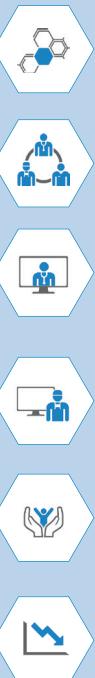




THE VIRTUALIZATION OF THE  
OR AND DISRUPTION OF THE  
MEDICAL DEVICE INDUSTRY

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## EXECUTIVE SUMMARY



The current “virtualization” of hospital operating rooms (ORs) is a movement that is gaining ground and will disrupt the medical device industry. The virtualized OR is helping hospitals respond to critical healthcare reform mandates, making real-time communication and collaboration possible, increasing efficiencies, driving opportunities for improving patient outcomes, and reducing costs.

Hospitals in the United States face myriad challenges in 2018—including an increased focus on managing costs and expenses. Critical issues confronting the nation’s hospitals include responding to requirements related to Healthcare Reform, managing the increasing cyber security risks, and, of course, all of the challenges inherent in ensuring patient safety and quality of care.



## THE HOSPITAL OPERATING ROOM

In hospital settings, the operating room, as a whole, accounts for 40 percent of total hospital expenses, and it generates 70 percent of the revenue, write James D Kinderscher and Melissa Rockford in “Operating Room Management,” Miller’s Anesthesia.

“Operating rooms are one of the most costly areas of hospital operations, and as hospitals face a range of mounting financial pressures, most are reexamining OR operations for any avoidable costs,” writes Molly Gamble, of Becker’s Hospital Review.

Gamble explains, “Although OR costs and potential profits are prone to an array of variables, one thing is certain: Time is an OR’s most valuable resource. Even a slight delay in a case’s start time, a lengthy turnover, or a few minutes spent looking for a piece of missing equipment, can severely hinder an OR’s efficiency and ability to maintain a positive contribution margin.”



## VIRTUALIZING THE OR AND DISRUPTING THE MEDICAL DEVICE INDUSTRY

In 2018, identifying places to reduce costs within the OR is imperative. Finding ways to increase efficiencies by improving the OR turnover process, reducing patient wait time and eliminating surprises (and thereby driving better workflow and procedure suite turnover) is vital.

Hospitals are using real-time video over IP for managing video within the OR as well as for monitoring each procedure room and supporting areas including Pre Op, Post Op, SPD and Pathology. By harnessing this technology, the entire department is connected, transforming physical locations into a virtual ecosystem and creating the new "virtualized OR."

The virtualized OR can support collaboration in many ways. Communication happens in real time between ORs, from OR to remote consultation resource, or even OR to Pathology—providing complete bi-directional audio and video communications. This real-time use of audiovisual technology for communications is saving time, money, and also potentially helping to improve patient care.



**These OR Integration Solutions Exist in Today's Marketplace.**

They are disrupting the medical device industry. The solutions are vendor-neutral and vintage-agnostic with any video source, which means they support proprietary video formats employed by medical device companies—regardless of manufacturer or age of the system. The tools operate using video over IP architecture, with complete flexibility for input/output port assignments and are compatible with Standard/High/Ultra High definition (4K) video formats.

Employing a 10GB LAN architecture, the platform supports an IT service model embracing the use of in-house technical support as first responders providing a venue for transitioning to a lower cost IT service model (as compared to traditional medical device service support models).

The virtualized OR is aiding hospital leaders searching for ways to improve efficiencies, enhance patient satisfaction and positive patient outcomes, increase collaboration between departments, cut wasted staff time, and reduce costs.

## THE CHALLENGE FACED BY HOSPITAL LEADERS TODAY

*Delivering efficient, sustainable and affordable healthcare to the world's aging population and emerging middle class will become more difficult without profound and substantive changes to national healthcare systems.*

Anthony Back, BlockchainReview.io.

