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PROMOTION OF INNOVATIVE MICROCHIP IN THE MARKET OF MEDICAL SERVICES: MARKETING ASPECTS

Abstract. *In current conditions, people can quickly move between regions, countries, and continents. This freedom of movement makes it easier to share knowledge and strengthen potential. However, the period of the COVID-19 pandemic showed that diseases move too. It becomes more challenging to detect and control conditions in time. Accordingly, there is a need to develop a concept of an innovative product. This innovative product must facilitate the timely detection, treatment, or prevention of diseases caused by pathogenic components, poisons, or toxins that may endanger human life and health during travel. The article aims to develop an innovation in the field of medicine and describe the marketing aspects of its promotion.*

The study showed that innovation is becoming an essential part of medicine. Artificial intelligence technologies and nanosized (microscopically tiny) materials and objects develop rapidly in the medical sphere. Following specific trends in treatment, we have formed the concept of an innovative product. The essence of the idea is as follows: a microchip «InBlood» can detect specific pathogens and toxins and create opportunities for timely medical care. At the initial stage, it was proposed to produce two versions of the innovative product: 1) «InBlood Tourist» the primary target audience of which are people who travel; 2) «InBlood Life» the target audience of which are people who have health problems and monitor the state of their performance or people for whom disease prevention is important. The analysis of indirect competitors helped to determine the price of innovative microchips. A system of discounts has also been developed.

In addition, it is advisable to use a multi-channel distribution system to sell innovative microchips. It means using direct sales through online stores and sales departments of the manufacturer and sales through intermediaries. Thus, the principal intermediaries in the sale of chips «InBlood Tourist» will be travel agencies and «InBlood Life» - medical centers. For the innovative microchip promotion on the market, we proposed the following plan of communication activities: (1) participation in international electronics exhibitions; (2) collaborations with techno-bloggers on Youtube, Instagram, Tiktok; (3) personal presentation of goods to future partner companies (medical centers, travel companies, etc.); (4) launch of review articles on technological and tourist resources and stories in the media; (5) mailing to consumers, launching contextual advertising, and targeting search networks; (6) placement of outdoor advertising in the form of billboards and interactive screens. Moreover, a brand with a complete visual identity will be formed.

Thus, the practical significance of the article consists in the strategy formation for innovative microchip presentation and dissemination among consumers in the field of medicine.

Keywords: innovation, medicine, marketing concept, tendencies of a medical sphere, microchip, chipping.

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Introduction. Today, due to globalization and the emergence of fast and cheap vehicles, the movement of the population is increasing. It results in diseases spreading rapidly. There is an urgent need for early diagnosis and prompt treatment. Proof of this is the Covid-19 pandemic, which appeared in China and distributed worldwide in a few weeks.

The number of travelers is increasing every year. So, there is a need to introduce an innovative product to protect human health from local viruses and diseases in areas with a high probability of infection.

The topic's relevance is explained by the need to develop and implement innovative solutions in the field of medicine and provide subsequent marketing support for their successful introduction to the market.

Thus, the article aims to develop innovation in the field of medicine and describe the marketing aspects of its promotion.

Literature Review. The problem of implementing innovative solutions in health care is relatively new. It is still under development among domestic and foreign scientists. Consider some materials related to this topic.

Researchers (Barzylowych et al., 2020) confirmed the need for innovative transformations in health care. They also considered the importance of implementing modern approaches to health management - value, human-centric and holistic. These approaches formed the basis of the developed conceptual model and principles of transformation of the medical sphere.

The application of nanotechnologies in the medical field, their impact on disease treatment, regenerative medicine, and the organization of medicine delivery were covered in detail (Talukdar et al., 2016).

Cerdan and Nicolas (2012) discussed the importance of organizational innovations for improving healthcare organizations. An analysis of 240 Spanish medical companies showed that properly selected and implemented organizational innovations allow healthcare organizations to be more successful in innovating products and processes. The review (Kim et al., 2016) of the current state of health care can be used by health policymakers and management decision-makers.

