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Chest pain guideline and continuous quality improvement system for Canadian rural emergency health care facilities

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[résumé]

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Abstract

Purpose: To design a chest pain guideline and continuous quality improvement (CQI) system for rural emergency health care facilities (REHCFs) for the rapid identification and initial management of patients with possible acute coronary ischemic syndromes and acute myocardial infarction (AMI).

Reason for the program: REHCFs, like urban emergency departments, might have difficulty meeting the recommended objectives of 15 minutes to AMI diagnosis and 30 minutes thrombolysis "door-to-drug" time. Some opportunities to give thrombolysis are missed. Existing guidelines and CQI systems are not designed to account for emergency practice in the rural context.

Method of development: The Rural & Small Urban Committee of the Canadian Association of Emergency Physicians (CAEP) developed the guideline and CQI dataset in a series of teleconferences. They paid careful attention to emergency health care in the rural context in Canada. The guideline is based on evidence from published literature obtained with MEDLINE searches. Recommendations were classified by level of evidence. A software program called Country Minutes Matter (CMM) was developed for use in REHCFs based on the CQI data set.

Description of the program: The chest pain guideline assigns patient care tasks to nurses and physicians and provides quality assurance objectives. Key data points defined in the guideline match data elements in the CMM software. The CMM software can be used by REHCFs to generate feedback to identify and correct causes of delay.

Implementation: The guideline and CMM software system are being distributed to all REHCFs in Canada. Individual facilities can use the guideline to write protocols that fit resource availability appropriate to their community and to develop in-services to keep staff current.

[Contents]

Résumé

Objet : Concevoir, pour les services d'urgence en milieu rural (SUMR), un guide sur les douleurs thoraciques et un système d'amélioration de la qualité (AQ) pour l'identification rapide et la prise en charge initiale des patients qui peuvent avoir des syndromes d'ischémie coronarienne aigue et un infarctus aigu du myocarde.

Justification du programme : Comme les services d'urgence en milieu urbain, il se peut que les

SUMR aient de la difficulté à respecter les objectifs recommandés de 15 minutes pour diagnostiquer un infarctus et de 30 minutes écoulées entre l'arrivée et l'administration d'un médicament thrombolytique. On rate quelques occasions d'administrer la thrombolyse. Les lignes directrices et les systèmes d'AC actuels ne sont pas conçus pour tenir compte de la médecine d'urgence en milieu rural.

Méthode d'élaboration : Le comité de la pratique en milieu rural et dans les petites villes de l'Association canadienne des médecins d'urgence a élaboré le guide et l'ensemble de données sur l'AQ au cours d'une série de téléconférence. Les participants ont tenu attentivement compte des soins de santé d'urgence en milieu rural au Canada. Le guide repose sur des données probantes tirées de documents publiés réunis à la suite de recherches effectuées dans MEDLINE. Les recommandations ont été classées en fonction du niveau des données probantes. On a créé, à l'intention des SUMR, un logiciel appelé Country Minutes Matter (CMM) fondé sur l'ensemble des données d'AQ.

Description du programme : Dans le guide sur les douleurs thoraciques, on confie le soin des patients à des infirmières et des médecins et on présente des objectifs d'amélioration de la qualité. Les principaux points de données définis dans le guide correspondent aux éléments de données du logiciel CMM que les SUMR peuvent utiliser pour produire de la rétroaction afin de définir et de corriger les causes des retards.

Mise en éuvre : On est en train de distribuer le guide et le logiciel CMM à tous les SUMR au Canada. Les établissements peuvent utiliser le guide pour rédiger des protocoles qui correspondent aux ressources disponibles dans leur communauté et pour rédiger des notes de service afin de tenir le personnel à jour.

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Chest pain is a common presenting problem in rural emergency practice.1-8 Acute coronary ischemic syndromes (ACIS) and acute myocardial infarction (AMI) are 2 of the most important differential diagnoses in this group of patients.8 About 30% of Canadian residents and many travellers to rural Canada are served by rural emergency health care facilities (REHCFs); it is possible that up to one-third of Canada's ACIS/AMI patients are managed in rural facilities.9

Management for AMI must be rapid because delays clearly are associated with adverse outcomes in terms of both morbidity and mortality.7-12 The Canadian Heart and Stroke Foundation's Emergency Cardiac Care Coalition and the Canadian Association of Emergency Physicians (CAEP) both recommend that patients suffering AMI should be treated with thrombolysis within 30 minutes of arrival at the facility.11,13 The CAEP also recommends that AMI be diagnosed within 15 minutes of patient arrival.13 Rapid response and recognition of all patients with AMI who are eligible for thrombolysis are difficult objectives to achieve in all emergency departments,

both rural and urban.14 "Door-to-drug" times longer than that recommended appear to be typical in all settings,10,15,16 and not all REHCFs offer thrombolysis.17-19 Myocardium begins dying soon after the onset of coronary occlusion, so all providers should strive to minimize the time from onset of symptoms to initiation of thrombolysis.16

