University Economic Bulletin
Vol. 19, No. 1, 2024
Journal homepage: https://ue-bulletin.com.ua/en
Received: 14.02.2024. Revised: 10.05.2024. Accepted: 28.06.2024

UDC 615.12
DOI: 10.69587/ueb/1.2024.26

Pricing in the medical sector: Theoretical foundations and practical aspects

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Abstract. Pricing is one of the components of ensuring competitive conditions in the market: it has its own specificity in the healthcare market, which is characterized by various forms of operation of enterprises, access to goods and services. The purpose of the study was to investigate the methods and approaches to this process in Ukraine, taking into account the peculiarities of the country's development related to the full-scale invasion of the Russian Federation. The methods used in the study were formal and legal (to form logical links between individual regulatory documents) and comparison (to assess the specifics of pricing in the medical sector in different countries). The study assessed the pricing process as such and described the factors that influence it in practice in general and in the medical sector. It was also concluded that understanding the role of this process for both the state and potential clients is important, as it affects economic stability, quality of medical services, social justice. Particular attention was paid to such approaches as "cost+markup" and "market-based". Based on the models built in this paper, it was concluded that these approaches should be used in symbiosis (to focus on both market conditions and the company's goals for forming a margin). Attention was also paid to the Value-Based Pricing approach: it was concluded that it is inherently different from the other two approaches, as it requires much more complex estimates, since it is based on the expected utility of the created product. The study also highlighted the problem of non-transparent pricing as one of the main ones that prevents the formation of effective market conditions. The results obtained in the study can be used both to formulate public policy and to create strategies for individual companies in the Ukrainian market of medical goods and services

Keywords: microeconomics; healthcare; public policy; innovation; market configurations

INTRODUCTION

The process of pricing, which is essentially the formation of a single fair price for a particular good or service, is essential to the existence of any market good. Without the existence of this process, economic agents could not be sure whether the price formed for the good they buy is fair. In Ukraine, the study of this issue is particularly relevant, as the country has certain problems in this sector. They are primarily related to the war and its consequences: the country is suffering from economic difficulties that lead to a decline in living standards and higher prices for healthcare products; at the same time, the demand for medicines and services in this sector is only growing, which leads to a double effect, making it increasingly difficult for the population to afford quality treatment. That is why research into pricing is so important in Ukraine today. There are certain variables in the healthcare industry that should also be taken into account. These include the specifics of the regulatory environment, complex logistics, high research and development costs, certain ethical aspects. This is also the case in Ukraine.

Quite a few scholars have assessed the current state of development of the healthcare sector in Ukraine in their own research, although few works have focused on pricing issues. V.I. Borshch (2020) identified the main features of the functioning of the healthcare market in Ukraine, assessed its current state and inherent trends. This helped to identify certain patterns in the market, such as the dependence of prices and sales on real incomes, the need for further reform, the lack of qualified personnel in the industry. I.O. Kizikova *et al.* (2020), in turn, assessed the difficulties

Suggested Citation:
Inozemtsev, S. (2024). Pricing in the medical sector: Theoretical foundations and practical aspects. *University Economic Bulletin*, 19(1), 26-33. doi: 10.69587/ueb/1.2024.26.

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of determining profitability and pricing in the healthcare sector. They noted that such difficulties arise due to differences in the functioning of public and private institutions in this area. They proposed to carry out reforms in the healthcare sector aimed at improving the efficiency of the industry as a whole, including the pricing component, but did not specify what kind of reform this should be. A.Yu. Palamarchuk & V.A. Samchuk (2022), in turn, drew attention to the role of marketing in the pricing of medical products, and also described the trend towards an increase in the role of price changes for such goods for the local population as a whole. No clear approaches to the formation of a pricing strategy have been proposed in any work.

