

Testing the EMR and beyond.



Delivering exceptional patient care through quality technology.



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Introduction.

With each passing day, technology becomes more integral to our lives. In healthcare, recent world events are accelerating this trend.

Many healthcare providers are embracing the benefits that electronic medical records (EMR) or electronic health records (EHR) can offer. Throughout this guide, we will refer to these digitized healthcare IT platforms as EMRs. When they work well, EMR systems provide accessibility and visibility into a patient's medical history. This visibility enables healthcare professionals to deliver better care. But there is more to gain from this healthcare technological revolution. To deliver exceptional patient care, healthcare professionals must implement further modernization of workflows, systems, and medical devices.

Consider the huge amount of administrative work involved in basic patient care. Or the colossal effort needed to digitize health records, patient registrations, appointment scheduling and rescheduling, discharges and transfers, insurance submissions and claims, laboratory results, billing and invoicing, e prescriptions, and much more.

Clerical work must be accurate for patient safety and compliance. Patient records must be up to date and available 24/7. Instruments need to integrate with systems and work with no margin for error.

Fortune Business Insights projects the global telehealth market will exhibit a CAGR of 32.1% between 2021 and 2028.¹

At virtually every stage of a patient's wellbeing, different forms of technology and software support the expansion of better healthcare. As the reliance on technology grows, ensuring that these lifesaving systems don't break under the strain is imperative.

To keep operations running smoothly, healthcare IT professionals must perform regular and exhaustive testing. Fortunately, the introduction of automation, robotics, and artificial intelligence (AI) has made testing easier to deliver.

In this eBook, you will discover how these technological developments help optimize processes, integrate workflows, and improve the performance of systems and medical devices.

The result? Better decision-making, greater diagnostic accuracy, and more productive staff to support what matters most: delivering successful patient outcomes.

Let's begin by looking at how testing contributes to a seamlessly integrated EMR.

Five Key Areas of Focus When Testing Your EMR

As digital healthcare evolves, patient care becomes more intertwined with and reliant on technology. Treating patients, tracking health progress, and updating medical records are just the tip of the data iceberg for EMR systems.

EMRs are highly customizable, which means critical workflows and applications, both internal and external, need to connect to function correctly. Accurate patient information must be consistent across numerous systems and accessible at the right time. If it isn't, the results could be catastrophic.

Patients bestow huge amounts of trust in medical professionals. Doctors and nurses trust that technology will support them in delivering lifesaving care.

38%

of physicians want better support workflow management across the continuum of care.²

Testing your EMR goes beyond checking data quality, although this remains crucial. It also involves testing key workflows, integrations with other applications, and handling of custom rules and configurations. And with most major EMR providers offering quarterly software updates, hospitals need the testing capacity to keep up with these releases.

When you begin testing your EMR, make sure to include these main areas:

- **functionality**
- **integration**
- **regression**
- **user Interface /usability**
- **performance**



Functionality.

EMR systems have various uses beyond serving as a database of patient records. Providers use EMRs to improve the quality of patient care, assess new treatments, identify high-risk patients, and facilitate clinical research.³

From patient registrations and laboratory records to e-prescriptions and insurance claims, EMR systems need to function as expected. If they don't, clinicians will not be able to access the right information at the right time to make informed decisions when caring for patients.

However, with the enhanced scope of today's EMR, testers now have more to consider regarding functional testing. Functional testing can be manual or automated. However, as the EMR's remit and feature set grow with each release, so do the demands on testers. This is why automation is an increasingly essential part of the EMR testing process.

5 key areas to focus on when testing your EMR.

Integration.

Critical systems, such as picture archiving and communications (PACS), databases, and application programming interfaces, connect to EMRs. With so many inputs and outputs, ensuring the reliability and seamless operation of any EMR system requires integration testing.

Linking diverse systems, whether across medical departments or multiple clinics, involves judicious integration testing. Ensuring integration and accessibility of these systems is vital to maintaining a high level of patient care, considering the importance of the data flowing back and forth.

Integration testing uncovers any data flow obstructions that block the connection to and from the EMR. Removing impediments ensures a single view of a patient's medical history and health requirements at the time of treatment.



Integration cont.

It is challenging for manual testing to cover all necessary components of these interconnected systems. Increasing test coverage with AI-powered test automation uncovers more bugs faster than any team of manual testers could, ensuring that your EMR system functions as expected.

The proportion of physicians communicating with patients through EMRs grew from 38% in 2018 to 63% in early 2020.⁴



Regression.

