The 2022 International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/6/20220211

Risk Analysis and Countermeasures for Wearable Mobile Medical Devices

Yaozong Wang[1,a,*]

[1]BANGOR UNIVERSITY Bangor, Gwynedd, LL57 2DG, UK
a.1290868103@qq.com
**corresponding author*

Abstract: With people's attention to health, wearable mobile medical devices have gradually entered people's vision in recent years. With its convenient and fast functions, it is expected to improve the current medical environment. A wearable mobile health device is a portable device that is worn directly on the body or integrated into the user's clothing or accessories. Wearable devices are not only hardware devices but also perform powerful functions through software support, data interaction, and cloud interaction. Wearable devices will bring great changes to our lives and perceptions. This chapter will explain the technology, development, device form, market performance, and other aspects of wearable devices.

Keywords: Mobile Health, Wearable Medical Devices, Mobile Health Assistance

1. Introduction

1.1. Research Background

More and more people are pursuing health as the economy develops to meet people's basic material needs. The uneven distribution and shortage of high-quality medical resources is one of the current conditions in China's medical environment. Moreover, in the traditional medical environment, the medical treatment process is complicated and the diagnosis process is long, which is the norm in each hospital. At present, China has entered an aging society, which will further exacerbate the burden on the medical system. The number of chronic diseases in China is increasing year by year, and chronic diseases are characterized by high medical costs and long treatment times. How to make people understand their own health status more quickly and conveniently is a difficult problem in today's medical environment, and wearable mobile medical devices are expected to become a solution to the problem in China's medical environment. With the release of Google Glass in 2012, wearable mobile medical devices have attracted wide attention and attracted many enterprises to begin to lay out this market [1-4] .

1.2. Research Significance

Wearable mobile medical devices can make the medical treatment process more convenient so that people can understand their own physical conditions more intuitively through wearable mobile medical devices without going to the hospital[5] . For some patients who need to be observed in a hospital, wearable mobile medical devices can help them get the same observation results outside

DOI: 10.54254/2754-1169/6/20220211

the hospital environment, saving them time and money [6] .In addition, wearable mobile health devices tailored to specific chronic conditions can allow patients to receive the same treatment away from the hospital[7-8] . Wearable mobile medical products will solve many of these problems for today's traditional medical industry [9].

1.3. Product Classifications

Today's wearable mobile medical devices are mainly developed in a wearable, portable, and intelligent direction through upgrading and transforming traditional medical devices [10-11] .According to their functions, wearable mobile medical products are generally divided into two types: One is mobile medical auxiliary equipment, which is usually embedded in personal clothing (bracelet, ring, glasses, shoes, socks, etc.). It is characterized by the use of built-in biosensors to monitor the user's body indicators, such as body temperature, blood pressure, blood glucose, heart rate, and exercise. Through the data feedback provided to the user, the user can carry out long-term dynamic monitoring, provide comprehensive diagnostic data, facilitate the diagnosis and control of disease, as well as prevent sudden diseases [12-13]. The other is wearable treatment devices, which are characterized by their use to help the body function properly. For example, the Microtech Medical's latest application of an intelligent insulin pump uses a micromotor to push a piston to inject the insulin embedded in the device into the body of diabetes patients at a set dose through an indwelling needle. The product is directly worn on the user's waist, and the device can automatically help patients inject insulin by setting the dose and injection cycle, which has a significant improvement in the lives of diabetic patients [14]. Most of these products are aimed at a specific patient or disease to help users live a normal life, such as cochlear implants, cardiac pacemakers, brain pacemakers, and so on.

2. Current Market Development Status of Wearable Mobile Medical Products

2.1. Current Situation of Market

The market share of wearable medical devices in China was 2.7 billion RMB in 2016 and increased to 14.3 billion RMB in 2021. In recent years, the wearable medical devices market in China has shown rapid development. Looking at the world, the wearable medical device industry is also experiencing explosive growth. It is expected to exceed $6 billion by 2023, and the wearable medical device industry is developing vigorously[15] . Most of them are mobile medical auxiliary devices. Since most mobile medical auxiliary devices feed back data to users through mobile phones, elec-

