AVAILABILITY OF THROMBOLYTIC THERAPY IN RURAL NEWFOUNDLAND AND LABRADOR

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Objective: To determine the availability of thrombolytic therapy in rural Newfoundland and Labrador.
Design: Self-administered questionnaire mailed to staff at health care facilities. Respondents were sent two reminders by mail, and questionnaires not returned were completed through telephone interviews.
Setting: Rural health care facilities, including hospitals, 24-hour clinics and satellite clinics.
Participants: All chief medical officers, nursing supervisors and administrators in the 34 government-funded rural health care facilities in Newfoundland and Labrador.
Outcome measures: Number of facilities offering thrombolytic therapy to patients with acute myocardial infarction (AMI) in 1992. For each facility: number of patients presenting with AMI during that year, number of these patients who received thrombolytic therapy, number of staff trained in advanced cardiac life support, travel time to the nearest referral centre, population served and number of beds.
Results: Of the 34 rural health care facilities in Newfoundland and Labrador, 91% (31/34) responded to the survey. Thrombolytic therapy was offered in 93% (13/14) of the rural hospitals, 22% (2/9) of the 24-hour clinics and none of the single-physician satellite clinics. In 1992, 390 patients with AMI presented to these health care facilities; 39% of these patients presented to facilities that did not offer thrombolytic therapy.
Conclusions: Thrombolytic therapy has been successfully introduced in many of the rural and isolated health care facilities in Newfoundland and Labrador. An important factor in this success is continuing medical and nursing education on the effectiveness of thrombolytic therapy and the skills needed to provide it. Cost-effectiveness data are needed to determine whether it is reasonable to offer this therapy in isolated, low-volume clinics. More research on the outcomes in patients receiving thrombolytic therapy in rural facilities is also needed.

Objectif : Déterminer la disponibilité du traitement thrombolytique dans les régions rurales de Terre-Neuve et du Labrador.
Conception : Questionnaire auto-administré posté au personnel des établissements de santé. Les répondants ont reçu deux rappels postaux et les questionnaires qui n'ont pas été renvoyés ont été remplis au cours d'entrevues téléphoniques.
Contexte : Établissements ruraux de santé, y compris hôpitaux, cliniques ouvertes 24 heures sur 24 et cliniques satellites.
Participants : Tous les directeurs médicaux, superviseurs de soins infirmiers et administrateurs des 34 établissements ruraux de santé financés par la province à Terre-Neuve et au Labrador.
Mesures des résultats : Nombre d'établissements offrant des traitements thrombolytiques aux patients qui ont subi un infarctus aigu du myocarde (IAM) en 1992. Dans le cas de chaque établissement : nombre de patients qui se sont présentés après avoir subi un IAM au cours de l'année, nombre de patients qui ont reçu un traitement thrombolytique, nombre de membres du personnel ayant reçu une formation avancée en réanimation cardiaque, durée du déplacement vers le centre de référence le plus proche, population desservie et nombre de lits.
Résultats : Sur les 34 établissements ruraux de santé de Terre-Neuve et du Labrador, 91% (31/34) ont répondu au sondage. Le traitement thrombolytique était offert dans 93% (13/14) des hôpitaux ruraux, 22% (2/9) des cliniques ouvertes 24 heures sur 24 et aucune des cliniques satellites à un seul médecin.

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The use of thrombolytic agents in the initial management of acute myocardial infarction (AMI) is standard in tertiary care centres that provide advanced cardiac life support (ACLS). Clinical trials have shown that thrombolytic agents administered intravenously are effective in dissolving the coronary artery thrombi that cause myocardial infarction. Early thrombolysis reduces the death rate, infarct size and left ventricular dysfunction. The main therapeutic benefit of this therapy occurs within 6 hours of the onset of symptoms. Myocardial damage starts about 20 minutes after occlusion of a coronary artery and becomes irreversible within 4 to 6 hours. The results of the first GISSI (Gruppo Italiano per lo Studio della Sopravvivenza nell'Infarto Miocardio) trial showed that thrombolytic therapy initiated within 1 hour of the onset of symptoms resulted in a 47% decrease in the death rate, whereas when such therapy was initiated within 3 to 6 hours it resulted in a 17% decrease in the death rate, and when it was initiated within 6 to 12 hours, a 2% decrease. The results of the recent CUSTO (Global Utilization of Streptokinase and t-PA in Occluded Arteries) trial confirmed that the clinical benefit from thrombolysis is related to the early and sustained recanalization of the occluded coronary vessel. In patient-selection studies it has been estimated that up to 33% of patients who present with an AMI should receive thrombolytic therapy.

