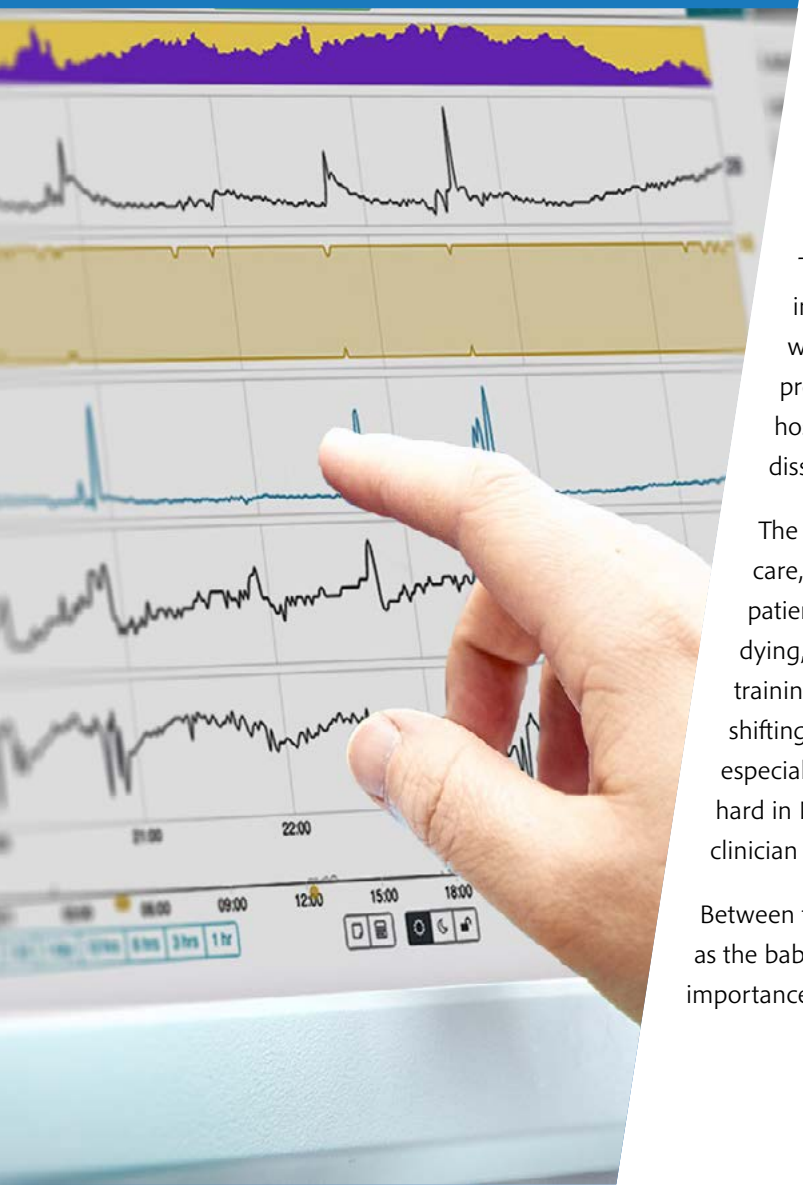
etiometry

TRENDING FOR THE FUTURE:

How AI and Analytics are Shaping the Evolution of Cardiac Surgery

How will AI and machine learning transform the long-standing roots of cardiac surgery and recovery for patients?



The Past, Present, and Future of Cardiac Surgery

With roots dating back to the 19th century, modern cardiac care arose abruptly and grew rapidly in the second half of the 20th century. With continued research and technical advancements in the last few decades, once-common techniques, like open-heart surgery, are increasingly being replaced by less invasive procedures as the new standard of care.

Despite these technological advancements, heart disease continues to be the leading cause of death for people among most racial and ethnic groups in the United States, causing about one in four deaths each year.[1] Cardiac surgeries are among the most common procedures nationwide. According to an article by Health Grades, of the top 10 list of procedures, three of the most frequent medical procedures are cardiac surgeries: angioplasty/atherectomy, stent procedures, and heart bypass surgery.[2] Each year, 900,000 cardiac surgeries are performed in the U.S., with an annual surgery volume growth of about 5% year over year.[3]

The pandemic has significantly disrupted cardiac care. Early in the pandemic, routine procedures and elective surgeries were abruptly postponed or canceled; monthly cardiac procedures dropped 53%.[4] During the first peak of the pandemic, hospitals allowed only emergency surgeries such as acute aortic dissections.[5]

The pandemic-related decline in procedures and cardiovascular care, including diagnostic testing, has had serious ramifications for patients with many patients' conditions worsening, some patients dying, and others experiencing serious psychological effects.[6,7] Even training for new cardiac surgeons has been impacted because of shifting priorities within healthcare systems. This is a major concern especially with the Great Resignation hitting the healthcare workforce hard in November 2021, and COVID-19 infections exacerbating clinician staffing shortages.[8]

Between the pandemic backlog and the steady risk of heart disease as the baby boomers age, improving cardiac care is of significant importance.