T. Demchenko & M. Slatvinskyi (2023) also examined the peculiarities of pricing in the Ukrainian medical sector in some detail. The authors described in detail the peculiarities of the pricing policy of companies in this sector, and also paid a lot of attention to the impact of the 2018 healthcare reform. The peculiarities of marketing in the healthcare sector were considered by Ya. Malyarenko & T. Pulina (2020), drawing attention to the differences that exist in the medical sector compared to others. The changes observed in this area with the development of new technologies and in connection with certain global trends were also studied. Some recommendations were also formulated in the context of such activities, but no significant attention was paid to pricing. Analysis of the effectiveness of the affordable medicines programme in Ukraine as one of the main approaches to providing the population with cheap medicine was carried out by V. Dobrova *et al.* (2023). The authors noted that this programme has indeed had a significant impact on health policy in the country, improving access to medicines among the population, albeit at the expense of budgetary funds. They also expressed some doubts whether the overall effect of the programme was positive or negative. It is therefore important to conduct additional research in this regard in the future. It may be relevant to investigate the impact of the programme on pricing in the healthcare sector. I. Vlasenko & L. Davtian (2023) described in their study the problems associated with rising drug prices due to Russia's full-scale invasion of Ukraine. They concluded that, in general, the country's healthcare system proved to be quite resilient, as the negative consequences could have been much worse.

The purpose of this study is to describe the main characteristics of approaches to healthcare pricing in Ukraine.

MATERIALS AND METHODS

The paper depicts certain peculiarities of pricing in the field of medicine using certain models. One of the models describes the characteristic components in a free market, when the price is formed only on the basis of the interaction between supply and demand, i.e., D (Demand) equals S (Supply); in this context, P (Price) and Q (produced volume in the case of Supply and consumed volume in the case of Demand) remain important. This is not the only approach to price formation that is actively used today: others are characterized by the "cost+markup" approach. Its schematic representation was formed on the basis of the concept of aggregate long-term average costs (ATC), i.e., costs that include both variable and fixed costs (1):

$$ATC = AFC + AVC, \quad (1)$$

where: AFC – the long-term fixed average cost; AVC – the long-term variable average cost.

According to microeconomic theory, the market price should be formed at the lowest point of the ATC indicator, since in such conditions the market will be most efficient and there will be no competition. Given that the medical products market is not perfectly efficient, an approach based on monopolistic competition has been proposed. The main fundamental difference in this context is that each of the companies in the market is a kind of monopolist, since its products have their own characteristics and, therefore, have unique direct demand. This leads to different prices for products, different production, sales and profits, despite the fact that the companies actually operate in the same industry. The features of the Value-Based Pricing method were also analysed, without depicting models, given the peculiarities of this approach and the difficulties of its application in real conditions.

The study used a comparative approach to examine the pricing situation in different countries and regions to understand similar and different trends in this area globally. The graphical method was used to illustrate the models developed in the study, which described the specifics of pricing in the market.

RESULTS

Pricing itself is the process of determining the price of a product or service. From a theoretical point of view, it is formed on the basis of the interaction between supply and demand for a product, i.e., through the interaction between various forces in the market. In practice, there are many other variables that influence the formation of the price for a particular product. Important variables include production costs (raw and pack materials, labour, energy, equipment, transport costs), the competitive environment (companies that exist in the market and their capabilities to produce the product), and, in fact, the supply and demand for the product (Gregson *et al.*, 2005). There are other variables that influence price, such as the brand for which people are willing to overpay to gain a "higher status" in society, although this is not economically justified from the point of view of classical economic theory.

The medical sector as such plays an important role in the development of a country. It ensures the health of the nation, which is one of the main indicators of human capital and quality of life (Keehan *et al.*, 2020). Healthy people are more able to work, have more opportunities for learning and development, which contributes to economic growth and social welfare of the country. In addition, a healthy nation reduces the cost of treating illnesses and the loss of

productivity: an effective healthcare system enables faster diagnosis and treatment of illnesses, which reduces treatment costs in the long run (Incze *et al.*, 2022). High-quality healthcare services can attract foreign patients, which stimulates medical tourism and generates additional revenue for the country. Affordable and high-quality healthcare system helps to increase the level of trust between the government and citizens, which contributes to social stability and development of the country as a whole (Jommi *et al.*, 2020; Vogler *et al.*, 2021). Nevertheless, its development is quite complex, as it requires significant investments in innovation and research, as well as infrastructure development.

