Adherence to Hospital Discharge Medication in Patients With Ischemic Stroke
A Prospective, Interventional 2-Phase Study

Carina Hohmann, PhD; Tobias Neumann-Haefelin, MD; Jürgen M. Klotz, MD; Annette Freidank, PhD; Roland Radziwill, PhD

Background and Purpose—Communication between hospitals and primary care physicians is essential for the continuity of care for patients being transferred from hospital to ambulatory care. Patients are often discharged from hospital on medication regimes different from those used before hospital admission. The aim of the study was to evaluate the adherence to hospital discharge medication in patients with ischemic stroke before and after implementing a systematic approach provided by a clinical pharmacist.

Methods—Patients with transient ischemic attack/ischemic stroke taking ≥2 drugs during hospital stay and at discharge were prospectively recruited. In the control group, the neurologist included the medication list in the discharge letter as before. In the intervention group, the clinical pharmacist listed the medication on admission and at discharge next to each other and gave detailed information for all medication changes during hospital stay.

Results—Overall, 312 patients were enrolled in the study with 156 patients in each group. Significant differences between the control group and intervention group were ascertained with regard to adherence to both antithrombotic drugs (83.8% control group versus 91.9% intervention group [P=0.033]) and to statin therapy (69.8% control group versus 87.7% intervention group [P<0.001]).

Conclusions—Providing detailed information on medication changes can lead to substantially improved adherence to discharge medication, probably resulting in better secondary stroke prevention. (Stroke. 2013;44:522-524.)

Key Words: adherence ■ hospital discharge medication ■ ischemic stroke ■ secondary prevention

Communication between hospitals and primary care physicians (PCPs) is essential for the continuity of care for patients being transferred from hospital to ambulatory care, because many types of drug-related problems and medication errors may occur at the interface. Most errors result from inadequate communication between the hospital team and the PCP, where patient discharge letters often fail to provide important medical information, or the quality of information with regard to medication is insufficient. Patients are often discharged from hospital on medication regimes different from those used before hospital admission; the medication regimes can be significantly altered during hospital stay because of acute illness and new diagnosis. These changes are often made without valid information being provided in the discharge letter with the reasons for the changes, so that the PCP must decide whether or not to continue the new medication. This lack of information transfer between hospital and PCP can lead to low adherence rates to hospital discharge recommendations. The efficacy of antithrombotic medication, statin therapy, and the consequent control of cardiovascular risk factors in patients with ischemic stroke has been proven in several clinical trials. Nonadherence to secondary prevention after stroke is a big clinical problem and is a major risk factor for a recurrent ischemic event. Little is known about the adherence to hospital discharge medication in patients with ischemic stroke, especially with regard to secondary preventive medication.

Methods
An open, prospective, interventional 2-phase study was conducted at the Klinikum Fulda gAG from January 2011 to June 2011 (control group [CG] = phase 1) and from October 2011 to March 2012 (intervention group [IG] = phase 2) (plus a 3-month follow-up for each). Patients with transient ischemic attack or ischemic stroke, ≥18 years, who were taking ≥2 drugs during hospital stay and at discharge, were prospectively recruited.

Control Group
In general, a discharge letter is given to the patient to inform the PCP of main diagnosis, diagnostic findings, lab tests, complications, and current medication. Upon hospital discharge, the neurologist included the medication list in the discharge letter as before.

Intervention Group
The clinical pharmacist listed the medication at admission and at discharge next to each other in the discharge letter and gave detailed information for all medication changes during hospital stay.
and reasons for new drugs, drug modifications, and discontinued medication. In addition, the clinical pharmacist gave reasons regarding antithrombotic drugs (escalation of drug use, indication, and duration for anticoagulant treatment or for the combination of 2 antiplatelet drugs) and adding simvastatin.

Follow-Up After 3 Months
To evaluate the adherence to medication in the discharge letter regarding entire medication regime, antithrombotic drugs, and statins, the PCP was interviewed by phone 3 months after hospital discharge about the current medication list of each patient.

