or region) that is becoming increasingly common in the United States.¹⁰ The availability of funding, access to human resources, and abundance of hospital bed capacity in the country allow such a health system to focus on developing the components of healthcare delivery, such as the health sector supply chain, rather than scurrying to meet basic healthcare demand.

JBJS.K.00355.

⁶ Kanu Okike et al., 'Survey Finds Few Orthopedic Surgeons Know The Costs Of The Devices They Implant', *Health Affairs* 33, no. 1 (1 January 2014): pp. 103–9, <https://doi.org/10.1377/hlthaff.2013.0453>.

⁷ William H. Shrank et al., 'The Use Of Generic Drugs In Prevention Of Chronic Disease Is Far More Cost-Effective Than Thought, And May Save Money', *Health Affairs* 30, no. 7 (1 July 2011): pp. 1351–57, <https://doi.org/10.1377/hlthaff.2010.0431>.

⁸ J. C. Lerner et al., 'The Consequence Of Secret Prices: The Politics Of Physician Preference Items', *Health Affairs* 27, no. 6 (1 November 2008): pp. 1560–65, <https://doi.org/10.1377/hlthaff.27.6.1560>.

⁹ G. Michael Allan, Joel Lexchin, and Natasha Wiebe, 'Physician Awareness of Drug Cost: A Systematic Review', ed. Suzanne Hill, *PLoS Medicine* 4, no. 9 (25 September 2007): e283, <https://doi.org/10.1371/journal.pmed.0040283>.

¹⁰ Lawton R. Burns and Mark V. Pauly, 'Accountable Care Organizations May Have Difficulty Avoiding The Failures Of Integrated Delivery Networks Of The 1990s', *Health Affairs* 31, no. 11 (November 2012): pp. 2407–16.

Background

Kuwait's demand for healthcare services has been increasing rapidly, driven by an increase in population, greater life expectancy, and lower infant mortality. Despite a highly affluent population that enjoys a high per-capita GDP, the population suffers from high rates of non-communicable diseases, such as diabetes, cardiovascular diseases, and cerebrovascular diseases.¹¹ These factors, among others, have placed a significant burden on Kuwait's healthcare system. Although Kuwait's health spending relative to GDP (4 percent) may not appear high compared to the world average (9.9 percent), government health expenditure exceeded \$5 billion USD or \$1,200 per capita in 2015.¹² Compared to its GCC peers, Kuwait's healthcare supplies expenditure is higher as a percentage of total expenditure and as a percentage of GDP.¹³

In Kuwait, public health expenditure on pharmaceuticals and medical devices in 2015 was estimated at 800 million USD (243 million KWD), up from 580 million USD (177 million KWD) in 2012.¹² Kuwait's hospital supply expenditure makes up approximately 16 percent of total hospital expenses. The Central Medical Stores, a department in Kuwait's Ministry of Health, is responsible for the procurement of medical supplies for public health institutions, aggregating their procurement requests and negotiating contracts with international suppliers for pharmaceuticals, consumables, capital goods, and medical devices.

Approximately 65% of the Kuwaiti population is covered by a public health plan, with expatriates paying subsidised fees for non-emergency health services.¹⁴ The public health sector accounts for 80% of patient discharges in the country, with six general hospitals and eleven specialty care hospitals.¹⁵ An unintended consequence is a limited attention given to the costs of the pharmaceuticals and medical devices. Physicians have little incentive to factor costs in their decision-making even when considering clinically equivalent alternatives as it impacts neither their clinical work nor their compensation. An indication of this is the very low market penetration of generic drugs in the country, where generic products account for only 21.6% of the total volume of prescribed drugs. In contrast, generic drugs accounted for 89% of prescriptions in the United States¹⁶ and 81% in the United Kingdom.¹⁷ The limited incentives to reduce costs may be driven by the universal health

¹¹ Kuwait Ministry of Health, 'World Health Survey in Kuwait: Summary Report 2013' (Kuwait, 2015).

¹² Kuwait Ministry of Health, 'Annual Health Report 2015: 52nd Edition' (National Centre for Health Information Health & Vital Statistics Division, 2017); The World Bank, 'World Health Organization Global Health Expenditure Database', 2015.

¹³ BMI, 'Kuwait Pharmaceutical & Healthcare Report', 2017.

