

Poland

Enhancing patient safety by implementing an electronic system for medical orders and GS1 barcode scanning

Challenge

The Paediatric Teaching Clinical Hospital wanted to transition from its manual, paper-based processes of ordering and administering medicines into automated ones, supported by GS1 standards. One major goal of the project was to improve patient safety and significantly minimise (or even eliminate) medication-related errors.

Approach

In collaboration with GS1 Poland and other partners, the hospital implemented new processes supported by GS1 identification standards encoded in GS1 DataMatrix barcodes. IT systems were integrated to support the new processes. Now medical orders can be automatically generated (called an e-order). As medications are administered to patients, GS1 barcodes are scanned to ensure the right patient takes the right medicine, at the right time. This information is also recorded in the patient's electronic medical record. As medicines are used, they are replenished for optimal inventory management.



81%

reduction in service time



70%

improvement in use of doctor resources



Costs directly allocated to patients



Increased patient safety with medication verification

Addressing medication-related errors

Medication-related errors are one of the most common, serious adverse drug events (ADEs) occurring in hospitals. These errors can be attributed to mistakes made by the medical staff or may result from organisational missteps. When administering medications, issues may include the wrong medication, patient, dose, route of administration and/or timing.

Regardless of the reasons, the consequences for patients can be severe or even fatal. It is estimated that 2-14% of patients are affected by adverse drug events. In Poland, healthcare experts have emphasised that the domestic data is substantially underestimated since ADEs are rarely reported by hospitals.

At The University Clinical Centre of the Medical University of Warsaw (formerly The

Paediatric Teaching Clinical Hospital in Warsaw) and The Department of Paediatrics with Observation and Insolation Ward sites where the project was conducted, hospitalisation data included:

The Paediatric Teaching Clinical Hospital (DSK)	2018	2019
All units/wards	123,970	126,019
The Department of Paediatrics with Observation and Insolation Ward	1,223	1,246

Figure 1: Total number of hospital patients (2018-2019)

Any risks associated with medication-related errors are significantly important, especially when treating paediatric patients. More effective control over the administration of medications in hospitals can not only improve patient safety, but also increase organisational efficiency and optimise medication costs—a major cost for hospitals.

The Paediatric Teaching Clinical Hospital (DSK)	2018	2019
All units/wards	PLN 32,453,645	PLN 38,734,746
The Department of Paediatrics with Observation and Insolation Ward	PLN 233,645	PLN 236,698

Figure 2: Total value (PLN or Polish Zioty, the local currency) of the consumed medications (2018 - 2019)

The Paediatric Teaching Clinical Hospital (DSK)	2018	2019
All units/wards	47,337	47,445
The Department of Paediatrics with Observation and Insolation Ward	1,157	1,129

Figure 3: Total number of consumed medications (2018-2019)

Assessing the situation

Before starting the pilot project, The Paediatric Teaching Clinical Hospital was preparing to implement the Accreditation Standards System for evaluation by the Health Care Quality Monitoring Centre in Poland. The hospital identified a problem with the incorrect management of patient medical records when ordering medicines.

Orders were being placed manually (written on paper) outside of the Clininet Health Information System (HIS) IT system. There were orders for products that were not available or even withdrawn from circulation. Drugs were ordered by different names. There was a lack of correct doctors' signatures under each prescription or there was a record

of signing orders all at the same time, which was also inappropriate.

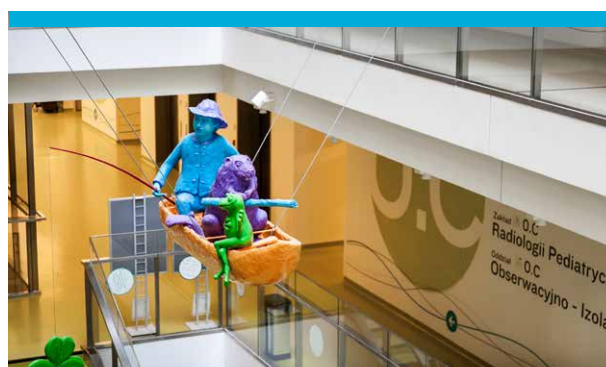
Nurses who were executing orders had to visually verify the prescription, check the availability of inventory and inform the doctor if there was no inventory and the need to modify the prescription. The nurses updated patients' medical records after the orders were placed. With this inefficient and error-prone process, it was difficult to consistently update the inventory of medicines in the ward and also assign administered medications to patients in their medical records.