The primary end point was adherence, defined as continuing therapy from hospital discharge to 3 months after discharge. Every deviation from the recommended medication at discharge is defined as nonadherence. The adherence of each drug was assessed dichotomously. The adherence of the entire medication regime was quantified as the mean of the adherence of each drug.

The study was conducted in compliance with the requirements of the institutional review board. All patients signed the informed consent.

Results
Overall, 312 patients were enrolled in the study with 156 patients in each group (Figure 1). Patients’ baseline characteristics are summarized in Table 1. Table 2 demonstrates the different adherence rates to hospital discharge medication regarding entire medication regime, antithrombotic drugs, and statin therapy. Because of detailed information in the discharge letter, the adherence rose significantly from 83.3% (CG) to 90.9% (IG) ($P=0.01$). Significant differences between the CG and IG were ascertained with regard to adherence to both antithrombotic drugs (83.8% CG versus 91.9% IG [$P=0.033$]) and to statin therapy (69.8% CG versus 87.7% IG [$P<0.001$]).

Discussion
The efficacy of secondary stroke prevention is greatly dependent on the adherence of PCPs to medication regimes started at the time of in-hospital stroke treatment. In this prospective study, we show that adherence can substantially be improved by systematically providing reasons in the discharge letter for both the start of new medications, as well as medication changes. This concerns all aspects of secondary stroke prevention including antithrombotic and statin therapy. The
results show a higher adherence on the part of the PCPs, most likely because the rationale behind changes made in hospital were made more transparent. The adherence rate for antithrombotic drugs increased significantly in the IG. In the CG, the adherence rate lies in persistence rates from other studies. Perhaps even more impressive was the difference for statin therapy with significantly less discontinuation or dosage reduction in the IG compared with the CG. The higher adherence rate in the IG is an indicator for the PCPs higher awareness of the benefits of statin therapy after a cerebrovascular event, because the reason was given in the discharge letter.

Patients’ medication-taking behavior (compliance) also influences the efficacy of secondary stroke prevention in not filling the prescription or not taking the medication as prescribed. Reasons for noncompliance are, for example, complex medication regimens, side-effects, less instructions of correct intake, and problems in patient–physician interaction.

### Conclusion

This is the first systematic study in Germany to show an improved adherence rate to hospital discharge medication in stroke patients because of a structured approach implemented by a clinical pharmacist.

### Acknowledgments

We would like to thank the participating patients and physicians who supported our study.

### Disclosures

None.

![Table 2. Adherence to the Recommended Medication 3 Months After Discharge](http://stroke.ahajournals.org/)

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Intervention Group</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire medication regime</td>
<td>n=135 patients</td>
<td>n=146 patients</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>83.3 (71.4–100)%</td>
<td>90.9 (75.0–100)%</td>
<td>0.01</td>
</tr>
<tr>
<td>Antithrombotic drugs</td>
<td>119/142 (83.8%)</td>
<td>137/149 (91.9%)</td>
<td>0.033</td>
</tr>
<tr>
<td>Statins</td>
<td>90/129 (69.8%)</td>
<td>121/138 (87.7%)</td>
<td>$&lt;0.001$</td>
</tr>
</tbody>
</table>

IQR indicates interquartile range.
* Mann–Whitney U test; † χ² test.

### References

Adherence to Hospital Discharge Medication in Patients With Ischemic Stroke: A Prospective, Interventional 2-Phase Study
Carina Hohmann, Tobias Neumann-Haefelin, Jürgen M. Klotz, Annette Freidank and Roland Radziwill

*Stroke*. 2013;44:522-524; originally published online December 6, 2012; doi: 10.1161/STROKEAHA.112.678847

*Stroke* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2012 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/44/2/522

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Stroke* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to *Stroke* is online at:
http://stroke.ahajournals.org//subscriptions/