¹⁴ IMS Health, 'Market Overview 2016, Kuwait', 2016, <https://www.tfhc.nl/wp-content/uploads/2017/08/KLSC-IMS-Kuwait-Health-Industry-Report-2016-vF2.pdf>

¹⁵ IMS Health.

¹⁶ Association for Accessible Medicines, '2017 Generic Drug Access and Savings in the U.S. Report', 2017, <https://accessiblemeds.org/resources/blog/2017-generic-drug-access-and-savings-us-report>

¹⁷ NHS Business Services Authority, 'Medicines Optimisation - Generic Prescribing' (National Health Services, 2018), <https://www.nhsbsa.nhs.uk/epact2/dashboards-specifications/medicines-optimisation-generic-prescribing>

coverage in the country, which gives physicians even less reason to be concerned about costs. However, limited cost awareness among physicians is not only observed in countries with universal healthcare.¹⁸ The medical devices industry poses a greater challenge with even less price transparency and product alternatives relative to the pharmaceuticals industry, even in mature health systems.

Despite the physician's important role in supply selection and hospital costs, they receive limited education in healthcare supply management.¹⁹ The medical college in Kuwait is no exception as medical students receive no training or education about hospital operations and supply chain management. Substitutable supply options (i.e., different brands of the same medical item) vary greatly in terms of their costs. Between two clinically equivalent medical items, physicians generally select one based on their personal experience, training, and relationship with supplier representatives rather than on the basis of cost.²⁰ Supplier representatives frequently interact with physicians to present them with new technologies, educate them about products, and provide clinical assistance related to the technical products. Strong relationships form between physicians and supplier representatives, which naturally¹⁸ influences physician decision-making via the 'value-added' services that some brands provide directly to the practitioners.²¹

Previous studies have demonstrated the lack of awareness that physicians hold with regards to drug costs. Our study extends this line of inquiry further by assessing physician cost perceptions of both pharmaceuticals and medical devices and attempts to determine the factors that provide physicians with more knowledge about supply costs. Specifically, we consider physicians in Kuwait, a country that provides universal health coverage to an affluent population, but whose medical supply spending exceeds its neighboring peers.²²

Methods

Survey Instrument

A survey instrument was developed to measure physicians' cost perceptions. In total, the survey was confined to 30 questions to ensure that the time required to complete did not exceed ten minutes. The survey was presented in an electronic format and made accessible online. The first section of the survey asked physicians to estimate the cost of 18 medical items. The second section of the survey asked respondents to answer 12 general and demographic questions.

¹⁸ Allan, Lexchin, and Wiebe, 'Physician Awareness of Drug Cost.'

¹⁹ Jim Eckler and Eugene S. Schneller, 'Physician Leaders' Roles in Supply Chain Management', *Physician Leadership Journal* 2, no. 6 (November 2015): pp. 22–25.

²⁰ Okike et al., 'Survey Finds Few Orthopedic Surgeons Know The Costs Of The Devices They Implant.'

²¹ Lawton R. Burns et al., 'Implant Vendors and Hospitals: Competing Influences over Product Choice by Orthopedic Surgeons', *Health Care Management Review* 34, no. 1 (January 2009): pp. 2–18, <https://doi.org/10.1097/01.HMR.0000342984.22426.ac>

²² BMI, 'Kuwait Pharmaceutical & Healthcare Report.'

The first section of the survey presented physicians with eight different pharmaceutical drugs and ten different medical devices. The drugs in the survey were selected to ensure that the majority of physicians, regardless of their specialty, would recognise them. Several steps were taken to ensure this outcome. First, we reviewed the literature to aggregate a list of drugs used in similar studies.²³ Subsequently, a focus group, composed of four physicians from various specialties, was consulted to refine this list and identify drugs that are commonly used in Kuwait's hospital environment. Finally, the refined list was cross-referenced with the World Health Organization's List of Essential Medicines.²⁴ The final list consisted of eight drugs commonly prescribed to hospital patients. A picture of each drug's packaging was displayed in the survey.

Ten medical supplies were selected after discussion with the focus group, ensuring high recognisability of items and a wide price range. Items ranged from a few dollars to several thousand dollars. To avoid haphazard guessing, respondents could skip items they did not recognise. A picture of each medical item was displayed in the survey. Physicians were then asked to respond to questions about (1) their overall knowledge of the listed items, (2) their confidence in the estimates they provided, (3) the accessibility of cost information at their institution, and (4) their perceived importance of costs. Finally, demographic information about the physicians was collected.

