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White paper

Mastering High-Level Disinfection

Opportunities for Infection Prevention at the Intelligent Edge

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EXECUTIVE SUMMARY

The Internet of Things (IoT) has quickly redefined the world around us—a system of networks where billions of intelligent, connected devices can communicate and share massive volumes of data. What does it mean to the healthcare industry?

It means virtually every aspect of the continuum of care has undergone an incredible digital transformation—from the reporting of illnesses to diagnosis and treatment, patient monitoring, disease state management, and infection prevention.

IoT in healthcare is no longer a question of "if" it will manifest, but rather how it will evolve. In fact, the concept of IoT has lent itself to a specific breed of clinical capabilities and cyber resiliency coined, Internet of Medical Things (IoMT).

And it means healthcare enterprises are presented new opportunities which regularly beg the question: do we view digital transformation as a threat and try to protect business-as-usual or see it as an opportunity to create new competitive advantages while advancing safeguards in patient care.

This paper describes just a few of the opportunities that intelligent devices focused on infection prevention present to innovation-driven, and patient-centric healthcare providers.

It also examines the foundation for delivering a new breed of services that are cost-effective, secure, safe, and compliant; and it describes the role Nanosonics, Inc. can play in transforming the continuum of care for patients, increasing efficiency for clinicians, assuring compliance, and maximizing existing investments across the digital ecosystem.

NEW TRENDS REQUIRE A NEW STRATEGY

Healthcare executives and clinical leaders contemplate many difficult strategic issues every day–and historically a "connected strategy" has not been a common consideration.

Since the adoption of paperless records through the 'Meaningful Use' program, developing and maintaining a connected strategy has become a primary consideration in purchasing for not only workflow efficiencies, but also for maximizing return-on-investments already made within the digital ecosystem.

Augmenting the capabilities of point-of-care instruments through connectivity creates new avenues to orchestrate the flow of data to the right people at the right time. The proliferation of data can help resolve many of the most pressing challenges that the healthcare industry faces. Here is a brief recap of recent trends that are making connectivity a higher priority:

- **Healthcare costs continue to rise at an incredible rate,** while the average lifespan continues to increase. The cost of medical equipment is also rising; physician salaries and staff costs are increasing; facilities expenditures are growing.

  The practical approach to significantly cut healthcare costs is to increase efficiency and productivity, and the best way to do that is to harness device intelligence and connectivity to streamline and automate tasks, reducing the need for high-cost, time-consuming manual processes, while effectively lowering risks contributed by human error.

- **The era of the traveling clinician is upon us.** The average 2-year turnover rate of sonographers in the US is nearly 50%. Of the nearly 89,500 sonographers in the US, less than 10% of sonographers identify as "traveling"–which is expected to grow.[1] The relatively high general FTE turnover rate in either case speaks to larger hurdles concerning on-going compliance and training.

  Infection preventionists often manage multiple sites spanning a healthcare system–overseeing adherence to best practices, creation of training SOPs, documenting compliance requirements. The logistical burden of managing analog and antiquated paper-based record-keeping across these sites contributes to on-going inefficiencies and unaddressed vectors for risk.

- **The Internet of Medical Things (IoMT) is building out quickly,** increasing the opportunities for creating innovative new healthcare services and integrating novel workflow efficiencies. An estimated 1.7 billion medical devices were connected globally to close out 2024. That number is expected to double by the end of 2028.[2] The combination of these two facts represents an enormous opportunity for the healthcare industry.

  Throughout the last several decades, the maturation of data exchange standards and innovations in embedded technologies have lent themselves to transformative workflow efficiencies proven to add additional risk reduction safeguards for patients while reducing times leading to effective clinical outcomes.

- **The next generation of clinicians and technologists are reliant on digital solutions** and expect innovative point-of-care solutions. Common tasks, major to minor, have undergone significant digital transformation–from medical records to patient telemetry to wireless diagnostic tools.

  The next generation of care providers are seeking opportunities to work in facilities offering innovative, leading-edge solutions.

The future of healthcare will draw more and more heavily on the connectivity of devices. The key to success is to examine the opportunities from a business perspective, not just a technical perspective, and to create a realistic connectivity strategy.

A CLOSER LOOK: HOW CAN CONNECTED DEVICES DRIVE BETTER HEALTHCARE?

The previous sections outlined the overall opportunity connected devices present to the healthcare industry; now let's examine just a few examples:

Device connectivity adds a level of data quality confidence to clinical activities at the point of care. Leveraging existing investment in facility-wide EMR, RIS, and PACS infrastructure, connected devices that communicate via common healthcare data protocols to provide a new level of data accuracy. Devices capable of querying worklist interfaces ensure care activities are associated with the correct procedure, while associating critical modality, probe, and disinfection data to patient-level encounters.