Defining the project strategy and goals

The hospital determined that some errors could be eliminated through systemic solutions and additional control points in the process. Ideally, they could optimise the process, using up-to-date IT tools and system resources.

The hospital decided to implement an electronic system for medical prescriptions, based on automatically verifying data accuracy with medical prescriptions and with the patient's identity by scanning the wristband. The new system would also automatically register the administration of medication to the patient's report, including the cost of treatment. Using an electronic system instead of paper-based prescriptions, the hospital could reduce the time required to place medical prescriptions and administer medications.

The hospital also wanted to transition from the internal labelling of medications to use GS1 Global Trade Item Numbers (GTINs) encoded in two-dimensional (2D) GS1 DataMatrix barcodes applied on medication labels. With the use of GS1 standards, they could confirm the authenticity of medicinal products in compliance with the European Union's Falsified Medicines Directive (FMD).



The project was planned to achieve several goals:

- Improve the safety of patients by eliminating the risk of medication-related errors, by scanning GS1 barcodes on each patient's wristband, at the time of administration.
- Prescribe medications only in the electronic system.
- Identify all participants in administering medications as well as the time and date stamps of particular activities.
- Automate and report these particular activities in administering medications.
- Allocate the costs associated with medications to each patient.
- Reduce the service time for medical staff.

Challenges were also identified and needed to be addressed:

- The hospital's medical personnel were used to old habits, to a paper-based process and, in worst case scenarios, to issuing verbal medical prescriptions.
- There were two, separate information systems—the HIS and Eurosoft Pharmacy Information System—that were not fully integrated nor were they interoperable.
- There would be a delay in implementing a pilot project due to needed modifications, systems' upgrades and integrations with separate modules by different IT system providers.
- There was a lack of infrastructure and tools such as barcode scanners, mobile versions of HIS and WiFi access points covering the entire ward.
- The hospital was labelling medications with internal hospital barcodes, in addition to manufacturer codes.
- It was not keeping complete electronic medical records.
- At the same time, the hospital was combatting the SARS-CoV-2 pandemic.

Implementing solutions and methods

The implementation process was in collaboration with the Institute of Logistics and Warehousing and GS1 Poland. The first element of process optimisation was process management and an analysis of the current status ("as is").

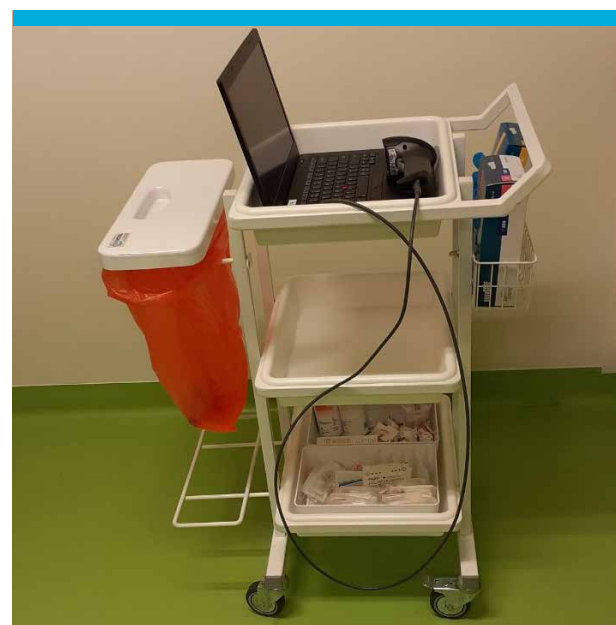
GS1 experts then prepared process maps that focused on the future state ("to be"). The solution included the transition from internal codes to using only GS1 identifiers encoded in GS1 DataMatrix barcodes.

