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Barcode scanning in healthcare

Towards better, more efficient and safer patient care

A REPORT BY CHRISTIAN HAY

Christian has worked in the healthcare industry for 20 years and is a recognised expert in the drive to improve the accuracy and efficiency of information about the healthcare supply chain. Today he represents the GS1 organisation in discussions on data interoperability and is involved in development of the IDMP standards and implementation guides.

Introduction

As the retail sector, and supermarkets in particular, grew rapidly in the 1950s, shops were faced with a major challenge: how to easily and cost-efficiently account for the thousands of stock items they held? The initial approach was based on a manual stock-take, with stores closed for prolonged periods – often monthly – or staff called in overnight to count what was in store. The process was time-intensive and often inaccurate and led to store managers having to make educated guesses about what to reorder. Retailers were in desperate need of a better way to manage and account for their stock and speed-up their check-out process.

The first attempt at a more efficient process, prior to World War II, came in the form of punch cards. The idea was that customers would punch holes in their card to mark the items they wanted to purchase, and the data would be read at checkout and the items delivered to them at a pick-up desk. However, punch card readers were bulky and expensive items and the idea never caught on. But the challenge of easily accounting for thousands of items continued to fascinate researchers and mathematicians.

The pharmaceutical industry became interested, too, in how a symbol-based technology could help track and identify medicines. In the 1950s, a company developed a mini-card system. This was based on the use of 7-digit codes to identify medicines sold in pharmacies, and the cards are still in use today for stock management purposes. Recently the CIP-code, used in France, and the PZN code, used in Germany, were based on this limited number of characters detailed on a very simple barcode (code 39). Other barcode formats were used in other countries, too, and with both manufacturers and distributors using their own – and often separate – label types, clinicians in the care setting could easily become confused by the very labelling that was meant to make their lives easier. In addition, with the growth of cross-border trade and the need to both trace medicines and prevent counterfeiting, a widespread consensus has grown that the healthcare sector needs to adopt standard barcode systems.

This paper looks in more detail at some of the problems caused by the use of different barcodes before discussing how regulators and organisations are looking to improve the way data on medicinal products and medical devices is captured. With reference to interviews with clinicians and executives from healthcare organisations and pharmaceutical firms, the analysis moves on to highlight the benefits that barcode scanning can deliver both to clinicians and their patients.

The need for standards

Barcodes are widely used across the medical sector, particularly in warehouses and central pharmacies. Barcodes are also a common feature in clinical environments – on patients' wristbands, bio-samples, test tubes, order sheets and many other objects. While the technology can dramatically improve processes and patient safety, systems are often conceived and implemented without an overall strategy. This leads to different types of code being used across the clinical environment – and even on the same product – which can lead to problems for clinicians.

For example, different scanners might need to be used to discriminate between codes, it takes busy clinicians time to identify which symbol to scan and, if they scan the wrong label, clinical error can inadvertently occur. In some instances healthcare staff have to key instructions in to their scanning device to direct data capture to the appropriate IT environment. Frequently, the data carried in these barcodes is related to a distinct IT system. In some cases an identification key issued by one IT system (e.g. a patient's ID from patient administration) can match that in a totally different IT system on the same premises (e.g. a patient's bio-sample collection for laboratory analyses) so increasing the scope for clinical errors.

With such issues in mind, the healthcare sector is becoming more aware that the benefits of scanning technology can only be maximised by adopting a single system of standards. Indeed, with research showing the clear benefits that barcode scanning can deliver, momentum is growing to encourage the use of uniform barcode systems for healthcare.

The move towards accurate dosing in the medication process has been the subject of a number of research studies in the US,[1] Europe or New Zealand.[2] In 2005, the European Association of Hospital Pharmacists adopted a resolution, which recognises the importance of 'bedside scanning' – that is, scanning at the point of care to check, audit and record the prescription, healthcare staff, subject of care and object to be administered.[3] Scanning helps remove the difficulty faced by the caregivers and pharmacists of identifying single units unambiguously – by the manufacturer, or hospital pharmacy, printing a barcode on the blister hole. Once individual vials, prefilled syringes or blistered solid forms have been labelled, it's much easier, and safer, for caregivers to follow the process on the electronic prescription. Furthermore, point-of-care scanning reduces mistakes and increases documentation accuracy while also helping to cut costs by reducing hospital stays (by avoiding medication errors and inappropriate clinical decisions based on patient records that are incomplete or include the wrong information). Advice and guidance for healthcare providers on how to move to standard barcode systems is being provided both by regulators and industry bodies.