He et al. (2021) considered an actual problem related to preventive medicine. The authors proposed an innovative system based on big data and able to build big medical data of patients. They mentioned that the implementation of this system could increase their treatment's effectiveness and allow providing the concept of disease prevention.

Scholars (Marques et al., 2018) confirmed the importance of investing in knowledge (their creation and acquisition) to increase medical organizations' efficiency and customer satisfaction.

The latest view on the prospects for the transformation of the medical field has been highlighted by scientists (Aloini et al., 2022). They suggested using blockchain technology to manage innovative healthcare processes.

Thus, innovation becomes a driving force in the development of health care. Accordingly, our research will be devoted to developing an innovative product that can strengthen the medical field.

Methodology and research methods. A systematic approach forms the theoretical and practical basis of the article. The research aims to confirm a specific hypothesis: reducing the prevalence of disease and mortality through preventive measures to identify and provide timely medical care through an innovative microchip.

Accordingly, to prove the hypothesis, the following objectives were considered:

- 1) to consider the market of medical services and analyze trends in the medical sphere;
- 2) to develop the concept of an innovative product;
- 3) to explore the main indirect competitors in the market of innovative products development and implementation;
- 4) to set the price for innovative goods;
- 5) to determine the distribution channels of innovative goods and aspects of sales policy;

6) to develop a strategy and identify tools to promote innovation in the market.

To achieve each of these objectives, the authors used appropriate research methods. In particular, to analyze current data on the application of innovative technologies in medicine and identify other trends, statistical and trend research methods were used.

The innovative product concept was developed based on the logical generalization of research results. During the investigation, we analyzed scientific studies of foreign and domestic scientists on innovations in medicine, the practical implementation of these innovations, and the unmet needs of consumers in the medical market.

Based on the formed concept, we created portraits of target consumers and chose the marketing channels for innovation distribution.

Competitive analysis and the method of comparisons were used to study the main indirect competitors in the market of innovative product development and implementation. The obtained results helped to achieve another task - to set the price on innovation, considering the prices for microchips of indirect competitors.

The focus group method immediately allowed communication with the target audience to identify the advantages of innovation and its disadvantages. In addition, the focus group provided valuable data on building an effective strategy to promote innovation in the market and overcome the objections in the minds of prospective consumers.

Thus, the research methods used reflect the research logic and allow to achieve the study's aim.

Results. Recent years show the rapid development of artificial intelligence technologies in medicine for in-depth diagnosis and disease detection. This trend continues in 2022.

According to reports by Reportlinker, the global nanotechnology market in 2020 was estimated at \$ 42 - \$ 54 billion. The forecast for 2027 is \$ 78 - \$ 127 billion (Fig. 1).

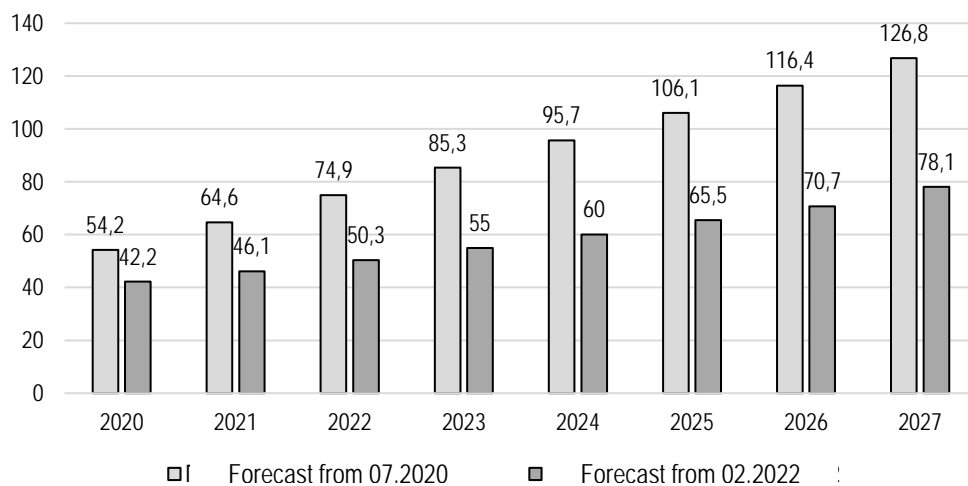


Figure 1. Forecast of the dynamics of the global nanotechnology market, billions of US dollars
Sources: developed by the authors on the basis of (GlobeNewswire, 2020; ReportLinker, 2022).