The maps provided the team with an overview of the process and resources needed. The maps also supported discussions with the IT company that provided the IT system to the hospital.

The starting point for the updated process was to change the form of ordering medicines to an electronic order (e-order) in the HIS. With an e-order, it was possible to scan GS1 DataMatrix barcodes during the completion of administering medications to the patient and, before the administration of the medications, identifying the patient by scanning the GS1 barcode placed on his wristband. The new process required the integration of two different IT systems from different suppliers, making this step in the project time-consuming.

The ability to generate medical orders and confirm their execution in the system allowed the hospital to "close the process" by verifying the identity of the patient and the ordered medicines at each stage, as outlined below:

- Prescribe medicines by a doctor in the HIS.
- Confirm the ordered medicinal products in the ward or central pharmacy of the hospital.
- Accept the order in the system by a nurse for execution.
- Prepare the medication by a nurse by scanning the Global Trade Item Number® (GTIN®) encoded in the DataMatrix barcode.
- Confirm the patient's identity by scanning the GS1 identifier encoded in a barcode on the patient's wristband compared with the order in the system.
- Confirm the execution of the order by the nurse in the system with automatic registration.

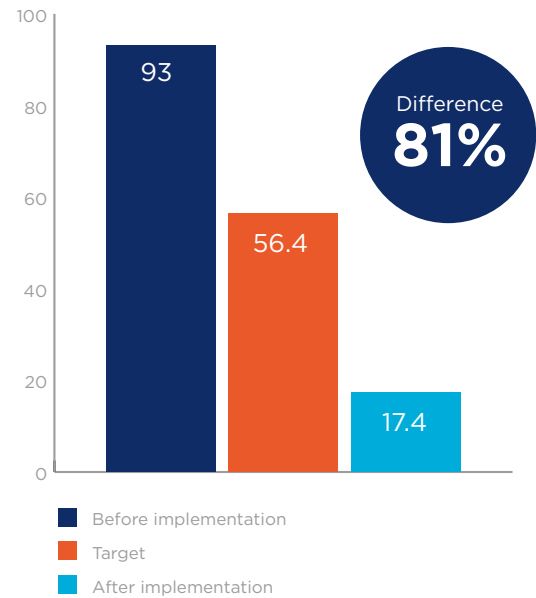


Changes in the hospital's infrastructure were also needed. In the ward, additional WiFi antennas were installed to allow staff to use mobile scanners and laptops at patients' bedsides. The nurses were equipped with trolleys carrying medications prepared for patients, as well as scanners and laptops. Ultimately, medical tablets will be used, but currently the HIS does not have a fully functional mobile version.

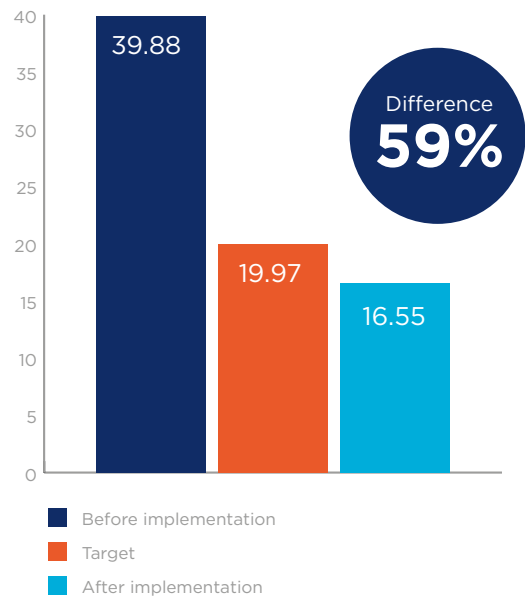
The benefits and results of using the automated process

The new automated process has primarily minimised the risk of errors in the administration of medications to patients, during the processes of ordering medicines and their administration. In addition, the process has reduced the working time of staff in this process, which means additional, available time for other activities for patient care.

