Long-term effect of an individualized medication plan with drug administration recommendations on the patients' drug knowledge

Alexander F. J. Send[1,2], Walter E. Haefeli[1,2], Hanna M. Seidling[1,2]

[1]Department of Clinical Pharmacology and Pharmacoepidemiology, [2]Cooperation Unit Clinical Pharmacy, University of Heidelberg

OBJECTIVES

Inadequate patients' drug knowledge correlates with medication errors, which can lead to avoidable adverse drug events, adverse health outcomes or even death. Lack of drug knowledge is particularly large in patients with polypharmacy, resulting in a higher risk for drug administration errors in this subgroup. To prevent administration errors, patients must be supported by adequate drug information including the provision of standardized written information.

To provide patients with individual, standardized, and written handling information tailored to their drugs, we developed a medication plan enhanced with graphical and textual drug information (enhanced medication plan, EMP) [1]. When used at hospital discharge, the EMP improved patients' ad-hoc drug knowledge [2]. However, active interventions such as patient education often produce only short-term benefits because their impact rapidly vanishes.

Hence, in a randomized controlled study we aimed to

- **evaluate the long-term effects of the EMP on patients' drug knowledge after two months and**
- **assess patient satisfaction with the EMP and its comprehensibility in outpatients with polypharmacy.**

STUDY DESIGN

The study was conducted in four family practices in Germany with patients ≥ 18 years using ≥ 5 drugs (Figure 1). After inclusion, patients' drug knowledge on their medication regarding indication, food interactions, and drug handling was assessed with three standardized questions randomly selected from a predefined question catalogue (baseline assessment). Then, patients were randomized to the control (CG) or intervention group (IG). Patients in the CG received a simple medication plan (SMP) containing only standard information (i.e., information on drug name, active ingredient, strength, dosage schedule, and dosage form), patients in the IG received the EMP with additional structured information on indication and drug administration (Figure 2). After two months, patients' drug knowledge was reassessed and patient satisfaction with the EMP or SMP and the comprehensibility of the included drug information was evaluated (post-hoc assessment).

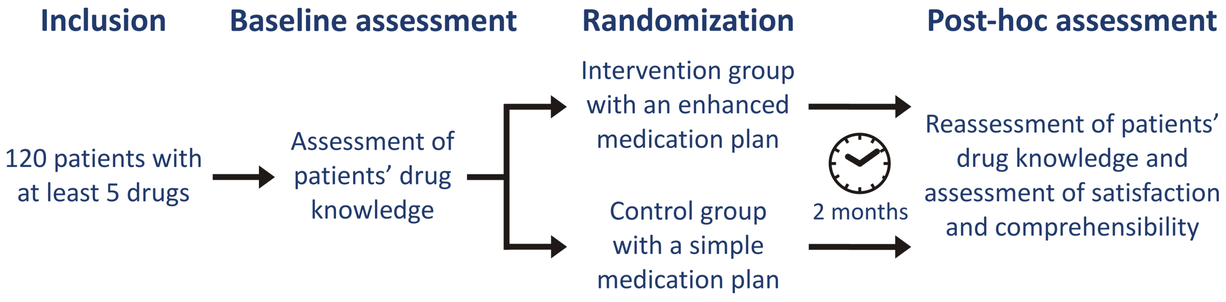

Figure 1: Study design.

Medication plan
of John Doe, born on 01.01.1960

UniversitätsKlinikum Heidelberg — Printed: 11.11.2014

Drug with potency Tradename	Reason for application	Morning	Noon	Evening	Night	Before/during/after eating	Instructions for use
Diclofenac-Natrium (0.3 mg) Voltaren® ophtha sine 1 mg/ml Augentropfen	Eye inflammation	1 drop	0	1 drop	0		• Wait at least 15 mins after administration before wearing contact lense • Once opened, use within 4 weeks see appendix
Salbutamolsulfat (0.12 mg) Salbutamol-ratiopharm® N Dosieraerosol	Asthma	2 puffs	0	2 puffs	0	regardless of	• Shake before use • Clean plastic case without metal container daily with warm water and dry well see appendix
Acetylsalicylsäure (100 mg) Aspirin® protect 100mg, magensaftresistente Tbl.	Blood thinner	1 tablet	0	0	0	Before meals (ca. 30 mins)	• Do not split tablet
Ciprofloxacin-HCl 1H2O (582 mg) Ciprobay® 500 mg, Filmtabletten	Bacterial infection	1 tablet	0	1 tablet	0	regardless of	• Avoid direct sunlight and UV radiation during treatment • Administer 2 hrs before or 4 hrs after taking calcium, iron, or magnesium containing products
Natriumalendronat 3H2O (91.37 mg) Alendron-HEXAL® einmal wöchentlich 70 mg Tabletten	Osteoporosis (bone loss)	once a week				30 mins before breakfast	• Take with at least 200 ml of tap water • Apply only once per week on same day • After taking this medication, sit or stand upright for at least 30 mins - do not lay down!
Insulin, normal (human) (300 I.E.) Actrapid® FlexPen® 100 I.E./ml Injektionslösung in einem Fertigpen	Diabetes	according to plan				30 mins before meals	• Protect from excessive heat and light • Once opened, do no longer store in refrigerator • Once opened, use within 6 weeks see appendix

Figure 2: Medication plan with stars (*) highlighting the columns that were only filled in the EMP.

RESULTS

Of 120 patients enrolled (60 per group), 42 patients in the CG (70.0%) and 45 in the IG (75.0%) completed the study (p=0.54). Patients in both groups did not differ regarding age (p=0.96), sex (0.07), level of education (p=0.99), and drug intake (p=0.12).

