

**'Meaningful Use' and your existing IT infrastructure**

-Christian Lindmark, RCDD

The electronic health record (EHR) is quickly becoming a major focus of today's healthcare system. The goal of an EHR system is to provide patient care more effectively, more efficiently, and at a much lower cost than our current, paper-based patient record system. While some healthcare organizations have already implemented an EHR system or are working to implement one, many others have not yet made that jump. It's about time to do so, since new government regulations mandate that healthcare organizations implement an EHR system in order to achieve 'Meaningful Use,' by 2015—a mere four and a half years away.

While there has been much debate about what "Meaningful Use" means, there seems to be a consensus developing about what such a system will require at a minimum. Systems must have laboratory, radiology, and pharmacy ancillaries, document imaging (Picture Archiving and Communication System (PACS)), Clinical Decision Support (CDS) for error checking, nursing/clinical documentation, and must be health information exchange capable. Full-blown Clinical Decision Support (CDS), Computerized Physician/Provider Order Entry (CPOE), and closed-loop medication administration are among some of the system capabilities around where the debate continues.

Because of the dependence healthcare organizations across the spectrum of care will have on the EHR system, it is imperative that it be continually accessible, that data is secure, and that the system is reliable. Unfortunately, many existing hospitals do not have the necessary IT infrastructure in place to properly support an EHR. More worrisome is that many of these hospitals aren't even aware of the existing IT issues they are up against. It is crucial that these IT infrastructure issues that have been overlooked, ignored and swept under the rug year after year are now fixed.

IT infrastructure upgrades, often accomplished behind the scenes or inadvertently overlooked, need to be considered as part of the EHR implementation process. A failure to identify these requirements can prohibit, if not completely derail a successful and organization-wide acceptance and use of the EHR system and core modules.

I. Older vs. new facilities

Implementing an EHR system in any healthcare building over 15 years old is a big challenge. Chances are that Technology Distribution Rooms (sometimes called Telecom Rooms, TRs, or IDFs) are not equipped to properly handle the fault-tolerant requirements expected from an EHR system. Even facilities built within the past 5 years can be problematic. Older Telecom Rooms ("closets" might describe them better) are small, usually jammed full of equipment, with inadequate space, power and cooling to support the existing technology systems, let alone a new one. Often there is water to deal with (such as a janitorial or housekeeping sink) or water pipes (sewer, storm drain, etc.) running overhead. All of these concerns must be considered and dealt with during an EHR implementation.

At a minimum, Technology Distribution Rooms (TDRs) should be used **only** for technology systems (single-purpose) and not shared with other uses, such as electrical, mechanical and housekeeping. These rooms should have card access system so that individuals accessing critical equipment can be tracked. Ideally, TDRs should be stacked on top of each other from floor to floor, but when retrofitting an existing patient care area, this can be difficult.

All new construction, however, should have stacked TDRs. TDRs should be sized appropriately based on the square footage they serve and the number of technology systems they support. The American Institute of Architect's 2010 guidelines recommend 12' x 14' as a minimum. Each TDR can serve roughly 25,000 square feet, if centrally located within to accommodate cable distance limitations.

In addition, each TDR should have a dedicated electrical panel-board, ideally fed from a centralized UPS serving the room, preferably 100 Amp minimum. 120V and 208V circuits can be run from this panel to the appropriate equipment in the room. These rooms need to maintain a temperature range of 65 – 74 degree Fahrenheit and it is not uncommon for the equipment in each of these rooms to require up to 2 tons of cooling.

## II. Cabling

The Structured Cabling System provides the information technology foundation for the transport of information (voice, data, and video) between end-user devices and network equipment. The structured cabling system supports voice, data, wireless, PACS, cable TV, security cameras, and other technology systems that utilize non-proprietary cabling systems. It not only includes the horizontal cabling from the TDR to the individual devices, but also includes the high-bandwidth single and multi-mode fiber optic backbone cabling as well.

The two types of cabling that needs to be addressed with an EHR roll-out are the horizontal cabling and the backbone cabling. The horizontal cabling supports the end-user devices and it routed from the TDR to each end-user device. If the facility was built within the past 10 years, chances are Category 5, Category 5E, Category 6 or Category 6A cable was installed, all of which provided acceptable bandwidth for data transmission at the time it was installed. All cabling rated Category 5 and below needs to be replaced to properly support the data transmission speeds ideal for an EHR. If cable replacement is required for the EHR implementation, it is recommended to install the best cabling available, currently Category 6A.

The backbone cabling for your data network consists of the fiber optic cabling that connects the network electronics in each TDR to the network electronics in the data center. The network electronics in the data center in turn connect to each of the technology system servers. It is recommended that both single-mode and multimode fiber optic cable be installed to each TDR. Multi-mode fiber should be 50 micron, specified to support speeds up to 10 gigabits per second (Gbps).

### III. Network electronics

The network electronics are often referred to as the Local Area Network (LAN). The LAN is the life-blood of an organization, keeping information flowing from point to point. It includes the network electronics that allow for the transmittal of data (saving and retrieving emails, documents, images, and information from servers, access to the internet, etc.) within a facility and externally. Continuously increasing bandwidth demands keep these electronics changing rapidly. Unfortunately, newer equipment can also mean expensive cost, which facilities often put off for years. A local area network and the associated electronics should be reviewed and analyzed at least every three years, to determine if the existing design still meets the organization's requirements for speed, security, and functionality.

Prior to implementing and/or upgrading an EHR system, it is important to review the existing network design and configuration. The LAN must be designed to accommodate both the current and future bandwidth demands of working with large files and images as well as designed with redundancy and proper configurations to reduce the chance of catastrophic network failure. Similarly, certain applications that can run across the network, such as voice, video and wireless, require unique configurations and network settings to properly route their data. Many older network electronics are not capable of supporting these applications.

