RFID in Oncology Clinics

Use of RFID to enhance the patient experience, increase safety and eliminate treatment errors

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ALLIANCE ONCOLOGY
A Division of Alliance HealthCare Services

XECAN™
Increase Patient Safety

Table of Contents

Executive Summary

Alliance Oncology is the first radiation oncology organization to integrate RFID technology into an oncology Electronic Medical Record (EMR) at their radiation treatment centers, offering patients a safer and more inviting clinic experience. Alliance chose Boston-based XECAN to develop this cutting edge solution which is fully integrated with their EMR. Breakthrough wedge technology, seamless EMR integration, with no need to modify the EMR software, and agent software embedded in the RFID readers, make XECAN's RFID Oncology Solution cost effective, unique, and truly plug-and-play.

XECAN's RFID system offers significant benefits over barcode technology, eliminating errors such as "wrong patient" and "wrong treatment," thereby ensuring patient safety while enhancing patient satisfaction and improving operational efficiencies. Features include patient flow and queuing and automatic opening of the patient chart and treatment plan in the EMR software. In addition, asset tracking and clinical analytics are viewable through the XECAN web portal running in a standard browser.

Since September 2010, when the system went live at the Commonwealth Newburyport Cancer Center in Newburyport, Massachusetts, Alliance's cancer patients, healthcare providers and administrators know they can rely on XECAN's RFID Oncology Solution to support the highest standards of cancer care available today.

Introduction

Alliance Oncology operates 26 radiation therapy centers and stereotactic radiosurgery facilities in 10 states across the US. Alliance's commitment to patient safety continually drives the company to explore technical innovations to improve their clinical practice. Per Halvorsen, Alliance Oncology's Director of Medical Physics, invited XECAN to the Commonwealth Newburyport Cancer Center at Newburyport, Massachusetts, to explore the possibility of developing an RFID solution for patient identification that could be integrated into the oncology EMR.

Although Alliance was satisfied with their barcode solution, they also knew that some patients had problems scanning their patient cards. Seniors and others with poor eyesight or hand-eye coordination had particular difficulty, especially if the barcode were smudged. If RFID technology could eliminate these types of problems, patient satisfaction as well as safety would be improved. If such a solution could also be integrated with the oncology EMR software, huge safety gains would be realized by automatically opening patient charts and verifying in real time the accessories required for their treatment.

A few months later, Alliance Oncology selected XECAN to design and develop what is now known as the XECAN RFID Oncology Solution. Alliance was impressed with XECAN's successful commercial products and deep RFID expertise, but both companies understood that seamless integration, from reception area to treatment room, was key to the success of the project. And, of course, the system needed to be lean and cost effective.

A strong collaborative effort between Alliance Oncology's clinical team and XECAN's experts produced results in a matter of months, with an integrated RFID-EMR solution validated in a clinical environment. Every day now, Alliance Oncology's cancer patients and their health

care providers know that patient safety and well-being are protected by this cutting edge technology.

XECAN RFID Oncology Solution

Below is an overview of the XECAN system components and how they work in the Commonwealth Newburyport Cancer Center.

System Components

The XECAN system includes: patient lanyards, RFID readers, a gateway processor, EMR wedge software, and RFID web portal as shown in Figure 1. RIFD lanyards are worn by patients. Readers are installed at various locations in the clinic, and tag readings are processed by the XECAN gateway's business logic. Wedge software agents are installed on the EMR desktop to integrate with the EMR system for patient queuing, chart opening and treatment procedure tracking. The RFID web portal provides functions to improve operational efficiencies such as patient flow, asset tracking and inventory management, and produces various analytics for clinic operations. Patient-identifiable information can only be viewed within the clinic and only by authorized staff members.

