

The Research of Intravenous Drip of Medical Instrument Design in The Concept of Ecological Criticism and Barrier-free

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Abstract. At a time when the whole medical level is promoted, the most commonly used intravenous injection products have not changed much, in the meanwhile many problems arise. Based on the barrier-free design concept and eco technologies, through the eco-criticism aspect and the environmental ethics aspect, the old intravenous way has been carried under improvements for a convenient, practical, and more human-friendly intravenous injection way. The main consideration are that by intravenous injections, the environmental ethical relationship can be achieved between people with the product, nurses with the product, people and nurses, which also take into account how to help patients overcome the psychological fear for diseases, injections and medicines etc. Embellishing the appearance of intravenous injection products, at the same time the product's functions can be suggested by its appearances.

Introduction

Intravenous injections products are one of the most commonly used medical apparatus and instruments in the hospital. However, over the years, both in shape and function, it hasn't presented too much big changes. Now the intravenous injection has still inherited the old ways. In the 21st century, economic achievements and living standards' improvements mean that governments are paying more and more attention to the medical equipment investments^[1], so the development of medical industry will inevitably lead to the development of intravenous products' designs. As you can see, intravenous injection products' industry is positively correlated to macro economic cycles. So it's an inevitable to change its same old pattern, combing it with ubiquitous high-tech and human element designs, to better and fully meet the needs of people. All the while, patients have held long-standing fear for intravenous injection products as a cold, ruthless medical equipment, but it is also a rapid-developing, effective and unavoidable medical apparatus and instrument^[2]. In addition, from the industry's life cycle curve which intravenous products are in, it can be seen that intravenous injection products hold high profit space. Designing and manufacturing high-tech intravenous equipments may require large investment at the beginning, but in the end it will produce substantial profits.

From the above analysis, we can know that the economic environments in China are constantly changing, with more investments in the field of medical apparatus and instruments. Medical industry is a technology-intensive industry, affecting human health^[3], and even human survival. Science and technology are more applied in the field of medical apparatus and instruments with national investment in this aspect also increasing. As a medical apparatus and instrument people in daily life encounter most, intravenous injection products' design is of imminent importance.

The Technical Constraints and Deficient Human Care of Existing Products

The old intravenous products adopt stainless steel as its main material, with the advantage that it will not rust easily in humid environments and have a long service life. However, this kind of material gives a patient with an impression of coldness, especially when the hospital walls are white. Generally the rollers are covered with rubber, with the advantage of regular friction, and the disadvantage of poor wear-resistance.

Nowadays there is a variety of Intravenous injection patterns, such as: the console model one and rail hanger, etc. Our design mainly adopts the console model, which is the focus of this research. It can be divided into the following two kinds: one is, as shown in figure 1 left 1, of a vertical bar as the main structure, and the liquid medicine bottles hanging at the top are supported by bending stainless steel plates. Another, as shown in figure 1 left 2, comprises of a rod and an outstretched stent as a operating platform for nurses. The first console model has the advantage of being neat and simple but without considering the nurse's inconvenience in practice^[4], and the second boasts the advantage of being fully attentive to the nurse's needs but is not slick and eye-catching.

The existing intravenous dripping products have taken the full consideration on the hydraulic pressure, but no more. When people are waiting, their psychological feelings may change. Everyone will inevitably fall ill at times. At the peak hours, hospital is always crowded with people waiting for dripping treatments^[5]. The general intravenous equipments are as shown in figure 1. Almost everyone had unpleasant memories about it. The following problems often occur: the elderly and the children's blood vessels are hard to locate; during peak times, the intravenous equipments often appear inadequate; when finished, the nurse are called out loud, making the room very noisy; at night, nurses need to turn on the light to know the rate and remaining amount, which will disturb others.



Fig. 1 intravenous drip of floor drop

Perceptions of Emotions and Environment-barrier Free Designs' advantages

The concept "barrier free design" was introduced in 1974 by the United Nations organization^[6]. Barrier-free design emphasizes that in the science and technology highly-developed modern society, all public space environments concerning daily lives and all kinds of building facilities, equipments, planning and designs, must fully pay attention to the requirements of the physical disabled and people with decreasing normal-activity abilities (such as the elderly, etc.) and be able to provide services and devices to meet those needs, build a loving and caring, secured, convenient, and comfortable environment for modern lives. Barrier-free design's ideal target is "barrier-free"^[7]. Based on meticulous researches and observations for human behavior, consciousness and reactions, it is dedicated to optimize every design used by humans, to remove the confused, difficult "barriers" on the interface and provide the user with maximum possible conveniences. That is the basic idea of the barrier-free design. Products of this design fully consider the special needs of the people so that they can, with the help of design, finish the tasks that seems preserved for only normal persons. Barrier-free design embodies the idea of humanized designs, bringing more warmth and care to others.

Targeted people analysis: From the perspective of the barrier-free design, the intravenous injection design should fully consider the special needs of the targeted people. Intravenous injection

is for patients in the hospital for dripping liquid medicine in, which requires the nurses to insert the needles. Many people, especially young children are afraid sharp objects .In addition, the elderly and the children's blood vessels are not clear enough to pinpoint, which may often result in wrong injections. New intravenous design must fully consider these two factors, addressing people's fear for sharp objects and avoiding wrong stabbing of the needles.

