UAE

Dubai Health Authority implements GS1 standards to empower automated pharmacies

Challenge
Before the adoption of GS1 standards, DHA did not have a barcoding system in place and was therefore quite prone to medication errors.

Approach
All pharmaceutical companies, agents, and suppliers now supply pharmaceuticals to DHA with a Global Trade Item Number (GTIN) and the 2D DataMatrix. By leveraging GS1 standards and adopting a fully integrated system for its pharmaceutical transactions, DHA has made crucial advancements in providing quality services in the provision of medicine.

96% decrease in the risk rate of medication errors for inpatient services

95% of the nurses no longer experience missing dose medication

Patients' level of trust in outpatient services grew to **92%**

$480,000 cost reduction in two years

هيئة الصحة بدبي
DUBAI HEALTH AUTHORITY

The aim of Dubai Health Authority (DHA) is to transform Dubai into a leading healthcare destination by fostering innovative and integrated care models. In 2017, DHA adopted the use of GS1 standards for all pharmaceutical products being supplied and used within DHA hospitals and health centres. All pharmaceutical companies, agents, and suppliers now supply pharmaceuticals to DHA with a Global Trade Item Number (GTIN) and the 2D DataMatrix based on GS1 standards. Some of the benefits seen include improved traceability, reducing medication errors, productivity gains, and saving time and costs. By leveraging GS1 standards and adopting a fully integrated system for its pharmaceutical transactions, DHA has made crucial advancements in providing quality services in the provision of medicine.

Dr. Ali Al Sayed

Unified and efficient healthcare for all

Dubai Health Authority (DHA) is the largest healthcare provider in the emirate of Dubai and provides a unified and efficient healthcare system, one that is effective and accessible for all. DHA's values embrace consumer centricity, efficiency, an engaged and motivated workforce, accountability and transparency, and innovation and excellence.

Dubai Health Authority channels their services through the DHA healthcare facilities throughout Dubai, which includes a total of four hospitals, 13 primary health centers, and seven specialty centres. In total, these DHA healthcare facilities accommodate almost 2,000 beds, with almost a million patients each year.

DHA's healthcare facilities include dozens of specialised centres, such as cardiology, oncology, obstetrics, gynecology, neonatology, paediatrics, as well as surgical and medical departments, intensive care units, operating theatres, and clinical support throughout the facilities.

Adopting GS1 standards

In 2017, DHA implemented a new management system by leveraging GS1 standards in all pharmaceutical transactions taking place in its hospitals and health centres. DHA is the first healthcare provider and government authority in the region to implement GS1 standards. GS1's system of standards allows for smart and comprehensive solutions in pharmaceutical and medication dispensation management.

It guarantees the safety of patients by assigning a unique identifier (GTIN) in a GS1 DataMatrix to each medicine, thus reducing the chances of any errors when dispensing medication and ensuring pharmaceutical safety and medicine consumption with complete end-to-end traceability. This allows manufacturers and distributors to work together to comply with DHA's regulations. DHA mandated all pharmaceutical companies, agents, and suppliers to supply pharmaceuticals with a GTIN in the 2D Data Matrix. The GS1 barcode system is compatible with Epic (the electronic patient record system) and smart pharmacy systems.

Starting from scratch: the initial process

Before the adoption of GS1 standards, DHA did not have a barcoding system in place and was therefore quite prone to medication errors. "We started with GS1 from scratch, as we realised we needed to have a barcoding system as a prerequisite of the implementation of an automation system in DHA," says Dr. Ali Al Sayed, the director of the pharmacy department. DHA initially considered creating their own in-house barcoding system, but with sustainability being one of their goals, they concluded that an in-house system would not be very sustainable and would prove to be a huge effort for DHA, as well as for the suppliers.

> We were very lucky to have partnered with GS1 UAE - adopting GS1 standards means implementing a sustainable solution, one that is applicable anytime, anywhere."
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> **Dr. Ali Al Sayed** Director of pharmacy department Dubai Health Authority

DHA immediately began communication with all its pharmaceutical companies and suppliers, informing them of the adoption and implementation of the GS1 system of standards.

These companies and suppliers would need to label each medicine pack with a GS1 DataMatrix as part of the purchasing data requirement to comply with the new DHA regulations and ensure that it becomes a smoother and more efficient process for all.