The challenges facing hospitals in the United States today are many. In 2018, hospital leaders are expected to respond to healthcare reform and its changing requirements. This means they must work to cut costs, retain top talent, protect their organizations from cyberattacks, and improve the quality of the patient experience; while also ratcheting up the positive patient outcome numbers, and reducing or eliminating "Never Events." And all of this during a period of extreme uncertainty.



## HEALTHCARE REFORM AND ITS IMPACT ON HOSPITALS

Financial challenges again ranked No. 1 on the list of hospital CEOs' top concerns in 2017, according to the American College of Healthcare Executives' annual survey of top issues confronting hospitals. Governmental mandates ranked second, followed by personnel shortages. Hospitals support 16 million jobs in the U.S. economy, and make a \$2.8 trillion impact on the economy, according to the American Hospital Association (AHA.)

Total admission in all U.S. registered hospitals have remained flat, according to a survey from the AHA, while total expenses for all U.S. registered hospitals have climbed from \$829.7B in 2012 to \$936.5B in 2015. According to Moody's Investor Services, operating cash flow for nonprofit hospitals is expected to shrink by 2-4 percent over the next 12-18 months, and Moody's believes hospitals will take action to increase efficiencies to offset the margin issues.

"Patient admissions have been softening thanks to rising deductibles and medical cost increases outpacing wage growth," states Jeff Byers, of HealthcareDive. Reimbursements have waned, and private payers are pushing patients to less expensive low-acuity settings while operating expenses climb."

In this environment, the race is on to find cost-effective solutions for all aspects of hospital care. Pay-for-performance regulations that tie hospital reimbursement to patient satisfaction are driving an increased focus on the patient experience and outcomes. "The pay-for-performance model offers financial incentives to providers (physicians, hospitals, medical groups, etc.) to improve quality and efficiency," writes Courtney Baird, of the Committee for Economic Development. "Typically, incentives are paid on top of the standard fee-for-service compensation if the provider meets or exceeds certain pre-established metrics of performance. Additionally, some models penalize providers when they do not meet the predetermined performance standards, or for specific situations like medical errors and hospital readmissions."

With focus on increasing patient satisfaction levels, interactive care has become a priority. Interactive solutions, including audiovisual (AV) technology, access to the Internet, streaming video, and chat functionality provide patients with high-level communication and entertainment choices within the hospital building and often at the bedside.

Interactive solutions are also facilitating opportunities for improvements in patient outcomes. It makes sense that AV technology can enhance the patient experience in the OR, pre procedure, by piping in streaming video of tranquil settings and providing calming and distracting music. But AV technology is being used to do so much more in the virtualized OR today.



The OR virtualized by the installation of these integration and collaboration tools offers improved connectivity, collaboration, coordination, and communications between the OR and external resources and departments. These solutions integrate as a natural part of the clinical workflow, automatically capturing critical procedure metrics and supporting continuous improvement initiatives. The enhanced communication, between all supporting areas and staff, is saving time and, providing a venue to improve quality of care—at a time when each of these things is in high demand.

### ISSUES WITH THE MEDICAL DEVICE INDUSTRY

According to the Federation of International Medical Equipment Manufacturers (FIME), the United States is the world's largest medical device market, and it shows no signs of slowing. The US medical device industry was valued at US \$147.7 billion in 2016 (about 40 percent of the global medical device market), states FIME, and is projected to grow significantly through 2019, when it should increase to US \$173 billion.

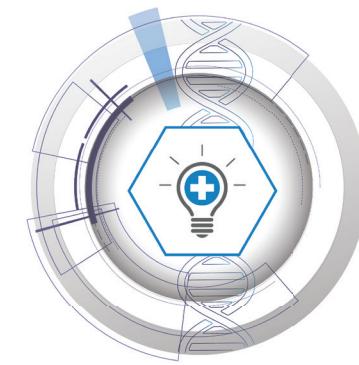
Medical devices are, without question, essential components of every operating room. "Medical device industry trends for 2018 are reflective of the breakneck pace of discovery and innovation that's arisen in the life sciences industry over the past few years," writes Alyson Hein, medical device industry lead for Clarkson Consulting.

