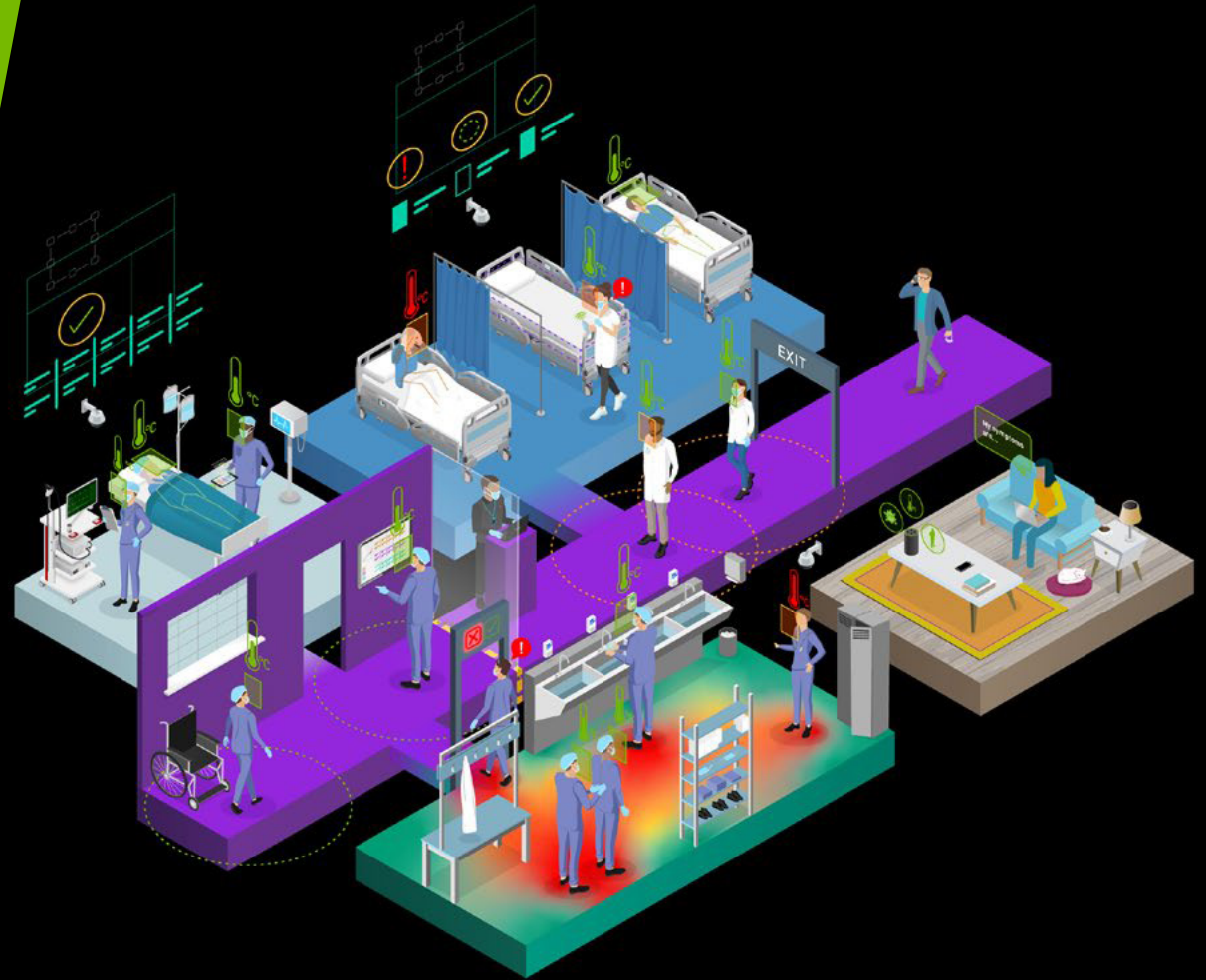




XENON[®]
High Performance Computing

SMART HOSPITALS: OPTIMIZING INFRASTRUCTURE FOR THE HOSPITALS OF TOMORROW



OPTIMIZING IMAGING WORKFLOWS

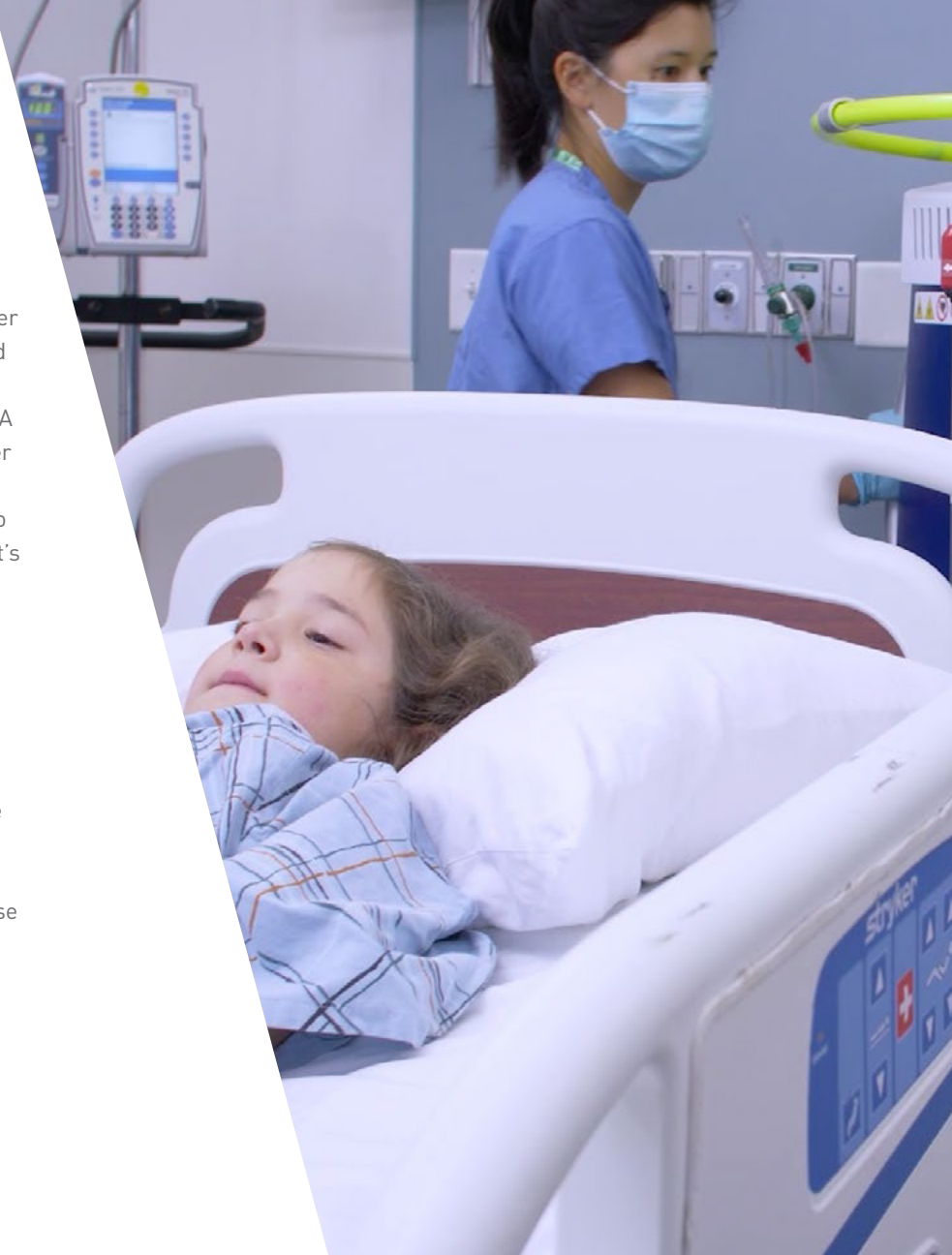
Radiology acquisition systems like magnetic resonance imaging (MRI) scanners are complex but vital tools used to help caregivers diagnose a variety of medical issues. Technologies like Hyperfine's Swoop portable MRI solution powered by NVIDIA GPUs (pictured right) reduces complicated scheduling coordination and patient backlogs for MRIs in time-sensitive situations.

Medical imaging AI tools can also help detect, classify, measure, and flag anomalies in complex studies, enabling clinical teams to make better patient-related decisions. AI models, powered by NVIDIA GPUs, are also used to reduce the radiation dose in X-rays, enhance image quality, guide surgeon instruments during surgery, and optimize overall patient experiences.

For example, researchers at NVIDIA and Massachusetts General Brigham Hospital recently developed an AI model, in collaboration with 20 hospitals from around

the world, using federated learning for chest X-rays. The model determines whether a patient with COVID-19 symptoms will need supplemental oxygen hours or even days after an initial exam. And, Qure.ai, an NVIDIA Inception partner, designed AI tools to better detect signs of disease from lung scans. Their tool has been used during COVID-19 to quantify the impact of COVID-19 on a patient's lungs, making it easier for clinicians to triage cases.

