Quality of Hospital and Outpatient Care After Stroke or Transient Ischemic Attack

Insights From a Stroke Survey in The Netherlands

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Background and Purpose—Limited data are available on management of outpatients with stroke or transient ischemic attack (TIA) and on clinicians’ reasons for withholding procedures recommended by guidelines. We assessed to what extent guidelines are appropriately applied after ischemic stroke or TIA, in admitted patients as well as outpatients.

Methods—A survey was conducted in 11 centers in the Netherlands, which prospectively enrolled 579 admitted patients and 393 outpatients. Data were collected by trained research assistants. Duplicate assessment in 10% of patients showed good agreement with neurologists (median $\kappa = 0.86$). Treating neurologists were asked to provide arguments for withholding recommended procedures in eligible patients.

Results—Recommended acute procedures were provided in the majority of admitted patients, but less often in outpatients: brain imaging (98% and 93%, respectively), 12-lead ECG (96% and 81%), laboratory tests (97% and 86%), aspirin within 48 hours (90% and 68% of eligible patients). Secondary preventive measures were not always taken in both eligible inpatients and eligible outpatients: carotid endarterectomy (provided in 31% and 30% of patients), antiplatelet agents (93% and 90%), oral anticoagulants (60% and 48%), antihypertensive agents (57% and 44%), and cholesterol-lowering therapy (71% and 52%). Reasons for withholding recommended procedures were plausible for almost all admitted patients, but were unclear in the majority of outpatients.

Conclusions—Compared with other national stroke surveys, we found high-quality acute care in admitted ischemic stroke patients, whereas secondary prevention was comparably poor. Although the majority of our centers have rapid-access TIA clinics, there is still substantial potential to improve quality of stroke care in outpatients. (Stroke. ;37:-.)

Key Words: ischemia ■ Quality assurance ■ transient ischemic attack

A straightforward approach to quality assessment from the perspective of a clinician is to evaluate whether known effective and efficient diagnostic and therapeutic procedures are actually applied to patients for whom they are considered to be appropriate. Clinical trials have provided scientific evidence for the efficacy of a variety of interventions after acute ischemic stroke, including early treatment with aspirin, thrombolysis within 3 hours from onset, and multidisciplinary organized inpatient stroke care. Furthermore, most guidelines stress the importance of early brain imaging and a 12-lead ECG. Regarding prevention of new vascular events after ischemic stroke, clinical trials have established the efficacy of carotid endarterectomy for severe symptomatic carotid stenosis, antiplatelet therapy, and anticoagulation for atrial fibrillation. In addition, a favorable effect of medical treatment of hypertension and hyperlipidemia on the incidence of new vascular events has been reported, and the need for rapid-access transient ischemic attack (TIA) clinics is increasingly highlighted in guidelines.

Despite scientific evidence and consensus, several national audits have demonstrated significant gaps between guidelines and management of ischemic stroke patients. Little is known, however, about the reasons for nonadherence to these guidelines and the management of outpatients with minor ischemic stroke or TIA. The aim of this study was to evaluate to what extent guidelines on acute management and secondary prevention are appropriately applied to admitted ischemic stroke patients, as well as to patients who only visited the outpatient clinic.

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Methods

Study Population
A survey was conducted in 11 centers (16 hospitals) in The Netherlands: 2 in the north, 5 in the middle, and 4 in the southern regions. The participating sites included 2 small centers (<400 beds), 5 of intermediate size (400 to 800 beds) and 4 large centers (>800 beds). Two centers were university hospitals. All centers had a neurology department, a neurologist with expertise in stroke, and a multidisciplinary stroke team. All but 1 had a stroke unit and a rapid-access outpatient TIA clinic, 9 (82%) were participating in a regional stroke service, and 9 (82%) were equipped for thrombolytic therapy. These institutions deliver care to ~10% of all acute stroke patients in The Netherlands, and their size and stroke expertise can be considered representative.1

All patients who were admitted to the neurology department or visited the neurological outpatient clinic with suspected ischemia of brain or eye between October 2002 and May 2003 were screened. Screening per hospital could be discontinued when at least 30 admitted patients and 30 outpatients were enrolled. Patients with ischemic stroke and symptom onset within the last 6 months were enrolled consecutively and prospectively if the initial diagnosis of first or recurrent ischemia of the brain or eye was confirmed by the neurologist’s assessment. All patients or their proxies provided informed consent. The medical ethics committees of the participating hospitals approved the study.

