

Slow Progressive Acceptance of Intravenous Thrombolysis for Patients With Stroke by Rural Primary Care Physicians

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Background: In the rural United States, patients with stroke are usually first evaluated locally by a nonneurologist physician (NNP) before treatment is determined.

Objective: To determine the evolution of NNPs' familiarity and attitudes about using recombinant tissue plasminogen activator (rtPA) since this therapy has been approved.

Design: Cross-sectional design using 2 similar surveys mailed in 1997 and 2003 to all primary care, family, internal, and emergency medicine physicians in the state of Iowa (1582 and 1679 physicians, respectively).

Participants: All NNPs (primary care, internal, and emergency medicine) practicing in the state of Iowa.

Main Outcome Measures: Comparison of 1997 and 2003 aggregate responses to questions about familiarity and willingness to use rtPA to treat patients who have had an acute ischemic stroke.

Results: The willingness of NNPs to use rtPA to treat acute ischemic stroke increased from 18% to 32% between 1997 and 2003. The number of NNPs who were very familiar with the National Institutes of Health Stroke Scale increased from 1% to 13%. Compared with physicians in 1997, more physicians in 2003 knew that prolonged international normalized ratios (42% vs 61%) or excessively high blood pressures (61% vs 78%) were contraindications for the use of rtPA. Still, half of the respondents perceived that they were inadequately exposed to educational material about rtPA during these years. Most expressed preference for personal methods of delivery for future educational efforts.

Conclusions: The familiarity and comfort among NNPs with the administration of rtPA is still relatively low in rural settings. The improvement observed between the years 1997 and 2003 is encouraging. The responses suggest that NNPs' acceptance of rtPA can be further improved with educational campaigns involving personal methods of delivery.

Arch Neurol. 2007;64:518-521

INTRAVENOUS RECOMBINANT TISSUE plasminogen activator (rtPA) remains the only pharmacological therapy approved for treatment of acute ischemic stroke. Still, too few patients are benefiting from this treatment.¹ In the rural United States, strokes often occur in patients who are located at sites that are far from a tertiary health care center or stroke program. In smaller hospitals, a neurological consultation is only requested in one third of the suspected strokes.² These consults may be delayed by hours or days, depending on the local availability of neurologists.^{3,4} As a result, often patients are first evaluated in local health facilities by nonneurologist physicians (NNPs), who sometimes have specific emergency medicine training but often have a family medicine or internal medicine background.⁵ These physicians may receive assistance from tertiary centers through advice over the telephone, through a telemedicine consultation,⁶ or by requesting an aerial trans-

fer.⁷ Despite such potential aids, the time constraints for thrombolytic treatment⁸ often calls for a local administration. This makes NNPs ultimately responsible for obtaining consent and deciding about treatment. For that reason, their knowledge and attitudes about thrombolysis are crucial to the implementation of rtPA treatment and other future therapies for the 59 million residents in the rural United States.⁹ While the quality of stroke care in nonurban emergency departments has already been explored,² little is known about NNPs' perceptions of and familiarity with rtPA in a broader sense or NNPs' evolution since rtPA was initially approved.

METHODS

We used a cross-sectional design employing 2 similar independent surveys conducted in 1997 and 2003. Using a state registry, we identified all the physicians practicing family, internal, and emergency medicine in the state of Iowa. We mailed the surveys to all NNPs in the reg-

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Table 1. Baseline Characteristics of Surveyed Rural NNPs

Characteristic	1997 Survey, % of Responses (n = 773)	2003 Survey, % of Responses (n = 827)*
Type of practice		
Family medicine	71.8	61.4
Internal medicine	14.5	17.7
Emergency medicine	12.3	18.0
Age, y		
<35	12.8	12.6
35-44	41.0	29.7
45-54	28.3	38.8
>54	17.9	18.2
Size of town, No. of inhabitants		
<5000	22.5	20.8
5000-19 999	27.7	27.9
20 000-49 999	15	15.1
>50 000	34.8	35.1
Hospital is capable of performing CT 24 h/d, 7 d/wk	78.3	92.3
Hospital is capable of performing blood work 24 h/d, 7 d/wk	98.4	98.0
NNP feels his/her local EMS gives priority to stroke	75.4	87.0
Hospital provides coverage for emergencies 24 h/d, 7 d/wk	90	88.0
Hospital has a neurologist available on consultation	51.2	56.4

Abbreviations: CT, computed tomography; EMS, emergency medical services; NNP, nonneurologist physician.

