ISSN 2616-5791 Vol.5, Issue 9: 61-66, DOI: 10.25236/AJMHS.2024.050910

Research on the Design of Asthma Atomization Products Based on Emotional Design

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Abstract: *In recent years, the medical industry has paid more and more attention to the emotional needs of patients. The use of emotional design in product design in the medical industry has become an inevitable trend, which allows medical institutions to establish a closer and warmer relationship with patients. Based on the current development of medical products, this article provides an overview of medical atomizers from an emotional perspective, integrating emotional design into the design of medical atomizers, and providing more possibilities for the development of emotional design in other medical products.*

Keywords: *emotionalization; Medical products; atomizer*

1. Introduction

In the rapid economic development and accelerating industrialization of the present, environmental pollution continues to intensify, coupled with the pace of people's life and work is also accelerating, the incidence of bronchial asthma in the elderly is getting higher and higher, becoming one of the chronic diseases seriously endangering people's health. In this context, people's demand for asthma medical products is also increasing. Due to the easy recurrence of asthma, long treatment cycle of patients, and high physical and mental pressure in long-term treatment, people's demand for the function, technology and quality of asthma medical products, especially atomization products, is becoming higher and higher, and the comfort, safety and human touch of products during use are the keys to the design of asthma medical products. The purpose of design is for people, and the emotional product design with temperature can effectively promote the dialogue between people and products, and also allow patients to get mental and spiritual comfort in the use process, which plays an important role in promoting the health of patients. Therefore, how to add emotional design elements to the medical nebulizer to make the product more suitable for the use of asthma patients is a topic that relevant researchers focus on [1-2].

2. Development Status of Medical Asthma Aerosol Products

With the current aging population and the continuous increase of patients with chronic diseases, the clinical demand for medical devices is increasing. With the development of the global economy and the progress of medical technology, the medical device market has broad prospects for development. The market has a large demand for asthma nebulizer products. Various nebulizer products for different people with asthma have emerged one after another, providing a variety of options for patients with asthma. Compared with the traditional oral method and intravenous infusion method, atomized products can directly inhale certain drugs through atomization inhalation, which has the advantages of fast efficacy and small side effects. It is deeply loved by doctors and patients, and has become an important adjuvant treatment. According to statistics, in 2022, the output of China's atomizer industry was about 17.35 million units, and the demand was about 12.7 million units, with a year-on-year increase of 14.7% and 21.3% respectively. In 2022, the scale of China's atomizer industry was about 3.402 billion yuan, with a year-on-year increase of 15.8%. With the change of the environment and the incidence of respiratory diseases showing an upward trend, the demand for atomizers has increased. Atomization therapy has the advantages of small dosage, rapid onset of effect, good clinical effect and so on, and has a great development prospect. In general, nebulizer products have huge development space and a broad medical market[3].

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3. Asthma Product Design Principles Based on Emotional Level

3.1. Principles Based on Instinct

The instinctive layer is the user's instinctive direct reaction to the product's vision and first impression. Influenced by the product's appearance, for example, the user is attracted by the product's appearance at first sight, so he has an impulse to understand the product. Designers can design asthma medical products from the aspects of shape, material, color and so on, so as to increase the acceptance of patients and make the appearance of products daily.

3.2. Principles Based on Behavior

Behavior layer emotion focuses on the efficiency and fun of using products. Many behavioral level designs consider function, but rarely consider other aspects, especially feeling experience. The essence of product experience design is to effectively integrate user perceived experience design into product design, bring unique aesthetic experience to consumers, and make consumers obtain spiritual pleasure in the process of contacting with products. Designers can integrate the elements of patients' daily life into the operation behavior of asthma medical products to make the treatment methods simple and daily.

3.3. Principles Based on Reflection

The reflection layer is often related to the meaning of the product. By triggering the common memory of users and products, users can enhance their sense of identity with the product. The design element of the reflection layer is to let users produce positive emotional experiences such as satisfaction and pride in the interaction with the product, or affect their self-image and memory. The emotion of the reflective layer is related to the long-term feelings of users. They may also have a perception of the product, improve their trust, and then increase the frequency or service life of the product[4-6].

4. Analysis of Existing Atomizer Products and Existing Problems

4.1. Pressure Quantitative Aerosol Inhaler (PMDI+ Mist Storage Tank)

The pressure quantitative aerosol inhaler consists of a drug, a metal drug tank, a driver and a suction nozzle. Because insufficient vital capacity of patients during inhalation may cause drugs to not enter the lungs smoothly, it is generally equipped with a pneumatic holder with a valve or a storage tank for combined use (Table 1). The aerosols used in the inhalation device of pressure quantitative aerosol inhaler include Ventolin aerosol, chuankangsu aerosol, etc.