The survey instrument is presented in Appendix A.

Data Collection

The target respondents were physicians working in Kuwait's public health sector. Our inquiry was not confined to a specific clinical specialty or physician rank. A convenience sampling approach was taken to maximise potential respondents, using the 'snowball sampling' approach. The researchers disseminated survey links with a concise explanation of the study to their physician contacts (mainly via WhatsApp), who were then asked to relay the message to their colleagues in turn and report the number of people the message was forwarded to. The data collection period occurred in October 2018 for a period of three weeks with reminder messages sent ten days after the initial request. Approximately 50 percent of the responses were received within the first four days of data collection.

For the medical items included in the survey, data about the actual cost (on the health system) was obtained from several sources. Wholesale and retail drug prices are regulated by the Ministry of Health's Pharmaceuticals and Herbal Medicines Registration & Control Administration and published on their website.²⁵ For medical devices, the prices

²³ G. Michael Allan and Grant D Innes, 'Do Family Physicians Know the Costs of Medical Care? Survey in British Columbia', *Canadian Family Physician February* 50, no. 2 (February 2004): pp. 263–70; Allan, Lexchin, and Wiebe, 'Physician Awareness of Drug Cost'; Lisa Korn et al., 'Improving Physicians' Knowledge of the Costs of Common Medications and Willingness to Consider Costs When Prescribing | SpringerLink', *Journal of General Internal Medicine* 18, no. 1 (January 2003): pp. 31–7.

²⁴ World Health Organization, 'The Selection and Use of Essential Medicines 2017', March 2017.

²⁵ State of Kuwait Ministry of Health, 'Drug & Food Supplement Prices', 2018, <https://eservices.moh.gov.kw/drugdetails.aspx>

that apply to public hospitals were obtained from the largest medical supplies distributor in Kuwait. The provided pricing data was cross-checked with a hospital's procurement representative and found to be reliable.

Analysis

We compared the estimates that physicians provided with their actual costs to determine the rate of accuracy in estimating medical items. This is done by first calculating the absolute value of the difference between the estimate and actual cost and then dividing that by the actual cost for each physician-item observation. A binary variable is then assigned to indicate whether the estimate is accurate within a 25% margin of error. In other words, if a provided estimate is within plus or minus 25% of the actual cost, it was considered correct. A 25% margin is the most commonly used similar studies.²⁶ As a sensitivity analysis, all models are re-estimated with a 35% margin of error and findings from the statistical results remain consistent.

A paired two-sample t-test compared the accuracy rate between pharmaceutical items and medical devices. A two-sample t-test determines the likelihood that the average difference between two groups is truly significant as opposed to resulting from random chance. We check for significant differences in mean accuracy of physicians based on education, specialty, and hospital affiliation.

Results

Sample Statistics

The survey was completed by 106 physicians. Table 1 summarises demographic information gathered from the survey. Only four respondents indicated a lack of familiarity with at least one item, and their rate of correct responses was adjusted accordingly. Four other observations were missing some demographic data and were included in the analysis when possible.

The years of professional clinical experience among participants varied between one year to 45 years, with an average of 7.2 years of work experience and a standard deviation of 7.3. Approximately 60 percent of the respondents held the title of Resident, Assistant Registrar or Registrar, with the rest holding more senior positions. The most common specialisation among respondents was Internal Medicine, which is to be expected since Internal Medicine departments are the largest in each of Kuwait's general public hospitals.

In 2015, Kuwait reported a total of 8,105 physicians practicing in the public sector. Just over half (i.e., 4,285) of all physicians practice at one of the six general public hospitals in the country, and another 1,371 practice at tertiary care hospitals.²⁷ In the sample, 76 percent of respondents were practicing at general hospitals.

²⁶ Allan, Lexchin, and Wiebe, 'Physician Awareness of Drug Cost'.

²⁷ Kuwait Ministry of Health, 'Annual Health Report 2015: 52nd Edition'.