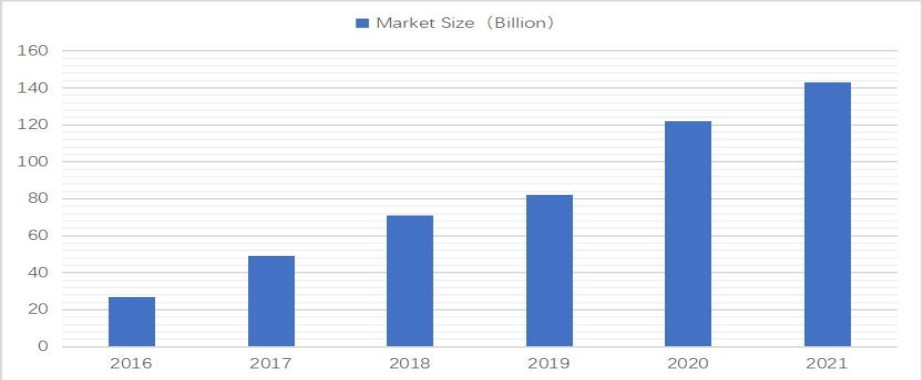

Figure 1: Forecast of wearable medical devices market size in China from 2016 to 2021.Data source: Insight&Info Consulting Ltd., collation

DOI: 10.54254/2754-1169/6/20220211

tronic product giants such as Samsung, Apple, Huawei, and other companies have an absolute advantage in the market for wearable mobile medical products[16-17] . However, wearable medical devices have a limited customer base due to high research and development costs and strict supervision. The majority of the market is occupied by related medical device companies.

2.2. Future Development

With the increasing maturity of relevant technologies, various products are about to enter the lives of ordinary people on a large scale, bringing significant technological changes to human life. Due to the large customer group and wide audience area of mobile medical AIDS, it can be found that wearable devices will develop in the following aspects in the future by integrating the market for wearable devices in recent years:

2.2.1. Intelligent

Wearable devices will become a major tool to change people's lifestyles and improve the quality of life. At present, some wearable devices on the market, such as the IWan smart wristband for detecting sleep quality or the Maio Alpha heart rate meter for monitoring heartbeat and pulse, mainly output data directly, which makes it difficult for ordinary users to judge their own physical conditions based on these data. It can be predicted that in the future, wearable devices will not only measure users' physical signs in real time but also accurately display their comprehensive health indicators, so that users can know their physical conditions in a more timely and convenient way [18-19].

2.2.2. Beautiful and Stylish

Existing wearables focus on technology rather than everyday fashion items. Brands such as Pebble and Martian have introduced products that are close to regular watches; Asus has introduced round smartwatches such as the ZenWatch, Moto 360, and LG G Watch R; and Apple has unveiled its Apple Watch smartwatch. This series of designs sparked the fashion competition for wearable devices and set the product design trend for the entire industry. In recent years, there have even been some very beautiful and fashionable products specifically designed for female users. Fashion is an obvious trend [20].

2.2.3. Flexible

The existing devices are mainly limited to headwear and wristwear. With the booming development of the wearable device market, wearables will be more flexible and changeable in the future. Wristwear devices and smart glasses are not the only product types worth looking forward to. And the focus of research and development will shift from data tracking to data-based services [21-22].

2.2.4. Civilian

Looking at the wearable devices in the market, although the price varies, the price is relatively high, which is closely related to the scarcity of wearable devices. With the development of society, more wearable devices will change this situation. In the future, everyone will have the opportunity to wear such devices, which will be as common as mobile phones are today. In addition, the functions of future wearable devices will be more and more perfect, and exclusive applications will be more and more abundant.

DOI: 10.54254/2754-1169/6/20220211

3. The Existing Risk Points of Wearable Mobile Medical Products

3.1. The Data Detected is not Accurate Enough

The main function of medical AIDS is to provide feedback on data to users through detection means, and accurate data feedback can improve customer satisfaction with products. However, the detection accuracy of most medical AIDS on the market currently fails to meet the standards of medical monitoring instruments, which leads to user groups with real needs being more inclined to go to hospitals instead of using these medical AIDS to measure your body's indicators.

3.2. Battery Life

For patients with chronic diseases such as hypertension, diabetes, and hypoglycemia, long-term detection of their physical indicators is helpful to improve their condition. One of the advantages of mobile medical AIDS is that they can carry out long-term detection of their various indicators for 24 hours, which means that compared with other electronic products, they need longer battery life, and long-term battery life means an increase in battery size. Weight increase: if a portable device is too bloated, the selectivity for the user will become low. General electronic equipment usually has 10%–40% of the weight on the battery; usually, the lighter the equipment, the higher the proportion. If improving the battery life reduces the comfort of the product, on the contrary, improving the comfort will reduce the practicality of the product. How to ensure the comfort of mobile medical AIDS and make the product have long-term endurance is one of the problems facing most manufacturers in the market at present.