Table 1: Analysis of Pressure Quantitative Aerosol Inhaler (Author Drawing)

Name	Picture	Function Introduction	Intelligence Level
Pressure quantitative aerosol inhaler		It is composed of a drug, a pressurized tank, a quantitative valve and a suction nozzle, which is loaded into the drug and pressurized to deliver the drug to the lungs.	Mechanical
Mist storage tank		Solve the problem of spraying and inhaling out of sync. Reduce the irritating effect on the throat.	Mechanical

4.2. Dry Powder Inhaler (DPI)

There are many types of dry powder inhalers, including rotary type, quasi dispenser disc type and

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DUBAO type (Table 2). The shape of the suction device is different, and the use steps are roughly divided into: (1) open or unscrew or slide the inhaler port; (2) Loading drug capsules; (3) Press the button to pierce the capsule and release the drug into the inhaler; (4) Push the handle to prepare a single dose (5) place the inhaler vertically or horizontally according to different drugs; (6) Exhale thoroughly and close the inhaler mouth with your lips; (7) Inhale deeply according to the bottle body of the inhaler; (8) Hold your breath for up to 10 seconds, remove the inhaler and exhale slowly; (9) Gargle after hormone inhalation.

Table 2: Analysis of Dry Powder Inhaler (Author Drawing)

Name	Picture	Function Introduction	Intelligence level
Dry Powder Inhaler		Fill the drug capsule, press the button to puncture the capsule, and release the drug into the inhaler: according to the different drugs, arrange the inhaler vertically or horizontally, deeply inhale the inhaler bottle, and deliver the drug to the lungs.	Mechanical

4.3. Atomizing Inhaler

Compared with other inhalers, atomization inhalation does not need to learn inhalation therapy. The atomizer design technology is gradually updated. The atomizers in the existing market are classified (Table 3): ultrasonic atomizer, compression atomizer and screen atomizer (as shown in Figure 3). The first generation of ultrasonic nebulizers used ultrasonic atomization device to break up the liquid medicine into small particles and inhale them into the pharynx and lungs. However, because the spray of ultrasonic nebulizer was not selective for particles, the deposition of drug particles in the lungs was small, and the ultrasonic nebulizer had a large amount of fog, which was easy to choke, and had a poor therapeutic effect on asthma. The second-generation compression nebulizer, also known as jet nebulizer, uses the venturi jet principle, uses compressed air to form a high-speed air flow through the small nozzle, and becomes foggy particles to be ejected from the trachea under high-speed impact. At the same time, compared with the ultrasonic nebulizer, the atomized particles are improved, which is not easy to make people cough. At present, many medical institutions use compressed nebulizers for treatment in atomization rooms, but they are bulky, noisy and difficult to carry around, which easily makes patients afraid of atomization treatment. The third-generation mesh atomizer can effectively control the medical micro mesh spray module output of ultra-fine atomized particles. When the liquid medicine is sprayed to form atomized gas, the sprayed atomized gas will impact the filter again to produce finer atomized gas particles for patients to absorb the medicine. The micro grid nebulizer has become a new generation of household and medical nebulizers. It is more intelligent in function and tends to be humanized in shape. Technically, the atomized particles are small, there is little noise, and the volume is small and easy to carry. It is almost silent at work, making it the first choice for family therapy.

Table 3: Classification of Atomizers (Author Drawing)

Name	Picture	Function Introduction	Intelligence Level
Ultrasonic Atomizer		Efficient integrated circuits and atomization plates for atomization, with a large atomization volume	Electronic Formula
Compression Atomizer		The drug micron particles are inhaled with fine atomization, the atomization amount can be regulated and quiet	Intelligent Type
Filter Atomizer		Handheld vibrating wave atomization, fine particles and quiet, micro-mesh atomizer can be connected to the APP with Bluetooth	Intelligent Type

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The existing products for the treatment of asthma have single appearance, rigid L-shape and single function. For people with asthma, it is necessary to regularly test the lung function during the treatment period, so as to monitor the dynamic lung function; Detection can help patients effectively prevent asthma attacks, reduce the dosage of drugs, and improve the cure rate. At the same time, if patients need to dilate their own lung lobes, there are also potential safety hazards. The existing products either only focus on the measurement of the onset of the disease, or can only provide drugs to alleviate the disease, which is very inconvenient for people to use[7].

