

Why your medical display should have a fully cleanable design

How design can help fight HAI

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Introduction

When considering buying a new medical-grade monitor, the ability to thoroughly clean and disinfect the device is often overlooked. However, with the increased prevalence of (cross-)contamination and the importance of infection control, a cleanable design is becoming indispensable.

This white paper explains the issue and addresses key points to consider when choosing a monitor for use in a clinical environment.

Healthcare-Associated Infection (HAI) is a major, but often neglected, public health problem

Healthcare-Associated Infections (HAI) have developed into a well-documented challenge on a worldwide scale. The number of these infections is on the rise, and the pathogens – bacteria in most cases – show increasing resistance to antibiotics.

An estimated 1.7 million healthcare-associated infections occur each year, leading to about 100,000 deaths¹. And because of their increasing resistance, treating such infections is becoming more and more difficult and cost-intensive.

Every investment in fighting HAI is economically viable

Each measure that leads to a reduction of HAI is a meaningful investment in the well-being of patients as well as the hospital. The burden of follow-up costs caused by these infections is enormous: it is projected that, for a typical 420-bed hospital, treatment costs for HAI are \$36 million annually².

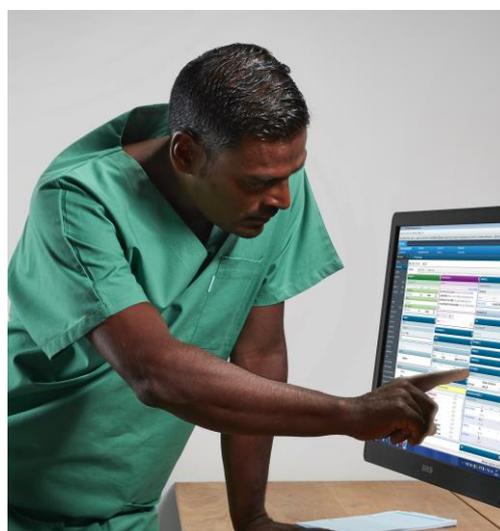
Therefore, strategies and devices that help prevent infections are becoming increasingly meaningful, especially in critical care locations such as the emergency room (ER), intensive care unit (ICU), oncology, surgical suites, clinics and patient wards.

Computer monitors tend to be underestimated as possible sources of HAI

Most attention to HAI prevention is given to high-risk invasive diagnostic and therapeutic tools, while the importance of less critical tools tends to be underestimated. Moreover, medical professionals routinely wash their hands with antibacterial agents, change gloves, and take many other measures to prevent transmission of infections. But after these precautions, other tasks may be performed that could transfer microbes, such as touching (or changing the angle of) a computer monitor. A single monitor is often also used by multiple health workers, such as monitors on carts that are used on patient floors and moved in and out of different hospital areas, which considerably increases the potential transfer and spread of microbes. Likewise, touch screen displays are used with both gloved and non-gloved hands, possibly making them more susceptible to contamination.



Clinical review display on cart



Clinical review display with touchscreen

Also, when people cough or sneeze, germs fly everywhere. Once these germs hit a hard dry surface, they can survive for days or even months³. Dust-associated microbes, such as MRSA and Acinetobacter, settle on rarely cleaned or inaccessible surfaces, such as shelves, stored equipment, and computer keyboards and monitors.

According to the University of Arizona, a typical computer work-station can support up to 10 million bacteria (400 times more germs than are found on the average toilet seat!). Next to the keyboard, a major contributor to this figure is the monitor. But despite this reality, the vast majority of hospitals have no routine cleaning policy for monitors used in critical care.

This is because conventional computer monitors are difficult to clean & disinfect. Most of these monitors are not protected against:

- Exposure to chemicals and intensive usage
- Invasion of moisture and liquids
- The spread of micro-organisms that have accumulated in corners and edges of the device

Protection against exposure to chemicals and intensive usage

Liquids that are expected to come into contact with hospital equipment include disinfection and cleaning products that are alcohol-, alkali-, water- or chlorine-based. Common examples are:

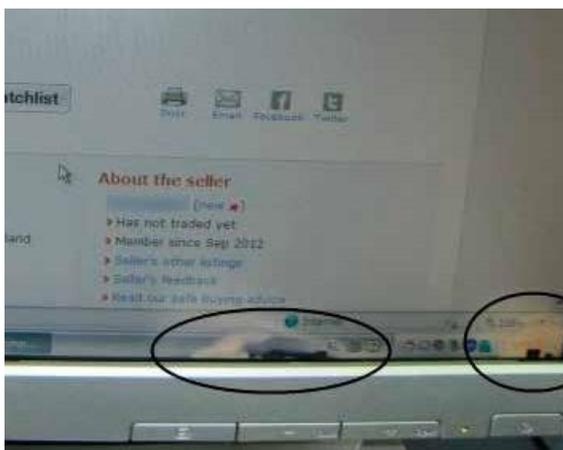
- Isopropanol 100%
- Ethanol 70%
- 0.5% Chlorehexidine in 70%
- Ortho-Phthalaldehyde (OPA) 0.55%
- Haemo-sol, 1% in water
- 250 ppm Chlorine solution
- 1.0% Iodine in 70% ethanol
- 1.6% aqueous ammonia
- "Green soap" (USP)
- 0.5% Chlorehexidine in 70% isopropyl alcohol
- Products similar to optical cleaning liquid
- Bacillol AF
- Flux
- Sodium hypochlorite 10%

These products can be used on cover, no cover and touch screen medical displays. In order to be effective, the liquid must remain on the display for a certain amount of time (ranging from 30 seconds to 2 minutes). Note that these liquids should never to be used on conventional computer monitors as these could stain the screen.

Besides the importance of using a cleaning agent, it is strongly advised to apply these types of liquids to a soft lint-free cloth, such as a microfiber or gauze, and never directly onto the display. It is also imperative to never use a paper-based product to clean with (i.e. paper towels, facial tissues, toilet paper) as these can scratch the screen. This applies to cover and no cover monitors, as well as touch screen displays. However, there is one fundamental difference in cleaning these medical-grade displays. The no cover version needs to be cleaned more thoroughly, it is therefore key to disinfect the corners and edges properly. As there is no cover to act as a protective barrier, extra care should be taken when using liquid cleaning agents, as these can more easily seep through the ridges of the monitor and damage vulnerable components (e.g. LCD panel, sensors, electronics). Additionally, no direct pressure should be applied on the monitor, as this could damage the LCD screen.

The displays with a protective cover have a smooth and more solid surface, making them easier to wipe down. Furthermore, this cover is made of toughened, scratch proof glass that is specially designed for intensive hospital usage and protects vulnerable components of the monitor (such as sensors) from damage (e.g. scratching, added pressure on display, humidity). Since medical monitors must comply with standards like IEC 60601-1, the toughness of this protective cover is guaranteed by a well-defined impact test⁴.

An alternative way of disinfecting medical displays is UVGI (ultraviolet germicidal irradiation). This method uses UVC (aka Ultraviolet C Band) LEDs which produce wavelengths with a peak between 260nm and 270nm. This germicidal wavelength is powerful enough to be used as disinfectant: the physical process disrupts the DNA of harmful microorganisms and stops their ability to reproduce. It should be noted that this method does not replace the traditional way of cleaning and disinfecting (i.e. wiping down the medical display). But it serves as an effective solution in diminishing the ability for a virus to reproduce itself, reducing the spread of contamination.⁵



Conventional Computer Monitor
The result of cleaning products being sprayed directly onto the screen, combined with poking and rubbing the display.



Medical Display
A medical monitor must withstand the free fall of a solid steel sphere of 2 inches in diameter and weighing 1.18 lb from a height of 4.24 ft. A toughened protective cover with a flat surface will make the display more resilient and also allow easier cleaning.

Conclusion

Infection Control in hospitals is of paramount importance. Although computer monitors are still underestimated as sources of hospital-associated infections, they are a major hygiene risk.

As the need for cleaning and disinfecting policies in hospitals becomes ever greater, there is a growing need for monitors with a fully cleanable design that can withstand exposure to commonly used liquids and intensive usage in a hospital environment. The advantage of a medical display with a protective cover made of toughened glass can therefore be considered as twofold; facilitating thorough cleaning as well as protecting vulnerable components of the monitor.

In any case, whether referring to the cleaning and disinfecting of medical-grade displays with or without a protective cover, it remains important to carefully consider the disclaimers formulated by manufacturers.

¹ 2010 National Healthcare Quality Report (NHQR) U.S. Department of Health and Human Services Agency for Healthcare Research and Quality AHRQ Publication No. 11-0004 March 2011² <http://www.advisory.com/daily-briefing/2013/08/05/cms-2225-hospitals-will-pay-readmissions-penalties-next-year>

² Calculation of \$36 million annually is based on 420 bed hospital; 40 patient stays per bed; 5% infection rate; cost of infection @ \$43,000 (source: Agency for Healthcare Research and Quality August 2010)

³ T Persistence of clinically relevant bacteria on dry inanimate surfaces (Kramer et al. BMC Infectious Diseases 2006 6:130 doi:10.1186/1471-2334-6-130)

⁴ UL-60601-1 55 DV.4.3

⁵ Konica Minolta, The standard in measuring light (Sensing Americas, 2020)