Understanding the specifics of the pricing structure for healthcare products and services is important for both patients and public authorities responsible for healthcare governance. Patients need to understand what they are paying for and what the difference is between using different types of medicines (Hernandez *et al.*, 2020; Mattila *et al.*, 2021). A clear understanding of the pricing structure also helps patients assess their ability to obtain the healthcare services or products they need and choose the most affordable options. Understanding the benefits of services can also help patients assess the value for money of healthcare services and choose the best treatment options. As for government agencies, their needs are somewhat different. Understanding the price structure allows them to plan the state healthcare budget more effectively and allocate resources according to the needs of the population and expected economic effect. Information on the price structure helps to develop policies and regulatory measures aimed at ensuring accessibility and equity in healthcare, as well as to introduce price control mechanisms to guarantee that healthcare services are affordable for the population. On the other hand, the government can use price information to provide social support to vulnerable groups by ensuring access to essential healthcare products and services. Price structure transparency also serves to more effective investments in development of new and innovative treatments.

There are several main approaches to product pricing in the healthcare sector (Nemchenko, 2022). The first is the cost+markup method, which is a strategy for pricing goods or services based on determining the cost of production or provision of services and adding a certain percentage of markup to this cost, which determines the profit for the enterprise or supplier. The basic idea behind this method is to ensure the profitability of the business by including in the price of a good or service the cost of its production together with an additional amount, which is the profit. If the cost of producing a unit of goods is 100 units of currency and the markup is set at 50%, the selling price of this unit of goods will be 150 units of currency.

Another method of pricing is the market-based method. In essence, it is a strategy for determining prices for goods or services based on supply and demand in the market. The main idea behind this method is that prices for goods or services are formed in accordance with changes in supply and demand, rather than based on the costs of production or provision of services. The features of "market-based" pricing include flexibility, as prices can vary depending on the level of supply and demand in the market. When demand for goods or services increases, an entity may increase prices, and when demand decreases, it may decrease prices to increase consumer interest and sales. In addition, "market-based" pricing takes into account the needs and capabilities of consumers. Prices are set in such a way that they are acceptable to the target audience and help to increase demand. This method also allows companies to respond to changes in market conditions and meet competitive requirements; it also encourages companies to introduce the latest technologies, improve the quality of goods and services, update marketing strategies. The use of both methods can be depicted graphically. Thus, the "from the market" method can be depicted by the interaction of known direct supply and demand, as shown in Figure 1.

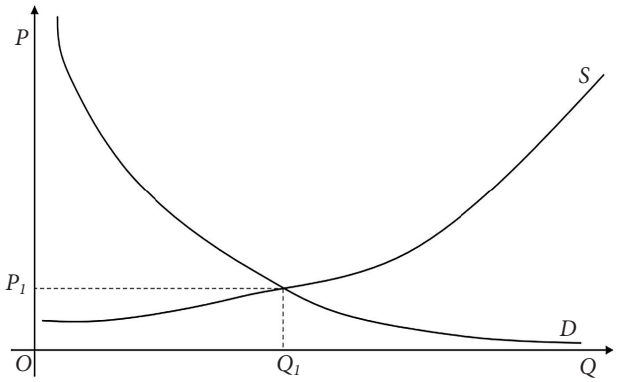

Figure 1. Model of supply and demand interaction as a representation of the "market-based" method

Notes: Q_1, P_1 – price and output at market equilibrium; S – supply; D – demand

Source: compiled by the author

As can be seen from Figure 1, pricing under this methodology is effectively market-based, and is entirely based on the principles of supply and demand, which form the price. The "cost+markup" approach is also common. A pricing model based on this approach is shown in Figure 2.