Systematic, protocol-driven approaches to chest pain have been used to improve the initial management, in the emergency department, of patients suffering chest pain.7,20-22 Canadian courts have determined that protocols should be adhered to in managing patients with possible cardiac pain.22 Reduction in door-to-drug time can be achieved through continuous quality improvement (CQI).16,23,24

To date all published approaches are designed for use in urban facilities and are not sensitive to the rural context. The CAEP recommended in 1997 that a chest pain guideline and audit process be developed that is sensitive to the rural context, and that it then be adopted by all REHCFs.9 This paper describes the guideline and CQI system that was developed to meet that recommendation.

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Method of development

The rural chest pain guideline and CQI dataset were developed from publications identified by MEDLINE searches, searches of reference lists and suggestions from individuals. The guideline and CQI dataset were discussed and revised through consensus-seeking teleconferences by the CAEP's Rural & Small Urban Committee. The CAEP Standards Committee reviewed the Rural & Small Urban Committee's third draft. The Rural & Small Urban Committee made revisions based on these reviews. The CAEP Executive then approved the fourth draft as official CAEP policy.

Supporting evidence for each recommendation was classified according to a system based on one proposed by the Canadian Task Force on the Periodic Examination (Table 1).25 Evidence was graded with a 3-part notice showing the class of recommendation, the best level of evidence that we were able to verify to support the choice of class, and the best level of evidence that we were able to verify from a rural setting (indicated by the letter "R"). If a reference is not given for level III evidence, it can be read as the consensus opinion of the Rural & Small Urban Committee.

Hoffman-La Roche Ltd. developed the CQI software system Country Minutes Matter (CMM) based on the Rural & Small Urban Committee's recommended CQI dataset and advice. Hoffman-La Roche Ltd. provided unrestricted funding for the Rural & Small Urban Committee's work on the guideline and for disseminating the wall poster and software system. The Rural & Small Urban Committee followed the Canadian Medical Association's policy for interaction with the pharmaceutical industry throughout the project.26

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The rural context of managing AMI

The CAEP recognizes that delivering emergency health care in the rural context has special features that must be considered in the design of clinical practice guidelines (B, III, R-III).8 Some key examples are the multiple roles of rural nurses who sometimes cover both inpatient wards and the emergency department, low rate of physician contact with AMI (about 2 to 4/yr), the call-back nature of physician and laboratory technician staff after hours, and variations in resource availability relative to REHCF size and function.9,27-29 These and other issues of context were considered in the design of the guideline and CQI dataset.

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Guideline overview

The guideline is divided into 4 clinical phases: "prefacility," "waiting room," "triage nurse" and "physician" (Table 27,9-16,19, 20,23,24,30-61). These phases are shown sequentially but can overlap. The fifth phase, "continuous quality assurance," includes a CQI mechanism to promote self-evaluation for identifying sources of delays that might be unique to individual REHCFs. ACIS and AMI must always be considered in any patient presenting to an emergency department with chest discomfort.7,22 The guideline emphasizes these disorders but does not preclude other entities in the differential diagnosis of chest pain or discomfort.

Prefacility phase

The inability of patients to recognize symptoms of AMI is a well-known cause for delay in treatment.11,19,62,63 Health system managers can have a variable but generally positive effect on reducing thrombolysis times, and therefore morbidity and mortality, by promoting adequate public education.30,34,35

A significant proportion of rural patients with AMI arrive at REHCFs in private vehicles rather than by ambulance, the latter being the usual form of transport for urban patients.62 Ambulance transport, even at the basic life support level has many theoretical advantages over private transport: a supply of oxygen, transport in a semi-Fowler's position, administration of acetylsalicylic acid (ASA) and earlier notification of the REHCF staff. However, no research has been done to support a recommendation regarding ambulance use in rural settings. Some research from urban settings suggests that calling an ambulance can result in delayed arrival at the emergency department and that the risk of cardiac arrest in patients who travel by private vehicle

is very low.64,65 On the other hand, there is evidence that the presence of trained nurses and paramedics working in the prehospital environment can improve significantly the recognition of AMI and subsequently early thrombolysis.66

Waiting room phase

Large-volume, urban emergency departments often employ a triage nurse, who interviews all patients as soon as they enter the waiting room to determine their priority. This level of staffing is not practical in many REHCFs, where special solutions are required for the waiting room phase. Participation in the CQI process can heighten the awareness of all staff who interact with patients in the waiting room or lobby.

