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Decarbonization takes a team



Gordon Howie
MSPM, CHFM, CHC,
ASHE President

A true privilege and joy of my role as the Advisory Board president of the American Society for Health Care Engineering (ASHE) is the opportunity to visit regional ASHE Chapters and provide updates on the many benefits that ASHE offers. It is energizing to see the great work that our chapters are doing to meet the needs of their members and equally rewarding to meet in smaller, informal groups to discuss the state of health care.

Because of the connections we make, we can trade best practices and lessons learned through our collective efforts and meet new friends along the way. It is also interesting to learn that we share similar issues, like the need to better ourselves for the sake of the patients we serve, or that we recognize succession planning is critical to our long-term success.

In chapters across North America, from the Georgia Association for Healthcare Facility Managers to the Canadian Healthcare Engineering Society's Ontario chapter, one major concern is top of mind: the need to continue our efforts in sustainability and in mitigating environmental impact by building and operating efficient buildings. It is imperative that we share our knowledge and come together to influence our field rather than wait for regulations to dictate our path.

ASHE has many tools, educational offerings and methods to track and report sustainability efforts. The Energy to Care® Award is one measure of success that health care facilities can strive for. Through the program, facilities can benchmark performance, set improvement targets and be recognized for meeting their goals. ASHE has also introduced a new program called HealQuest™ that brings teams together and promotes a culture of sustainability within an organization. I would encourage you to review the highlights of the program and consider participation.

Connecting and learning is what makes us successful. Through ASHE programs, chapter visits and discussions with colleagues, it is clear that organizations are not, and have not been, ignoring the ways our facilities impact the environment. Be proud of the work we have accomplished and motivated by what we will continue to do.



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ADVOCACY ADVISER

Medical gas storage room compliance

Medical gas storage can be challenging, as there are many things to consider, such as type of gas, quantity, location, ventilation and exhaust. The relevant codes are the International Building Code (IBC), the 2021 International Fire Code (IFC) and the National Fire Protection Association's NFPA 99, Health Care Facilities Code.

Oxidizing gases, such as oxygen and nitrous oxide, are limited by IBC/IFC to 1,500 cubic feet of gas at standard temperature and pressure. However, this can be doubled to 3,000 cubic feet in buildings with an approved automatic fire sprinkler system. In 3,000 cubic feet, a facility can hold about 12 H-Type oxygen cylinders. NFPA 99 allows up to 3,000 cubic feet to meet the less stringent require-

ments of Section 11.3, while quantities exceeding 3,000 cubic feet must meet the requirements of Section 5.1.3.3.2. Inert medical gases like nitrogen or carbon dioxide are not limited in quantity by IBC/IFC.

There are two allowable storage room configurations under IBC/IFC:

- The 1-hour exterior room must be separated from the rest of the building by approved fire barriers with a fire-resistance rating of not less than one hour. Any openings between

the room and interior spaces need to be protected by self-closing smoke and draft control assemblies with at least a 1-hour rating. The room must have at least one exterior wall with two vent openings to the outside that are sized based on the quantity of gas stored, each with a minimum free area of 72 square inches. One opening must be located 6 inches from the ceiling and the other 6 inches from the floor.

- The 1-hour interior room has the same construction requirements as the exterior room, but this room must be exhausted to the exterior of the building by a 1-hour enclosed shaft duct system. Mechanical ventilation shall be supplied at a rate of 1 cubic foot per minute per square foot of room area.

Both rooms must have automatic sprinkler systems. Storage room construction requirements under NFPA 99 are a little less stringent but similar and no less important when ensuring medical gas storage compliance. **HFM**



Sandy Renshaw
PE, CCP, LEED AP,
Principal mechanical
engineer, Kaiser
Permanente

QUESTION: What should we seek when hiring a security consultant with a special focus on conducting a physical security and security policy review?

Health care security has increasingly become more complex and fraught with risks such as increased violence, regulatory intervention, lawsuits and loss of public confidence when adverse events occur. A professionally conducted security vulnerability assessment is a very good step in the right direction toward minimizing these risks. When a hospital is seeking a security consultant, they should look for individuals with a combination of relevant experience and expertise in the health care field. Consultants should have experience in and knowledge of the following: security vulnerability assessment and management, security technology, health care compliance requirements and regulations, incident response and emergency planning, and strong communication and collaboration skills. Also, certifications along with ongoing professional development are critical.

QUESTION: Now that the pandemic emergency status has been lifted, our team is deciding whether to put our water fountains back in service. What are others doing?

We turned ours back on about three months ago. Prior to that, we had them blocked off from public use from about May 2020. To prevent stagnant water, we implemented a frequent flushing program so we wouldn't have to go through a special sterilization process to open them back up. Being that we are Joint Commission-accredited, we also had to consider new standards around water management for the prevention of waterborne pathogens, especially Legionella. Having a plan for addressing stagnant water in buildings is a big part of that. We have also begun moving toward bottle-fill stations. **HFM**



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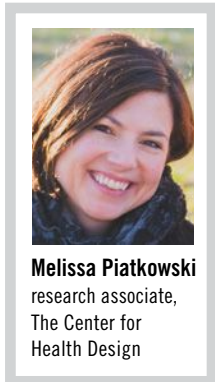


Facilities that anticipate future challenges

The health care field has experienced unprecedented change and upheaval over the past few years. Increasingly, resiliency is referenced as a way for systems to adjust to changes and disturbances, but what does that really mean? Health care facilities must be designed in such a way as to respond to challenges related to everything from disease outbreaks to climate change to artificial intelligence. These changing times have ignited interest in concepts of flexibility, adaptability and “future-proofing,” in both health care operations and design. The Center for Health Design’s Knowledge Repository

includes several papers on these topics, including three covered here.

While the concept of future-proofing has received a renewed focus in recent years, there is a wide range of opinions on what it is and what it entails. Memari



Melissa Piatkowski
research associate,
The Center for
Health Design

and colleagues attempt to better understand and explain this concept in a recent study exploring how future-proofing is perceived and implemented. They interviewed 16 health care architects in Australia and translated findings into a model for future-proofing practice. The model is unique in how it goes beyond the traditional thinking of a building in a passive role during risk management (such as resilience against disruptions) and moves toward more proactive concepts of the building in mitigating adverse events and improving patient outcomes.

With the intent of providing design recommendations for the management

Research used for this column

The following research citations from The Center for Health Design’s Knowledge Repository of health care design resources were used by the author when writing this column:

- S. Memari, et al., “Future Proofing for Hospital Building Design: From Research to Practice,” *Architectural Engineering and Design Management*, 2023, in press.
- A. Alansari and X. Quan, “Designing High-Performance Emergency Care Facilities against COVID-19,” *The International Journal of Design in Society*, vol. 16, no. 2 (2022): 91–113.
- K. Brooks, et al., “Heatwaves, Hospitals and Health System Resilience in England: A Qualitative Assessment of Frontline Perspectives from the Hot Summer of 2019,” *BMJ Open*, vol. 13, no. 3 (2023).

and prevention of future outbreaks, a literature review by Alansari and Quan focuses on key findings from studies focused on emergency department design strategies in response to the COVID-19 pandemic.

Findings from 56 publications in the review resulted in a set of 41 design strategies within different categories including physical separation, virtual care, ventilation, environment surface cleanliness and hand hygiene. The review emphasizes the importance of a systems approach, in that all design strategies must be considered in conjunction with operational measures to ensure the best health care outcomes.

A study by Brooks and colleagues looks back at how the 2019 heat wave in England impacted health care and explores lessons learned. Researchers interviewed National Health Service health care professionals about their experiences and identified key themes around health and well-being of patients and staff, health

care provision, barriers to service delivery and considerations around planning for future heat waves and other weather events. The open-access paper includes several design implications related to medical equipment, information technology and HVAC, as well as general

recommendations for health system resilience related to heat wave preparedness.

While the pandemic has perhaps been the loudest canary in the coal mine of the health care design industry, there is a constantly growing list of unknowns to consider when designing for the future. Health care design professionals can benefit from research on these topics as they continue to

search for the best methods in the art of expecting — and designing for — the unexpected. If you are interested in more on resilience and future-proofing design, you can find articles on this and other health care design topics in The Center for Health Design’s Knowledge Repository. **HFM**

ABOUT THIS COLUMN

“Design Discoveries” highlights research from The Center for Health Design’s Knowledge Repository, a user-friendly library of health care design resources. This research effort is supported by the American Society for Health Care Engineering, the American Institute of Architects, the Academy of Architecture for Health Foundation and the Facility Guidelines Institute. It can be accessed at www.healthdesign.org/knowledge-repository.





Elegant design, modern resilience

The OU Health University of Oklahoma Medical Center is the only Level I trauma center in the state of Oklahoma. Launched to meet an acute volume that consistently exceeded the health care system's existing patient capacity, the project marks the largest hospital expansion in Oklahoma's history. The result is a new patient tower designed to be a world-class healing facility that is at once resilient and poetic, using natural forms to enhance the healing process.

Opening its doors in 2020, the new patient tower has significantly expanded surgical, critical care and medical-surgical capacity. The 450,000-square-foot structure includes 32 new operating rooms and 144 patient beds. Every patient room is flexible, adjusting as needed to provide acute, palliative/hospice and intensive levels of care all within the same patient environment. The expansion fits seamlessly with the existing facility while creating a distinct gateway to the medical campus.

The tower's form evolved out of a desire to connect the building to its natural setting. Fluid architecture clad in a taut envelope of terra cotta and glass evokes Oklahoma's wind-swept geological formations — specifically, the Gloss Mountains, a mineral-rich range northwest of Oklahoma City that shimmers from crystals exposed to light after millions of years of prairie-wind erosion. The design creates a modern, "painted desert" effect with distinct forms and layers of materiality. This inviting form tempers the hospital's institutional nature and visual bulk while maximizing views toward downtown Oklahoma City and landmarks like the state Capitol.

Embracing the healing power of nature, the tower uses light, transparency and biophilia to soothe patients and staff. Floor-to-ceiling glass lining every patient room enables even those lying in bed to have views of the landscape. Abundant natural light fills the space, and open sightlines permeate the bed tower floors. Visual and physical connections to vegetated outdoor spaces are distributed throughout, and calming colors — subtle accents in blue and crimson tones that deepen the tower's allusion to its setting — combine with biophilic elements to help mitigate stress upon entry.

The medical center extension represents a step forward for resilient design. The tower is the second pilot project for RELI, the first resilient-design guideline of its kind in the United States to gain national consensus. Oklahoma City is particularly vulnerable to environmental stressors such as tornadoes and earthquakes, and the new patient tower proactively addresses these and other challenges. Resilient strategies in the tower's design include impact-resistant glazing that protects against flying debris, a facade that can withstand wind speeds up to 160 miles per hour, in-grade radiant heating at the entry zone, and a top floor that can easily be converted to an epidemic/isolation floor with independent air intake and exhaust. **HFM**

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SUSTAINABILITY

Innovative recycling programs reduce environmental impact

With a focus on community health, hospitals across the country are stepping up recycling efforts to reduce their environmental footprints. Long challenged by the complexities of medical waste disposal, compounded by limited options in recycling and waste management, hospitals are now finding innovative ways to recycle products that would previously end up in the incinerator or as trash in the landfill. These efforts come amid increased recognition of the harmful impact the mishandling of medical waste disposal can have on the environment, leading to serious public health consequences.

WellSpan York (Pa.) Hospital is partnering with a local business to turn plastic waste into building material. In 2022, the Costa Rica-based Center for Regenerative Design and Collaboration (CRDC) opened its first U.S. facility in York, where it converts plastic waste into RESIN8, a concrete and asphalt additive used in construction materials. While the hospital had a recycling program in place, the CRDC partnership has significantly increased the amount of waste that is eligible for recycling, accepting all types of plastic waste.

“We are committed to keeping our community healthy, and protecting the environment is an important part of that,” says Keith Noll, WellSpan Health’s chief administrative officer. “Many chronic health conditions have environmental factors that cause them, and we need to do our part to protect the environment and promote health.”

The recycling initiative both protects the environment and supports the community, Noll says. WellSpan uses a local minority-owned business to transport the waste to the recycling facility, and CRDC sells its finished product to local cement companies. The process will eventually come full circle, as the local cement companies will use their finished product in the hospital’s future expansion project. “We are excited that our waste can be



From left: WellSpan President and CEO Roxanna Gapstur is led on a tour of the Center for Regenerative Design and Collaboration recycling center by Chief Operating Officer Ross Gibby.

turned into something useful, and we are continually looking for new products to recycle,” Noll says.

Operating rooms (ORs) create more than 30% of hospital waste and two-thirds of regulated medical waste, according to Practice Greenhealth. Yet few options are available to recycle disposable medical supplies from the OR. The University of Michigan Health in Ann Arbor, Mich., has found an innovative solution. Uncontaminated waste from the OR will be shipped to a facility in Ohio that converts plastic waste into feedstock that is used to make new plastic products.

During a six-month pilot project launched in October 2021, 2.5 million tons of medical plastics and Styrofoam were collected, including blue wrap, gowns and shoe coverings, and packaging. The success of the pilot program has clinicians throughout the health system eager for the program’s expansion, which starts this month.

“Our patient care providers are very enthusiastic about this,” says Chris Victory, senior mechanical engineer at the University of Michigan Health’s Michigan Medicine. “They are excited for us to roll this out across the system.”

AdventHealth Orlando (Fla.) is focusing part of its sustainability initiative on recycling unused items left behind in patient rooms post-discharge. Unopened supplies, including syringes and bandages, were previously discarded due to contamination concerns. Under a new recycling program, these items are placed in bins to undergo a multistep cleaning process.

Once the products are cleansed, they are sent back to the units for reuse and used during training or simulations or are shipped overseas to areas in dire need of medical supplies. In addition to keeping items out of the landfill, AdventHealth has realized significant savings by cutting back on purchases. And several countries have benefited from supply shipments that include the repurposed products through the AdventHealth Global Missions program.

“Health care is just starting to realize the impact it is making on the environment in terms of waste generation and carbon emissions,” Victory says. “The environmental impact of health care delivery is counterintuitive to the mission of most health care organizations, which is to promote health. We have to do what we can to minimize the impact.” // BY LEE ANN JAROUSSE

IMAGE COURTESY OF THE CENTER FOR REGENERATIVE DESIGN AND COLLABORATION

BIOMEDICAL

Idling MRIs overnight costs U.S. facilities millions, study says

Radiology is a major contributor to health care's overall climate footprint due to its energy-intensive devices. Despite this, radiology departments tend to let magnetic resonance imaging (MRI) units idle rather than turning them off because of the time it takes them to start up and shut down, says Sean Woolen, M.D., a faculty member with the University of California San Francisco (UCSF). In some cases, equipment may remain in idle mode overnight and on weekends to allow time for software updates or over concerns around cooling. During that time, the equipment continues to draw massive amounts of energy.

To understand an MRI unit's power demand when scanning, off, idle and in power-saving modes, Woolen partnered with Siemens Healthineers and Siemens Smart Infrastructure to monitor energy usage in UCSF's department of radiology and biomedical engineering.

In the resulting study, "Ecodesign and Operational Strategies to Reduce the Carbon Footprint of MRI for Energy Cost Savings," published in the April issue of *Radiology*, they concluded that even the off mode may not be the most efficient solution.

The researchers equipped four outpatient MRI scanners from three different vendors with power meters. Monitoring revealed that switching MRI units from idle to off mode for 12 hours overnight could reduce power consumption by as much as 33%. This translates to a potential annual savings of up to 21 megawatt-hours, 14.9 metric tons of carbon dioxide equivalent and \$2,943.

However, the researchers also drew upon previous research, conducted by Siemens with Switzerland's University Hospital of Basel's department of radiology and published in *Radiology* in 2020. The study, "The Energy Consumption of Radiology: Energy- and Cost-saving Opportunities for CT and MRI Operation," indicated that one-third of MRI energy consumption happens in off mode, due to the need for constant cryogen circulation to cool superconducting magnets. The UCSF team determined that switching to power-save mode — which reduces power

consumption by cycling the operations of the cold head compressor — rather than simply off mode during non-use hours could reduce consumption by an additional 22% to 28% more than off mode.

Using the power-save mode overnight has the potential to save an additional 8.8 to 11.4 megawatt-hours, or between \$1,226 and \$1,594 annually. The researchers determined that using the power-save mode overnight in all outpatient MRI units across the United States could save the U.S. health care field up to 76,288 megawatt-hours and as much as \$10.7 million annually.

The first step to realizing these savings, the researchers note, is making it standard operating procedure to switch to the lowest power mode when equipment is not in use and configuring MRI units to go into off mode on a predetermined schedule.

Woolen notes that powering down the MRI units did not result in any additional maintenance or unexpected consequences.

"One of the things we learned is that it is essential to incorporate the thoughts of MRI technologists, facilities engineers and industry partners into an implementation strategy," he says. "Only by working together can the most effective strategy be made." // BY MEGAN HEADLEY



Three steps to identify unknown risks in facilities

Risk, or the possibility of an adverse action occurring, exists in every system whether the system is mechanical, electrical, human or something else.

In his book *The Unknown Known: A Memoir*, Donald Rumsfeld stated: "There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know."

Assessing risk is a key component of determining what is known and unknown. A risk assessment, a process to identify

potential hazards and analyze the potential impact of these hazards, can help to provide guidance in the risk assessment process and is required

by Section 4.2, Risk Assessment, of the National Fire Protection Association's NFPA 99, Health Care Facilities Code. The American Society for Health Care Engineering's NFPA 99-2012 Risk Assessment Tool has been developed to help staff comply with the risk-based, patient-focused approach required by NFPA 99.

The tool recommends three steps be taken prior to completing the assessment. First, a multidisciplinary team that has knowledge of the facility's space use, patient care services, clinical practices and other areas as appropriate should be established. The multidisciplinary team significantly affects the "unknown unknowns," because involving multidisciplinary experts provides greater understanding and decision-making.

Second, it is recommended that the team become familiar with the risk category definitions within NFPA 99. These definitions provide the patient focus necessary within the risk assessment tool. Finally, the team should be familiarized with the ways in which system and equipment operability can affect patient safety.

These three steps will allow the team to better assess the systems and equipment and their impact on building occupants.

As the American Society for Health Care Risk Management states, risk assessments are vital to advance safe and trusted health care. Following an established process with a multidisciplinary team to assess risk will help to reduce adverse actions from occurring, helping to optimize the health care physical environment. // BY JONATHAN FLANNERY, MHSA, CHFM, FACHE, FASHE

MORE ONLINE

For links to resources, log on to [ashe.org/nfpa/99-2012-risk-assessment-tool](https://www.ashe.org/nfpa/99-2012-risk-assessment-tool)

ASHE INSIGHTS

VALUABLE RESOURCES AVAILABLE FROM ASHE

Visit www.ashe.org to learn more about the following resources available for health care facilities professionals:

Create a collaborative sustainability culture

The new HealQuest™ program guides interdepartmental teams through two days of hands-on activities to help create sustainability-minded health care facilities. With the help of ASHE experts, this program trains participants about the importance of building a sustainability culture and accountability across the organization. The program is broken into four training tiers that starts with how to build a cross-functional team that will lead goal-setting initiatives and action-planning activities.