AI and GPUs have also been critical in the digital pathology space, serving to optimize workflows and aid clinical teams in identifying anomalies more accurately. Through digitalization, the process of whole slide imaging is more streamlined, eliminating the need for physical slide sharing. AI models can be trained from these images, resulting in faster measurements and quicker anomaly identification.



NEW USE CASES FOR SMART HOSPITAL TECHNOLOGY

Healthcare spending is increasing rapidly due to a rise in chronic diseases and growth in the elderly population. AI-powered solutions can help clinicians gain better visibility and provide the insights needed for timely intervention and reduced costs. That's why smart hospitals everywhere are deploying a multitude of innovative technologies designed to provide patients with a higher standard of healthcare.

High performance computing (HPC) and AI help improve operational and clinical efficiency, as well as to increase reimbursement rates—saving hospitals time and money. Plus, use cases in timely intervention, patient-monitoring, more innovative operating rooms, and video analytics are strengthening the value of smart sensors with multimodal AI in hospitals.

Patient Monitoring and Assistance

Smart hospitals are using AI-capable, computer vision-based systems to monitor patients, mitigate risks, and augment the value of nursing care. The technology enables continuous monitoring of a

patient's vital signs and activity, detecting activity with real-time alerts and preventing falls. For example, Artisight's smart telemonitoring solutions powered by NVIDIA Clara™ Guardian can monitor multiple patients simultaneously with computer vision-enabled object detection to reduce patient falls.

Virtual patient assistant solutions leverage conversational AI to answer important questions for patients or alert a staff member to help accommodate needs that arise. Patients can get up-to-date information about a procedure without any assistance from hospital staff or guidance on dietary restrictions or medications that can be taken from their hospital bed.

Optimizing Clinical Workflows

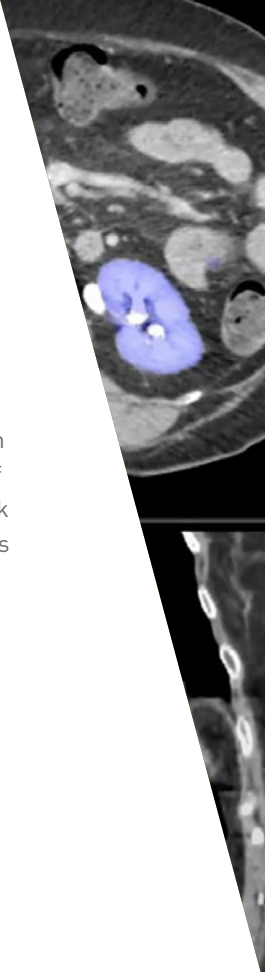
Nearly 30¹ percent of spending in a hospital environment is identified as waste caused by complex administrative and operational workflow inefficiencies. Processes and systems in a smart hospital are implemented to simplify workflows, cut waste, decrease medical errors, remove manual processes, and improve patient

experiences—thereby improving a hospital's financial health and delivering more affordable care to patients.

AI-powered service robots help streamline tasks, such as keeping track of inventory and making sure supplies and medications are available when needed. These service robots can also keep staff safe by transporting supplies where there is a risk of pathogen exposure or to disinfect hospital rooms between patients.

Intelligent sensors and video streaming, like that used by Artisight's video analytics solution, are powered by NVIDIA Clara Guardian, which enables OR optimization in multiple dimensions, including time, instrument utilization, staffing, and documentation. More importantly, these sensors allow clinicians to focus on safe and efficient OR procedures.

¹ <https://www.healthleadersmedia.com/clinical-care/wasteful-spending-us-healthcare-estimated-760-billion-935-billion>



SMART HOSPITAL SECURITY: STAYING SAFE AND THRIVING IN THE DIGITAL WORLD

Ransomware attacks are increasing and hospitals are a prime target. A recent analysis reported that ransomware attacks cost healthcare organizations nearly \$21B in 2020². Given the numerous smart hospital applications in use today, along with countless more in development, the need for robust security is essential. Using NVIDIA-Certified Systems, smart hospitals can confidently deploy scalable hardware and software solutions that securely run accelerated workloads.

A smart hospital faces many serious security threats, only one of which is private patient data. Medical records can be locked, making it impossible for doctors and nurses to effectively treat patients. A hospital can literally be held hostage until ransom demands are met. Medical device tampering is another critical threat, resulting in a device being reprogrammed or deactivated. As part of a comprehensive smart hospital strategy, security practices need to be cohesive and resilient. For example, anti-malware solutions and security applications must include intrusion detection and prevention. More advanced silicon chips like data processing units (DPUs) play a key role in encryption and behavior-based packet inspection.