Thus, according to research, the nanomedicine industry will grow and increase the excellent potential for early investors. The nanomedicine industry means using nanosized (microscopically tiny) materials

and objects, such as biocompatible nanoparticles, nanoelectronic devices, or even nanorobots, for specific medical purposes and manipulations, such as diagnosis or treatment.

The popularity of microchips is constantly growing. Neuralink hopes to start implanting its chips in the human brain in 2022. More and more companies, organizations, projects, and startups will offer their neuro implants for various medical needs (Khristich, 2021).

For example, in 2021, a group of scientists reported that a microelectrode array (a penny-sized implant) had been inserted into a blind man's visual cortex, allowing him to recognize several letters and shapes (Watts, 2021).

In general, RFID and NFC chips are distinguished. RFID is already losing popularity and is being replaced by Near Field Communication (NFC) technology. Google Trends search proves the dynamics of queries (Fig. 2).

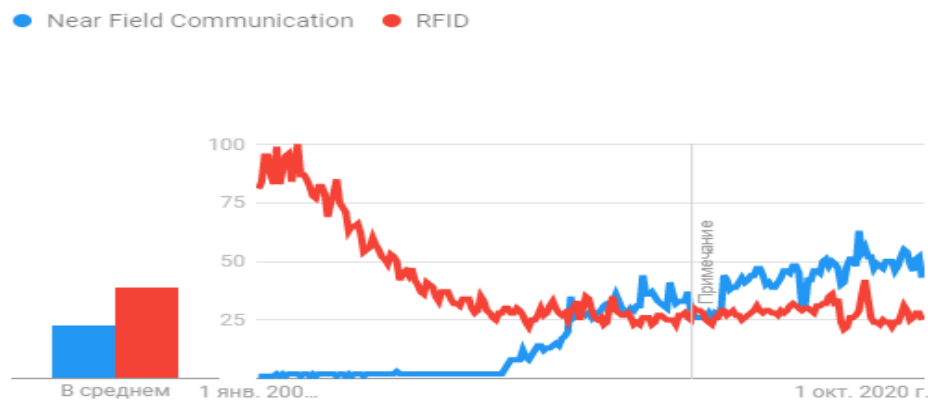


Figure 2. Comparison of the dynamics of search queries around the world from 01.01.2004 to 11.06.2022

Sources: developed by the authors.

With the development of society, the number of travelers is constantly increasing. But not all places on the planet travel are safe. So, there is a need to create an innovative product that can ensure a stay in exotic countries without harm to health.

According to the identified need, it is proposed to develop and promote such an innovative product as «InBlood». It is a microchip implanted under the skin. It responds to specific pathogens, poisons, or toxins in the human blood, providing timely medical care.

The «InBlood» chip is implanted mostly on the vessel of the hand. The principle of its work is as follows:

1. Implantation of a chip by a medical professional into a vessel on the arm.
2. Providing round-the-clock blood scans.
3. Sending a signal through the NFC module to the smartphone in case of detection of a dangerous component.
4. InBlood software response on the phone and threat identification.
5. A loud beep and notification of the type of illness or poisoning. An ambulance is called, or the address and telephone number of the nearest ambulance are given.

The range of InBlood at the initial stage will consist of the two modifications: (1) "InBlood Tourist", (2) "InBlood Life."

The purpose of "InBlood Tourist" is to ensure the rapid detection of venom of insects, snakes, spiders, or pathogens of local diseases, to provide the necessary information for help, or to call an ambulance through a mobile application. The «InBlood Tourist» microchip will help to solve the problem of dangerous diseases and deaths of tourists due to virus infections or bites from dangerous animals, insects, and snakes.