Because of the critical nature of EMR performance, regression testing needs to take place to ensure that your EMR system operates at peak performance after any modifications. Regression testing checks that the core software still works after it has changed or interfaced with other applications and platforms.

EMR vendors provide regular version upgrades and maintenance updates to fix glitches, address problems with previous versions, or add features. With every update comes the risk of new errors. For example, new features may adversely affect custom workflows or configurations. Regression testing is necessary to make sure these updates won't break anything.

Hospital IT teams are often reluctant to implement vendor updates because of the challenges they might bring. However, many vendors require their customers to update their EMRs up to three times per year. Testers must anticipate these updates and implement a process that streamlines regression testing through automation to minimize risk.



UI/Usability.

Testing your EMR's user interface (UI) reveals whether the system delivers a straightforward experience that works as expected. Test automation software can interact with and drive the EMR from the user's perspective, giving testers a direct view of system behavior in various testing scenarios.

Properly testing the UI avoids any nasty surprises that a user might encounter when logging in to the system, entering or updating patient records, or performing other key functions. Testing the UI becomes even more important when you consider the variety of end users who interact with the EMR, including patients, nurses, and administrative staff.

Portals such as MyChart allow patients to interact with healthcare providers and manage their care online. They can manage appointments, medications, test results, and bills, giving patients more control and visibility over their health. The patient's experience can suffer if usability is poor.



UI/Usability cont.

Another challenge is that no two EMR configurations are the same. Each hospital or health system incorporates its own workflows and custom functions into its EMR. This customization increases the number of possible user journeys, further complicating testing efforts.

EMR testing using advanced machine learning (ML) and AI allows testers to investigate every permutation of the user journey and deliver insights on how to optimize the user experience. Testing from the user's perspective is non-invasive, so you never have to access the underlying code — you can test whatever is on screen.

Non-invasive testing also helps with compliance regulations that prohibit interrogation of the source code. Legal acts in the US, such as the Health Insurance Portability and Accountability (HIPAA), impose strict rules and guidelines on the handling of patient data. To ensure that your EMR meets the privacy, access control, and transmission security standards required by law, you need a noninvasive testing solution that sits on a separate machine and securely connects to the EMR's staging environment.

[Blog Post: Why Highly Regulated Industries Demand Noninvasive Testing](#)



Performance.

Closely aligned with UI testing is monitoring the performance of your EMR to be sure that it operates under the strain of heavy usage. Many healthcare professionals across various departments will use your EMR. An array of processes and applications will also plug into it. Peak usage can have disastrous effects on the performance and functionality of your EMR.

Testing will ensure that your EMR performs under peak load and with no downtime, so all users remain productive when accessing the system during a spike in activity. Increases in activity can come at a moment's notice. Just as healthcare professionals must prepare for anything that comes their way, so does the EMR.

Performance and load testing enable the following:

- **configuration testing**
- **growth and scaling of the EMR**

EMR systems are robust, but configuration for the unique clinical environment of each hospital is where people tend to run into trouble. Configurations should be performance tested to ensure that the system will stand up to adjustments over time. IT teams should be aware of the potential consequences of proposed configuration changes.

New staff, additional locations, and integrations with new medical devices bring additions and changes to the EMR over time. Performance testing can help IT teams get ahead of these potential scaling issues, identifying bottlenecks ahead of time and planning adjustments to their infrastructure accordingly.



Performance cont.

Modern test automation solutions can help with performance testing so that your EMR doesn't suffer even as its footprint in your organization grows. Performance testing uncovers and alleviates bottlenecks before they create problems for patients, clinicians, and administrators alike.

Given the central role EMRs play in modern healthcare, their importance cannot be overstated. By creating a robust testing plan and taking full advantage of the advances in intelligent automation technology, healthcare providers can ensure that the EMR is working as intended and becomes more useful over time. However, the use cases for automation go way beyond the EMR.

[Blog Post: Performance Testing the EMR](#)



**The importance
of robotic process
automation in
healthcare.**

Healthcare generates huge volumes of paperwork. Patient data, prescriptions, invoices, insurance claims, denials — the list goes on.

Healthcare workers are digitizing and uploading documentation across internal and external healthcare systems. Doing this work manually is time-consuming and expensive, and it drags analysts and healthcare professionals away from their core responsibilities. When administrative duties take up their time, providers spend less time with patients, and the quality of care declines.