Table 1: Sample Descriptive Statistics (n=104)

	n	%
Gender		
Male	63	61.0
Female	41	39.0
Education		
Kuwait University	54	51.9
Royal College of Surgeons in Ireland	13	12.5
Other	33	31.7
Undisclosed	4	3.8
Years of Experience		
0–5	55	52.9
6–10	25	24.0
11–15	12	11.5
16–20	3	2.9
Over 20 years	5	4.8
Undisclosed	4	3.8
Institution Type		
General Hospital	79	76.0
Specialised	8	7.7
Primary Care or Other	9	8.7
Undisclosed	8	7.7

Physician Estimation Accuracy

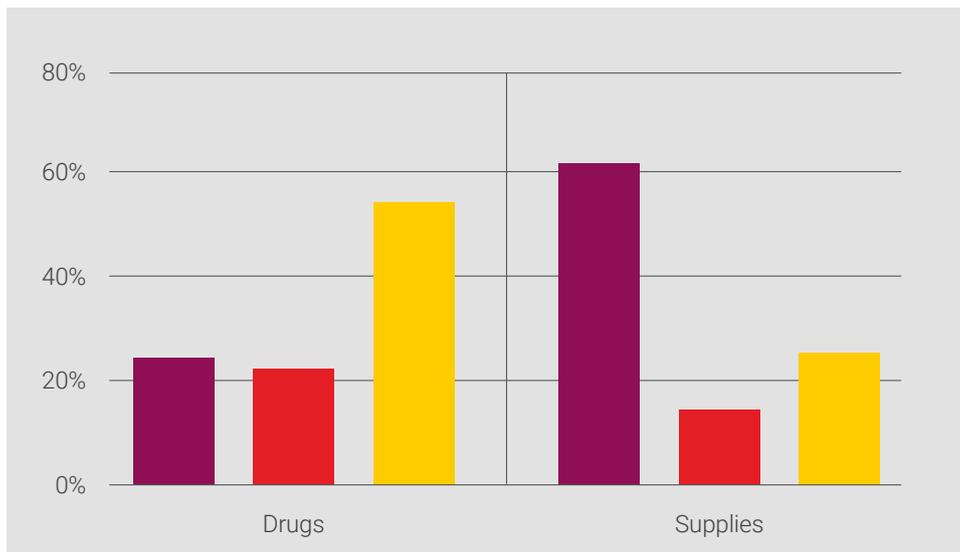
Considering a 25% margin of error, physicians gave an accurate cost estimate for an average of 3.1 of the 18 items (17.9% of the time) with a standard deviation of 1.90. With a 35 percent margin of error, physician estimates were accurate 24% of the time on average. With a 15% margin of error, accurate physician estimates dropped to an average of just 9.6%. In terms of the magnitude of estimation error, the median physician deviation from actual costs was 75% on average.

Physicians overestimated the cost of drugs with an actual price of less than 5 KWD and underestimated the cost of drugs more expensive than 5 KWD. Physician cost estimates

were most inaccurate for the two cheapest drugs on the list, Tramal and Clexane. In terms of medical supplies, physicians underestimated the cost of supplies included in the survey, with the exception of the two cheapest devices. Figure 1 illustrates the frequency that physicians underestimated or overestimated drugs and supplies.

As observable in Figure 1, physicians provided accurate estimates of drug prices ($\mu=0.22$ $\sigma=0.032$) more often than they did for medical supplies ($\mu=0.14$ $\sigma=0.018$).²⁸ The difference was statistically tested via a paired two-sample t-test ($t=3.77$, $df=103$, $p<0.01$) and found to be significant, based on an α of 0.05. The median deviation of the estimates from actual costs for drugs and medical supplies was 85 and 81 percent, respectively. A two-sample t-test shows no statistical significance between the accuracy rates of locally trained versus internationally trained physicians ($t = -1.58$, $df = 102$, $p = 0.12$).

Figure 1: Frequency of Physician Cost Estimations, By Item Category (N=104)



The mean accuracy of Internal Medicine physicians was compared against the mean accuracy of all other specialties. Internal Medicine is the most common specialty both in Kuwait's physician population and our sample. Other specialties could not be isolated due to limited observational data in each group. In terms of drug cost accuracy, Internal Medicine physicians, on average, had 4.7 accurate drug cost estimates compared to 3.9 accurate estimates by physicians of other specialties, a statistically significant difference ($t = -2.61$, $df = 102$, $p = 0.01$).

