



VA ELECTRONIC HEALTH RECORD 

KEY INFRASTRUCTURE CONSIDERATIONS FOR MODERNIZATION PROJECTS

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Once complete in 2028, the U.S. Department of Veterans Affairs' Electronic Health Record Modernization (EHRM) will have delivered one of the most advanced electronic health record (EHR) systems in the country, providing doctors and staff with a robust, centralized platform for storing and retrieving patient medical information worldwide.

The new EHR will enable better healthcare delivery and outcomes for veterans and active military alike as it will transition the VA from 130-plus different variants of its current system to one common health record connecting VA medical facilities with the Department of Defense,

the U.S. Coast Guard, and participating community care providers.

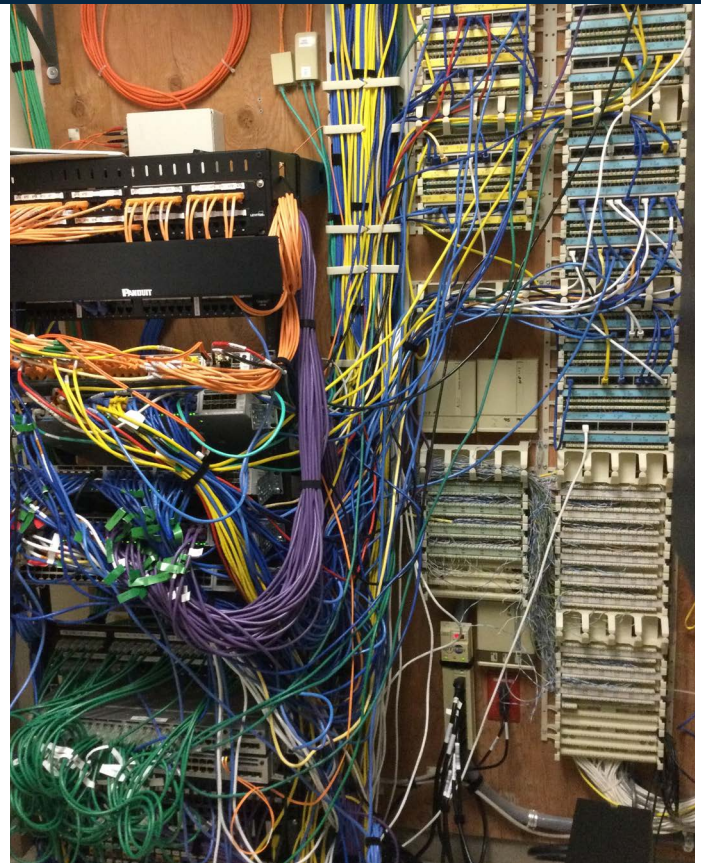
The \$16.1 billion initiative began implementation in 2020 and is being conducted through individual, campus-specific projects. Far from only involving software and hardware, the ripple effect of technology often results in an EHRM project also requiring significant building infrastructure upgrades or redesigns. This is no easy task for the many VA facilities constructed in the mid-20th century — or even for newer facilities that currently are challenged to keep up with advances in digital technology.

Each facility and campus are different and no approach to these projects is universal. However, the following discussion provides a high-level look at key infrastructure design considerations and strategies applicable to most EHRM projects. The authors draw on their experience and lessons learned from IMEG's 11 VA EHRM projects currently in design.

Technology

An EHRM project should begin with designer and owner identifying the critical path items (CPI) that have an impact on the patient, caregiver, and connected care/interoperability experience. Since the CPIs have dependencies that require direct construction evaluation and consideration, the team will be able to determine the impact on the overall project design, budget, and schedule. The CPI at the forefront of all others is identifying the telecommunication room locations. This will drive all discipline work associated with the project, from architectural space planning to electrical and mechanical system redundancies.

Though considered industry best practice, stacked telecommunications rooms may have significant architectural and constructability challenges, leading to higher cost. In such cases, an owner will have to decide if stacked telecommunications rooms are financially feasible; if not, the designer should be prepared to provide alternate design options for the telecommunications rooms.



An array of infrastructure assessments and renovations may also be required to support telecommunications room modifications for EHRM upgrades. Therefore, the structured cabling (local area network infrastructure) installation approach will be the key to the project's design. This approach should include:

1. Technology facility assessment of all aspects of structured cabling. The design team should review existing cabling types (copper and fiber optic), existing backbone capacity (inter- and intra-building), redundancy, existing telecommunication rooms, existing diverse (resiliency) pathways and spaces, and provide recommendations for upgrades to support the EHRM.
2. Design of structured cabling system to include upgrading structured cabling system

and termination equipment to Category 6A performance. Design also should be provided for diverse pathways and redundancy for upgraded backbone cable, updated power, cooling, and physical security in all telecommunication rooms. Design upgrades for outside plant fiber optic backbone between buildings also should be provided, including redundancy and diverse pathways.

The VA's requirement for bringing 1G speed to the desktop will likely result in the installation of cabling with a larger diameter than the existing cabling. Accommodating the larger cable in existing utility pathways can be problematic due to already constrained plenum space and existing floor-to-floor heights. The design team should seek to mitigate costly modifications by optimizing the existing plenum volume and locating the best routes for the larger cabling. IMEG has found 3D laser scanning of the plenum space to be the most accurate and successful method of analyzing and optimizing the space. Existing horizontal cable drop

pathways from the endpoint outlet to cable tray also will need to be considered.