ASHE adds new handbook to facilities management series

The *Facilities Manager's Handbook for Health Care Project Management* is the newest addition to ASHE's award-winning handbook series. The new project management handbook lays out the processes and flow of a health care project, including planning, design and construction. Taking a sequential approach to each topic, the handbook first addresses planning, then the various phases of design and construction of a project, and the operations and management throughout and following project completion. The handbook is part of the Health Care Facilities Management Handbook Series, which is a multiyear initiative.

Member tools address top compliance issues

The ASHE Member Tools Task Force has created a continuously updated library of resources including checklists, crosswalks, analysis tools and more to help health care facilities managers address some of the toughest compliance and operational challenges. From creating an energy conservation plan to developing relevant job descriptions for recruiting qualified applicants, ASHE Compliance Tools walk users through practical steps that will lead to success.

Achieve sustainability goals with new roadmap

The Sustainability Roadmap for Health Care™ provides strategic thought leadership, resources and programs to support health care organizations pursuing sustainability. Starting with defining the meaning of environmental sustainability and how it affects health care, the roadmap provides a clear path for organizations at every point of the sustainability journey, whether just getting started or going to the next level.

Get to know fellow ASHE members

Voices of ASHE highlights individual members and their diverse experiences with the aim of celebrating members and the amazing work they do. Members can join the mission by sharing their stories today or nominating a colleague to be featured. There are no criteria related to years on the job, title or background. Sharing stories will inspire current members and future professionals while broadening the health care field's awareness of the key roles facilities managers play in creating safe patient care settings.

Brush up on cybersecurity knowledge

The ASHE Cybersecurity page includes recommendations, articles, resources and more to help health care facilities leaders manage cybersecurity threats and protect patients, staff and visitors by identifying and eliminating vulnerabilities in the physical environment. Visit the page to access guidelines from the Department of Health and Human Services and the Office of the Assistant Secretary for Preparedness and Response, and the "Best Practices Framework for Health Care Cyber-Physical Protection" monograph.

EXTERIORS

Hospital designs sense of community

Newark Beth Israel Medical Center in Newark, N.J., is in the final stages of a multiphase renovation. Working with Philadelphia and New York-based architecture, planning and design firm FCA, the hospital's 11-acre campus has been reimagined and redesigned to drive interaction with the surrounding community.

"Institutions of all kinds, including hospitals, are generators of activity on a near round-the-clock basis," says Eric Galipo, AICP, LEED AP BD+C, director of academic planning and urban design for FCA. "When the neighborhoods surrounding them are pedestrian-friendly environments, like the area around Newark Beth Israel, new design elements such as seating and shading provide spaces that encourage visitors to linger, relax and spend more time there."

FCA's upgrades to pedestrian thoroughfares and streetscapes immediately adjacent to the hospital concentrated on improving aesthetics and creating small gathering spaces, or "pocket gardens."

The addition of four seating areas includes benches for small gatherings, with plantings and shade trees that provide privacy to encourage interaction and create cool spots during warm weather. The expanded sidewalk area facilitates convenient pickup and drop-off and is dotted with planted "islands."

The reconfiguration of the spaces involved reducing vehicular travel lanes and expanding the sidewalks adjacent to the hospital buildings. The larger pathways also make room for raised planting beds that further soften and enhance the environment. // BY BRIAN JUSTICE



Raised planting beds, sidewalk seating and larger sidewalks create beauty and gathering opportunities for the community.

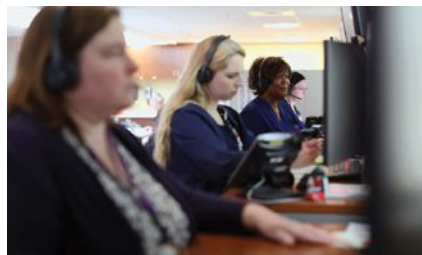
IMAGE COURTESY OF FCA

TECHNOLOGY

Guthrie scales up virtual support team

Like many health systems serving rural areas, the Guthrie health care system based in Sayre, Pa., faced severe staffing shortages during the pandemic. This led the system to implement an integrated artificial intelligence-supported video solution that allows fewer staff within facilities across New York and Pennsylvania to attend to more patient needs. By selecting vendor-agnostic solutions that integrate with the system's electronic health record software, Guthrie laid the groundwork for a scalable virtual support team that it continues to expand.

The first component of the "Guthrie Pulse Center" was a telesitting program designed to provide visibility into patient fall risks from a central location using in-room cameras. That expanded into a virtual nurse program that allows experienced critical care nurses to support newer nurses via cameras, in-room computers and audio monitors.



Virtual nurses play an integral part in ensuring Guthrie keeps up with patient demand.

Terri Coutts, chief digital officer at Guthrie, explains that the typical technology installation requires taking a bed out of service for about four hours, primarily in older facilities where network cables or wiring had to be run.

In some cases, installation was extended by the need to readjust cameras to ensure visibility into key areas of the room. "For example, for our virtual nursing program, the cameras help with second signoffs for high-risk medications, so [staff] have to be able to see the IV pump," Coutts says.

"There were also placement considerations for the speakers and the microphone to make sure that we didn't

capture noise interfering with the voice of the patient or the nurse."

Cameras and speakers use artificial intelligence to interpret input in real time and highlight circumstances that require the telesitter's attention. The system is trained to distinguish patients from non-patients by learning room layouts, beds and patient gowns. The system has also learned to identify actions associated with a higher risk of falls based on factors such as positioning and movements.

Coutts explains that the next program expansion will be multifunctional televisions that allow patients to see the virtual registered nurse, not just hear them. TVs will provide additional functionality too, as a digital whiteboard and support for virtual consults. That multifunctionality is key for moving forward, Coutts says. The goal is to involve environmental services staff and potentially respiratory staff, among other departments.

Today, two staff members are able to monitor 50 cameras across five hospitals in the Guthrie system. That support, Guthrie estimates, has helped it reduce its labor costs by more than \$7 million annually. // BY MEGAN HEADLEY

CHECKLIST

CODES+STANDARDS



CMS issues guidance on unannounced surveys

The Centers for Medicare & Medicaid Services (CMS) issued a memorandum reminding accrediting organizations (AOs) that no contact should occur with a facility prior to the surveyor or survey team's entrance into the facility. Any prior notice of a survey, via email, phone, electronic portal or other means of communication, is a violation of CMS regulations. Additionally, CMS instructed AOs that the practice of "blackout dates" — allowing facility requests for dates that the facility prefers not to be surveyed — is inconsistent with the policies of unannounced surveys and the expectation that a facility must be "survey ready" at all times.

MORE ONLINE

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ASHRAE publishes new infectious aerosols standard

ASHRAE recently announced approval for the publication of its new airborne infection risk mitigation standard for buildings. ASHRAE Standard 241, Control of Infectious Aerosols, establishes minimum requirements to reduce the risk of disease transmission by exposure to infectious aerosols in new buildings, existing buildings and major renovations. The new standard applies during identified periods of elevated risk of disease transmission. Authorities having jurisdiction can determine when the enhanced protections of Standard 241 will be required, but its use can also be at the discretion of the owner/operator.

AORN updates surgical suite design guideline

The Association for periOperative Registered Nurses updated its Guideline for Design and Maintenance of the Surgical Suite. One update to the guideline focuses on how to engage and incorporate input from perioperative registered nurses (R.N.s) on features and functions such as clinical workflows, equipment, space utilization and workplace safety. Other updates include how to share patient needs when developing functional design plans, ways to assess risk in facilities and recommendations to help perioperative R.N.s learn about the latest building standards in health care. The guideline was designed to help perioperative R.N.s build confidence when presenting feedback on design and maintenance.

The Joint Commission revises CAH standards

Effective Aug. 27, The Joint Commission is making several changes to the elements of performance (EPs) for its accredited critical access hospitals. The changes were made to better align with Centers for Medicare & Medicaid Services' (CMS') Conditions of Participation. The changes include new EPs to address CMS definitions of rural health network and personnel qualifications, and the expectation for compliance with the 2012 editions of the National Fire Protection Association's NFPA 101®, Life Safety Code®, and NFPA 99, Health Care Facilities Code. Other revisions going into effect include removing the references to alternative equipment maintenance programs and manufacturer's recommendations from the requirements for equipment maintenance.



Weaving ESG initiatives into health care facilities

As the former vice president of sustainability at Advocate Aurora Health (AAH), **Monica Nakielski** has developed and led organizationwide environmental, social and governance (ESG) initiatives. She recently transitioned into independent consulting and this month discusses the growing adoption of ESG in health care.

How did your early experience influence your career journey?

My mother is from Ecuador, and I was impacted by our travels to her home country. Early on, I witnessed economic instability and understood that those living downstream in marginalized communities were greatly impacted by our upstream decisions. Also, I grew up in an environmental justice community near a wastewater treatment facility, and when we moved across the city, it was next to a recycling center. My childhood was abundant with love, humor and community. Neighbors and a local network with deep connections cultivated a desire to create space in our future that is better than what we found.

My path is nonlinear. I have been fortunate to create a career that aligns with my personal purpose and values of creating sustainability. Within ESG and sustainability, we are at a pivotal stage where there is a level of energy, attention and commitment to do more. We can create value while also leveraging the power of business for impact.

What are some of the ESG initiatives you led at AAH before transitioning into independent consulting?

My team was responsible for setting the strategy. In collaboration with our system's executives and senior business leaders, vendors and manufacturers, and community partners, we implemented the strategy to create business, environmental and societal value.

In response to stakeholder inquiries and evolving ESG disclosure requirements, my team spearheaded a benchmarking process. Leadership sought insights on industry practices, performance comparisons, target setting and associated costs. This process revealed several gaps and opportunities, including the establishment of an ESG council. I took the lead in designing the council's structure, governance and first-year deliverables to conduct a materiality assessment, produce an ESG report and create an ESG fact sheet.

The assessment also revealed the need to conduct a carbon emissions inventory as a foundational step for future objectives. Once completed, I trained my team

IMAGE COURTESY OF MONICA NAKIELSKI

to utilize this data and build models to establish a baseline and perform financial assessments alongside carbon emissions. We used these findings in our communications with leadership as we sought approvals of the next-generation goals.

Another initiative I am proud of was co-leading the creation of AAH's Healthy Spaces Roadmap 2.0, completed in the spring of 2023. It serves as an internal accreditation process for their planning, design and construction team and integrates ESG principles and elements of LEED, WELL, Fitwel and net-zero building standards.

While there are many more projects and initiatives to highlight, I'll end with the co-creation of the first of its kind interprofessional climate and health continuing education series that was recently admitted into Advocate Health's Midwest graduate medical education repository. A six-part series was developed using the American Public Health Association's model on health impacts of climate change. The training, Get Climate Smart, is open for all to access.

What are the factors accelerating ESG adoption today?

In recent years, ESG has gained mainstream attention and has become a crucial consideration for businesses, investors and regulators. Several factors have contributed to the acceleration of ESG adoption and its evolution:

- *Increased awareness and stakeholder demand.* The last decade witnessed a significant increase in awareness and concern about environmental and social issues. Climate change, social inequality and corporate misconduct have gained widespread attention, leading stakeholders like customers, employees and communities to demand more sustainable and responsible business practices.

- *Financial performance and risk management.* Research has shown a positive correlation between strong ESG performance and financial performance. Companies with robust ESG practices tend to exhibit lower-risk profiles, better operational efficiency and enhanced long-term sustainability.

- *Regulatory interventions.* Governments and regulatory bodies worldwide

THE NAKIELSKI FILE

CV

- ESG and sustainability adviser.
- Vice president of sustainability at Advocate Aurora Health, Downers Grove, Ill.
- North American health care practice lead at Anthesis Group, Boulder, Colo.
- Director of sustainability and environmental health at Blue Cross Blue Shield of Massachusetts, Boston.

ACCOMPLISHMENTS

- Healthy Building Network, current board chair.
- The Chemical Footprint project, current steering committee member.
- City of Boston, Zero Waste Advisory Committee.
- Farm to Institution New England, Network Advisory Council.
- Women in Sustainability Leadership Award recipient.

EDUCATION

- Bachelor of Science in medical microbiology and immunology at University of Wisconsin – Madison.
- Masters in business administration at Simmons College, Louisville, Ky.
- Executive education for sustainability leadership at Harvard T.H. Chan School of Public Health, Boston.

have taken steps to integrate ESG considerations into their frameworks. This includes introducing regulations that require companies to disclose ESG-related information, enforcing stricter environmental standards and promoting sustainable practices.

- *Investor pressure and capital flows.* Institutional investors have become key drivers of ESG adoption. They increasingly integrate ESG factors into their investment strategies, engaging with companies on ESG issues and allocating capital to sustainable investments.

- *Rise of sustainable finance.* The last decade has witnessed a surge in sustainable finance initiatives. Sustainable investing, green bonds and other instruments have gained popularity.

- *Technology and data advancements.* Advances in technology and data

availability have facilitated the collection, analysis and reporting of ESG. Companies can now more accurately measure performance, set targets and track progress.

- *Integration into business strategy.* ESG considerations have shifted from being peripheral to integral to business strategy. Companies increasingly view sustainability as a source of competitive advantage and innovation. ESG factors are now incorporated into product and service development, supply chain management, employee engagement and stakeholder relations.

How can facilities prioritize ESG amid limited budgets and competing needs?

Health care executives face a range of unique challenges due to shifting regulations, reimbursement models, technological advancements, human capital shortages and emerging medical treatments, among other factors.

I would recommend organizations first assess and prioritize projects and initiatives to advance those aligned with long-term goals. Next, create a business case by highlighting the cost savings, growth, efficiency gains, reputation enhancement and/or risk mitigation to gain support. Engage stakeholders and communicate transparently to involve colleagues, patients, investors and communities in the shared ESG goals and progress. Also, seek partnerships and collaborate with organizations sharing ESG goals to pool resources, share best practices and secure joint funding. Explore external funding like grants, loans, green bonds and the Inflation Reduction Act.

Start with low-cost, high-impact actions like conservation measures that save money to reinvest in other long-term initiatives. Be sure to integrate ESG into the process; for example, an ESG purchasing and decision-making process can support local purchases and economic development, reduce human rights violations in the supply chain, and implement healthier, safer products.

Any or a combination of these steps can support meaningful progress despite budget limitations. **HFM**

Jamie Morgan is editor of *Health Facilities Management* magazine.

SOLUTIONS

ON OUR RADAR



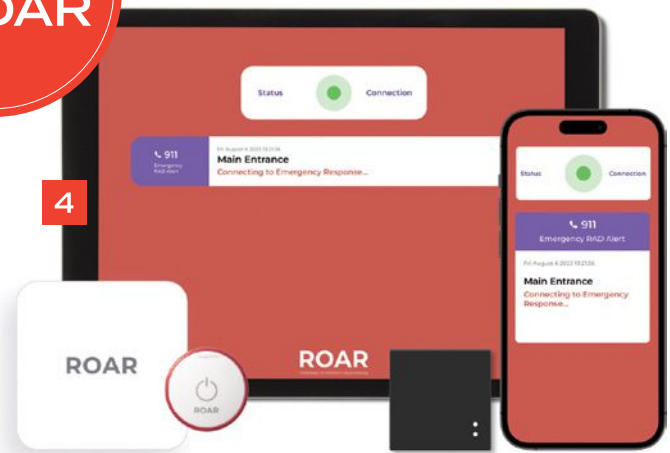
1



2



3



4

1 DRAIN DIVER // The See Snake Mini Pro inspection camera is designed to inspect up to 200 feet of 1 ½- to 8-inch pipe. It sports a digitally self-leveling camera with no moving parts to navigate even 90-degree bends while keeping the in-pipe image upright. The device features a high-dynamic range image sensor and digital zoom-and-pan capability, allowing users broad control and a clear picture even in light-limited environments. **Ridgid**

2 INSIDE THE BOX // The Framery Q Meeting Maggie pod is a sound isolation unit ideal for small meetings between staff and patients or private conversations with families. The pods feature built-in lighting and ventilation and, when closed, reduce speech volume by 29 decibels. Units come furnished and can be equipped with an articulated monitor arm to facilitate video conferencing. **Framery**

MORE ONLINE
Learn more about these products at www.HFMmagazine.com/solutions

3 CLEAN HEAT // The Veritus air-source heat pump water heater uses low-global warming potential R513A refrigerant to deliver high performance with minimal environmental impact. Units can be installed outdoors while the touch-screen interface can be placed indoors to simplify space planning. Multiple heaters may be banked to meet high demand and provide redundancy. **Lochinvar**

4 SILENT LIFELINE // The Roar panic button is a wearable, static device that allows health facilities professionals working alone to notify instantly and discreetly of an emergency. This silent panic button sends a location-based signal over a self-healing Bluetooth network straight to fellow team members or emergency services, saving time in situations where mere seconds are critical or reaching for a phone is impossible. **Roar**

These product descriptions have been condensed from information supplied by manufacturers, representatives and distributors. They are for informational purposes only. Product inclusion should not be construed as an endorsement by *Health Facilities Management* magazine, ASHE or the American Hospital Association.

SPONSORED PRODUCT LISTING

Landmark health care facility project incorporates advanced real-time location systems

Children’s Healthcare of Atlanta’s new \$1.5 billion construction project is the largest in the history of Georgia. The 70-acre medical campus features the Blank Hospital — a 19-story, 1.5-million-square-foot, 446-bed facility — and an 11-story, 325,000-square-foot medical office building. Children’s selected Vizzia Technologies to pre-install the industry’s most advanced real-time location system (RTLS) solutions to optimize asset management and improve patient care.

Health Facilities Management’s 2023 Hospital Construction survey noted a prioritization of building technology systems, including RTLS, environmental monitoring and electronic wayfinding. Hospital leaders are looking to leverage advanced technologies in the planning process of “smart hospitals.”

Piedmont Atlanta Hospital’s Marcus Tower, the winner of the ASHE 2023 Vista Award, also included Vizzia RTLS in the planning process. Other notable construction projects that pre-installed Vizzia RTLS include Grady Health System’s new 10-story, 600,000-square-foot Correll Pavilion surgical center.