When it comes to medical devices, there was no significant difference between the average accuracy of estimates given for Internal Medicine versus other specialties. A comparison

²⁸ The symbols μ and σ represent the average and standard deviation of the discussed measure, respectively. The t-statistic (t), degrees of freedom (df) and p-value (p) describe the result of the t-test. In layman's term, the p-value denotes the probability that the tested difference in means is due to random occurrences.

of groups of physicians working at different institutions showed no significant difference in mean accuracy rates across groups.

Physician Perceptions of Medical Supply Costs

Figure 2 provides histograms of the four general survey questions related to supply costs. The specific questions asked, and definitions of their 1 to 5 scales are included in Appendix A. Generally, '1' indicated low agreement to the survey item and '5' indicated high agreement.

Physicians believed that cost is an important supply selection criterion for clinically equivalent items but indicated a low level of accessibility to cost information at their institutions. Physicians also reported that their clinical knowledge of the medical items presented in the survey was relatively high while their cost knowledge was low, as measured by the confidence in the cost estimates they provided. Cost knowledge was positively and significantly correlated with the experience ($R = 0.27, p < 0.05$). No other metric was correlated with experience nor gender.

Figure 2: Physician Perceptions of Supply Costs (N=104)



Discussion

Research Findings

Previous studies have examined physician cost perceptions, and most have concluded that physicians have limited knowledge of medical care costs.²⁹ This study extends this line of inquiry by widening the scope of supplies to include both pharmaceutical drugs and medical devices and considers the factors associated with higher physician awareness. The distinction between drugs and devices is important because drugs are discretely classified, with regulated pricing, a high level of price transparency, and product substitutability. Medical devices, on the other hand, do not share any of these characteristics, posing a challenge for both hospital material managers and physicians in selection and pricing.³⁰

Physician cost perceptions of pharmaceutical supplies in this study are consistent with results from previous studies, summarised in a systematic review by Allan et al.³¹ Across 12 studies that applied the same margin of error ($\pm 25\%$), the median accuracy rate was 29%. The median accuracy rate of drugs in this study was 25%. This study further adds that cost perceptions of medical devices are significantly less accurate than perceptions of the costs of drugs. One reason may be that the price variation of drugs is lower than that of devices. The middle 80% price range of all drugs registered in Kuwait is between 0.820 KWD and 19.500 KWD.³² While we do not have similar data for medical device prices, it is safe to assume that they would exhibit a much wider price range.

Consistent with previous studies, physicians generally overestimated the cost of drugs. Our findings add that medical device prices were much more likely to be underestimated than overestimated (Figure 1). An underestimation of supply costs can lead to a significant amount of waste. For example, a recent study estimated that \$968 worth of unused supplies (about 13 percent of the total procedure cost) go to waste in each neurosurgery operation.³³ The authors also indicate that the surgeon was an important predictor of the amount of waste per surgery. This observation provides an indication that changing surgeon behaviour (through education, incentives or directives) can improve cost efficiency.

Seventy percent of physicians indicated that cost was an 'important' or 'very important'

²⁹ Allan, Lexchin, and Wiebe, 'Physician Awareness of Drug Cost'.

³⁰ Burns et al., 'Implant Vendors and Hospitals'; Pauly and Burns, 'Price Transparency For Medical Devices'; Joseph Walker, 'Medical Technology Firms Branch Out', *Wall Street Journal*, 1 February 2016, sec. Business, <http://www.wsj.com/articles/medical-technology-firms-branch-out-1454364767>; Wenzl and Mossialos, 'Prices For Cardiac Implant Devices May Be Up To Six Times Higher In The US Than In Some European Countries'.

³¹ Allan, Lexchin, and Wiebe, 'Physician Awareness of Drug Cost.'

³² State of Kuwait Ministry of Health, 'Drug & Food Supplement Prices'.

³³ Study was carried out at the University of California, San Francisco. Corinna C. Zygourakis et al., 'Operating Room Waste: Disposable Supply Utilization in Neurosurgical Procedures', *Journal of Neurosurgery* 126, no. 2 (1 February 2017): pp. 620–25, <https://doi.org/10.3171/2016.2.JNS152442>

criterion in selecting between clinically equivalent supply alternatives. However, physicians also indicated very limited access to cost information at their institutions. This contrast is illustrated in Figure 2 and is reflective of the low level of generic drugs substitution in Kuwait.³⁴ Making supply cost information more accessible may be an effective approach to motivate the prescription of generic drugs.

