How Augmented Video Analysis Is Improving Patient Care — and More
Introduction

For health care providers, alert fatigue is real. According to a study published by the Journal of Healthcare Informatics Research in 2016, medical professionals in hospitals can encounter more than 700 alarms in a single day – making it difficult for some to differentiate between what’s an emergency and what’s not. ECRI listed false alarms among its top 10 health technology hazards in 2020.

Currently, virtual sitters – hospital staff who remotely monitor patient rooms – rely on static systems that can contribute to the plethora of alarms throughout the hospital. In addition to monitoring health indicators like vital signs, these sitters exist to help respond to patients who may fall out of bed or while walking, whose equipment may be too far from their bed, or whose visitors may be doing things that put the patient at risk. But the video systems they rely upon are essentially a “box around the bed” that isn’t sensitive enough to distinguish between actions that should be happening in a room versus those that shouldn’t.

Augmented Intelligence (AI) – sometimes called artificial intelligence – can help solve health care challenges like this one. The 2018 World Medical Innovation Forum included “bringing intelligence to medical devices and machines” on its list of 12 health care technologies most likely to be transformed by AI in the next decades. “Inserting algorithms into these devices can reduce the cognitive burdens for physicians while ensuring that patients receive care in as timely a manner as possible,” reported Health IT Analytics.

In particular, AI can be applied to the video recordings taken in most hospital patient rooms to better categorize alarms related to movement in those rooms. AI-assisted Augmented Video Analysis (AVA) systems can provide additional information and data to hospital decision makers, resulting in more accurate warnings and alerts, among other benefits.

In this white paper, you’ll learn how:

- AI and machine learning work hand-in-hand with video systems
- AVA systems function in a hospital room
- Patient privacy can be protected using AVA systems
- AVA systems can benefit patient care and your bottom line.
How Augmented Video Analysis Works

AVA systems combine real-time video with historical knowledge to determine if there’s an activity afoot in a patient room that could increase risk to that patient. Through a machine-learning process, computers digest video images captured by bedside-cart or wall-mounted cameras to understand how things happen in a hospital room – such as the movement of caregivers, doctors, visitors, and the patient, and the location of objects like IV pumps, bedside trays, and other equipment.

The AVA system uses unique algorithms, or sets of rules for the computer to follow. The algorithms can determine the severity and/or scope of the action in the room. The more video the system receives, the more detail it can detect, and the more accurate assessment it can provide of what’s happening in the room. Has the patient fallen out of bed – or just leaned over to pick something up off the floor? Did a visitor reach to hold a patient’s hand – or did they pull out the IV needle?

Some distinguishing features of AVA systems include:

- Identifying “regions of interest” that provide a holistic view of the patient room, rather than the traditional “static box”
- Distinguishing between who is a caregiver, patient, or visitor – and applying different rules for each persona
- Producing “bounding boxes” around each object in the room and indicating when they interact (for example, when a visitor touches a patient or a patient touches an IV pump)

The algorithms can be set up to determine whether the action in a certain patient room is considered high-risk and therefore in need of more monitoring. They can also incorporate thresholds to determine how much interaction or boundary-crossing qualifies as a low, medium, or high-risk alert.

“Inserting algorithms into [medical devices and machines] can reduce the cognitive burdens for physicians while ensuring that patients receive care in as timely a manner as possible.” – Health IT Analytics, 2018

USE CASES FOR AUGMENTED VIDEO ANALYSIS

AVA systems can be leveraged across many workflows to help:

- Prevent patient falls
- Prevent patient elopement
- Reduce false caregiver alerts
- Monitor visitor actions
- Track in-room equipment
- Determine room availability
Augmented Video Analysis Workflow and Components

Typically, an AVA system is best deployed as part of a hospital's larger remote observation or virtual sitter program. The system’s components are built into three areas: existing bedside or wall-mounted units, an on-site media server, and cloud storage. The schematic below shows how a typical advanced video analysis system would operate.

The video from the bedside unit is directed to two places: the virtual sitter program, where you can see the patient room live, and the media server, where the machine-learning process happens. The live sitter can choose whether they wish to view the AVA version or simply the live feed based on their needs and preferences.

Although most AVA systems can integrate with existing hospital infrastructure, there are some configuration items you should consider to achieve optimal results, such as ensuring you have:

- the highest quality cameras possible on bedside or wall-mounted units
- enough cameras to achieve your business goal (e.g., do you need to see the whole patient room or just a small portion?)
- a media server to reduce impact on your overall network.

Ensuring Patient Privacy with Augmented Video Analysis

Privacy is a common concern when organizations consider incorporating an AI-enabled system. But it is possible to implement an AVA system in a hospital without compromising patients’ privacy. In many configurations, hospitals using AVA systems will blur or pixelate recorded patients’ faces and scrub any other personal health information from the visible video or its background data. It’s also essential to ensure that the data storage areas the AVA system uses – both onsite and off-site – are HIPAA compliant.

Although AVA systems aren’t altogether different from virtual sitter programs, which are widely used, hospitals must specifically get permission from the patient to use an AVA system during their course of care. Most hospitals will include mention of the AVA system in the admission paperwork patients sign before a visit, under a provision related to the possibility of remote monitoring or telehealth during their stay.
Augmented Video Analysis Benefits Patient Care — and Your Bottom Line

AVA systems offer tremendous value and can be leveraged across multiple workflows. First and foremost, AVA systems can positively impact patient outcomes by alerting caregivers to hazards such as improper bed angles that can affect ventilation, an impaired gait that could lead to a patient’s fall, and even patient elopement. The system can reduce alarm fatigue for hospital staff by helping them better understand the severity of an issue, enabling them to react appropriately to what’s happening. These systems can even speed room turnover by automatically informing cleaning staff when a patient has vacated a room, then letting the operations staff know the room is ready for the next patient. All of these efficiencies mean more gets done, patients are safer, and less staff is necessary to monitor activity.

AVA CAN ANALYZE PATIENT POSTURE WHILE WALKING AS WELL AS OTHER ACTIVITIES

- Visitor Actions
- Caregivers
- Room Cleaning Verification
- Patient Gate
- Patient Posture
- Bed Position
- Bathroom Visits
- Elopement

At Caregility, we’ve adopted our AVA systems in response to our many health care clients who have asked us how they can minimize risk and improve patient outcomes and care processes. What excites us most about this technology, though, is not what we’ve already built but the new ways we can leverage AVA technology in the future.

To learn more about how Caregility can help your hospital harness the power of an AVA system, contact us today.

Caregility is dedicated to delivering care to wherever the patient is located through the use of the Caregility Virtual Care Platform. Designated as the #1 2021 Best in KLAS Virtual Care Platform (Non-EMR), Caregility’s core telehealth offering is a purpose-built ecosystem for the entire healthcare continuum. The Caregility Virtual Care Platform provides secure, reliable two-way audio and video communication designed for any device and clinical workflow, in both inpatient and outpatient settings. Today, Caregility supports more than 2 million video sessions annually and has deployed over 9,000 access points of care systems across the US. From critical and acute, to urgent and emergent, to post-acute and ambulatory, and to the home, Caregility is helping transform the delivery of patient care everywhere. Follow Caregility at https://www.linkedin.com/company/caregility/ or on Twitter @caregility.