Medical Grade Computers:

Understanding the What, How and Why

Introduction

Why should hospitals and medical facilities use medical grade computers? Patient health and safety, and ROI. Medical grade computers ensure patient safety and reduce the potential liability, they are built to run 24/7 (as hospitals must), and represent a positive long-term return on investment. Cybernet is redefining medical grade computing.

Evolving Terminology:

With the increased use of computers in hospitals and medical facilities, along with the continued evolution of computer technology and form factors, computers are sometimes referred to as another type of "medical device". That is a measure of how essential computers have become to hospital operations. So as not to confuse computers with conventional medical devices such as those used for diagnosis, therapy, or surgery, here we use the term computers or PCs – more precise descriptions of their functionality.

"Computers used in medical environments need to be designed differently. They need to be medical grade."

The Enterprise Mindset:

It's tempting for hospitals to follow the non-medical enterprise mindset: buy the same Tier 1 brand desktop or laptop computers as your servers. However, medical facilities have important different concerns than non-medical enterprises: liability, patient health and safety, and 24/7 operation (including EMR software).

A New Definition of Medical Grade:

The term "medical grade" is loosely applied to many products that are used in a medical environment, but there is no universally accepted definition. Sometimes it means that the product has met an industry standard or has been tested in a laboratory to measure impact on some aspect of patient health or safety. As applied to computing or computers, manufacturers use "medical grade" to mean any number of things that may or may not be backed up by any testing. However, Cybernet's definition of "medical grade" is quite thorough and has several attributes. True medical grade all in one computers are medically certified, built with an antimicrobial housing, may be fanless and have sealed front bezels, and have 24/7 reliability. They also feature cybersecurity protocols and are highly customizable for all clients.

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What does Medical Grade Mean?

Medically Certified:

The International Electrotechnical Commission (IEC) is the standards body responsible for the IEC- or EN-60601 standard for electromagnetic compatibility and safety for medical devices. The EN60601 designation is the European name for the standard, and is slightly more stringent than the U.S. UL60601 standard. Therefore, if a medical device or computer is EN60601 certified, it has met the highest requirements for safety and electromagnetic compatibility. The IEC continues to evolve the standard. The EN60601 standard provides requirements for common hazards related to electro-medical products, and the objective is to protect patients by reducing the likelihood of these hazards. When a product undergoes EN60601 certification testing in a lab, it is tested for hazards related to: electrical shock, mechanical impact, radiation, ignition from flammable anesthetics, fire, and excessive electrical energy output.

The process of obtaining EN60601 or UL60601 certifications takes at least several months and costs up to $30K per device. The testing must be done by an approved independent laboratory. Once the product is certified, no more changes can be made to the product; otherwise it has to be re-certified. Medical certification adds a lot of time to the product life cycle for computers, often adding years to the development cycle. Many Tier 1 manufacturers implement development and production schedules that result in the release of new models every 6 months, targeted for sale to both consumer and businesses at the same time. They use a "mass production" development cycle instead of a development cycle that incorporates specialized testing and certification for the medical market. Manufacturers who specialize in medical grade technology, on the other hand, builds the medical testing and certification process into the development cycle for all of its medical computers. Consequently, the development and production cycle for these medical grade computers ranges from three to five years.

Antimicrobial:

Straight from the headlines are many stories about nosocomial (hospital-acquired) infections during hospital stays, from contact with humans or inanimate objects such as medical equipment or devices, which can include computers. Microbes have been shown to live longer on plastics, such as those used in computer hardware. Patients can acquire serious infections that result in serious illnesses that go on for months, or even result in death.

According to a 2002 article in the Journal of American Medical Informatics Association, 2 million patients acquire these infections annually, resulting in 19,000 deaths. **The annual cost to treat these infections is $28-$34 billion.**
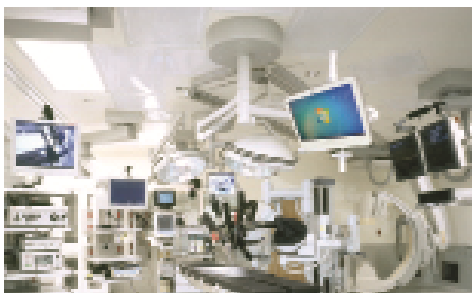
There are health and economic issues at stake. Despite waivers signed by patients

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prior to surgery or admission, hospitals and doctors can still be sued for damages. Such lawsuits are not only costly, but damage the reputation of the hospital and or doctor.

Infection control is critical, and antimicrobial technology has been developed for computer hardware that can help maintain a germ-free environment. Computers used in the areas of the hospital where patients can come in contact with them (or where health care workers can transfer germs from computer to patient) should definitely have antimicrobial technology.