Artificial Intelligence is Claiming a Stake in Healthcare

Given the frequency and projected growth of cardiac surgeries, it is critical to improve patient outcomes, reduce costs, and decrease the risk of injury or death related to cardiac surgery. As with most medical solutions, one way to move this forward is by applying new technology.

Among those new technologies is Artificial intelligence (AI). In fact, the use of risk analytics and AI has been on the rise across healthcare, from diagnostics to treatment.[9] These technologies are not meant to replace clinicians and their relationships with patients; rather, AI technology in healthcare is designed to provide new insights to clinicians to optimize clinical outcomes and reduce healthcare spending. AI can be the foundation for a shift from a reactive healthcare approach to a proactive one. As a result, the U.S. healthcare system could save $150 billion each year by 2026, about half of the annual cost of heart disease.[1,9]

According to researcher Abhimanyu S. Ahuja, "AI is poised to play an increasingly prominent role in medicine and healthcare because of advances in computing power, learning algorithms, and the availability of large datasets (big data) sourced from medical records and wearable health monitors."[10] More data seems like a ***good*** outcome, except when there is little-to-no time to process it. And with the ever-present challenges that clinicians face like burnout, staffing shortages, and the usability and interoperability of their devices, understanding how to use and efficiently process this data can be cumbersome. AI will be instrumental to turn this data into actionable insights across the continuum of care.[11]

The Evolution of Actionable Patient Data

There are solutions that can do more than just simply unveil the myriad of data streams available on each patient in a clinician's care. As an aggregator of data, Etiometry aids clinicians' understanding of their patients by reviewing, analyzing, and synthesizing often disparate and disconnected data streams. The data sources include, but are not limited to, patient demographics, peripheral devices, lab results, invasive monitoring, and vital signs. With the continuous flow of patient data, Etiometry has created model-based algorithms, cleared by the FDA, that alert clinicians to physiological condition changes that may indicate increased risk for adverse events.

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One of the major challenges ICU clinicians face is the ability to quickly comprehend and communicate the continuous changes in patient conditions that can happen in minute-by-minute. Currently, such data must be manually aggregated from disparate sources such as the EMR, which contains biased, often inaccurate, low-resolution data that is accessed through a challenging user interface; numerous medical devices with varying interfaces and limited longitudinal viewing capabilities; asynchronously reported data elements such as lab results, fluids, etc. with differing output formats and frequency.

The Etiometry platform consists of three integrated software components, including Data Aggregation and Visualization Software, Risk Analytics Engine, and Quality Improvement System. Together, these systems provide critical information for immediate patient care and trajectory of patient condition, generate risk estimation of compromised patient conditions, and archives data for research and quality improvement initiatives.

With roots in the cardiac intensive care environment, Etiometry brings deep experience in managing data crucial for decision-making at the bedside. Powered by model-based, personalized risk analytics and FDA-cleared

indices, Etiometry's platform collects data that brings attention to a patient. The platform is being applied to automate and deploy hospitals' Enhanced Recovery After Surgery (ERAS) protocols for the management of cardiac surgery patients throughout their hospital stay. The increased patient surveillance available with the platform brings improved detection and management of potential complications associated with cardiac surgery.

Case Study: Algorithms in Action for Pediatrics with CHD

Patients with this condition are more likely to experience cardiopulmonary decompensation. Monitoring a patient's mixed venous oxygen saturation for when it may drop below 40% is essential to recovery post-surgery. Children facing mixed venous oxygen saturation below 40% are at increased risk of cardiac arrest following the surgical repair of CHD. Three top-tier children's hospitals came together to conduct a multi-center, retrospective study highlighted in Critical Care Explorations. The study demonstrated the findings of success or failure of weaning of vasoactive agents.

Using algorithms, clinicians were able to assess the likelihood of a patients SvO2 dropping below 40% and could better draw attention to critical patients before they encountered catastrophic events. Children who have been operated on for the repair of CHD are often placed on vasoactive drugs and inotropes. While weaning and de-escalating their care, clinicians' understanding of their underlying physiology is essential to achieving successful outcomes. By improving the de-escalation of care, patients may have shorter ICU exposure, shorter length of stays, and globally improved outcomes.

Pioneering the Path Forward for Patient Outcomes

With new technologies like Etiometry's model-based algorithms, the potential impact on patient care is enormous. Having a more holistic view of critical data as a patient moves from the operating room to the ICU is imperative to improving outcomes for complex cardiac conditions. Etiometry partners with organizations to bring this opportunity to clinicians and patients for improved and more informed bedside decisions.

To learn more about the Etiometry platform, click here.

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