Artificial Intelligence in Predictive Maintenance of Hospital Medical Equipment

Increasing efficiency, cutting costs and enhancing service quality through AI backed predictive maintenance

Medical equipment is an essential enterprise-critical component of a healthcare system, for both hospitals in general and hospital EDs. Studies conducted by [Source] with data collected from several healthcare centers indicate each hospital has about 15-20 pieces of medical equipment for each staffed hospital bed, that amounts to a capital investment of about US$200,000–400,000/staffed bed. This suggests that a 500-bed hospital acquires more than US$100–200 million worth of medical equipment, and even more if it is affiliated with a medical school. According to the same studies, annual medical equipment maintenance and management cost amounts to approximately 1% of the total hospital budget, which translates to $5 million/year for a 500-bed hospital.

Medical equipment maintenance is the lifeline of hospitals. The survival of healthcare centers depends not only on the quality of healthcare provided but also the efficiency of the medical devices used. The global medical equipment maintenance market was valued at $13.5 billion in 2016 and is estimated to register 10.8% CAGR during 2017-2023 to reach $27.5 billion by 2023.

The Problem

A hospital's productivity and success largely depend on how well its medical equipment is utilized toward treating patients. However, while medical technology is growing by leaps and bounds, hospital assets/devices are not performing to their full potential due to non-functionality. The

World Health Organization (WHO) estimates that 50% to 80% of medical equipment remains non-functional and the most commonly cited reasons include poor maintenance and a lack of trained technicians. WHO statistics further claim that equipment failure cases due to inadequate maintenance account for about 60% of all medical equipment performance cases.

The lack of a proper system for timely maintenance of medical assets can often lead to compliance issues for a hospital. Furthermore, without adequate asset visibility and availability within a hospital, staff can often spend precious hours looking for specific medical equipment. Sometimes the asset isn't found by the time its maintenance is due, leading to functional aberrations of the asset. Faulty equipment and poorly maintained medical assets can cause grave damage to a hospital's reputation.

Why Predictive Maintenance with AI is a Game Changer

Predictive maintenance is a surefire way to drastically enhance asset efficiency. The aim of predictive maintenance is to predict when a particular piece of medical equipment might fail and schedule maintenance accordingly. This involves the testing and constant monitoring of machines to predict equipment failures. Considered a step above preventive maintenance, predictive maintenance helps to maximize equipment uptime and enhance the quality of healthcare provided.

Predictive maintenance relies heavily on Artificial Intelligence for the data and predictive analytics that it provides. Especially with asset management where accurate tracking of medical equipment, management, and reporting of all levels of maintenance, organizations stand to benefit immensely.

Reduced maintenance costs

Predictive maintenance cut the cost associated with maintenance by more than 50%. Maintenance costs typically include the labor and maintenance department overhead, the cost of replacement, tools and other equipment required to complete the maintenance of the medical asset.

Reduced downtime for repairs

Predictive maintenance reduces the time required for equipment repair or reconditioning (also called Mean Time To Repair or MTTR) by almost 60%. The tracking, monitoring, and analysis of machine conditions can help in determining the time for predictive maintenance.

Reduced machine failures

Through an efficient asset management system, hospital staff can regularly monitor the condition of equipment and process systems and schedule predictive maintenance, thereby reducing the number of unexpected equipment failures by 55%.

Reduced stock of spare parts

Predictive maintenance helps hospital management pre-determine defective parts in need of repair, tools, and required labor to conduct the repair. This reduces both repair time and costs and also helps cut the cost of stocking spare parts by more than 30%. Instead of hoarding all the required spare parts for stock, hospitals will now have enough time to place an order for the spare or replacement parts.

AI in Predictive Maintenance

AI in healthcare has immense potential to improve patient care and staff efficiency through asset management which in turn facilitates predictive maintenance. Predictive maintenance is a

continuous and iterative process, and the set model tends to improve and adapt over continuous usage, meaning that predictions for a particular piece or set of equipment will become more and more precise over time. Such precision can lead to reduced downtime, enhanced service quality, and lower costs, making predictive maintenance a crucial part of hospital management.

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