Cost transparency and accessibility may be an effective cost containment strategy in some circumstances, such as with pharmaceuticals, where generic alternatives are readily available with well-established clinical equivalency. However, price transparency alone may be less effective as product complexity increases, partly due to physician–supplier relationships and marketing. Our results show substantially lower accuracy in gauging medical device costs. More efforts may need to be invested in educating physicians about their role in the supply chain. Combining clinical knowledge with an awareness of product alternatives, distribution channels and costs can make a difference in supply chain performance.³⁵ On the other hand, aligning physician incentives with cost efficiency objectives may trigger adverse consequences, such as comprising the patient’s quality of care or encouraging opportunistic behaviour.

Policy Implications and Recommendations

The results of this research provide some guidance to policymakers for improving supply cost efficiency. To become benevolent stewards of the healthcare supply chain, physicians would require three elements: information, incentives and education. Empowering physicians allows them to make decisions and improvements in the system that consider costs.

Increasing Availability of Medical Supply Information

Information useful to improve supply selection decision-making includes product characteristics and pricing, potential product alternatives, efficacy studies and so forth. The Ministry of Health’s current drug look-up e-service is a start, but it should be greatly developed to assist local doctors and augment international medical drug databases. For example, the e-service currently does not allow for searching generic drug names for brand alternatives and prices. Information about medical devices is even harder to come by, both in Kuwait and worldwide. Establishing product equivalency between device alternatives is much more difficult than pharmaceuticals, but can prove to be rewarding given the huge price variations among the former.³⁶

When information is not readily available, it should be created. Senior physicians in each

³⁴ IMS Health, ‘Market Overview 2016, Kuwait’.

³⁵ Korn et al., ‘Improving Physicians’ Knowledge of the Costs of Common Medications and Willingness to Consider Costs When Prescribing | SpringerLink’.

³⁶ Wenzl and Mossialos, ‘Prices For Cardiac Implant Devices May Be Up To Six Times Higher In The US Than In Some European Countries’.

specialty can form 'value analysis teams' to study and consider all aspects of product alternatives used in common diagnoses or procedures in that discipline. They can then recommend best practices and steer the product choice for less experienced physicians.³⁷ Specialised committees composed of clinicians, procurement analysts, actuaries and perhaps economists could publish nation-wide clinical standards and best practices that consider the financial and clinical aspects of treatment and technology choices.

Aligning Physician and Hospital Incentives

Incentivising physicians towards more cost-effective healthcare delivery is also necessary to improve performance. However, one must caution about the unintended consequences of incentive plans that may give rise to self-serving behaviours by physicians. Further research with underpinnings in agency theory and stewardship theory may help identify the right contract structures to set up successful incentive schemes.³⁸ The gain-sharing model is one incentive structure that motivates physicians to consider supply costs while also accounting for clinical outcomes.³⁹ In other countries, bundled payment programs push physicians to account for costs when planning out a treatment strategy or operating procedure.⁴⁰ In instances where treatment costs trickle down to patients, physicians will have to pay closer attention to their prescription habits to cater to their clients both clinically and financially. The United Arab Emirates recently launched an effort to increase the accountability of drug expenditure by transferring the cost difference between the generic and brand drugs onto the patient should a physician prescribe a branded drug.⁴¹ Manufacturers of brand drugs will also have the incentive to push their prices down to remain competitive or risk alienating the physicians prescribing their products.

Educating Physicians About Supply Chain Management

Supply chain education directed towards physicians are generally absent in medical programs worldwide. Physicians represent a crucial node in the supply chain of pharmaceuticals and medical devices, yet they are neither aware of the hospital's procurement process, nor their significant role in it. An introductory-level course about hospital management that covers topics in operations management, finance, inventory management, strategy and human resource scheduling could shape physician behaviours and elevate

³⁷ Kathryn Lang and Bradley Eaton, 'The Value Analysis Team: A Shared Mental Model', *The Health Care Manager* 28, no. 2 (June 2009): pp. 165–71, <https://doi.org/10.1097/HCM.0b013e3181a2cc61>

³⁸ Abdulsalam et al., 'The Impact of Physician-Hospital Integration on Hospital Supply Management'.

