Case Scenarios to Assess Australian General Practitioners’ Understanding of Stroke Diagnosis, Management, and Prevention

Sandy Middleton, PhD; David Sharpe, FRACP; John Harris, FRACS; Alastair Corbett, MD; Robert Lusby, MD; Jeanette Ward, PhD

Background and Purpose—Stroke represents the third-leading cause of death in Western society. Prompt and appropriate intervention for those with stroke or at risk of stroke is highly dependent on general practitioners’ (GPs’) knowledge and referral practices.

Methods—We randomly selected 490 eligible GPs from New South Wales, Australia, to complete our self-administered questionnaire. Case scenarios were used to assess GPs’ knowledge of transient ischemic attack/ stroke risk factors, stroke prevention strategies, and management of asymptomatic and symptomatic patients.

Results—We received 296 completed questionnaires (60% response rate). Nearly all GPs (286, 96.6%) strongly agreed or agreed that stroke is a medical emergency. Most were aware that management by multidisciplinary teams improves outcomes (strongly agree or agree, 279; 94.3%). GPs endorsed the effectiveness of aspirin and warfarin in reducing stroke morbidity. GPs also were aware of the benefit of carotid endarterectomy (CEA) for symptomatic patients with >80% carotid stenosis but were less aware of the value of CEA for symptomatic patients with moderate stenosis. Vascular surgeon was the specialist of choice for referral of patients with high-grade carotid stenosis. Few GPs reported having seen the Cochrane Collaboration reviews of CEA for symptomatic (3.0%) and asymptomatic (1.7%) patients.

Conclusions—GPs were well apprised of the evidence to support CEA for symptomatic patients with high-grade carotid stenosis. Our findings, however, invite more purposeful and effective education of GPs about stroke prevention, diagnosis, and management if optimal outcomes are to be realized. (Stroke. 2003;34:2681-2686.)

Key Words: carotid endarterectomy ■ practice guidelines ■ referral and consultation ■ stroke

Australia’s national government recognizes stroke as a national health priority.1 The National Stroke Strategy advocates greater awareness of stroke as a public health issue.2 It also recommends that current patterns of stroke prevention and management be determined.3 In addition, Australia’s peak health and medical research body, the National Health and Medical Research Council (NHMRC), published evidence-based clinical practice guidelines for stroke prevention and management in 1997.3 These guidelines summarize the evidence for anticoagulants, antiplatelet agents, and carotid endarterectomy (CEA).3 In Australia, general practitioners (GPs) provide primary medical care and are responsible for patient referral to specialist care. Given the importance of stroke prevention and its optimal management as a global health priority,4-6 we designed a representative survey to examine Australian GPs knowledge about stroke issues.

Methods

GP Sample and Survey Administration

We randomly selected 490 practicing GPs from New South Wales, the most populous state in Australia. Each GP was sent a questionnaire and cover letter signed by an author (J.H.) and another well-known surgeon. Standardized follow-up strategies for nonresponders were used.7 Our survey was conducted from November 2000 to February 2001.

Survey Instrument

In the first section of our 21-page questionnaire, we asked GPs to indicate whether each of 13 stroke risk factors was modifiable in general practice. Risk factors were classified as clinical (n=8) or lifestyle (n=5). GPs were then asked to indicate the average risk for a 45-year-old man of having a stroke before 85 years of age (correct response, 1 in 4).3 We also asked respondents to estimate the proportion of strokes attributable to hypertension (correct response, about one quarter). We also asked respondents to estimate the proportion of strokes attributable to hypertension (correct response, about one quarter). Respondents then were asked to indicate their level of agreement with each of 10 statements from key stroke publications2,3,9 (strongly agree to strongly disagree).