Average service time (minutes)



Average working time (minutes)



Figures 4 & 5: Data related to the process of preparing and administering medications



Automating the prescription of medicines to patients and the automatic verification of compliance has enabled the recording of detailed information about the names of the administered products, their batch numbers, hours of administration, the amounts, doses and costs.

The introduction of a way to verify the correctness of completed medicines has also contributed to improving the safety and confidence of medical and nursing staff. Using GS1 DataMatrix barcodes has eliminated manual processes, reduced the risk of error and saved time for optimal productivity. Before the new process, the average service time was more than 1.5 hours; after implementation, it has been reduced to about 17 minutes, a savings up to 81%.

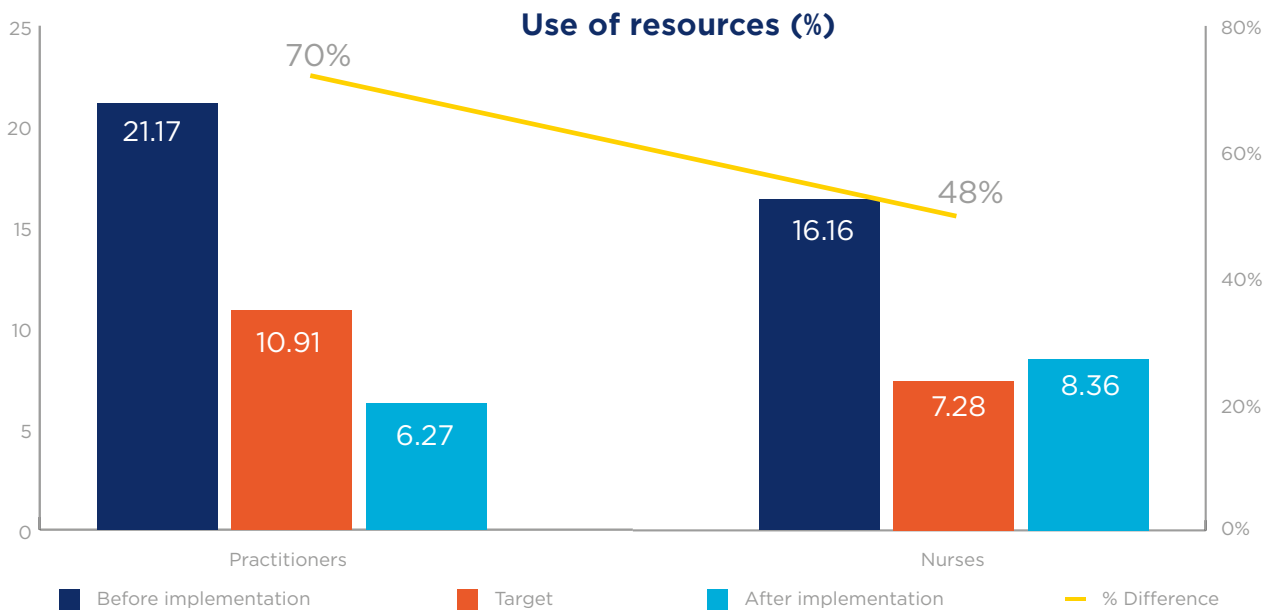


Figure 6: Improvements in use of resources administering medications

Automating the confirmation of prescribed medications for the patient will also allow the direct assignment of those products, as well as their costs, to the individual patient. As a result, the hospital will be able to take into account all costs associated with treating individual patients.

More effective control of medications used and ongoing inventory updates in wards are expected to contribute to optimal resource utilisation and loss reduction. However, this area has not yet been tested during the pilot phase.

The implementation of the project during the SARS-CoV-2 pandemic revealed an additional benefit of using GS1 DataMatrix barcodes. The piloting unit was transformed into a COVID ward. To limit contact by the medical staff with isolated patients infected with the virus, barcodes from patient wristbands are used and placed on the door of the patient isolation room. The staff who transported the medications down the corridor on the trolley were able to deliver the necessary assorted medicines to patients without having to enter the room.