To tip the balance back in favor of patients, many healthcare professionals are looking to streamline manual clerical processes with robotic process automation (RPA). RPA refers to software that does basic, repetitive tasks across applications. Designed to help with manual office work, RPA acts as a digital assistant, performing everyday tasks that would otherwise consume employees' time. With RPA, modernization of workflows quickly becomes a reality.

The latest advancements in RPA technology involve AI and ML, as companies expect their RPA processes to be self-guiding and able to make the majority of process decisions based on data, environment, time, and localization without human intervention.

Healthcare providers use RPA for tasks such as staffing an IT help desk, physician credentialing, and verifying insurance eligibility. By automating simple, routine tasks, RPA optimizes costs and outputs and enables providers to concentrate healthcare resources on higher-value tasks.

Automating critical healthcare processes eliminates human error and allows the systems to run 24/7, which is vital when delivering round-the-clock care. More importantly, doctors and nurses are more productive and can focus on what matters: the patients.

The importance of robotic process automation in healthcare.

Research shows that 50% of US healthcare providers will invest in RPA by 2023.⁶

Six critical tasks RPA can optimize.

The best use of RPA is to optimize repeatable and mundane tasks that need to run around the clock. In the healthcare industry, such activities are plentiful. Numerous tasks, including updating patient records, inventory, and billing, can and should be automated. Consider some of these areas where RPA can optimize your workflow:

→ Patient updates

Inputting patient data into the EMR is a daily occurrence. From the collection of personal information to diagnosis details and insurance policy numbers, patient charting is labor-intensive.

RPA makes changing patient records quick and accurate. The software can extract, interpret, and process data from PDFs, handwriting, emails, images, and scans. Clicks and actions on the screen can be recorded and then automated to classify medical documents into different categories, such as insurance cards, claims forms, and medical reports.

→ Creation and deletion of dummy records

A key part of testing the EMR involves creating batches of dummy patient data, importing them into the EMR, running tests, and then removing the dummy data. RPA streamlines this process, saving time and allowing hospital staff to concentrate on testing the most critical functions and configurations on the EMR.

→ Data validation

All data entered into your EMR must be accurate; otherwise, patients could be at risk. The chance for human error when manually entering data is too high. RPA allows you to set up rules to ensure that all data is accurate to maintain patient safety. Automation helps validate information to ensure that it adheres to regulations and is ready for audit. Furthermore, with fewer errors in the system, providers will experience fewer payment delays and other financial hiccups.

→ **System Integration**

To be effective, healthcare providers use a mix of systems — some old, some new. With legacy systems and traditional management workflows, processing errors are bound to occur. But with RPA, the software can export data from legacy systems into privacy-compliant data warehouses before migrating the data to a new or upgraded system. EMRs must also connect to various external systems, such as those at pharmacies and insurance companies. By implementing RPA, patient information flows rapidly and securely between platforms, simplifying administrative tasks and reducing risk.

→ **Patient communications**

Online scheduling is common practice for many patients. However, managing these scheduling systems has become a substantial burden on healthcare staff.

RPA makes it easier to notify patients and healthcare professionals of appointment changes, reschedule missed consultations, and send reminders to collect prescribed medication. RPA can also help quickly identify gaps in schedules for elective surgery or procedures and communicate this information to patients, reducing waiting lists and improving care.

→ **Medical inventory**

Managing medical inventory at a hospital or other healthcare practice can be a complex process with severe consequences if essential supplies run out. RPA can help reduce errors and ensure accuracy by monitoring medicine stock levels and sending automated notifications when supply levels get low.

How can RPA benefit you?

Healthcare is a fast-paced environment with many time-intensive and repetitive jobs. Certain processes are tedious yet necessary for delivering exceptional patient care.

By implementing RPA, healthcare providers can automate patient onboarding processes and increase accessibility and security across interconnected systems.

Up to 60%

of US hospitals could see negative margins by 2025 if they are unable to achieve productivity growth.⁷

Patient data and lab reports are more accurate because human error declines considerably with the use of RPA. Continuous monitoring and recording of inputs results in improved transparency, ensuring that records are ready for audits.

By improving these processes to boost data quality, healthcare companies can more easily reduce risk, adhere to regulations, and make better use of data tools. Ultimately, smart use of automation can support improvements in performance measures by accreditation bodies such as the National Committee for Quality Assurance (NCQA) or government agencies like the Agency for Healthcare Research and Quality (AHRQ).

RPA goes beyond improving and optimizing clerical work; it hugely benefits your patients too.