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In the next section of our questionnaire, we presented 4 case scenarios. Case 1 was a previously symptomatic 62-year-old man who had recently been discharged from hospital after a nondisabling stroke; case 2 was a symptomatic 62-year-old woman with a history of recent carotid transient ischemic attack (TIA); case 3 was an asymptomatic 62-year-old woman with a neck bruit; and case 4 was an asymptomatic 63-year-old man who had previously undergone a CEA (“asymptomatic other side”). See Figures 1 through 4 for full case scenarios.

For each scenario, GPs were asked to indicate their views on the patient’s suitability for CEA and their typical referral practices, depending on differing levels of carotid stenosis (>60%, >75%, or >80%). The 75% and 80% carotid stenosis levels were chosen to place these patients clearly in the high-grade carotid stenosis category as defined by North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria. Correct responses were determined by reference to NASCET criteria. GPs also were asked whether they would change their treatment choices, depending on patient sex or age.

We also assessed their awareness of 2 relevant Cochrane Collaboration reviews. GPs then were asked to indicate whether they had seen each of 3 authoritative national guidelines, namely comprehensive stroke clinical practice guidelines, an abridged GP version of these guidelines (A Guide For General Practitioners), and a consumer version. All 3 versions of these guidelines are accessible via the Internet. To compare recall of less methodologically rigorous information, we also asked GPs whether they had seen a recent stroke management article in a “throw-away” medical publication, Australian Doctor. Articles appearing in this publication typically are not peer reviewed. Finally, GPs were asked 9 standard sociodemographic questions.

Data Analysis

Data were analyzed with SPSS, version 9.0. Frequencies for questionnaire responses were calculated for all variables. Univariate analyses using \( \chi^2 \) statistics were performed to examine measures of association between correct responses for the following variables: risk of a 45-year-old man having a stroke before 85 years of age, proportion of strokes attributable to hypertension, and GP awareness of relevant stroke guidelines. McNemar’s \( \chi^2 \) test was used for paired responses.

GPs’ responses regarding their views about strategies to reduce stroke morbidity and mortality in the Australian community were collapsed. “Strongly agree” and “agree” were aggregated, as were “disagree” and “strongly disagree.”

Results

From 490 eligible GPs, we received 296 completed questionnaires (60% response rate). Table 1 summarizes GP demographic details, also providing comparable Australian data for the reference sample. The median age of participating GPs...
TABLE 1. GP Characteristics Including Comparison With NSW Data (n=296)*

<table>
<thead>
<tr>
<th>Study Data (n=296),</th>
<th>NSW (n=7080),</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>%</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>25–34</td>
<td>25 (8.4)</td>
</tr>
<tr>
<td>35–44</td>
<td>82 (27.7)</td>
</tr>
<tr>
<td>45–54</td>
<td>112 (37.8)</td>
</tr>
<tr>
<td>55–65</td>
<td>47 (15.9)</td>
</tr>
<tr>
<td>&gt;65</td>
<td>25 (8.4)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>208 (70.3)</td>
</tr>
<tr>
<td>Female</td>
<td>88 (29.7)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
</tr>
<tr>
<td>Full time</td>
<td>220 (74.3)</td>
</tr>
<tr>
<td>Part time</td>
<td>72 (24.3)</td>
</tr>
<tr>
<td>Practice description</td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>166 (56.1)</td>
</tr>
<tr>
<td>Solo</td>
<td>91 (30.7)</td>
</tr>
<tr>
<td>Partnership</td>
<td>37 (12.5)</td>
</tr>
<tr>
<td>Practice location</td>
<td></td>
</tr>
<tr>
<td>Capital city</td>
<td>165 (55.7)</td>
</tr>
<tr>
<td>Other metropolitan center (population&lt;100 000)</td>
<td>52 (17.6)</td>
</tr>
<tr>
<td>Larger rural center (population 25 000-99 999)</td>
<td>32 (10.8)</td>
</tr>
<tr>
<td>Smaller rural center (population 10 000-24 999)</td>
<td>21 (7.1)</td>
</tr>
<tr>
<td>Remote area (population 5000-9999)</td>
<td>12 (4.1)</td>
</tr>
<tr>
<td>Other remote area (population&lt;5000)</td>
<td>12 (4.1)</td>
</tr>
<tr>
<td>Fellow of the RACGP</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96 (32.4)</td>
</tr>
<tr>
<td>No</td>
<td>166 (56.1)</td>
</tr>
<tr>
<td>Member of the Australian Medical Association†</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>110 (37.2)</td>
</tr>
<tr>
<td>No</td>
<td>153 (51.7)</td>
</tr>
<tr>
<td>Postgraduate training</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>76 (25.7)</td>
</tr>
<tr>
<td>No</td>
<td>176 (59.5)</td>
</tr>
</tbody>
</table>