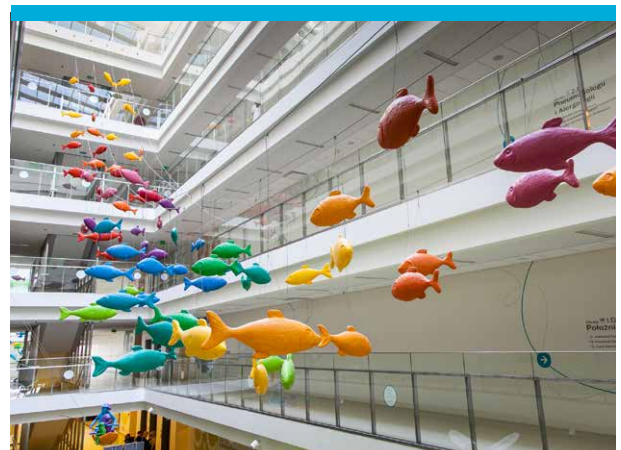
Conclusion

The hospital confirmed that the greatest challenge in implementing GS1 standards was the readiness of IT systems to use these standards. In the case of University Clinical Centre of the Medical University of Warsaw, the problem was to change the use

of internal barcodes; yet, a positive aspect was the readiness of staff to use automatic identification techniques.

Cooperation with the IT companies required significant time and patience, which could be experienced during cooperation with other medical entities. Standardisation of expectations on the part of hospitals certainly contributes to a change in the perception of hospitals by IT companies.

The most advantageous are projects that improve the organisation of the hospital in several areas at the same time. By piloting the process of medication distribution at The Paediatric Teaching Clinical Hospital, this allowed for the automation of work performed by nurses and doctors in the execution of





medical orders using GS1 barcodes. Thanks to this, the hospital has immediately gained several benefits such as increasing patient safety, reducing the working time of medical staff, increasing the comfort and safety of staff, automating medication administration to patients and recording administered medicines in the ward's inventory system.

Secondly, the need to scan GS1 barcodes applied on manufacturer's packaging in the process of administering the medication to the patient allowed the transition from paper orders to HIS IT systems. This, in turn, influenced medical staff to outsource medications to

patients only in electronic form. This is a key change in maintaining medical records, and the compliance of legal requirements and accreditation standards audited by the Health Care Quality Monitoring Centre in Poland.

The next step in the project will be the transition to only use GS1 barcodes from manufacturers' packaging—from the admission of medicines in the hospital's central pharmacy to their administration to patients at bedsides.

Ultimately, medical tablets will be used, but currently the HIS system does not have a fully functional mobile version.

About the author



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Maciej Zabalski, Deputy Director of the University Clinical Centre of the Medical University of Warsaw and Director of the Central Clinical Hospital. Mr. Zabalski has extensive managerial experience in the field of public and private healthcare. He co-created the Program of Consolidation and Restructuring of the three Medical University of Warsaw clinical hospitals. He was also in charge of implementing suggested amendments at the operational level.

Mr. Zabalski has advised on restructuring processes of several dozen hospitals and co-managed mergers and acquisitions (M&A) in the private medical sector.

He is a lecturer of MBA healthcare programs at the Medical University of Warsaw, Warsaw School of Economics and Medical University of Lublin.

About the organisations



University Clinical Centre of the Medical University of Warsaw (UCC WUM) was established on 1 January 2019 through the merger of the three clinical hospitals of the Medical University of Warsaw, to include:

- The Central Clinical Hospital in Warsaw (CSK)
- The Paediatric Teaching Clinical Hospital in Warsaw (DSK)
- The Infant Jesus Clinical Hospital in Warsaw

The pilot project was managed by The Department of Paediatrics with Observation and Isolation Ward in The Paediatric Teaching Clinical Hospital in Warsaw (DSK).

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