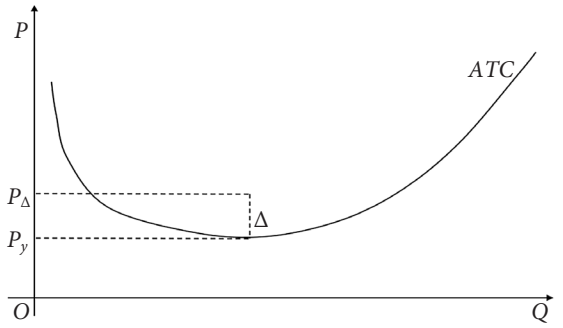

Figure 2. Depiction of the "cost+markup" approach to pricing

Notes: P_Δ – markup price; Δ – markup level; P_y – price level at which the company will not make a profit

Source: compiled by the author

Figure 2 shows that the price at which a company will be willing to sell its products at a certain volume of output is equal to the ATC level (i.e., the long-term average cost plus a markup). Setting such a markup based solely on a plan and without assessing the market situation is risky, as it can result in either a price that is too low (resulting in a loss of potential profit) or too high (which will reduce demand for the product or, in a perfectly competitive environment, eliminate it altogether). That is why assessing market trends in this context is important. Pricing based on these two approaches is shown in Figure 3. As can be seen in Figure 3, setting the price, including the markup, in this context should be based on analysis and finding the point of interaction between supply and demand to ensure the highest possible profit. The price eventually set may still differ from the true market price (both due to the inefficiency of the analysis and a certain lag between the companies' reaction to changes in the market and the actual situation), but it will be closer to the real market price and thus will achieve the most efficient result. In reality, modern markets, including those for medical products, are not characterized by absolute competition. More often they are similar to monopolistic competition, although there are also oligopolistic or completely monopolistic ones. For the purposes of this study, it is worth considering the situation characteristic of a monopolistic competition market, as shown in Figure 4.

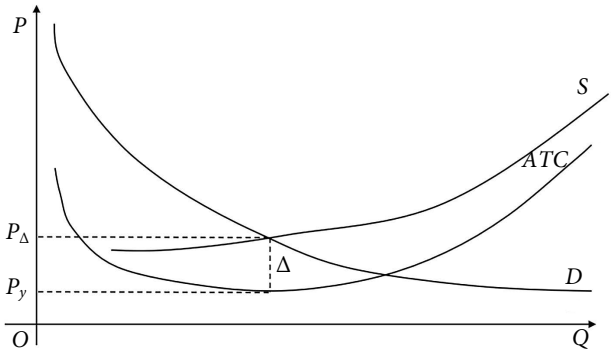

Figure 3. Interaction between market-based and cost+markup pricing approaches
Source: compiled by the author

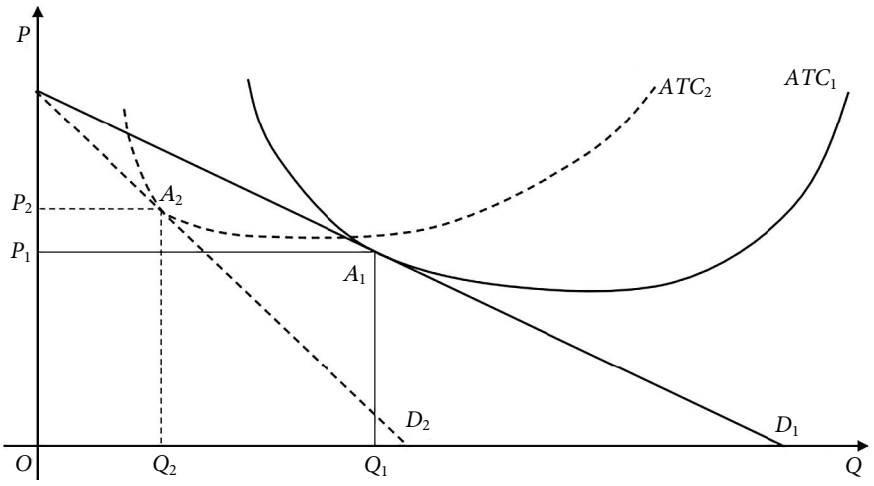

Figure 4. Pricing model within the monopolistic competition model
Notes: the lines D_1 and D_2 show the level of demand for the product produced by the market player, and the lines ATC_1 and ATC_2 show the level of long-term average production costs; the points P_1 and P_2 are the corresponding prices for each company under these conditions; Q_1 and Q_2 are the corresponding production volumes under these conditions; A_1 and A_2 are the points of intersection of the direct demand with the direct aggregate average costs
Source: compiled by the author