³⁹ Jonathan D. Ketcham and Michael F. Furukawa, 'Hospital-Physician Gainsharing In Cardiology', *Health Affairs* 27, no. 3 (1 May 2008): pp. 803–12, <https://doi.org/10.1377/hlthaff.27.3.803>

⁴⁰ Thomas C. Tsai et al., 'Medicare's Bundled Payment Initiative: Most Hospitals Are Focused On A Few High-Volume Conditions', *Health Affairs* 34, no. 3 (1 March 2015): pp. 371–80, <https://doi.org/10.1377/hlthaff.2014.0900>

⁴¹ Sharmila Dhal, 'Generic Drugs Can Be Cheaper than Branded Ones by 60 Percent in Abu Dhabi', *Gulf News*, 15 August 2018, <https://gulfnews.com/uae/generic-drugs-can-be-cheaper-than-branded-ones-by-60-per-cent-in-abu-dhabi-1.2266675>

their role to that of stewards of the hospital itself, rather than just of the patient.

Healthcare institutions should also consider including these topics as part of an orientation program upon recruitment. Future research needs to explore the prevalence of such programs around the world and assess their overall efficacy on various dimensions of hospital performance, including supply management. Combining clinical knowledge with an awareness of supply management, distribution channels and costs has been shown to improve supply chain performance.⁴²

Future Research

Future research should consider a more refined sample to answer questions pertaining to specific physician groups. For example, past research has focused on the cost perceptions of medical items in supply-intensive settings, and where physicians have more selection options, such as in orthopedic surgery.⁴³ Furthermore, considering the moderating effect of different governance structures and physician employment contracts may prove insightful.⁴⁴ For example, comparing physicians in private hospitals, public hospitals, primary care clinics and specialised private practices may reveal differences in cost awareness and attention. These directions of future research can also resolve a limitation in the current study related to the convenience sampling approach, which may introduce bias.

Another track of research should also examine the effects of physician perceptions on costs. Are supply resources utilised more strategically when there is a higher cost awareness among physicians? Past studies indicate that simply displaying the cost of medications and laboratory tests on the computerised physician order entry screens can influence physician prescribing behaviours and reduce overall costs without adversely impact the quality of care.⁴⁵ While such studies are encouraging, the causal logic between physician cost awareness and cost reduction requires further research.

Another avenue for future research is to consider the role and perceptions of other stakeholders, such as supplier representatives, patients, and hospital's procurement agents. With increased access to health information via the internet, affluent patients are becoming more involved in their diagnoses and treatment plans. In what situations do informed patients improve cost efficiency? On the one hand, patients who may sometimes pay out-of-pocket for drugs or medical supplies are expected to be more cost-conscious. On the other hand, patients with public health coverage are more inclined to request the costliest

⁴² Korn et al., 'Improving Physicians' Knowledge of the Costs of Common Medications and Willingness to Consider Costs When Prescribing | SpringerLink'.

⁴³ Okike et al., 'Survey Finds Few Orthopedic Surgeons Know The Costs Of The Devices They Implant'.

⁴⁴ Abdulsalam et al., 'The Impact of Physician-Hospital Integration on Hospital Supply Management'.

⁴⁵ Korn et al., 'Improving Physicians' Knowledge of the Costs of Common Medications and Willingness to Consider Costs When Prescribing | SpringerLink'; Y. C. Lin and S. R. Miller, 'The Impact of Price Labeling of Muscle Relaxants on Cost Consciousness among Anesthesiologists', *Journal of Clinical Anesthesia* 10, no. 5 (August 1998): pp. 401–3.

alternative for peace of mind. This is evident in patient perceptions of generic medications, where they acknowledge the cost-saving potential of generic drugs but are uneager to use them.⁴⁶ In Kuwait's context, the changing reimbursement structure for citizens versus temporary residents may provide a good natural experiment to test physician cost knowledge and prescription behaviours.

