



## SUMMARY



Hull University  
Teaching Hospitals  
NHS Trust

**Customer**

Hull University Teaching Hospitals NHS Trust

**Sector**

Healthcare

**Partners**

Tagnos, clinical tracking software  
The Barcode Warehouse, systems integration,  
installation and delivery

**Challenge**

Optimise the management, tracking and tracing of key medical equipment across two campuses and 1.3 million square feet of clinical space

**Outcomes / Benefits**

- Visibility of assets in real time available to all staff
- Improved patient care
- Enhanced risk management
- Estimated time savings of 88,000 hours across 2,500 staff
- Reduced procurement costs
- Data-informed purchasing decisions
- Improved workflows for equipment maintenance
- Planned improvements to patient tracking
- Planned improvement to equipment tracking
- Creation of an equipment library

**Solution**

- 500 x FX7500 Fixed RFID Readers
- RFD8500 Handheld RFID Sled
- TC52-HC Android™ Mobile Computers
- ZD500R and ZT411 Industrial Printers
- Zebra OneCare™ Maintenance Plans
- >100k RFID labels
- MotionWorks™ for Healthcare

# Advancing Patient Care with Real-Time Location Solutions (RTLS)

Hull University Teaching Hospital Saves Time and Money and Optimises Workflows with Zebra Technologies, the Barcode Warehouse and Tagnos

Hull University Teaching Hospitals NHS Trust, 'The Trust', is a large hospital with two main campuses spanning 120,000 square metres of clinical space. It covers all major areas of healthcare and is also a University Teaching Hospital. Its annual revenue is around £720 million.

Close to a million people attend the hospital each year for visits ranging from accident and emergency (A&E) and outpatient clinics to longer ward stays. Around 8,000 clinical staff provide services, with secondary care delivered to a catchment area of 600,000 people in and around the Hull and East Riding of Yorkshire area.

The Trust is a complex organisation. It also faces many of the issues challenging the wider healthcare system, including rising incidents of chronic illness, an ageing population, more expensive drugs and a shortage of clinical staff. Together, these put pressure on teams and budgets. To help address these issues, The Trust looks to new technology and is seen as a pioneering and innovative healthcare provider. However, technology is never deployed for technology's sake. As Rachael Ellis, Scan4Safety Programme Director at The Trust, explains, "We only embark on a change programme if we're 100% convinced that, ultimately, it will help us improve the care we give to our patients. This was front of mind when we evaluated our approach to the NHS' Scan4Safety initiative which was introduced to the Trust in 2018."

## The First of a Kind: NHS' Scan4Safety Initiative

The NHS' Scan4Safety initiative is the first of its kind in healthcare. It provides guidance to NHS trusts to deploy the GS1 standard to uniquely identify every person, every product and every place in healthcare. Pilots of the project ran across six "demonstrator" Trusts of the UK. Results showed the key benefits included enhancements to care and safety by, for example, improving implant traceability and the real-time locationing of critical equipment. Projected cost savings across the NHS are estimated to be £1 billion over seven years.<sup>1</sup>

The Trust initially planned to pilot RFID as part of the Scan4Safety programme in its Intensive Care Unit (ICU). Patients in ICU can be monitored and supported by a large number of machines such as ventilators, blood pressure monitors and electrocardiographs. If the patient needs to be moved, the equipment travels with them. It's therefore hard to track its location as it moves around to many wards and departments.

<sup>1</sup><https://www.scan4safety.nhs.uk>

## SUCCESS STORY

HULL UNIVERSITY TEACHING HOSPITALS NHS TRUST

“It’s clearly vital we have the right equipment available for patient use in the ICU so it made sense to look at this unit first. Also, a large deployment of RFID within the Scan4Safety implementation, across an entire hospital on this size and scale, had yet to take place in the UK. We wanted to make sure we could validate the technology in a confined area and have the evidence to see if it could be scaled across our two main sites within reasonable budgetary constraints,” said Ellis.

Around this time, the pandemic hit and fewer patients were attending hospitals for routine elective procedures. As a result, the team which Ellis directed, weren’t able to visit many of the segregated and isolated wards. And, with equipment being urgently required for COVID-19 patients, Ellis decided to bring RFID technology higher up the priority list. Ellis took the opportunity to apply for additional discretionary funding from NHS England, which, given the importance of the project, was approved and then subsequently matched by The Trust. The extra funds allowed the project team to procure the technology across both main campuses and for all patient facing departments.