Complimentary to data accuracy, connected devices add a new dimension to completeness of information within the continuum of care. Again, looking back to existing investments in various information systems, connected devices must be designed to help wring out additional, and perhaps unrealized value from these investments by directing the right data, to the right people, at the right time.

As such, device manufacturers must account for ease of integration into existing systems and workflows while providing broader integration options to satisfy the digital transformation goals in the healthcare domain. In this regard, where a simple vendor-managed turn-key solution may offer tremendous value for smaller organizations, more scaled organizations seek fleet-level integration capabilities to deliver a richer dataset directly to existing information systems.

As we continue to observe, the healthcare landscape has been challenged by the continued consolidation of single-site practices into multi-site, multi-state systems. Spanning all specialties the consistency and timeliness of data has been impacted–regardless of the mode of record keeping. Particularly in infection prevention where standardization of compliance information across multiple sites and potentially multiple regions has been increasingly challenging for infection preventionists, who answer the demands of an increasing scope of responsibility.

Having once focused on surveillance of hospital-acquired infections and prevention strategies, they have come to rely on readily available data to drive decision-making in areas such as quality improvement initiatives, training, and compliance.

AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE

A study from 1988 showed that for every 3 cents that the U.S. spent on prevention, it spent 97 cents for curative treatment–that's only three percent of every dollar spent. As more recent figures are not available, the general feeling in the healthcare industry is that even less is spent on prevention today.

All things considered, if that 3 percent was tied solely to infection prevention where would a connected device strategy wring out more value, efficiency, and safety? The strain of the COVID-19 pandemic challenged the capacity of infection prevention in hospitals, noting a 500% increase in calls to infection prevention.

Exponential growth in workloads, increased reporting requirements, and feelings of diminished self-efficacy quickly led to a 25% vacancy rate in IP departments that are already looking ahead to solve for a 40% retirement rate over the next decade.

When looking under the lens of an infection preventionist's workflow and anticipating the efficiency needs of the healthcare organization, the opportunity for connected devices to digitally transform existing workflows are substantial:

- Alignment to a homogenous digital documentation and compliance strategy across ambulatory and acute care settings.
- Allow the diagnostic imaging clinicians to focus on patient care while automating compliance tasks to greatly reduce risk of human error.
- Provide visibility to all IP stakeholders and clinical support staff associated with care tasks–from delivery, to administration, to support.

Several frameworks and strategies have been developed over the years, all seeking to create high-performing infection prevention programs–including the 'ten pillars' to support health system infection prevention programs. The underpinnings to just about every layer of this framework is heavily reliant on data–the right data, to the right people, at the right time:

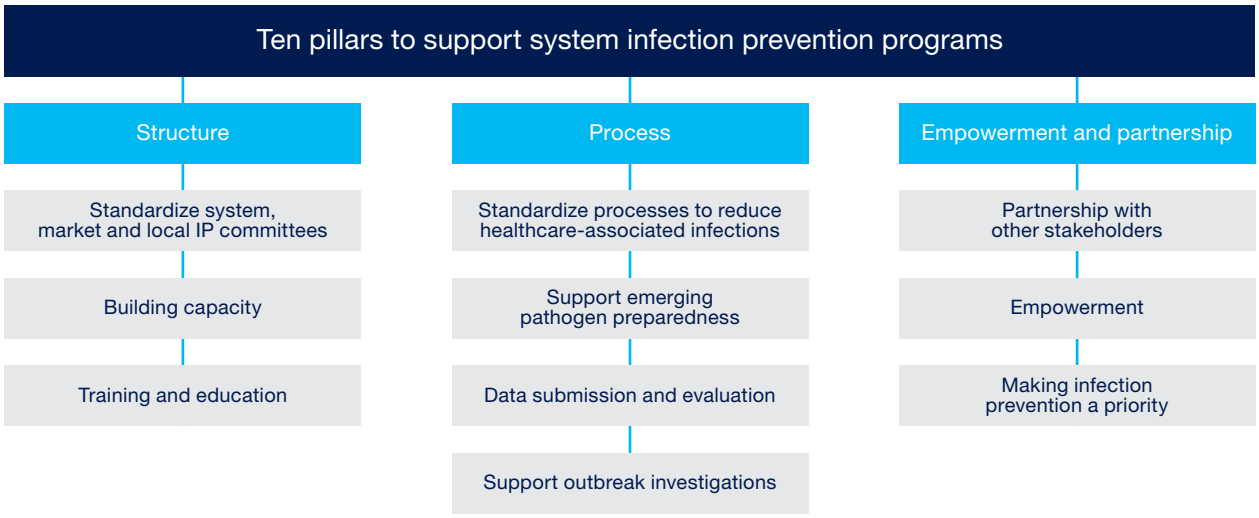


Figure 1: Infection prevention system model based on structure, process, empowerment and partnership (source: https://pmc.ncbi.nlm.nih.gov/articles/PMC10945934/).