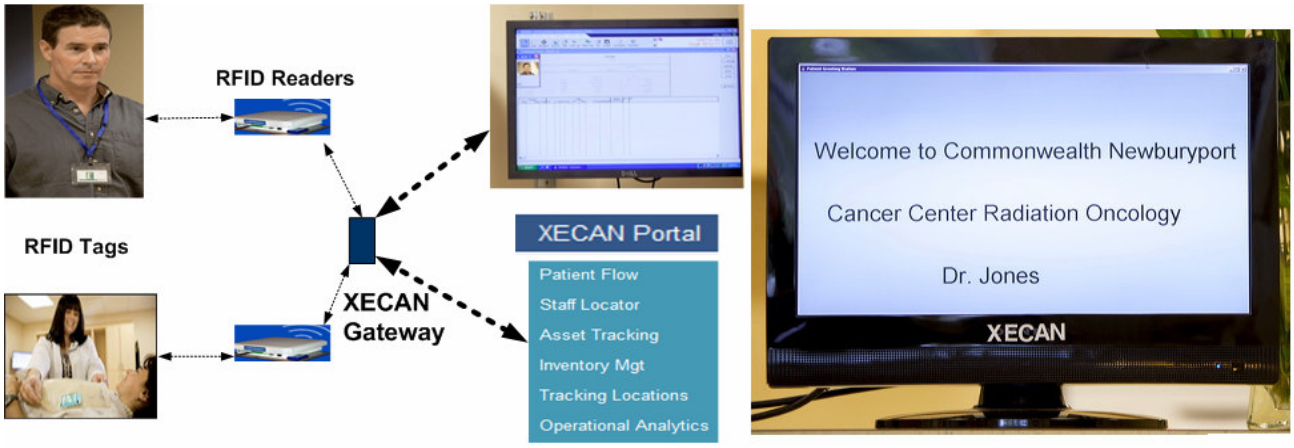

Figure 1: The XECAN system component block diagram

Patient Tracking, Patient Queuing and Treatment Delivery

Figure 2: Patient lanyard, reception area and patient greeting station

Each patient receives a unique XECAN RFID lanyard. Upon entering the reception area, the RFID reader, which is concealed above the ceiling, automatically identifies the patient and, through the XECAN EMR integration, simultaneously places him/her in the EMR daily schedule queue. Multiple RFID readers are installed throughout the facility to provide real-time patient location and flow data. RFID technology is non-intrusive and, unlike barcode scanners, does not require line of sight. Patients need only pass within approximately 15 feet of any reader to be recognized.

Figure 3: Opening patient chart and treatment plan

When a patient walks into a CT scan room or treatment vault, s/he is identified automatically by the RFID reader in that room. His or her patient chart and treatment plan are immediately opened with 100% accuracy. If another patient's chart is open in the EMR system at the time of the patient's arrival into the procedure room, the first chart is closed and the chart of the patient who is physically present is automatically opened. Therapists, doctors, and patients can be confident that "wrong patient" medical errors are eliminated.

Figure 4: Verifying treatment delivery setup

Treatment devices are tagged so that they can be detected by XECAN RFID readers during treatment. Through the interface to the treatment plan in the patient's EMR, XECAN's software automatically ensures the correct patient accessories are present, including positioning devices and bolus. Radiation cannot be started if treatment devices are incorrect or missing, ensuring safe, secure, and reliable treatment.

Web portal to monitor patient flow, track assets and operation analytics

The XECAN web portal is the clinic staff's window into clinic operations. Any staff member with the proper permission can log onto the web portal to view patient flow. Detailed information such as the time the patient arrives at the clinic, enters into the treatment room, finishes treatment and departs, is recorded, as shown in Figure 5. It should be noted that the patients' personal information is not passed to the web portal.