## Technology Selection

A small number of vendors, deemed capable of supporting such a large deployment, were invited to tender through a compliant NHS procurement process. But if one word could sum up what The Trust was looking for it was 'flexibility'. It needed the technology to be in place for many years and knew that, over time, the scope of what it wanted to track and trace might change.

As part of its discovery process, the project team spoke to Zebra customers from other sectors, including retail and logistics, who typically deploy RTLS solutions across numerous sites and to track many thousands of items. These discussions increased confidence in an RFID-led solution.

"We quickly realised that asset tracking can cover pretty much anything, and we looked for the solution to seamlessly track a much wider range of assets than we initially anticipated," said Ellis. "After speaking to vendors, it was Zebra who were most open to accommodating our changing needs, with its cloud-based Zebra MotionWorks™ healthcare medical equipment tracking solution. As far as it was concerned, the solution was a blank canvas. This willingness to listen to our requirements and be versatile was the primary reason we went with Zebra, along with its customer references and its ecosystem of technology and support."



Initially, The Trust set out to address a lack of visibility of its assets, which caused a range of issues. A key problem was that clinical staff were spending time looking for items, especially those needed for the next case on the operating theatre list. Patient assets may have been moved to another ward or were unknowingly in medical engineering for routine maintenance. In one time and motion study, which was carried out for a 4-hour period, a total of 3 hours and 48 minutes was taken up by eight theatre team members including clinicians searching for assets. Moreover, due to the lack of visibility, commonly used items, such as surgical trays, were often over-purchased, or required to be fast tracked through the sterile services department to provide buffer stock.

As Ellis' team explored the capabilities of RTLS, and the potential to immediately track items, it looked to extend the scope of the brief. One area of interest was the traceability of patients' belongings. Items like glasses and hearing aids can be misplaced so the patient is unable to read or watch TV, which causes distress.



This creates a chain reaction too. Relatives need to raise a concern with the hospital and then clinicians, housekeeping, nursing teams and porters need to spend time looking for items. In the NHS, there's a big focus on the GIRFT methodology ('Getting It Right First Time'), which aims to improve patient outcomes. Using the solution for patients' belongings was seen as a classic example of GIRFT and a big win for patients, relatives and clinicians.

### Building Europe's Largest RFID RTLS Solution

The Trust worked closely with Zebra, Tagnos and The Barcode Warehouse to specify its solution. It looked at how many items needed to be tracked, what types of items they were, whether they needed to withstand hot or cold temperatures, the type of materials the labels would be applied to, the number of users on the system and how to zone the hospital to make it intuitive for staff to use the software. It also evaluated whether to use passive or active RFID technology and Wi-Fi versus a networked solution to connect RFID readers.

The Trust opted to use passive RFID technology to label its items. It cites the primary driver behind its decision as lower cost and easier maintenance compared to an active RFID solution, where label batteries need to be changed more frequently.

Passive RFID labels need to pass under readers, so The Trust installed over 650 FX7500 fixed RFID readers plus over 400 antennas across its campuses to provide comprehensive tracking coverage. The Trust determined that each patient entrance and exit would be required to be visible. Readers are networked using Power over Ethernet (PoE) cables to mitigate future changing Wi-Fi standards and technology which might mean the readers would need to be updated to work with any new wireless network standard. (This required over 6.2 miles of cabling to make all of the readers connect).

Clinicians also needed to have access to handheld RFID reading capabilities. They would consult Zebra MotionWorks to locate the zone an item was in, then use the mobile device to identify it. It would also be useful to enable ad hoc inventory checks and, in the future, manage tasks such as tracking a patient's belongings. Zebra has a strong track record in rugged mobile computers designed for healthcare and The Trust opted to select 320 Zebra TC52-HC mobile computers.

The Android™ mobile computer is rugged, robust and powerful and can support a range of applications, including updating patient records, enabling push-to-talk services between staff, capturing barcode data and many more. Designed for healthcare, the computer's advanced medical grade plastics can withstand frequent cleaning from a wide selection of disinfectants. With The Trust's application, the main use of the devices is to read RFID labels, and scan patient care procedures with the mobile computers either physically connected to, or synced via Bluetooth with, the Zebra RFD8500 handheld RFID sled to enable label reading.

"Zebra's devices are much lighter than our previous handsets and are robust and meet the needs of our Infection Prevention and Control requirements. I was impressed with the TC52-HC when I saw it," said Ellis. "Across wider industry, the RFID sleds are often colloquially called 'guns' but this felt inappropriate in a hospital! We call them 'wands' referring to the almost magic like state of being able to find any asset across the hospital by simply tapping a few buttons on the screen and using the wand to go and find it. I often hear people saying, 'Who's got the wand?' as you walk the wards."