Side effects of thrombolytic therapy include hemorrhage, immunologic reactions to streptokinase, hypotension, stroke and cardiac rupture. Other problems that may occur in these patients — left ventricular failure, cardiogenic shock and arrhythmias — are complications of myocardial infarction, not side effects of thrombolytic therapy. White compared the safety of thrombolytic therapy with the outcomes of no therapy and concluded that the benefits of therapy outweigh the risks in most patients. As well, Taylor and associates showed that cardiac arrhythmias that occur as a result of thrombolytic therapy are no more difficult to recognize or treat than those that result from an AMI alone. Results of the first GISSI trial and the second ISIS (International Study of Infarct Survival) trial showed a lower incidence of ventricular fibrillation in those treated with streptokinase than in those given placebo.

There has been a reluctance to offer thrombolytic therapy in rural health care facilities despite the importance of starting it early in the course of a myocardial infarction. According to reports of the use of this therapy, an estimated 9% to 25% of patients with an AMI in rural facilities and in some community hospitals as few as 5%, are given thrombolytic therapy.

Published reports of the use of thrombolytic therapy in rural areas are few, and the definitions of rural and community hospital in such reports vary greatly. A study conducted in a rural 110-bed hospital in Illinois showed that thrombolytic therapy could be performed safely in a hospital that had no specialists on staff. A 1988 survey of rural hospitals with a mean size of 56 beds in southern Alabama showed that only 33% of general practitioners offered thrombolytic therapy. McNamara and collaborators defined rural hospitals as those with a coronary care unit, in towns of less than 50 000 people, more than 30 miles from a cardiac catheterization laboratory, they concluded that thrombolytic therapy could be performed safely in such hospitals. Taylor and colleagues showed that the incidence of side effects of thrombolytic therapy in rural Illinois hospitals was not significantly higher than that in tertiary care centres. A survey conducted in northern Ontario found that thrombolytic agents were used in 32 of 45 rural hospitals. However, the hospitals that offered thrombolytic therapy were fairly large, with a mean of 113 beds, and 50% had intensive care units. Thompson and Wanica recommended that thrombolytic therapy be considered standard care for treatment of AMI in rural hospitals.

These studies were conducted in settings that are markedly different from rural Newfoundland and Labrador, where most hospitals have 8 to 20 beds. These hospitals are often in isolated communities, some accessible only by water or air. Since thrombolytic therapy is most effective when administered within 1 hour of an AMI, it is tempting to suggest that even the smallest clinic that serves as the first contact for a patient with an AMI should be able to administer thrombolytic agents, especially if the patient cannot be transported to another centre within 1 hour of the onset of symptoms.

Health care in rural Newfoundland and Labrador is provided by three types of medical facilities: small, rural hospitals, which usually have three to five physicians, nursing staff and an administrator, 24-hour clinics, which have medical, nursing and administrative staff similar to that in a rural hospital but have only holding beds for overnight observation of patients, and district medical offices or satellite clinics, which usually have a physician and a nurse and are administered by the closest rural hospital. Although there
may be a small degree of overlap, in general each facility serves a distinct population.

This article reports the results of a study initiated by the Rural Medicine Research and Development Network of Newfoundland and Labrador, an association of rural physicians and other health care providers interested in research on rural health care. The objectives of the study were to determine the availability of thrombolytic therapy in rural Newfoundland and Labrador and to identify issues concerning the use of thrombolytic therapy in rural and isolated settings, as perceived not only by physicians but also by nurses and hospital administrators.

METHODS

The Canadian Hospital Directory 1992–1993* was used to identify 14 rural hospitals, nine 24-hour clinics and 11 satellite clinics in Newfoundland and Labrador. These health care facilities were defined as rural if they did not have an internal medicine specialist on staff. This definition is appropriate in the context of the medical and geographic environment of Newfoundland. Each site was contacted by telephone, and the chief medical officer, nursing supervisor and administrator were identified if these positions existed. The 14 hospitals had all three positions. The nine 24-hour clinics had chief medical officers and nurses, but only two had administrators, the remaining seven being administered from the nearest hospital. The 11 satellite clinics had 11 senior medical officers, 3 registered nurses or registered nursing assistants and no administrators, since all were administered from the nearest hospital. Each of the 34 physicians, 26 nurses and 16 administrators identified received a personally addressed questionnaire appropriate to his or her position. The Dillman mail-survey method† was used to achieve the best possible response rate. One week after the first mailing, postcards were sent to remind the respondents to complete the survey. Three weeks after the first mailing, a second cover letter and questionnaire were sent to those who had not yet responded. Chief medical officers who had not responded after 8 weeks were contacted, and the information was collected in a telephone interview.

