Managing Paramedic Knowledge for Treatment of Acute Myocardial Infarction

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INTRODUCTION

There are about 280,000 acute myocardial infarctions (AMI) each year in the United Kingdom (British Heart Foundation (BHF), 2004). Up to half of these events will prove to be fatal, many within the first few hours following symptom onset as a result of disturbances of cardiac rhythm. For those patients who survive the initial period of vulnerability, subsequent mortality and the risk of disabling chronic heart failure can be markedly reduced by prompt restoration of blood flow through the affected coronary artery.

This can be achieved in patients sustaining a STEMI by mechanical means (percutaneous coronary intervention) or pharmacologically by thrombolytic ("clot buster") therapy (Antman et al., 2004) or where initial thrombolytic treatment fails—"rescue" intervention. Mortality benefit from thrombolysis is time dependent; for patients presenting with STEMI in the first 2 to 3 hours from onset, each minute's delay equates to 11 days loss of life expectancy (Department of Health (DoH), 2003).

BACKGROUND

In England, publication of the National Service Framework (NSF) for coronary heart disease (CHD) has resulted in dramatic improvements in the timeliness of thrombolytic treatment (DoH, 2000), with half of eligible STEMI patients starting treatment within the NSF standard of 60 minutes from the call for help (Birkhead et al., 2004) compared to one in 10 in the years preceding the NSF (Quinn, Allan, Birkhead, Griffiths, Gyde & Murray, 2003). These improvements are largely a result of improved hospital processes (Birkhead et al., 2004), but further increasing the proportion of patients treated within the NSF "call to needle time" is reliant on thrombolysis commencing prior to hospitalization (Quinn et al., 2003), administered mainly by ambulance paramedics.

Significant government investment in emergency ambulance services in England has facilitated universal availability of 12 lead electrocardiograph (ECG) equipment, programs to enhance training of paramedics in assessment of patients with suspected STEMI for thrombolysis eligibility (and other aspects of cardiac care), and procurement of the appropriate thrombolytic drugs.

The United Kingdom provides a mainly paramedic-led ambulance service in contrast to several other countries where some ambulances are manned by physicians or intensive-care trained nurses (Bouten, Simoons, Hartman, Van Miltenburg, Van der Does & Pool, 1992; Leizorovicz et al., 1997). This has led to concern in some quarters about the feasibility and safety of nonphysicians administering thrombolysis in the ambulance setting.

Recent UK studies, however, have confirmed that paramedics can accurately identify patients with suspected AMI requiring specialist coronary care (Quinn, Allan, Thompson, Pawelec & Boyle, 1999) and, in particular, patients presenting with ST segment elevation (the cornerstone of decision-making in this context) on the ECG (Whitbread et al., 2002) and eligibility for thrombolysis (Pitt, 2002; Keeling

et al., 2003). Moreover, a recent international clinical trial has demonstrated that the efficacy and safety of prehospital thrombolysis was independent of physician presence (Welsh et al., 2005). Around 4,000 patients in England have received "paramedic thrombolysis" since 2003.

Nevertheless, the government's own Review of Early Thrombolysis (DoH, 2003) has acknowledged concerns about paramedics' retention of knowledge and skill in relation to thrombolytic treatment; in particular, in relation to the low exposure to this aspect of emergency care in low-density populations in rural areas. The review acknowledges the need for research to address the question of a "volume-outcome" relationship between paramedics' exposure to the procedure and patient safety.

LEARNING, SKILL, AND KNOWLEDGE RETENTION

It is appropriate to make a distinction between learning (a change in behavior as a result of experience) (Haskell, 2001) and skill retention (persistence of skill proficiency after a period of no practice) (Cree & Macauley, 2003).

Although there is a paucity of research specific to the areas of learning and skill retention around paramedics and thrombolytic treatment, the literature on other aspects of paramedic practice may be relevant. For example, paramedics' skill acquisition, retention, and decay have been assessed in relation to tracheal intubation (Barnes, 2001), neonatal resuscitation (Skidmore & Urquhart, 2001), and laryngeal mask intubation (Coles, Elding & Mercer, 2001). Studies of skill decay in the delivery of cardiopulmonary resuscitation demonstrate poor skill and knowledge retention with a return to pretraining levels within six months (Roach & Medina, 1994). Issues of motivation, competence, confidence, and assessment come in to play (Chamberlain & Hazinski, 2003).

COMPETENCE

While these are essentially psychomotor skills, the safe administration of thrombolytic treatment requires paramedics to demonstrate a range of competencies (Quinn, Butters & Todd, 2002) involving patient assessment, ECG interpretation, identification of contraindications to treatment (the latter largely aimed at reducing risk of intracranial and other haemorrhagic complications), weight estimation (Hall et al., 2004), and explaining the risks and benefits of treatment to patients.

The presence of a so-called rural paramedic paradox has been suggested in which patients living further away from hospitals tend to be in low-density, rural populations where an individual paramedic's exposure to severe emergencies (e.g., STEMI) may be low, but the distance and time to reach a hospital may mean that the need for highly skilled paramedic intervention is highest (Rowley, 2001). Whether this results in poorer patient care is unknown.

A volume outcome relationship for STEMI patients has been reported in relationship to physician exposure to the condition (Tu, Austin & Chan, 2001). However, with an estimated 700,000 emergency attendances with chest pain to hospitals in England and Wales per annum (Goodacre et al., 2005), it is likely that paramedics will be performing many more assessments and ECG recordings than they will be administering thrombolysis to or referring for primary intervention; therefore, the key assessment skills will be subject to frequent exposure.

KNOWLEDGE MANAGEMENT

A number of studies have put forth the notion of incorporating KM in health care as a way out of the imminent information explosion crisis (Koretz & Lee, 1998; Wyatt, 2001). The average physician spends as much as a quarter of his or her professional activities managing information and has to learn an estimated 2 million clinical specifics (Wyatt, 2000), a burden compounded by the doubling of biomedical literature every two decades. The burden on other health professionals, including paramedics, has not been reported. Paramedics, as registered health professionals, also are required to maintain their knowledge base, although currently didactic clinical guidelines are prepared and distributed nationally. As with other generalist health professionals, paramedics' scope of practice (and thus, underpinning knowledge) is potentially enormous.

"Knowledge is the enemy of disease" (Brice & Gray, 2003) and serves ultimately to protect the patient from harm. Data from NHS information sources (Brice & Gray, 2003) indicate the scale of the problem of serious