

New Considerations for Medical Appliance Designers

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Medical devices are no longer just medical devices - they are consumer products. In the past, medical product manufacturers stressed the medical efficacy of their devices over all other considerations; however, now they are borrowing a page from the consumer product designers' playbook. Manufacturers are realizing a key insight, one that is changing the entire medical appliance field: users of medical products are *consumers*, who bring the same interests and biases when shopping for medical devices that they do when shopping for housewares and other goods.

This is quite a revelation for an industry that has never put much emphasis on the emotional needs and aspirations of its consumers. We all know what a home medical appliance looks like – it's beige, it's squared-off, maybe it beeps unpleasantly. The aesthetic philosophy seems to have been, "don't bother – people need the products regardless of how they look." And while it may be true that people need the devices, it doesn't mean they don't care about aesthetic friendliness.

It's not only user preference for nicer looking products causing the change. Research is pointing to new thinking around the design of product behavior. In their 1996 book, "The Media Equation," Clifford Nass and Byron Reeves describe research in which they found that people relate to computers and technology in the same ways they relate to other people. The implication is that designers need to design devices that behave like people do, emoting the same respect and honesty we expect from each other. No longer is it appropriate to flummox consumers with cryptic error messages, rude prompts, or extra hoops to jump through in order to get a task done.

Consider the humble glucose meter – a handheld used by diabetes patients to measure the amount of sugar in their blood. Several times a day, the patient pierces a finger and deposits a drop of blood onto a small plastic test strip that he's previously inserted into the meter. Meters have been available for decades, and for most of that time they had the standard home medical appliance look about them. Flat, beige, and sterile, with puzzling icons on a tiny screen, these products screamed, "I am a medical device." That was fine back then – diabetes patients really did need the products, and were grateful for them.

Fast-forward to today. At least ten manufacturers have meters on the market, all available for next-to-free (although a meter may carry a sticker-price of \$90, most have hefty rebates when a patient trades in an older model; newly diagnosed patients often receive obsolete models from their health care providers for trade-in purposes).

Now picture yourself at the drugstore buying a meter. The products on the shelf are all roughly equivalent in performance, so what distinguishes them from each other? What you find today is much different from the selection of the past: meters in colors; meters

with large, clear screens; meters with features to not only measure blood glucose but to manage diabetes as a condition. Ads for these products include endorsements by the likes of B. B. King. With 1.3 million new cases diagnosed every year¹, the glucose meter has truly become a consumer product, much like a CD player or spatula.

Products for People

Once we view medical products as consumer products, many opportunities present themselves. A medical device can do more than support the physical need for medication or monitoring. It can assist, advise, and support the patient, providing for emotional needs as well as medical ones. Through form (shape, color, texture) and behavior (conversational interfaces, friendly messages), designers are creating devices that deliver their intelligence better.

In his 1997 book, *The Innovator's Dilemma*, Clayton Christensen likens the purchase of a product to the hiring of an employee. This metaphor works particularly well with medical appliances. When we hire an assistant, we screen for personality, occupation, and aptitude. Is this person easy to get along with? Does he understand the job? Can she perform the tasks? We can apply this to designing products. For example, organizing the features of a modern glucose meter requires considering the “occupation” of the device. The challenge for the design team is to structure the features to provide the highest value to the user.

One mechanism that places specific functionality into the overall context of a device is the Frequency/Intensity map, a simple chart that plots a function's frequency (how often the user performs the function) against its intensity (the level of importance, concentration, or stress associated with the function). For example (see left-hand chart, figure 1), testing blood is a frequent and important activity. Tracking trends in daily glucose readings is less frequent and less important – some patients may not use this feature at all. Alerting the patient to a dangerously high glucose level is a rare occurrence but is also very important. The simple technique of mapping all of the functions of a device in this way helps organize physical and on-screen interfaces.

In addition, considering how the frequency/intensity map changes over time is instructive: certain features may be used often when the device is new, but less frequently after a few months, and other features may become more important as the user acclimates to the device. By understanding the points where features change positions on the map designers can provide patients with the kind of support they need most.

Know Me, Know My Condition

The most important implication of this new attitude toward medical products is that “efficacy” must be redefined. We can no longer measure only the medical effectiveness of a product; we must also include *acceptance*. If device A treats a condition better than device B, it is less effective if device B is accepted (purchased, recommended, and used) more. This disrupts manufacturers' traditional route to the drugstore shelf – develop

¹ American Diabetes Association. 19 May, 2004 <<http://www.diabetes.org/diabetes-statistics/national-diabetes-fact-sheet.jsp>>

technology in the lab, hold clinical trials, gain regulatory approval, distribute – because it requires a deep understanding who the patient is, what she likes, wants, and buys.

When medical devices are viewed as consumer products, manufacturers must consider trends in product design and even fashion. On the shelf, products are competing against each other for consumers’ attention, so it becomes vitally important to understand the attributes that attract consumers.. Everything from medical efficacy to readability, learnability, shape, and color is important if we are to create products that truly connect with consumers.

This is not a tradeoff between effectiveness and aesthetics, but a broadening of the definition of creating medical products. Understanding how consumers *perceive* a device and the benefit it delivers is as important as what the device actually delivers. Today, manufacturers must take consumer perception into account.

Redefine “Quality”

Medical appliances are designed to improve consumers’ quality of life. As devices flood the market, consumers get accustomed to a level of quality. At that point, other aspects come to the fore, including the physical and behavioral compatibility with the patient’s lifestyle. In competitive markets, product value is created when we give the same attention to the life and lifestyle of the patient as we do to the science behind the medicine.

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Figure 1: Frequency/Intensity charts for a glucose meter and a hypothetical user. On the left, the chart for a new user; testing blood is frequent and requires concentration, whereas tracking trends is less frequent. On the right, the chart for the user with more experience: testing blood is less intense, and trend tracking is done more frequently and with more concentration. For both users, warning of high glucose is infrequent but very urgent. Designers must consider that the relationship between user and product will change over time.