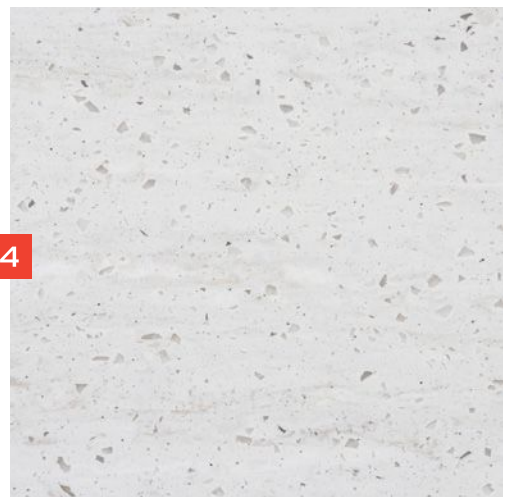
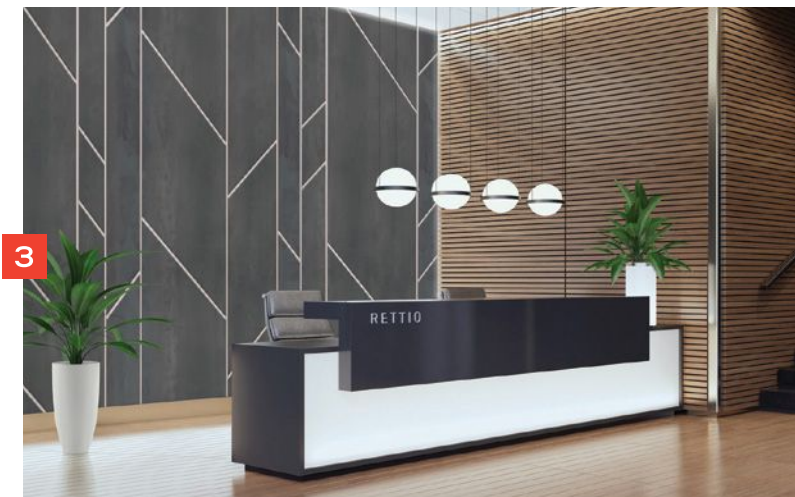
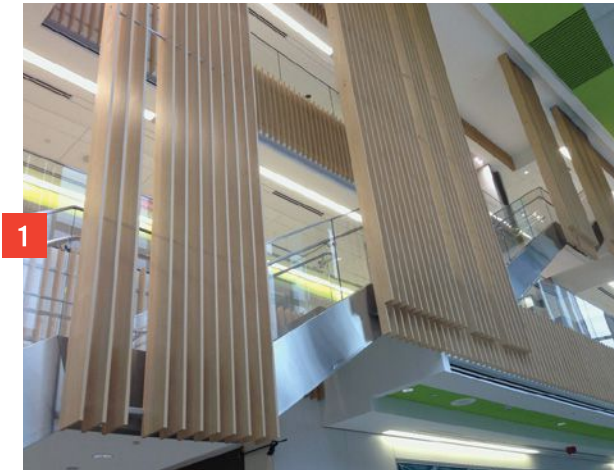
Vizzia Technologies is a leader in advanced RTLS and data analytics for health care organizations. Its industry best practices have earned it the 2023 Healthcare RTLS Company of the Year Award from the influential research firm Frost & Sullivan. Visit vizziatech.com for more information. **Vizzia Technologies**



TAG, YOU'RE IT // This miniature multimode asset tag utilizes a facility’s existing Wi-Fi networks to provide real-time location capability, offering a convenient and low-cost asset location solution with minimal infrastructure requirements. The tag’s two-way wireless connectivity offers zone-level or even room-level location accuracy and also supports encrypted-network enterprise protocols for improved security as well as over-the-air configuration and firmware upgrades. **CenTrak**



GET A ROOM // This real-time tracking module for the VLogicFM facility management software platform offers a comprehensive, easy-to-install solution to continuously monitor room occupancy. Users can view room occupancy in list format or by floor plan, and the platform records historical occupancy data to report tracking trends. The system’s sensors and cellular gateway hardware transmit occupancy data via cloud-based servers to the module, which can then be accessed through a web browser. **VLogic**



1 PAPER PLANE // Richlite is a sustainable wood alternative composed of a laminate of post-consumer recycled paper soaked with phenolic resin, which is then heat- and pressure-treated. The material is heat and stain resistant and waterproof, making it suitable for exterior cladding, interior wall paneling, countertops and cabinetry. Select product lines have been certified by the Forest Service Council and are eligible to earn LEED credits. **Richlite**

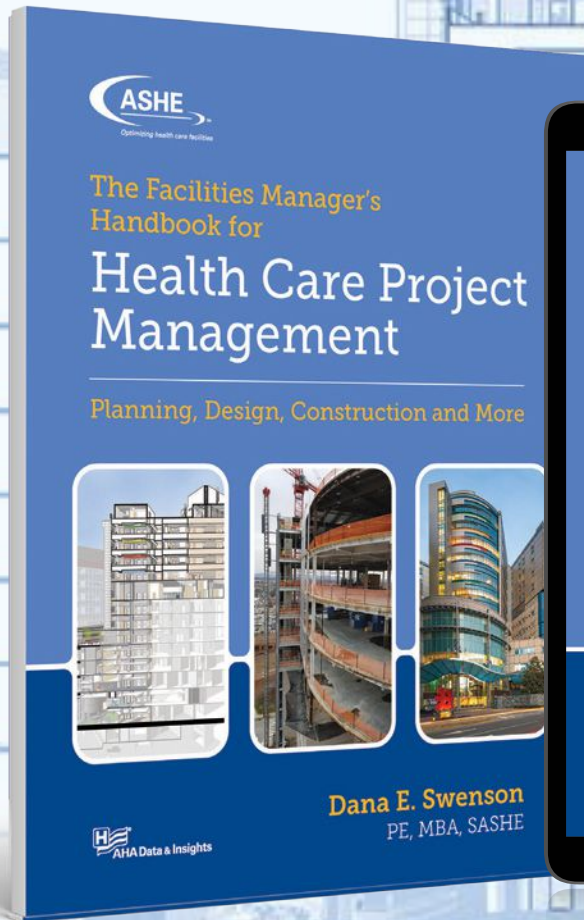
2 CLEAN N' GREEN // Altro Puresentials is a durable, easy-to-clean wall cladding system ideal for areas where PVC wall coverings are typically used. These 2-millimeter-thick panels are composed of sustainably produced, nontoxic, semi-rigid thermoplastic polyester that contains no halogens or BPA, and feature matte and high-gloss surfaces on reverse sides to suit different design needs. **Altro**

3 ETCH-A-WALL // The Engravings Collection is a line of decorative surfacing panels that give a polished look to walls and structural columns. These durable, easy-to-clean panels are made from renewable aluminum etched with one of six geometric designs in an array of colorful powder-coat finishes. Panels may be mounted directly onto walls or with a low-impact terrace panel system. **Moz**

4 ROCK SOLID // The Balanced Collection of acrylic-based surfaces mimics common natural materials found in high-design interior finishes like wood and stone, yet is food-safe, nonporous, nontoxic and antibacterial. This dense, stonelike material is made from a blend of alumina trihydrate and high-performance resin, making it thermoformable and easy to shape with conventional fabrication tools yet extremely hard wearing when cured. **Durasein**

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As Gen. Dwight D. Eisenhower famously said, "The plan is nothing. Planning is everything."

Dive into the processes and flow of health care project management, including planning, design and construction.



Using RTLS to improve ED experience

Atrium Health Wake Forest Baptist is an academic health system based in Winston-Salem, N.C., and part of Atrium Health Enterprise. The emergency department (ED) at Atrium Health is a Level I adult and pediatric trauma center that provides emergency care and services to approximately 500,000 patients each year.

The past few years of the COVID-19 pandemic have caused significant care disruptions. In response to receiving lower scores on a patient experience survey via NRC Health, the ED's patient experience enhancement team partnered with CenTrak, Newtown, Pa., in 2021 to develop a patient experience initiative leveraging real-time location systems (RTLS) technology. The team's goal was to use RTLSs to optimize resources, streamline workflows and create the "ultimate patient experience."

Implementation consisted of workflow planning, system configuration and 12,000 RTLS-enabled employee badges. The ED team looked forward to utilizing the robust data and insights supplied by RTLSs. By using location technology, health care decision-makers gain data insights that are real, unbiased and actionable. This information creates the groundwork for leadership discussions by leveraging real data that spans many years.

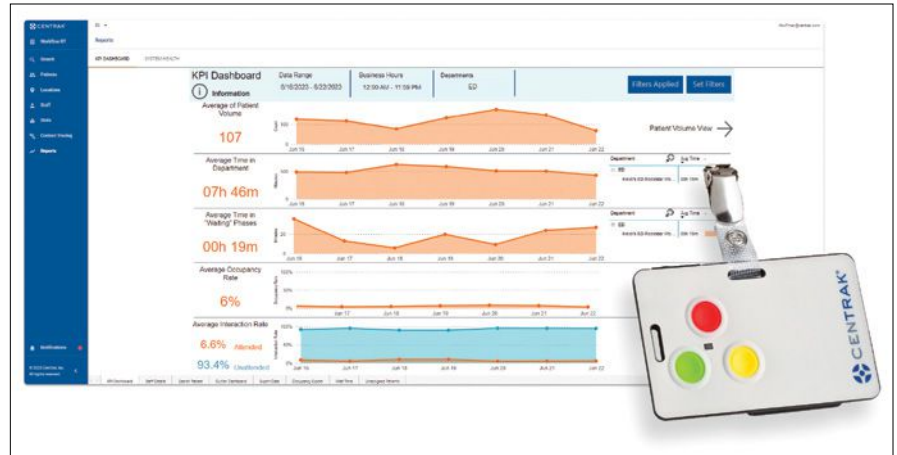
"We've tested just about every new approach and technology to enhance the patient care journey throughout my 35 years as director of patient experience, and I've been impressed that RTLS data is so insightful and has aided the enhanced patient experience in the ED," says Amanda Smith, M.Ed., CPXP, director of the office of patient experience. "The technology makes clean, actionable data easily accessible. In fact, the metrics have encouraged me to pursue RTLS advancement throughout the EDs in our health system. The insights are a game-changer."

RTLS challenge

NEED // Improve scores on a patient experience survey

SOLUTION // CenTrak real-time location systems

RESULT // Surpassed NRC Health score goal and internal key performance indicators



CenTrak's workflow automation solution has optimized the patient experience at Atrium Health Wake Forest Baptist Medical Center.

The Atrium Health medical center utilized CenTrak's workflow automation platform to improve the patient experience and operational performance. As a result, staff now can quickly gather baseline information that is necessary to register patients. Clinical and registration staff then go into their RTLS workflow platform and select a call button, immediately notifying patients of the next steps in their care journey.

Through the platform, approved family members remain informed of a patient's status via text messaging updates. Also, families can view board monitors that display HIPAA-compliant patient names and phases of care in waiting areas, providing 50% more visibility within the main ED waiting lobby and triage areas.

As another initiative, the hospital leverages its RTLS staff duress technology to give patients real-time input on the facility's performance. The team mounted staff duress buttons within a wall unit in six public restrooms in the adult ED. Another six buttons will soon be placed within public restrooms in the pediatric ED. If a patient, family member or team member feels that the facilities need attention (e.g., supplies or cleaning), a sign instructs them

to press the yellow alert button on the wall. This notifies environmental services (EVS) that a specific restroom requires urgent maintenance attention. EVS staff members are assigned an Ascom telephone, called "ED Support," that receives the notification as a text message when the yellow button is pushed.

"We knew RTLSs could make a difference, and we are pleased with the ongoing results," says Frances Charlton, R.N., DNP, MBA, MHA, NE-BC, director of nursing and clinical operations for the ED and heart and vascular service line. "Our team continues to partner with CenTrak to identify additional uses of the RTLS technology to enhance the overall patient experience even more."

The value of real-time technologies at Atrium Health Wake Forest Baptist is measurable and sustainable. Over the course of the year, patients' likelihood of recommending the ED increased by nearly 20%. During the past five months, with the implementation of the various initiatives and the use of actionable data, scores now surpass the average NRC Health score and Atrium Health's targets.

Qualitative key performance indicators — such as wait time, communication, recognition and responsiveness — continue to trend positively. Facilitywide, Atrium Health Wake Forest Baptist has successfully implemented more than 50 RTLS use cases, all with positive results. **HFM**

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2023 Sustainability Champions



ASHE honors **10 hospitals** for outstanding leadership
in environmental performance

INTRODUCTION AND PROFILES BY **ERIK J. MARTIN**

Facilities that demonstrate outstanding leadership in health care sustainability and decarbonization deserve to be recognized for their efforts, which is why the American Society for Health Care Engineering (ASHE) bestows its Energy to Care® Program's Sustainability Champion Award every year to worthy applicants.

This year, 10 different hospitals earned the Sustainability Champion distinction after tailoring exceptional programs and exhibiting strong leadership, dedicated staff and an overall commitment to sustainability that is deeply ingrained in each facility's culture. The 2023 awardees are Ascension NE Wisconsin – Mercy Campus, Oshkosh, Wis.; Ascension Seton Medical Center Williamson Hospital, Round Rock, Texas; Ascension St. Vincent Fishers Hospital, Fishers, Ind.; Ascension St. Vincent Warrick, Boonville, Ind.; Ascension St. Vincent's Medical Center Clay County Hospital, Middleburg, Fla.; Atrium Health Lincoln, Lincolnton, N.C.; Atrium Health Mercy, Charlotte, N.C.; Atrium Health Union, Monroe, N.C.; Aurora Medical Center – Oshkosh, Oshkosh, Wis.; and Parkland Health – Main Campus, Dallas.

By meeting and exceeding key goals and metrics, demonstrating forward-thinking and accountability, and following best practices like conducting audits, monitoring progress and comparing their performance against key benchmarks, these 10 organizations stood out among a crowded field of candidates, according to Kara Brooks, LEED AP BD+C, senior associate director of sustainability for ASHE.

"This is only our second year after launching the award. In 2022, there were three winners, and this year 10. The increase shows that health care organizations are taking serious actions to be more sustainable," she says.

Sustainability objectives pose significant challenges for every hospital as

they strive to reduce their environmental impact. Large health care facilities must navigate a constant demand for power due to increasing lighting, heating and water needs, making their energy consumption substantial. The health care sector contributes approximately 8.5% of all annual greenhouse gas emissions, which underscores the importance of its involvement in global decarbonization efforts.

ENERGY to care SUSTAINABILITY CHAMPION AWARD

Sustainability Champion Award recipients have actively addressed these challenges by implementing various energy-efficiency initiatives, including rebalancing HVAC airflows and water flows, recalibrating occupancy sensors and thermostats, installing greener materials and LED lighting, modifying operating schedules for top efficiency and, in some cases, adopting renewable energy sources such as solar, wind and geothermal power. These measures can substantially lower expenses while decreasing carbon dioxide equivalent emissions and carbon footprints.

"All of the 2023 award winners are leaders in the field, and I am impressed by the work they have done," Brooks says. "For instance, the five Ascension hospital winners have committed to counteract the effects of climate change and enhance green thinking across their organizations by setting key goals for energy, greenhouse gas emissions and solid waste reduction; Parkland

Health established a team dedicated to greening the operating room through waste reduction, single-use device reduction, sterilization and other initiatives; Aurora Medical Center in Oshkosh utilized on-site operations staff to install a solar array that can provide enough electricity annually to power seven homes; and Atrium Health's sustainability pledge focuses on energy reduction, air quality, waste reduction and team engagement across its three award-winning hospitals."

Initially named the ASHE Energy to Care Champion Award in 2016, the accolade was re-christened the Energy to Care Sustainability Champion Award in 2022 to broaden its focus on sustainability. ASHE has also introduced more rigorous criteria for this honor, which now include the need for quantifiable data to support sustainability metrics.

To qualify for the honor, hospitals now must achieve an Environmental Protection Agency ENERGY STAR® score of 75 or higher, possess ENERGY STAR certification and diligently track energy, water and greenhouse gas emissions using the ASHE Energy to Care Dashboard. Furthermore, hospitals must establish a green team, assign a sustainability leader, and publish a sustainability statement. Any facility that meets these conditions is granted the Energy to Care Sustainability Champion Award.

"I'm hopeful that the work these winners have done to deserve this recognition will inspire others to strive to engage in sustainability initiatives, set goals, empower staff and ultimately earn the award in the future. I am also optimistic that more organizations will be inspired to apply for the award in the coming years, as the 10 recipients likely represent only a fraction of the number of eligible organizations," Brooks says.

The Energy to Care Sustainability Champions are profiled on the following pages, and winners of other 2023 Energy to Care Awards are on page 26.

Ten health care facilities have earned the American Society for Health Care Engineering's 2023 Energy to Care® Sustainability Champion Award for demonstrating strong leadership in becoming more sustainable facilities and using saved resources to support patient care. They are profiled on these pages.



Ascension NE Wisconsin – Mercy Campus

Asset reuse, food waste digesters, steam traps and more

Encompassing 139 hospitals in 19 states, Ascension is one of the leading non-profit health care systems in the U.S. Impressively, five of its facilities earned Sustainability Champion Awards in 2023, including Ascension NE Wisconsin – Mercy Campus in Oshkosh, Wis., a 633,521-square-foot hospital with 117 beds.

Ascension launched an environmental stewardship program across Ascension NE Wisconsin – Mercy Campus and its other hospitals over 10 years ago. In 2017, it surpassed the Department of Energy's Better Buildings Challenge goal, three years earlier than planned, to reduce energy use by 20% by 2020 from a 2008 baseline.

What's more, the organization implemented a long-term environmental impact and sustainability program in 2021 to increase efforts around energy conservation, waste management and environmentally preferred purchasing. In addition, Ascension established a goal of achieving net zero carbon emissions and zero waste by 2040, and meeting the Department of Health and Human Services Health Sector Climate Pledge of reducing emissions by 50% by 2030.

Today, the ENERGY STAR®-certified Ascension NE Wisconsin – Mercy Campus participates in Ascension's Marketplace platform, which allows sites to list and claim unneeded equipment. The

intent is to promote sustainability by reusing assets with additional life remaining, avoiding new asset purchases and removing surplus assets from storage.

The Oshkosh facility also has a food waste digester – a machine that uses organic microorganisms and oxygen to break down refuse – that has helped divert 32 tons of food scraps and downstream waste from landfills. Steam traps, designed to eradicate steam leaks, have been surveyed and replaced throughout the facility too, leading to greater energy efficiency.

Kyle Sunderlin, PE, energy project manager and demand side lead at Medxcel, which provides facilities management services for Ascension hospitals, says, "We are thrilled and grateful to receive the Sustainability Champion Award, which highlights our team's efforts to promote healthier communities by having more energy-efficient systems."



Ascension Seton Medical Center Williamson Hospital

Reducing time between commissioning and implementing solutions

Another Ascension site deserving of serious kudos is Ascension Seton Medical Center Williamson Hospital in Round Rock, Texas, which has 181 patient beds across 370,000 square feet and earned a 2023 ENERGY STAR certification.

What's more, the Ascension Texas Ministry Market, which includes the Ascension Seton Williamson facility, won a 2023 Governor's Texas Environmental Excellence Award in the innovative

operations/management category for making environmentally beneficial changes, including its efforts to transition to clean energy sources, which will help reduce air pollution in the community and decrease the amount of municipal solid waste sent to landfills.

"We worked hard to retrocommission our air-handling units so that they operate more efficiently and as intended, which provided a great opportunity to validate hospital compliance without over-ventilating our facility. It really showed us new opportunities for proper ventilation control," says Scott Czubkowski, PE, CHC, national director of energy and facility performance at Medxcel. "And, as with Ascension NE Wisconsin – Mercy Campus, Ascension Seton Williamson participates in Ascension's food waste digester initiative, which prevents excess waste from reaching landfills."

He believes other hospitals should take a cue from what he and his team have learned.

"The time between commissioning efforts and implementation of solutions should be accelerated to recognize sustainability results. This must be done thoughtfully to optimize quality for the long term," says Czubkowski, who expressed gratitude on behalf of the facility for being recognized as a Sustainability Champion.



Ascension St. Vincent Fishers Hospital

Measures include BAS, LED and steam system efficiency

Spanning three stories, with 30 medical-surgical beds, 10 labor-delivery-recovery-postpartum beds and 10 observation beds, Ascension St. Vincent Fishers Hospital in Fishers, Ind., has been honored with a PRC National Excellence in Healthcare award, an internally bestowed Green Champion Award for reducing greenhouse gas emissions, and a 2023 ENERGY STAR award, among other accolades.

Now, it can add a Sustainability Champion Award to its trophy case, too.

The hospital stands out for optimizing its building automation system (BAS), including keeping it in “auto” mode to improve efficiency. BAS programs allow an operator to monitor all connected building systems from a single interface.