Drug knowledge was similar in both groups at the beginning of the study and over 50% of the questions were answered incorrectly (43.7% vs. 40.7%; p=0.63; Figure 3). The provision of the SMP did not affect patients' drug knowledge after 2 months (46.0%, p=0.78). On the contrary, there was a 60.2% relative increase (24.5% absolute) in drug knowledge in the patients receiving the EMP (p<0.01; Figure 3). Compared to CG, the relative knowledge increase was 38.7% (p<0.01; 17.8% absolute). More patients answered all questions correctly and less patients answered all questions incorrectly with the EMP after two months (Figure 3).

Regardless of the received medication plan variant, patients in both groups were equally satisfied (p=0.19) and found both templates easy to understand (p=0.26). Patients with the EMP also perceived the additional drug information (i.e., indication terms and drug administration recommendations) as easy to understand and were satisfied with it.

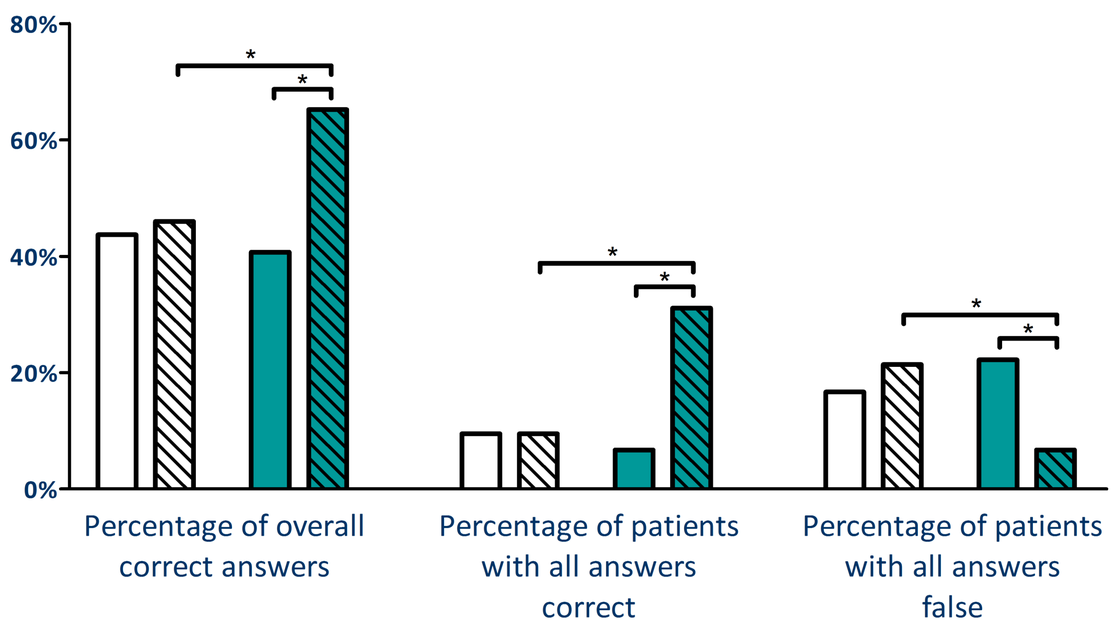

Figure 3: Percentage of overall correct answers and patients who answered all questions correctly and incorrectly during baseline assessment (empty columns) and post-hoc assessment (hatched columns) in the control group (white columns) and intervention group (green columns). *p<0.05

DISCUSSION

This study in ambulatory patients with polypharmacy confirmed that their knowledge on their actual drug treatment was alarmingly poor and revealed that issuing of a sophisticated medication plan substantially and persistently increased their state of knowledge. In contrast, patients receiving a simple medication plan did not improve their drug knowledge. This findings are remarkable because active interventions tend to show only short-term benefits.

CONCLUSION

A medication plan enhanced with graphical and textual drug information persistently improved knowledge on proper drug handling and administration in outpatients with polypharmacy. Patients were satisfied with the EMP and its content rating both as very comprehensible. This potentially qualifies the EMP as an essential basis for a safer drug therapy; whether its application will prevent adverse events resulting from administration errors has to be evaluated.

ACKNOWLEDGEMENTS

The authors would like to thank patients and members of the family practices participating in the study; as well as Stefanie Amelung, Christine Faller, Anette Lampert, Dr. Kristina Lohmann, and Tanja Mayer assisting in data acquisition and Dr. Thomas Bruckner supporting statistical analysis.

Contact:
alexander.send@med.uni-heidelberg.de
Department of Clinical Pharmacology and Pharmacoepidemiology, Cooperation Unit Clinical Pharmacy, University of Heidelberg
Im Neuenheimer Feld 410, 69120 Heidelberg

References:
[1] Send AFJ, Al-Ayyash A, Schecher S, Rudofsky G, Klein U, Schaier M, Pruszydlo MG, Witticke D, Lohmann K, Kaltschmidt J, Haefeli WE, Seidling HM. Development of a standardized knowledge base to generate individualized medication plans automatically with drug administration recommendations. Br J Clin Pharmacol 2013;76 Suppl 1:37-46.
[2] Send AFJ, Schwab M, Gauss A, Rudofsky G, Haefeli WE, Seidling HM. Pilot study to assess the influence of an enhanced medication plan on patient knowledge at hospital discharge. Eur J Clin Pharmacol 2014;70:1243-50.

This work was submitted as "A medication plan containing drug administration recommendations improves patient's drug knowledge persistently" to the Journal Patient Education and Counseling.