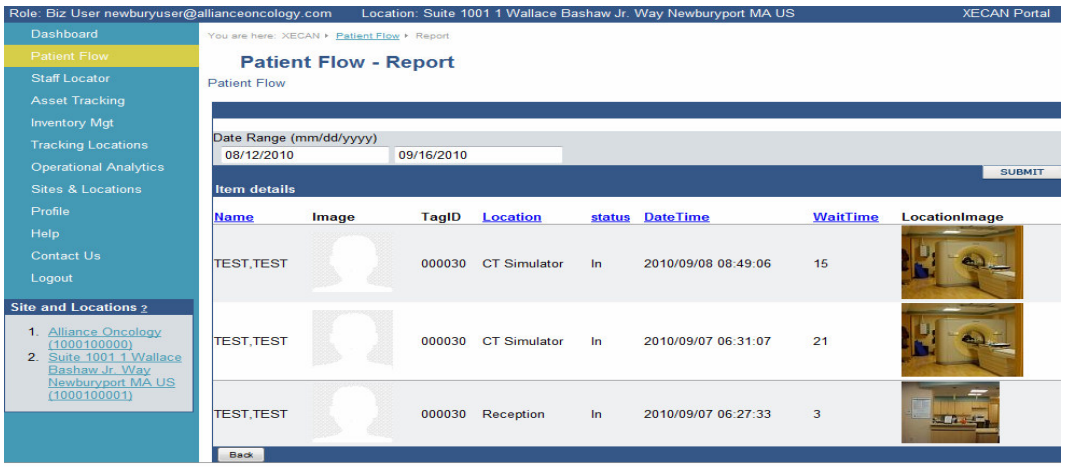

Figure 5: Patient waiting time at different locations

The web portal also permits asset tracking, to locate instruments and supplies throughout the department. Staff can find devices by looking on the web portal, rather than searching on foot around the facility, increasing treatment efficiency and preventing loss (see Figure 6). Data

may be passed to an inventory management system for reordering products such as thermoplastic masks and other disposable items.

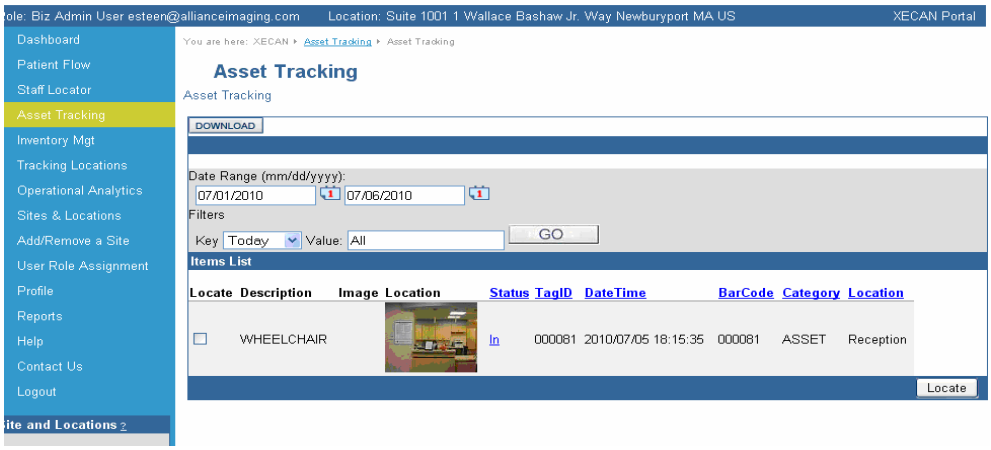

Figure 6: Asset tracking

From the detailed patient, asset and other clinic data, various reports and analytic charts can be generated to improve operational efficiencies as shown in Figure 7.

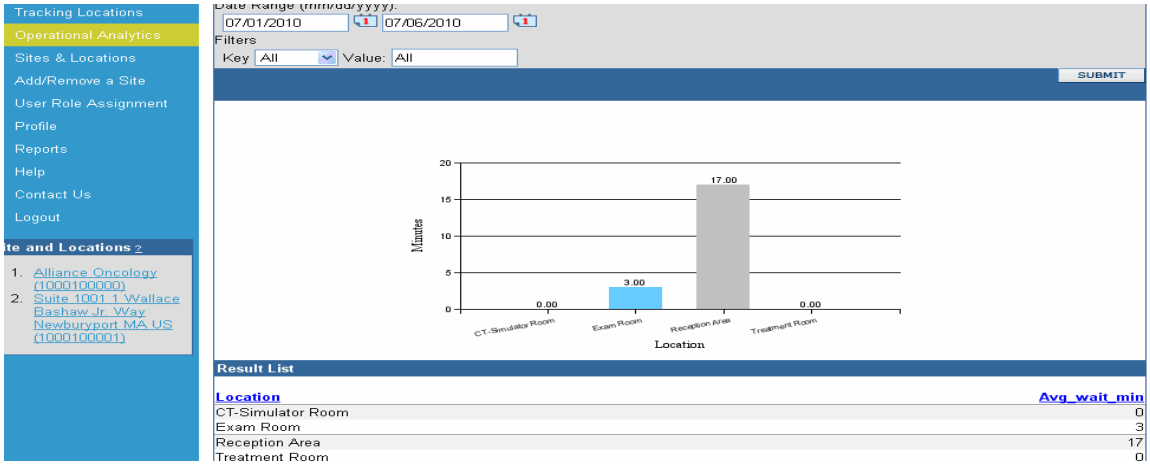

Figure 7: Analytics and graphing and reports

What is unique about the XECAN RFID Oncology System?