Ascension St. Vincent Fishers and other Ascension sites have also replaced numerous fluorescent fixtures with LEDs, which reduces power consumption by almost 40%. And its steam blanket program aims to reduce heat loss in insulated pipes and requires less natural gas to meet heating loads. The heat energy saved directly contributes to Ascension’s carbon-reduction goal.

“We’re quite proud of how we’ve implemented programs at many Ascension hospitals, including initiatives designed to optimize existing assets and improve hospital energy efficiency,” says Andrew Fairbank, energy mechanical, electrical and plumbing performance analyst for facility performance at Medxcel. “We’ve found that close collaboration between local operators and national programs is key, as are efforts to replicate successful programs.”

Fairbank says that receiving a Sustainability Champion Award is both gratifying and rewarding for the hospital.

“It validates the hard work and innovation put into energy projects and sustainability initiatives,” he says. “It also serves as recognition for the positive impact made in reducing energy consumption and implementing green practices.”



Ascension St. Vincent Warrick Sustainability efforts include medical device program

As busy as this smaller critical care hospital can get, it hasn’t put environmentally friendly practices on the low-priority list. Several key sustainability endeavors in recent years have garnered positive attention and acclaim for Ascension

St. Vincent Warrick in Boonville, Ind., which is also a recipient of 2023 ENERGY STAR certification.

Case in point: The hospital supports Ascension’s medical device reprocessing program, approved by the Food and Drug Administration, which has collected over 1.1 million devices across all Ascension hospitals — contributing to more than \$19 million in savings and 481,000 pounds of waste diverted from landfills.

“We’ve learned that engagement of operators is critical to energy and sustainability success. There is an excellent collaboration between national energy programs and site engagement at this hospital,” says Andrew Fairbank, energy mechanical, electrical and plumbing performance analyst for facility performance at Medxcel.

Being named a Sustainability Champion is a testament to the team’s hard work and dedication, “and we are truly honored to be recognized for our commitment to reducing energy consumption and promoting sustainability in our community,” he says.

Every green effort by Ascension St. Vincent Warrick’s staff is celebrated at the facility. “On Earth Day this year, the hospital’s Green Team chair and other Ascension associates planted and created two azalea beds as part of a neighborhood park renovation in nearby Evansville,” Fairbank says.



Ascension St. Vincent’s Medical Center Clay County Hospital Boosting coil efficiency and reducing food waste

Since first opening its doors 10 years ago, Ascension St. Vincent’s Medical Center Clay County Hospital in Middleburg, Fla., has made a strong impression in the region after doubling in size in 2016 and earning an IBM Watson Top 100 Hospitals Award in 2019 and 2020, a Healthgrades Patient Safety Excellence Award in 2019, ENERGY

STAR certification and now a Sustainability Champion Award.

Helping the full-service, 134-bed hospital claim these distinctions are initiatives like the regular cleaning of heating and cooling coils on air-handling units, an “unusual but usable produce” program that reduces waste by distributing healthy food items that might have been discarded due to having an unattractive appearance, and its expanding recycling program.

The campus has also replaced and upgraded coils to optimize energy consumption, airflow, ventilation, control sequences and related maintenance.

“Addressing coil pressure drops led to significant improvement in energy savings,” says Scott Czubkowski, PE, CHC, national director of energy and facility performance at Medxcel. “We are very proud of our energy and sustainability work at Ascension St. Vincent’s Clay County Hospital. Focusing on these objectives motivates us to dig deeper until we find successful solutions. The lesson here? Keep digging until you find the root cause.”



Atrium Health Lincoln Proactive practices drive down energy consumption

Opened in 2010, Atrium Health Lincoln in Lincolnton, N.C., was driven to keep its 101-bed facility green and sustainable virtually from the start by continually making improvements.

Efforts began with reducing energy to lower health care expenses and decrease energy waste, helping to minimize the use of natural resources and lower carbon emissions. That impressive early momentum continued with proactive practices over the years that included retrocommissioning building automation systems, implementing operating room airflow setbacks and energy-efficient control sequences, and optimizing chilled water systems.

“This was extremely challenging because it touched just about every aspect of the hospital’s HVAC systems, including areas with special pressure control, such as operating rooms and sterile suites. It took months of planning, detailed execution and commissioning over short periods to ensure adequate airflow and pressurization, and minimize downtime for the surgery schedule,” says Michael D. Roberts, PE, SASHE, CHFM, SrHE, director of energy services for facilities management at Atrium Health.

Hard work pays off: Energy consumption at the facility has dropped by 35%, yielding annual energy savings of \$103,000. Victories like these helped the hospital earn ENERGY STAR certification six years in a row.

Lincoln’s Green Team has made great strides in plastic elimination and waste reduction, and the campus was named an Arbor Day Foundation Tree-Campus Healthcare Facility for three consecutive years.

Roberts credits Atrium Health Lincoln’s site-based plant operations and maintenance team with its winning streak of success.

“This was the first Atrium Health team to utilize the energy-reduction initiatives, and they stayed the course as we learned how best to implement these changes,” Roberts says. “Sustainability and energy efficiency take time and effort, and the path to success is one of sustained push and perseverance. The work doesn’t necessarily show immediate results, but the effort builds over time. The takeaway here is to stay vigilant, keep plugging away and, little by little, you will get buy-in from everyone involved.”



Atrium Health Mercy
Benchmarked systems and practices
bring operational savings

Atrium Health Mercy in Charlotte, N.C., was spending over \$1.7 million in annual energy costs a decade ago. But thanks to its diligence in adopting green systems and practices, annual energy consumption has fallen by over a third, triggering a \$530,000 annual savings for the 580,000-square-foot facility.

A Sustainability Champion Award was bound to follow, as was ENERGY STAR certification five years in a row and the honor of being named an Arbor Day Foundation Tree Campus Healthcare facility four years running.

As with its sister facility in nearby Lincoln, the journey toward sustainability started years ago with energy-reduction efforts campuswide like installing airflow setbacks in operating rooms, upgrading outmoded pneumatic HVAC controls with energy-efficient direct digital controls, and retrocommissioning different building automation systems.

Michael D. Roberts, PE, SASHE, CHFM, SrHE, director of energy services for facilities management, says that Atrium Health Mercy’s earth-friendly initiatives wouldn’t be possible without its dedicated staff.

“Plant operations and maintenance stayed the course with an older building and infrastructure. Our Green Team, in place since 2017, promotes sustainability education and action through internal platforms, social media, emails and events,” he says.

Atrium Health Mercy has long been the health care system’s designated hospital for comprehensive benchmarking via Practice Greenhealth; this benchmarking identifies areas of opportunity for greater efficiencies and provides a facility model for developing systemwide targets toward carbon-neutrality goals.

“Receiving the Sustainability Champion Award shows that sustainability efforts,

which began with and were championed by the plant operations and maintenance team as energy-efficiency initiatives, have spread across the facility and now have involvement from many other departments,” Roberts says.



Atrium Health Union
Facility staff creates culture of
energy efficiency

When you have a health care facility housing 248 beds and covering 558,000 square feet, preventing energy waste and keeping utility costs down is a constant challenge. Fortunately for Atrium Health Union in Monroe, N.C., its savvy sustainability squad has a keen knack for excising excess and optimizing efficiency. Their strategies have helped reduce annual energy usage at the hospital by approximately 35%.

Atrium Health Union, now ENERGY STAR-certified three years in a row, has especially benefited from participating in a systemwide Sustain the Gains initiative, spearheaded by a mechanic training program that has created a culture of energy efficiency. HVAC mechanics and technicians continue to take ownership of equipment performance, review energy data routinely, and collaborate with colleagues and vendors to improve energy efficiency.

In 2012, Atrium Health set a five-year goal of a 20% reduction in energy across the acute care portfolio, hitting this goal in 2017. This teammate education and training program has enabled the site-based plant operations and maintenance teams to drive energy reduction across the 7.5-million-square-foot acute care portfolio from the goal of 20% to 35%.

Atrium Health Union has also implemented many of the same upgrades and improvements successfully accomplished at its sister facilities, Atrium Health Lincoln and Atrium Health Mercy. And, as at those sites, the Monroe campus has a robust Green Team in place.



PHOTOS COURTESY OF THE HOSPITALS

Energy-reduction efforts at Atrium Health Union, Atrium Health Mercy, Atrium Health Lincoln and across the enterprise have also been recognized by ENERGY STAR. In fact, Atrium Health has been awarded ENERGY STAR Partner of the Year status for six years in a row earning Sustained Excellence for the past four years.

“Established in 2021, these green champions raise awareness of Atrium Health’s sustainability vision and goals and educate teammates at the facility on how to make a difference for the environment,” says Michael D. Roberts, PE, SASHE, CHFM, SrHE, director of energy services for facilities management. “One of our objectives is for each department to have a green champion involved in the Green Team to increase multidisciplinary participation.”

The 2023 Sustainability Champion Award “recognizes our teammates for all the great work they are doing in an area that doesn’t always get the recognition it deserves,” Roberts says.



Aurora Medical Center – Oshkosh

Condensate recovery, solar panels, “food forest” and more

Part of the Aurora Health Care health system, Aurora Medical Center in Oshkosh, Wis., has emerged as a major mover and shaker in health care sustainability across the region. For proof, consider that the facility earned an ENERGY STAR score of 98 out of 100 this past year, which marks 10 years since initially achieving ENERGY STAR certification; in 2022, it was also bestowed an ASHE Energy to Care Sustained Performance Award and a Practice Greenhealth Environmental Excellence honor.

Green actions undertaken by Aurora Medical Center – Oshkosh include extensive efforts such as recovering waste condensate from rooftop cooling coils and piping to the cooling tower;

installing screen- and roof-mounted photovoltaic array solar panels; replacing or upgrading brushless direct-current motors on circulating and hot water pumps; cultivating a green space “food forest” to grow fresh fruits and vegetables for team members and the community; achieving passive heat recovery on duct runs between cooler operating rooms and warmer waiting rooms; and programming the building automation system for optimal performance.

Key to the team’s success is innovation and motivation in the pursuit of continuous improvement. These initiatives were, in most cases, conceived, led and physically installed by facilities operations staff.

The approach has reduced the energy and greenhouse gas intensity by nearly half in the past 15 years to below 150 kilo British thermal units per square foot levels. This equates to removing nearly half a hospital of the same footprint from the grid.

“It’s an honor to be recognized by our peers, who understand the effort it takes to both maintain the safe operations of a medical center and reach strategic inspirational goals,” says John Habeck, manager of facilities operations for Aurora Medical Center.

Jeff Bard, hospital president, commends his staff for their exemplary efforts. “We’re committed to increasing sustainability and conserving natural resources for our communities today as well as for future generations as part of our commitment to helping people live well,” he says. “And I am proud Aurora Medical Center – Oshkosh is helping to set that precedent.”



Parkland Health – Main Campus

Massive campus improves HVAC and energy performance

Parkland Health, one of the largest public hospital systems in the nation and a Level I trauma center with 878 beds, spans

a whopping 3.3 million square feet on its main campus in Dallas. That kind of real estate makes it particularly susceptible to squandered energy.

But in 2021, Parkland hired an in-house energy manager to enhance its energy performance and sustainability efforts. An energy management framework was created and initiatives were implemented that improved boiler and chiller optimization, temperature setpoints, system upgrades, demand management and renewable energy opportunities.

These efforts reduced energy consumption across the property by over 10%. Parkland Health soon became the largest ENERGY STAR-certified health care campus in the U.S., currently maintaining an ENERGY STAR score of 90.

“In 2022, Parkland received LEED Gold certification for a new 525,000-square-foot clinic building, the Moody Outpatient Center,” says Miranda Skaaning, LEED Green Associate, director of sustainability and energy conservation for Parkland Health. “Parkland also increased its total available recycling streams to over 40 types of items.”

In fact, between 2021 and 2022, the hospital’s entire energy program reaped more than \$2 million in savings and increased recycling by 275 tons of waste.

“What’s particularly rewarding is being able to reduce energy consumption by 10% on a campus where the buildings have been open for seven years or less and a major retrocommissioning project had already been completed,” Skaaning says. “Our sustainability and facilities teams have put in a lot of effort to create and implement forward-thinking initiatives that improve both our bottom line and our impact on the environment.”

Erik J. Martin is a freelance writer based in Oak Lawn, Ill.

ASHE recognizes more hospitals for sustainable practices



Top-performing hospitals and professional organizations across a wide range of award categories

Byond the 10 Sustainability Champion Award winners profiled on the preceding pages of this month's cover story, the American Society for Health Care Engineering's (ASHE's) Energy to Care® Program also recognized 31 Sustained Performance Award winners, two Chapter Challenge Award winners and more than 75 other hospitals that have earned an Energy to Care Award for lowering energy use.

Energy to Care is an energy-reduction program for health care facility management professionals who want to add value to their organizations through energy savings. ASHE is working hard to help members set and achieve sustainability goals. To meet this objective, ASHE created trusted sustainability resources that are specifically tailored for health care facilities.

The Energy to Care Program has seen consistent participant growth since its inception in 2006. More than 4,000 facilities have participated since 2010, and in the entire life of the program, health care facilities have seen a combined savings of more than \$550 million dollars reallocated to patient care.

Health care facilities professionals can learn more about ASHE's Energy to Care Program by logging on to energytocare.org.

ENERGY to care SUSTAINED PERFORMANCE

Sustained Performance

Past Energy to Care Award winners that have continued to accomplish sustainability goals receive the Sustained Performance Award, which was introduced in 2022. ASHE congratulates these facilities for further reducing or maintaining reduced emissions:

- AtlantiCare Regional Medical Center – Atlantic City Campus.
- AtlantiCare Regional Medical Center – Mainland Campus.
- Atrium Health Cabarrus.
- Atrium Health Cleveland.
- Atrium Health Floyd Medical Center.
- Atrium Health Kings Mountain.
- Atrium Health Lincoln.
- Atrium Health Mercy.
- Atrium Health Pineville.
- Atrium Health Polk Medical Center.
- Atrium Health Stanly.
- Atrium Health Union.

- Atrium Health Wake Forest Baptist Medical Center.
- Atrium Health Wilkes Regional Medical Center.
- Aurora Lakeland Medical Center.
- Aurora Medical Center – Grafton.
- Aurora Medical Center – Burlington.
- Aurora Medical Center – Manitowoc County.
- Aurora Medical Center – Oshkosh.
- Aurora St. Luke's South Shore.
- Geisinger Grays Woods.
- Geisinger Justin Drive 2.
- Geisinger Healthplex Woodbine.
- Geisinger Wyoming Valley Medical Center.
- Memorial Hermann Greater Heights Hospital.
- Memorial Hermann Katy Hospital.
- Memorial Hermann Memorial City Medical Center.
- Memorial Hermann Northeast Hospital.
- Memorial Hermann Heart & Vascular Institute at Southwest.
- Memorial Hermann Southwest Hospital.
- Memorial Hermann The Woodlands Medical Center.

ENERGY to care AWARD

Energy to Care

More than 75 other hospitals earned the Energy to Care Award for accomplishing energy and sustainability goals. ASHE congratulates these facilities:

- Adventist HealthCare Rehabilitation Hospital.
- Adventist HealthCare White Oak Medical Center.
- Advocate Dreyer Clinic – Aurora.
- Advocate Outpatient Center – Des Plaines.
- Advocate Outpatient Center – Lakeview.
- Advocate Outpatient Center – Libertyville.
- Advocate Outpatient Center – Oak Lawn.
- Advocate Outpatient Center – Orland Park.
- Advocate Sykes Outpatient Center.
- Albany Medical Center.
- Ascension Health System Office.
- Ascension Saint Thomas Hickman Hospital.
- Ascension Seton Shoal Creek Hospital.
- Atrium Health Behavioral Health – Davidson.
- Atrium Health CPN Administration Building.
- Atrium Health Huntersville Oaks Skilled Nursing.
- Atrium Health Mercy.
- Atrium Health Pineville.
- Atrium Health Stanly.
- Atrium Health Stanly Manor Skilled Nursing.
- Aurora Ambulatory Surgery Center – Germantown.
- Aurora Health Center – Good Hope Clinic.
- Aurora Health Center – Hartford.
- Aurora Health Center – Mayfair North.
- Aurora Health Center – New Berlin.
- Aurora Health Center – West Bend.
- Aurora Lakeland Medical Center.
- Aurora Mayfair Surgery Center.
- Aurora Medical Center – Kenosha Cancer Care Clinic.
- Aurora Southern Lakes Surgery Center – Burlington.
- Aurora Surgery Center – North Mequon.
- Aurora Surgery Center – Racine.
- Box Butte General Hospital.
- Cleveland Clinic – Global Cardiovascular Innovation Center.
- Cleveland Clinic – Medical Outpatient Center, Lakewood.
- Cleveland Clinic – Mentor Express Care Clinic.
- Cullman Regional Medical Center.
- Cushing Medical Plaza.
- DCH Family Medicine Perry.
- Geisinger Grays Woods.
- Geisinger Healthplex Woodbine.
- Geisinger Justin Drive 2.
- Intermountain Healthcare Holladay Clinic.
- Intermountain Healthcare Memorial Clinic.
- Intermountain Healthcare Parkway Office Building.
- Kindred Hospital Bay Area – St. Petersburg.
- Kindred Hospital Chicago – North.
- Kindred Hospital Dallas Central.
- Kindred Hospital Houston Medical Center.
- Kindred Hospital Indianapolis.
- Kindred Hospital Westminster.
- Lifepoint Health – Canyon Vista Medical Center.
- Lifepoint Health – Fauquier Health.
- Lifepoint Health – Los Alamos Medical Center.
- Lifepoint Health – Lourdes Counseling Center.
- Lifepoint Health – Lourdes Health.
- Lifepoint Health – Person Memorial Hospital.
- Lifepoint Health – Southern Tennessee Regional Health System – Pulaski.
- Lifepoint Health – Sovah Health – Danville.
- Lifepoint Health – Trousdale Medical Center.
- Lifepoint Health – UP Health System – Bell.
- Lifepoint Health – UP Health System – Portage.
- Memorial Hermann The Woodlands Medical Center.
- Midland Memorial West Campus.
- OSF Saint James – John W. Albrecht Medical Center.
- OSF St. Joseph Medical Center.
- Parkland Health – Main Campus.
- Parkview Health – Medical Office Building 2.
- Parkview Health – Medical Office Building 4.
- Parkview Health – Premier Surgery Center.
- Saint Luke’s Child Care Center.
- Saint Luke’s Hedrick Medical Center.
- Saint Luke’s Multispecialty Clinic – Shoal Creek.
- Saint Luke’s Health System Primary Care – Shoal Creek.
- Shirley Ryan AbilityLab.
- University of Utah Health Farmington Health Center.
- WakeMed Cary Hospital.

ENERGY to care CHAPTER CHALLENGE

Chapter Challenge

Thirteen ASHE Chapters participated in the Energy to Care 2023 Chapter Challenge. ASHE congratulates the winners of the 2023 Chapter Challenge:

Large Category Winner:

- Texas Association of Healthcare Facilities Management.

Small Category Winner:

- Arkansas Association for Healthcare Engineering.



Computed tomography machines are the workhorses of health care facilities, which is why they're seen in every emergency department and inpatient hospital.