"As manufacturers begin to actualize the benefits of big data and analytics, artificial intelligence, and new digital tools, the medical device industry faces a new wave of unprecedented opportunities for increased growth and market share."



The challenge inherent in designing products to meet the highest performance standards for the increasingly complex healthcare business model and changing regulatory requirements is intense, and manufacturers are working feverishly to accommodate market demand.

However, no one company makes the best product for all markets they serve, which presents challenges in obtaining best-of-breed devices from multiple manufacturers. For example, one brand of endoscopes may be the best product for an Interventional GI, but another brand of endoscopes may be the best for laparoscopy applications. The majority of medical devices are not yet interoperable, and the integration offering from a particular OEM may not support its competitor's endoscopic or other medical products.



### THE ANSWER?

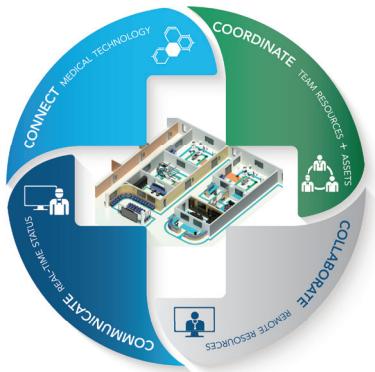
**Solutions designed from the outset as vendor-neutral and vintage-agnostic, which offer hospital leaders potential for valuable cost savings.**

Additionally, as demand for visual communication increases exponentially, medical device companies are faced with certain realities. Video integration is not a core competency and requires different skill sets including: Understanding competitors' video formats and possessing the ability to integrate with them, and video management technology expertise. Many device manufacturers lack OR integration project management experience, which includes working with trades architects, project coordination, etc.

Lack of interoperability between devices and technical solutions plus lack of experience in video integration and project management can create significant challenges for the hospitals considering purchasing and installing new solutions. Also, these realities can equate to higher total cost of ownership (TCO) as service pricing can be based on MSRP or Sell Price (and many items may not require servicing, those made entirely of metal, as one example.)

Finally, the cyber security issues with medical devices are very genuine. The FDA has recognized the cyber security risk to medical devices and has directed manufacturers to "develop a set of cyber security controls to assure medical device cyber security and maintain medical device functionality and safety" (from Content of Premarket Submissions for Management of Cybersecurity in Medical Devices). Manufacturers are working diligently to identify threats and vulnerabilities and develop safeguards—but it's a moving target. So the potential for cyber security issues related to medical devices used in an OR is high on the list of security concerns faced by healthcare leaders today.

## VIRTUALIZING THE OR ENVIRONMENT



A well-managed OR results not only in a high surgical turnover but also in reduced postoperative complications, improved patient-centered outcomes, and greater patient satisfaction. J. Divatia, and P. Ranganathan, Journal of Post Graduate Medicine, 2015

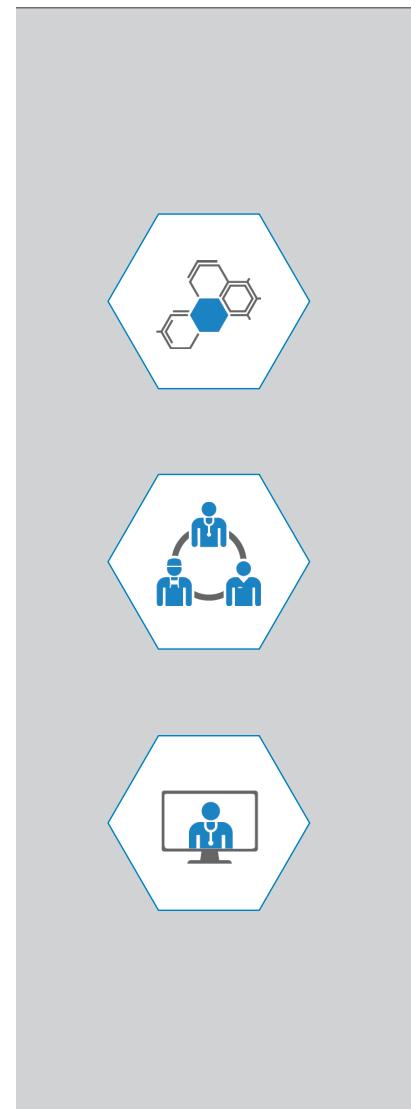
The OR is somewhat of an island in a hospital. However, the OR has enormous dependencies on supporting departments such as Pre Op, Post Op, Sterile Processing, Pathology and Environmental (housekeeping).

