
Tracking medical devices: The role of active and passive RFID as part of an effective medical device management system

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Abstract

Effective inventory management of medical devices is transitioning from being an ideal to a necessity. Clinical and medical engineering teams across the UK and worldwide face a daily and entirely avoidable battle to locate equipment. Moreover, the raft of legal, regulatory and policy forces driving the adoption of an effective medical device management system has never been greater.

RFID (radio-frequency identification) technology is proven to be highly effective in managing medical devices, providing a fast and accurate way of capturing asset data and automatically tracking the location of devices.

This white paper provides a comprehensive overview of the reasons driving and supporting the adoption of RFID technology, as well as explaining how RFID works and can be applied in a healthcare setting. It also explains in detail the benefits of using RFID, categorised into the four key areas of cost reduction and avoidance, improved quality of care, improved risk management and increased efficiency.

Finally, to illustrate how trusts across the UK are using RFID to improve the management of medical devices, this white paper is supplemented by four case studies.

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Section 1

Drivers behind the need for device tracking as part of an effective medical device management system

Medical devices such as infusion pumps, ECG monitors, beds, syringe drivers and many others play a crucial role in our healthcare service. They provide the essential means of diagnosis, treatment, care, monitoring and rehabilitation.

Every hospital in the UK is equipped with thousands of medical devices worth billions of pounds. Yet, despite this massive and critical investment, many medical device management systems leave much scope for improvement.

All too often, clinical and medical engineering teams face a daily battle to locate equipment. Mobile devices in particular are frequently being underutilised and poorly maintained, creating a significant yet avoidable cost and risk burden. Inevitably, compromises in relation to time and cost efficiency, safety, patient care and risk management are common.

There are many reasons why it is important to know the current location of mobile medical devices (Figure 1) but essentially, there are two key drivers behind the need for RFID device tracking as part of an effective medical device management system. As explained below, these drivers include difficulties in managing and locating medical devices, and legal, regulatory and policy forces.

Figure 1: Why it is important to know the current location of mobile medical devices:

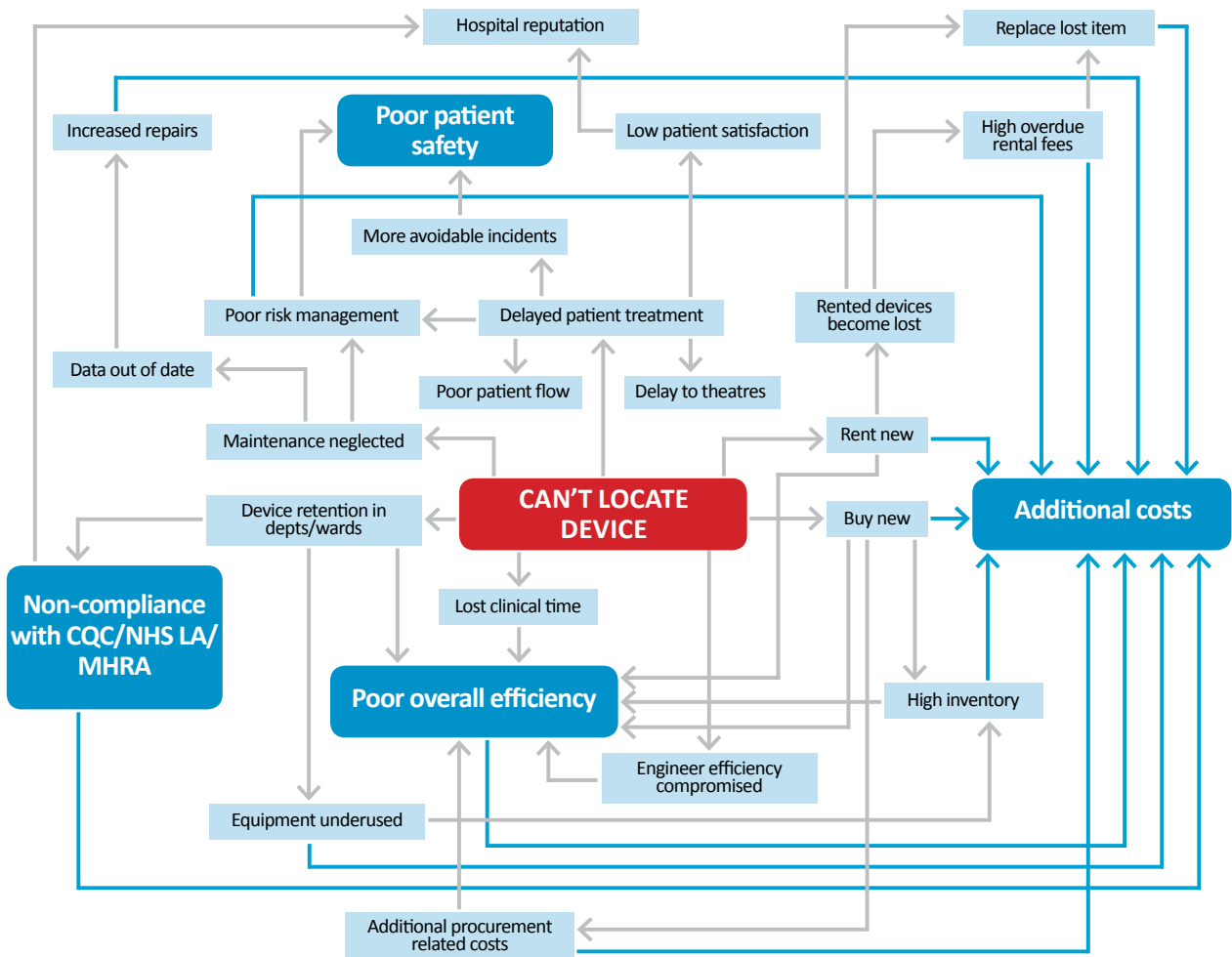
- Increase clinical and medical staff productivity by eliminating time spent searching for devices
- Provide prompt patient care
- Maximise device utilisation
- Prevent/reduce device loss
- Manage loan requests
- Manage cleaning and repairs
- Undertake statutory maintenance (planned preventative maintenance or PPM)
- Demonstrate proactive regulatory compliance
- Reduce risk

Key driver 1: Difficulties in managing and locating medical devices

Thousands of medical devices in a vast and busy hospital coupled with hundreds of staff vying for their use creates a complex network of tracking and management challenges.

Difficulties in locating and obtaining medical devices commonly makes problems worse as staff respond by hoarding devices. More often than not, these issues lead to significantly inflated costs stemming from multiple sources, such as high inventory levels, poor risk management as well as low equipment efficiency, utilisation and maintenance. Figure 2 illustrates the intrinsically linked nature of this problem.

Figure 2: The intrinsically linked challenges of managing medical devices



The cost of poor medical device management is vast and can be summarised as follows:

- Inability to find devices when needed
- Increased clinical and medical engineering time spent searching for devices
- Increased and unnecessary investment in additional devices
- High proportion of device misplacement and loss
- Increased requirement for maintenance and repairs
- Substandard device maintenance
- Compromised healthcare including avoidable delays in care and increased risk exposure
- Unnecessary rental charges for hired devices

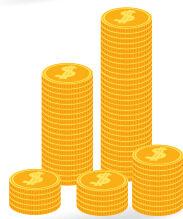
Facts:



*of nurses spend up to **60 minutes per shift** searching for supplies including wheelchairs and infusion pumps.¹ For a mid-size trust this equates to a loss of more than **36,500 clinical hours** every year or the equivalent requirement of **18 extra nurses** or healthcare assistants.²*



*The average hospital loses as much as **15 per cent** of its critical assets every year, leading to significant unnecessary costs relating to staff time spent searching for equipment, as well as purchasing new and renting additional equipment.³*



*Devices that cannot be found on two consecutive occasions for maintenance are typically retired – **often at a high expense.**⁴*

With the NHS under unprecedented financial pressure and RFID (radio-frequency identification) technology proven to be highly effective in managing medical devices, trusts across the UK are increasingly adopting RFID solutions.