*In 2003, 277 (33%) of 827 responses were blank or not sufficiently completed to include in the study.

istry. Each survey covered demographic data, attitudes toward rtPA, knowledge of the current guidelines, and educational needs. A self-addressed prepaid envelope labeled with a numeric code to allow identification while maintaining anonymity was included for their response. There was no compensation for participation. Nonresponders were sent a follow-up letter (in 1997) or received a phone call (in 2003) to increase response rates. Counts and proportions were used to describe the responses of NNPs. We used χ^2 statistics to compare differences in the responses between 1997 and 2003. Given the presence of multiple comparisons, we used a Bonferroni method to adjust the level of significance to 0.5%. For the statistical analysis we used SAS version 9.1 (SAS Institute Inc, Cary, NC). This study was previously approved by the institutional review board at the University of Iowa.

RESULTS

Forty-nine percent of physicians returned the survey in both years (1997, N=1582; 2003, N=1679). The degree of completion of the questionnaire varied but was greater than 67% in both years. The demographics of the surveyed NNPs are presented in **Table 1** by age, specialty, size of town, and basic resources for acute stroke care. More than 92% of the NNPs practiced in hospitals that can perform computed tomography and blood work on a continual basis, but only 56.4% of the hospitals had a neurologist available for consultations. **Table 2** presents the experience with rtPA and stroke among respondents in 2003. Only 21.9% of the NNPs reported that

Table 2. Experience With rtPA and Stroke Among Survey Respondents in 2003*

Survey Response	Value, %
No. of patients transferred to other institutions for rtPA in the last 5 y	
0	28.8
1-3	54.6
>3	16.6
Use of thrombolysis for stroke in the last 5 y	
Insufficient or very insufficient	36.3
Adequate	61.5
Excessive or very excessive	2.2
Witnessed a serious complication due to rtPA	
Stroke	26.7
Myocardial infarction	33.0
Current use of rtPA compared with 1997	
More frequent	21.9
Same	30.4
Less frequent	6.9
Never used	29.2
Was not practicing in 1997	11.6

Abbreviation: rtPA, recombinant tissue plasminogen activator.

*In 2003, 277 (33%) of 827 responses were blank or not sufficiently completed to include in the study.

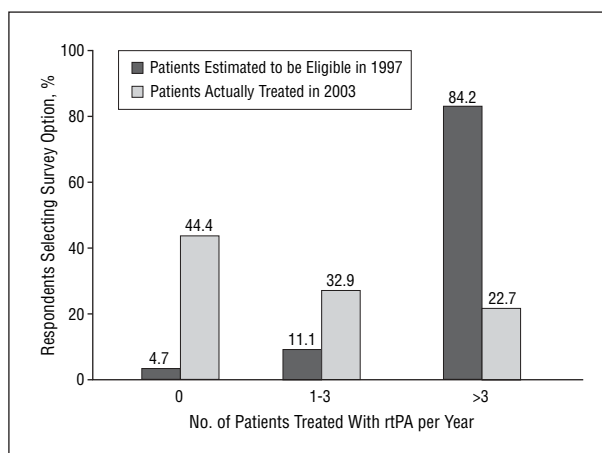


Figure. Comparison of the intended use of recombinant tissue plasminogen activator (rtPA) in 1997 (n=773) with actual use in 2003 (n=827).