> "We've been facing considerable trouble because of the multiple barcodes on medical device packaging and their diversity. We decided to label, ourselves, what was not compliant with the GS1 standards, and expect our suppliers to move to better compliance and improved labelling. This will not only reduce costs on both sides of the procurement process, but will also improve patient safety as duplicate labelling might introduce mistakes."
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> **Justin Bitter,**
> **manager OR at Bernhoven Hospital,**
> **Uden, NL**

> "The NHS has been among the first to recognise that the extensive use of the GS1 system of standards will realise the many benefits of scanning barcodes across a number of processes in the hospital setting. The eProcurement Strategy for the NHS ensures a strong commitment to the use of GS1 identification by NHS suppliers. We have also implemented a GS1 standard for patient identification in NHS Trusts and expect to expand the use of scanners to support accurate documentation and traceability to improve cost-efficiency, treatment effectiveness and patient safety."
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> **Chris Doyle,**
> **healthcare development associate,**
> **LANSA Ltd, UK**

Barcoded data: a link to database information

Initiatives such as the Unique Device Identification (UDI) have increased awareness towards the use of master data in the supply chain and clinical practices. UDI is an initiative from the International Medical Device Regulators Forum (www.IMDRF.org). The US' Food and Drug Administration (FDA) is leading the implementation of UDI recommendations that includes the requirement to identify and label medical devices in a standardised way, and the use of a 'UDI Database' maintained by the US FDA.[4] Similar approaches are expected in Europe and in other regions. One of the drivers behind UDI is to better handle incidents such as the high-profile PIP breast implant scandal. Implants of bad quality were widely distributed and, even if they were properly labelled, it looks like no-one read these barcodes: it was nearly impossible to trace which patient received which implant. The UDI database will make it much easier to maintain patient files and registers so that, in future, monitoring and recalls should be more efficient.

To demonstrate the value of UDI, the FDA has been involved in research including a study into the effectiveness of scanning manufacturers' barcodes. One example is the pilot study made in 2013/2014 conducted by Mercy Health.[5] It included:

- Integration of UDI into an Electronic Health Record (EHR)
- Creation of data sets containing clinical and device information
- Database links to other health systems and national registries (Distributed Data Network)

Mercy Health's initiative was designed to address typical supply chain issues across ordering, transportation, warehousing and invoicing by securing traceability. The research found that: 'Adoption and use of UDIs across the health care system by provider systems, patients, payers, HIT developers, and many others can lead to significant improvements in the ability to deliver high-quality, high-value health care to patients.'[6]

In Europe, similar initiatives are being led by healthcare organisations. For example, the NHS in England requires that its suppliers use GS1 standards for product labelling as well as for master data exchanges, by using the Global Data Synchronisation Network (GDSN). This approach will lead to more frequent scanning, better accuracy and increased patient safety.[7]

"We decided here that manufacturers are in the best position to implement single unit identification. To demonstrate our willingness to implement scanning at the point of care, our internal compounds are labelled by using GS1 identifications and barcodes. The most important step has certainly been when we implemented a complete loop for the oncology medications, having developed computerised physician order entry, computerised compounding support and computerised administration support – where the verification process occurs: right patient, right medication (with right dosage), right time, right route of administration by the right caregiver. This has raised huge interest in scanning processes by the nurses – and we expect this will open the way to the scanning of other products in the future.

We published a few years ago an article in the ISQua Journal to detail how we calculated the cost effectiveness of this process. I trust our article has paved the way for other similar implementations."

Prof. Pascal Bonnabry,
chief pharmacist,
Geneva University Hospitals

New regulatory initiatives are progressively being implemented, which deliver safe, verified, information about medicinal product. Together with additional information, the IDentification of Medicinal Product initiative (IDMP) is going to provide robust data quality for clinical decision support systems. For example, when scanning a medicinal product's label, pharmacists will be shown details of the drugs. They can check this data against the patient's electronic record to avoid any problems – such as possible allergic reactions – to avoid harm and even save lives.

The IDMP standards will also make it easier to monitor the efficacy and safety of medicines, to create Medicinal Product Dictionaries, document EHRs and improve patient safety. The European Medicines Agency (EMA) has established a task force to help implement the IDMP standards for the whole European Region.

When the EU Falsified Medicines Directive 2011/62/EC becomes mandatory in 2018, every package of prescription-only medicine sold in a retail pharmacy will have to be scanned. This will include, in addition to the current stock management and payment processes, the verification of the 'unique number' towards the identification printed in the packaging line. The verification process, initiated by a single multiple-use scan, will be documented in a national master database where 'unique numbers' will be stored in the safest conditions. Similar processes will be implemented by healthcare providers in hospital settings. The data will be linked to, and automatically update, the patient's EHR to improve the accuracy of record.

"The intelligent use of medicinal product dictionaries as decision support modules will expand in the very near future. The more data entries by barcode scanning, the more systems will be able to deliver increased accuracy and predictability of health outcomes."