As can be seen from Figure 4, different companies producing a similar, but different in certain respects, product in the market will have different aggregate average cost curves, as well as different demand for their products. This may result in different prices for the products, as well as different profits, as shown by the area of the corresponding rectangles $P_1A_1Q_1O$ and $P_2A_2Q_2O$. In the context of selling goods or services in the healthcare sector, it is worth considering how the demand from potential customers for products in this sector may differ.

The use of the Value-Based Pricing method is also relevant in healthcare. At its core, this is a strategy where prices are set based on the perceived value to a client or a patient. It's easier to understand this with an example: if a marketing agency that spends £25,000 on a campaign and wants to make 100% profit – it will charge £50,000 for its services ((50/25 – 1) *100 = 100%). If making an estimate according to Value-Based Pricing, it is worth evaluating the benefits that this marketing campaign will bring to the client: if it will bring the company an additional million pounds in sales with profitability more than 5%, then a price of 50 thousand pounds may be considered a fair price for the provision of such services. This approach is also relevant in medicine, as innovative treatments are expensive, but they bring significant benefits to public health, among other things. In practice, it is quite difficult to use this method, as

it is not easy to estimate the benefit that customers will gain from the acquired products. There are several approaches to this assessment. One of them is the assessment of willingness to pay, which is based on customer surveys. Another approach is to study cost-effectiveness by comparing the economic benefits of a product versus competitors. In each case, the use of this approach is complex, as it requires additional resources for research and surveys but justified in pricing for innovative treatments. Therefore, in the medical sector, pricing using the Value-Based Pricing method should also be supported by additional research.

Sometimes pricing can be controversial: for example, the distribution of COVID-19 vaccines had a significant ethical component, as the pandemic led to a global crisis and resulted in significant casualties in many countries. The companies that produced the vaccines also spent significant resources on their development. From an ethical point of view, the vaccine should have been given to low-income countries almost for free, while from a market point of view, they should have charged a fair price for it, which they could not actually do, that could have caused significant human losses (Ezekiel *et al.*, 2021). In the end, the distribution was carried out through a multilateral approach, which should have guaranteed equal access to the vaccine in low- and middle-income countries. In addition, some international organizations purchased vaccines for further distribution to low-income regions.

One of the problems that also exists in the healthcare sector is the lack of price transparency, which prevents patients from making optimal decisions when selecting a particular drug. More effective disclosure of information on all components of the price formation for a particular product or service in the healthcare sector, as well as its advantages or disadvantages, could bring many benefits to patients and economy overall. This would increase competition in the market and thus lead to lower costs while improving quality. Achieving this is difficult given the variability and heterogeneity that exists in the healthcare sector. In other words, it is difficult to achieve standardization of products or services, and therefore difficult to make comparisons between them. In addition, ensuring something like this would require direct and active involvement of government officials, which is a difficult, sometimes harmful process in general (including due to bureaucracy), and especially in times of war.

DISCUSSION

Based on the analysis, options for improving the situation in the context of pricing can be formulated. One of the options is to ensure a higher level of transparency (Russo *et al.*, 2021). In other words, all market participants should understand the basis on which other players are pricing the market. In addition, online platforms that provide up-to-date information on prices for medical products and services can be developed and maintained. The state, for its part, should also develop a more effective and simplified regulatory framework that would encourage more transparent pricing of medical products. This includes the fight against monopolies and the application of strict antitrust laws in the healthcare sector to prevent price manipulation and ensure a competitive market. It is also effective to support innovations in the industry as a whole, but questions arise as to when such changes can be implemented, given the situation in Ukraine with the full-scale invasion and its consequences.