XECAN is not the only healthcare RFID technology solution in the marketplace, but XECAN has three distinct technological advantages:

EMR Wedge Integration Agent

XECAN's proprietary wedge software is a small footprint, low-level MS Windows agent which interfaces with the clinic's EMR software. Importantly, the XECAN wedge does not require any modification of the EMR software.

RFID Lanyard and Wristband Worn by the Patient

XECAN uses a special, patent pending RFID lanyard and wristband which the patient wears. Consistent with XECAN's design principles, the system is non-intrusive and does not require manual handling: patients need only walk by the installed readers to be recognized

Figure 8: The XECAN patent pending lanyard can be reliably detected by the RFID readers in clinics. It has a very small form factor (1.2"X2.1")

Proprietary, Economical Plug-and-Play Agent Software

XECAN's breakthrough agent software, which is embedded in the RFID readers, makes our solution truly plug-and-play and eliminates the need for expensive RFID middleware. By removing an extra layer of software and server, the XECAN solution is more affordable compared to other solutions.

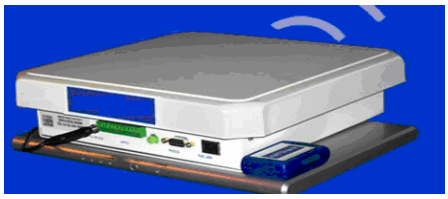

Figure 9: The XECAN agent embedded intelligent RFID reader

What is RFID?

A RFID system consists of two main components: a tag and a reader. Tags are placed on objects or people and contain information about the object or person. The reader, activated automatically, uses RF energy to "wake up" or interrogate the tag and read the information it contains. If you have used EZPass at a toll booth, then you have already used RFID. An RFID (EZPass) tag is installed on your windshield. When you pass through the toll station, the tag is read by an RFID reader installed nearby (see Figure 10).

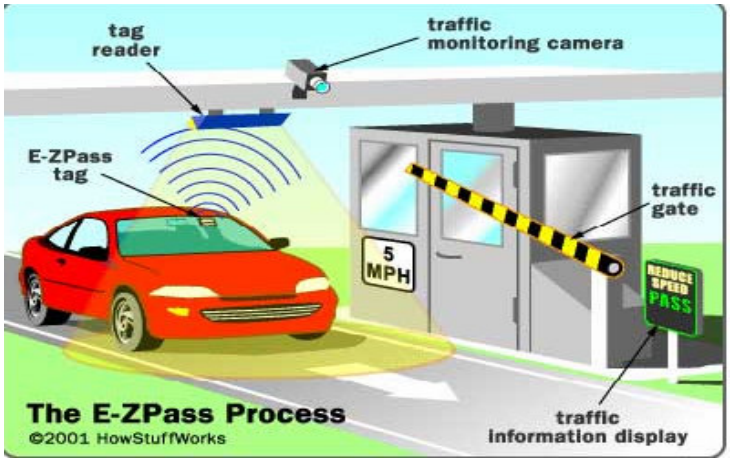

Figure 10: A car is identified at a RFID EZPass entrance

In the oncology clinic setting, an RFID lanyard or wristband (tag) is worn by the patient. The RFID reader is normally concealed above the ceiling as shown in Figure 11. When the patient passes within approximately 15 feet of the reader, s/he is identified automatically as the tag is read.

Figure 11: Patient with an RFID lanyard is identified automatically in a clinic

RFID is ambient intelligent, meaning that it is always on. It does not require line-of-sight communication and has a reading range of a few to a few tens of feet without any human intervention. These features make RFID especially suitable for improving patient care and safety in oncology clinics.

Is RFID Safe to Use in Oncology Clinics?