NSW indicates New South Wales; RACGP, Royal Australian College of General Practitioners.

*When totals do not add to 100%, data were missing.
†Medicopolitical organisation.

As shown in Table 1, which can be found online at http://stroke.ahajournals.org, knowledge of stroke risk factors modifiable in general practice was high. With respect to quantification of stroke risk, however, only 34 GPs (11.5%) correctly estimated that the average risk of a stroke for a 45-year-old man before 85 years of age was 1 in 4.3 GPs who were correct were more likely to be male (15.1%) than female (3.5%) (χ²=7.80, df=1, P=0.005). There were no other significant associations for a correct response. Although 23 GPs (7.8%) correctly identified that about a quarter of strokes are attributable to hypertension,6 most (n=250, 84.5%) overestimated attributable risk. GPs who responded correctly were more likely to be 49 years of age than those who were not (11.8% versus 5.0%) (χ²=4.52, df=1, P=0.03).

Table 2 summarizes GPs’ views about stroke management. Nearly all (286, 96.6%) strongly agreed or agreed that stroke is a medical emergency. Similarly, most GPs (279, 94.3%) strongly agreed or agreed that management of stroke patients by a multidisciplinary team improves patient outcomes. Fewer than a third (n=88, 29.7%) indicated that aspirin is not useful in the management of lone atrial fibrillation (AF) (nonvalvular AF in people with no history of previous thromboembolism, hypertension, or congestive cardiac failure and with a normal echocardiogram) (Table 2).

Case Scenarios

Case 1: 62-Year-Old Man With a History of Nondisabling Stroke

Figure 1 shows GPs’ self-reported practices for this symptomatic patient. When informed that investigations subsequently showed that this patient had a <60% stenosis of the relevant carotid artery, 128 (43.2%) GPs stated that this patient should definitely not be considered for a CEA. Yet, 116 GPs (39.2%) stated that perhaps this patient should be considered for a CEA. At the time of our survey, stroke guidelines did not recommend CEA for a patient with this level of stenosis.3 A meta-analysis of symptomatic CEA patients, published subsequently, showed that patients with this degree of stenosis would benefit from CEA.11 GPs were significantly more likely to definitely refer this patient with <60% stenosis to a vascular surgeon (30.8%) than a neurologist (16.2%) (McNemar’s χ²=12.25, P<0.001).

When asked whether a similar patient with >80% stenosis should be referred for CEA, 208 GPs (70.3%) correctly stated that this patient should definitely be considered for CEA. Furthermore, 199 GPs (67.2%) indicated that they would be unlikely to change their referral choice if the patient were female rather than male. Despite evidence that age is not a predictor of poorer outcome after CEA,16 36 GPs (12.2%) stated they would be highly likely and 98 GPs (33.1%) would be somewhat likely to change their treatment if this patient was >80 years of age. GPs were significantly more likely to state that the patient with >80% stenosis should definitely be considered for CEA (71.2%) than the patient with <60% stenosis (5.1%) (McNemar’s χ²=189.05, P<0.001).