> A major advantage of adopting GS1 standards is that these are international standards. Because of this, most of the suppliers' inbuilt barcode from the manufacturers themselves were based on GS1 standards, which made the integration process even smoother. Since GS1 is so well established and well known worldwide, it was very easy to adopt the GS1 standards and to map the GTIN information with our own in-house coding."
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> **Dr. Ali Al Sayed** Director of pharmacy department Dubai Health Authority

Before adopting GS1 standards, there was an immensely probable chance of wrong medication preparation and dispensing. With GS1 standards and the integration of barcoding within DHA's HIS (Hospital Information System) SALAMA, scanning the barcodes on each item upon preparation and dispensing now leaves almost zero chance of any medication errors. Additionally, without any barcoding system in place, DHA's new HIS, SALAMA would not have been used to its full potential, and the execution of smart pharmacies would have been inconceivable altogether. The GS1 system of standards needed to be used if their project for smart pharmacy was going to be put into motion.

Challenges before and during implementation

Dr. Ali Al Sayed recalls several challenges before and during the implementation of the GS1 system of standards, "First, we had a huge stock so to manually barcode the entire stock proved impossible. With the implementation of GS1 standards, we would have full control of the stock and accuracy with handling it. Secondly, we had to opt for a smart solution so as to utilise as little resources as possible in a sustainable way. We also had to have a smart solution for medicine suppliers so that it would be easier for them as well. We thought about implementing our inhouse system, but it would have been very difficult to maintain it. We were the first governmental entity to implement GS1 standards and to barcode the primary packs of the medicine. It was a new concept in the market, so it was a challenge to adapt to it, there was no comprehensive understanding of what barcoding really is. But with time and with support from GS1 who were with us through the entire process of implementing barcoding, and with the integration of barcoding with SALAMA and with smart pharmacy solutions, it was ultimately a very successful operation."

Three of the most critical challenges in hospital pharmacy that DHA cites are patient safety, providing the best patient experience, and efficiently tackling the increasing demand for DHA services. DHA conducted several surveys at their healthcare facilities before and after implementation to gain insight into how GS1 standards have made a difference. Before the implementation of GS1 standards, several problems that persisted primarily for DHA were patient waiting time, returned medications, maintaining the expiry date of medication, risk of medication error, missing doses, and constant phone calls.

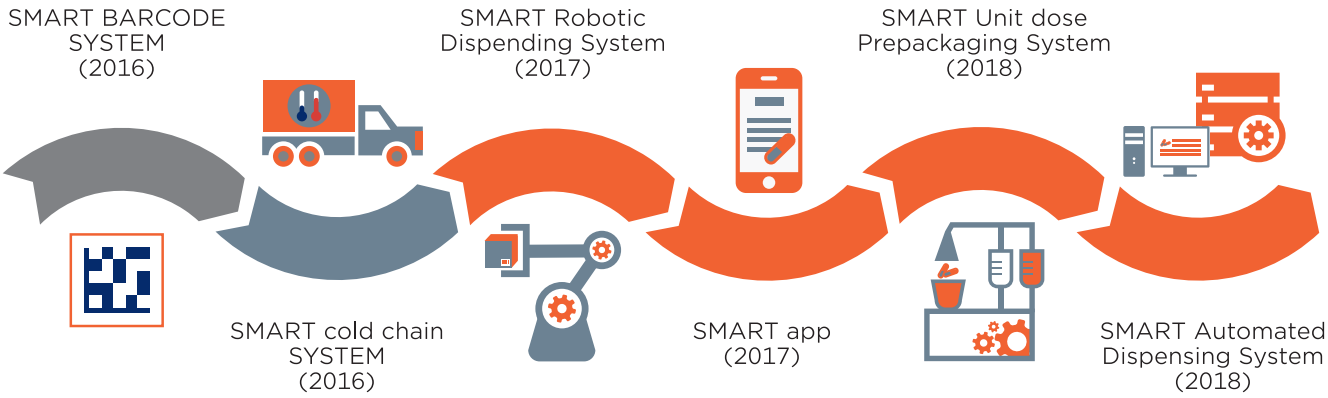
Nurses and pharmacists relayed their previous pharmaceutical experiences. Based on a survey conducted on inpatient services before the implementation of GS1 standards, the nurses observed that the waiting time to receive the first dose was 30 minutes, the waiting time until the missed dose medication was received was also 30 minutes, and that there were daily phone calls to the pharmacy during preparation of the single unit dose medication. Pharmacists observed that the medication preparation for the first dose took 30 minutes, the average time spent checking the patient profile was five minutes, the time spent on checking expired medication per ward took between 30 to 60 minutes, and that they were constantly sending medications to the nursing unit.