The current study also drew attention to the fact that there is a problem in the context of insufficient information on the prices of medical goods and services. It was shown that Ukraine is on the way to this, but there are currently a significant number of problems, including the consequences of a full-scale invasion of the country, that will not allow solving this problem at the moment, although such opportunities may arise in the future. Similar problems were noted in their study by A.D. Ambtman *et al.* (2020), who studied the peculiarities of pricing in Dutch hospitals. They noted that there is a significant difference in the prices of medical products in Dutch hospitals, which contradicts conventional economic theory. The researchers concluded that there is a non-transparent pricing system, which is exacerbated by the lack of awareness of each other's prices among hospitals. In view of this, they propose to significantly increase attention to the pricing process in local hospitals, controlling the procurement process and other key components that influence the price of goods.

The current study also drew attention to the possibility of pricing medical goods and services through market forces: this approach is generally quite effective, but it can cause certain problems and difficulties, especially among the most vulnerable segments of the population. The pricing of pharmaceuticals in the context of the impact on the healthcare sector was considered by S.G. Morgan & H.S. Bathula (2020). The scientists noted that despite the key role of pharmaceutical innovation in healthcare, price increases are becoming increasingly disproportionate to the ratio of price to research investment, which is becoming a problem for citizens of countries and those with financial difficulties. The authors concluded that market-driven pricing of pharmaceuticals poses a threat to the sustainability of health systems and equitable access to essential medicines. They highlighted innovation and market power as key contributors to the current pricing problems. They also mentioned the existence of phenomena such as "confidential price discounts", which further exacerbate existing inequities. The article also examined the dynamics of pricing for old medicines, noting cases of significant price increases due to market monopolies and lack of competition.

A.J. MacNeill *et al.* (2020) considered the possibilities of reducing the prices of medical products in their study. They concluded that there is a need to move to a circular health economy to address the unsustainable effects of current practices. The researchers wrote that this transition requires the integrated work of many public services, and interaction with businesses and citizens. Given that the introduction of such practices is generally beneficial for the economy, the researchers write about the possibility of achieving the effect of reducing the prices of medical

products in countries. The current research has not paid much attention to the approaches that can reduce the price of medical products. The methods used within the framework of the circular economy concept can indeed have a positive impact on this situation. It is worth noting that this is not the only way to reduce the price of medical products: in Ukraine, price aggregators have helped to achieve this. The development of such approaches is also effective for the purpose of reducing the cost of healthcare products.

The impact of volume and price contracts on pharmaceutical prices was studied by Z. Li *et al.* (2021). The study evaluated the impact of the volume contracting initiative on the unit price of cardiovascular drugs in 35 hospitals over two years. Using a generalized linear regression model, the study found that the initiative led to a significant reduction in unit prices, especially for brand-name drugs and those supplied by leading Ukrainian suppliers. The results underline the effectiveness of volume-based pricing contracts in reducing drug costs, although the impact varies across suppliers and types of drugs. In other words, the formation of collective tenders and volume-based procurement has reduced administrative and transaction costs, leading to an overall reduction in product prices. The current study also drew attention to the need to minimize the price of healthcare services, if possible, especially for the poorest segments of the population. This approach may also be relevant in the Ukrainian context.

The study paid particular attention to value-based pricing, concluding that it is theoretically effective, but that there are many difficulties in implementing it in practice. While it is fair enough to price products based on how they will benefit society, it should be possible for most companies to price their products more clearly. The peculiarities of pricing in terms of cost-effectiveness for pharmaceutical companies were noted in their study by G. Hyeraci *et al.* (2023). They drew attention to the fact that cost-effectiveness is increasingly the basis for choosing the price of a product and estimating the cost of its production. The scientists noted that for innovative products, the price is estimated based on the cost and compared with the proposed price and the threshold of society's willingness to pay. The scientist pointed out the need for a clearer method of existing pricing methods in the medical products market.

The difference between the prices of pharmaceutical products in the Yangtze River Delta in China was studied by L. Li and B. Liu (2023). They noted that there was a significant gap between the prices of such products between regions, with Shanghai having the highest prices, followed by Anhui, Zhejiang and Jiangsu provinces. These price differences were not consistent with the socio-economic status of these regions. Unlike conventional markets, healthcare prices in China are set by the government for the public welfare, which potentially explains this discrepancy. The current study did not analyse how the price of healthcare products differs in countries with different standards of living. It can be concluded that highly developed countries will have more expensive prices for products and services of the same nature as in developing countries. This is one of the reasons for the development of the insurance sector in highly developed countries, as it allows them to cover expensive treatment costs in the event of an emergency. In Ukraine, however, it is still in its infancy.