Equipment planning for imaging suites

Future-proofing strategies that prioritize innovation

BY PIER VETTORAZZI, AIA, IIDA, LEED AP, AND LISA CHARRIN, AIA, ACHA

Regular health care construction projects are instrumental in keeping the lights on in the incredibly demanding health care field. More specifically, the state of facilities is critical to patients' perceptions of care quality; employee attraction and retention; and compliance with ever-evolving facility standards, environmental requirements and building codes.

Therefore, a health care construction project goes way beyond slapping a new coat of paint on the walls. Often, it requires years of active construction. And, although there will always be hurdles to any project regardless of industry or

building type, health care construction projects are uniquely difficult to navigate — whether dealing with lengthened equipment lead times or additional budget considerations.

However, evolving technology's impact on equipment planning in hospitals poses an especially interesting challenge. As equipment technology progresses, so does the desire to have it all integrated and connected to the facility's electronic health records, or just as simple as a connection to the internet for manufacturer access and supervision.

This creates the challenge of trying to anticipate not only the connections to the

network but also the protection of the network or providing multiple hard-wired or wireless networks and, more importantly, the infrastructure and space for conduits cabling and wiring.

Among these challenges is ensuring medical equipment planning is integral with the design and construction for the high-acuity areas of imaging and hybrid rooms.

Equipment evolution

Although the mechanical portions and units of diagnostic modalities have become more physically compact, they now require a lot more infrastructure support and planning — specifically regarding data transfer and storage. To illustrate, consider computed tomography (CT) machines.

This piece of medical equipment is the workhorse of health care facilities, which is why it's seen in every emergency department and inpatient hospital. The core units themselves haven't changed much beyond efficiency updates to produce higher-resolution images and lower the radiation footprints. At face value, these machinery updates don't seem to affect facilities too much. However, as pieces of medical equipment grow more sophisticated, people begin to use them differently.

For instance, more hospitals are incorporating intraoperative magnetic resonance imaging (iMRI) suites in their facilities. These suites, which sit adjacent to operating rooms (ORs) and allow surgeons to obtain imaging in the middle of surgery (among other modalities), were basically unheard of 10 years ago. It is now common practice for hospitals to add robotic systems into their new operating suites to stay competitive. Today, it's rare to do any health care construction project that doesn't include a hybrid OR with at least infrastructure for robotics.

Project management teams must be sure to consider who will use the medical equipment and how it'll be implemented. This will reduce internal conflicts and ensure smooth workflows. MRIs have typically been part of the diagnostic imaging (DI) departments, but when imaging and surgery merge in this suite setting, surgeons and diagnostic specialists must work in symbiosis.

This type of suite creates the opportunity to add interventional radiologists (IRs), who perform minimally invasive surgical procedures while patients are in

Florida hospital expands technology to handle growing patient population

A few years ago, the University of Florida Health Shands Hospital realized referral patient demand at its main campus in Gainesville, Fla., was quickly exceeding capacity.

The health system knew it needed to expand its facilities to better serve a rising patient population, improve access to care and ensure a positive patient experience. As part of its continued future-proofing strategy, UF Health Shands green-lit the construction of a specialty tower that would neighbor its cancer center and provide state-of-the-art care to patients with neurosurgical, neurological and cardiovascular conditions.

UF Health Shands needed a technology consulting and engineering firm to design and construct several prominent towers on its main campus. The system's leadership team tapped Introba to lead visioning services to marshal these specialties around familiar technologies. It leveraged the interventional suite's programmatic and spatial arrangement to satisfy the diverse needs of these distinctive specialties.

In the end, the project spanned approximately 500,000 square feet. Construction costs sat at around \$400 million, including an equipment budget of nearly \$100 million. Almost 18 operating rooms (ORs) were designed within an integrated platform to leverage common core support elements, such as central supply and anesthesia support for hybrid neurological and cardiovascular ORs, and trauma and general ORs.

The new specialty tower, completed in 2017, contains 216 beds, including acute care and intensive care unit beds. It also has clinics and diagnostic areas for neurological and cardiovascular assessment, prep and recovery, pharmacy and pathology. ■

MRI machines, as part of the iMRI suite. As medicine advances and technology evolves, IRs have introduced additional procedures, requiring more medical equipment inside the suite. So not only does a project management team have to plan for additional medical equipment in the room, but it also must ensure that the equipment integrates with the imaging and hospital system, meets MRI and surgery requirements, and is adaptable enough to future-proof construction.

Future-proofing sounds straightforward enough. And in some ways, it is. For instance, it's good practice to install extra conduits to account for future use cases. However, full-scale future-proof construction is much more complicated, especially when considering how much time it takes to get medical equipment planned, ordered, delivered and incorporated into workflows during active renovations.

For instance, MRI machines have about a 40-week delivery timeline from order to delivery. Before ordering, project management teams have to think about how they'll get it in (and eventually out) of the building. Once it arrives, they must account for a two-month installation and commissioning period. Basically, they are looking at a year from order to first use, not including planning and design time.

Making a room bigger or outfitting the walls with removable panels is one thing; getting the unit to an upper floor of the hospital is another entirely. Project management teams can't simply load it onto an elevator. At its lightest, an MRI machine weighs about 16,000 pounds. Instead, they need to prepare an equipment installation plan in advance, which will likely involve cutting a hole on the side of the building so a crane can move the unit in.

Moreover, it's not uncommon for health care construction projects to span more than four years. As a result, project management teams must make physical room for additional medical equipment installation and consider the future of health care technology. Building codes and regulations will undoubtedly change in that time too, and teams need to be ready to adapt to them.

Texas regulators, for instance, once deferred to manufacturers on the size of the imaging rooms. More recently, however, they have started requiring 4 feet of passage space around the units. As a result, architects who work on Texas projects have had to increase the size of the rooms to ensure they're up to code. These situations are precisely why future-proofing construction can be so difficult.



A hybrid suite showing operating room (OR), diagnostic imaging (DI) and interventional radiologist (IR) areas.

Better equipment planning

Fortunately, hospital decision-makers can employ future-proofing strategies to prioritize innovation while improving connectivity and standards across the health care system. These strategies can be broken down into project management and construction categories.

Project management strategies. When it comes to health care construction projects, there are a lot of moving parts. That’s why it’s important to start planning early. Tips to help facilities professionals better prepare include:

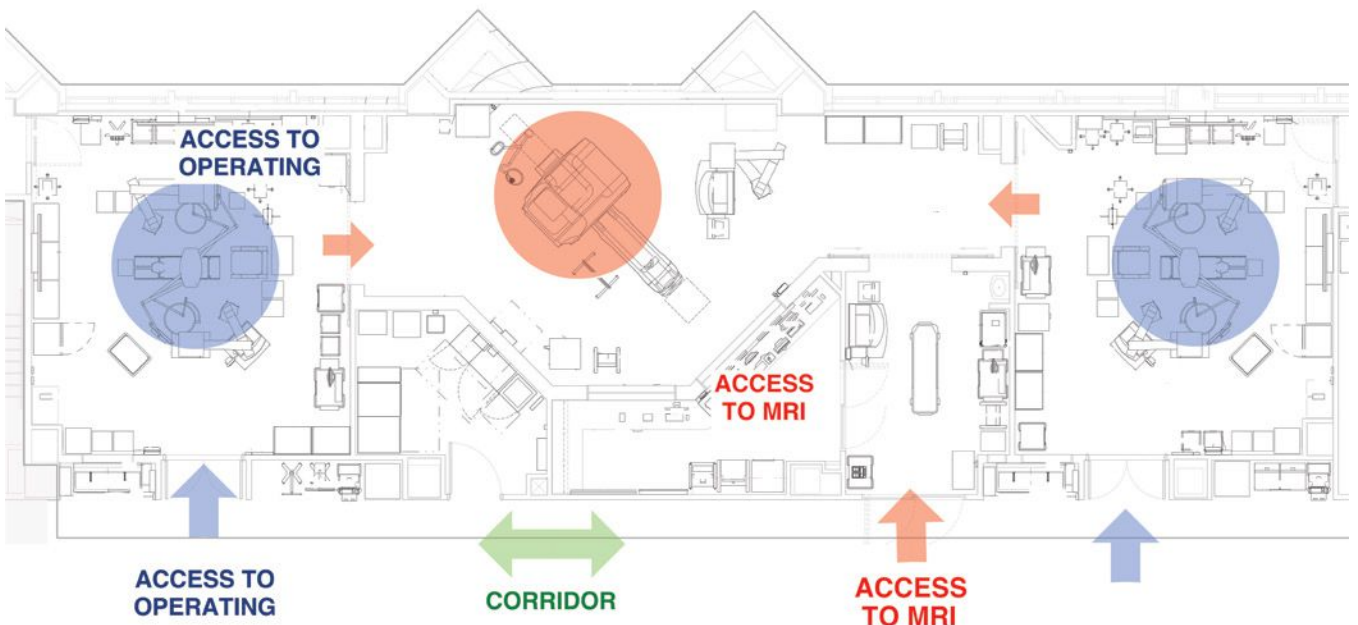
- Give the right information at the right time. There’s generally a 20- to 40-week

lead time on major medical equipment, and technology can evolve over that time. So, contracts will often be outfitted with clauses specifying that the manufacturers must deliver the latest technology at the time of installation for no upcharge. That means if a project team orders a Model 10 today and a Model 11 is released two months before installation, the manufacturer is obligated to deliver the Model 11.

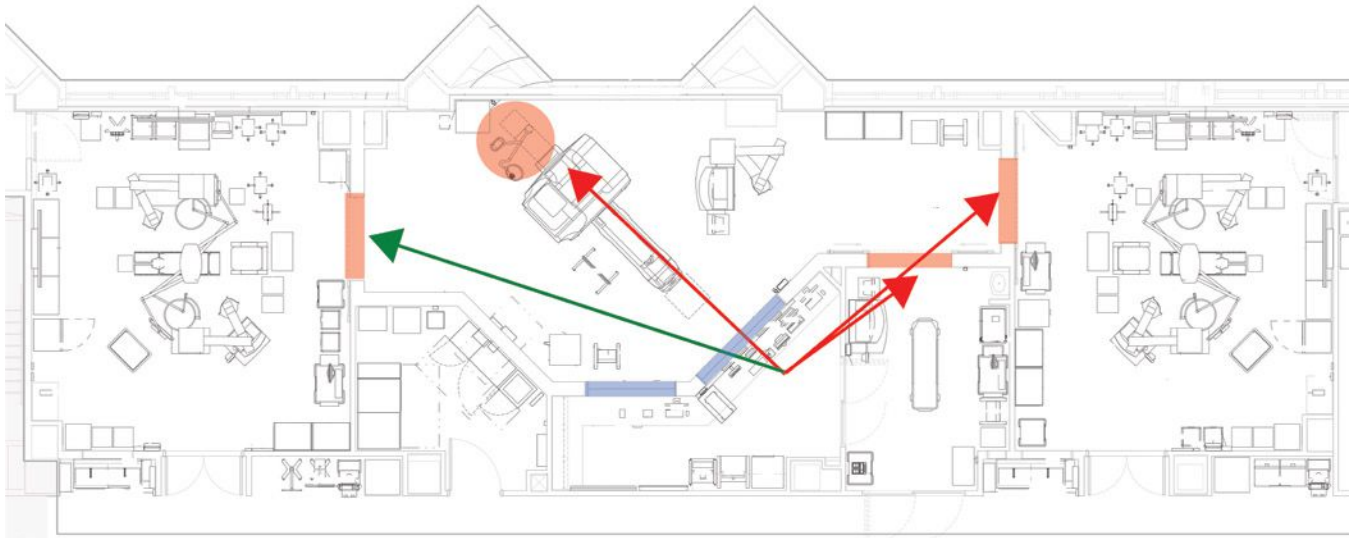
This change has a trickle-down effect on medical equipment installation contractors, which is why timing and communication are crucial. If the project management team must adapt its plans to fit a new model, it will ultimately be charged

for the redesign work. Alternatively, the team can hold a design fee, contractor fee or allowance for the specific room. The engineer and architect will wait to design the room until the equipment is ready, but that could be more than two years away. Either way, the project management team must pay – it’s just a matter of when.

A recent facility project involved renovating two existing floors that included ORs, hybrid rooms and a CT scanning room. After meeting with all parties, the designers decided to phase the work. They previously worked on a similar project and had to go through costly redesigns time and again due to



Patient flow patterns for a hybrid imaging and operating suite.



Visibility to multiple access points in a well-designed hybrid imaging and operating suite.

changes in technology and operational requirements as well as the construction times associated with renovating two full floors at once. The project was not only built and equipped in phases but also planned and procured in the same fashion to reduce the costs of changes and technology obsolescence.

- *Get estimates early.* Estimates and budgets are two different things in the world of planning, design and construction. Medical equipment planning provides estimates on equipment costs for one straightforward reason: Equipment planners can't control medical equipment prices. Instead, they build a report that includes estimates for all the equipment and contingencies when planning a facility for a health care system. They use real-time prices instead of list prices for their estimates based on their current purchase averages. So, it's best to involve an equipment planner as early as possible when setting goals for equipment spending strategies.

The later the equipment teams get involved in the planning and design process, the harder it will be to align the equipment needs with the facility budget. This is especially true if it was set without incorporating the associated equipment and supplemental costs. At this point, the conversation turns to reduction strategies. These strategies usually involve deferring purchases, finding alternative funding methods or, in a worst-case scenario, reducing the functionality or quality of the equipment below the original expectation to meet a budget.

- *Lay out the decision path.* The past two years have been erratic when it comes to medical projects and equipment. Medical supply chains bore the brunt of fluctuating supply and demand, pushing medical equipment delivery timelines far back. Pharmacy hoods, for example, went from eight weeks to nine weeks to 12 months. When the COVID-19 vaccines rolled out, a refrigerator couldn't be purchased anywhere. Consulting and engineering teams had to constantly communicate with manufacturers and distributors to properly advise health care organizations on these changing time frames. That way, the purchasing decisions could be made in time to align with the project schedules.

Therefore, it's imperative to develop a schedule with the equipment planner that includes purchasing time frames and a go-live date. If a project management team wants to go live on an exact date, it will need a certain number of days for planning, purchasing, production, delivery and installation. So, the team needs to start making decisions on what it wants to buy. In some cases, the team can stretch the timeline of these decisions. Generally, it's best to begin the purchasing meetings 18 months ahead of a hospital's go-live date. Sometimes, this includes selecting and buying equipment before the design is complete.

Construction strategies. Once construction begins, it becomes a lot harder to pivot. The following strategies can help ensure the process goes smoothly:

- *Choose the right room size and technology.* In some ways, choosing the right room size is cut and dried: Manufacturers must meet Occupational Safety and Health Administration requirements — and the project management team must follow these specifications, too. However, if one looks at a manufacturer's drawings for an MRI machine, they'll see that they

don't consider anything else in the room other than the one machine. Realistically, that room needs to be outfitted with supply closets, physiological monitors, injectors, linen hampers and other pieces of equipment. Therefore, the team needs to decide how

much to increase the square footage to account for additional technology and medical equipment.

For instance, patients will likely be wheeled into the room on bulky stretchers in an inpatient setting. And, in the case of a hybrid OR, they might even be on general anesthesia. In that case, the project management team will need to build more space for the anesthesia machine, which is about 12.5 square feet. Failing to account for other medical or non-medical equipment is one of the biggest holes in medical equipment

RESOURCE

i American Society for Health Care Engineering members can access the monograph "Designing and Engineering MRI Safety" by logging on to ashe.org/mri.

planning, so teams must be careful not to fall into the trap.

- *Maintain flexibility for manufacturers' models.* Equipment changes about every three to seven years. During that time, medical equipment manufacturers race to release leading-edge models. Once one manufacturer releases the blueprint, the rest scramble to copy the design and get it out to market. Maintaining flexibility in planning helps a facility absorb some of these changes with minimum impact.

Plus, in DI equipment, the changes are typically software related. That's by design. Manufacturers know that existing hospitals don't have the extra square footage to install larger medical equipment, so manufacturers try to keep their updates restricted to the existing footprint.

- *Ensure infrastructure support for technology.* Hindsight is 20/20, but that hindsight comes with a price tag in health

care construction. Of course, project management teams are never able to foresee every future need, but they can take a few steps to ensure infrastructure support for future technology.

For instance, imagine a facility has an MRI machine that is just running basic scans for the time being. If the facility has any plans for IRs to do procedures in that MRI machine in the future, however, it will need a wall-mounted monitor where the IRs can view images. Adding blocking in the infrastructure so that the monitor can someday share images is exceptionally cheap (approximately \$500) if it is installed while the room is being built. On the other hand, installing such infrastructure after the fact will cost tens of thousands of dollars and take much longer to complete.

- *Follow future-proof planning.* The pace of technological advancement is so great in the health care field that it's not

ABOUT THIS ARTICLE

This article is based on a presentation given by the authors during the 2022 International Summit & Exhibition on Health Facility Planning, Design & Construction.



a good idea to plan for construction more than five years in advance. If a project management team wants a 10-year plan, it's better to masterplan and allow for flexibility rather than focus on details of current equipment.

Staying up to date

It's not easy to keep a health care facility up to date and future ready. But it's not impossible, either. Health facilities professionals must find a good project partner who can help them keep an eye on the future of health care technology and watch as their health care organizations lead the way. **HFM**



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Elevating patient well-being through health care design

By Mary Holt, chief design strategist at Carnegie

The physical environment in health care interiors significantly affects patient recovery rates, length of stay and overall well-being. As health care begins to adopt many of the key characteristics of hospitality, design becomes the vehicle for improving wellness for patients and staff alike. According to a ThinkLab Health and Wellness Roundtable, the rise of health care spaces influenced by the hospitality industry has resulted in a demand for materials in various aesthetics that don't feel sterile or typical for health care. However, designers often find it difficult to source products that convey a hospitality-inspired feel but stand up to the uniquely rigorous demands of a health care environment. Beyond aesthetics, they must prioritize durability, cleanability and sustainability, emphasizing the importance of responsible material selection in everything from surfaces to upholstery. By keeping these design elements in mind, health care designers will be able to offer beautiful, comforting and holistically welcoming environments.

Durable and sustainable material selection

Health care settings require materials that withstand constant use and extensive cleaning without degrading in quality. From waiting areas to patient rooms, solutions must be durable, resistant to stains and wear, and tolerant of harsh chemicals. To maintain a hygienic environment, finishes and materials for textiles, wallcoverings and surfaces should be able to withstand rigorous cleaning procedures, including exposure to bleach and disinfectants and regular wiping and scrubbing. Performance-oriented solutions must also offer protection against moisture, bacteria and pathogens. In addition to considerations for durability and cleanability, selecting finishes that are proven to be sustainable contributes to a healthier environment for patients, staff and the planet. Opting for materials with better life cycle impact and reduced environmental damage, designers should prioritize clean manufacturing processes, evaluation of total carbon footprint and products that reduce energy demands. By choosing solutions backed by third-party verification such as Cradle to Cradle, LEED and Greenguard, they ensure health care spaces are free from harmful substances and contribute positively to indoor air quality and occupant health.

Sound reduction and natural lighting to promote calm

Sound pollution can significantly impact patient comfort and recovery, especially given the constant equipment,



conversations and foot traffic in health care environments. Incorporating acoustic solutions into space planning may include sound-absorbing materials, wall panels and ceiling treatments. These methods help reduce noise levels, enhance privacy and create a calmer atmosphere that supports recovery and wellness more broadly. Effective light control is crucial for creating a soothing and functional health care environment. Natural light positively impacts patient outcomes and well-being. However, balancing natural light with privacy and heat and glare reduction is essential. Incorporating performance window treatments, such as blinds or heat and glare control drapery, is an effective way to address this challenge.

