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Potential benefit of a medication plan with drug administration recommendations for patients

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Every third patient does not know how to take his drugs correctly and up to 85 % of drugs are indeed used incorrectly. Likewise, one of three medication errors that lead to avoidable adverse drug events and one of two reported medication errors that lead to adverse health outcomes or death happen during drug administration. Inadequate oral or written communication precludes sufficient drug knowledge and handling deficits of patients, which often entails drug administration errors. To prevent such errors and follow the drug therapy as intended, patients need adequate written information on all drugs. When combined with pictograms, written information can be even more meaningful, especially for elderly patients, patients with low health literacy, or patients with a migration background. A medication plan is a potential medium to provide standardized, structured, and written drug information to patients and can thereby support them and their caregivers during drug therapy. However, current medication plans do not include all important drug information, do not provide standardized and structured content, and have to be created by adding information manually which makes them unpractical for a default provision of written drug information.

This work therefore aimed to develop a medication plan enhanced with graphical and textual information on drugs including their indication, simultaneous food intake, and handling. The enhanced medication plan (EMP) was designed for integration in an electronic prescription platform to allow an automatic and electronic generation. The EMP was pretested, optimized, piloted, and validated in a three-step process. First, its comprehensibility was qualitatively evaluated with patients and physicians. Both parties agreed that the addition of drug administration recommendations in a medication plan enables a safer drug therapy and patients in general could benefit from the EMP. Suggestions of patients and physicians for improvement triggered an iterative optimization of the plan particularly with regard to the design of the pictograms and the layout.

For the validation phase, a database covering all information required to automatically generate the EMP for any commonly used drug was established. Based on the 140 most frequently prescribed active ingredients, 160 indication terms and 355 different administration recommendations were defined and allocated to 12,595 brands which covered about one-third of the large German drug market. Thereby, the approach that was developed to link drug information to the corresponding brands facilitated coverage of many brands in a large drug market in an easy way.

The EMP was then implemented in the electronic prescription platform of the Heidelberg University Hospital. The use of the EMP in a clinical setting and its influence on discharge conversations and patient drug knowledge at discharge was piloted in a prospective, non-randomized before-and-after study. The study revealed that the EMP increased the amount of drug information provided by physicians during the discharge conversations without prolonging information exchange. It provided written drug information to over 90 % of patients' drugs and immediately increased patient drug knowledge at hospital discharge by over 60 %. To validate the EMP with regard to its long-term effects, 120 outpatients with polypharmacy were recruited in a prospective, randomized controlled study to compare patients with the EMP (intervention group) to patients with a simple medication plan (i.e., the EMP without written and graphical information on indication, food intake, and drug handling; control group). After two months, the EMP improved drug knowledge within the intervention group by 57 % and compared to patients in the control group by 39 %. In the ambulatory setting, the EMP included drug information to even > 95 % of patients' drugs. More patients indicated use of the EMP compared to the standard medication plan they had before and less patients of the intervention group stated that they would not need a medication plan at all. Patients with the EMP judged its structure and content as very comprehensible and were very satisfied with the integrated drug information.

In conclusion, the generation of the EMP with automatic addition of drug information to the majority of a patient's drugs therapy is possible and likely to promote medication safety. The EMP improved drug information during hospital discharge, increased drug knowledge in inpatients and outpatients, and was rated as very comprehensible by the patients. The EMP was still beneficial after two months, and thus offers the potential to be essential to safe drug administration on a long-term basis.