A similar survey conducted prior to implementation on the previous pharmaceutical outpatient services in DHA showed that the service waiting time was 15 to 20 minutes, and the service delivery time was two minutes. The occupancy rate was between 130 to 240, and there was the possibility of medication error. The overall customer satisfaction level was 69%, with the satisfaction of the speed of delivery service at 50%, the ease of use at 83%, the quality of service at 68%, accessibility at 78%, and the level of trust at 85%.

When DHA introduced the DHA outpatient smart pharmacy first in 2017, there were similar challenges before adopting GS1 standards. The waiting time was 20 minutes, and there was a high risk of medication error. Moreover, the medication review for appropriateness was only at 77%.

There was also a massive increase in demand for DHA services; there was a significant increase in Dubai's population in 2016, and more people began to turn to DHA for their services. While there were only 2,019,148 outpatients in 2016, by 2018 there were 2,257,393 outpatients with a 28% increase. The number of prescriptions also increased; with a 25 increase over two years, the total number of prescriptions rose from 1,770,380 to 1,894,307. There was also a 30% increase in the number of transactions taking place within the DHA smart pharmacies; in 2016 there were 4,524,957 transactions, and in 2018 there were 4,977,453 transactions in total.

DHA's solution



DHA initiated their solution to the challenges they were facing by first putting the GS1 system of standards into practice, which then led to the next steps in their solution. The smart barcode system was implemented, and 35,911,492 items were barcoded. DHA made it obligatory for all pharmaceutical companies, agents, and suppliers to supply pharmaceutical products with a GS1 GTIN in a 2D DataMatrix. It was the first step in a larger project that aims to ensure the safety of the supply chain and the drugs supplied to the authority, and to avoid any counterfeiting of drugs.

The next step was the Smart Cold Chain System. This system entails computer tablets becoming integrated with the medical refrigerators that register and document the temperature automatically, as well as smart devices showing the temperature graph range to which drugs were exposed during transportation. The Smart Cold Chain System also includes voice alerts and text messages to be sent out in case the temperature was to exceed standard limits.

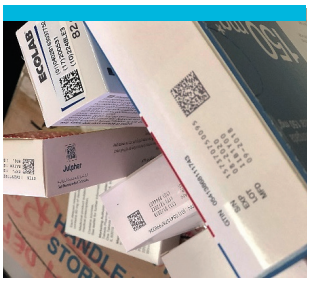
The Smart Robotic Dispensing System for outpatient pharmacy was the third step of DHA's solution. This is a complete dispensing solution for fast, medium, and slow items, and dispenses 8,000 medicines in one hour. It decreased the waiting time down to two minutes, which also allowed more time to be spent on clinical care.

The Smart Robotic Dispensing System also manages inventory and optimises space.

DHA launched a Smart App next. This provided all the required information for all healthcare providers in DHA and helped them in making their clinical decisions.

The fifth step of the solution was the Smart Single Unit Dose Prepackaging System. This comprises of an oral solid and liquid system as well as a packaging system, and complete automated printing labels. Moreover, the system greatly reduces the risk of administration medication errors and reduces medicine utilisation costs.

The sixth and final stage of DHA's solution was the Smart Automated Dispensing System for inpatient pharmacy. It encompasses a smart automated dispensing cabinet, a smart single unit dose cart, and a smart anesthesia cart. It assures that the medication is taken on time, thereby enhancing patient safety. The Smart Automated Dispensing System also includes a complete medication profile for each patient, inventory control, and an automatic reporting system. The workload on the pharmacy and nursing staff was also reduced with the implementation of this step.



DHA also implemented an Automated Inpatient Closed Loop Medication Management System at their hospitals. This system automates the entire process from the point of medication ordering by physicians, review and supply of medication orders by pharmacists, to the point of administration by nurses. The system aims to improve patient safety and work efficiency.