¹ Cisco. 2009. *The High Cost of Nurses' Communication Challenges*.

² Based on 100 nurses/healthcare assistants spending 1 hour per day x 365. Equivalent to 18 extra nurses/HCAs.

³ ID TechEx. 2007.

⁴ RFID Journal Webinar, sponsored by IBM.

Key driver 2: Legal, regulatory and policy forces

Effective medical device management is essential for providing high quality patient care and satisfying clinical, regulatory and financial governance. There are several legal, regulatory and policy forces driving the adoption of effective device management practices:

MHRA

Acting to protect and promote public health and patient safety, the MHRA (Medicines and Healthcare products Regulatory Agency) regulates medical devices in the UK to ensure they comply with the Medical Devices Regulations.⁵ In particular, the MHRA aims to minimise the risk of new adverse incidents involving medical devices and reduce the likelihood of those that have already occurred happening again.

In its guidance for healthcare organisations, the MHRA states several typical causes of incidents with medical devices. These include inappropriate management procedures, inadequate servicing or maintenance and inadequate decontamination. It therefore makes a comprehensive set of recommendations for an effective medical device management system, including the need to record the current locations of medical devices and device/asset number to patients (Figure 3).⁶

Figure 3: MHRA 2015 recommendations for an effective medical device management system:

- A comprehensive, organisation-wide policy on the management of medical devices and a system in place which ensures that all risks associated with the acquisition, deployment, use, monitoring, record integrity, reprocessing, maintenance, record generation and storage, decommissioning and disposal of medical devices are minimised. Board-level responsibility for medical devices management is clearly defined and there are clear lines of accountability throughout the organisation, leading to the board
- A medical devices group with representation from a wide range of staff
- A comprehensive organisation-wide policy on the management of medical devices including: acquisition, deployment, use, monitoring, maintenance, decontamination and disposal

⁵ Medical Devices Regulations. 2002.

⁶ MHRA. 2015. *Managing Medical Devices: Guidance for healthcare and social services organisations.*

- A record of the current whereabouts/location of medical devices to facilitate a systematic approach to medical devices management and to help establish the relevance of any particular Medical Device Alert (or other MHRA advice) or manufacturer's Field Safety Notice to the organisation. Records of the action taken as a result should be maintained
- Mechanisms to distribute manufacturers' Field Safety Notices, MHRA Medical Device Alerts, as well as MHRA safety guidance to the appropriate people in the organisation and to report incidents
- Robust procedures to deal with all medical devices loaned within the organisation or to individual users. Independent contractors using medical devices have appropriate risk management systems in place and are aware of the overall policy and systems for medical device management within the healthcare organisation
- Connectivity between the healthcare organisation's strategic plan and the 'on the ground' equipment lifecycle management activities
- An evidence-based and methodical decision-making framework to optimise decisions taken within each stage of the equipment lifecycle
- Risk management as inherent in the management of medical devices

Regulation 16 of the Health and Social Care Act 2008 (Regulated Activities) Regulations 2010

Regulation 16 of the Health and Social Care Act 2008 (Regulated Activities) Regulations 2010 stipulates that equipment, including medical devices, is to be properly maintained, suitable for its purpose and used correctly. The registered person must also ensure that equipment is available in sufficient quantities in order to ensure the safety of service users and meet their assessed needs.⁷

The requirements of this regulation form the Care Quality Commission's (CQC) Outcome 11: Safety, availability and suitability of equipment, which is used for determining whether providers are meeting essential standards.⁸

Policy CEL 35 (2010)

For Scotland in particular, policy CEL 35 (2010) encompasses strategic asset management, including medical equipment, to optimise the utilisation of assets in terms of service benefits and financial return. To meet these requirements appropriate arrangements must be in place for the effective management of medical equipment.

⁷ Legislation.gov.uk. 2010. Access online at <http://www.legislation.gov.uk/ukSI/2010/781/regulation/16/made>

⁸ Care Quality Commission. 2010. Summary of regulations, outcomes and judgement framework.

NHS eProcurement Strategy

In 2014 the Department of Health published the NHS eProcurement Strategy.⁹ The strategy mandates that every NHS Acute Trust in England and every supplier of products and services into the NHS must comply with GS1 standards by 2019/20 to identify people, products and places.¹⁰ This requirement follows the Department of Health's initial and subsequent recommendations for the adoption of GS1 standards between 2007 and 2013.¹¹

“Adoption of GS1 global standards provides consistently safer healthcare with fewer mistakes, with clinicians spending less time on procurement activity, and with redundant activities and their associated costs being eliminated.”

Department of Health, NHS eProcurement Strategy, 2014.¹²

The adoption of GS1 standards is integral to ensuring efficiencies and improvements in the quality and safety of care are sustained and continuously improved across the NHS. As an additional GS1 application, GS1 standards can be applied to improve the management of medical equipment.¹³

Figure 4: GS1 frequently asked questions

Q: What is GS1?

A: GS1 sets standards for identifying, capturing and sharing information about products, assets, services, people, locations and more. Universally adopted in the retail grocery trade, GS1 standards create a familiar barcode which can be seen on every product pack.

Q: Why does the NHS eProcurement Strategy mandate the adoption of GS1 standards?

A: Using barcodes based on GS1 standards makes it possible for companies and healthcare providers to speak the same language and connect with each other. Ultimately, this can deliver improved patient safety, regulatory compliance and operational efficiencies. Countries including Australia and Canada are already using healthcare eProcurement systems with GS1 barcodes.

⁹ Department of Health. 2014. NHS eProcurement Strategy. Access online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/344574/NHS_eProcurement_Strategy.pdf

¹⁰ Department of Health. 2014. NHS eProcurement Strategy. Access online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/344574/NHS_eProcurement_Strategy.pdf

¹¹ Department of Health. 2007. Coding for Success.

¹² Department of Health. 2014. NHS eProcurement Strategy. Access online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/344574/NHS_eProcurement_Strategy.pdf

¹³ GS1 UK. 2016. Medical Equipment Management, <https://www.gs1uk.org/our-industries/healthcare/eprocurement/what-nhs-trusts-have-to-do/medical-equipment-management>

Using GS1 standards to improve medical equipment management systems

When used in conjunction with RFID tags, GS1 numbers and barcodes provide the necessary information and process controls to manage devices more effectively. Linking device barcodes to barcoded patient wristbands also makes it easy to record which medical equipment has been used on which patients.