The advantage of this chip is its exclusivity. It can run for ten days, corresponding to the trip's average duration. Implantation is painless and imperceptible to humans due to the chip's small size. It also provides free service after the expiration date in any branch of InBlood.

The device can be programmed to detect about 1000 pathogens and toxins at an early stage. In the future, the range of pathogens will be expanded.

The purpose of "InBlood Life" is to ensure the detection of pathogens or changes in the number of certain substances in the blood on request. Ability to track trends.

The special chip «InBlood Life» is activated only through the phone and can detect changes in the level of one specific component of the blood and is used, for example, for patients with diabetes. Thanks to passive technology, InBlood Life performs up to 180 readings, which can be enough for three months with two daily measurements.

It is also possible to use this type of chip by people at the disease's epicenter and with a constant risk of infection, for example, by medical staff and patients. In the future, it is expected to increase the duration of the chip's use, its diagnostic accuracy, and expand the possibilities for the introduction of a therapeutic substance or antidote. The kit consists of a disposable syringe for inserting the chip, the chip itself, instructions for use, and a QR code for downloading the application to a smartphone. The healthcare professionals at the point of purchase implant and remove chips free of charge with a painkiller. All InBlood branches or partners provide accessible service. InBlood chips are a commodity innovation. According to the degree of novelty, they belong to the group of improving innovations. Chipping is already used in the medical technology market, but it is an absolute innovation in the tourism sector. In terms of efficiency, the chip is a radical innovation as it is necessary to create new work areas and production lines for its manufacturing. Depending on the result, InBlood is product innovation. Based on the market analysis of microchips, the leading manufacturers of microchips for humans and potential competitors for the studied innovation were identified (Table 1). The biggest indirect competitors are manufacturers from the USA, Germany and Sweden. It should be noted that at the moment there are no direct competitors, because this product is innovative. So, among the competitors, the cheapest is a chip from the manufacturer I Am Robot for \$ 30, as it is already firmly established in the market and has a well-established distribution system. The most expensive is the solution from the Swedish company Epicenter - the price per chip is \$ 112. This is the latest development presented and released last year. Neuralink is the most promising and closest competitor. It is Elon Musk's startup. This chip is technological innovation. Tests are still underway, so the price for this chip is approximate and too high.

Table 1. Competitors manufacturers of microchips for humans

Name	Country	Purpose	Chip price
Dangerous Things	USA	- access key to the computer, door, etc. ; - storage of a small amount of information available for reading	RFID (\$50) and NFC (\$69)
I Am Robot	Germany	- access to the entrance, start a motorcycle or car; - data exchange; - use instead of password; - travel ticket in the subway	RFID (\$30) and NFC (\$30)

Continued Table 1

Name	Country	Purpose	Chip price
Epicenter	Sweden	- carrier of information about vaccination against Covid-19	Passive RFID \$112
Three Square	USA	- instead of an identity card; - use instead of password	RFID (\$50)
Neuralink	USA	- help people with paralysis by enabling them to control computers and mobile devices directly through the brain	In the perspective several thousand dollars

Sources: developed by the authors on the basis of (Global Health Security Index, 2019).

The price for the InBlood Tourist chip for travel is \$ 119, and the simpler version of InBlood Life is \$ 89. The prices were set according to the strategies of unrounded prices and the competitor's highest price.

When buying three sets for chipping «InBlood Life» simultaneously, the set will cost \$ 229 instead of \$ 267, saving the buyer who needs constant monitoring. 5% discount for diabetics if they bring their previous device for measuring blood sugar.

«InBlood Tourist» will have a discount when buying together with a tourist voucher in partners' branches.

As the product moves into the market, the pricing policy will be revised.

InBlood's sales policy involves intermediaries. The company's multi-channel distribution system will provide the most convenient way to deliver goods to each group of consumers.

The first option is a one-level marketing channel: the producer's sales department – partner – the consumer. The manufacturer opens its own sales departments in European countries. Then the products move to selected travel agencies, medical centers, etc., and then to the consumers.