Key Benefits

- reduced costs
- improved scheduling
- less human error
- better patient experience
- greater employee satisfaction

By automating administrative tasks, the amount of time healthcare professionals spend with patients increases. And the more time spent with patients, the better quality of care

It's not just administrative tasks that can be automated — so too can patient-facing interactions. By having software take care of things such as appointment notifications, patients miss fewer appointments, administrators can streamline patient onboarding, and providers can deliver documentation like e-prescriptions much faster.

Patient care improves as a result. Better care can benefit the healthcare provider's quality scoring when discharged patients provide feedback about their experience for the Hospital Consumer Assessment of Healthcare Providers and Systems survey.

The benefits don't end there. Because RPA doesn't require previous coding knowledge, many users can benefit from recording and automating workflows. This means that RPA initiatives can benefit from contributions from across the business.

[eBook: RPA the Eggplant Way](#)

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Testing the graphical interface has meant that we're not necessarily reliant on highly specialized development skills for all aspects of the process. We're able to use business analysts to build the majority of our flows with some support from our higher end development team within the Trust as and when needed, rather than that being required for all aspects of every build.”

**David Wyndham Lewis,
Director of Transformation and Technology - NHS Foundation Trust**



Testing to support the rise of on-demand healthcare.

As healthcare embraces technology and digital continuous care becomes a reality, a patient's experience often begins at home. Recent world events have underscored this fact.

Under huge amounts of strain, healthcare professionals have used technology more than ever to care for and treat patients. Remote care became the norm as providers used telemedicine to avoid overflowing waiting rooms. Out of this necessity, “on-demand” healthcare has continued to grow in popularity as more patients want to interact with healthcare providers online via systems like MyChart.

However, this new way of doing things poses a new set of challenges around maintaining online patient-facing systems and reducing the stress on IT infrastructure.

To understand how peak traffic will impact the performance of these interconnected platforms, IT teams are turning to performance testing tools. These allow teams to “dial up” network activity to see how critical infrastructure withstands peak loads, as well as any changes in the patient and clinician-facing user experience.

Considering that patients will access portals and systems from different browsers and devices, replicating what the patient sees with user-centric performance monitoring is essential when examining the reliability of on-demand healthcare portals.

This process should unveil areas of needed improvement, whether on the software side or in terms of infrastructure provisioning — and often some mix of the two. Patients will benefit from a smoother online experience while scheduling appointments, accessing health guidance, and arranging lifesaving procedures. IT departments will have one less thing to worry about.

When technology worries evaporate, delivering quality patient care can remain your No. 1 concern.





**2 types of
medical devices
that need robust
testing.**



The use of medical devices continues to grow in healthcare. The Internet of Things (IoT) gave rise to the pervasiveness of medical devices in the field, at home, and on medical premises.

No matter where they are, these devices must work. There are no excuses for faulty products.

Having a 95% operational success rate is not good enough when patient lives are at risk.

This situation raises the stakes when it comes to testing and poses some challenges. But with AI-powered test automation, these problems can turn into opportunities.

Two main types of medical devices need robust testing:

- on-site medical devices
- wearable devices

2 main types of medical devices that need to be tested and why.

On-site medical devices.

We have all come in contact with a medical device of sorts when visiting a clinic, doctor's office, surgery facility, or hospital. Our expectations are high that they will work and play a major part in improving our health.

With test automation as part of your testing strategy, medical device reliability, usability, and performance will help save lives and deliver quality patient care as expected.

Systems that use medical imaging techniques, including X-rays, computed tomography (CT) scans, and magnetic resonance imaging (MRI), often use custom code. Usually, the software is embedded, making it difficult to access the source code. Picture archiving and communication systems, critical for storing and accessing these medical images, can span a viewing station, a controlled server room, and the medical imaging devices themselves. As data moves through the system, each part of this journey requires proper testing to ensure accuracy and ease of access.



On-site medical devices cont.

Testing via the graphical user interface addresses the concerns around embedded software. This noninvasive approach means that you can test anything you see on a screen. You can also investigate the user experience to make sure these machines are simple to operate.

To further ensure that these machines remain operational, AI-assisted automation increases test coverage when conducting exploratory testing. This process results in finding more defects in less time compared with manual testing and reduces the number of bugs that ultimately end up in production.

When updating any piece of software, further issues may occur. Regression testing ensures that the software and device perform as expected with each new release. This process involves many repeatable and mundane tests, which can introduce human error.