The changes and benefits seen as a result of leveraging GS1 standards

By 2018, after the implementation of GS1 standards, significant improvements were recorded in inpatient and outpatient services. Some of the most notable benefits seen are improved traceability, reducing medication errors, major productivity gains, greatly saving time and costs, improved interoperability and reliability, and effective inventory management from the reduction of stock kept in storage.

As described earlier, surveys conducted prior to implementation meant DHA were able to monitor all the improvements made.

% The follow up survey conducted on inpatient services in 2018 demonstrates that the waiting time to receive the first dose and until the missed dose medication was received, both of which were previously **30 minutes**, was reduced to **3 to 5** minutes only, and over **80%** of pharmacists did not experience returned medication.

The management of the expiry dates were sped up considerably, and automatic report tracking was implemented, allowing the maintenance of the expiry date of medication to become easier and more efficient. In addition to this, there was a 96% decrease in the risk rate of medication errors. Over 95% of the nurses no longer experienced missing dose medication, and there was a 95% reduction in phone calls by the nursing unit during the preparation of single unit dose medication, which were previously taking place daily.

Customer satisfaction also shot up substantially, as illustrated by the follow-up outpatient services survey in 2018. The overall satisfaction went up to 94%, with the satisfaction with delivery service at 95 %, and the satisfaction with ease of use at 96%. Satisfaction with the quality of service increased to 96%, and accessibility increased to 93%. The patients' level of trust also grew to 92%.

Since implementation in 2017, drastic improvements have been seen. The waiting time was cut down to only two minutes, and the risk of medication error went down to almost zero %, and the medication review for appropriateness shot up to a 100%. In addition to this, DHA was also able to reduce costs by AED 1,744,344 (approximately $480,000) in the two years.

> With the guidance of GS1, we started the right way, and the entire course was very successful. The entire integration process, reading the barcodes with our own HIS, Salama, and reading the barcodes with our automation solution, is all going very smoothly."

Dr. Ali Al Sayed
Director of pharmacy department
Dubai Health Authority

DHA's next steps

DHA has around 1,400 active pharmaceutical products in its portfolio. In two years, 36 million packs have been dispensed for both out-patients and in-patients and labelled with GS1 barcodes by manufacturers and distributors.

Moving forward, DHA's next steps include tighter control of cost and inventory management, optimising use of space, assisting the inpatient condition, and maintaining a successful track and trace implementation. The next phase will also include working with GS1 UAE to ensure the safety of medicine.

> Adopting barcodes can either be very successful or very risky. If you don't adopt an international and intact system, there can be serious consequences. Any mistake in barcoding or in the integration of barcoding has fatal consequences on patient safety. Because of that, we were very keen to opt for international standards and a controllable environment. We are still working with GS1 UAE to reach this ideal implementation and to properly utilise the GS1 UAE's BrandSync portal, and to integrate the portal with our system. The GS1 system of standards was the main pillar on which we built our smart pharmacy solutions and for utilising our HIS, SALAMA to the full extent."

Dr. Ali Al Sayed
Director of pharmacy department
Dubai Health Authority

About the author

Dr. Ali Al Sayed
Director of pharmacy department
Dubai Health Authority

Dr. Ali Al Sayed is currently the director of the pharmacy department in Dubai Health Authority, where he has been working for over 30 years. He has a Ph.D. in Health Services Administration, an M.S. in Pharmacy Administration, and a B.Sc. in Pharmaceutical Sciences. He has formulated and implemented several policies and programs for DHA's pharmacy department. Dr. Ali Al Sayed has also executed numerous DHA pharmacy services such as the Dubai Drug Coding System, the implementation of Patient Care Services and Medication Errors Reporting System. Dr. Ali Al Sayed has also established and implemented SMART application and automation of DHA's pharmaceutical services.

About the organisation

The Dubai Health Authority (DHA) was established in 2007, and its aim is to provide an accessible, effective and integrated healthcare system, protect public health and improve the quality of life within the Emirate. The DHA's mission is to transform Dubai into a leading healthcare destination by fostering innovative and integrated care models and by enhancing community engagement. In addition to overseeing the health sector for the Emirate of Dubai, the DHA also focuses on providing services through DHA healthcare facilities including hospitals, specialty centres and DHA primary health centres throughout Dubai. www.dha.gov.ae