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Systems of care for STEMI in developing countries – the way forward

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Early reperfusion in ST-segment elevation myocardial infarction (STEMI) improves cardiovascular outcomes. Primary percutaneous coronary intervention (PPCI) is the preferred modality of reperfusion if it can be performed on a timely basis. The randomised clinical trials proving the superiority of PPCI over fibrinolytics resulted in a concerted effort to increase timely access to PCI in the developed countries and the commencement of regional STEMI systems. "A STEMI system was defined as an integrated group of separate entities focused on reperfusion therapy for STEMI within a geographic region that included at least one hospital that performs percutaneous coronary intervention and at least one emergency medical service agency"[1]. These systems help to redirect the patients with STEMI to PCI-capable hospitals through emergency medical service (EMS) protocols and timely inter-hospital transfer, thereby curbing the time delays to reperfusion. Systems of care have radically altered the way patients with STEMI are treated in the developed countries. The Reperfusion of Acute Myocardial Infarction in North Carolina Emergency Departments (RACE) project which started in 2003 decreased the median door-in to door-out time at transfer hospitals from 120 to 71 minutes, and median time to beginning treatment at a receiving hospital fell from 149 minutes to 106 minutes. In 2007, the American Heart Association (AHA) launched "Mission: Lifeline", the first national initiative to improve quality of care and outcomes in STEMI patients; 80% of states established a Mission: Lifeline Task Force within the first year[2]. Europe has also witnessed similar success stories in the treatment of STEMI. The Vienna STEMI registry showed that, after establishing the central triage organisation via the Viennese Ambulance System, there was a marked decrease in the proportion of patients who received no reperfusion therapy, from 34% to 13.4%. PPCI usage increased from 16% to 60%, and in-hospital mortality decreased from 16% to 9.5%[3]. After the initiation of a STEMI network with the support of the Stent for Life (SFL) initiative in Central Romania, there was an increase in the reperfusion rate from 26.9% to 87.2%, mainly driven by an increase in the rate of PPCI (from 10.9% to 78.6%)[4].

Although these systems are effective, they are resource intensive. This approach presupposes the availability of a fairly evenly distributed catheterisation laboratory density along with an effective EMS system and physical infrastructure for transportation. In developing countries, however, huge gaps exist in STEMI care as a result of limited healthcare infrastructure, financial barriers, poor knowledge and accessibility of acute medical services for the majority of the population[5]. Time delays are crucial: PPCI loses its advantages over fibrinolytic therapy when door-to-balloon times exceed door-to-drug times by 60 to 90 minutes. The concern that

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enthusiasm for PPCI has the inadvertent consequence of delaying reperfusion for patients presenting to hospitals without PCI capability and needing transfer mandates the inclusion of the "pharmaco-invasive (PI) strategy" – a concept of timely reperfusion by fibrinolytics with a routine and systematic coronary angiogram within 24 hours followed by PCI if indicated. A PI strategy compared well with PPCI in the STREAM and STEPP-AMI trials[6,7], showing better results than stand-alone fibrinolysis[8]. Integrating the PI strategy into the systems improved STEMI care via increased number of PCIs and resulted in better mortality rates at one year[9]. Routine use of the PI strategy in a system of care may also help in redirecting the much needed transfer resources to more critical patients such as those with contraindications to fibrinolysis, cardiogenic shock or out-of-hospital cardiac arrest.

The challenges to execute STEMI systems of care in low and middle income countries (LMICs) are formidable because of several non-clinical, system-level factors[10]. The most important limitations arise from poverty, and the fact that many of these patients may not have medical insurance and have to pay "out of pocket" for their treatment even in case of emergencies. This divide hinders uniformity of treatment protocols and fragments the healthcare delivery system. There is a great variation in the accessibility as well as the capability of EMS services and PCI-capable hospitals in LMICs. Technology gaps, dearth of standardised protocols, operational complexity and lack of centralised policies hamper designing STEMI systems to best match the needs of a community. Despite the challenges, few developing countries have made headway in the management of STEMI. In India, "STEMI India", a private non-profit organisation, launched an innovative and sustainable system of care. The design of this system is based on a hub and spoke model with each unit called a "STEMI cluster". The treatment protocols combine a dual approach of PPCI and a PI strategy of reperfusion. Linking public-private partnership EMS, state insurance schemes for vulnerable populations, and innovative information technology platforms with existing hospital infrastructure are the crucial aspects of this system. When implemented across the southern state of Tamil Nadu, this system of care reported increased rates of coronary angiography (35.0% vs. 60.8%; p<0.001) and PCI (29.5% vs. 46.5%; p<0.001) during the post-implementation phase. One-year mortality was also lower in the post-implementation phase (17.6% vs. 14.2%; p=0.04). This difference remained consistent after multivariable adjustment[9].

In this issue of AsiaIntervention, Dharma et al report "Hospital outcomes in STEMI patients after the introduction of a regional STEMI network in the metropolitan area of a developing country"[11].

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Dharma et al also previously published an interesting article about the success of the Jakarta Cardiovascular Care Unit Network System, the STEMI network which was introduced as an integral part of the government project in 2010/2011[12]. The present study compared the outcomes before and five years after implementation of the STEMI system. The proportion of patients with STEMI presenting late (>12 hours duration) has decreased significantly (37% vs. 29%, p<0.01) and the number of patients with inter-hospital referral has increased (55% vs. 68%, p<0.001) post implementation, suggesting better connectivity in the STEMI system. There was greater use of PPCI (28% vs. 56%, p<0.001), possibly contributed to by the creditable healthcare coverage, where all costs related to acute reperfusion therapy are covered by the government healthcare insurance system[12]. Better door-to-device times (94 min vs. 82 min, p<0.001) and, most importantly, reduction in the number of patients with "no reperfusion strategy" (59% vs. 37%, p<0.001) after the implementation of the STEMI system are perhaps the reasons for fewer deaths.

Although the authors should be congratulated for their efforts to build effectual regional STEMI systems of care in a developing country (appropriate to their country's healthcare system), there could be improvement at several levels. There is non-availability of data, especially of patients who underwent fibrinolysis, their timelines, follow-up angiograms and their outcomes. To develop a system of care in developing countries, it is important to recognise that PPCI as the exclusive mode of reperfusion is not feasible, and a PI strategy must be included in the treatment protocol. Categorising and equipping the referring hospitals will avoid delay in the initiation of treatment. As in other countries, effective management of STEMI at the community level will require executing proven treatment protocols along with efficient and rapid inter-hospital transfer within coordinated hospital networks.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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