Transport time was used as a measure of distance, since many facilities can only be reached by air or water. Inclement weather is common, often rendering roads impassable, grounding flights and preventing ferries from operating.

Descriptive statistical analysis of the data was conducted with the use of Epi Info (ver 5, USD, Stone Mountain, Ga., 1990). Comments handwritten on the questionnaires were reviewed and summarized by the investigators.

RESULTS

Of the 76 questionnaires 63 were returned, for a response rate of 83%, 91% (31/34) of the senior medical officers, 80% (21/26) of the nurses and 69% (11/16) of the administrators responded. Hence, responses were received from 91% (31/34) of the institutions. Table 1 details the response rate by the type of facility and the position of the respondent.

Table 2 gives the characteristics of the 31 sites that responded, each serves a population of approximately 7000 people and is located approximately 90 minutes' travel time from a referral centre. Together, the responding facilities provided initial treatment for 390 patients with an AMI in 1992. Thrombolytic therapy was offered by 93% of the

| Table 1: Responses by position of respondent and type of facility* |
|-----------------------------|-----------------------------|-----------------------------|
| Facilities                  | Senior medical officer      | Head nurse                  | Senior administrator |
| Hospitals                   | 14                          | 11                          | 10                          |
| (n = 14)                    |                             |                             |                             |
| 24-hour clinics             | 9                           | 7                           | 1†                          |
| (n = 9)                     |                             |                             |                             |
| Satellite clinics           | 8                           | 3†                          | NA                          |
| (n = 11)                    |                             |                             |                             |

*NA = not applicable.
†Only two of the 24-hour clinics had on-site administrators, of whom one responded.
‡Only three of the satellite clinics had trained nursing staff; all three responded.

| Table 2: Characteristics of responding facilities |
|---------------------------------------------|
| Variable*                                         |
| No. of facilities | Hospitals | 24-hour clinics | Satellite clinics | All facilities |
|-------------------|-----------|-----------------|------------------|----------------|
| Mean population served (and SD) | 9142 (3245) | 5644 (3829) | 5012 (4582) | 7129 (4106) |
| Mean no. of beds (and SD) | 14.5 (11.5) | Holding beds only | 0 | NA |
| No. (and %) of facilities offering thrombolytic therapy | 13 (93) | 2 (22) | 0 | 15 (48) |
| No. (and %) of physicians with training in ACLS | 53/71 (75) | 15/24 (62) | 14/17 (82) | 82/112 (73) |
| No. (and %) of nurses with training in ACLS | 41/221 (18) | 11/58 (19) | 0/4 (0) | 52/283 (18) |
| Mean time to referral centre (and SD), h | 1.8 (1.2) | 1.6 (0.9) | 1.3 (0.9) | 1.6 (1.0) |
| No. of AMIs seen in 1992 | 242 | 56 | 92 | 390 |

*SD = standard deviation, ACLS = advanced cardiac life support, AMI = acute myocardial infarction.
hospitals, 22% of the 24-hour clinics and none of the satellite clinics. Of the 390 patients with an AMI in 1992, 61% (239/390) presented to facilities that offered thrombolytic therapy and 39% (153/390) presented to sites that did not offer such therapy.

Of the 15 sites offering thrombolytic therapy all 15 stocked streptokinase and 9 also stocked tissue plasminogen activator (t-PA). Although some facilities began to provide thrombolytic therapy before 1987, the average year of introduction of therapy with streptokinase was 1990 and of therapy with t-PA, 1992.

At the 15 sites that offered thrombolytic therapy there was variation in the practice of consulting with a specialist by telephone before starting therapy. Respondents from 67% (10/15) of the sites said they conferred with a specialist “frequently” or “always,” and those from 27% (4/15) said they consulted a specialist “occasionally” or “never.” Staff from one site did not respond to this question.