Mechanical

As telecommunications rooms are expanded and telecommunication racks are added for an EHRM, additional cooling will likely be required. To accomplish this, owners should review the capacity of their campus central chilled water system to determine if it can be extended to these rooms. Dedicated DX split system equipment to cool the rooms is another option that can be considered.

A life-cycle cost analysis of all feasible cooling options should be performed, taking into consideration cost, energy usage, maintenance, and operator preference. Once complete, the owner and design team should discuss the results and select the optimal system. Components of the system can then be coordinated and include chilled water pipe routing, refrigerant line routing, equipment locations,

VA Data Migration Milestone

As the first major step toward a truly interoperable EHR, the VA has migrated approximately 77 billion rows (50

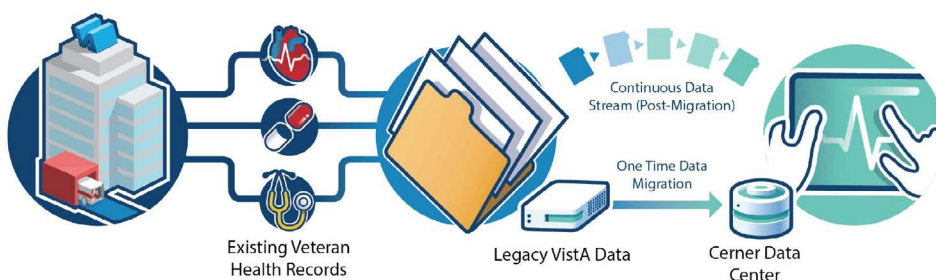
terabytes) of data, representing the records of 23.5 million unique veterans, to a shared data center with the DoD. This

data encompasses 21 domains of clinical information relevant for veterans' care, including vital signs, lab results, pharmacy prescriptions, inpatient and outpatient diagnoses, procedures, and more.

To achieve this milestone, VA aggregated and standardized data from 130 operational instances of Vista, VA's legacy EHR system. Data was then copied to Cerner's Kansas City data center where VA's new EHR will be hosted.

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VA has migrated health records for 23.5 million unique Veterans to the new Cerner EHR





power requirements, and condensate drains. The necessary alarms should be integrated with the BAS control system and include alarms for power loss, temperature, humidity, smoke, condensate drip pan water sensing, and room flooding.

Electrical

The reliability of the electrical power for the EHR is critical and includes power to the telecommunications systems as well as the mechanical systems that create the ideal environment. This reliability starts at utility entrances.

Ideally, VA campuses should have two medium voltage utility feeds from different substations of the utility distribution system. These two feeds create a medium voltage loop and a high level of reliability for the different facilities to be served, including the patient care buildings. The campus also needs to have an on-site generator should both utility feeds fail.

Despite the high level of reliability from the utility and on-site generator, a VA campus also should have an uninterruptible power source (UPS) in the event of “blips” or brief interruptions to normal or emergency power services. A UPS provides energy that is stored on batteries, allowing an EHR and other systems to “ride-through” brief power loss due to utility interruption or the time needed to turn over the generator.

Since a UPS upgrade is often required for an EHRM project, both centralized and localized (unitary) systems should be studied. Centralized systems are becoming an industry best practice for new construction, but careful deliberation must be conducted when choosing the appropriate power supply for an EHR renovation. A centralized UPS requires a large footprint but can save valuable rack space within the data closet. In contrast, a unitary UPS does not require a large footprint and lends itself to better modularity and simplicity for service and maintenance. After understanding the spatial concerns and existing infrastructure, the owner and design team should carefully examine the pros and cons of both

UPS system types. Regardless of the choice, the successful implementation of either UPS system also requires clearly stated responsibilities of the IT and electrical staff.

The two utility sources, on-site power generation, and stored energy via batteries (UPS) will provide a VA campus with the required reliability and redundancy of the EHRM.

Cost and other considerations

The design of the fiber optic backbone will be a one-time installation, and future moves, additions, and changes are not practical. Therefore, it is imperative to receive a robust optical fiber backbone that provides future capacity and supports ever-changing biomedical needs.

For any EHRM project, the major initial and ongoing costs will be determined primarily by the complication of routing the new horizontal cabling. The constructability and cost will be impacted by the ceiling construction (lay-in or hard surface), the capacity of the plenum, the existence of fire and smoke walls, the location of elevator shafts, the

existence of other utilities, and many other factors. Owners and their design teams also need to analyze their entire network enterprise to identify the most creative and cost-efficient solutions, not only for the EHRM but for security and other mission critical functions. Therefore, an EHRM project requires the design team to have a thorough understanding of the entire VA campus and its interconnections. It is also critical to have a high level of design team coordination and interdisciplinary communication since infrastructure common to EHR systems overlap, providing opportunities for efficiencies.

It's also vital to ensure your facility's clinicians and other key stakeholders are engaged early in the project to provide input and suggestions to the design team and aid in decision making. Once the potential design solutions are identified, vet them through your core team to ensure the strategies not only meet the VA EHRM requirements but also answer your facility's needs.

Such an approach will help ensure the VA is able to complete its mission of providing better outcomes for our country's military personnel and veterans. Learn more at ehrm.va.gov.



ABOUT THE AUTHORS



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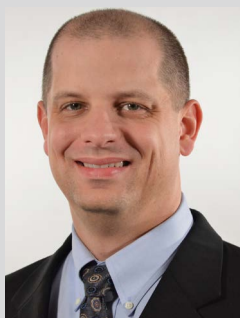
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