Jean-François Forget, chief medical officer, Vidal France

The vision: The future starts right now.

Increasingly, legislators and key organisations in the healthcare sector – from pharmaceutical manufacturers to distributors and clinics themselves – recognise the benefit of using GS1 compliant 2D barcodes. Using one type of barcode label will make it much easier, and more affordable, to implement scanning systems that can capture data on any device, medicine or product.

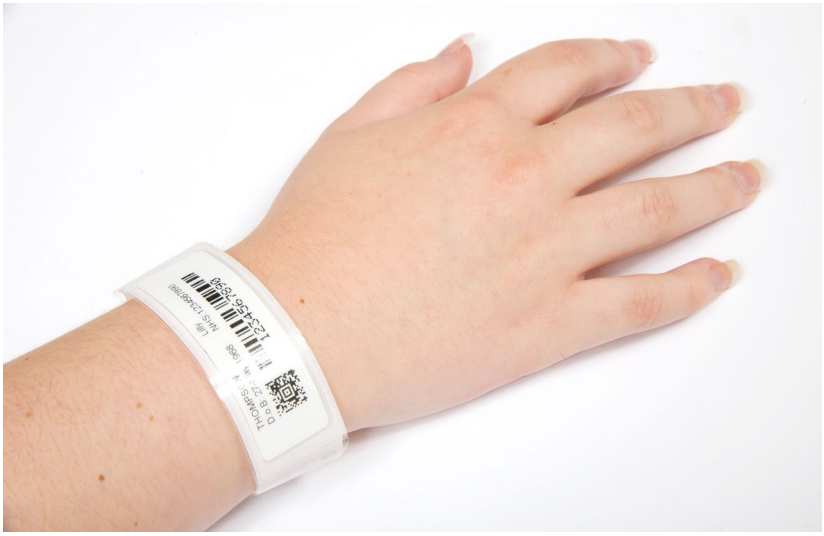
And with more medicines and medical devices carrying detailed information on barcodes, the healthcare industry can more easily embrace better workflows and care practices. So what does this mean?

In respect of giving medications to people, the whole process will improve, with accurate data capture and greater visibility across the supply chain – at the point of dispensing and at the point of care. Hospitals and clinicians can check that the right medicine is being dispensed, to the right patient, by the correct clinician at the right time. This will reduce error, optimise patient care and improve clinical records. The processes can be used across clinical settings from doctors' practices to care homes and hospitals, and patients will, in the future, come to expect that their caregiver will scan their wristband before giving them medicine or an injection.

Barcode scanning is going to become second nature across the industry – from warehouses to the pharmacy, to test-lab, to the bedside and more. This flow of data is invaluable because, where legislation permits and with appropriate anonymisation of patients' records, it can be analysed to spot trends for public health purposes. Examples include understanding the development of seasonal viruses, how a pandemic may develop and how allergies are changing. Such insight will help public health organisations anticipate needs in medication supplies, secure medicinal products and adapt communication to support public health policies.

"We are entering a fantastic period, where individuals will interact directly with their healthcare processes. Scanning the products they take provides access to the most accurate patient instructions in their own language. They will document their health record. They will check appropriateness of some medication when they travel and don't understand what is printed on the packaging. And, even when unconscious, their caregivers will be able to access accurate and complete information about medications and allergies. Detailed electronic registries will enable caregivers to find out which implant has been used for the patient, when, why and by whom. Considering the current initiatives for cross-border care, for transatlantic patient summaries and personal health records, the use of barcode scanning, combined with master data registries, all based on international standards such as GS1, is promising huge progress. The use of international standards right now also paves the way for faster introduction of new AIDC technologies, such as RFID, NFC or who knows what comes next."

Robert Stegwee,
Capgemini Consulting,
chair of CEN/TC 251 Health Informatics



The same applies for medical devices. Mass-produced devices are going to be referenced in the care processes, to ensure their appropriate and safe use, traceability, automatic resupply, cost calculation and documentation in registries. Reading a device's barcodes is the fundamental requirement to simplify the processes in the most cost-efficient manner – reducing administration time and preventing typing errors. Barcodes will also be included on individual medical devices – something the 3D printers and similar technologies will provide – to ensure they can be easily traced too.

Away from clinical settings, outpatients will increasingly use smartphones and similar devices to be reminded of when to take their medicine and to scan their medication to ensure they are following the electronic prescription. They can also scan barcodes on healthcare equipment using wearable devices – e.g. blood pressure monitors – with the data shared over the internet with their patient record.

The move towards the use of common 2D barcodes is gathering pace. The future of seamless data capture, from devices, equipment, medicine and people – data that's easily shared with databases – is here, now. It will help clinicians save time and money, while simultaneously achieving the number one goal of all caregivers: improving patient care.

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