Measures
Stroke subtype was defined by the treating neurologist based on clinical features and brain imaging (CT or MRI) data. Previous stroke was defined present if ischemia of brain or eye or cerebral hemorrhage was noted in the medical history. Level of consciousness was assessed with the Glasgow Coma Scale,19 and disability in activities of daily living with the Barthel Index.20 Atrial fibrillation (AF) and cardiac comorbidity were marked if diagnosed by physical examination or detected on ECG or if this was noted in the patient’s medical history. Also peripheral vascular disease, diabetes mellitus, and chronic hypertension were based on patient’s medical history or scored if diagnosed during hospitalization. Hyperlipidemia was defined present if total serum cholesterol exceeded 5 mmol/L or low-density lipoprotein exceeded 3.2 mmol/L or when hyperlipidemia was noted in the patient’s medical history. The presence of carotid stenosis ≥70% was assessed by carotid imaging, and the absence of brain stem, cerebellar symptoms and isolated hemianopia by the treating neurologist based on clinical features and brain imaging.

Data Collection
Trained research assistants collected all data from the patients’ hospital charts, within 5 days after discharge. Additionally, in both admitted patients and outpatients they asked the treating neurologist arguments for withholding brain imaging, thrombolysis, or anti-thrombotic agents if this was not documented in the patient’s chart. Research assistants worked independently of the hospital team. All data were entered into the electronic Case Record Form and transferred regularly to a central database via the Internet.

Data Quality Assurance
Duplicate independent assessment of a random sample of 10% of all patients showed good agreement of scores between research assistants (median κ=0.81; item range = 0.62 to 1.0). For another random sample of 10% of the patients, the scores recorded by neurologists and research assistants also turned out to correspond adequately (median κ=0.86; item range = 0.73 to 1.0). Data entered into the electronic Case Record Form was continuously checked for completeness and consistency during the data collection phase. The overall percentage of missing values was 0.2%.

Statistical Analyses
Dichotomous data are described as numbers and percentages, and continuous data are presented as means with standard deviations (SD). When the distribution was skewed, we reverted to median values and interquartile range. χ² tests were used to assess whether the patient characteristics listed in Table 1 are related to withholding recommended procedures. All statistical analyses were carried out using SPSS 12.0 statistical software.

Results
The study population consisted of 972 patients who where evaluated because of ischemic stroke or TIA. Of these, 579 patients were admitted to the hospital and 393 visited the outpatient clinic (Table 1). As expected, 88% of admitted patients had experienced a brain infarction, whereas most of the outpatients (61%) visited the clinic because of a TIA.

Acute Management: Diagnostic Investigations
Of admitted patients, 71% arrived within 24 hours from onset, whereas this was 17% in outpatients (Figure 1). In admitted patients, the only patient characteristic associated with arrival within 24 hours was a depressed level of consciousness (P=0.010), whereas for outpatients only a previous stroke was related (P=0.034). CT or MRI was performed in 98% of admitted patients and 93% of outpa-
patients (Table 2). Documented reasons for withholding brain imaging in 12 admitted patients (2%) were poor prognosis (7 patients) or brain imaging was recently performed (5 patients). In none of the 27 outpatients (7%) a reason for withholding brain imaging was documented. Among admitted patients that received brain imaging, 10% of admitted patients received this within 3 hours after symptom onset, and 64% within 24 hours (Figure 2). Patient characteristics associated with nonuse of brain imaging within 24 hours were an alert consciousness level at hospital arrival ($P<0.004$) and the absence of vascular comorbidity ($P=0.004$), in particular the absence of AF ($P=0.007$). For outpatients, none of the evaluated patient characteristics could explain why brain imaging was or was not carried out within 24 hours. A 12-lead ECG was performed in all admitted patients (96%), but only in 81% of outpatients. Nonuse of a 12-lead ECG in outpatients was associated with older age ($P=0.044$) and a previous stroke ($P=0.026$). Also laboratory tests were less often performed in outpatients (86%) than admitted patients (97%; $P<0.001$), especially tests for hematocrite (66%), and blood levels of sodium (66%) and glucose (80%).