Available people analysis: in addition, another group should be taken into account. That is nurses. Every day, especially at the peak hours, the nurse will receive hundreds, even thousands of patients. So the piling amount of work often makes people feel tired, who are easy to lose temper, and thus come into conflicts with patients. In this case, the nurse should also be included in the scope of disabled people. How to reduce the workload of the nurse, and provide them with a more relaxed, comfortable working condition should be one of the problems that design must notes.

New intravenous injection products, as the bridge between the nurse and patient, should consider these two aspects for comprehensive benefits, not overlooking either's . As a often used medical apparatus and instrument, how it is used should be grasped by the nurse through its appearances, so the nurse does not need require special training or learning to use it. At the same time, from the perspective of patients, they have the right to understand nurses' every step, at the same time serving as a supervisor. In addition, the design of the intravenous injection products should, added to the most basic functions, have other emotional implications like reducing the coldness and even becoming the common topics between patients and nurses. Through system integration design and meeting the requirements of multi-functions, the related peripheral products, such as needles, intravenous injection etc can be redesigned, and be more cooperative to serve people better.

Ecological Technology and Environmental Ethics——the Eco-critical Design for Intravenous Injection

Began in the 1990s, the ecological criticism originates in western countries, starting with cultural and literary criticism. America's leading advocate of ecological criticism and originator Cherry Grottephil defines it as: "ecological criticism is the criticism of the relationship between literature and the natural environment discussed." Shuyuan Ru is one of the earliest leading figures and advocates of ecological literature criticism in China, and advocates to consider "ecological literature" as a branch of art, which is of contemporary significance. Modern definition of the ecological criticism is more extensive. Any criticism related to nature, the environment can be used as the content of ecological criticism, in which ecological design is also included. All forms bearing life forms and the sustainable development belong to the category of the ecological criticism. Ecology is not only historical heritages, but is also human culture heritages^[8]. It is made up of specific national or regional way of life, mode of production, religious beliefs, customs, ethics and other cultural factors, a cultural system with independent characteristics of the structures and functions. And the modern product's eco-design concepts focus on creating products accustoming to a new way of life with modern technology and traditional aesthetic concepts.

The intravenous injection design is a model of modern science and technology combined with natural environmental ethics: the intravenous facilities together with air-purifying devices let patients breathe the fresh air in the ward, which not only purifies the air, but at the same time can also embellish the environment. In addition, organic ingredients in plants can also be used to provide power and save the electricity uses. The terminal equipments in the nurse's office should also be integrated with the concepts of green design. According to a survey study, fresh plants can reduce the feelings of fatigue and boredom. The connections between terminal designs and the plants, will bring a more comfortable working environment and a better mood to nurses.

The Ecological Technology

Ecological technology refers to all means and techniques that both can satisfy people's needs, saving resource and energy, and protect the environments. The new intravenous injection products mainly use the ecological technical processing configuration, mainly composed of four parts: the main body intravenous injection, the dripping-rate tester, infrared detector and terminals. The four part have its own roles. Start with intravenous injection, as shown in figure 2. It is mainly used to contain the liquid medicine and place the dripping-rate tester and ultraviolet detector. In addition, the main body contains two pairs of screen, which can be used to make patients see the dripping speed and residual quantity. In material, it abandons the old way of stainless steel design, but adopts the more human-friendly biodegradable plastics. In structure, it evolves into the bionic design by posing as an abstract nurse form, so the feeling of coldness is dispelled. Finally it is equipped with a different color scheme, so the ward can also look colorful and warming. And then take look at the dripping-rate tester. Although in the past, we can by looking at the bottle to predict the remaining quantity. But because of the uneven different dripping speed, although sometimes just a little bit of liquid medicine remains, it still requires the patient to sit there for a long time. The patience will fidget around from time to time and ask the nurse how much longer will it take. This device is to save the trouble on both sides. Liquid through of gravity will drop to the dripping-rate tester's ball surface, whose membrane on the surface can test out the dropping speed, and stores the rate. When liquid remains less than 5%, the terminal will through clear fonts remind nurses, and at the same time the lights on the ball will be switched on, so the nurse can with the help of the light in the evening help patients replace solutions and won't disturb others. Then look at infrared detectors. Through this instrument, nurses can see the patient's blood vessels' grain more clearly to avoid misconducts, not only bringing convenience for the nurses, but also the patients. Technical support on infrared detectors will be explained in detail in the following paragraphs. Finally, the nurse can monitor the progress by terminals.



Fig. 2 design of the new intravenous injection

Environmental Ethics

To ease psychological and physiological impacts caused by environment is environmental ethics, namely. To ease cold hard impressions of environment and the nervousness of the patients , the shapes of the intravenous injection products have taken on a female figure, the main body similar to a woman's body, the top part for hanging the solution corresponding women's hair. In addition, the product fully considers the psychological state of the patients, for playing music can rid them of boredom. The Intravenous base uses the plant grass, which can purify the environment, and at the same time cheer them up. A complete set of other designs are intended to make patients feel comfortable, as well as for the working staff.

Summary

Health care is so intertwined with people's lives. Among various kinds of medical facilities, the intravenous injection types are the most widely used ones. Through the design of the intravenous injection, better care for people's health can be realized. In the tide of development of medical equipments, the intravenous injection products should also keep up with the pace of science and technology and the current trends, to advance innovation and create a better , comfortable environment for patients and doctors.

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