At 6 of the 15 sites that offered thrombolytic therapy the patient is transferred within 1 hour after he or she is given the thrombolytic agent. At two of the facilities the patient is observed for 48 hours after being given a thrombolytic agent and is then transferred. At the other seven facilities the patient is managed on site until discharge unless a serious complication develops.

At 5 of the 16 sites that did not offer thrombolytic therapy, staff had considered offering it but had decided not to. Insufficient nursing staff, inadequate blood banking and a short travel time to the nearest referral centre were the main factors cited for their decision.

Many of the nursing supervisors at sites that offered thrombolytic therapy expressed concern that their staffs received inadequate in-service training to allow them to feel comfortable with offering the therapy. At facilities where thrombolytic therapy was not offered, nursing supervisors said more equipment and nursing staff would be needed to implement this therapy.

The administrators of facilities that offered thrombolytic therapy reported that the main catalysts for adopting it were specialist support for its introduction and the initiative of physicians at the facility.

Table 3 compares the facilities that offered thrombolytic therapy with those that did not. The sample is small, therefore, most differences are too small to be statistically significant. It appears that sites offering thrombolytic therapy are more likely to have blood-grouping capability. Thrombolytic therapy is probably associated with blood grouping because of the possibility of hemorrhage with administration of streptokinase and t-PA. However, the current opinion is that the risk of hemodynamically unstable hemorrhage from thrombolytic therapy is so low that storage of blood products at the rural hospital is not needed in order to offer this treatment.

**DISCUSSION**

Thrombolytic therapy has made its way into most of the rural hospitals but few of the 24-hour clinics in Newfoundland and Labrador. In 1992, 153 patients presented to facilities that did not offer such therapy. From previous findings of the proportion of patients with AMI who are eligible for thrombolytic therapy, we estimate that up to 50% of these patients were eligible for therapy.

However, is it reasonable to expect all of these facilities, most of which are 24-hour or satellite clinics, to offer thrombolytic therapy? The staff at each clinic would see 8 to 10 patients with AMI per year, of whom only 3 or 4 would be candidates for thrombolytic therapy. Is maintaining the necessary level of staff competence and equipment at these sites the best use of scarce resources? There is strong evidence supporting the efficacy of intervention with thrombolytic agents at the earliest possible opportunity after an AMI. But can our health care system afford to offer this therapy in every circumstance? This is a difficult decision for a small rural health care facility to make. There is insufficient research on rural health care to determine the cost-effectiveness of offering thrombolytic therapy in these settings.

| Characteristic                              | Facilities offering thrombolytic therapy | Facilities not offering thrombolytic therapy | p value* |
|--------------------------------------------|------------------------------------------|--------------------------------------------|----------|
| % of physicians with training in ACLS      | 74                                       | 72                                         | 0.50     |
| % of nurses with training in ACLS          | 18                                       | 20                                         | 0.60     |
| Mean no. of AMIs seen per facility in 1992 (and SD) | 16 (13)                                  | 10 (11)                                   | 0.20     |
| Mean time to the nearest referral centre (and SD), h | 1.8 (1.5)                                | 1.4 (0.8)                                 | 0.20     |
| % with blood-grouping capability           | 80                                       | 25                                         | 0.02     |
| % with defibrillator                       | 93                                       | 75                                         | 0.17     |

*p < 0.05 was considered significant. Blood-grouping capability was the only characteristic with a significant difference between the two types of facilities.
Our study has several limitations. The information is based on self-reports and recall, hence, the results may understate or overstate the true situation. The collection of information from more than one source at each site probably improved the accuracy of the data, however, an on-site prospective approach would produce the most accurate account. Rural and isolated areas of Newfoundland and Labrador are probably not significantly different from isolated areas in other parts of the country, including northern Canada. Yet it is difficult to know whether our results can be generalized to these areas. There is also no clear standard of comparison for rural and isolated health care services. The results of large, urban, multicentre trials are often applied to rural communities without consideration that the inherent features of these settings may render the results of larger trials, when applied in the usual way, invalid or inappropriate.

The question remains Should all rural sites that are the first contact for patients with an AMI offer thrombolytic therapy?

Continuing medical and nursing education on the effectiveness of thrombolytic therapy, and the skills needed to provide it, is vital. More research on the outcomes in patients receiving thrombolytic therapy in rural facilities is also needed. Physicians, nurses and administrators must work together to develop and implement the most appropriate strategies for care of patients with acute cardiac conditions in rural and isolated areas.

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