No Interference with Pacemakers and other ICDs

The U.S. Food and Drug Administration's (FDA) Center for Devices and Radiological Health is responsible for regulating companies that manufacture medical devices sold in the United States, as well as for regulating radiation-emitting electronic products (medical and non-medical) such as lasers, x-ray systems, ultrasound equipment, microwave ovens and color televisions. It conducted an RFID safety study in a laboratory. The study involved exposing 15 implantable pacemakers and 15 implantable cardioverter-defibrillators (ICDs) to an interrogation field. Each device manufacturer provided an engineer for testing its own implantable devices. Each device was turned on, and proper operation was verified in a clinic.

The findings showed that at the frequencies used by the XECAN readers, no measurable reaction was observed from either the pacemakers or the ICDs.

Benefits of RFID versus Barcodes

Oncology administrators are constantly searching for ways to improve patient safety and provide a quality clinic experience, while simultaneously managing costs and lowering potential liability. Wrong patient and treatment chart errors could potentially harm many patients every year. Barcode solutions have been used in an attempt to identify patients and verify treatment setups.

But barcode technology is a manual process for both patients and therapists. A barcode wristband or card may be smudged or torn, making them hard or impossible to read. In the treatment room, a therapist must manually scan the patient's barcode identification card. Similarly, each accessory must be scanned individually. This takes time, and if not done properly can lead to medical errors. As explained previously, RFID offers unique technological advantages over barcodes to automate these manual processes, with several benefits as outlined below.

Eliminates Wrong Patient Errors

Manual patient barcode verification is replaced with automated RFID identification. Wearing a lanyard or wristband, patients are identified automatically across the clinic. Doctors and therapists can be certain of "right patient, right site" every time.

Eliminates Wrong Treatment Technique Errors

Similarly, the manual opening of the patient's chart or treatment plan is replaced with an automated RFID process. The patient's chart or treatment plan is automatically opened as soon as s/he walks into any treatment, CT Simulator, or exam room. RFID also automatically matches the treatment devices to the patient's treatment plan, to ensure that the right treatment is given to the right patient.

Improves Clinic Experiences

Patients no longer need to position their barcode identification cards in order to be checked in. RFID automates the process entirely: As soon as patients enter the clinic, they are automatically queued in the EMR software system.

Increases Operational Efficiency

RFID provides detailed patient flow information and the ability to track oncology assets and inventory. Clinics may operate more efficiently and enhance patient satisfaction by identifying any patient flow bottlenecks that may exist. Tracking assets and inventory in real-time offers opportunities to reduce costs.

Comments from Users

"Patient safety is our top priority. By eliminating all manual intervention to automatically open the treatment chart for the patient who enters the procedure room, we can be certain that we have the 'right patient, right site' with every single treatment session. A fully integrated RFID-EMR solution represents a substantive improvement in patient safety. Our testing to date has shown the system to be highly robust".

Per Halvorsen, Director of Medical Physics, Alliance Oncology LLC.

"Radiation safety is an important focus in radiation oncology. Through Alliance Oncology's collaboration with XECAN we were able to address this very important issue in our clinics. We can guarantee that we have the right chart and right patient every time. Alliance Oncology is committed to providing the best patient care for all our patients. When explaining the use of the RFID lanyards to our patients, a smile of reassurance comes over their faces, knowing that here at Alliance Oncology we have taken the extra steps to ensure the accuracy of their treatment each and every day. The use of the RFID technology can also help identify workflow issues in the clinic, which in itself can make for a better patient experience. When adding the benefit of asset management to your company, it makes it hard to understand why one would not want to have this technology implemented. My experience working with XECAN has been pleasant and effortless. They have exceeded every target goal, taken all our suggestions and implemented them. They have offered around the clock support throughout the implementation. I would recommend XECAN to any clinic, hospital, or business to help them answer their needs."