5. Product Design Trends for Asthma Patients

5.1. Digital Trends

The product digitalization direction is represented by the product intelligence and the information development direction based on the Internet, which can improve the medication compliance of patients, optimize the self-management of patients, and realize the remote doctor-patient communication. At the same time, intelligent medical products can make timely warning of acute attack according to the condition of patients, and the purchase and use of products also provide convenient after-sales services.

5.2. Systematization Trend

Besides providing therapeutic functions, the product also provides a platform for product management. Due to the complexity of asthma treatment, it is difficult to carry out comprehensive management for the inhalers of emergency inhaled drugs, chronic atomized inhalers and lung function testing instruments. Therefore, in the future monitoring management, we should pay more attention to the common intelligent development direction between products, conduct comprehensive management, and form a systematic product management system.

5.3. Portable Trend

The lightweight direction of the product is shown in the increasingly light shape of asthma self-management and home medical products, especially the new generation of atomizing inhalers and lung function meters are small in size, and the use is not limited by time and place. Therefore, the convenience and compactness of the product should be considered when designing the atomizer.

6. Asthma Product Design Practice Based on Emotional Design

According to the current market situation of asthma products, combined with Donald Norman's emotional design theory, this paper summarizes the design method of medical products based on the emotional hierarchy theory. This study concludes that the innovative design based on the existing asthma monitoring inhaler, taking asthma patients as the main object of use, solves the problems of the existing asthma therapeutic device, such as versatility does not meet the use needs, inconvenient to carry, etc. Simplifying the operation steps and guiding the drug inhalation method can improve the medication compliance of patients; Set medication reminders and warnings, and send relevant data to the mobile terminal synchronously for real-time monitoring; The detachable design is adopted as a whole, and the electronic screen can display the remaining treatment times, which is convenient for timely replenishing drugs, increasing the product life cycle and saving costs.

6.1. Form Design

The shape design of medical products should convey a safe and comfortable feeling to patients. Avoid sharp straight lines in the design, and try to use softer curved surfaces, arcs, rounded chamfers, etc(Figure 1). to improve the affinity of the product. At the same time, the internal parts and structures should be properly shielded to reduce the discomfort of patients in the treatment process. In most cases, the nebulizer is used by patients alone. Its overall design should be simple and soft. The contact part of the patient should conform to the size of the human body. The texture of the hand should be appropriately increased to increase the friction force, so as to prevent patients from sliding their hands during use. The mouth should be comfortable to use.

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Figure 1: Design with Simple Shape and Arc Chamfer (Source: Network)

6.2. Color Design

Color affects the user's first impression of the product and determines the user's psychological state when using the product. Low saturation color should be used in the color of medical products to avoid visual fatigue caused by long-term use of medical staff (Figure 2). The color design of medical nebulizer should adopt simple and low saturation colors to create a comfortable and quiet feeling, so as to relieve the tension and anxiety of patients. Different colors can be used to distinguish the intubation port and mouth, which is convenient for patients to use quickly.

Figure 2: Color Design with Low Saturation (Source: Network)

6.3. Material Design

Different materials will give users different feelings. The patient's first feeling when touching the product will accompany the whole process of use. Soft materials will make the patient more relaxed when touching the product, while hard and cold materials will give the patient a cold feeling when touching the product. When using the medical atomizer, patients need to hold the atomizer for a long time. In the material selection, we should avoid using metal and other materials, and use plastic and other materials with relatively mild touch and light body feeling.

The design of the asthma inhalation monitor combines the lung function monitoring with the acute attack inhalation function. The function integration is convenient for multiple uses. In the appearance design, it breaks the traditional "L" shape, changes the common stereotype in the inhaler, makes it more in line with the user's lifestyle, and makes the appearance more concise and generous. Small and portable (Figure 3).

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Figure 3: Designed with Gentle Materials and a Lightweight Appearance (Source: Network)

7. Conclusions

Emotional design of medical products is the inevitable trend of the development of the medical industry in the future. Medical nebulizers are commonly used for the treatment of patients with respiratory diseases. In addition to meeting the basic treatment function needs of patients, medical nebulizer monitors should also consider their physiological experience and emotional needs when using medical nebulizers. When designing medical nebulizer products, we should take asthma patients as the center, start from the psychological and physiological needs of patients, increase the safety and lifestyle of medical nebulizers, reduce patients' anxiety about treatment, so as to increase patients' trust in medical nebulizers, and better play the therapeutic function of medical nebulizers.

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