The virtualized OR leverages the "4 Cs" (Connectivity, Collaboration, Coordination, and Communication) to connect all supporting departments and stakeholders—virtually.



### The Virtualized OR uses Best-of-Breed Technology that Features:

- Vendor-Neutral and Vintage-Agnostic Solutions compatible with existing capital assets and infrastructure
- Solutions that integrate as a natural part of clinical workflow, automatically capturing critical procedure metrics for analytics and support continuous improvement initiatives
- IT Service Model leverages in-house technical support personnel as first responders to reduce service costs driving lower Total Cost of Ownership
- Proactive notification of service issues minimizing impact to staff and patients
- Solutions that can be repurposed from legacy deployments to new installations as procedure suites are renovated with new equipment
- Advanced cyber security through application control and intrusion protection in combination with hospital's security policies



**Connectivity** to existing assets and infrastructure serves to extend the life of existing capital asset investments and reduces the need to make additional capital asset investments. The virtualized OR leverages vendor neutral and vintage-agnostic integration that provides connectivity to "best-of-breed" medical devices for procedures and other medical requirements.

**Collaboration** with support personnel using real-time bi-directional audio and video content sharing to reduce the time to complete vitally important processes. For example, imagine a pathologist assessing tumor cells removed from a patient during surgery. In this scenario, while the patient is still under anesthesia, the surgical team must determine if sufficient "margin" (healthy cells) has been taken before they complete the surgery. If this process is not efficient, the patient could remain under anesthesia longer, which has been shown to increase the rate of post-surgery complications. Collaboration between the surgical team and the pathology department with real-time bi-directional audio and video content sharing can reduce the time needed to complete this vital evaluation and procedure.

**Coordination and Communication** with support departments such as Pre Op, Post Op, Physician's Lounges and Housekeeping ensure each location is queued to improve the OR turnover process, which reduces patient wait time and eliminates surprises. The improved coordination and communications with all support departments can drive an enhanced workflow and procedure suite turnover—potentially increasing efficiencies and reducing costs.



The virtualized OR is unprecedented in the marketplace. The technology employed supports healthcare reform requirements within the OR. The technology's IT service model will drive a lower total cost of ownership (TCO) and improve the longevity of capital asset investments. Additionally, the technology introduces a new level of preventative maintenance to a level of predictive support, which leverages the IT infrastructure to monitor system health. This IT monitoring provides early warning signs of failure, which facilitates the ability to proactively replace components before they fail—eliminating a "down situation." A down situation is highly disruptive and costly and affects everything from patient satisfaction, schedule disruption, and patient procedure delays, which results in increased costs for the hospital.



## THE NEXT GENERATION IN CLINICAL INTEGRATION

### CORIS®



The suite of tools referenced in the descriptions of the virtualized OR is the CORIS® Product Family, from Diversified's Medical Innovation Group. Diversified is an industry-leading technology solutions provider delivering innovative digital media, collaborative, broadcasting, electronic security, and over-the-top (OTT) solutions to a global clientele across a wide array of markets including financial, media & entertainment, enterprise, energy, higher education, technology, healthcare, hospitality, government, and more.

Its Medical Integration Group (MIG) provides clinical vendor-neutral and vintage-agnostic integration solutions, content management, workflow optimization tools, asset management tools, and situational awareness applications. The solutions include a database of clinical procedure suite metrics, critical data elements captured during the course of each procedure facilitating opportunities for continuous improvement initiatives.