they used rtPA more frequently in 2003 than in 1997. The **Figure** compares the NNPs' estimations for rtPA use in 1997 with their actual experience reported in 2003. While in 1997, 84.2% estimated that more than 3 patients would be treated with rtPA each year at their institution, only 22.7% actually reached that mark in 2003. **Table 3** presents the NNPs' perceived educational exposure to rtPA and stroke, which was judged as insufficient by 45.0% of respondents. The preferred methods of further learning about stroke and rtPA were local presentations (64.5%) and conferences (49.7%). In contrast, Web site education and continuing medical education pamphlets were only favored by 13.1% and 21.4% of the physicians, respectively. **Table 4** compares their knowledge about indications and contraindications of thrombolysis and attitudes toward rtPA between 1997 and 2003. The percentage of NNPs that identified anti-

Table 3. Perceived Educational Support From 1997 to 2003*

Educational Support	Survey Response, %
Exposure to rtPA educational material in the past 5 y	
None	5.5
Insufficient	45.0
Adequate	49.4
Educational tools/methods effective in increasing knowledge of rtPA	
Web site education	13.1
CME pamphlets	21.4
Journal articles	39.5
Educational conference	49.7
Presentation	64.5
Support received from Iowa stroke units	
Never used	31.5
Insufficient	15.7
Adequate	52.8

Abbreviations: CME, continuing medical education; rtPA, recombinant tissue plasminogen activator.

*In 2003, 277 (33%) of 827 responses were blank or not sufficiently completed to include in the study.

coagulation as a contraindication of rtPA increased from 42.3% in 1997 to 62.0% in 2003. The percentage of physicians willing to give rtPA to an eligible patient rose from 18.0% in 1997 to 31.5% in 2003.

CONCLUSIONS

Rural NNPs are a crucial but often forgotten element in the stroke chain of survival. Their perceptions about thrombolysis will not only influence their own use of rtPA but likely the acceptance of this therapy by patients, family members, and other colleagues as well. Initiatives like the promotion of primary stroke centers¹⁰ or the “drip-ship strategy”¹¹ are unlikely to succeed in rural areas without endorsement by NNPs. In these surveys, we confirmed the crucial role that NNPs play in acute stroke care. Despite having around-the-clock computed tomography scanners and laboratory resources to treat stroke patients, consultant neurologists are not available in half of the cases.

Familiarity with the indications of rtPA has clearly grown between 1997 and 2003. This improvement is encouraging, because it translates into a more proactive attitude toward the use of rtPA in the year 2003. This relationship corroborates the notion that a lack of familiarity with rtPA is a barrier for using it and should encourage educational campaigns targeting this group of physicians. We cannot attribute this positive trend in knowledge and acceptance to any specific intervention. Instead, it may be the result of a combination of experience and exposure to rtPA, patient and relatives' increased awareness, journal articles, continuing medical education courses and pamphlets, organizational campaigns, and new trainees entering into the workforce. Similar trends of improvement are commonly seen regarding medical knowledge. For example, public awareness about acute stroke has improved in the period 1995-2000,¹² and a spontaneous improvement in the number of patients treated with rtPA for stroke was noticed in

Table 4. Evolution of Familiarity With Indications for rtPA Use for Stroke Treatment

Survey Question/Response	1997 Survey, % of Responses (n = 773)	2003 Survey, % of Responses (n = 827)*
Familiarity with NIH Stroke Scale†		
Very familiar/use it regularly	1.3	13.4
Familiar but not able to apply/seldom use	17.7	59.2
Not familiar	81	27.4
Would you give rtPA to a patient with an INR of 2.3?†		
No	42.3	62.0
Not sure	48.7	24.4
Yes	9	13.6
Would you give rtPA to a patient with a BP of 185/115 mm Hg?†		
No	60.6	77.8
Not sure	31.1	16.3
Yes	8.3	5.9
Time of onset when the patient wakes up with a deficit†		
Time patient wakes up/not sure	59.7	19.0
Time patient goes to sleep	40.3	81.0
Position regarding the use of rtPA†		
Willing to use it in eligible patients	18.0	31.5
Defer use to a neurologist or transfer patient	55.5	58.7
Use with reservation	12.8	7.5
Do not recommend until more data are available	12.2	1.3
Would not use in any patient	1.5	1.0

Abbreviations: BP, blood pressure; INR, international normalized ratio; NIH, National Institutes of Health; rtPA, recombinant tissue plasminogen activator.

