

Why your clinical display should have a fully cleanable design

How design helps fight HAI

When considering buying a new clinical display, 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 sealed and cleanable design is becoming indispensable.

This white paper explains the issues and addresses key points to consider when selecting 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 deaths**¹. 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 annually**².

This is why strategies and equipment that help prevent infections are becoming increasingly meaningful, especially in critical care locations such as the ER, ICU, OR, 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, they may touch (or change the angle of) a computer monitor, or perform other tasks that can transfer microbes.

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 workstation 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 conventional computer **monitor**. But despite this reality, the vast majority of hospitals have no routine cleaning policy for monitors used in key clinical settings of the hospital.

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 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)

BARCO

Visibly yours

This is because **conventional computer monitors are difficult to clean & disinfect**. They are not protected against:

- Exposure to chemicals and intensive usage,
- Invasion of moisture and liquids,
- The spread of micro-organisms that have accumulated inside.

1. Protection against exposure to chemicals and intensive usage

Liquids that are expected to come in 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% Chlorhexidine in 70% Ethanol
- Cidex® (2.4% glutaraldehyde solution)
- Haemo-sol, 1% in water
- 250 ppm Chlorine solution
- 0.9% NaCl solution
- 1.0% Iodine in 70% ethanol
- Hexabrix 370
- 1.6% aqueous ammonia
- "Green soap" (USP)
- 0.5% Chlorhexidine in 70% isopropyl alcohol
- Products similar to Cleansafe® optical cleaning liquid

Typically, these liquids are never to be used directly on conventional computer monitors, because they may **stain the screen**. In addition, to be effective, the liquid must remain on the display for up to 2 minutes – which can severely damage a conventional monitor.

Next to the chemical composition of the cleaning agents, it's important never to use a paper-based product to clean with: paper towels, facial tissue and toilet paper can **scratch the display**. In general, conventional computer monitors should be cleaned only with a soft cloth dampened with water. In contrast to conventional computer monitors, **medical-grade clinical displays with a fully cleanable design** have a **protective cover** that can tolerate these cleaning liquids. The cover is made of **toughened**, scratch-proof glass that is specially designed for intensive hospital usage. Since clinical displays must comply with standards like IEC 60601-1, the toughness of this protective cover is guaranteed by a well-defined impact test⁴.



Conventional Computer Monitor

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



Clinical Display

A clinical display 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.

⁴ UL-60601-1 55 DV.4.3

2. Protection against invasion of moisture and liquids

Because conventional computer monitors have gaps and connector openings, a cleaning liquid must not be sprayed directly onto them as it could drip inside and cause **electrical shock** or **malfunction**.

Conversely, medical monitors with a fully cleanable design are sealed completely to prevent moisture and liquids from getting inside. The extent to which a display is sealed is reflected in its IP-rating⁵, where the first digit indicates the level of protection from solid objects, and the second digit indicates the level of protection from liquids.

However, even when a monitor has an IP rating, you must make sure that the rating applies to the **complete device**, not just the screen. Many conventional computer monitors and even clinical displays have no IP-rating at all, or they have an IP-65 rating (dust-free and waterproof) for the **front cover only**. This means that the back cover is probably not sealed, or that the connectors and cables are not fully protected by a cable cover. This is crucial, because, as most disinfectants have to remain on the display for up to 2 minutes in order to take effect, they can drip into the display through the connector openings or gaps on the back cover. Check the monitor's technical specification and manual to verify its official IP-rating.



IP-rating on front panel only

This monitor has an IP-65 rating, but for the **front panel only**. This means that the sides and back are not sealed, and so disinfectants can drip inside.



Complete IP-rating

This clinical display is rated IP-32 front and back. The photo shows a test set-up in which water is sprayed on the monitor at different angles (up to 120°) for 5 minutes. The test is conducted on the **front**, the **back**, and the **sides**.

⁵ IEC 60529: Degrees of protection provided by enclosures (IP Code). International Electrotechnical Commission, Geneva

3. Protection against the spread of micro-organisms that have accumulated inside the device

In addition to gaps and connector openings, conventional monitors sometimes have an **air ventilation system** as well. Tests have shown that these monitors blow out dust particles and micro-organisms that have accumulated inside the device. Certainly, in an OR, ICU, oncology ward, or sterilized environment, this poses an extremely high risk of infection.

On the other hand, clinical displays with a fully cleanable design contain **no fans or vents**. A sealed clinical display with an IP-32 rating front and back monitor conducts heat away from critical internal components without a cooling fan – thus preventing the intrusion of airborne dust particles and micro-organisms.



Conventional Computer Monitor

Air ventilation openings on top will stimulate circulation of micro-organisms.



Clinical Display

Clinical Displays have an efficient cooling system without fans or air vents.

Conclusion

Infection Control in hospitals is of paramount importance. However, conventional computer monitors form a major hygiene risk and therefore are an underestimated source of infection.

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**. This requires a **completely sealed** solution that can withstand exposure to commonly used liquids (IP-rating, cable cover) and the intensive usage in a hospital environment (toughened glass).