### CORIS® IPS2™

Drive Interoperability with  
New & Existing Equipment



### CORIS® Director™

Optimize Procedure  
Suite Turnover



### CORIS® Coll™

Facilitate Bi-directional  
Audio and Visual Collaboration



### CORIS® Family™

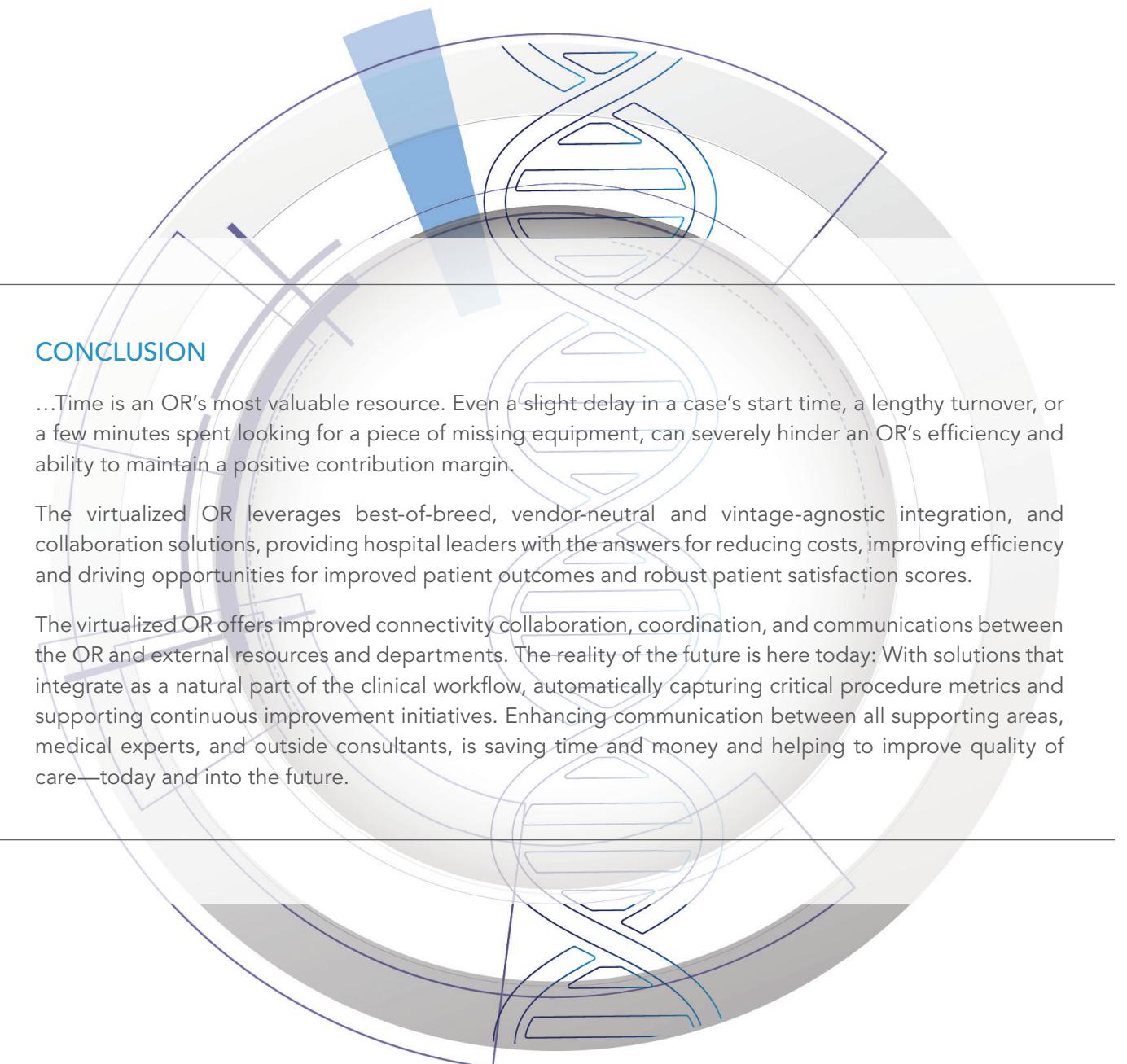
Virtualizing your Environment

The CORIS® Product Family is a multifaceted solution set providing workflow optimization, improved collaboration and asset utilization, as well as enhanced real-time situational awareness for patient procedure based applications such as surgical or interventional procedures, and their supporting departments.