According to the scheme, the second option is a direct sales channel: an online store/sales department of the manufacturer - consumer. The company personally researches the market of the country it enters and selects potential partners with a high level of customer service, prevalence in different regions, good reviews, and specialization. This selection method is called selective and helps maintain a good image of the manufacturer and provide quality full sales service.

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Sales branches are in the capitals of the countries. Departments provide product storage and sorting. The products are delivered by air from the origin to the department. It is a fast vehicle and has minimal impact on the appearance and performance of electronics.

Microchips are delivered to and from the airport by road. Therefore, large consignments of goods will have air-highway packaging.

InBlood Tourist certified chips will be sold mainly by travel agencies and InBlood Life by medical centers. Cooperation with the Ministries of Tourism and public clinics is possible in the future.

Examples of selected partners for Ukraine are: travel agency «Come with us !», Join UP !, Annex Tour, medical centers «Mediland», Angelia, R + Medical Network, Poly Clinic.

To strengthen the research, identify the opinions of target consumers and form a quality promotion strategy, we conducted a study based on a focused group interview.

The focus group consisted of 5 people of different genders and ages. The following issues were considered:

1. Would you use this technology?
2. What factors would be essential for you in making a decision?
3. Assess your level of innovation: from 1 – I do not perceive to 5 – I intend to use this technology whenever possible.
4. If there are no alternatives, are you willing to pay \$ 119 for personal safety while traveling?
5. Your impressions of this innovation.

The study received the following answers:

1. The experts were divided into two groups. The first answered that it would be used, and the second had not yet been entirely determined.
2. Fears due to the pain of the implant, the possibility of allergies, and the price factor.
3. Expert A – 4 points, because he needs to monitor health, but not 5 points because of the fear of whether the chip will take root and what will be the body's response.
4. Expert B – 4 points; it is a helpful thing. He wants to know more about it.
5. Expert B – 3 points because no tests and experiments prove safety.
6. Expert G – 3 points because he does not travel and does not have diabetes.
7. Expert D – 4 points, exciting innovation and needed.
8. Experts: Yes, but if the country is dangerous, he will have to pay. Due to the availability of insurance, implanting a chip may not be necessary. However, it will not help in the rapid detection of the disease.

9. Experts' impressions: an exciting and relevant innovation, necessary for tourists, wishes to take tests before chipping, needs to be studied in more detail from a medical point of view, longer service life.

Therefore, it is necessary to research the safety of the chip in the future to expand its range of action and increase its service life.

The main advantages are a feeling of security and the small size. The disadvantages are the fear of pain when implanted and an allergic reaction.

Consequently, to promote innovative chips, we use an offensive innovation strategy. Moreover, this strategy highlights the advantages of the microchip factors and creates benefits for consumers. So, it is advisable to emphasize anesthesia and use hypoallergenic materials when promoting innovation.

The importance of developing an effective communication policy is confirmed in the works of many scientists (Makerska et al., 2021; Teletov et al., 2020; Minchenko et al., 2020; Pimonenko et al., 2017; Khomenko and Saher, 2021).

First, to attract partners and form awareness of innovation, it is advisable to present a microchip at international electronics exhibitions.

CPCA Show 2023 will be held at the National Exhibition Center (Shanghai) by the Chinese Association of Printed Circuits and Shanghai Ying Zhan Business Service Co., Ltd. The exhibition covers an area of 33,500 square meters. There will be more than 500 exhibitors from more than 20 countries. CPCA SHOW is one of the most influential electronic circuit exhibitions held annually in China (ShowsBee, 2022).

CEE is the largest annual electronics exhibition in Ukraine. It has presented electrical equipment, toys, and electric vehicles since 2006. In the fall of 2023, it will occur in three areas - CEE Home & Family, CEE Games, CEE Enterprise. The event will be attended by more than 200 world market leaders in various industries and business specializations (CEE).

CES is the most significant technology event in the world. It is a testing ground for breakthrough technologies and global innovators. It is a place where the world's largest brands do business and meet

new partners, and the most brilliant innovators come on stage. Participation in this event will give a massive breakthrough in technology awareness, investment, and attraction to early customers.