Data integration and interoperability has been a game-changing luxury since the time of the 'Meaningful Use' program of the early 2000's, but it's only now becoming a viable means to connect the "last-inch" of hospital workflows with a heavy focus on infection prevention–specifically the high-level disinfection (HLD) workflow.

For the mission of the infection preventionist, reliance on quality HLD data has been almost wholly dictated by a manual entry process via paper-based compliance mechanisms.

This paper based system can include frequent site visits to enforce compliance of analogue operating procedures, searching through volumes of historical HLD logbooks, and time lost to travel across multiple sites. Data re-entry as a manual report generation task also adds to lost time, and potential misreporting leading to data quality issues.

VALUE BEYOND THE WORKFLOW

A “single source of truth” for HLD workflows must encompass the data critical to all stakeholder functions of an infection prevention program, accommodating the demands of both order-based and encounter-based imaging workflow venues:

- Infection preventionists–prevention, compliance, and regulatory reporting
- Imaging department managers–training, standard operating procedures, and record keeping
- Sonographers–low-touch, streamlined documentation workflows
- Biomedical/clinical engineering–probe usage, device status, and digital ecosystem health
- Systems and cyber security teams–ensuring infrastructure security across all devices and systems.

Just as workflow-specific systems are critical tools that provide alignment and focus for the immediate clinical mission, they must provide integration to augment existing workflows and data collection across the hospital digital ecosystem. Interoperability and integration between systems allow hospitals to realize previously unknown value from existing investments, increasing the reach and availability of not only clinical data and results, but also actionable data to maintain workflows and infrastructure.

The business view

For the healthcare system, HLD is a critical task in reducing risk of healthcare-associated infections (HAIs) from reprocessed equipment.

The most recent available data from The Joint Commission reveals that non-compliance of HLD and sterilization of medical equipment, devices, and supplies remains as the top citation issued among ambulatory care, hospitals, critical access hospitals, and office-based surgical facilities. Proliferation of traceability and compliance data informs oversight activities that limit patient risk, and the implications that follow that risk.

The security view

As healthcare technologies have evolved over the last two decades, security is the overarching concern in the connected era–so much so that it is as critical as the business view. Devices and applications must provide comprehensive and tightly integrated security capabilities that ensure patient privacy and confidentiality, protect the integrity and availability of data, guard against advanced threats such as malware, “zero-day” attacks, and the evolving critical vulnerability and exploits landscape.

In addition, medical device system software needs to deliver secure data storage and transmission and tamper-proof designs. And, since security threats are ever-changing, the system software needs to support the secure upgrade, download, and authentication of applications to help keep devices secure through the lifecycle of the device.

The safety view

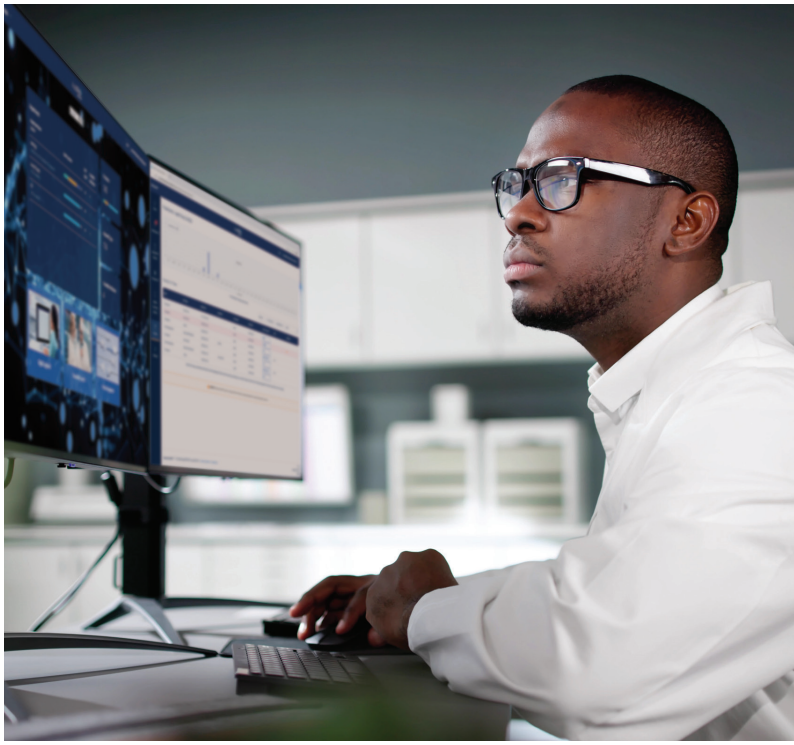
Without question, safety is paramount. Whether it’s ensuring the efficacy of a HLD cycle, or recording and tracking of efficacy results, failure to execute either task to compliance standards can change the patient experience.