Proper firewalls need to be implemented to protect patient data as well. Due to the extremely sensitive nature of the data being stored and transmitted, proper network security measures must be in place. While HIPAA regulations are somewhat ambiguous as they relate to the network and storage, any breach of the data will no doubt create a headache, both financially, to rectify the situation, and from a marketing standpoint, to rebuild the communities trust.

### IV. Insuring your wireless network actually works

Nearly all healthcare facilities have some type of 802.11 "Wi-Fi" coverage in their facilities. In fact, many facilities have what they consider 100 percent coverage, be it 802.11 a/b/g or the new 802.11n protocol. Facilities use the wireless network for guest laptop access, mobile computing by physicians, and even the deployment of wireless phones. Some are even putting master clocks, tracking systems, temperature monitoring, telemetry, and other medical communication systems on the Wireless LAN (WLAN).

While it is encouraging that more and more healthcare facilities are realizing the benefits wireless, there is a misconception that 100 percent coverage will adequately support the wireless demands placed on the network. Each wireless access point can support a specific amount of bandwidth, which must be shared among users connected to that specific access point. So while a healthcare organization may have Wi-Fi coverage throughout their facility, the density of access point deployment greatly affects a user's experience in terms of data

transmission speed, dropped connections, dropped calls, and potentially even the ability to connect to the wireless network at all.

Ubiquitous wireless coverage is definitely required to support the implementation of an EHR system. The wireless system must also be designed to handle **projected** wireless bandwidth by analyzing projected individual connections, bandwidth usage, and applications. Multiple laptop connections surfing the internet have a certain demand, while a single video-streaming application has a much greater impact. Additionally, using the WLAN for tracking equipment, staff, and patients requires a dense access point deployment to generate the granularity typically expected of a tracking system.

Above all, a properly implemented wireless network is critical to the successful implementation of an EHR. It will improve care-giver mobility, provide immediate and universal access to patient data, enhance asset tracking capabilities, provide patient and patient's family's access to the internet and even support real-time video-streaming.

#### V. The critical function: your data center

The data center (often called server room in smaller healthcare facilities) is the “brain” of any healthcare organization. It is also the most expensive piece of real estate, per square foot, that an organization owns and maintains. This is not referring to its construction or maintenance costs, which are quite significant, but rather to the lost revenue and increased costs associated with unplanned data center outages. As your data center is the central repository for all information, a patient's electronic records and even their lives are riding on the ability of intricate systems to send, receive, store, and analyze data.

Simply put, your data center cannot fail. It must be designed with redundancy, not only from a cabling and network electronics standpoint, but also from an electrical and mechanical cooling perspective. A well-planned and tested disaster recovery plan should also exist in case of massive failure.

Unfortunately, many healthcare organization's data centers and server rooms are located in places that were not designed to be data centers. Many of these locations have inadequate power and cooling, are too close to water sources, or are located in areas that are not best situated to house your critical data. In the last few years, some healthcare facilities have constructed new data centers, however, a greater number continue to ignore the need for reliability.

A healthcare data center should be built somewhere between a Tier II and Tier III data center, as defined by the Uptime Institute's Tier levels. All equipment within the data center should be on UPS power that is connected to the facilities generator power system. The data center should have a redundant UPS infrastructure to handle the data center load in case of primary UPS failure. Likewise, HVAC systems should be designed to an N+1 standard at a minimum.

In smaller healthcare organizations, the same data center principals apply to server rooms. It is all about scale.

While it would take too long to provide all the requirements for a proper data center design, a few key things are worth mentioning. Equipment cabinets should be set up with hot and cold aisles to provide optimum air flow and cooling efficiency. The CRAC (Computer Room Air Conditioning) units must be designed to disperse cold air to the cold aisles and hot air returns should be installed to remove hot air from the hot aisles as quickly as possible. Hot, stagnant air is an enemy of the data center environment.

The data center should also be a very restricted area, with card access or biometric readers required for entrance. Video surveillance cameras should record what individuals are doing within the data center. Leak detection and fire suppression systems should be installed to minimize equipment damage in case of a fire. The data center should have multiple service provider connections, to eliminate the single-point-of-failure if the primary service provider loses service.

Planning an EHR system roll-out is an exhaustive and costly process. Even minor upgrades can have a significant impact on how well this system—and other systems--work. Attempts to achieve “Meaningful Use” are going to impact every area of a healthcare organization in the very future, and not just the obvious financial, clinical, and technical impacts. Technology infrastructure upgrades are necessary to provide the proper system redundancy and resiliency. Newer facilities, including those currently under design or construction are most likely able to easily handle the IT infrastructure impacts of an EHR. Potential issues typically arise in facilities older than 10 years old, where the proper IT foresight and planning was not yet commonplace and ingrained into the design and construction process. Healthcare organizations would be wise to consider the impacts of an EHR system on all their facilities, both old and new, planning the appropriate upgrades to properly support an EHR system.



Christian Lindmark, RCDD, CPHIMS is an Associate Principal, Technology with Mazzetti Nash Lipsey Burch (M+NLB). Christian has been planning, designing, budgeting, and implementing technology systems in healthcare facilities for the past 10 years. He has lead the technology design for four (4) 1,000,000 square foot facilities and worked with over 50 healthcare facilities across the United States and Internationally, totaling over 10,000,000 square feet of healthcare space. Christian can be reached at [clindmark@mazzetti.com](mailto:clindmark@mazzetti.com).