### Acute Management: Treatment

Ninety percent of admitted patients not using anticoagulation received aspirin within 48 hours after symptom onset, whereas this was 68% in outpatients. In admitted patients, nonuse of aspirin was associated with absence of a previous stroke ($P=0.029$), a depressed consciousness level ($P=0.011$) and early in-hospital mortality ($P=0.006$), whereas among outpatients females ($P<0.001$) and patients without a previous stroke ($P<0.002$) less often received aspirin within 48 hours than their counterparts. Thrombolytic therapy was provided in 40 admitted patients (7%). In all except 3 patients, 1 or more of the NINDS trial exclusion criteria were provided as reason for withholding thrombolysis. The prime reasons for not providing thrombolysis in 123 patients arriving at the hospital within 3 hours were minor symptoms or rapidly improving symptoms (33%).

### Secondary Prevention: Diagnostic Investigations

Duplex ultrasound, magnetic resonance angiography or angiography of the cervico cerebrovascular vessels was performed in 77% of admitted patients and 84% of outpatients with a Barthel Index $>18$ and no brain stem, cerebellar symptoms or isolated hemianopia (Table 3). Among these admitted patients imaging was less often performed in patients with older age ($P=0.015$) or female gender ($P=0.026$) than in their counterparts. In outpatients, only advanced age, especially age over 75 (75% versus 89% in patient below 65 years of age, $P=0.006$), was associated with no duplex ultrasound, magnetic resonance angiography or angiography. Assessment of plasma levels of glucose, total and low-density lipoprotein cholesterol was not carried out in 12%, 26% and 45% of all patients, respectively. Plasma glucose level was more often not assessed in outpatients (21%) than in admitted patients (7%; $P<0.001$).

### Secondary Prevention: Treatment

In all, 95% of patients received antithrombotic therapy at discharge: antiplatelet agents (89%) and oral anticoagulants (12%). Documented reasons for not starting anticoagulant therapy in 54 patients (43%) with AF were increased risk of bleeding (14 patients), poor prognosis (11 patients), treatment with heparin (6 patients), anticoagulant therapy planned but not yet started (6 patients), and international normalized ratio instability (2 patients). In 4 admitted patients and 11 outpatients with AF and without anticoagulants, no reason for nontreatment was documented. All these patients, however, were treated with antiplatelet agents. Correspondingly, patient characteristics related to withholding antithrombotic agents were a depressed consciousness level ($P=0.004$) and in-hospital mortality ($P<0.001$) among admitted patients. None of the evaluated patient characteristics could explain

### TABLE 2. Acute Management of Ischemic Stroke

<table>
<thead>
<tr>
<th>Diagnostic investigations</th>
<th>Admitted Patients</th>
<th>Outpatients</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT/MRI performed</td>
<td>567 (98)</td>
<td>366 (93)</td>
</tr>
<tr>
<td>12-lead ECG</td>
<td>555 (96)</td>
<td>317 (81)</td>
</tr>
<tr>
<td>Laboratory tests</td>
<td>564 (97)</td>
<td>336 (86)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Admitted Patients</th>
<th>Outpatients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylsalicylic acid within 48 hours</td>
<td>479 (83)</td>
<td>259 (66)</td>
</tr>
<tr>
<td>Prescribed before hospital arrival</td>
<td>216/479 (45)</td>
<td>147/259 (57)</td>
</tr>
<tr>
<td>Inpatients without anticoagulation</td>
<td>438/485 (90)</td>
<td>251/367 (68)</td>
</tr>
<tr>
<td>In patients without anticoagulation that arrived within 48 hours</td>
<td>396/434 (91)</td>
<td>96/113 (83)</td>
</tr>
<tr>
<td>Thrombolysis</td>
<td>40 (7)</td>
<td>...</td>
</tr>
</tbody>
</table>
withholding antithrombotic agents in outpatients. Antihypertensive therapy was provided in 75% of hypertensive admitted patients and 62% of hypertensive outpatients. For both admitted patients and outpatients, none of the patient characteristics was related to withholding antihypertensive therapy. Of patients with past or current elevated cholesterol levels in combination with a history of ischemic heart disease or an increased cardiovascular risk profile, 71% of admitted patients and 52% of outpatients received lipid-lowering therapy. No vascular comorbidity ($P_{\text{adj}} < 0.008$ in admitted patients; $P_{\text{adj}} = 0.001$ in outpatients), in particular no cardiac diseases ($P_{\text{adj}} < 0.001$ in both admitted patients and outpatients), was the only factor associated with nontreatment of hyperlipidemia among both eligible admitted patients and outpatients.