Case 2: 62-Year-Old Symptomatic Woman With Recent Carotid TIA

Figure 2 presents GP examination, investigation, and management options for this second symptomatic patient. When GPs were told that carotid ultrasound results demonstrated that this patient had >80% stenosis of the relevant carotid artery, 199 GPs (67.2%) correctly identified that the patient should definitely be considered for a CEA. GPs were signif-
icantly more likely to definitely refer this patient with >80% stenosis to a vascular surgeon (39.1%) than to a neurologist (19.3%) (McNemar's \( \chi^2 = 19.72, P<0.001 \)). Half the GPs indicated that they would be likely to change their treatment if the patient were >80 years of age (highly likely: \( n = 38, 12.8\% \); somewhat likely: \( n = 110, 37.2\% \)).

**Case 3: 62-Year-Old Asymptomatic Woman With a Neck Bruit**

In response to this scenario, just over half the GPs would prescribe aspirin (\( n = 159; 53.7\% \)) (Figure 3). Just over half the GPs (\( n = 153, 51.7\% \)) indicated that, should this patient be found to have a >80% carotid stenosis, she should definitely be considered for CEA. A further 124 GPs (41.9%) indicated that perhaps this patient with >80% stenosis should be considered for CEA. Only a small percentage of GPs would change their treatment if the patient were male rather than female (highly likely: \( n = 16, 5.4\% \); somewhat likely: \( n = 21, 7.1\% \)).

**Case 4: 63-Year-Old Asymptomatic Man (Asymptomatic Other Side)**

Figure 4 displays GPs’ self-reported management for this second scenario of an asymptomatic patient. Most GPs (\( n = 221, 74.7\% \)) stated that they would prescribe aspirin and order a carotid ultrasound (\( n = 171, 57.8\% \)) (Figure 4).

Although fewer than half the GPs (\( n = 115, 38.9\% \)) stated they would definitely consider this patient for a CEA if he had >75% stenosis in the left internal carotid artery, a further 145 GPs (49.0%) would perhaps consider CEA for this patient. Similar to case 3, only a small percentage of GPs would change their treatment if the patient were female rather than male (highly likely: \( n = 10, 3.4\% \); somewhat likely: \( n = 13, 4.4\% \)). Just under half the GPs stated that they would be likely to change their management if the patient were >80 years of age (highly likely: \( n = 29, 9.8\% \); somewhat likely: \( n = 97, 32.8\% \)). GPs were significantly more likely to state that the asymptomatic patient with a neck bruit (case 3) with high-grade stenosis should definitely be considered for a CEA (52.2%) compared with the patient with the asymptomatic other side (case 4) with high-grade stenosis (39.2%) (McNemar’s \( \chi^2 = 14.88, P<0.001 \)).

**GP Awareness of Relevant Stroke Guidelines**

Table II, which can be found online at [http://stroke.ahajournals.org](http://stroke.ahajournals.org), summarizes GP awareness of 6 stroke publications. Only 74 GPs (25.0%) reported having seen a copy of the