Figure 5: A GS1 barcode on a medical device



The benefits of using GS1 standards for managing medical equipment include:¹⁴

- Reduction in clinical time spent searching for the assets
- Better device utilisation
- Capital cost savings from renting less equipment
- More accurate and efficient equipment maintenance
- Improved patient safety from electronic medicine and medical device tracking and tracing to a specific patient

What does efficient medical device management look like, according to GS1?¹⁵

- GS1 numbers, barcodes and RFID tags identify all medical devices, as well as locations, staff, patients and products
- Where possible, paper records replaced using barcode or RFID reading devices to update asset databases without the need for rekeying information
- Equipment commissioning, transfers, repairs and maintenance tracked using barcode or RFID readers in order to build up the accurate information required to improve asset management policies and processes

¹⁴ GS1 UK. 2016. *Medical Equipment Management*, <https://www.gs1uk.org/our-industries/healthcare/eprocurement/what-nhs-trusts-have-to-do/medical-equipment-management>

¹⁵ GS1 UK. 2016. *Medical Equipment Management*, <https://www.gs1uk.org/our-industries/healthcare/eprocurement/what-nhs-trusts-have-to-do/medical-equipment-management>

The Carter Report

Published in February 2016, The Carter Report sets out how non-specialist acute trusts can increase productivity and efficiency to save the NHS £5 billion each year by 2020 to 2021.

Lord Carter explains: “To improve the quality of care hospitals must grasp resources more effectively... The best performing hospital systems around the world have real-time monitoring and reporting at their fingertips enabling them to make decisions on a daily, weekly, monthly basis to improve quality and efficiency performance.”¹⁶

“To improve the quality of care hospitals must grasp resources more effectively... The best performing hospital systems around the world have real-time monitoring and reporting at their fingertips.”

Lord Carter, 2016.

In his interim report, Lord Carter highlighted the value GS1 standards can bring to the NHS. He affirmed the introduction of GS1 standards will help every NHS hospital in England to save on average up to £3 million each year while improving patient care.¹⁷

In his final report as part of ‘Recommendation 9’ Lord Carter also recommends that by October 2018 all trusts should have the key digital information systems in place, fully integrated and utilised. Where appropriate, these systems should include RFID.¹⁸

In summary, the message from these key forces which are driving the adoption of RFID is clear: an effective medical device management system must be in place.

¹⁶ Lord Carter of Coles. 2016. Operational productivity and performance in English NHS acute hospitals: Unwarranted variations. Access online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/499229/Operational_productivity_A.pdf

¹⁷ Lord Carter of Coles. 2015. Review of operational productivity in NHS providers: Interim report. Access online at https://www.gs1uk.org/~/_media/documents/carterinterimreport.pdf?la=en

¹⁸ Lord Carter of Coles. 2016. Operational productivity and performance in English NHS acute hospitals: Unwarranted variations. Access online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/499229/Operational_productivity_A.pdf

RFID: A solution for managing medical devices

RFID technology has been used for more than 50 years. The total RFID market is growing year-on-year and predicted to rise to \$13.2 billion by 2020. Today, the cost of manufacturing RFID tags has fallen to the point where certain types can be used as a disposable inventory or control device.¹⁹

How RFID works

Consisting of a small chip and antenna, RFID tags can be active or passive, and are attached to medical devices for management purposes. Both types of tags offer unique device identification and use radio waves to identify, and track and trace medical devices. Active RFID technology can also gather and report information about status and condition, such as temperature or humidity.

RFID tags can fulfil a similar function to barcodes by providing identifying information. However, RFID offers significant advantages over barcodes. Active tags for example proactively transmit a regular radio frequency signal with a unique ID which can be associated to a specific medical device. In contrast, passive RFID technology can enable more than a thousand tags to be scanned per second (Figure 6).²⁰

What's more, scanning can take place even when privacy screens are drawn around beds, doors are shut and rooms are occupied. This is because RFID readers do not require a direct line of sight. RFID readers can scan an entire room or ward to detect and total all tagged devices, regardless of how it is occupied. The received signals are then passed to a central database, either wirelessly or using a USB connection, for tracking and analysis by clinical staff and medical engineers.

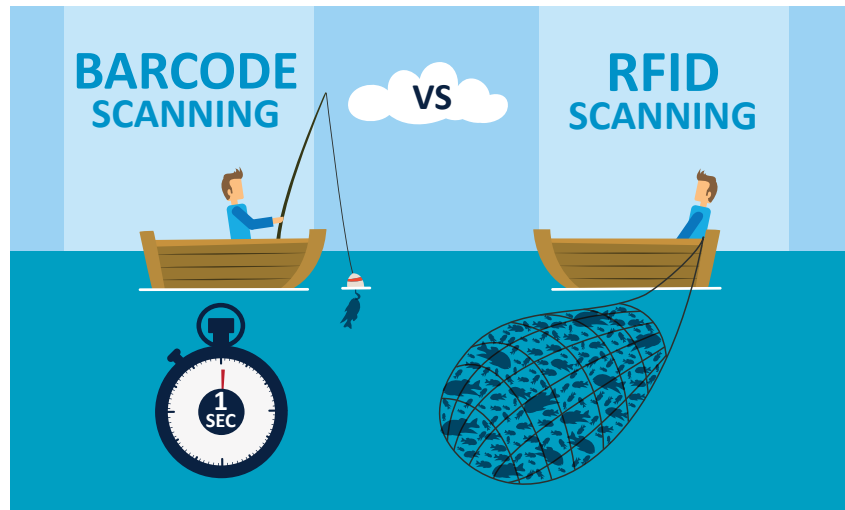
Fact:

An RFID reader can scan more than 1,000 tags per second and produce an accurate corresponding identity and location report.²¹

19 IDTechEx. 2015. *RFID Forecasts, Players and Opportunities 2016-2026*.

20 Based on the performance of the Speedway reader made by Impinj, the #1 selling RAIN RFID readers in the world.

21 Based on the performance of the Speedway reader made by Impinj, the #1 selling RAIN RFID readers in the world.

Figure 6: Barcode scanning versus RFID scanning

As well as tags and readers, RFID systems also include a database and software for processing the data. The software can be integrated with other equipment management systems for truly efficient and effective medical device management.

Importantly, depending on the RFID system type, users can search for devices in different ways. These include for example:

- 1. A web-based device search interface**
Clinical and medical engineering staff can search by device name or image with an easy to use and understand search interface, accessible from any internet-connected PC.
- 2. RFID and asset management software**
Medical engineering staff can search directly within the RFID and asset management systems and retrieve detailed device information in addition to location.
- 3. Handheld readers**
Where active mobile RFID readers are used, medical engineering staff can search for equipment as they move around the hospital, with location data displayed on the handheld device.

Active and passive RFID tags offer different benefits and have distinct roles for the purposes of tracking medical devices, as explained below.

Active RFID tags

Active RFID tags are fitted with an internal battery and proactively transmit a regular radio frequency signal with the unique ID associated with the medical device.

Signals, which are transmitted at regular specified intervals (typically ranging from every 20 seconds to every five minutes), are picked up either by a network of strategically placed fixed proprietary active RFID readers (Figure 7) or an existing Wi-Fi infrastructure. Medical engineers can also use handheld mobile readers (Figure 8) to detect the presence of tagged devices.

Figure 7: An example of a fixed proprietary active RFID reader



Figure 8: An example of a handheld active RFID reader



Fixed active RFID readers in a healthcare setting reliably and conveniently receive signals from a range of typically 30 to 40 metres.²² This makes active RFID tags ideal for tracking high-value mobile medical devices as well as those devices where it is important to have accurate and up to date location information, including high-risk medical devices (Figure 9). Many trusts also choose to tag fixed high-value devices with active RFID tags for security and financial auditing purposes.