3.3. Security Risks and Privacy Risks

It is one of the features of mobile medical assistance devices to feedback customers' physical indicators through data. In the era of big data information, personal data privacy is more or less inevitable to be leaked. How to protect users' data privacy and provide users with more secure and reliable products is a key point to quickly seize the market [23-24].

4. Countermeasures against Risks

4.1. Improving the Accuracy of Inspection Data

At present, most of the manufacturers of mobile medical devices in the market are not medical device companies but traditional manufacturers of watches, bracelets, mobile phones, and glasses. Due to their original customer groups, the mobile medical aids produced by them can more quickly occupy the market. Before this, most of them had never been involved in the medical field. Due to the lack of relevant experience in the medical industry, the products produced cannot meet the standard medical standards, so the customers who really need their products do not respond strongly to them. These manufacturers can choose to cooperate with traditional medical device manufacturers in the field so as to produce better products.

4.2. Reducing the Impact of Battery Life Issues.

Battery life is not only a problem faced by mobile medical aids but also all mobile devices. Because current technology cannot meet long-term battery life requirements, the product structure can be optimized. Most of the current products have integrated charging rather than the traditional detachable battery. The use of a removable battery should be a better choice, although it cannot solve the

DOI: 10.54254/2754-1169/6/20220211

battery life problem, but it can minimize the impact of the problem on the user while ensuring the comfort of the product.

4.3. Security Response Plan

If we are talking about how domestic Internet companies generally behave, we can only say that both moral self-discipline and technical measures are generally very poor. Leakage or resale of user information and data are common, and there is little privacy protection for vulnerable teenagers. The Children's Online Privacy Protection Act in the United States has special protections for children's privacy, So like apple's privacy policy of http://www.apple.com/hk/privacy/ “in the case of the people, we do not collect personal data under the age of 13 years old children. If we learn later that we have collected personal data of children under the age of 13, we will take steps to remove the data as soon as possible.” In the Chinese market environment, the complicated privacy protection policies of Apple and Google are too costly and difficult to implement in practice. But responsible privacy protection for users should include at least the following basic elements:

(1) Companies should be more open, let users know how they collect and use their data, and give them some choices.

(2) Companies should use technology to protect legally collected data from disclosure and resale.

(3) The government should not spy too much and should get rid of information that clearly invades the privacy of other users.

5. Conclusion

To sum up, wearable mobile medical products are a new field in the medical industry, a combination of electronic products and the traditional medical industry. As a medical and health field closely related to people, it is highly likely to usher in an outbreak period. Wearable mobile medical devices are in the early stages of development and have great prospects. There is likely to be a new technological direction that will fundamentally change human health. On the one hand, our aging population causes the rapid growth of medical demand; on the other hand, there is a serious shortage of medical resources, especially in remote areas. The gap between supply and demand brings opportunities for mobile health care, while the rapid development of mobile Internet and big data provides the necessary conditions for its development. In the future, patients with chronic diseases such as coronary heart disease, hypertension, and diabetes will receive not only drug treatment but also a holistic disease management program that includes remote monitoring, remote treatment regimen adjustment, lifestyle management, and wearable drug delivery [25].

References

[1] *Li Yanjun, Li Yinghui, Yu Xinyue. The present and future of wearable health monitoring devices [J]. Space Medicine & Medical Engineering, 2016,29(03):229-234.DOI:10.16289/j.cnki.1002-0837.2016.03.014.*

[2] *Feng Shuntian. Development status and trend of wearable devices [J]. Information and Communication Technology, 2014,8(03):52-57.*

[3] *Ruan Xiaodong. Wearable devices: Strong layout of mobile health [J]. The New Economy Guide, 2015(Z1):46-49.*

[4] *Hao Xiaosai, Gong Hongyu, Wang Shaosen. From scale and quantity to quality and Benefit-review of the development of Chinese hospital architecture in the past ten years [J]. Chinese Hospital Architecture & Equipment, 2022,23(07):35-39.*

[5] *Zhao Limin, Wang Lina. Current situation and development of mobile medical treatment in Internet era [J]. Light Industry Science and Technology, 2018,34(05):97-98.*