Fanless Operation:

A fanless computer is desirable for sterile environments such as an operating room. It eliminates the circulation of dust or other particulates that could compromise the sterile environment. Even if a computer is located several feet away from a patient in a sterile environment, the computer's fan can still circulate dust or particulates within the room and affect a patient. Using fanless computers is an additional way to implement infection control and ensure patient safety. Many of Cybernet's medical computers are fanless, and these are recommended for the operating room, ICU, or the ER.

To implement a fanless solution, it all starts with the design of the PC, especially the CPU and the motherboard components. The primary cause of heat buildup in today's PC is the heat generated by the CPU, as a function of the frequency and voltage at which it operates. Therefore, using CPUs that have lower power consumption (10 to 30 watts instead of a typical 95) will generate less heat and eliminate the need for a fan.

Sealed Front Bezels and IP Certification:

Some computers have a sealed front bezel or an "IP" certification. This means that the front of the computer can be cleaned with water or solutions without damaging the internal electronics of the computer. In a healthcare environment, this is one more way to maintain a hygienic and germ-free environment. If a computer has a sealed front bezel, it will have an IP code that describes the degree of protection.

An IP code is a designation established by the International Electrotechnical Commission (IEC), and consists of the letters "IP" followed by two digits and an optional letter. This code specifies the degrees of protection provided against the introduction of dust, solid objects and water in electrical enclosures (hardware). For IP65, the first digit "6" means that the enclosure is dust tight and offers complete protection against dust. The second digit "5" indicates the enclosure is protected against water being sprayed by a water jet or nozzle at a rate of 12.5 liters per minute from a distance of 3 meters (and a second digit "6" means that it can be sprayed with a power nozzle will have no harmful effect.)

Why does Medical Grade Matter?

24/7 Operability:

A hospital never has down time. Computer systems must operate 24/7. That means that the computer must be designed with this level of reliability. Tier 1 mass-produced PCs are designed for multiple markets, including home use. They are not meant for 24/7 operation of the medical applications that hospitals must run continuously: EMR/database software such as Epic and Cerner, radiology imagery, diagnostic analyses, and laboratory reports. The IT departments in most hospitals are responsible for 24/7 uptime and for all maintenance, so reliability and software compatibility is a critical concern. Other medical grade computers are mobile, utilizing hot-swappable rechargeable batteries to keep them on as medical staff attend to patients on a constant basis. Tier-1 mobile computers such as laptops don't carry as reliable power sources, and without integrated touch-screen controls, they're not as easy to use for medical professionals. Robust mobility and power resources are a must for medical grade.

Medical all-in-one computers are designed for medical environments that require 24/7 use and operation versus home/consumer grade PCs made by HP, Dell, Lenovo and other Tier 1 manufacturers. Tier 1 manufacturers may offer the same home and consumer grade PCs to their medical customers, however, those units aren't designed or built to survive heavy use and continuous demand in a medical environment and therefore require more frequent service after the first 12 months. Medical all-in-one computers are designed for reliability from the beginning, down to the component level of the motherboard.

Medical grade hardware manufacturers use very high grade discrete components (capacitors, resistors, transistors, diodes, etc.) in its manufacturing of motherboards and PCBs; all are designed to last 5+ years and provide a strong MTBF (Mean Time Between Failures) of 50,000+ hours. However, other Tier 1 manufacturers use standard commercial grade discrete components that have a much lower MTBF. Medical grade computers are designed for the reliability needed to sustain 24/7 hospital operations, and reduce the time and cost of routine maintenance. That's why reliability is an important part of the "medical grade" definition. The use of industrial and military grade components also results in a much lower failure rate for medical grade computers compared to their Tier-1 counterparts.

Hot Swap Batteries allow for up to 16 hours of up time without plugging into a power source.

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Cybersecurity:

Security for data in the medical space is another concern. Patient medical records are valued on the black market more than credit card information. Medical grade computers can be customized with RFID scanners and biometric access so patient records are under lock-and-key unless authorized personnel need to access them. Non-medical PCs can also have these physical components, but what's missing is encryption. Trusted Platform Modules ensure that the information held on a medical grade PC cannot be read without the proper encryption key.

Built to Order:

Customizability is a crucial aspect for medical grade computers. Medical staff need to use computers in operating rooms, ICUs, patient areas, and other situations where adaptability and capability are highly important. Cybernet can customize medical grade computers however the client sees fit, whether the computer will be on a medical cart or in-hand for patient charting. These computers are often VESA-mountable for patient and medical staff use to reduce clutter and increase

patient safety. Medical grade computers utilize multi-touch PCAP wide screens so hospital staff can easily see their work without problems of low-resolution or small screens. Whatever the need might be, each medical computer fits the needs of the hospital space.