Nursing phase (triage and initial management)

The guideline reminds nursing staff about key issues in triaging patients with chest pain and managing those with suspected ACIS and AMI.

Cummings23 found that a team of at least 3 professionals at the bedside was required to speed response (A, II-3, R-III). In many REHCFs the triage nurse often has multiple roles, including caring for inpatients and maternity patients. A single nurse might cover the REHCF, particularly in low-volume periods. In these situations the nurse should be able to call other nurses for assistance, since many nursing functions should be carried out simultaneously. In many, and perhaps most, REHCFs the triage nurse will also be one of the nurses treating a patient with AMI; hence, we placed the triage and nursing management phases together.

Patients who might have coronary ischemia or infarction should be triaged to a very high urgency level owing to the risk that the patient will become unstable, the need for prompt thrombolysis, and the need to call in additional nurses, the on-call physician and the laboratory technician.

There is insufficient evidence to recommend a preferred sequence for nursing tasks when limited numbers of nurses are available to assist. The sequence we show is based on the Advanced Cardiac Life Support principle of managing the airway first, then breathing (oxygen) and then circulation (cardiac monitor and intravenous line).36,42 The importance of a cardiac monitor and intravenous line for patients with AMI in rural hospitals has been indirectly demonstrated by Hindle and associates.15 They documented a moderate rate of complications, such as hypotension and arrhythmia, in rural patients treated with thrombolysis. An electrocardiogram must be obtained and interpreted as soon as possible because it is critically important for diagnosing ACIS and AMI and for determining whether thrombolysis is indicated.42,43 Electrocardiography should be done by a registered nurse when a laboratory technician is not immediately available (A, III, R-III). The initial ECG should be shown or faxed to the on-call physician very early in the triage phase.

The dosage of oxygen in chest pain is controversial.67,68 There appear to be benefits from supplemental oxygen because hypoxemia can be associated with ongoing pain, ischemia, arrhythmia and myocardial dysfunction.36,69-74 However, there is also animal evidence that oxygen-free radicals can exacerbate both infarction and reperfusion injury.71,75-80 No direct connection has been made between administered oxygen dose and oxygen toxicity. The recommendation of the American Heart Association in Advanced Cardiac Life Support 1997-99 is to start oxygen at a rate of only 4 L/min by nasal cannula.36 Therefore the practice of administering high-dose oxygen (10 to 15 L/min) to patients with chest pain but no other indication cannot be supported (D, II-2, R-III), but the administration of, at the least, low-dose oxygen can be (B, II-2, R-III).

Early adminstration of ASA is as effective as thrombolysis alone: together they produce added benefit, but how "early" ASA must be given has not been determined.36,53,81-83 For practical reasons, and because it seems logical to initiate ASA administration as early as possible, we recommend that ASA be given as soon as the patient is suspected of suffering an AMI, before the physician confirms the diagnosis. The precise timing deserves further research. Emergency department use of ASA is an established recommendation for AMI and unstable angina (A, I, R-III).7,12

The role of sublingual nitroglycerin is controversial. Although it can relieve ischemia and pain in patients with angina and is widely used, its use in AMI has not been well studied. In fact until 2 decades ago nitroglycerin was contraindicated in AMI.48 There is some evidence of beneficial hemodynamic effects of sublingual nitroglycerin in AMI comparable to intravenous nitroglycerin, although this comes with a significant increase in heart rate and decrease in systolic blood pressure.84 Sublingual nitroglycerin can cause profound hypotension in patients with AMI, particularly inferior AMI, but the precise frequency of this complication is not well documented. One prehospital study found that sublingual nitroglycerin was associated with profound hypotensive bradycardia, hypotension or apnea/asystole in 4 of 300 cases.85 Patients with inferior AMI and ST elevation in lead V4R on a 15-lead ECG often present with hypotension. In one study, 11% of such patients had cardiogenic shock.47 Sublingual nitroglycerin can cause profound hypotension in these patients, although the precise risk has not been measured. Hindle and associates15 found that significant hypotension was present at some point in 23.1% of patients who received thrombolysis in rural Alberta. Although it is not known how many of those patients had hypotension as a result of right ventricular infarction, clearly the risk is present. Therefore sublingual nitroglycerin should be withheld, or used with caution, if right ventricular infarction is suspected (D, II-2, R-III). Certainly it should be withheld if the patient is hypotensive or bradycardic (E, II-1, R-III). The on-call physician might not be present when the decision to give or withhold nitroglycerin has to be made. This creates a conundrum for rural nurses who must manage a patient with chest pain before a physician can confirm the diagnosis. Further research is needed to determine the true risk of complications induced by the use of sublingual nitroglycerin in rural settings.

Physician phase (diagnosis and definitive treatment)

The guideline encourages early physician attendance and reminds physicians about key issues in assessing patients with chest pain with a view to ruling out or diagnosing ACIS and AMI and initiating appropriate treatment for AMI.