Carnegie solutions for healthcare facilities

Carnegie spent the last 70-plus years championing responsible innovation through Materials That Matter™, proving that beautiful, high-performance solutions can be delivered sustainably. Carnegie provides a variety of solutions for health care settings that can handle aggressive cleaning measures from bleach and hospital-grade disinfectants to hot water tolerance and the ability to withstand repeated scrubbing and wiping — all without compromising style and comfort for patients and staff. Whether bio-based alternatives, durable upholstery or easy-to-clean wall coverings, Carnegie products are 100% PVC-free, have Health Product Declarations and are eligible for earning LEED points.

Additionally, Carnegie offers a range of artful acoustic solutions, privacy dividers and options for light, heat and glare control. Health care professionals can take advantage of Carnegie Design Services, which provides complimentary design support, including custom-curated samples of palettes and acoustic solutions, with an in-house team of designers that can assist in meeting any projects design, specification, deadline and budget parameters.



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Any external or internal electrical power equipment item can fail and any single room can become untenable for equipment operation.

Conducting assessments of electrical system risks

Discovering and protecting against power vulnerabilities

BY DAVID L. STYMIEST, PE, CHFM, FASHE, CHSP

Because ongoing changes in health care facilities can affect electrical system operations, the original failure procedures can lose their significance, creating inadvertent difficulties between original concepts and current needs. Effective procedures should include all potential existing failure modes (both external utility failures and internal failures) with the most effective and appropriate responses.

Unexpected failures are not the only issue — both planned and unplanned shutdowns can have adverse consequences if ongoing changes have not yet been factored into shutdown procedures. Among other considerations, the big picture asks: Which risks are most

challenging? How accurate and effective are the failure procedures? Who can safely follow them?

Another potential risk mitigation opportunity can be equipment nameplates (e.g., controls, breakers and switches) that have not been validated or modified after other equipment load changes occurred. Inaccurate nameplates or panel directories can lead to mistakes in responding to adverse conditions or authority having jurisdiction (AHJ) citations. By the same token, inaccurate, outdated or nonexistent failure procedures can adversely affect the response and ability of a health care facility to return to approved normal operations as quickly and carefully as possible.

The most effective processes for mitigating electrical system risks in health care facilities are discussed here.

Utility management plans

Multiple processes can be included in utility management plans and detailed subsidiary policies and procedures invoked by those management plans as well as the electrical power portion of emergency management operations procedures.

While current Centers for Medicare & Medicaid Services (CMS) requirements invoke the 2012 editions of the National Fire Protection Association’s NFPA 101®, Life Safety Code®, and NFPA 99, Health Care Facilities Code, along with several dozen referenced codes and standards, facilities professionals may also want to consider two more recent NFPA publications.

Although not mandated by CMS, the 2023 edition of NFPA 70B, Standard for Electrical Equipment Maintenance, is the very first such NFPA standard, superseding the previous NFPA 70B recommended practice documents. Readers may want to obtain and review NFPA 70B-2023 and compare it against previous recommended electrical maintenance processes. The NFPA 70B-2023 Annex K on electrical disaster recovery, starting on page 197, is a seven-page informational source with photos for disaster recovery of electrical equipment and systems.

Likewise, the 2024 edition of NFPA 70E, Standard for Electrical Safety in the Workplace, is also not mandated by CMS; or the Occupational Safety and Health Administration (OSHA), which addresses electrical safety issues. Regardless, electrical safety is an electrical power system risk mitigation process, and this latest edition contains new changes worth considering for electrical hazard elimination.

The electrical power system portion of a typical utility management plan has numerous objectives. Among them are providing a safe environment, minimizing electrical failure risks, maintaining electrical systems for reliable operations and maintaining effective procedures for addressing any equipment failures while minimizing their impacts.

Like some other utility systems, electrical equipment can be subject to change — especially equipment connected to panelboard circuit breakers, motor control center starters and larger switchboard breakers. Such equipment directories and labels must always be accurate and in compliance with AHJ requirements. Inaccurate information in such cases cannot only result in adverse AHJ survey findings but can also result in inaccurate emergency

procedures and even dangerous decisions during other challenging situations.

As with other utilities, electrical power systems are required to have accurate emergency utility procedures for responding to disruptions or failures. Those procedures sometimes may not have been reviewed and updated when equipment or intended response protocols changed.

Staff changes may also have occurred, resulting in the responding staff member not having been adequately trained for the actual situation at hand.

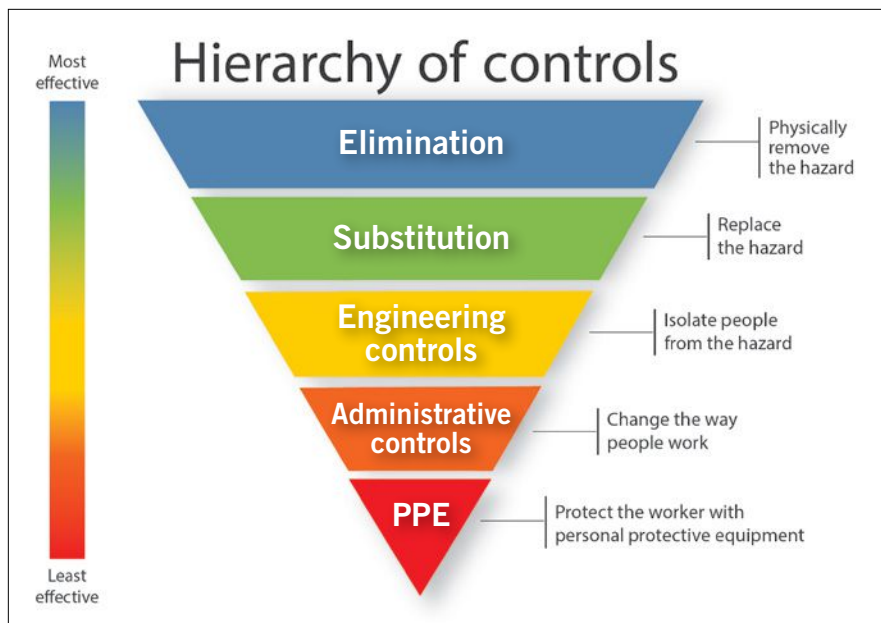
Additionally, electrical equipment sometimes may not be maintained when

planned. Because properly maintained equipment is safer to operate and results in fewer unplanned interruptions, prioritizing electrical maintenance will increase safety and decrease risks.

The most common cause of dangerous arc flash accidents is human error. OSHA is recommended as a source of information and guidance resulting in workers (employees and others) avoiding dangerous accidents. The National Institute for Occupational Safety and Health hierarchy of controls (see graphic on this page) rates from most effective to least effective the safeguards “elimination,” “substitution,” “engineering controls,” “administrative controls” and, finally, “personal protective equipment.” NFPA 70E also follows this hierarchy.

ASHE RESOURCE

i The American Society for Health Care Engineering’s monograph on “Managing Hospital Emergency Power Systems” can be accessed at ashe.org/mheps.



The National Institute for Occupational Safety and Health’s hierarchy of controls rates the effectiveness of safeguards.

Finding vulnerabilities

Facilities personnel can find emergency power vulnerabilities by assessing their installations, operations, knowledge, communications, maintenance, electrical safety, contingency planning and hidden common-mode failure potential for their effect on reliability, availability and dependability.

In systems engineering, dependability is a way to measure a system’s availability, reliability and maintenance support. Reliability is often considered the probability that a system operates and gives the same result on successive trials. Availability, on the other hand, can be considered the probability that a system will be able to function at any instant required, including within the next instant and for as long as required from that point.

It is incumbent upon health facilities professionals to find vulnerabilities and mitigate them. This can be accomplished with gap analyses, risk assessments, vulnerability assessments and through other means.

Quite simply, a gap analysis is a process for change. It enables users to determine what changes are needed or wanted, and then it facilitates the process of getting there. A generic gap analysis requires that facilities professionals answer the following questions: Where is the facility staff now? Where does it want to be? What does it need to do to get there? How does it accomplish this?

An emergency power gap analysis asks the following questions: What is connected to emergency power now? What else needs to be connected to emergency power? What should be done in the short term? How can the facility staff get there in the long term?

A similar approach can be used to address normal or emergency power system vulnerabilities, or even a strategy to eliminate or mitigate power failures. For instance, a gap analysis can be used to address the results of a power system vulnerability analysis to answer the following questions: How vulnerable is my normal or emergency power system to failures? Where are my vulnerabilities, and to what types of postulated failures? What vulnerabilities do I want to eliminate? What do I need to do to eliminate or reduce those vulnerabilities? How do I accomplish that?

A gap analysis strategy for power failures might look like the following:

- **Define concerns, policies, urgency, data needed and metrics.** Is the facilities staff concerned about external or internal disasters? Is it concerned about full or partial power loss? What needs to continue operating?

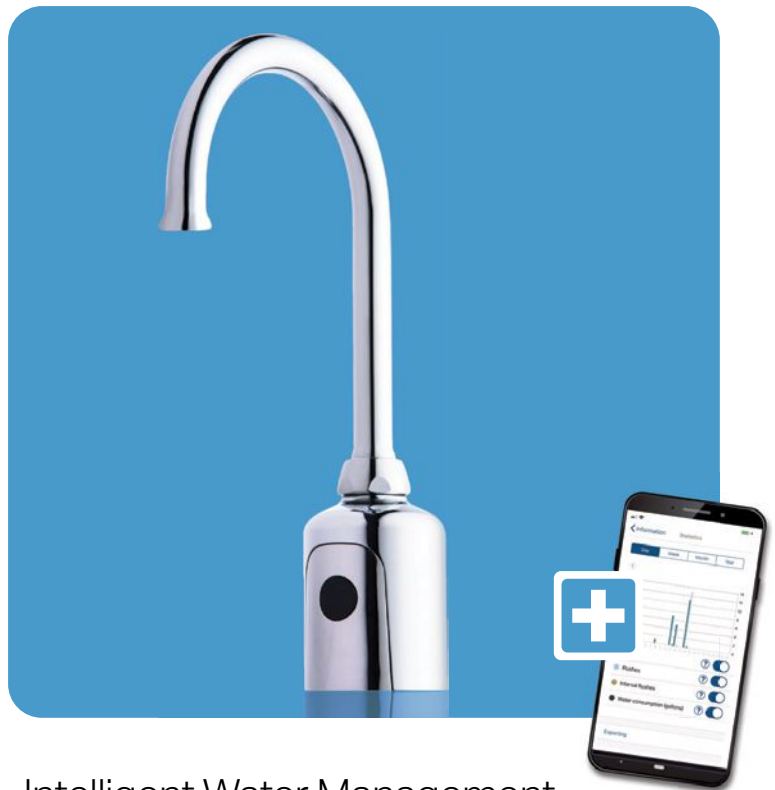
- **Assess current situation.** This activity requires load lists and power source lists. What temporary wiring was used for the last power shutdowns? This assessment identifies areas, services and loads that need to continue operating even when the power was no longer available. What lessons were learned by the organization itself and by others?

- **Analyze data and summarize gaps.** This analysis will look at infrastructure equipment and electrical systems. It will also address listed areas and the power systems that serve those areas.

- **Develop recommended actions.** The recommended actions for a power system gap analysis might involve additional generation, distribution, modifications to existing systems and power failure procedures to address infrastructure gaps.

- **Determine strategies to bridge gaps and recommendations.** Consider

specific areas and look at the options for dealing with power failures that are affecting those areas. The brainstorming session records areas and results. Further discussion can then address the options for long-term improvements to mitigate the effects of future failures.



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The elements of an overall risk mitigation effort

Many organizations only focus on authority having jurisdiction (AHJ)-required emergency power testing. However, the larger and more important concept includes not only testing but also other activities that find new or ongoing risks in time to mitigate and then remove unresolved vulnerabilities.

Emergency power reliability

Consider ensuring that a utility management program addresses the following considerations to assist an organization in maximizing electrical system impact and safety:

- Designing for reliability with input from the hospital's hazard vulnerability analysis.
- Careful construction, augmented by full-system commissioning and installation acceptance testing.
- Determining system load profiles to predict accurate peak demand loading during emergencies.
- Weekly inspections of all emergency power supply system equipment and locations.
- Monthly testing with proactive examination of operational issues and surprises during testing.
- Investigation, resolution and trend analysis of training or systemic issues.
- Extended run load test every 36 months.
- Vulnerability analyses, risk assessments and vulnerability mitigation activities.
- Preparedness for all emergency power system failures, including contingency planning for all levels of subsystem failures.
- Contingency planning for other internal and external failures.
- Comprehensive utility management plans with accurate and up-to-date system documentation.
- Integration of utility management plans and emergency management programs.
- Comprehensive and accurate short circuit and protective coordination studies.
- Coordination with construction/renovation and infrastructure upgrade projects.
- Consideration of essential electrical system subsystem failure plans in renovation and infrastructure designs.
- Awareness and follow-through of the patient safety impact of emergency power systems.
- Maintenance and clinical staff education on emergency power system-related issues.
- Comprehensive emergency power system maintenance program that also includes the branch subsystems.

Emergency power testing

Most emergency power testing requirements are clearly documented in the 2010 edition of the National Fire Protection Association's NFPA 110, Standard for Emergency and Standby Power Systems, and AHJ requirements. The primary goals are to maintain the emergency power system in a constant state of operational readiness and to comply with regulatory requirements without adversely affecting the operation of the hospital or the well-being of the patients.

Additional goals are to verify the infrastructure's ability to withstand power transfers that will occur when utility power is lost and to educate clinical caregivers accordingly so that patient care is not at risk during utility power outages or internally caused normal power outages.

A comprehensive, proactive emergency power testing program should train maintenance and clinical personnel to deal with the loss of utility power and power system transfers; test the functionality of all equipment related to the generation and distribution of emergency power; test the mechanical and building system responses to power system transfers; test clinical equipment responses to power system transfers; and avoid conditions that compromise patient treatment and safety.

All electrical equipment test failures should be analyzed to discover whether they were caused by human error, problem system interactions, test procedure inadequacies, equipment malfunctions or other causes. Corrective action should be planned regardless of the cause of the failure, and the corrective action should be sure to address the cause.

If an equipment failure results in the emergency power system failing a test, interim measures should be implemented until the necessary repairs and corrections are completed, followed by a retest that is passed. Each failure should be considered for its generic relevance as well. Similar circumstances could cause similar failures to occur again elsewhere in the health care system. ■

• **Determine best short- and long-term options.** Consider, analyze and rank preferred approaches.

• **Develop action plans.** Action plans for power failures identify the best course of action developed for immediate use. They might also include acquiring new generating capacity or rental units. These action plans should be as specific as possible (e.g., how portable generators will be wired into a power

system safely and then removed safely later). All stakeholders should participate in action plans.

• **Implement action plans.** This could require more funding if infrastructure improvements are required.

Failure procedures

Any external or internal electrical power equipment item can fail, whether it is a utility circuit, switchgear lineup,

transformer, motor control center, generator, paralleling switchgear, transfer switch, panelboard, battery, flywheel or other uninterruptible power supply technology, distribution riser or feeder, or other piece of equipment. Similarly, any single room can become untenable for equipment operation, including rooms housing many of these items and even different pieces of equipment intended to be redundant to each other.

In case of normal power failures, health facilities professionals should expect power at emergency (red) outlets only, emergency lighting only in affected areas and critical equipment fed from emergency power to be operating. Staff should ensure life support and other critical equipment are plugged into emergency (red) outlets and remove any nonessential items from these outlets. Staff in impacted areas should have flashlights.

In case of emergency power failures, facilities professionals should expect power only at normal (non-red) outlets in affected areas; most normal lighting will still be available. Staff should ensure life support and critical equipment are plugged into normal (non-red) receptacles as long as emergency power is not working. Staff should remove any nonessential equipment from red outlets and plug it into normal power outlets. Staff in impacted areas should have flashlights.

Utility equipment failure procedures are very important and work most effectively when they are accurate, thoroughly considered, consistent with control device nomenclature in the field and make sense to the staff who will be required to follow them during emergency conditions. Frequent training on the procedures helps ensure effectiveness.

Documentation should also be accurate and regularly updated to reflect the potential loss of institutional memory over time. Typical documentation that may require review and updates over time include utility system drawings, one-line diagrams, flow diagrams, riser diagrams and layouts when changes occur. Proactive updates may become challenging but, in many cases, will help avoid mistakes during unexpected response activities.

Facilities professionals should ensure both equipment and pathway shutoff devices and other control devices are correctly and effectively labeled. They should also use that labeling in the utility failure training and related drills or exercises. Additionally, they should



Matching switchboard breaker naming and tags with validated failure procedures can minimize the chance of errors.

make sure all utility failure procedure documentation, system reference documentation and field-installed labeling are consistent with each other to avoid adverse consequences.

Professionals should also consider how they might address the following sources as potentially common root causes of hospital utility infrastructure equipment failures: any component failure that reasonably could not have been anticipated or prevented by inspection, testing or maintenance; equipment mishandling or misuse; inadequate or incorrect instructions, procedures or processes; harmful wear and tear that was not corrected by maintenance; hazardous sabotage, vandalism, malware or hacking; failure of incoming utility service with inadequate on-site backup; or the unavailability of another necessary component.

Constant changes

Health care facilities professionals know that health care power systems infrastructure and management are not static environments; in fact, many would say it is an environment of constant change. Among their many challenges is to maintain control of facilities, equipment and personnel changes with their associated power system management.

Some challenges include finding unknown vulnerabilities and then mitigating them, using a gap analysis to change an existing issue and training a

soon-to-retire employee how to share that critical institutional memory before it is no longer available. Another challenge includes maintaining updated utility failure procedures that will match the responding staff's reality test.

Not all processes, such as failure procedures, meet ongoing requirements. Sometimes, planned shutdowns for inspections, testing, maintenance or even equipment modifications can also provide opportunities for improvement when it is realized the existing instructions should be modified to provide additional safety and other improvements.

Equipment locations can also have an impact on potential future failures. This potential can be identified and then mitigated with a well-documented gap analysis and vulnerability analysis. **HFM**



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Technical Committee on Emergency Power Supplies, all views and opinions expressed in this document are purely those of the author and shall not be considered the official position of NFPA or any of its technical committees and shall not be considered to be, nor be relied upon as, a formal interpretation. Readers are encouraged to refer to the entire texts of all referenced documents. Stymiest can be reached at dstymiest@ssr-inc.com.



Security cameras monitored at CoxHealth in Missouri.

Implementing solutions for health care safety

Integrated video and audio systems offer improved operations

BY PAUL J. BARATTA AND TIM LEE

Approximately 25 years ago, the first internet protocol (IP) camera was invented by Swedish inventor and entrepreneur Martin Gren. His original vision was that networks would grow and the need for IP solutions would grow along with them. The Internet of Things was just a dream then, but Gren recognized that video and audio solutions — along with useful analytics — were the wave of the future.

Today, connectivity has become the standard and, in hospitals, traditional security cameras are now being used to enhance the patient experience and improve the quality of patient care. These highly integrated systems feature smart cameras and audio speakers, with edge analytics devices on the hospital's infrastructure providing a unified solution that

keeps people and property safe. Further uses, including improved patient monitoring and telemonitoring, alongside integration with electronic medical records, have also improved operational efficiencies.