Understanding Cost & ROI

Return on Investment:

Computers have become an essential part of the technology infrastructure of today's hospital or medical center. Although computers are not nearly as expensive as sophisticated medical equipment, they should be analyzed for long-term Return on Investment (ROI). Because computers will be used to run nearly every aspect of hospital operations from administration to patient care, the quantity of computers may number in the hundreds, so price becomes an issue. Maintaining them to ensure 24/7 operation is also a factor that contributes to the investment. Since hospitals are in the primary business of patient care and safety, computers in patient areas must be medical grade, and the price will be slightly higher. Although medical grade designation is not usually a financial concern, it could become one if the hospital is sued for damages related to non-medical grade computers, so the risk should be quantified and considered in the analysis. Therefore, the return on investment analysis for computer assets needs to take into account:

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- Projected maintenance cost (more reliable PCs reduce cost)
- Price of computers (medical grade slightly higher)
- Risk to patient safety (medical grade reduces risk)

Medical grade computers may have a slightly higher initial price, but that is balanced out by reducing the potential for patient risk; almost a form of "insurance". Additionally, medical grade computers as as we define them have greater reliability, reducing the maintenance cost over time. Overall, investment in medical grade computers results in a positive long-term return on investment.

The Procurement Cycle and the Decision-Makers:

There are three main constituencies involved in the decision-making process for procuring computers in a hospital or medical facility whose needs must be met. They include Finance, Regulatory/Legal, and IT.

 - **The Finance department** has budgetary review and approval, and usually manages the procurement process. Their biggest concerns are pricing and keeping the procurement process simple, preferring not to have to set up or negotiate new agreements with vendors. Hospital finance departments often choose a well-known Tier 1 brand for their entire hospital's computers. They go with a brand they know and expect to receive volume pricing.

 - **The Regulatory/Legal department** is focused on compliance with government regulations and safety standards, and reducing legal risk of litigation or malpractice. They have an interest in making sure that the hospital or medical facility is not audited or sued. They are not as concerned with the brand of equipment that is purchased, as long as it meets the standards that the medical facility has adopted.

 - **The IT department** in hospitals has a constant workflow and is responsible for maintaining all information technology assets throughout the facility. They may also have a prominent role in sourcing, recommending and procuring new computer equipment depending on the size of the organization. The IT individuals may prefer a certain brand, but are likely to be more objective and make recommendations based on technical specifications and performance rather than brand. They are interested in acquiring computer hardware that is easy to deploy and that can process all the software applications necessary, with the reliability to reduce the amount of maintenance they need to conduct.

In Conclusion:

The definition for "medical grade" can vary between many manufacturers, but with Cybernet it's the standard we adhere to with each of our medical computers. Each computer is designed with staff operability, ease of use, patient safety, and ROI in mind. Settling for a Tier-1 computer that can put hospital staff and patients at risk isn't acceptable. Computers that don't run 24/7 as hospitals do cannot meet the demands for medical professionals. These are the reasons why clients continue to purchase from Cybernet.

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Cybernet Specs at a Glance

Cybernet Model	EN 60601	IP65	Antimicrobial	Mounting Options	Fanless	Hot Swap Batteries
CyberMed NB24K	Yes	Yes	Yes	VESA	Yes	Yes
CyberMed NB24	Yes	Yes	Yes	VESA	Yes	Yes
CyberMed NB22	Yes	Yes	Yes	VESA	Yes	Yes
CyberMed NB20	Yes	Yes	Yes	VESA	Yes	Yes
CyberMed H24	Yes	Yes	Yes	VESA	No	No
CyberMed HN24	Yes	Yes	Yes	VESA	Yes	No
CyberMed CN22	Yes	Yes	Yes	VESA	Yes	No
CyberMed C22	Yes	Yes	Yes	VESA	No	No
CyberMed H22	Yes	Yes	Yes	VESA	No	No
CyberMed RX	Yes	Yes	Yes	VESA	No	Yes
CyberMed T10C	Yes	Yes	Yes	VESA	No	No

About Cybernet:

Cybernet Manufacturing is a global manufacturer of all-in-one PCs and tablets built with military grade components to ensure durability and reliability. Cybernet serves a variety of vertical markets such as health care, industrial, business, banking, and education. Cybernet is privately held, and is headquartered in Irvine, CA, with operations in Taiwan, China, and Europe. The company employs 450+ employees worldwide. To learn more, please visit our website. www.cybernetman.com

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