"We believe this is the biggest deployment of RFID in healthcare for real-time location tracking in Europe. It's certainly the most complex but, throughout, Zebra has been a great support. Its solution is the most flexible, and we're already seeing improvements to patient care, as well as huge time savings and a reduction in procurement costs. The return on investment (ROI) ensures it will pay for itself through staff time savings and benefits in two years and, with plans to add many more applications, such as tracking patient belongings, we only see returns increasing long into the future."

**Rachael Ellis,**  
Scan4Safety Programme  
Director at Hull University  
Teaching Hospitals  
NHS Trust

## SUCCESS STORY

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As part of the project, Ellis' team undertook a major equipment inventory to establish a baseline. They also created a smart trolley solution to enable team members to conveniently travel around the hospital and label items. This has been a game changer, as it has enabled the Trust's RFID team the ability to see assets and label them immediately without the fear of having to leave the asset to go and print a label only to return and find the asset has moved! The 'trolley hub' has a Zebra ZT411 industrial printer attached to it to print industrial RFID labels.

In all, The Trust has now labelled over 72,000 assets and continue to label up to 2700 sterile trays each week which is believed to be the largest healthcare deployment of RFID for RTLS in Europe. Given the importance of the solution, it is backed by a Zebra OneCare™ Maintenance plan with guaranteed turnaround



times for mobile devices and maintenance of fixed readers.”

### Improvements to Patient Care Top an Extensive List of Benefits

The project is delivering a wide range of benefits across three key areas: day-to-day operations, procurement and patient care.

In terms of daily workflows, clinicians now spend much less time looking for equipment. They can track items to wards and use the wands, which are waved around, to quickly identify what they're looking for.

It's estimated that around 2,500 staff spend approximately 56 minutes a week (equivalent to 14 minutes per shift) looking for items. Each search now takes less than 4 minutes on average. This saves about 35 hours per employee per year, equal to 87,500 hours across 2,500 staff, the equivalent of 2,187 weeks of time. Clearly, this is a massive gain and central to the projection that return on investment will be achieved in around 24 months. The Trust also aims to eradicate global emails sent to all staff to request they search for items. The Trust estimated that, of the 5,500 people who receive the global email, 50% open it (2,750 people). If each took 3 minutes to read this email and determine next steps, this would be the equivalent of 8,250 minutes, or 137.5 hours, of wasted time per email.

With procurement, The Trust can use real-time data to understand exactly what stock it has and where. It can also buy what's needed without overcompensating and, as it knows which items are most commonly used, it can buy more of these. Further cost savings will come by better managing the return of rental assets. For instance, The Trust may hire expensive items such as bariatric beds and chairs for specific patients. Sometimes, the beds are moved and misplaced.

Also, it can be easy to overlook the date when an item is due to be sent back, which means the hire company will charge punitive fees for a late return. In the future, The Trust will be able to use MotionWorks for Healthcare to track hire equipment and be alerted automatically when it is due for return so avoiding excess charges.

When it comes to patient care – the key measure for Ellis and her team – benefits are multifaceted. Planned patient belongings tracking will prevent items from being lost, reducing stress on patients, their families and clinicians who may need to spend time looking for things. Procedures are also less likely to be cancelled. For example, surgical trays are sometimes misplaced and, if not found, operations may be cancelled. Now the tray can be searched for on a desktop PC or a medical grade tablet and the wand used to locate it in storerooms or theatre corridors. Even if it is in the wrong place, it will be found. This is a huge benefit to patients, as their operation will not be cancelled due to missing sterile trays and instruments. Furthermore, mitigating risk is key as well. For example, should a heart surgery instrument tray be dropped, another one can be located in seconds, ensuring minimal delay to vital surgery.

Looking ahead, The Trust has the versatile asset tracking system it set out to deploy. Benefits will multiply further as new applications are rolled out. These include the tracking of patient belongings and adding hire equipment to the real-time inventory.

Commenting on the solution, Ellis concluded: “The system is easy to use and colleagues have taken to it quickly. For me, the best outcome is a clear improvement to patient care. If we always have the right equipment on-hand when it's needed, we can ultimately shorten length of stays which is a great result. The time savings are also eye-catching, and we see huge potential for RFID to be deployed across other Trusts. This has been a challenging project with many obstacles as hospitals are complex, pressurised environments which have many legacy systems and buildings, plus mandatory legal and patient care requirements but I'm delighted with the project and the versatile foundation it provides to flex with us as we add more applications to improve our operations over the next few years.”

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Publication Date (Last Update): 06/2023