In this case, test automation mitigates risk and runs regression tests much faster. Because these tests are conducted via the UI, changes to the look and feel of the software between versions won't break existing test scripts.

Finding defects and testing the UI are just half the battle. Without connecting to an EMR, the machines work in isolation and can't transmit potentially lifesaving information to support patient care. Integration or interoperability testing maintains a strong connection between devices and EMRs.

[White Paper: How IoT is Transforming the Future of Healthcare](#)

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**Product quality has been
enhanced by strengthening
test coverage and shortening
lead time by executing
automated tests.”**

Mr. Wataru Sasaki - FUJIFILM Software CoDirector of Transformation and Technology



Wearable devices.

The rise of health and fitness devices, smartphone apps, and watches aligns with the rise of telemedicine. As technology advances, a growing number of healthcare providers are using wearable devices to remotely monitor their patients.

Not only can these devices support predictive healthcare, such as identifying issues like irregular heartbeats, but they can also record data when monitoring blood pressure, weight, and glucose levels.

This leap in technology has begun to save healthcare providers and insurers money too, as it encourages preventive care by identifying potential long-term health issues.

Wearable devices are also expanding the reach of care for patients in remote and rural areas. These systems can transmit data back to an EMR where health reports can present in real-time.

Through health apps and wearable devices, preventive care could save US healthcare providers close to

\$7 billion per year.⁸

But as telemedicine's adoption increases, these devices must undergo rigorous testing to ensure that they connect to an EMR system. More importantly, they must be reliable. Simulating network conditions to ensure that a medical device continues to work across cellular (5G), cable, and Wi-Fi connections is essential.



Wearable devices cont.

Device software undergoes continuous updates, so regression testing investigates new versions and updates to ensure that they work as expected. This process involves a raft of repetitive tests, so using test automation saves time and reduces mistakes from tester fatigue.

With multiple devices and operating systems in use, non-invasive testing from the user perspective ensures that your patients' device experience matches their quality of medical care.

As the influence of medical devices and IoT increases, there will be challenges when developing medical products and the software that makes them tick. AI-powered test automation gives you the confidence that you can perform testing faster and more efficiently than manual testing, no matter how often it needs doing.

Testing this way lets you divert your focus from technological concerns and focus firmly on patients.

Conclusion.

As technology takes on greater importance to our healthcare system, testing capacity must keep pace.

From customer EMR configurations to patient-facing portals and medical devices, every component of the healthcare ecosystem must seamlessly connect. To fully test everything, hospitals need effective test automation software.

Eggplant, from Keysight Technologies, is the non-invasive test automation solution trusted by EMR vendors like Epic and Cerner, as well as the award-winning healthcare systems and hospitals that rely on their software.

To learn how Eggplant can empower you to take your software to the next level, please [visit our healthcare resource center](#). You can also [request a free trial](#) to see Eggplant in action.

Related Resources.

¹ *Telehealth market size, growth, share | Global industry analysis [2027]*. (2021). Retrieved from <https://www.fortunebusinessinsights.com/industry-reports/telehealth-market-101065>.

² *Deloitte 2018 Survey of US Physicians*. Deloitte, 2018. https://www2.deloitte.com/content/dam/insights/us/articles/4627_Electronic-health-records/DI_physician-survey.pdf.

³ *Electronic Health Records to Facilitate Clinical Research*. 2016. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5226988/>.

⁴ "How the Virtual Health Landscape is Shifting in a Rapidly Changing World." Deloitte Insights. Accessed September 20, 2021. <https://www2.deloitte.com/us/en/insights/industry/health-care/physician-survey.html>.

⁵ "Gartner Says 50% of U.S. Healthcare Providers Will Invest in RPA in the Next Three Years." Gartner. Accessed September 20, 2021. <https://www.gartner.com/en/newsroom/press-releases/2020-05-21-gartner-says-50-percent-of-us-healthcare-providers-will-invest-in-rpa-in-the-next-three-years>.

⁶ Ibid.

⁷ *The uncertain road ahead*, Deloitte, 2017. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/life-sciences-health-care/us-lshc-hospital-financial-performance-emerging-technologies.pdf>.

⁸ "Digital Transformation in Healthcare in 2021: 7 Key Trends." DAP. Last modified April 26, 2021. <https://www.digitalauthority.me/resources/state-of-digital-transformation-healthcare/>.

Buyers guide:

Evaluating test automation solutions.

This guide comes loaded with key considerations, common pitfalls to avoid and practical questions every business should ask when choosing a test automation solution.

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