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Computerised physician order entry and bedside scanning as a tool to improve patient safety

Thomas De Rijdt

It has been a very long time since hospital pharmacists only moved medication boxes around. For a long time now, the primary focus has been on quality care and patient safety. A few hospital pharmacies have obtained quality standard labels such as ISO 9001, NIAZ and JCI.

A short literature review on analysis of what causes medication errors shows that they most often occur at the moment of prescription or transcription and during drug administration. Therefore, the improvement of these processes will have a considerable impact on the optimisation of pharmaceutical care.

Electronic prescription has a legal basis in Belgium regarding authenticity of the medical prescription through 'third party trusted time stamping'. A growing number of hospitals are implementing computerised physician order entry (CPOE). Using this system the prescription is clearly readable and the relevant data are also available in a structured way, which enhances the distribution process and allows for the implementation of prescription assistance (figure 1).

At the University Hospitals of Leuven (UZ Leuven), the prescriber is guided towards the correct product according to the regulations of the Pharmaceutics and Therapy Committee (P&T Committee). The CPOE is checked on line, and in real time for drug interactions and contraindications. These algorithms are integrated in the hospital information system 'KWS', which was locally developed by the information technology department of the NexUZ-hospitals. Pharmacological interactions are divided into three priority groups. The highest priority is considered as life-threatening and generates a warning pop-up at the moment of prescription. This warning can only be overruled by entering the prescriber's password plus a motivation.

For products with a priority 2 interaction, only a motivation is required. For priority 3, the number of interactions is shown in a ribbon bar (figure 2); the ribbon bar is a compact visual tool at the top of the therapy page which allows the healthcare worker to see all interactions at

once. Background information, scientific references, and directions for correct use can be accessed if required. This avoids 'pop-up fatigue' and 'automatic click through'. Drug allergies and contraindications during pregnancy are also shown in the same way.

For allergies there is a three-step system which allows for detection of cross-reaction allergies. An allergy is entered by making a choice between predefined allergies (eg, penicillins, iodinated radio-contrast agents, etc). Only when the allergy does not fit into the predefined list can it be entered at ATC-code level or specific brand name. Free text entry is only an option when a structured input is impossible, as it cannot be detected by the algorithm. Double drug use is controlled via the ATC structure, and takes into account several administration methods and any possible exemptions. Depending on the group, ATC level 4 and 5 are checked. In the case of potentially toxic substances, CPOE is also checked for high dosage and dose reduction is suggested to the prescriber according to the laboratory

Figure 1. Computerised physician order entry (CPOE) therapy sheet. A screenshot from a CPOE therapy sheet used by physicians, pharmacists and nursing staff showing the patient's medication therapy per day, per hour or per 10 min (for oncology schemes). In the left columns the medication and administration route are shown while the grid on the right shows information on dose, posology and administration according to the prescription. Note the CPOE ribbon bar in the upper right corner.

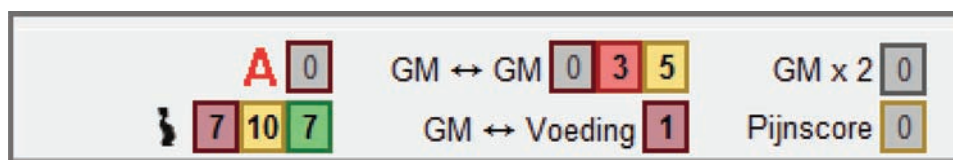


Figure 2. Detailed computerised physician order entry (CPOE) ribbon bar. This tool shows the healthcare worker the number and type of interactions. By clicking boxes more information pops up. A, number of prescribed drugs to which the patient is allergic; GM \leftrightarrow GM, number of pharmacological interactions between the prescribed drugs for each of the three priorities; GM \times 2, number of prescribed drugs having a duplicate; GM \leftrightarrow Voeding, number of prescribed drugs interacting with predefined food groups or products; Pijnscore, pain level score (numerical scale of 1–10 for the fifth vital sign); Pregnancy, number of prescribed drugs which are safe (green), contraindicated (red) or for which no evidence is found (yellow).

parameters. All these modules are controlled and validated by a multidisciplinary work group which operates under the supervision of the P&T Committee. This Committee also ensures follow-up, by analysing the number of overrules, the number of 'clicked through' interactions, and modified prescription behaviour of the physicians. If required, this information is used to redirect the drug policy. More profound analysis of the motivation used for deviation leads to clinical rules when the system, using artificial intelligence, will adapt the warnings to the specific situation of the patient. A simple example is in showing the contraindications in the case of pregnancy. This information is not available for male patients, older people and small children; it is available in a ribbon bar for adult women and is shown as a pop-up if the pregnancy of the patient is registered. All information related to the described interactions is available to each healthcare worker who is in contact with the patient, and is checked a second time before administration.

At UZ Leuven, antineoplastic drugs and blood products have for some time been compared with the CPOE via bedside

scanning before administration to the patient. This working method applies to all medications from spring 2012. The healthcare worker is identified through the hospital information system (HIS). They then scan the barcode on the patient's bracelet (with a visual double check via the patient's picture in the HIS) and the medication that has to be administered. The computer checks if the scanned product should indeed be administered to that patient, and that the medication has not expired. In this manner, the final check of the 'five patient rights' (right drug, right dose, right time, right patient, right administration method) is made just before administration, and patient safety therefore increases. This method requires a fully deployed CPOE, and the availability of a barcode on each unit dose package. In this regard, much effort has been made by the pharmaceutical industry, and the first primary packages with a GS1 barcode are gradually entering the market. It is clear that Europe will take the lead in this matter compared with the USA. In the mean time, hospital pharmacists are obliged to organise unit dose packaging themselves. In order

to speed up the evolution, the Belgian Association of Hospital pharmacists supports this vision and demand by the European Association of Hospital Pharmacists for unit dose packaging containing barcodes and therefore has set up a partnership with GS1, a non-profit organisation.

By using CPOE, with modules guiding the subscriber towards an optimal therapy, and by introducing bedside scanning before administration, a huge number of medication errors can be avoided. Nevertheless, vigilance is still required as new errors could well appear, and must be anticipated. Therefore, the hospital pharmacist keeps his vital role as the drug expert.

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