Collaborations with opinion leaders will occur before and during the product launch. In our case, opinion leaders will be techno-bloggers on Youtube, Instagram, Tiktok. In particular, Wylsacom, 808, Nauchpok, Artur Sharifov, Ai, Kak Prosto!, Thebox - about technology and gadgets, Kik Obzor and travel bloggers Anton Ptushkin, "On my own," Kung Fu Trip. Then there will be a personal presentation of microchips for some future partners (medical centers, tour companies, etc.).

It is mandatory to form a brand with a complete visual identity, packaging design (Fig. 3), a reliable image, pages on social networks, own website (Fig. 4), and branded products (Fig. 5).



Figure 3. Packaging prototype for «InBlood Life» (own development)
Sources: developed by the authors.

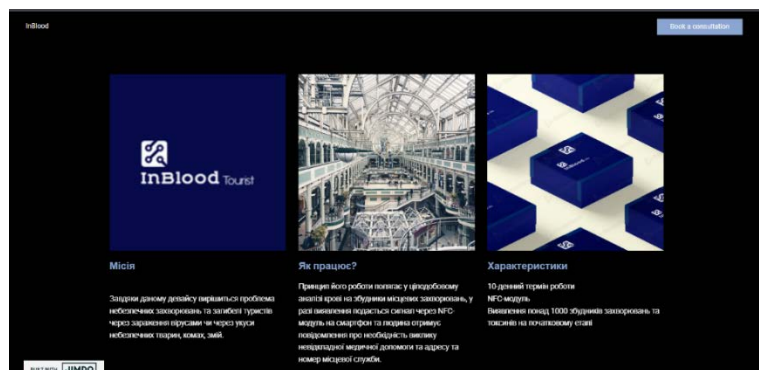


Figure 4. Site prototype for the «InBlood Tourism» (own development)
Sources: developed by the authors.



Figure 5. Branded products of «InBlood» (own development)

Sources: developed by the authors.

The next step is to launch review articles on technological and tourism resources and stories in the media, particularly from exhibitions, YouTube bloggers, and opinion leaders with the partners' names.

Also, an essential role in forming innovation awareness will pay the Internet marketing campaign.

Attention will be paid to two target audiences:

1. InBlood Tourist audience:

- age 18-50 years;
- location: Ukraine, Europe;
- language: Ukrainian, Russian, English, or other (depending on the advertising text);
- interests: travel and innovation, technology;
- income level: medium or high;
- search queries: pathogens in..., tickets to the country....

2. InBlood Life audience:

- age 16-50 years;
- location: Ukraine, Europe;
- language: Ukrainian, Russian, English, or other (depending on the language of the advertising text);
- interests: medicine, technology;
- income level: below average, medium, or high
- search queries: disease prevention..., diabetes treatment, means to control sugar levels.

Highlights of the advertising campaign:

- hypoallergenic materials;
- small chip size;
- no analog;
- safe use;
- painless implantation and removal;
- fast adaptation period
- availability of a mobile application;
- providing an immediate response to the threat.

In addition, outdoor advertising on billboards and interactive screens will be developed and placed in

the capitals of European countries (Kyiv, Warsaw, Prague, London, Paris, Berlin, etc.).

Conclusions. Thus, the marketing of medical services depends on their specification. It can be considered a direction of using market relations to meet the population's and medical organizations' needs. The nanomedicine industry has enormous potential and already has early investors. There are more and more companies, organizations, projects, and startups that are going to offer their neuro implants for a variety of medical needs.

Accordingly, we analyzed the specifics of the medical services market and its main trends, compared search trends, identified the most promising technology in the field of microchips, analyzed the demand for innovation, and found significant indirect competitors.

Based on the performed research, we offered an idea of an innovative product. We described the innovation's essence and features and established the price. Also, we proposed ways of distribution and created strategy innovation promotion in the market.