CAEP recommends that the decision to initiate thrombolysis should be made only on the advice of a qualified physician.9,13 This does not preclude thrombolysis in level 1 or 2 REHCFs if they are appropriately staffed with trained, qualified and experienced registered nurses and paramedics, and if a clear consultation process to a physician is established (A, II-2, R-III).9,37

The short time objectives for initiating thrombolysis are controversial86 and have not been verified with appropriate outcome research in any setting, either rural or urban. Although myocardial rescue is clearly time-dependent, the degree of improved outcome by shortening the objective is not clear from the literature.16 A number of rural physicians have reported during Internet discussions and teleconferences that these objectives seem unrealistic in REHCFs staffed by physicians on call-back rather than in-house, or in REHCFs where there are no physicians in the community. It has been emphasized, however, that the time frames are objectives, not standards of care.87

We therefore recommend that the objectives for door-to-drug time should be 30 minutes for classic AMI presentations when the physician is immediately available in the REHCF (B, I, R-III). It should be 60 minutes when the AMI presentation is not classic, complications are present, or when the physician has to be called back to attend the patient (B, III, R-III).

Missed opportunities for coronary thrombolysis in rural facilities have not been studied, but they undoubtedly occur and the rate could be improved in some facilities. AMI diagnosis can be difficult when symptoms and the ECG are atypical, and atypical presentations of AMI are common.7,42,43 About 50% of initial ECGs are not diagnostic of AMI.43 The rural nurse and physician can improve diagnosis and the rate of AMI recognition in these situations by re-evaluating the patient often, obtaining serial ECGs, using the 15-lead ECG and consulting with colleagues.42,43 When specialist physicians are not available in the rural community then specialist consultation should be available promptly by telephone and facsimile.13

The guideline reminds physicians of important concepts in the recognition and management of AMI. Hindle and associates15 found that adjunctive therapies with proven benefit in the management of AMI were used variably in REHCFs. ASA was given in 96.7%, but beta-blockers in only 59.8% of cases.15 The American Heart Association recommends nitroglycerin intravenously with thrombolysis. There is some evidence that intravenous nitroglycerin is beneficial in both AMI and unstable angina, although its precise role remains unclear.36,48,57-60 There is insufficient published information to provide practice standards for rate of use of these adjunctive therapies.

Continuous quality improvement phase

The guideline encourages REHCF nonclinical and clinical staff to identify causes of delay soon after each case and to capture that information on a data-entry form.16 This approach has proven effective in urban settings. However, urban solutions appear to be too labour intensive for many REHCFs, so the Committee devised a shorter dataset, which includes physician call-back and interfacility transfer (Table 3).20,23 The CQI process requires that this information be entered into the CMM software. Both nurses and physicians should fill in a data collection form during and soon after the episode to ensure that accurate, complete information is collected. The CMM reporting module makes it easy for local managers to print tailored reports for prompt feedback to staff and managers.

The CMM software can be installed on a computer in each REHCF and data entered either by the emergency nurse or health records staff. All patients who are considered for the diagnosis of AMI in either the emergency department or in-patient wards should be entered.

REHCFs should set up regular in-services to ensure that all hospital staff remain current and understand the guideline (A, II-2, R-III).16,88,89 The CMM software reports can be used during in-services to improve guideline compliance.

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Implementation of the guideline and continuous quality improvement program in Canada

The summary wall poster and CMM software are being distributed to all Canadian rural hospitals with 24-hour emergency departments. The rural chest pain guideline was designed to be as generic as possible. However, so many variations exist in the staffing, inventory and layout of REHCFs and in the geography of rural communities in Canada, that some institutions will need to modify the guideline to suit their circumstances.13,17,18 This can be done by developing a chest pain care map. It can be inserted as part of the patient chart to remind staff about optimal care options and to record actual patient care for each individual.11

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Further work

Obviously much research needs to be done in many areas of managing AMI and ACIS in rural settings. A chest pain care map should be devised for REHCFs. Research should be conducted to determine the effectiveness of our guideline and CQI program in REHCFs. The guideline will require modification, as new evidence becomes available regarding both the effectiveness of

specific interventions in the management of AMI and the organization, function and staffing of REHCFs. Data collected with the CMM software can be pooled to study AMI management by REHCFs over a wide area and to identify causes of delay. Since the same nurses and physician who cover the emergency department in many REHCFs also cover the in-patient wards, this chest pain guideline and CQI system can also be used to manage in-patients. We did not explore special issues that might need to be considered when using this system for in-patients. Evidence-based guidelines should be developed for the continued management of AMI and ACIS in REHCFs after initial emergency care, including guidelines for inpatient management and interfacility transfer.

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