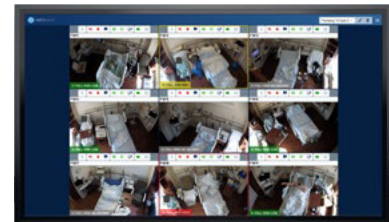
² <https://www.hcinnovationgroup.com/cybersecurity/data-breaches/news/21214314/report-ransomware-attacks-cost-healthcare-organizations-21b-in-2020>



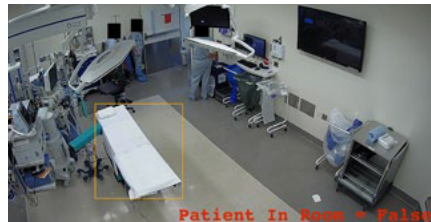
Safety and Security

Video surveillance has evolved to support behavioral tracking methodologies that monitor activities like distance control, PPE adherence, and queue lengths in ERs. A growing list of intelligent searches, such as facial recognition, license plate identification, and types of clothing worn are all factors used in more focused video initiatives. This use of video has evolved due to technology advancements in central monitoring, higher pixel adoption, and on-board GPU capabilities.

Contactless methodology in medicine enabled via video analytics is also an appreciative strategy during pandemics and beyond. Using intelligent computer vision, the application can identify people (even while wearing masks) to control contactless access of physical spaces and digital services. For example, Darvis, makers of complete digitization solutions for hospitals, uses AI and computer vision powered by NVIDIA Clara Guardian to ensure PPE compliance, clean beds, and other protective measures for patient safety.



