

## Successful switch to an electronic drug information system at a university hospital

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**Introduction** A majority of medication errors originates in the drug prescription process and many of those errors can be efficiently prevented by a computerized physician order entry (CPOE) [1] process linked to knowledge bases providing decision support (CDS) [2]. Having established a well accepted web-based drug information system (AiDKlinik) [3] in our 1,650-bed university hospital, which currently answers ~50,000 requests every month, we aimed to upgrade the system with CPOE/CDS and to quantify its performance and benefit for the user. We thus selected two prescribing areas of significant impact for the patient (drug information in discharge letters and drug prescription in ambulatory care) and assessed the influence of CDS systems on the costs of prescribed medication and drug interactions as a marker of prescription quality.

**Methods** Our web-based system is programmed in PHP using Asynchronous JavaScript and XML (AJAX) and MySQL as a database backend. As a new feature we developed a CPOE which allowed the combined listing of any number of drugs with corresponding dosing regimens. This list was linked to a CDS with ~8000 drug interactions that continuously evaluates all drug combinations on the list and immediately displays colour-coded alerts. CDS for discharge letters additionally included a cost-optimising tool which considers the German statutory requirement to suggest a less expensive therapeutic alternative if available on the market (§115c, SGB V). After piloting and validation the tools were integrated in the SAP hospital information system (i.s.h.med) and data on the following endpoints were consecutively collected. For a period of three months the duration of the prescribing process was measured. The time it took from starting input until data were transferred to i.s.h.med (where the print command was given) was recorded in a log file. In addition, the number and severity of drug interactions during the prescription process and after printing was collected. Finally, in the third month also the cost difference between the prescribed medication and alternatives, suggested by AiDKlinik and eventually accepted by the physician, was analysed.

**Results** From January to March 2006, 4846 electronic prescriptions were composed. 43% of the prescriptions were written in less than 1.5 minutes and two-thirds in less than 3 minutes (median=102s). During the ordering process, 178 potentially severe drug-drug interactions requiring explicit clinical management were identified. All these instances prompted an alert by the system followed by a significantly reduced number of interactions (n=135; -24.2%;  $\chi^2$ -test: p=0.016) at the time the prescription was printed. The analysis of 66 discharge letters in one month revealed possible cost-savings of 2049 euro (€ 31.05 per letter) by strict suggestion of generics instead of brand products.

**Conclusion and Discussion** This study revealed that the implementation of an electronic system with CPOE/CDS even in a large, multidisciplinary hospital providing primary and tertiary care is readily possible. After its implementation, electronic prescriptions were composed faster than manually and were of superior readability. More importantly, this project also revealed that such a system improves the prescription quality already in its first months of use as shown by the substantial decrease of prescribed combinations with serious drug interaction potential. However, not all interaction alerts were eliminated by the system. This is likely caused by the fact that numerous interactions are dose-dependent and that the current version of the interaction alerting system does not consider the appropriateness of doses. Another advantage of the system was to enable comparison of large amounts of information that may not be accomplished without electronic support (e.g. package prices). Hence, after implementation of this tool the discharge letters were written according to the strict legal requirements of Germany with an immediate opportunity to considerably reduce treatment cost.

## References

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