Therefore, we developed the idea of a microchip, «InBlood». This microchip is implanted under the skin and responds to specific pathogens, poisons, or toxins in human blood, providing timely medical care. The device can program to detect about 1000 pathogens.

The chip is available in two versions for different purposes. One device will solve the problem of dangerous diseases and deaths of tourists due to virus infections or bites from dangerous animals, insects, and snakes. The other microchip will help monitor changes in blood sugar or other blood components and detect pathogenic bacteria or viruses before symptoms.

So, summarizing the work results to promote innovative chips, we use an offensive innovation strategy. The purpose of the advertising campaign is innovation's presentation to the audience. In the beginning, the microchip will be presented at international electronics exhibitions to attract partners and form awareness of innovation. Then there will be a personal presentation of innovation for some potential partners. As a result, a brand with a complete visual identity will be formed.

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Просування інноваційного мікрочіпа на ринку медичних послуг: маркетингові аспекти

У сучасних умовах люди можуть легко переміщатися між регіонами, країнами та континентами. Така свобода руху дозволяє легше обмінюватися знаннями, підсилювати потенціал. Проте період пандемії COVID-19 показав, що разом з людьми легко переміщуються і хвороби, які стає все складніше вчасно виявляти та контролювати. Відповідно, виникає необхідність у розробленні концепції інноваційного товару, покликаною сприяти вчасному виявленню, лікуванню чи профілактиці захворювань, викликаних хвороботворними компонентами, ядами або токсинами, які можуть становити небезпеку для життя і здоров'я людей під час подорожей.

Метою статті є розроблення інновації у сфері медицини та опис маркетингових аспектів її просування.

Результати дослідження показали, що інновації стають важливою частиною сфери медицини. Відслідковується швидкий розвиток технологій штучного інтелекту в медицині, а також індустрії наномедицини, яка передбачає використання нанорозмірних (мікроскопічно крихітних) матеріалів і об'єктів. Відповідно до визначених тенденцій у сфері медицини, ми сформуваємо концепцію інноваційного товару, сутність якої є такою: мікрочіп «InBlood», здатний виявляти конкретні збудники захворювань та токсинів, створюючи можливості для надання своєчасної медичної допомоги. Було запропоновано на початковому етапі виробляти два варіанта інноваційного товару: 1) «InBlood Tourist», основною цільовою аудиторією якого є люди, які подорожують; 2) «InBlood Life», цільовою аудиторією якого є люди, які мають проблеми зі здоров'ям та контролюють стан своїх показників життєдіяльності, або люди, для яких важливою є профілактика захворювань. Ціна на інноваційні чіпи була встановлена з урахуванням цін на мікрочіпи, встановлені непрямими конкурентами. Також була розроблена система знижок.

Крім того, у ході дослідження було встановлено, що для організації розподілу інноваційного мікрочіпа доцільно задіяти багатоканальну систему розподілу, яка передбачатиме і прямий збут через інтернет-магазини та відділи збуту виробника, і збут через посередників. Так, основними посередниками при збуті чіпів «InBlood Tourist» будуть турфірми, а «InBlood Life» - медичні центри.

Для просування інноваційного мікрочіпа на ринок передбачений такий план комунікаційних заходів: 1) участь у міжнародних виставках електроніки; 2) колаборації з техно-блогерами на Youtube, Instagram, Tiktok; 3) персональне представлення товару фірмам-майбутнім партнерам (медичним центрам, туристичним фірмам і т.д.); 4) запуск оглядових статей на ресурсах технологічної та туристичної направленості та сюжетів у ЗМІ; 5) поштова розсилка на електронні адреси, запуск у пошукових мережах контекстної реклами та таргетингу; 6) розміщення зовнішньої реклами у вигляді рекламних щитів та інтерактивних екранів. Паралельно з цими заходами передбачається формування власного бренду з повною візуальною ідентичністю.

Таким чином, практична значущість статті полягає у формуванні конкретних етапів стратегії представлення та поширення серед споживачів інноваційного мікрочіпа.

Ключові слова: інновація, медицина, маркетингова концепція, тенденції медичної сфери, мікрочіп, чіпування.