



TRANSFUSION TRAINING

COMPONENT BARCODE GENERATOR

Training Lead for Pathology LIMS **Anas Nasir** outlines a new tool for blood transfusion trainers, testers and laboratory information management system specialists.

quickly become obsolete as expiry dates pass, requiring the laborious cycle to be repeated days later.

Through my experience as a Blood Transfusion Implementation Specialist Subject Matter Expert and now as a Training Lead for our pathology product (LIMS) at Magentus, I saw firsthand the difficulty of testing systems or training staff without access to accurate, compliant barcodes. Because real labels cannot be reused or easily altered for simulation, there was a clear disconnect between the central role barcodes play and the lack of appropriate tools to generate them. This gap prompted me to design and build the Only Cells Blood Component Barcode Generator using the NHSBT component list.

Meticulous construction

Before I could begin development, it was essential for me to understand the meticulous construction of each barcode. I relied on two primary sources: the ISBT-128 Technical Specification, which defines global data structures and encoding rules, and the publicly available NHSBT Component Portfolio. While comparing these, it transpired that NHSBT currently uses a hybrid labelling system rather than full ISBT-128 compliance across the board. In the UK, ISBT-128 is used for the donation identification number (DIN), while the legacy Codabar format is retained for the blood group, product code and expiry date.



● There has traditionally been no quick, safe, reliable way to generate blood component barcodes specifically for training.

● Now a tool has been built that generates four core barcodes: the DIN, product code, expiry date and blood group.

● The tool is free to download and feedback and suggestions can be submitted via the website.

In modern transfusion laboratories, biomedical scientists work at the intersection of clinical urgency and rigorous technical standardisation. Every day, blood component barcodes are scanned hundreds if not thousands of times, underpinning the traceability, safety and compliance essential for patient care. Yet, despite the ubiquity of these barcodes, there has traditionally been no quick, safe, or reliable way to generate them for training purposes.

When teaching staff how to handle or interpret barcodes, I have often seen trainers left with little option but to rely on real components. This frequently involves removing live units from controlled storage, taking frozen components out of freezers, and even scraping away ice simply to obtain a usable barcode image. These workarounds are time consuming, introduce unnecessary risk to clinical stock and sit uncomfortably with both good laboratory practice and stock management principles.

Compounding the issue, training materials

BLOOD TRANSFUSION: TRAINING TOOL

The tool I built generates four core barcodes: the DIN, product code, expiry date and blood group. Together, these represent the minimum dataset required for safe identification. The DIN is the most complex, following ISBT-128 Data Structure 001. It is a 13-character identifier comprising a five-character facility identification number (FIN), a two-digit year, and a six-digit sequence. A critical requirement I implemented is the inclusion of a check character calculated via the Modulo 37-2 algorithm. This is displayed only in the eye-readable text and is not encoded within the barcode itself; it exists solely to support manual data entry into the LIMS and transcription error detection.

The product code barcode identifies the specific component, such as red cells, plasma, or platelets, and is generated using NHSBT-recognised component codes encoded in Codabar. The expiry date barcode represents the component's expiry using a format compatible with NHSBT systems, again in Codabar. For simplicity and consistency, I fixed expiry times at 23:59, reflecting common practice. The blood group barcode encodes the ABO and RhD group using standard Codabar conventions. Although visually simple, this barcode is critical, as it underpins compatibility checks and electronic issue rules within the LIMS.

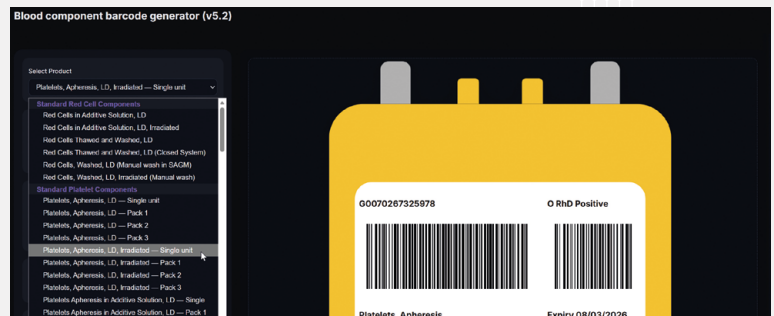
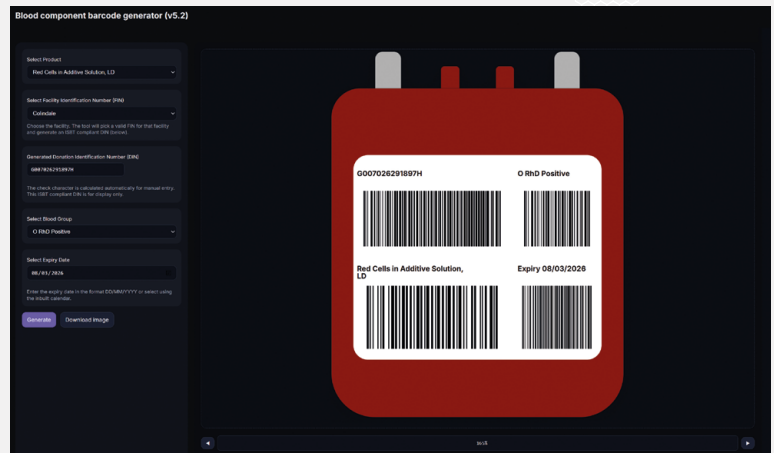
Portability and ease of use

I prioritised portability and ease of use. I developed the generator as a single-page HTML application. By containing the entire tool within one file using standard web technologies (HTML, CSS, and JavaScript), I removed significant barriers to access. There is no installation required and no dependency on external servers, allowing the file to be opened on any hospital workstation, shared via email, and used offline. In hospital laboratories strict IT policies make it difficult to install to applications.

The generator uses scalable vector graphics (SVGs) to render barcodes, ensuring they remain crisp and scannable at any zoom level. I initially used buttons for zoom control, but to make it more accessible, I added the option for users to manually type in their required magnification. The layout mirrors the appearance of real NHSBT blood component labels to reinforce familiarity during training sessions. Images can easily be saved for including in documentation or printing.

Development

Development went through several iterations. Early versions required users to manually enter a full 13-digit DIN, but feedback from my peers highlighted that this was unintuitive and error prone. In response, I redesigned the tool to generate donation numbers



automatically. Implementing the ISBT-128 check character calculation, particularly handling the asterisk character correctly, was one of the more challenging technical aspects I faced, but resolving this was essential to ensure accurate validation behaviour.

In later versions, I transitioned from random generation to a tailored approach by introducing a facility selection dropdown. By integrating FINs sourced from NHSBT documentation, I enabled users to generate donation numbers specific to their own regional centres, such as Manchester, Bristol or Colindale. A possible future development I would like to explore is a fully ISBT-128-compliant barcode generator. This would involve incorporating additional data structures beyond those currently used within NHSBT, such as processing attributes or special testing information. While such functionality is not essential for most routine laboratory training, it could offer value in more advanced educational contexts or for international use outside the UK.

Feedback and suggestions

I have made the tool entirely free to download and use at bloodbarcodes.co.uk. To help me ensure this resource continues to evolve, I would greatly value your feedback and suggestions via the website on how to make it even more effective for your training and simulation requirements. Please feel free to share any ideas for new features that would help make the generator better for your day-to-day practice in the comment section on the website.

Above. Screenshots of the Only Cells Blood Component Barcode Generator (v5.2).



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