PERSPECTIVE PAPER



Leveraging Predictive Analytics to support medical devices



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As the percentage of connected medical devices keeps rising, MedTech companies have made remote device monitoring a strategic focus to maximise the operational costs of devices in use. To ensure they work as required, device monitoring and updates are indispensable for medical devices. Driven by the relentless need to deploy novel technologies that enhance overall clinical outcomes alongside customer satisfaction, a device maintenance strategy is imperative for manufacturers and healthcare entities alike.

Conventionally, maintenance of medical devices was backed by onsite device maintenance provided via field service engineers. However, the emergence of connected medical devices nudged healthcare players to seek ways to swiftly change this approach. Medical device companies now want to manage devices remotely as well as ensure they can be serviced before they fail. Also, recommendations must be offered regarding the latest upgrades.

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Content

1. Resolving the challenges of medical device maintenance 2. Five pivotal measures to deploy a Predictive Analytics solution	3

Resolving the challenges of medical device maintenance

Medical device companies must now evaluate how to evolve maintenance processes by using technology and predictive tools extremely efficiently. This calls for an implicit awareness of when a device is likely to fail. Companies can limit the frequency of field service engineer visits to provider sites for a thorough device analysis by simply integrating predictive analytics into the servicing strategy.

Besides boosting the device quality and reliability, this strategy extends the device's life while offering extra safety and enhanced performance. By adopting novel technology solutions, field service visits could be reduced by up to 20% while also attaining substantial savings, thanks to proactive device maintenance.

Medical device maintenance supported by predictive strategies also has a beneficial impact on complying with patient safetyrelated industry regulations. It's possible to anticipate and pre-emptively address likely safety risks and detect device anomalies before they exert a larger or more threatening impact.

Five pivotal measures to deploy a Predictive Analytics solution

While the deployment of an efficient predictive analytics model for medical device maintenance seems daunting, AWS can simplify the use of cost-efficient, device-agnostic, scalable solutions. This will be done through five crucial steps:

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Connecting devices to the analytics platform:

By making sure an IoT gateway is set up appropriately, medical devices are allowed to stream real-time device data to a cloud-based analytics platform. Efficient data exchange is then facilitated between medical devices and the connected systems. An AWS IoT Core is used to connect devices to the analytics platforms on AWS. Furthermore, an AWS IoT ExpressLink connects the devices seamlessly to cloud, enabling integration through a series of AWS services.

O2 Tracking device KPIs:

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With the devices connected, they begin utilising descriptive device data analytics, generating business insights. Tracking device health KPIs (key performance indicators) helps ensure the overall performance is in sync with the needs of medical service providers. Utilisation, downtime and prospective threats from device failure are all included in tracking KPIs. Amazon Managed Grafana and Amazon QuickSight can be leveraged to build and publish interactive dashboards. These are accessible to service managers, field engineers or even CXOs using web applications or mobile devices.

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O3 Building service assistants:

GenAl and other assistive technologies help in building chatbots or virtual assistants, which are useful for technicians or field service engineers to streamline systems and processes. Nimble and adapting swiftly to varying feedback and changes, the service assistant chatbots will quickly troubleshoot devices and could be created using Amazon Lex.

04 Pinpointing anomalies in devices:

Advanced analytics that can discover adverse behaviour in devices helps in forecasting the overall health of devices. This assists in the proactive monitoring of likely risks or threats while also reducing needless field visits.

05 Monitoring the health score of devices:

By consistent reviews of device health scores, one can find devices requiring more proactive maintenance while preventing additional deterioration. With AWS IoT Events, abnormal device behaviour can be detected and alerts sent to field service engineers.

Additionally, AWS offers managed solutions to address the predictive maintenance needs of devices. To elaborate, AWS Monitron could capture medical equipment data, send it securely to cloud and analyse this for anomalies via machine learning. AWS Monitron comes with both hardware and software solutions such as sensors, anomaly detection service, gateway and mobile app for analytics plus real-time alerts.

Proactive maintenance through effective data use is contingent on the blend of devices and operational data that is presently generated by the medical device services teams and the providers. Typically, data will comprise two types – structured and unstructured. The first will reveal the production year, make, device model, warranty period, inventory, machine utilisation, CRM, etc. The second will constitute the maintenance history, logs or device, temperature, coolant levels, flow pressure or other sensor data.

When the two data types are blended into extremely customised predictive algorithms, medical device firms can detect devices deviating from normal behaviour as per their age, use, service history, etc. In this way, predictive analytics solutions are well-placed to offer device health warnings, days, weeks and even months before an actual failure.

Thereby, devices needing maintenance can be scheduled for servicing proactively before going offline and causing unanticipated downtime for medical service providers. By equipping field service engineers with AI-powered service assistants, medical device companies can also boost their efficiency levels. Proactive maintenance offers the extra benefit of helping medical device organisations optimise inventory levels of spares in various facilities. The integration of data from operational systems such as enterprise resource planning or inventory management helps device firms make sure parts don't run out of stock.

The path forward

By establishing a unified device data platform, medical device companies could function as a single source of information combining device, operational and clinical data. When unified data becomes available, companies could generate business insights and decipher trends (utilisation rates, downtime, labour cost, freight cost, etc.) to propel proactive maintenance of medical devices. This is a winning proposition for all stakeholders.

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