**Discussion**

This survey demonstrates that in The Netherlands, acute management of ischemic stroke is provided according to guidelines in most admitted patients, but needs improvement in patients who visit the outpatient clinic. Arguments to withhold recommended treatment were plausible for the majority of admitted patients whereas reasons for withholding procedures in outpatients were often not clear. Secondary preventive measures and procedures, however, are too often...
withheld in both admitted patients and outpatients, and specific attention is needed for earlier initiation of such measures in outpatients.

We observed high-quality acute stroke care in admitted patients with ischemic stroke. The proportion of patients that received brain imaging, a 12-lead ECG, recommended blood tests, aspirin within 48 hours, and thrombolysis was comparable to or higher than reported in other national surveys.\(^{12-16}\)

In addition to these findings, our results show that arguments for withholding procedures were in the large majority of cases legitimate. This relatively high quality of acute stroke management may be explained in part by patients selected for the denominator in the calculation of percentages of treated patients. Most national surveys only report the percentage of patients treated within the total study population. The detailed clinical data allowed us to examine the use of interventions among eligible patients without obvious contraindications.

Another explanation for the relatively high quality of acute stroke care may be a recent rapid increase in number of stroke units in our country. Comparing our current results with results from a national survey that we performed 10 years ago, brain imaging (92% then versus 98% now), ECG (88% versus 96%), and laboratory tests (90% versus 97%), for example, are now more often performed according to guidelines.\(^{17}\) Nowadays, most hospitals in The Netherlands have a stroke unit,\(^{18}\) whereas surveys in other countries often reported lower percentages of hospitals with either a stroke unit or a mobile stroke team. In line with our findings, some of these surveys demonstrated higher quality of stroke care in hospitals equipped with stroke units.\(^{13,16}\)

The arguments provided by neurologists for withholding recommended procedures were often too poor to extract reasons for not following guidelines. For example, “poor prognosis” was confirmed by in-hospital mortality. Although the arguments provided for not following guidelines were plausible from the perspective of the treating neurologist, some of them may be debatable. For example, the argument most often provided for withholding imaging was a “poor prognosis”. One could argue, however, that a “poor prognosis” can never be made without imaging. The poor neurologic status leading to a determination of “poor prognosis” may be attributable to a lesion that is potentially reversible, i.e., a subdural hemorrhage which could be evacuated. In our opinion, early brain imaging should be provided in all patients with suspected stroke, including patients that clinically look to have a poor prognosis.

With respect to secondary prevention, our results are consistent with other surveys\(^{12-16}\) showing a high proportion of patients receiving antithrombotic agents, but poor adherence to guidelines in hypertensive and hyperlipidemic patients. Clearly there are major opportunities missed in secondary stroke prevention, even in patients who have cardiac comorbidity or an increased cardiovascular risk profile. Whether patients with a recent TIA or ischemic stroke also benefit from statin therapy and whether statins also prevent stroke in these patients remains a critical question that will be answered this year by the SPARCL (Stroke Prevention by Aggressive Reduction in Cholesterol Levels) trial.\(^{21}\)

In outpatients, both acute management and secondary prevention were frequently withheld and reasons for doing so were often not clear. Documentation of treatment of outpatients was, in contrast to documentation of admitted patients, often too poor to extract reasons for not following guidelines. Neurologists were only briefly asked if they could provide further information, but we did not insist an answer. Further research is needed to assess and validate physician’s reasons for withholding recommended procedures.

Despite our large proportion of hospitals with rapid-access TIA clinics, we found that only 17% of patients visited this outpatient clinic within 1 day and just half within 1 week. In addition, prehospital initiation of secondary prevention was poor; for example, 37% of patients received aspirin. Dutch guidelines in 2002 recommend that patients with TIA and minor stroke should be seen within 1 week. However, recommending urgent preventive treatment would be more appropriate considering results of recent community-based studies that estimated a high short-term risk of recurrent stroke in patients with TIA or minor strokes.\(^{22}\) For stroke prevention to be effective, the public would need to be educated to seek medical attention urgently and services would need to be organized such that all patients with TIA or minor stroke are seen and treated immediately.

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Disclosures

None.

References


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