*In 2003, 277 (33%) of 827 responses were blank or not sufficiently completed to include in the study.

† χ^2 Test, $P < .001$.

the control group of a community education trial.¹³ A similar trend is seen for the acceptance of new therapies, which typically starts at large tertiary centers before moving to the community hospitals. This was the case for the treatment of acute myocardial infarction,¹⁴ where thrombolysis was initially restricted to use by cardiologists in tertiary centers, and rtPA was later used safely in the community hospitals when treatment regimes were strictly observed.¹⁵

Despite this improvement, the present familiarity with and acceptance among NNPs of rtPA remains relatively low. Only a small fraction of these physicians are knowledgeable about the factors that denote ineligibility for rtPA. Our results are similar to those found in other groups of physicians like US urban family medicine residents¹⁶ and practicing urban Canadian primary physicians.¹⁷ These findings clearly show that we need to increase knowledge among all NNPs about rtPA and its use in stroke care. Unfamiliarity with the therapy will signify less intended use, as only one third of the surveyed physicians are willing to use rtPA in eligible patients. While in 1997, many NNPs predicted that they would treat a significant number of patients with rtPA in their facilities, the reported experience in 2003 has been more modest. To improve the current rural use of rtPA,¹ we first need to

increase the comfort level of NNPs with this therapy. The slow rate of acceptance seen for rtPA in our study should be seen as a lesson for the implementation of any future acute neurological therapies with potentially serious complications in hospitals that do not have neurologists.

Still, prospects are encouraging. Stroke has been identified as a top health priority among rural health leaders nationwide,¹⁸ and there are initiatives to improve the current insufficient hospital reimbursement for rtPA.¹⁹ Our results support this trend, as many NNPs are eager to learn more about rtPA. We are hopeful that future educational efforts may further improve NNPs' acceptance of rtPA. A community trial combining public and physician education in a rural community has shown an improvement in the amount of eligible patients treated with rtPA.¹³ While the number of treated patients is a variable that can be influenced by multiple factors, including consultant neurologists' availability,^{3,4} neurologists' attitudes,²⁰ and public awareness,¹² it is possible that such transient benefits may have been partially achieved by altering NNPs' perceptions.

We have also found that NNPs do not consider all methods of learning equally effective. They prefer personal methods of delivery, such as on-site educational conferences, to learn more about rtPA and stroke. This finding is consistent with previous reports that found that formal continuing medical education conferences or activities, without enabling or practice-reinforcing strategies, had relatively little impact on changing physicians' behavior.²¹

We recognize the limitations of our study. We used mass mailings and obtained a response from half of the physicians, but one third of the surveys were not completed. Still, we are encouraged that a large number of colleagues took the time to complete the survey, which did not offer compensation. We also recognize that this response rate could have been biased toward those NNPs with interest in or exposure to stroke, in which case, we would actually be overestimating the degree of familiarity and enthusiasm about rtPA, including the interest for further education.

The strengths of this study include the long observation time between the surveys, which enables us to determine the secular trends in NNPs' familiarity and acceptance of thrombolytic therapy. The comprehensive nature of the assessment of NNPs, which was not just limited to emergency department care, is another strength of this study. Because of the large sample size of physicians practicing in the state of Iowa, we believe our findings can be generalized to rural care in most parts of North America.

Accepted for Publication: December 5, 2006.

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Financial Disclosure: Dr Pary has received an educational lecture honorarium from Genentech Inc, the maker of rtPA. **Funding/Support:** This study was supported in part by funds from the department of neurology at the University of Iowa, and grant 5K12RR017700-04 from the National Institutes of Health K12 Mentored Clinical Research Scholar Program at Iowa (principal investigator, Allyn Mark, MD). **Previous Presentation:** This study was presented in part at the 23rd and 29th International Stroke Conferences, respectively, in 1998, in Orlando, Fla, and in 2004, San Diego, Calif. **Acknowledgment:** We are thankful to Alicia Romont, BS, and Heena H. Maseri, BS, for their assistance, and to Miriam Zimmerman, PhD, for providing the statistical review.

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