Figure 9: Typical medical devices suited to active RFID tagging

Infusion pumps	Hoists
Syringe drivers	Bladder scanners
Beds	ECG monitors
Wheelchairs	Blood pressure monitors

Active RFID tags offer a higher level of intelligence by allowing information in addition to location to be communicated to the central database when used in conjunction with a Wi-Fi based system.

Active RFID tags are more expensive than passive RFID tags, costing approximately £30-£60 per tag. The internal battery has a lifespan which depends on the transmission frequency of the tag with replacement batteries costing as little as 20p and up to £4. Some trusts choose to renew the battery annually as part of routine maintenance.

Types of active RFID systems

Active RFID systems are characterised by the way the tags communicate with a central database, which can be in one of two ways:

1. Non-Wi-Fi based RFID systems

Non-Wi-Fi based RFID systems use a network of fixed proprietary readers strategically placed throughout the hospital to detect the tags' radio frequency signals. Handheld mobile readers with a read range of typically up to 20 metres can be used in addition for areas where there are no fixed readers.

²² The distance active RFID tags can be read from depends on the environment and asset properties. In a hospital environment the typical range is 30 to 40 metres, and up to 50 metres.

Non-Wi-Fi based systems are highly flexible and offer the option to start with a small number of fixed readers and grow the network of readers gradually as additional funds become available.

2. Wi-Fi based RFID systems

Wi-Fi based RFID systems use the hospital's existing wireless infrastructure to receive the tags' radio frequency signals. They are expected to grow 100 per cent annually.²³ Wi-Fi based RFID systems can be considerably more expensive to procure and run than non-Wi-Fi systems but allow additional information other than location to be communicated to the central database. Examples of this information include:

- Real-time temperature monitoring
- Alert messaging to central database via a button, such as personal alarm functionality
- Alert messaging to central database following motion detection of a device or person
- Real-time patient location tracking

Even if additional functionality such as the above is not required immediately, Wi-Fi based systems are flexible enough to allow it to be added at a later stage. Wi-Fi based RFID is therefore recommended if RFID is to be used for purposes other than device location tracking in the future.

Figure 10: Active non-Wi-Fi and Wi-Fi based RFID tags on medical devices



An active non-Wi-Fi based RFID tag on a medical device



An active Wi-Fi based RFID tag on a medical device

²³ Technology First. 2015. RFID over Wi-Fi.

Passive RFID

Unlike active tags, passive RFID tags have no battery and require an external source to trigger a signal (Figure 11).

This means that although the tags will not transmit a regular radio signal to identify their location, they can be located using a passive reader which will trigger a signal that can be read from a distance of typically 6 to 11 metres, depending on the type of reader.

Figure 11: A passive RFID tag on a medical device



Costing just 30-50p per tag, passive RFID systems provide a cost-effective solution for identifying and managing all types of medical devices. Trusts that are pioneering the adoption of passive RFID are choosing to label all their medical inventory with a passive tag for the purposes of accurate inventory management, auditing and regulatory compliance.²⁴

Importantly, passive RFID tags can replace existing asset labels and incorporate a GS1 barcode. These benefits are at virtually no additional cost in comparison to a simple barcode label which does not benefit from RFID. It therefore makes sense for trusts that are relabelling medical devices with a barcode for GS1 compliance to choose a passive RFID tag rather than a simple barcode label. Even if GS1 compliance is not a priority, replacing existing labels with passive RFID tags is a future-proof solution which offers many benefits for inventory management.

“It makes sense for trusts that are relabelling medical devices with a barcode for GS1 compliance to choose a passive RFID tag rather than a simple barcode label.”

²⁴ For example, NHS Forth Valley and Cambridge University Hospitals NHS Foundation Trust.

Types of passive RFID readers

Passive RFID tags can be read using one or more of the following types of readers:²⁵

1. Passive UHF RFID handheld reader

Handheld readers (Figure 12) allow medical engineers to perform equipment searches as they move around the different wards and areas of a hospital site. This reduces the time normally taken to audit a ward from hours to just minutes. The read range is typically up to six metres.

Figure 12: A passive UHF RFID handheld reader



2. Trolley-based readers

With all the benefits of the handheld reader, trolley-based readers (Figure 13) are fitted with multiple passive Ultra High Frequency (UHF) antennae to offer a more powerful option with a higher read range of typically up to 11 metres. As the trolley is pushed around the hospital site, it records tagged assets and inventory against a location.

Both handheld and trolley-based readers allow users to capture data quickly and to scan equipment that is not in direct line of sight, such as behind closed curtains or in non-metal cupboards.

Figure 13: A trolley-based passive reader



²⁵ The read ranges specified for each type of reader are typical and can vary greatly with the type of label, the antenna size and the environment.

3. Fixed passive UHF readers

Typically mounted at choke points, such as at the entrance to the equipment library or next to a passive RFID label printer, fixed passive readers (Figure 14) will record the movement of assets as they pass the reader.

Similar to fixed active readers, these readers can be selectively placed at strategically important points to support inventory management.

Figure 14: A fixed passive UHF reader



Active versus passive RFID tags

The table below compares the key differences between active and passive RFID tags for the purposes of tracking medical devices in a healthcare environment.

	Active RFID tags	Passive RFID tags
Average cost:	£30 to £60/tag	30 to 50p/tag
Internal battery:	Yes	No
Regular location signal:	Yes	No
Typical distance tag can be detected from:	30 to 40 metres	6 to 11 metres
Suited for:	Reliable real-time tracking of high-value mobile and fixed devices, auditing and regulatory compliance	Inventory management, auditing, regulatory compliance and GS1 compliance

“Active and passive RFID tags can be used in combination. A sensible strategy for example would be to:

1) Label all high-risk, high-value mobile medical devices with an active and passive tag for location tracking and inventory management, and

2) Label all other medical devices with a passive tag for inventory management.”

Simon Dawkins, RFID Product Manager, Paragon ID.

Benefits of using active and passive RFID to manage medical devices

The benefits of using RFID technology to track and manage medical devices are far reaching. Medical devices can be uniquely identified and located in a quick and efficient manner. Authorised users can perform ad hoc equipment searches and run reports from any local PC using the main database and a web-based application.

Overall, the benefits of using active and passive RFID to manage medical devices can be categorised into four key areas:

- Cost reduction and avoidance
- Improved quality of care
- Improved risk management
- Increased efficiency

Cost reduction and avoidance

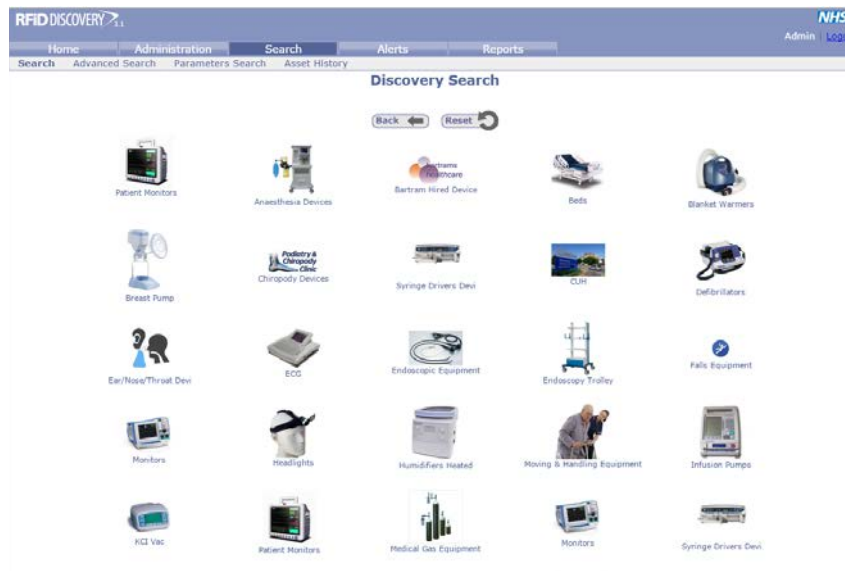
Using active and passive RFID to track and manage medical devices will reduce and avoid unnecessary costs by:

- **Reducing/avoiding capital investment** – Improved device management, availability and utilisation reduces the need to invest in new equipment and additional inventory.
- **Reducing/avoiding loan equipment expenses** – Similarly, improved device management, availability and utilisation reduces the need to loan equipment to accommodate short-term demand. What's more, significant rental charges can be avoided by ensuring clinical staff only use specialist equipment when necessary.
- **Reducing/avoiding operational expenses** – Improved equipment utilisation means less equipment is required and therefore better value is obtained from existing equipment. By reducing the volume of equipment, the associated costs involved in management and maintenance can be reduced, too.
- **Avoiding lost, overdue, incorrect and excessive rental equipment charges** – Accurate tracking of rental equipment can help avoid additional rental charges or replacement fees which occur when hired equipment has been misplaced or lost. It also ensures only equipment which is on-site and being used by the hospital is being paid for. Information from the

RFID reports can even identify where additional beds are being rented as a direct result of repairs taking an unreasonable amount of time.

- **Reducing/eliminating unproductive clinical and medical engineering time** – With active RFID automatically capturing the location of tagged devices, clinical and medical engineering staff can use the system software to search for and locate the device they need within seconds (Figure 15). This saves a vast amount of time usually wasted searching for devices. Both active and passive RFID also significantly reduce time spent manually recording device movements and managing large volumes of data.

Figure 15: Typical device search interface



- **Tracking use of damaged equipment** – Knowing the location of where damaged equipment was last used can identify not only where the damage occurred but also any recurring trends which may indicate users require additional specific training. Reducing equipment damage can in turn reduce operating expenses.

Another benefit of analysing damaged equipment is that poor manufacturer performance can be identified and appropriate action taken.

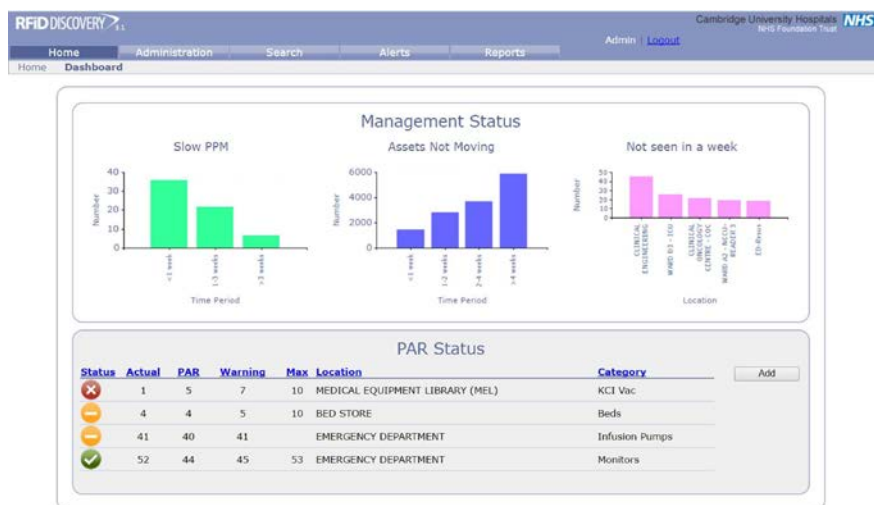
- **Avoiding fines** – Prompt patient care in the A&E department is essential for avoiding costly fines. If equipment can be accurately and rapidly located, unnecessary delays can be easily avoided.
- **Maintaining low insurance premiums** – The implementation of RFID tracking can help achieve compliance with Section 11 of the Care Quality Commission's Managing Medical Devices and achieve level 3. Maintaining a safer environment and lowering risk can in turn help maintain low insurance premiums.

Improved quality of care

Using RFID to track and manage medical devices can help improve the quality of patient care by:

- **Reducing delays in locating equipment** – Accurate equipment location information allows clinical staff to have the right equipment in the right place and at the right time.
- **Optimising device management** – RFID software offers excellent device management capabilities. This includes ensuring optimum device inventory levels. Certain RFID systems can be used to alert when equipment buffer stocks are below a specified threshold to allow stocks to be replenished, and above a specified threshold to allow surplus stocks to be removed and used elsewhere (Figure 16).

Figure 16: Using RFID software to optimise device management



- **Ensuring equipment is clean and fit for purpose** – If integrated with an asset database, the RFID system can detect equipment in need of servicing as well as equipment recalled by the manufacturer.²⁶ Asset history reports can further indicate where, when and for how long the equipment was last cleaned, allowing increased monitoring and control.
- **Positively changing a culture of hoarding** – Many trusts have discovered that when clinical staff no longer fear being unable to locate the device they need when they need it, a significant culture change takes place which moves away from device hoarding.

²⁶ Subject to service dates being set in the system or RFID being integrated with an asset management database.

Improved risk management

Using RFID to track and manage medical devices can reduce the risks associated with healthcare provision by:

- **Improving preventive and corrective maintenance** – RFID systems can track critical information such as when the device was last serviced and when the next service is due. Combined with an alert system, this can reduce/eliminate negligent clinical incidences arising from lapsed device maintenance.
- **Improving process and event audit capacity** – RFID systems facilitate rapid device auditing and in turn allow equipment to be audited more frequently to demonstrate proactive risk management.
- **Enhancing infection control** – Accurate historic and current device location reports allow devices to be tracked and traced for enhanced infection control, such as in the case of an outbreak.
- **Improving regulatory compliance** – RFID systems can help minimise the circulation of potentially dangerous, unsuitable or unmaintained equipment.
- **Providing accurate data for decision making** – Medical engineering teams can make informed decisions to reduce risk based on accurate, up to date and comprehensive data. Asset history data, for example, will show where the equipment has been, for how long and whether maintenance is overdue.

Using RFID to track and bring all devices under the control of a central system can also highlight potential patient safety issues. For example, in one instance at Cambridge University Hospitals NHS Foundation Trust, intensive care used to have unique specific settings on syringe drivers. This sometimes caused problems when these devices were moved to a ward with a patient and the staff were unfamiliar with these settings. Now all 475 syringe drivers have a generic setting and staff have been trained to use them.

- **Improved monitoring of contract service providers** – Comprehensive asset history data will reveal how long a tagged asset was in a certain area, such as cleaning or waiting for repair. This can be invaluable for checking and monitoring third party contractor performance, particularly where performance is suspected to be sub-standard such as not cleaning for the required duration.