#### By Design, CORIS® Product Family:

- Ensures compatibility with Existing Infrastructure
- Provides interoperability with Existing, and New, Capital Assets
- Enables Hospitals to invest in Best-of-Breed Medical Equipment
- Provides Tools for driving Workflow Optimization, Situational Awareness, and Continuous Improvement Initiatives
- Leverages Technology to Enable Improved Patient Care Focus / Experience

Diversified established its Medical Innovation Group in September 2016, with experts who have been instrumental in forging the Integrated OR market from its inception and in fostering improvements over the past 16 years. The MIG team also possesses extensive experience in interventional imaging and Hybrid procedure suite integration applications. MIG is currently working with several leading endoscopy solutions providers on multiple OR integration projects and recently completed projects at facilities located throughout the U.S.



## CONCLUSION

...Time is an OR's most valuable resource. Even a slight delay in a case's start time, a lengthy turnover, or a few minutes spent looking for a piece of missing equipment, can severely hinder an OR's efficiency and ability to maintain a positive contribution margin.

The virtualized OR leverages best-of-breed, vendor-neutral and vintage-agnostic integration, and collaboration solutions, providing hospital leaders with the answers for reducing costs, improving efficiency and driving opportunities for improved patient outcomes and robust patient satisfaction scores.

The virtualized OR offers improved connectivity, collaboration, coordination, and communications between the OR and external resources and departments. The reality of the future is here today: With solutions that integrate as a natural part of the clinical workflow, automatically capturing critical procedure metrics and supporting continuous improvement initiatives. Enhancing communication between all supporting areas, medical experts, and outside consultants, is saving time and money and helping to improve quality of care—today and into the future.



## ABOUT DIVERSIFIED

Diversified is an industry leading technology solutions provider delivering innovative digital media, collaborative, broadcasting, electronic security, and OTT solutions to a global clientele across a wide array of markets including financial, media & entertainment, enterprise, energy, higher education, technology, healthcare, hospitality, government, and more.

As an engineering-centric organization, each team of specialized technical experts partners with clients to design custom solutions that enhance their operations, increase productivity, and help drive ROI. Diversified even provides solutions that bridge the gap from today's technology to the emerging technologies, enabling clients to maximize their current investment by incorporating new strategic technical solutions.

Founded in 1993, Diversified has more than 30 offices serving Fortune 500 clients around the world. Recognized for thought leadership and strategic enterprise implementation, Diversified has been named Commercial Integrator Magazine's Integrator of the Year for 2016 and 2017 and appears on Enterprise Networking's Top 10 UC Solutions Providers for 2017.

Diversified ranks among Inc. Magazine's fastest-growing private companies for 2017, and is a pioneer AVIXA APEX certified company. From initial design consultation to deployment to managed services, Diversified is a trusted technology partner.

Learn more about Diversified's comprehensive portfolio of solutions and service offerings at [www.diversifiedus.com](http://www.diversifiedus.com).

## ABOUT DIVERSIFIED'S MEDICAL INNOVATION GROUP (MIG)

Diversified's team of medical experts, with in-depth knowledge and understanding of the growing challenges in healthcare, leverages our extensive expertise to deliver solutions that complement our partners' infrastructures and provide interoperability of new and existing capital assets. The MIG offers clinical integration solutions, vendor-neutral and vintage-agnostic content management, workflow optimization, data analytics and asset management tools, and situational awareness applications. For more information about MIG or the CORIS® Product Family visit <https://diversifiedus.com/medical-innovation-group/>.