Keeping in mind a modest spend of only three percent of healthcare dollars on prevention, a simple task of automating out the margin for human error in the HLD reporting process lends itself to another tangible layer of patient safety, while providing insights and information to challenge adverse events occur involving reprocessed equipment.

The training and compliance view

As previously noted, healthcare resources tasked with managing comprehensive infection prevention programs–especially in larger facilities–are faced with an increasing scope of responsibility. Consolidation of practices, employee turnover, increased reporting requirements, and regional facility dispersion have challenged these same resources to look towards technology for solutions.

Connecting sites across regions to gather compliance data, reduce/eliminate human error in reporting, and ensuring HLD procedures are being followed across geographies presents the next level of on-demand data access under a homologous system.



WHAT DOES A STREAMLINED SOLUTION LOOK LIKE?

While it is beyond the scope of this paper to architect tailored solutions for the thousands of unique workflows in the world, the key characteristics of HLD workflow orchestration have surfaced:

- **Secure and scalable:** Devices must meet or exceed security recommendations consistent with FDA cyber security guidance, while being flexible to accommodate the evolving security landscape of high-volume deployments.
- **Modular:** An effective IoMT solution for HLD will provide actionable insights to various stakeholders–from clinicians to biomedical/clinical engineers, to executive leadership. The level of access to relevant data and device function should be consistent with the user role.
- **Interoperable:** Data integration points to existing clinical systems, including RIS and PACS–the backbone of radiology workflows.
- **Intuitive:** An easy-to-learn and user-centric device interface, simple enough to operate with minimal training.
- **Evolutionary design:** The design should allow for the addition of new features and interfaces without requiring product redesign and recertification.

DELIVERING ON THE DEMANDS

Nanosonics is an Australian-based infection prevention company that has successfully developed and commercialized a unique automated disinfection technology, the trophon family of devices, representing the first major innovation in HLD for ultrasound probes in more than 20 years. The trophon family of HLD devices is fast becoming the global standard of care for ultrasound probe disinfection.

Evolving to meet the increasing demands and scope for infection prevention programs, Nanosonics introduces AuditPro®, a simple to use cloud-based, end-to-end solution that standardizes your ultrasound infection prevention practices, helps you meet accreditation requirements, and delivers best practice patient care across your organization.

Nanosonics is unique in its ability to offer a portfolio of proven solutions that meet the specific connectivity requirements of a successful HLD workflow. Nanosonics AuditPro® solutions allow healthcare businesses to define and execute on connectivity strategies that deliver new competitive advantages, streamline analog workflows, and adapt quickly to ever-changing business realities. Key offerings include:

- **trophon® family of HLD devices:** Effective and consistent automated HLD of ultrasound probes, compatible with over 1,300 probes from 30 OEMs.
- **Trace on trophon technology via DICOM:** One-touch worklist integration for order-based workflows, and mobile scanning solutions for encounter-based workflows.
- **AuditPro® Cloud:** A cloud-based system that combines clinician infection prevention decision-making with trophon and patient procedure information, offering automated, secure data management, compliance reports, risk notifications, and asset management.
- **Nanosonics Ultrasound Clinical Assessment of Reprocessing Excellence (UltraCARE) Service:** A personalized evaluation of your ultrasound reprocessing practices, ensuring alignment with federal guidelines, national standards and best practices. Conducted by Nanosonics' Clinical CARE Team, it offers actionable insights to improve compliance and patient safety.

Whether you are just starting a journey towards a HLD strategy or are on the path to digitally transform your existing strategy, Nanosonics can help you take the next step in a way that maximizes innovation and minimizes cost and complexity.

If you want to see how trophon fits into your HLD strategy, simply scan the QR code, complete the form and an HLD expert will contact you shortly.

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