[6] *Bian Maomao, Xie Hong, Study on the status quo and influencing factors of mobile medical service for diabetic patients [J]. Chinese General Practice, 2021,19(04):679-683.DOI:10.16766/j.cnki.issn.1674-4152.001892.*

[7] *Li Xiaolian, Xie Jianfei, Ding Siqing. Progress of mobile medical application in exercise rehabilitation of patients with coronary heart disease [J]. Chinese Journal of Nursing, 2019,54(11):1735-1739.*

DOI: 10.54254/2754-1169/6/20220211

[8] *Lv Xiaoyan, Xia Jinghua, Cao Yingjuan. Research progress of diabetes mobile medical APP quality status and evaluation tools [J]. Chinese Nursing Management, 2019,19(12):1881-1886.*

[9] *Yan Yan, Zou Hao, Zhou Lin, Yuan Chan, Wang Lei. The development of wearable technology [J]. Chinese Journal of Biomedical Engineering, 2015,34(06):644-653.*

[10] *Chen Minya, Zheng Konglin, Man Pan, Application of closed-loop medical order management in our hospital [J]. Chinese Journal of Hospital Administration, 2012, 28(11): 858—859.*

[11] *Xu Qian, Zhao Wenlong. Mobile medical applications at home and abroad and its enlightenment [J]. Laboratory Medicine and Clinic, 2014,11(09):1295-1297.*

[12] *Ma Yiwen. Research on wearable ECG monitoring system based on mobile Medical Internet of Things and its application in auxiliary diagnosis of cardiovascular diseases [D]. Zhejiang University, 2019. DOI: 10.27461/d.cnki.gzjdx.2019.001356.*

[13] *Li Huikai. Analysis of key components in wearable medical devices [J]. Electronic Components and Materials, 2014,33(06):83-84.*

[14] *Microtech Medical [2022] http://www.microtechmd.com/Products/EQUIL-Patch-Insulin-Pump Equil® Adhesive intelligent insulin pump*

[15] *Guanyan report network [2021] https://market.chinabaogao.com/dianzi/0R05521O2021.html Current status of Chinese wearable devices in 2021: The market size and shipment volume show an increasing trend, and Huawei ranks the first.*

[16] *Qian Tongxin. Tech giants jump the wearable medical device race [N]. China Business News, 2021-07-29(A10).DOI:10.28207/n.cnki.ndycj.2021.003418.*

[17] *Mao Tong, Zhou Kaiyu. Comprehensive analysis and suggestions of wearable devices [J]. Telecommunications Science, 2014,30(10):134-142.*

[18] *Liu Feng, Han Jinglong, Qi Ji, Zhang Yu, Yu Jialuo, Li Wenpeng, Lin Dong, Chen Lingxin, Li Bowei. Research and application progress of intelligent wearable devices [J]. Bunseki Kagaku, 2021,49(02):159-171.DOI:10.19756/j.issn.0253-3820.201410.*

[19] *Wang Pan, Zhao Qinghua, Xiao Mingchao, Xiao Ling. Progress of mobile medical application in health education of patients with coronary heart disease [J]. Chinese Nursing Management, 2018,18(07):953-958.*

[20] *Wang Xiaoli, Liu Yongmei. Category analysis and development trend of wearable devices [J]. Melliand, 2015,43(05):58-60.*

[21] *SALIMFD, PROHASKYD, BELBASISA, Etal. Design andevaluationofsmartwearableundergarmentformoni - toringphysiologicalextremesinfirefighting [C] / / Interna - TionalSymposiumonWearableComputers, 2014.*

[22] *Yu Jingjing, Deng Yongmei. Application and prospect of wearable intelligent clothing based on physiological monitoring [J]. Advances in textile Science and Technology, 2021(02):6-9+15. DOI: 10.19507/j.cnki.1673-0356.2021.02.002.*

[23] *Rong Shankui, Jiang Xiao, Zhang Yanli, Yu Xinhua. Analysis and thinking on the status quo of wearable device management [J]. China Medical Devices, 2021,36(05):177-179+183.*

[24] *Zong Wenhong, Chen Xiaoping. The enlightenment of mobile medical supervision from abroad to our country [J]. Chinese Journal of Health Information Management, 2015,12(04):340-345.*

[25] *L. Ohno-Machado, J. H. Gennari, S. N. Murphy, N. L. Jain, S. W. Tu, D. E. Oliver, et al., "The guideline interchange format: a model for representing guidelines," vol. 5, ed: Am Med Inform Assoc, 1998, p. 357.*