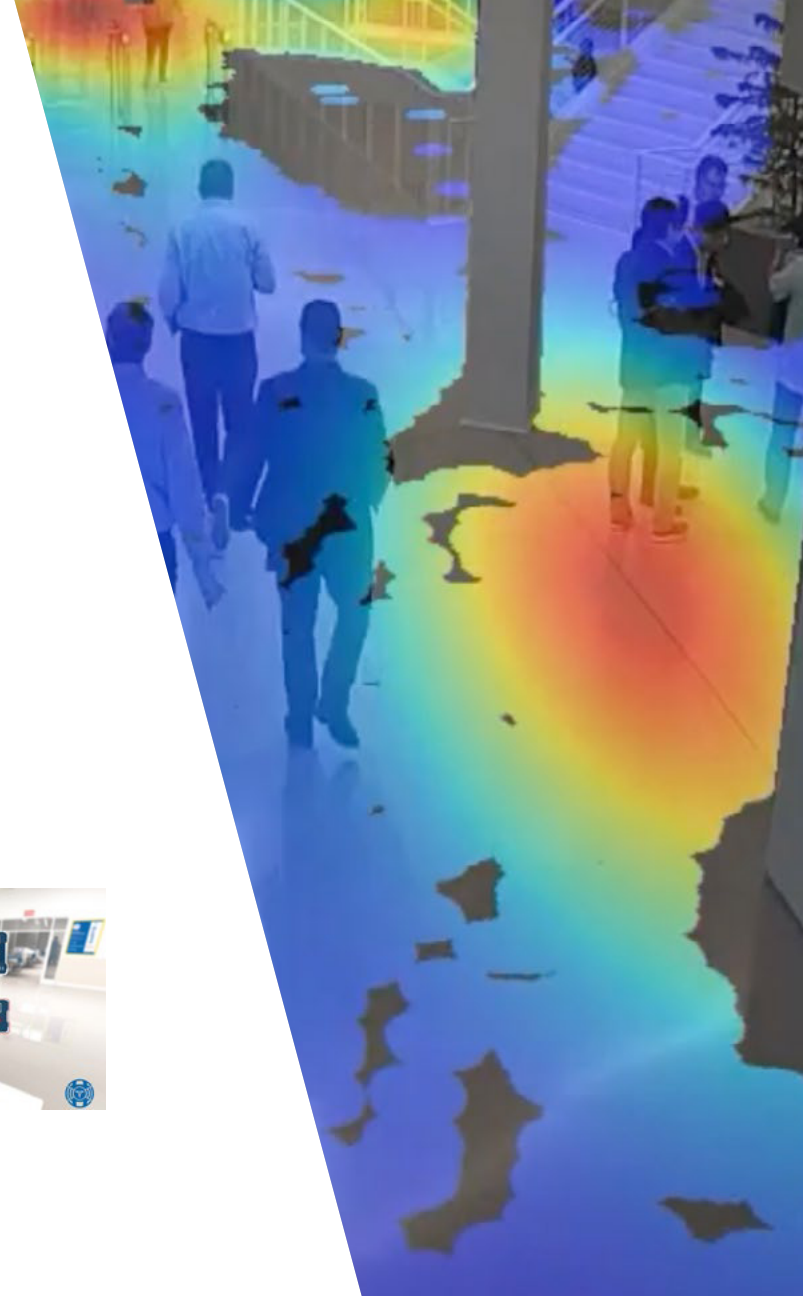
Patient Monitoring and Assistance



Optimizing Clinical Workflows



Safety and Security

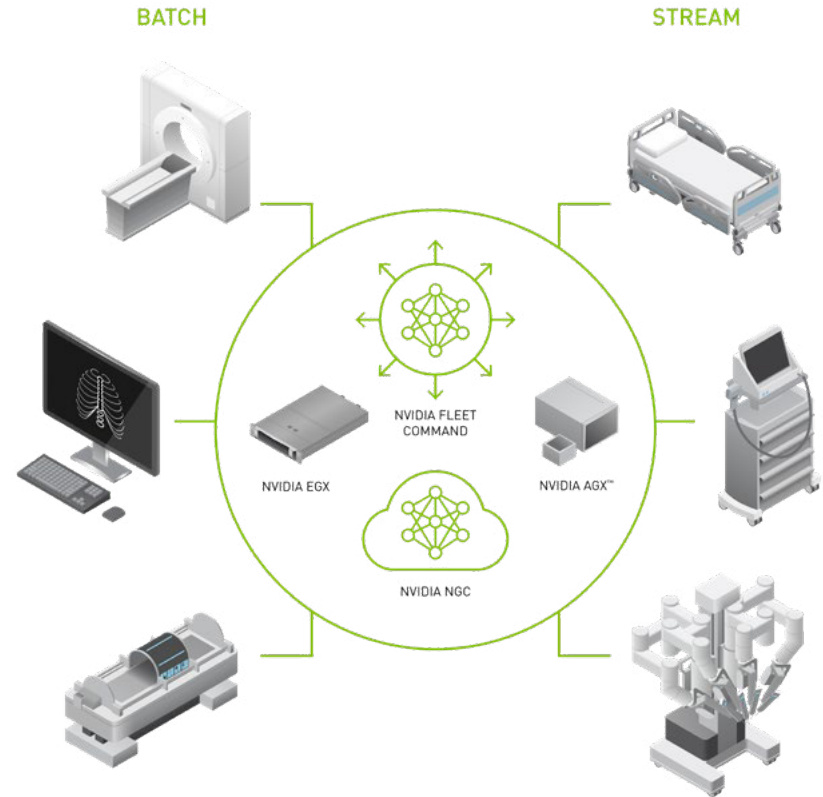


VITAL COMPONENTS OF A SMART HOSPITAL: POWERFUL INFRASTRUCTURE, RESEARCH, AND AI

Smart hospitals produce massive amounts of data. With so much data collected at the edge from IoMT devices, processing it in a data center or the cloud requires powerful compute engines to ensure AI algorithms can be used for real-time initiatives. However, infrastructure that can deliver AI-powered insights, like the **NVIDIA AI-Ready Enterprise Platform for Healthcare**, makes it simple to scale edge deployment of AI applications for smart hospitals.

With the right infrastructure, a smart hospital can also leverage cloud computing so that staff can access core applications and researchers can focus on solutions, gathering insights, and delivering value. Additionally, GPU-accelerated solutions are available through all top cloud platforms, providing the power needed for advanced medical imaging, automated customer service, and next-generation AI solutions.

Lastly, implementing a smart hospital strategy is a vital investment that can elevate a hospital's brand. Hospitals must have the ability to not only differentiate themselves, but to protect their reputation, preserve and increase market share, and tout their leadership in quality-based healthcare. Implementing a smart hospital strategy can achieve all of these goals.



CREATE A SMART HOSPITAL STRATEGY TODAY

Now is the time to embrace a smart hospital strategy. Forward-thinking hospitals around the world are optimizing processes, systems, and infrastructure to increase efficiency, improve patient care, save money, and reduce risk. A strategic approach to gain visibility into all things that generate data and surface actionable insights is the first step for growth, simplification, and transparency. Additionally, implementing a smart hospital strategy can fine-tune operational and clinical models, resulting in better quality care at a lower cost.

Ready to Get Started?

To learn more about NVIDIA solutions for smart hospitals.:

<https://xenon.com.au/category/case-studies/health-life-science/>

<https://www.nvidia.com/en-us/industries/healthcare-life-sciences/smart-hospitals/>

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