<table>
<thead>
<tr>
<th>GPs’ Views About Strategies to Reduce Stroke Morbidity and Mortality in the Australian Community*†</th>
<th>Strongly Agree or Agree, ( n (% )</th>
<th>Not Sure, ( n (% )</th>
<th>Disagree or Strongly Disagree, ( n (% )</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs should investigate the extent of carotid stenosis in patients who have had a nondisabling stroke or TIA if this has not already been done.</td>
<td>286 (96.6)</td>
<td>6 (2.0)</td>
<td>3 (1.0)</td>
</tr>
<tr>
<td>Stroke is a medical emergency.</td>
<td>286 (96.6)</td>
<td>3 (1.0)</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Management of stroke patients by a multidisciplinary team improves outcomes.</td>
<td>279 (94.3)</td>
<td>11 (3.7)</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Patients with acute stroke should be admitted to hospital within 6 h of symptom onset.</td>
<td>266 (89.9)</td>
<td>13 (4.4)</td>
<td>17 (5.7)</td>
</tr>
<tr>
<td>Aspirin is useful for patients with nonhemorrhagic stroke or TIA who do not have AF or valvular heart disease.</td>
<td>283 (95.6)</td>
<td>7 (2.4)</td>
<td>4 (1.4)</td>
</tr>
<tr>
<td>All suspected stroke patients should be admitted to hospital.</td>
<td>218 (73.6)</td>
<td>20 (6.8)</td>
<td>56 (18.9)</td>
</tr>
<tr>
<td>Aspirin is effective as a primary prevention strategy for patients at low risk of developing stroke.</td>
<td>227 (76.7)</td>
<td>33 (11.1)</td>
<td>35 (11.8)</td>
</tr>
<tr>
<td>Warfarin is useful for reducing stroke risk in people with nonvalvular AF without clinical evidence of prior thromboembolism.</td>
<td>242 (81.8)</td>
<td>31 (10.5)</td>
<td>21 (7.1)</td>
</tr>
<tr>
<td>Age is irrelevant in stroke prevention.‡</td>
<td>189 (63.9)</td>
<td>15 (5.1)</td>
<td>90 (30.4)</td>
</tr>
<tr>
<td>Aspirin is useful in the management of lone AF.</td>
<td>132 (44.6)</td>
<td>73 (24.7)</td>
<td>88 (29.7)</td>
</tr>
</tbody>
</table>

\( n = 296. \)

*When totals do not add to 100%, data were missing.
†Responses consistent with published evidence are shown in bold.
‡Depends on clinical condition, so no correct answer bolded.
abridged GP version of national stroke guidelines (Table II). Those who reported seeing the GP version were more likely to be male than female (29.1% versus 16.3%) (χ²=5.29, df=1, P=0.02). Older GPs (those ≥49 years of age) also were more likely to have seen these GP guidelines than younger GPs (33.6% who were ≥49 years of age versus 18.0% who were <49 years of age) (χ²=9.25, df=1, P=0.002).

Eighty-six GPs (29.1%) stated they had seen the recent stroke management article in the medical newspaper Australian Doctor. Australian Medical Association (AMA) members were more likely than nonmembers to have seen a copy of this publication (36.7% AMA members versus 24.8% non–AMA members) (χ²=4.28, df=1, P=0.04). GPs were no more likely to have seen a copy of the GP version of the stroke guidelines (25.3%) than the stroke article in Australian Doctor (29.1%) (McNemar’s χ²=0.95, P=0.33). Awareness of Cochrane Reviews was low (Table II).

Discussion

Ours is the first Australian study to determine GP knowledge of relevant epidemiology and evidence-based stroke prevention and management. Although the GPs’ knowledge of the risk of stroke before 85 years of age for a 45-year-old man was poor, most GPs correctly identified modifiable stroke risk factors. Importantly, GPs were aware that stroke patients managed by a multidisciplinary team have better outcomes. Most perceived that stroke is a medical emergency.

The use of aspirin for patients with nonhemorrhagic stroke or TIA who do not have AF or valvular heart disease also was well identified by GPs. In contrast, however, most GPs (87.7%) did not correctly identify that there is insufficient evidence to support the regular use of aspirin as a primary prevention strategy for patients at low risk of stroke. The lack of evidence for the use of aspirin in the treatment of lobe AF also was not well known, although subsequent to our survey aspirin has been recommended as useful for such patients >65 years of age.

GPs (98.7%) were well informed of the importance of managing all uncontrolled risk factors for symptomatic patients. However, a high percentage stated that they would be likely to listen for neck bruits. This finding is similar to a 1998 survey of resident physicians in Los Angeles County in which 96% of respondents recommended carotid auscultation as the clinical screening test of choice. Although NHMRC stroke guidelines acknowledged that neck bruits are an unreliable predictor of severe carotid stenosis, neck bruits “are a reasonable surrogate for epidemiological purposes.” Furthermore, the GP version recommends neck bruit auscultation. The usefulness of this technique, however, has been reconsidered in Australia. Guidelines for Preventive Activities in General Practice, published recently by the Royal Australian College of General Practitioners, states that GPs should not screen for neck bruits.