Increased efficiency

Using RFID to track and manage medical devices will improve efficiency in a number of ways:

- **Increases clinical operational efficiency** – Clinical and medical engineering staff can access a database of the location of tagged devices from any local PC or web-enabled device. Publicly recording the location eliminates time wasted searching for devices and prevents clinical staff from deliberately hiding or hoarding equipment.
- **Improves engineer efficiency** – For inventory management purposes, engineers can quickly and accurately collect data from around the hospital using handheld readers. RFID makes it easy to find equipment, eliminates handwritten (and often erroneous) serial numbers and the need to handle each piece of equipment individually. Where a network of fixed readers or a Wi-Fi infrastructure is used to collect data, this process is totally automated and does not even require the engineer to visit each ward or hospital area. By providing accurate location information, an RFID system also helps dramatically reduce the time engineers spend looking for equipment, so they can focus on the core tasks of maintenance and repair.
- **Reduces time to audit** – Automatic auditing eliminates the need to manually input data and therefore saves a significant amount of time. In addition, RFID readers do not require a direct line of sight, enabling a room or ward to be scanned regardless of how it is occupied and all tagged devices to be totalled in a report within a matter of minutes.
- **Rapid management reports** – Asset and location history reports can be quickly and easily generated to help manage equipment and inventory more efficiently and effectively. For example, the movement of individual devices over a chosen time frame can be audited to verify where a specific device has been used, and even help forecast future demand.

Obstacles to RFID deployment in healthcare

Many of the obstacles faced by early adopters of RFID technology for tracking medical devices have now been removed.

One of the most significant problems, for example, was a lack of data to provide a robust business case. However, there is now a significant amount of data and evidence to prove just how effective and successful RFID can be. The case studies provided in section two of this white paper reflect this.

Another perceived obstacle was the cost of installing a network of fixed active readers. Although fixed active readers are a significant investment, choosing a scalable RFID system allows a flexible and affordable configuration of fixed and mobile readers.

Due to limited funds, many trusts start with a small number of fixed readers installed in areas with a high volume of device movements, such as the medical equipment library, A&E department and theatre areas. These fixed readers are then complemented by mobile handheld readers to audit the remaining areas of the hospital. As the benefits of active RFID are made clear and additional funds become available, more fixed readers can be added over time.

Similarly, although fixed passive RFID readers are a significant investment, it is not necessary to install an entire network. Starting with trolley-based passive readers can offer an affordable solution to demonstrate the benefits of using passive RFID and pave the way for a fixed infrastructure when funds become available.

For trusts wishing to implement active Wi-Fi RFID, one significant existing obstacle to RFID deployment is the suitability of the existing Wi-Fi infrastructure. In situations where the existing infrastructure is not adequate, it is often not financially feasible to renew the infrastructure for the purposes of RFID use alone. For trusts that are already considering Wi-Fi improvements, RFID can create another business case to justify the investment.

Finally, trusts based in a publicly financed building (PFI) will require permission from the building owner and may face additional expense to install a reader infrastructure. Some building owners, for example, may require specific contractors to install new power points, which can be costly. One way of overcoming this is to use a fixed RFID reader powered by an Ethernet connection (PoE).

Some trusts based in a publicly financed building may also face other conditions. NHS Forth Valley, for example, was initially not permitted to attach fixed readers to the wall. This condition, however, was lifted several months later after the medical engineering team was able to prove the RFID system was achieving the benefits promised.

Case Studies

Cambridge University Hospitals 
NHS Foundation Trust

RFID medical device management case study: Cambridge University Hospitals NHS Foundation Trust

With 1,000 beds, 61 wards and medical equipment totalling £130 million, Cambridge University Hospitals (CUH) NHS Foundation Trust is one of the largest and best-known hospitals in the UK.

The solution

The scalability of RFID Discovery has enabled CUH to gradually roll out the system, starting with 900 active tags in 2012 and increasing to the present combined active and passive tag total of 37,500.

7,500 medical devices are currently fitted with an active tag. These include for example infusion pumps, syringe drivers, feeding devices and monitors. The 30,000 GS1 compliant passive tags have replaced all of the previous asset labels.

The active tags are read by a network of more than 80 fixed readers installed in strategic points across the hospital. The passive tags in contrast are read by a trolley-based passive reader as well as a mobile handheld reader. The RFID database is integrated with CUH's e-Quip asset management system for fully informed decision making.

One of the most recent challenges CUH has overcome was rolling out the new GS1 compliant passive tags – a UK first. Professor Paul White, Head of Clinical Engineering at CUH, explains: "We worked closely with RFID Discovery to ensure the passive label sizes could be applied to all different types of medical devices. We also successfully carried out a number of due diligence tests to establish the most suitable position for labels to be applied on each type of device."

Key facts

Name of RFID system: RFID Discovery

Year installed: 2012

Type of RFID in use: Non-Wi-Fi based RFID with active and passive tags

Number of devices tracked: 37,500

Number of sites: One

Medical equipment library: Yes

Asset database: e-Quip

Background and challenges

There were many linked challenges driving CUH's adoption of RFID. These included difficulties in locating equipment, delays in patient care, poor equipment utilisation, under delivery on capital investment, inability to account for medical devices, infection control difficulties, inflated rental charges and an inability to follow device use to patient care.

Starting with funds it independently raised, in 2012 the clinical engineering team chose an active RFID Discovery system to address these challenges. Since then, CUH has pioneered the use of active and passive RFID technology to manage mobile medical equipment and in 2015 became the first trust in the UK to introduce GS1 standards for tracking medical devices.

Key benefits

The following key benefits have been achieved following the introduction of RFID tracking:

- Reduced new device capital expenditure by over £400,000 by improving utilisation levels of existing devices



- Cost savings related to ad hoc hiring is expected to exceed £300,000 for 2016/17 by improving management of hired devices
- Elimination of time wasted searching for devices, leading to improved efficiency of clinical and medical engineering teams, better utilisation of thousands of employee hours every week and, ultimately, improved patient care
- Reduction in 'unable to supply' incidents as well as making 98% of deliveries within 30 minutes
- Time to audit wards reduced from around four to six hours per ward to just 10 minutes, allowing for more frequent auditing and improving data accuracy from 65% to over 90%
- Improved risk management and patient safety through the adoption of GS1 standards
- Achieved an understanding of the issue of devices going missing
- Optimised patient flow by ensuring equipment stays with patients through their care journey

Example benefit: Improving inventory management

With such a vast inventory, CUH had identified it needed a way of accurately and efficiently auditing all medical devices to improve inventory management. Professor White explains: "It's impossible to accurately audit 30,000 medical devices without using RFID. When we previously carried out a test audit on six wards, it took us two weeks to complete and a staggering 35% of devices were unaccounted for. Now all our medical devices are fitted with a passive tag, the same process takes just 10-15 minutes and we can account for more than 90% of our inventory. By auditing our equipment more regularly we can make sure our assets are where we think they are."

Example benefit: Improving management of hired devices

RFID has enabled CUH to streamline its hire processes to significantly reduce costs by ensuring equipment such as specialised beds are only used for their intended purpose, and that hire equipment utilisation is maximised. Professor White says: "We've seen a big impact

on our overall costs. This year we forecast to save £300,000 as a direct result of changing our hire device processes."

Future plans

Following the completion of medical equipment tagging, CUH is looking to extend the use of RFID technology by tagging 200 high value and mobile non-medical devices, such as workstations on wheels (WOWs) used for electronic patient records (ERP) with active tags. The medium-term plan is to increase this further and several pilot studies are due to start.



Feedback

"RFID Discovery is the backbone of our medical equipment library – it gives us data which provides vital information for decision makers at the Trust. Over the years, using RFID technology has improved our care and provided a phenomenal return on investment by saving us hundreds of thousands of pounds. It's become firmly rooted in our systems and operations. RFI Discovery has listened carefully to our needs – we couldn't have done it without their expertise and recommend them unreservedly."