CONCLUSIONS

Pricing in the healthcare industry is complex: in theory, prices are determined by market forces, but in practice, various other factors come into play, such as production costs, the competitive environment and the unique characteristics of the healthcare industry. This paper describes the main approaches to product pricing: cost-plus pricing and market-based pricing. Cost-plus pricing ensures that companies cover their production costs and make profit by adding a markup to the product cost. This method provides a simple approach to ensuring profitability, but can be risky if it does not take into account market dynamics, potentially leading to prices that are too high or too low. Market-based pricing is more flexible and responsive to changes in supply and demand, aligning prices with consumer willingness to pay and competitive conditions, promoting efficiency and innovation in the market. By adjusting prices in line with market conditions, companies can better meet consumer needs and maintain competitiveness. This method requires an in-depth understanding of market trends and consumer behaviour, which can be resource-intensive.

The study showed that value-based pricing is gaining popularity, especially for innovative treatments and medical technologies. This approach sets prices based on the perceived value to the customer, taking into account the benefits and outcomes of a product or service. Value-based pricing is difficult to implement due to the difficulty of quantifying the value and benefits perceived by patients. The use of behavioural economics methods may be relevant to address the problem of non-transparent pricing. For example, a "nudging" approach could be used to encourage healthcare providers to be more transparent in their price disclosures. This could include creating simple and easy-to-use price comparison tools, providing information on average market prices, or using "default" options that automatically provide patients with price information. Healthcare facilities should consider a significant number of factors and variables when pricing the products they manufacture and sell. The state and patients also need to be aware of how the price of such goods or services is formed in order to make informed decisions on healthcare-related issues.

It would be relevant for future research to assess the pricing in other sectors of Ukraine, such as agriculture or IT, which have been considered the main drivers of the Ukrainian economy in recent years.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

None.

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Ціноутворення в медичній сфері: теоретичні основи та практичні аспекти

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Анотація. Ціноутворення є однією зі складових частин забезпечення конкурентних умов на ринку медичних послуг: воно має свою специфіку, що характеризується різними формами функціонування підприємств, забезпечення доступу до товарів і послуг. Ціллю роботи було дослідити методи та підходи до даного процесу в Україні, зважаючи на особливості розвитку країни, пов'язані з повномасштабним вторгненням російської федерації. Методами, що використовувалися в рамках дослідження, стали формально-юридичний (для формування логічних зв'язків між окремими нормативно-правовими документами) та порівнянльний (для оцінки особливостей ціноутворення в медичній сфері в різних країнах). У рамках дослідження було оцінено процес ціноутворення як такий та описано фактори, що впливають на нього на практиці загалом, та у сфері медицини зокрема. Також було зроблено висновок про те, що розуміння ролі даного процесу як для держави, так і для потенційних клієнтів, є важливим, оскільки це впливає на економічну стабільність, якість медичних послуг, соціальну справедливість. Особлива увага була приділена таким підходам, як «собівартість+націнка» та «від ринку». На основі побудованих у роботі моделей було зроблено висновок про потребу використання їх у симбіозі (орієнтуватися як на ринкові умови, так і на цілі компанії стосовно формування націнки). Також увага була приділена підходу Value-Based Pricing: було зроблено висновок, що за своєю суттю він значно відрізняється від двох інших, оскільки потребує складніших оцінок, оскільки базується на очікуваній користі від створеного продукту. Також було виділено проблему непрозорості ціноутворення як одну з основних, що не дає змоги формувати ефективні умови функціонування ринку. Результати, отримані в рамках дослідження, можна використовувати як для формування державної політики, так і створення стратегій окремих компаній на українському ринку медичних товарів і послуг

Ключові слова: мікроекономіка; охорона здоров'я; державна політика; інновації; ринкові конфігурації