Only a minority of GPs in our study would not arrange any investigations for symptomatic patients. These results compare favorably with a UK study that reported that 24% of GPs would not arrange any investigations for patients after a recent TIA or minor ischemic stroke. After carotid ultrasound that demonstrated <60% stenosis, 43.2% of GPs stated that a symptomatic patient (case 1) should definitely not be considered for CEA, which is in accordance with the NHMRC stroke guidelines but contrary to the Cochrane review for symptomatic patients. However, a further 39.2% stated that perhaps this patient should be considered for CEA in accordance with NASCET results and the Cochrane review. To ensure that eligible patients benefit from surgery, GPs need to be better informed about the indications for CEA and refer patients appropriately.

In keeping with findings from previous studies, vascular surgeons were the first specialist of choice for referral of symptomatic patients when high-grade carotid stenosis was known. Most GPs were aware of the potential benefit of CEA for patients with >80% carotid stenosis. There does not appear to be any sex bias in referral patterns because most GPs indicated that they would not change their referral if the male patient in case 1 were female. Similarly, there does not appear to be any age bias regarding treatment choices for patients >80 years of age.

GPs appear to be less clear about the optimal management of asymptomatic patients. A high proportion of GPs stated that the asymptomatic patient with a neck bruit (case 3) with >80% stenosis should definitely (51.7%) or perhaps (41.9%) be considered for CEA despite the equivocal evidence to support this treatment. Increasing age may result in GPs changing their treatment choices, with just fewer than half the GPs (42.6%) indicating that they would consider different options if the patient were >80 years of age.

Familiarity of GPs with national stroke guidelines and the 2 Cochrane Collaboration reviews of CEA was poor. To the best of our knowledge, none of the 3 versions of the national stroke guidelines was disseminated in a systematic way. Only 25.0% of GPs reported having seen a copy of the version produced specifically for them. It is disappointing that very few GPs reported having seen the Cochrane Collaboration reviews of CEA for symptomatic (3.0%) and asymptomatic (1.7%) patients. This finding is consistent with poor access to evidence databases by Australian GPs.

Despite the poor familiarity with these publications, GPs were well apprised of the evidence of the appropriateness of CEA for symptomatic patients with high-grade stenosis. This may be due to feedback or teaching by specialists to whom GPs refer. There seems to be less clarity among GPs about the benefit of CEA for asymptomatic patients. The Executive Committee for the Asymptomatic Carotid Atherosclerosis Study (ACAS) study concluded that asymptomatic patients with ≥60% carotid stenosis may benefit from CEA when performed at centers with a low surgical risk (<3%). The ongoing Asymptomatic Carotid Surgery Trial (ACST), which is still in the patient recruitment phase, will help to resolve the question of optimal treatment for asymptomatic patients.

Methodological aspects of our study deserve comment. Although our response rate was higher than most reported in the literature, our study is based on GP self-report. This methodological limitation may influence the interpretation of results because actual behavior is typically overreported.
In summary, Australian GPs appear well informed about the indications for the use of aspirin and warfarin in stroke prevention and the potential benefit of CEA for symptomatic patients with high-grade (70% to 99%) stenosis. Just over half the GPs advocated CEA for asymptomatic patients with high-grade stenosis, despite the uncertainty surrounding the benefit of CEA for these patients. Yet, stroke risk factors are highly prevalent in Australian general practice; 70% of patients have ≥1 stroke risk factor.29 GPs will likely be the first point of medical contact for patients experiencing mild stroke or TIA. Hence, they are well placed to initiate evidence-based treatments to improve patient outcome. GPs’ knowledge of such treatments is fundamental for prompt and effective care of stroke patients.

Acknowledgments
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References
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