Professor Paul White, Head of Clinical Engineering, Cambridge University Hospitals NHS Foundation Trust.

Case Studies

East Kent Hospitals University 
NHS Foundation Trust

RFID medical device management case study: East Kent Hospitals University NHS Foundation Trust

East Kent Hospitals University NHS Foundation Trust operates across three hospital sites: William Harvey, Queen Elizabeth the Queen Mother and Kent & Canterbury Hospital.

Following extensive research, the Trust chose to invest in the RFID Discovery system and simultaneously establish a medical equipment library.

Background and challenges

In 2014, a newly appointed medical physics management team inherited multiple challenges. These included managing a large fleet of medical devices across the three sites, shrinking budgets, increasing patient numbers, and the need to improve an inadequate CQC rating.

RFID Discovery solution

To date, approximately 5,000 medical devices including over 1,000 beds across the Trust have been fitted with an active RFID tag. To read the tags, a number of networked readers have been strategically placed at various locations across each hospital site. The clinical engineering team also use mobile readers to ensure complete coverage of the hospitals.

Key facts

Name of RFID system: RFID Discovery

Year installed: 2014

Type of RFID in use: Non-Wi-Fi based RFID with active tags

Number of devices tracked: 5,000

Number of sites: Three

Medical equipment library: Yes

Andy Barrow, EME Service Manager at the Medical Physics Department, described the management of devices as a “free for all, crippled by poor maintenance and the inability to find equipment when needed.”

Clinical staff and technicians were wasting significant amounts of time looking for equipment and staff were frequently requesting new equipment to be purchased in order to ensure they could find devices when needed. Under and over device utilisation as well as poor maintenance performance were also causing problems.

RFID Discovery has been fully integrated with East Kent’s F2 Asset Management System from Infohealth to identify which devices require action and support risk management and compliance. The integration means medical device location data is made available directly into the asset database and asset data such as PPM dates and other alerts are fed back into RFID Discovery.

Key benefits of RFID Discovery

The following key benefits have been achieved following the introduction of RFID Discovery:

- Accurate location information on all tagged devices
- Maximised device utilisation levels
- Reduced number of devices required
- Reduced time spent by clinical staff and technicians looking for equipment
- Optimised inventory management
- Positive impact on CQC report, helping to improve overall rating

Example benefit: Cost avoidance

Before the introduction of RFID Discovery, infusion pumps costing £1,500 each were regularly in short supply and staff were frequently requesting more pumps to be purchased. The device management data provided by the new system, however, showed that across the three sites there was a total of 98 pumps not in use. This surplus stock has been temporarily removed from circulation and will be available to meet the growing demand of the three sites, which means the trust will not need to purchase infusion pumps for a considerable amount of time.

Example benefit: Supporting care provision

Improved inventory management is supporting care provision at East Kent Hospitals. By integrating RFID Discovery with its asset management database, the Trust has defined stock levels for key areas such as the dedicated buffer store in the A&E department. When stock levels exceed or drop below the specified thresholds, the system dashboard notifies the medical engineering team so corrective action can be taken and patient care delays can be avoided. Andy says: "This is a really useful feature for ensuring we have the right equipment in the right place at the right time."

"Our observations and discussions with staff indicated that access to equipment was good. The introduction of an equipment library (including the use of RFID tags) has been of benefit."

**CQC Quality Report for East Kent Hospitals
NHS Foundation Trust, November 2015.**

Future plans

The Trust is always optimising its device tagging strategy to achieve maximum benefits. It is currently considering tagging wheelchairs and hoists with active tags in the near future.

Following the success of the active RFID system, the Trust is due to start relabelling all medical devices with a passive RFID tag to achieve GS1 compliance. Andy sees particular benefits from tagging foam mattresses, which have historically never been managed. He explains: "Our dynamic mattresses already have an active tag but our foam mattresses are an ongoing challenge. A passive tag would allow us to record the mattress age, history and a full maintenance record."



Feedback

"RFID Discovery has given us an unprecedented level of confidence and evidence surrounding our medical device management. The support from the RFiD Discovery team has been exemplary and we are now confident we are managing devices correctly and meeting our maintenance targets with the resources we have available. Most importantly, we know where our devices are and can make informed decisions as a result."

Andy Barrow, EME Service Manager, Medical Physics Department, East Kent Hospitals University NHS Foundation Trust.

Case Studies



RFID medical device management case study: NHS Forth Valley

Opened in 2010, NHS Forth Valley in Scotland has 860 beds and 25 wards. In 2013, NHS Forth Valley's Head of Medical Physics, Bryan Hynd, approached RFID Discovery with several interrelated challenges to the management of an inventory of 14,000 medical devices.

The solution

The Trust initially fitted 1,000 medical devices with active RFID tags and installed five fixed readers in key areas of the hospital. The network was complemented by eight handheld mobile readers. Since then the system's scalability has allowed it to grow rapidly as the proven benefits have made justifying further investment easy. NHS Forth Valley is now tracking a total of 4,000 devices.

Today, clinical areas are covered by a network of 170 fixed active readers, including one in each operating theatre, four in each ward and even some in corridors. Being based in a PFI building, NHS Forth Valley was not initially permitted to mount the fixed active readers to the wall. With the benefits of RFID proven, this restriction has now been lifted.

To improve inventory management, including the management of devices of lower value and risk, NHS Forth Valley has recently started to tag all 14,000 medical devices with passive tags. To capture the information the medical physics team uses an RFID trolley fitted with active and passive readers. In addition to this, one passive fixed reader is located next to the passive RFID label encoder-printer.

Key facts

Name of RFID system: RFID Discovery

Year installed: 2014

Type of RFID in use: Non-Wi-Fi based RFID with active and passive tags

Number of devices tracked: 4,000 with active tags plus 14,000 passive tags

Number of sites: One

Medical equipment library: Virtual

Asset database: e-Quip

Background and challenges

Clinical and medical engineering staff were wasting vast amounts of time trying to locate equipment. Bryan explains: "We spent as much time looking for equipment as we did maintaining it. We also needed to make significant financial savings so continuing to purchase additional equipment was no longer an option."

More recently, NHS Forth Valley has been working with the RFID Discovery team and the Scottish Government to roll out passive tagging of all medical equipment as part of an innovative best practice test case to improve inventory management.

Key benefits

The following key benefits have been achieved following the introduction of RFID Discovery:

- Increased efficiency of clinical and medical engineering teams, including eliminating time wasted searching for equipment
- Better equipment utilisation and reduced maintenance expenses as a result of being able to reduce inventory
- Reduced capital expenditure from better equipment management



- Improved management of beds with the budget no longer being overspent by ensuring beds are used for their appropriate purpose, suppliers are carefully monitored and controlled and the number of additional rental beds required is minimised
- Reduction in ad hoc rentals of equipment
- Improved PPM compliance with levels currently at 99%
- Reduced overall equipment management costs
- Reduction in penalties by reducing delays for porters moving patients
- Increased ability to fund capital replacement programme
- Enhanced infection control by tracking equipment movement
- Compliance with CEL 35 (2010)
- Significantly reduced time to audit
- Improved overall management of contractors

Key savings 2014 to 2016

Within the first two years of implementing RFID, NHS Forth Valley has saved more than £343,000 by removing equipment from service and avoiding the purchase of additional equipment, delivering a return on investment in less than 24 months.