Tammy Miron, RTT, Site Administrator
Alliance Oncology, Commonwealth Newburyport Cancer Center

"Alliance Oncology considers safe patient treatment a foremost priority and in the modern era of radiotherapy treatment we use a variety of systems to deliver accurate, high-quality care. In an effort to move beyond the conventional tools in place at other facilities, we developed a relationship with XECAN to expand the capabilities of our electronic medical record (EMR) system. With the RFID tools that XECAN helped us implement, we have strengthened our system to better ensure that patients are

uniquely identified throughout the department, particularly while receiving treatment on the linear accelerator. In early 2010, Alliance and XECAN developed a plan around using RFID as a tool for identifying patients and interfacing that identification with the EMR in place at Commonwealth Newburyport Cancer Center. Throughout the collaboration, XECAN met or exceeded all expectations by developing solutions well ahead of schedule and being available during all hours of clinical operation to ensure that the solutions worked appropriately. Bin, Barney, and the entire XECAN team have provided outstanding customer support throughout the entire process. Alliance is now positioned to implement RFID in a wider range of our facilities. As the EMR becomes a more integral part of healthcare, tools like the RFID system that XECAN worked with Alliance to develop will be essential. On a personal level, I feel very fortunate to have been a part of the development effort and I look forward to seeing the RFID – EMR system used to its fullest potential."

Bruce Crawford, Senior Medical Physicist
Alliance Oncology, Commonwealth Newburyport Cancer Center

Conclusion

Because current barcode technology is a manual process, it is less user friendly in comparison to RFID, and cannot adequately address patient identification problems or eliminate treatment error issues. Oncology EMR integrated with XECAN RFID technology automates patient queuing, opens patient charts and treatment plans, and verifies accessories, offering a level of safety, security, and reliability never before achieved in radiation therapy. Additional features include asset tracking, inventory management and clinical analytics, enhancing operational efficiencies while helping to contain costs. XECAN's RFID solution is plug-and-play, cost effective, integration ready for most EMR systems on the market, and does not require modification of the EMR software.

Acknowledgement

Thanks so much to Alliance Oncology leadership and clinical staff for the opportunity to work and make a little bit of history together. Per Halvorsen's vision, drive and technical savvy are the reason why we have an integrated solution to talk about. Very special thanks to Ed Steen, Joe McGrath, Bruce Crawford, Tammy Miron, Amy Brigham, Angela Tambini, Whitney Lebs and other Alliance Oncology clinical and IT staff for their cooperation and assistance.

Thanks to my colleagues at XECAN Barney Szeto and Femi Omojola for working around the clock for weeks at a critical design and testing phase - you pulled through it brilliantly. Thanks also to Dori Lavefe, Denise Barbosa Lane, Jeff Freeman and Tom Dwan for various marketing, PR and other support. Thanks to my colleague Elaine Bresnick for her revisions and comments for the paper.

About the Companies

Alliance Oncology

Alliance Oncology partners with hospitals, physicians and other healthcare providers to set a new standard of care for cancer patients by establishing state-of-the-art cancer centers or upgrading existing facilities with advanced technologies, including Intensity Modulated Radiation Therapy (IMRT), Image Guided Radiation Therapy (IGRT) and Stereotactic Radiosurgery (SRS). Alliance's comprehensive turnkey solutions also include the expertise and resources to provide market analysis, management and staffing, billing and collections, and marketing.

Alliance Oncology operates 26 radiation therapy centers and stereotactic radiosurgery facilities in 10 states across the nation. We also share the strength and resources of our sister division, Alliance Imaging, the nation's largest provider of advanced outpatient diagnostic imaging, including MRI, PET/CT and CT services. Alliance Imaging serves more than 1,000 clients across 46 states. Together, as part of Alliance HealthCare Services, we are able to address the complete array of needs for cancer centers – from early detection enabled by advanced diagnostic imaging to exciting new technology in IMRT, IGRT and SRS.

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XECAN

XECAN is a Boston-based RFID technology company incorporated in 2007. XECAN's RFID web portal has been successfully deployed in several healthcare and supply chain businesses prior to our work with Alliance Oncology. XECAN's core team of MIT-trained engineers has many years of experience in the enterprise software industry, where they learned of the pain felt by businesses that lacked an easily integrable and versatile enterprise solution. Through work on RFID technology at MIT's Auto-ID center, XECAN subsequently developed plug-and-play technology and the secure enterprise-quality software infrastructure that RFID applications require. Plug-and-play and wedge integration technology pioneered by XECAN enables organizations to simply connect readers to the Internet, and immediately begin managing them and the business data they generate from any web browser. The executive dashboard, report generation and analysis tools from XECAN enable organizations to achieve rapid time-to-value using RFID technology. Based on its MIT research heritage, XECAN is proud to be a MIT Venture Mentoring Service company.

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