Thanks to improvements in image quality, processing power and analytics, security systems are no longer a purely reactive tool used primarily for reviewing incidents after the fact. The “smart hospital” is now a reality — and video, audio and analytics all play a role in revolutionizing health care operations and security.

Video and audio solutions

Modern cameras and sensors provide opportunities for real-time intervention when a potential security incident is detected, but they can also serve purposes that go far beyond security and response capabilities. Video can be used

to track patient movements, allow doctors to communicate freely with patients from a safe distance, issue automatic security alerts and more. Best of all, improvements in technology and accessibility have placed these video solutions within reach of any health care facility, regardless of its size.

In previous times, health care facilities consistently bumped up against one major limiting factor: staffing. No matter how observant or responsible a security team member is, human beings will inevitably miss things. After all, that's where the term "human error" comes from. They might overlook a visitor heading toward a restricted area or fail to notice the signs of a patient in distress.

What's more, doctors and nurses were limited by their ability to only be in one place at a time. Their ability to observe or converse with patients was limited by how often they could be physically present in the room. For health care providers juggling potentially dozens of patients, this could lead to both overworked doctors and patients feeling slighted or overlooked.

Modern audio and video devices have changed that substantially. For starters, cameras are no longer limited to traditional surveillance cameras on the walls or ceilings. Yes, traditionally fixed ceiling cameras can still provide a valuable perspective into patient rooms, but today's options include wireless carts, mobile wall mounts and even IV pole-mounted cameras. This makes it easier than ever for patients to communicate with their health care providers, but it also makes it easier for those providers to observe their patients directly and get a better sense of what is going on.

Best of all, these solutions don't require personnel to be physically present — something that was particularly important at the height of the COVID-19 pandemic. This makes it significantly easier for doctors and nurses to check in on their patients from anywhere and at any time. Because they don't need to be physically present in a patient's room, they can interact with a greater number of patients with more regularity, improving not just their standard of care but patient morale as well.

Planning for installation

Before implementing a new solution or technology, planning for the installation

Technology helps boost security and care at Florida health system

Security has always been a high priority for Lee Health, which manages health care facilities across Florida. With more than 13,000 employees and 4,500 volunteers, the organization is one of the largest medical providers in the state. More than 1 million patients are treated at Lee Health facilities each year, and the organization aims to greet each of them with a secure and welcoming environment.

Keeping patients, staff and caregivers safe is an essential part of Lee Health's mission — and modern video analytics have helped make that mission easier than ever.

A few years ago, Lee Health began the process of modernizing its surveillance system, replacing older analog cameras with high-definition-quality internet protocol cameras throughout its facilities. The organization replaced or upgraded more than 1,100 cameras in just under two years, along with a wide range of new hardware and software solutions designed to not only improve safety conditions, but quality of care and compliance standards as well.

The ability to monitor interactions between patients and their caregivers has helped ensure that patients are being given an appropriate degree of attention and care, and new analytics have helped keep an eye on patients who may pose a danger to themselves or others. Rather than paying individuals to sit in the rooms of high-risk patients to keep an eye on them, facilities can now rely on technology to monitor those patients in real time.

Amid the COVID-19 pandemic, other benefits became clear — such as the ability to ensure that staff members properly adhere to health and safety standards, including the use of personal protective equipment. The upgrades also made it easier to monitor entrances, exits and other access points to prevent unauthorized ingress and egress.

From top to bottom, the installation of modern, analytics-enabled cameras has allowed Lee Health to provide peace of mind for patients and staff, improve quality of care and operational efficiency, and ease vulnerability concerns — clear wins for all involved. ■



Lee Memorial Hospital in Fort Myers, Fla.

process is critical. This means having good policies and guidelines in place, as well as understanding the limits of the technology. Good planning means understanding any limitations the information technology (IT) staff may have, how the technology will be used, and what immediate and long-term costs will be associated with it, among other factors. For health care in particular, both internal hospital and external building and installation permits may be required. Understanding those needs and accounting for them will be critical.

Well-trained staff members can go a long way. They need to be trained on the solution, informed of its capabilities and given clear guidelines on how to respond

to an alarm or event. It is important to effectively convey how to respond to alerts, what the technology is expected to accomplish and all procedures associated with its safe operation. It is also critical to establish appropriate expectations for what the technology can accomplish and ensure that users understand what it can and cannot do. Finally, maintaining the solution with preventive maintenance and licensing should also be planned, as this is a major consideration that can sometimes be overlooked.

Bridging the gap between security and IT is also an essential element of creating and maintaining a strong security strategy. In many health care facilities, the



A pan-tilt-zoom camera maintains watch on a campus exterior.

IT department often has a larger budget, better processes and greater mastery of the technological infrastructure. As a result, it makes sense for security to work directly with — and build upon — the established expertise in IT to create a more comprehensive plan. Ultimately, everyone involved in health care security has the same goal: to create a secure, smoothly operating hospital that provides optimal levels of patient care and safety. Partnering with IT is the best way to achieve this goal.

One final element to consider during the installation process is life cycle management. Cycling out old devices — or updating them with improved software — is an important part of staying up to date with modern surveillance technology and ensuring that the best possible solutions are still in place. Creating a structured and organized platform to easily visualize the age and status of each device within

the network is an essential part of building a security system that will last.

Real-time monitoring

While improving communication between patients and caregivers is important, today's IP camera technology really shines in a safety and security context. Thanks to modern analytics, cameras can now be programmed to automatically detect and alert on certain objects, movements, behaviors, sounds and other factors, eliminating the human error factor and turning cameras into a proactive solution rather than a reactive one. This automatic alerting also helps further address the staffing issue.

Monitoring high-risk patients is a perfect example of how the technology provides a measurable improvement over prior solutions. Patients deemed a risk to themselves or others require careful monitoring. This could sometimes be performed via camera feeds, but most hospitals found that a single individual could reliably monitor no more than three or four patients at a time. Some particularly high-risk patients even required one-on-one monitoring, with an individual present in the room with them always. This is not without reason: a significant portion of all slip, trip and fall cases result in injury. This is not only bad for patient outcomes, but each of those injuries can cost the health care facility significantly. Monitoring these patients is essential.

Modern analytics have made it possible to effectively monitor all patients in real time. Today's cameras can be programmed to detect when a patient attempts to leave their bed, exit the room or simply cross a predetermined line in the room. The system can then generate an instant alert, a provider can access the camera and observe the patient, and help can be dispatched immediately. Just by reducing slip, trip and fall cases, and reducing or eliminating the need for human monitors, health care facilities can save a significant amount of money. In effect, the technology can pay for itself.

This is just one example of how the technology can serve an impactful security purpose. Today's cameras can detect people loitering around hospital access points or heading toward restricted areas

and trigger automated messages warning them to keep clear. Acoustic analytics can be trained to detect certain noises, including gunshots, breaking glass, raised voices and signs of patient distress like coughing or gasping for air.

In a health care context, the ability to instantly detect these

danger signs and instantly alert the necessary personnel can be the difference between life and death. Today, technology can further identify certain physiological monitor alarms, alerting clinical staff to a patient in distress. By decreasing response times, these devices can alert security to a potentially dangerous situation or help doctors and nurses get patients the help they need before the situation can escalate into a genuine emergency.

Health care is consistently ranked among the most hazardous fields. Some of this is because those who work in health care are naturally more likely to contract illnesses, but there are physical dangers as well. Patients sometimes become violent. Some may simply be scared or confused, while others might be in chemically altered states. Sometimes injuries are caused by attempting to move or handle a patient without sufficient support. Whatever the ultimate cause, health care facilities have a clear interest

RESOURCE

Health facilities professionals can access the on-demand webinar "Security Design Guidelines for HCFs: 2020 Updates" by logging on to ashe.org/security-design-guidelines-hcfs-2020-updates.



Video systems make it easier for nurses to check on their patients from anywhere and at any time.

in identifying ways to cut back on potentially dangerous situations.

Body-worn devices are another part of the solution. CoxHealth, a major health care system in Missouri, recently invested in a body-worn camera system for its security personnel. By equipping public safety officers with cameras, CoxHealth hoped to improve its ability to de-escalate situations, as well as provide a more accurate picture of events as they happened and eliminate false claims of officer misconduct. In addition, the cameras have provided valuable footage to help educate security personnel on how to respond to workplace violence incidents in the future, allowing them to serve as a training tool as well.

Modern audio and video solutions can help. In addition to detecting signs of patient duress, today's analytics solutions can be trained to identify signs of aggressive behavior, such as raised voices or wild gesticulation. The system can then immediately alert security personnel, who can potentially arrive in time to de-escalate the situation. This is the very definition of proactive security, and it would not be possible without automatic incident detection and alerts. In some cases, facial or license plate recognition can also help by identifying potentially dangerous visitors before they can gain entry to the facility. This, too, can prevent a tense situation from arising.

Not all signs of danger are obvious, though. Health care facilities must also give their employees the resources they need to discreetly signal for help should the need arise. This might come in the form of a universal serial bus duress button, a network input box, a wireless input button, or a discreet or wall-mounted button.

These solutions can be tailored to not only signal for help but open a live audio or video channel to security personnel so that they can see and/or hear what is happening in real time. They can also be configured as silent alarms, allowing the caregiver to signal that they need assistance without risk of further escalating the situation. Body-worn devices are also part of the solution and can help provide an accurate picture of what is happening in a situation while holding both patients and hospital staff accountable for their actions.



Video and audio systems allow clinical staff to interact with patients from a distance.

One underappreciated aspect of modern video and audio solutions is the ability to streamline facilitywide communications — particularly regarding emergency announcements. Today's solutions can generate automated alerts to specific security personnel, caregivers and other employees, but they can be integrated with the public address (PA) system to issue broader alarms when necessary. During a fire, active shooter or other emergency, tailored automated messages can be played. These messages can be customized for different zones, providing specifically tailored instructions or information. When needed, security personnel or facility managers can break in with live updates for those in affected areas.

Integrating these solutions allows health care facilities to build a more comprehensive approach to safety and security. Facilities managers can use access control solutions

to allow firefighters into a restricted area. They can track the location of a suspected assailant across multiple camera systems and keep law enforcement updated on their location. They can even use more advanced capabilities, such as cellphone pinging, to obtain location data in an emergency and send specific alerts to individuals in harm's way. In any emergency, the ability to convey information quickly and effectively to those who need it is paramount, and today's integrated security solutions can do just that.

A comprehensive approach

The COVID-19 pandemic forced many health care facilities to modernize their operations and implement remote monitoring and communications solutions that will provide value long after the pandemic is over. Doctors and nurses can look in on their patients from anywhere with the touch of a button and communicate with them directly from any location. Better still, cameras and audio sensors can identify signs of distress in real time, issuing immediate alerts and lowering response times.

Workplace safety, emergency response and patient care are all critical concerns for health care facilities, and analytics solutions have given them the ability to detect potentially dangerous situations faster and more reliably than ever. From facial recognition and access control to PA announcements and aggressive behavior detection, today's cameras and sensors can be equipped with the functionality that health care facilities need to improve both the standard of care and facility security. Integrating these solutions with tailored security alerts can ensure that the right people have the right information at the right time. **HFM**

ABOUT THIS ARTICLE

This article is based on a presentation given at the International Association for Healthcare Security and Safety Annual Conference & Exhibition.



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Emergency electrical systems add flexibility

Manufacturers introduce custom options and sustainable packages

Manufacturers of generators and other electrical equipment such as automatic transfer switches (ATSs) and uninterruptible power supplies (UPSs) have upgraded their systems to improve health care operations in recent years.

For instance, the latest generators use less fuel, produce fewer emissions and lower noise levels, and have longer service intervals than older models. They also have more sophisticated control and monitoring systems that can detect and diagnose faults, communicate with building management systems and optimize performance.

Additionally, the diversification of configurations allows hospitals to customize their emergency power supply systems (EPSS) according to their needs and

preferences. "For example, some hospitals may opt for a single large generator that can power the entire facility, while others may prefer smaller generators that can be paralleled or isolated as needed," says Corey Honl, vice president of sales and application engineering at Generac Power Systems Inc., Waukesha, Wis.

The deployment of microgrids, which can offer reliable, cost-effective power, adds more options. Microgrids can be customized to integrate solar photovoltaic modules and other renewable energy sources, energy storage solutions and traditional power solutions (such as generator sets) using diesel and gaseous fuels, according to Chris Norris, energy systems engineer at Caterpillar Inc.'s Electric Power Division, Irving, Texas.

"The entire system can be managed at the site level by monitoring and control technologies that continuously oversee load levels and power source availability to deploy the best mix of resources at any given time," Norris says.

COMPLETE CONTROL // Customized power control systems with SCADA enable users to control reliable power, monitor system operation, and review set points and alarm history. **Russelectric**

In fact, hospitals have started incorporating renewable energy sources, such as solar panels and wind turbines, into their EPSS. These alternative energy sources can supplement the grid power supply and reduce reliance on traditional fossil fuel-based generators, leading to greater sustainability and cost savings.

Additionally, the use of energy storage systems, particularly batteries, has gained traction in EPSS for hospitals, according to Kunj Sheth, marketing director for mission critical at Cummins Power Systems in Columbus, Ind.

"Batteries can store excess energy during non-emergency periods and release it during power outages, providing a reliable backup solution. Lithium-ion batteries have become more popular due to their high energy density and long lifespan," Sheth says.

Advances in generators

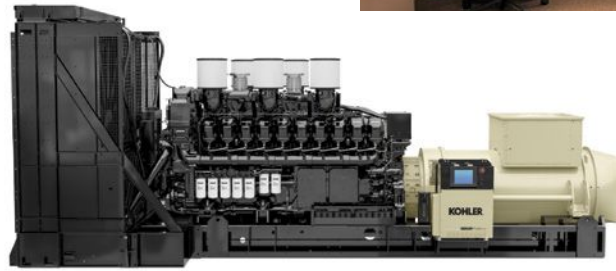
Caterpillar offers a wide range of fast-response, natural-gas generator sets from



PROTECTION PLUS // Double-conversion online UPS solutions protect against a wide range of power anomalies. **Vertiv**



SPINNING WHEELS // This flywheel works with major double-conversion UPS system OEMs. **Vycon Energy Inc.**



MORE POWER // The KD4000 diesel generator meets the need for larger load demands in hospitals, with a standby range of 4000/5000 kW/kVA. **Kohler Co.**



SOFTWARE SOLUTION // This distributed energy management software platform enables facilities to monetize their microgrids. **Caterpillar Inc.**

100 kilowatt (kW) to 2.5 megawatt that are Environmental Protection Agency (EPA)-certified and compliant with the National Fire Protection Association's NFPA 110, Standard for Emergency and Standby Power Systems, Level 1, Type 10, requirements. With a 10-second start and Class G3 transient performance capability, these generator sets are suitable for life safety loads, according to Norris.

Caterpillar recently added energy as a service (EaaS) solutions to its power portfolio. "EaaS solutions combine a leading technology platform with expert insights, managed services and cutting-edge technology to enhance the operational and economic opportunities of distributed generation and storage assets," Norris says. The technology automatically dispatches customers' on-site assets to generate and store energy at optimal times.

Future-fuel ready, Caterpillar engines operate on various renewable fuels. Hydrotreated vegetable oil (HVO) can serve as a drop-in replacement for diesel without sacrificing performance. Caterpillar also offers generator sets that can be configured to operate on natural gas blended with up to 25% hydrogen for continuous, prime and load management applications.

Rolls-Royce Solutions America, Novi, Mich., designs its mtu emergency power systems to serve a wide range of applications. Each solution is custom fitted to the needs of the specific application, whether it is stringent emissions standards (e.g., EPA Tier 4 and non-attainment zones) or performance certifications (e.g., International Building Code or hurricane ratings).

A wide range of its diesel generator set enclosures were recently certified to the highest standard for wind velocity, achieving the Miami-Dade County Notification of Acceptance, according to Rick Apple, senior manager for distribution sales and power generation in North America at Rolls-Royce Solutions.

Cummins Power Systems offers EPSS solutions ranging from 10 to 3,500 kW in diesel and gas variants that serve a wide range of requirements. The company recently introduced the first set of Centum Series generators. These new generator sets are engineered to meet hospitals' precise power needs with high-efficiency engines that fit in a smaller footprint.

"The Centum Series represents a significant shift in the Cummins approach to power system design, offering next-level flexibility, efficiency and sustainability,"

Sheth says. Centum Series generators are designed to help users meet sustainability and zero-emissions goals. "The Centum Series C1250D6E/C1500D6E generator sets are approved for use with paraffinic fuels, including HVO, which can reduce greenhouse gas emissions by 40% to 90% over the products' total life cycle," he adds.

Because hospitals want redundancy in capacity and have demands that exceed a single generator, they often use paralleling switchgear, says Nicole Dierksheide, director of category large engine power systems at Kohler Co., Kohler, Wis. "Kohler offers paralleling switchgear that meets hospital code requirements and adds flexibility for a choice of parallel controls (on the generator or in the switchgear) so the site can achieve the exact solution required."

Also, hospitals must run tests on generator equipment and record the data. "To that end, Kohler offers the APM603 generator controller, which provides control, system monitoring and system diagnostics for a single generator set or system paralleling multiple generator sets," Dierksheide says. Data can be logged from hundreds of data points — covering parameters such as voltage, frequency, percent load, oil pressure and

SAFE TESTING //

The enhanced bypass isolation ATS permits the ATS or automatic bypass switch to be drawn out and isolated within its compartment for routine testing.

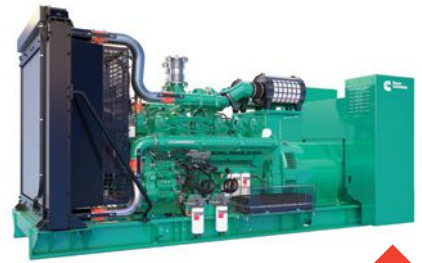
Eaton Corp.



KEEPING LIGHTS ON //

SBE series pairs with gas and diesel generators for full-facility resilience during long-duration blackouts and pairs with on-site solar to help reduce carbon footprint and energy costs.

Generac Power Systems Inc.



FITS IN WELL // Centum Series generators are engineered to meet hospitals' precise power needs with high-efficiency engines that fit in a small footprint.

Cummins Power Systems

ALL IN ONE // The mtu Kinetic PowerPack is a UPS system that combines the diesel engine and battery backup of a static UPS system into one package in which the immediate response is provided by kinetic energy.

Rolls-Royce Solutions America



DOUBLE DUTY //

The Series 300 MTDQ manual transfer switch with dual-purpose quick connects provides an economical way to connect a standby generator or load bank to a building's power distribution system.

ASCO Power Technologies



temperature. The data is automatically recorded from the controller to simplify and standardize collection.

ATS innovations

Generac Power Systems Inc. has introduced several additions to its line of TX Series ATSs. "With the addition of 600-, 800- and 1,000-ampere service and non-service entrance transfer switches, Generac's TX Series now provides solutions within an amperage of 600 and 1,200 and some of the highest withstand and closing ratings in the industry," Honl says. The switches are rated for full-load transfers in mission critical, emergency and optional power systems. Modular design and removable panels facilitate installation.

EPSS are critical to the safety of patients in a growing number of smaller, off-site medical facilities. Many of these facilities now require an emergency power supply, such as a generator with a bypass isolation transfer switch. These smaller facilities often have a single generator, which requires a means to connect temporary generators during outages for maintenance or service.