Conclusion

Opportunities to improve performance in the supply chains of the health sector remain plentiful. This paper considers one avenue, which involves the role of physicians in supply selection and their potential impact on hospital costs. Our findings indicate that physicians have little awareness about the costs of supplies that they select and use in their service delivery. Accurate information regarding medical device costs appears to be even more elusive to physicians than for pharmaceutical items. While pharmaceutical costs at hospitals in mature healthcare systems are relatively well managed, medical devices continue to pose a challenge across many health systems worldwide.⁴⁷

In Kuwait, the containment of pharmaceutical costs remains a major opportunity with only about 20 percent of drugs dispensed being generic, compared to 80 percent or more in mature health systems.⁴⁸ The United Arab Emirates has recently taken a major step towards supply cost containment by mandating the dispensing of generic drugs at pharmacies for insured patients, with patients able to opt to buy branded drugs by paying the cost difference out of their pocket.⁴⁹ Educating physicians about supply expenses and simplifying their choices are policies that would represent great strides towards improving the efficiency of supply spending in Kuwait's healthcare system.

⁴⁶ William H. Shrank et al., 'Patients' Perceptions Of Generic Medications', *Health Affairs (Project Hope)* 28, no. 2 (2009): pp. 546–56, <https://doi.org/10.1377/hlthaff.28.2.546>

⁴⁷ Wenzl and Mossialos, 'Prices For Cardiac Implant Devices May Be Up To Six Times Higher In The US Than In Some European Countries.'

⁴⁸ Shrank et al., 'The Use Of Generic Drugs In Prevention Of Chronic Disease Is Far More Cost-Effective Than Thought, And May Save Money.'

⁴⁹ Dhal, 'Generic Drugs Can Be Cheaper than Branded Ones by 60 Percent in Abu Dhabi.'

Appendix A

Survey Instrument

Section 1. Pharmaceuticals and Medical Supply Costs	
How much do you estimate the following medical items cost the hospital, in Kuwaiti Dinars? Please provide an educated guess of the value (in KWD) for each of the following items. Input '-1' if you do not recognise the medical item	
<i>Pharmaceutical Supply Costs</i>	
Plavix (Clopidogrel) - Tablet, 28 x 75 mg	[numerical input]
Gasec (Omeprazole) - Tablet, 28 x 20 mg	[numerical input]
Tramal (Tramadol) - Tablet, 10 x 100 mg	[numerical input]
Clexane (Enoxaparin) Syringe, 2 x 0.4mL	[numerical input]
Amoxil (Amoxicillin) - Tablet, 20 x 500 mg	[numerical input]
Rocephin (Ceftriaxone) - I.V. Vial, 1 g	[numerical input]
Klacid (Clarithromycin) - Tablet, 20 x 500 mg	[numerical input]
Augmentin (amoxicillin/clavulanate) - Tab, 14 x 1 g	[numerical input]
<i>Medical Supplies & Devices Costs</i>	
Laprascope - Stryker IDEAL EYES Standard	[numerical input]
Arterial Blood Gas (ABG) Needle - Pack of 100	[numerical input]
Blood, 500 ml, (O, Rh Positive)	[numerical input]
Foley's Catheter (All-Silicone)	[numerical input]
Guidewire for PTCA procedure	[numerical input]
Diagnostic Catheter	[numerical input]
Cardiac Pacemaker - St. Jude Assurity	[numerical input]
Bare Metal Stent	[numerical input]
Drug-Eluting Stent	[numerical input]
Bio-Absorbable Stent	[numerical input]
Section 2. General and Demographic Questions	
Please rate your overall familiarity with the medical items listed in this survey.	1 to 5 scale (1 = 'low', 5 = 'high')
Please rate your overall confidence in the cost estimates you provided.	1 to 5 scale (1 = 'low', 5 = 'high')
How important do you think the cost is in selecting between two clinically equivalent alternatives?	1 to 5 scale (1 = 'not important', 5 = 'very important')
How accessible is supply cost information at your hospital?	1 to 5 scale (1 = 'not at all', 5 = 'easily accessible')
Are you aware of the Kuwait Ministry of Health's drug prices look-up e-service?	[Yes] or [No]
What is your gender?	[Male] or [Female]
What is your medical specialty?	[Text input]
Current Medical Level?	[Text input]
Where did you receive your medical education?	[Text input]
Which year did you graduate medical school?	[numerical input]
Do you work in a private institution or practice?	[Yes] or [No]
Which institution have you worked in the longest?	[Text input]

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