Removed from service:

- 75 syringe drivers (£134,370)
- 8 PCA syringe drivers (£24,441)

Avoided the purchase of:

- 50 T34 pumps (£50,000)
- 12 bladder scanners (£97,200)
- 6 infusion pumps (£23,472)
- 5 humidifiers (£7,565)
- 3 neonatal syringe drivers (£6,116)

Example benefit: Reducing capital expenditure

Using RFID tracking has enabled NHS Forth Valley to avoid significant capital expenditure. For example, when a recent proposal suggested an additional 50 T34 syringe drivers at £1,000 each were required, Bryan decided to track all existing devices. Since tagging the T34s, a total of 22 of 40 have been found and six or seven are now always available at any one time. Tracking the syringe drivers has improved utilisation and avoided a

capital cost of £50,000 to purchase additional devices.

Example benefit: Reducing time to audit

Time spent searching for equipment was a major issue for medical engineering staff at NHS Forth Valley. Bryan explains: "Last time it took us a total of three months to complete a full inventory. With all 14,000 devices tagged with passive RFID we will be able to cut this down to a few days which means a huge time and cost saving every year."

Future plans


To date circa 2,500 medical devices have a passive tag and over the next year this will extend to all medical devices, with the tags typically fitted during planned maintenance. The Trust is also considering extending RFID tracking to its community hospitals as well as tagging vulnerable people with an active tag.

Feedback from NHS Forth Valley

"RFiD Discovery has gone beyond our expectations. The system has revolutionised how we manage our medical inventory and given a strong return on investment. RFID has changed our culture for managing mobile medical devices and staff have really bought into it. As a new hospital in 2010 with 80% of the equipment bought new we were facing a potential end of equipment life nightmare. Thanks to RFID, rather than buying the same again we are only buying what we need and have been able to remove lots of redundant equipment from service."

Bryan Hynd, Head of Medical Physics, NHS Forth Valley.

Case Studies

United Lincolnshire Hospitals 
NHS Trust

RFID medical device management case study: United Lincolnshire Hospitals NHS Trust

United Lincolnshire Hospitals NHS Trust (ULHT) operates across three main sites including Lincoln County Hospital, Pilgrim Hospital Boston and Grantham and District Hospital. Medical devices are owned by the clinical locations and none of the sites operate a manned medical equipment library.

support the implementation of a virtual medical equipment library to serve our three hospitals.”

The solution

Benefitting from a state-of-the-art Wi-Fi infrastructure, ULHT chose RFID Discovery to provide a Wi-Fi based RFID system with active tags. Rather than using a network of fixed and handheld readers, the active tags transmit signals every five to ten minutes, which are picked up by the Wi-Fi network. The signals are then sent to a central database which calculates the current location of each tagged device with an accuracy of three to five metres.

Key to the implementation was the integration of the RFID system with ULHT’s own equipment inventory database. This means location data for each device is available to clinical engineering staff and there is no need for dual entry of device data.

Clinical staff use a simple pictorial user search dashboard to help locate equipment quickly and free up valuable time for patient care. A phone number is additionally provided through the dashboard so they can also call the clinical location to retrieve their equipment. Alternatively, clinical staff can print a list of their medical equipment and associated locations to give to porters to recover.

Key facts

Name of RFID system: AeroScout by Stanley Healthcare

Year installed: 2016

Type of RFID in use: Wi-Fi based RFID system with active tags

Number of devices tracked: 1,500+

Number of sites: Three

Medical equipment library: Virtual

Equipment database: In-house developed



Background and challenges

Dr. Chris Hacking, Head of Clinical Engineering at ULHT, explains: “Key medical equipment constantly moves around the hospitals; sometimes loaned and sometimes with a patient as they are transferred to another ward. The cost of implementing three manned medical equipment libraries was too high yet we still needed a system that improved medical device availability.

“Feedback from a clinical staff action group also showed that staff wanted to know where their equipment is and, if they needed a particular device, where they could find one. We concluded we needed a tracking solution to

Key benefits

The following key benefits have been achieved following the introduction of RFID tracking:

- Equipment available in the right place at the right time to improve patient care
- Increased equipment utilisation and return on investment
- Visibility for clinical staff of where equipment is
- Reduced time spent by clinical and medical engineering staff looking for equipment

- Significant culture change with clinical staff no longer hoarding equipment
- Availability of more equipment that is fit for purpose
- Positive impact on CQC rating
- Supported the implementation of a virtual medical equipment library, avoiding the need for three manned medical equipment libraries

Example benefit: Avoiding the need to create a medical equipment library

ULHT needed to improve device management but did not want to create a medical equipment library. Chris explains: “Aside from the set-up and running costs, I believe if people own the equipment they use they will take greater responsibility over it. Using RFID to create a virtual equipment library has enabled us to maintain clinical ownership of devices while achieving a highly cost-effective system which puts the control back into the hands of our clinical staff. Everyone can now see where key equipment is.”

Example benefit: Improving device availability

Improved device availability is creating many benefits for ULHT. “Clinical staff spend less time searching for their equipment and patients are getting the right treatment and care at the right time,” comments Chris. “We’ve also seen a culture change amongst our clinical staff. As a direct result of devices being more available, the need to purchase new equipment such as infusion pumps has reduced, despite overall demand increasing. We have also increased our equipment utilisation to give us a better return on each device investment.”

Future plans

Speaking about his plans for active tags, Chris explains: “The Trust is losing tens of thousands of pounds every year as a result of drugs not being maintained at the right temperature and consequently being discarded. We have established a prototype system with temperature-monitoring tags in fridges. These monitor temperatures automatically and trigger an alert if they go outside pre-set tolerances.

“We are in the process of outlining who would be responsible for action and understanding how staff want to be informed, such as by displaying fridge temperature on central whiteboards.”

ULHT is also looking to implement GS1 compliant passive tagging for all inventory and is currently reviewing the technology and options. The passive tags will replace the current inventory labels.

Chris adds: “Increasingly, our estates team is asking for some of the equipment they manage to be tagged. Hoists are now tagged, which has reduced costs for LOLER inspections as the equipment can be found.”



Feedback

“The support from the RFiD Discovery team has been invaluable and RFID has been central to us getting the right equipment to the right place at the right time. Going forward, by increasing the availability and utilisation of key devices we won’t need to purchase at the same volume, which will create significant savings. We didn’t realise just how much our equipment moves around each hospital and between hospitals. The data we are gathering helps us understand these processes.”

Dr. Chris Hacking, Head of Clinical Engineering at United Lincolnshire Hospitals NHS Trust.



About this white paper

RFiD Discovery, the leading UK experts for RFID (radio-frequency identification) to the healthcare industry, commissioned this white paper to help share experiences of using RFID in acute hospital environments.

RFiD Discovery would like to thank the following NHS Trusts for their case study contributions, which add immense value to this white paper:

- Cambridge University Hospitals NHS Foundation Trust
- East Kent Hospitals University NHS Foundation Trust
- NHS Forth Valley
- United Lincolnshire Hospitals NHS Trust

Proven to help manage medical devices and provide a strong return on investment, the RFiD Discovery system is the number one choice for active and passive RFID tracking.

RFiD Discovery is a brand name owned by Paragon ID, an international leader in identification solutions and the largest manufacturer of RFID tags in Europe. The company is a GS1 UK and Ireland industry partner, and ISO9001 quality certified.

To speak to a specialist advisor about the application of RFID technology or for more information about RFiD Discovery, please contact Paragon ID on Tel: 0208 102 1883, email info@rfiddiscovery.com or visit www.rfiddiscovery.com