To help meet this need, ASCO Power Technologies, Scottsdale, Ariz., a subsidiary of Schneider Electric, recently expanded its 300 Series line of manual transfer

switches with integrated quick-connect panels. "If the facility's permanent generator is down for service or maintenance, these devices provide a safe and reliable means of switching to the temporary generator system," says Shannon Dynge, director of strategy and pricing.

Cummins Power Systems recently introduced the X-Series transfer switch and B Series bypass-isolation transfer switch products. "They have the highest UL-certified fault current ratings in the industry," says Tim Beaucage, product manager for switching technologies. Both products are equipped with a PC80 transfer switch control, which features a color LED backlit display, integral power quality monitoring, detailed diagnostics and built-in network communication.

Eaton Corp., Cleveland, offers a bypass-isolation ATS that allows routine testing, inspection and maintenance to be performed on equipment without disrupting facility operations. To improve worker safety, the ATS, automatic bypass switch and electrical control components are housed in separate steel compartments. The control compartment is equipped with a means to electrically isolate the space from the system and control

voltage prior to maintenance, thus mitigating shock hazards.

To optimize equipment uptime, Eaton's ATC-900 controller has been enhanced with two new features: ATS Health and Maintenance Watch. "ATS Health reports equipment condition to facility service personnel who can assess operational risk and plan for maintenance," says Charlie Hume, product manager. "Maintenance Watch issues automated notifications and task guidance to perform regular test, inspection and maintenance based on NFPA 110."

Within the past 15 years, Russelectric, Hingham, Mass., a Siemens Business, has designed and passed UL 1008 testing on a full line of 30-cycle transfer switches and bypass/isolation switches, according to John Stark, product line manager. "The development of the Russelectric (RTS-30) 30-cycle-rated family of transfer switches and bypass/isolation switches was in response to [NFPA 70®] National Electrical Code® changes calling for selective coordination in the health care space, or, legally required standby systems." The RTS-30 can seamlessly communicate ATS status with building management systems. They also can be web-enabled.

MORE ONLINE

Learn more about these products at www.HFMmagazine.com/marketplace

UPS introductions

Generac Power Systems has introduced a zero-emissions SBE Series of stationary battery energy-storage systems. It pairs with Generac's line of gas and diesel generators for full-facility resilience during long-duration blackouts. It also pairs with on-site solar to help reduce carbon footprint and energy costs. The storage systems are available in energy capacities ranging from 200 to 1,000 kW-hours and can help reduce peak charges.

Vertiv, Westerville, Ohio, has introduced the Liebert GXT5 Lithium-Ion UPSs. These rack/tower convertible UPS models protect against a wide range of power anomalies. They also include an integrated maintenance bypass, and allow for battery scaling with up to eight external battery cabinets. The 500-3,000 volt-ampere models include an internal battery. The company also has unveiled the Liebert ITA2, 8-10 kilovolt-ampere UPS system, which offers efficiency up to 96.5% in double conversion mode over a wide range of load conditions.

"The introduction of lithium-ion batteries as the backup power source for these UPS systems offers improvements in several areas," says Gary Dennis, regional sales director and health care lead for Vertiv in North America. "Lithium batteries have higher power densities but lighter weights, allowing hospitals to either pack more power in the same footprint or reduce the footprint even further."

Vycon Energy Inc., Chino, Calif., manufactures a direct current flywheel that works with all major double-conversion UPS system original equipment manufacturers to provide a safe, reliable and green alternative to chemical batteries, according to Carl Cullop, director of sales. "It can eliminate a potential fire risk and containment in critical applications. Flywheels also provide for a lower total cost of ownership and fewer maintenance requirements."

Advances ahead?

Apple predicts that more precise controls and the use of alternative fuels in

hospitals will continue to advance. "Both will play a more critical role as net zero technologies and zero-emission solutions are implemented into these applications," he says. "Rolls-Royce has developed its next generation control system, mtu EnergetIQ, which controls assets and can be optimized for a number of factors."

Dierksheide sees a continued shift to cleaner and more efficient emergency power sources.

"Kohler is working on a hydrogen fuel cell application for a hospital that can be used as a prime or backup power source or as part of a distributed energy network that can export power to the grid," she says. "Fuel cells that use green hydrogen produce no emissions at the point of use, so such systems can ultimately provide a pathway to net zero." **HFM**



Neal Lorenzi is a freelance writer and regular *Health Facilities Management* contributor based in Mundelein, Ill.

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Tips on enterprise asset management

A look at EAM, SAM and their benefits to health care organizations

The world of technology and data is an alphabet soup of acronyms and definitions. Among the potentially most useful of these for health facilities professionals is the concept of enterprise asset management (EAM) and the importance of strategic asset management (SAM) within the EAM system.

EAM is the systematic and strategic management of an organization's assets throughout their entire life cycles, including planning, design, acquisition, installation, maintenance and disposal. Assets include equipment, machinery, vehicles, buildings, software, patents and intellectual property. EAM is a critical aspect of modern business operations, as it enables organizations to optimize asset performance, reduce costs and improve overall operational efficiency.

EAM activities

EAM encompasses various activities, including asset tracking, maintenance planning and scheduling, inventory management, condition monitoring and performance analysis. It also involves integrating asset management practices with other business processes such as finance, procurement and operations. The ecosystem of an EAM can be expansive, yet the data and analysis from one's current systems become powerful. Some of these systems are:

- **Enterprise resource planning (ERP).** ERP is a software solution that helps organizations manage their business processes, including finance, human resources and procurement.
- **Geographic information system (GIS).** GIS is a software system that helps organizations manage geographic information and spatial data.
- **Energy management system (EMS).** This is a software system that helps



By integrating data analytics and business intelligence systems into an EAM system, organizations can improve their decision-making processes.

organizations manage energy consumption and reduce energy costs. By integrating an EMS into an EAM system, organizations can optimize their energy usage, reduce energy costs and improve sustainability.

- **Data analytics and business intelligence systems.** Data analytics and business intelligence systems are software solutions that help organizations analyze and interpret data to make informed decisions. By integrating data analytics and business intelligence systems into an EAM system, organizations can improve their decision-making processes, optimize asset management strategies and reduce costs.

- **Internet of Things (IoT).** IoT systems are connected devices that can communicate with each other and transmit data. By integrating IoT systems into an EAM system, organizations can improve their asset monitoring, optimize their maintenance operations and reduce asset downtime.

- **Computerized maintenance management system (CMMS).** This is a software system that helps organizations plan, schedule and track maintenance activities. The foundation of any EAM system is the assets. Often referred to as a "work order management" system, a modern CMMS can utilize machine learning, artificial intelligence and IoT as well as other technologies to provide advanced data, key performance indicators (KPIs) and analytics.

Key to this data is understanding work order types and workflows. The first delineation of work orders is between preventive maintenance (PM) and corrective maintenance (CM).

PM falls into four separate subsets. They include time-based maintenance, which is calendar-driven; run-based maintenance, which is based on how long the equipment has been utilized; condition-based maintenance, which is

often predictive or health-related; and operator-based maintenance, which is generally performed by an operator as part of their responsibilities.

CM falls into three types. They include CM routine, which is planned and scheduled work resulting from PM; CM repair, which is generally a planned and scheduled repair on or investment in an asset; and CM reactive, which is unplanned and unscheduled work resulting from a failure. Identifying these work orders and workflows will better utilize the EAM, SAM and CMMS capabilities.

• **Asset performance management (APM).** APM is a software system that helps organizations manage their assets throughout their life cycles. It is a key component of a reliability-centered maintenance (RCM) program. APM, whether in the form of remote ultrasonic and temperature devices, or data from building automation, fire alarm, security or video systems, allows one to create RCM maintenance strategies to reduce failures and unplanned events. The American Society for Health Care Engineering (ASHE) has created a reference on RCM, which can be accessed through the “ASHE Resource” box on page 50.

The outcome can be increased asset useful life, decreased deferred maintenance, reduced costs from planned versus reactive maintenance, and decreased project costs due to planning instead of addressing an emergency. Additional thought should be given to utilizing APM in commissioning, at least through the warranty period, to validate the performance of newly installed assets. The construction process offers further APM opportunities through integration from the project management; sustainability; environmental, social and governance; and financial systems to integrate with EAM and SAM tools.

By implementing effective EAM practices, organizations can ensure that their assets are available when needed, operating efficiently and delivering the expected results. EAM also helps organizations comply with regulatory requirements, manage risks associated with assets, and make informed decisions regarding asset investments, maintenance strategies and replacement schedules.

The role of SAM

SAM is another key component of EAM. It involves aligning asset management

The role of RCM in an EAM system

Reliability-centered maintenance (RCM) plays a crucial role in enterprise asset management (EAM) by providing a systematic approach for analyzing and optimizing maintenance strategies. RCM enhances EAM systems through:

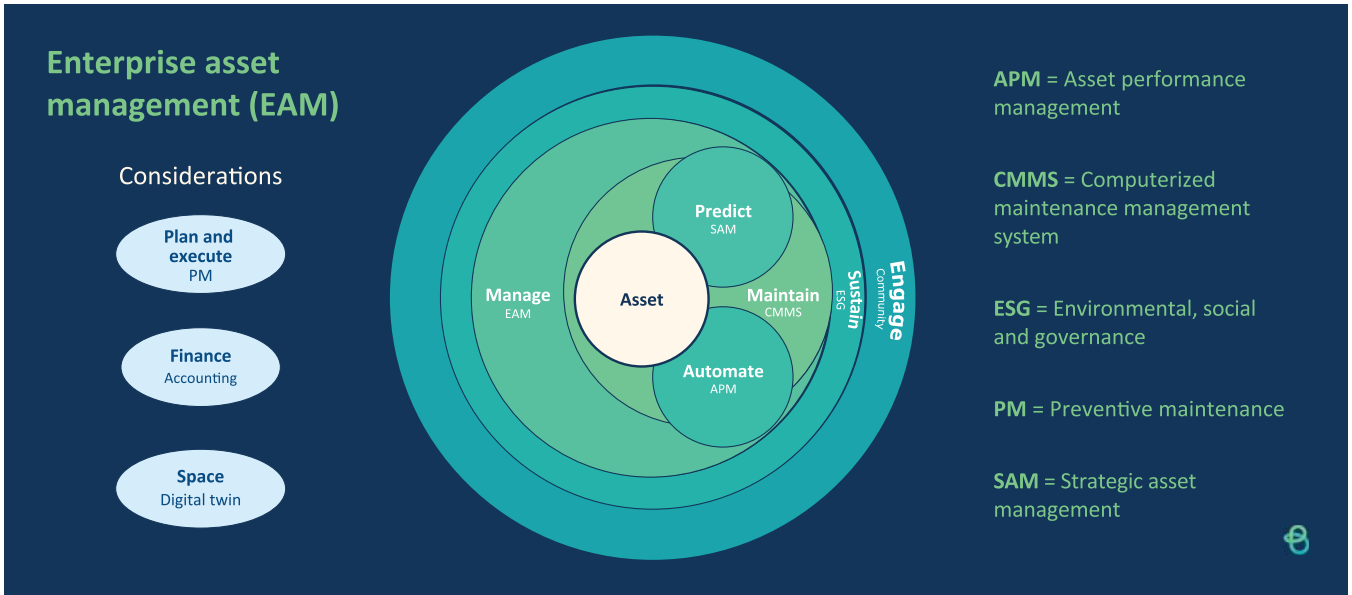
- **Asset identification and prioritization.** RCM can help identify and prioritize assets based on their criticality and impact on the organization's operations. By analyzing the reliability of assets and their failure modes, RCM can determine which assets require more attention and resources in terms of maintenance efforts and which assets can be managed with less intensive maintenance activities.
- **Maintenance strategy development.** RCM helps identify the most appropriate maintenance tasks, frequencies and methods based on the asset's reliability characteristics and the organization's operational requirements. These maintenance strategies can then be integrated into the overall EAM system to ensure consistent and optimized asset management practices.
- **Maintenance optimization.** RCM can help optimize maintenance activities by eliminating unnecessary maintenance tasks and focusing on the most critical ones. This can result in improved asset performance, reduced downtime and lower maintenance costs. RCM can also aid in developing condition-based maintenance strategies, where maintenance activities are triggered based on the asset's actual condition as opposed to a fixed schedule, leading to more efficient and effective maintenance practices.
- **Root-cause analysis.** By analyzing failure modes and their underlying causes, RCM can help identify and address the root causes rather than just treating the symptoms. This can lead to more sustainable and long-term solutions, reducing the recurrence of failures and improving overall asset reliability.
- **Data-driven decision-making.** RCM relies on a data-driven approach that can be integrated into an EAM system to provide a solid foundation for decision-making. By leveraging data on asset performance, maintenance history and reliability analysis, organizations can make informed decisions on asset management strategies, resource allocation and capital planning, leading to more effective asset management practices.
- **Continuous improvement.** By regularly reviewing and updating maintenance strategies based on new data and feedback, organizations can continuously optimize their asset management practices, improving asset performance, increasing reliability and reducing costs. This aligns with the principles of continuous improvement and optimization that are central to EAM. ■

practices with an organization's strategic objectives. SAM goes beyond day-to-day asset maintenance and operations and focuses on the long-term planning and optimization of an organization's asset portfolio. SAM requires organizations to understand their entire asset portfolio comprehensively. This involves conducting a thorough inventory of all assets; collecting data on their performance, condition and costs; and then analyzing the data to gain insights into asset utilization, efficiency and effectiveness. Organizations must identify critical assets, assess their value and risks, and prioritize maintenance and replacement based on strategic objectives.

Some key strategies include APM, asset life cycle management and asset risk management. Asset life cycle

management involves managing assets throughout their entire life cycles, from acquisition to disposal. This includes defining asset acquisition policies, developing asset standards and specifications, evaluating and selecting vendors, negotiating contracts, managing warranties, and overseeing asset installation and commissioning. It also involves managing asset operations, maintenance and repairs; optimizing asset utilization; and planning for asset replacements or disposals based on business needs and strategic objectives.

APM requires organizations to monitor and analyze asset performance to identify opportunities for improvement. This involves collecting and analyzing data on asset performance metrics such as availability, reliability, maintainability and



Considerations and components of an EAM system.

safety. Organizations can use advanced analytics techniques, such as predictive maintenance and condition-based monitoring, to identify asset performance trends, patterns and anomalies, and take proactive actions to optimize asset performance and reduce downtime. APM also involves setting performance targets, measuring performance against targets and continuously improving asset performance through data-driven decision-making.

Asset risk management involves identifying and managing risks associated with assets. This includes assessing risks associated with asset failures, safety hazards, environmental impacts, regulatory compliance and financial risks. Organizations must develop risk mitigation strategies, such as implementing PM programs.

SAM is a continuous process that requires ongoing organizational commitment. By implementing SAM, organizations can improve the value of their assets and achieve their strategic goals and objectives. SAM requires a cross-functional team of experts. The team should include finance, operations, maintenance, engineering and information technology representatives.

Several steps go into implementing SAM in any organization. The first step in SAM is to identify the organization's

strategic goals and objectives. Once the goals and objectives are known, the team can identify the assets needed to achieve those goals. The next step is to assess the current condition of the organization's assets. This assessment should include an evaluation of the asset's condition, expected useful life and replacement cost.

This is best accomplished through a well-scoped and defined facility condition assessment (FCA). Selecting the correct partner in conducting a FCA will be important to the success of the participation of the facility team's subject matter experts and the information provided to the FCA teams.

Once the current condition of the assets is known, the team can begin to develop a plan for managing the assets. The plan should include a schedule for PM, a budget for repairs and replacements, and a process for disposing of obsolete assets. The final step is to implement the plan and monitor its progress. The team should regularly review the plan and adjust as needed.

SAM aims to optimize the value of an organization's assets by ensuring they align with its strategic goals and objectives. SAM can help organizations reduce costs, improve efficiency, provide for short- and long-term planning strategies,

and increase profitability through data-driven capital planning.

Capital planning provides organizations with a framework for evaluating the effectiveness of their asset management strategies and making informed decisions about future investments and asset management priorities. SAM plays a critical role in capital planning by providing a structured approach for allocating financial resources to acquire, maintain and upgrade assets in alignment with an organization's strategic objectives. It helps organizations to make informed investment decisions, mitigate risks, ensure financial sustainability and monitor performance to optimize the value and performance of their assets throughout their life cycles.

When implementing a SAM plan, some key considerations include asset acquisition, which involves strategically allocating funds to acquire assets necessary to support the organization's operations, growth and strategic objectives; asset maintenance and upgrades, which includes allocating funds for the ongoing maintenance, repair and upgrades of assets to ensure optimal performance and extend their useful lives; and risk management, which mitigates risks associated with assets. This includes identifying risks such as equipment failure, technological obsolescence, regulatory compliance and financial risks, and allocating funds for risk mitigation such as insurance, warranties or contingency reserves.

ASHE RESOURCE

i Health facilities professionals can purchase the American Society for Health Care Engineering's *ASHE Reliability-Centered Maintenance Guide* by logging on to ashe.org/rcm.

When considering an EAM or SAM, facilities professionals should consider whether they are ready for such a commitment organizationally. Practical steps to prepare an organization for an EAM or SAM deployment begin by evaluating the CMMS. The data and workflows required for an EAM or SAM should be verified and documented. As described earlier, preventive, planned and corrective work orders should have an implemented and documented workflow. All assets should be captured in the CMMS. The data should be complete for each asset, including installation dates, units of measurement and related quantities. Each asset should have a bar code, and asset data types, locations and buildings should be standardized for the organization. Each asset should be assigned a risk and condition score, and asset cost and replacement cost should be determined.

Once this information has been collected, an organization can use the data to determine and assign maintenance strategies. These strategies can range from "age in place" to any form of RCM and

compliance-driven strategies. An organization will now have the fundamental data, workflows and processes to begin the deployment of either an EAM or SAM system. Because the work was done upfront, the organization can utilize the power of these KPIs, analytics and reporting functions to make solid business decisions with the highest confidence

level. The organization's leadership will appreciate data-driven, risk-based forecasts aligned with the organization's strategies. As an unintentional consequence of this work performed, the existing CMMS and related systems will also begin to function and be utilized as designed. KPIs and reporting can now be accomplished.

A major role

There is little doubt that technology will play a major role in the maintenance and operations of future buildings. With the prospect of losing key institutional and skilled knowledge through attrition or the deficit of qualified, skilled tradespersons, there is much value in a connected world.

ABOUT THIS ARTICLE

This is one of a series of articles contributed by the American Society for Health Care Engineering's Member Tools Task Force.

The health care organization's leadership teams will be looking to have this information and insight to make the most informed and educated decisions based on data. Having data to justify staffing levels, specify equipment types, automate labor-intensive processes, increase employee and patient safety, and increase patient satisfaction are mutual benefits for any organization.

ASHE has numerous resources available through previous articles, published literature, a community of subject matter experts, conferences, consultants and vendors. Many health care organizations are sharing their success stories with accompanying resources.

Facilities professionals should identify the resources they need and reach out. ASHE members are there to support, advance and equip their peers and the entire field. **HFM**



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DATA

2023 Hospital Construction Survey

Complete survey results can be found online at [HFMMagazine.com](https://www.hfmmagazine.com).

26%

of survey respondents reported that their projects are over budget and behind schedule — a 20% increase over the previous year and the highest in more than a decade.



Source: American Society for Health Care Engineering/*Health Facilities Management* 2023 Hospital Construction Survey

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