A system of care for patients with ST-segment elevation myocardial infarction in India

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SUMMARY

Alexander *et al*. studied the management and outcomes of ST-segment elevation myocardial infarction (STEMI) in Tamil Nadu after implementation of the Tamil Nadu STEMI (TN-STEMI) programme and compared it with the pre-implementation period in the same areas. The TN-STEMI programme was a '*hub-and-spoke*' model of hospitals with 35 primary care health centres and small hospitals (*spoke hospitals*) built around 4 large tertiary care hospitals (*hub hospitals*) with the capability for coronary angiography and percutaneous coronary intervention (PCI). Patients 20 years of age or older with symptoms or signs consistent with an acute coronary syndrome were enrolled. Two strategies were used to manage STEMI patients. All patients presenting to *spoke hospitals* were transferred to the *hub hospital* if they were within 30 minutes of transportation time to the *hub hospital* or received thrombolysis if they were beyond 30 minutes of transportation time from the *hub hospital*. The patients thrombolysed at *spoke hospitals* were subsequently transferred to the *hub hospital* for coronary angiography and if needed PCI at 3–24 hours after thrombolysis if they were stable and immediately in case of failed thrombolysis (Pharmacoinvasive [PI] strategy). All patients presenting to *hub hospitals* underwent primary PCI during routine hours and either primary PCI or PI strategy during off duty hours depending on the facilities available at the *hub hospital*. The key partners in the TN-STEMI programme included the Chief Minister's Comprehensive Health Insurance Scheme in Tamil Nadu (government-sponsored social insurance coverage for healthcare among those below the poverty line) and the Gunapati Venkata Krishna Emergency Management and Research Institute (GVK-EMRI), a public–private partnership (PPP), whose ambulances could acquire and transmit electrocardiograms and were used for transport of patients between hospitals. The implementation of the TN-STEMI programme also included introduction of STEMI information technology kit; new hardware and software components to optimize the performance and transmission of real-time clinical data and electrocardiograms across the network of hospitals by paramedics, nurses and physicians.

The authors enrolled a total of 2420 consecutive patients presenting with STEMI, 1367 (56.5%) presenting directly to 4 *hub hospitals* and 1053 (43.5%) to the 35 *spoke hospitals*. In the pre- and post-

implementation phases, 898 and 1522 patients were enrolled, respectively. The authors primarily looked at the differences in key measures of reperfusion therapy between the pre- and post-implementation phases.

Overall, the rates of reperfusion use and times to reperfusion were similar between the 2 phases and reasonably high (795 [88.5%] *v.* 1372 [90.1%], p=0.21). Primary PCI rates were higher and the rates of angiography and overall PCI were much higher in the post-implementation phase. The benefits of the programme were more marked in the *spoke hospital*s with patients presenting to these hospitals seeing a near 10-fold increase in the chance of receiving angiography (31.3% *v.* 3.5%) and almost 6-fold increase in PCI (20.6% *v.* 3.1%). There were no differences in in-hospital mortality (52 [5.8%] *v.* 85 [5.6%]; p=0.83) between the 2 phases. However, 1-year mortality was lower in the post-implementation phase (134 [17.6%] *v.* 179 [14.2%]; p=0.04). This difference remained consistent after multivariable adjustment (adjusted odds ratio 0.76; 95% CI 0.58–0.98, p=0.04). During the pre-implementation phase, in-hospital mortality was significantly lower in the *hub hospital* patients, but this difference was absent during the post-implementation phase. There was an increase in prescriptions of aspirin, statins and dual antiplatelet therapy in the post-implementation phase; drugs with proven survival benefits in STEMI.

COMMENT

India has the highest burden of acute coronary syndromes in the world, with more patients having STEMI (about 60%) than non-ST elevation acute coronary syndrome (NSTE-ACS).[1] It is estimated that more than 3 million STEMIs occur every year in India.[2] Optimum STEMI management includes providing reperfusion, antiplatelets and other drugs to patients and administration of these within the shortest possible time-frame. Thus, STEMI management is not only about good in-hospital management but also about optimum health system infrastructure to accelerate the speed of provision of the therapy. However, in India, both these components are far from desirable with large delays in diagnosis of STEMI and low access to life-saving early reperfusion therapy. In CREATE, a prospective registry at 89 centres from 10 regions and 50 cities in India, <10% of patients with STEMI received primary PCI. Thrombolytics were administered in about 59% of patients with STEMI. Ambulance was used for transportation in only 5% of cases; most used private or public transport. Out-of-pocket payment was extremely high in about three-quarters of the patients.

The TN-STEMI programme has tried to address these gaps in the management of acute STEMI in India. It attempts to provide solutions to the system-level barriers to improve overall reperfusion use and time to reperfusion in patients with STEMI in resource-limited settings. A model of STEMI care was implemented leveraging existing healthcare facilities, public health insurance scheme and a PPP-based ambulance transportation system to augment acute STEMI care delivery system. The study team combined the two strategies of STEMI management, primary PCI and PI, which resulted in a 10-fold increase in patients receiving coronary angiography rather than stand-alone thrombolysis in the *spoke hospitals*. The government-sponsored health insurance scheme enabled significant numbers of rural poor to access the STEMI system of care to get best-in-class treatment, thereby decreasing the disparity across classes. Transfer of patients with STEMI using the GVK-EMRI advanced cardiac life support (ACLS) ambulances with paramedics ensured safe transportation. The use of the STEMI information technology kit allowed for communication across the network. Thus, the model provides solutions for hospital-related issues, out-of-pocket payment, ambulance deficits and technology gaps. The implementation of this quality improvement programme led to a 19% reduction in mortality at the end of 1 year.

In addition, this study showed that reperfusion by PI strategy, a key strategy in this programme, is a pragmatic approach in Indian settings to alleviate logistic and geographical barriers of primary PCI. This strategy has been found to be useful when primary PCI cannot be done within 1–2 hours of first medical contact. It has been shown to be equivalent to primary PCI in patients who present early in the STREAM (Strategic Reperfusion Early After Myocardial Infarction) trial.[3]

In conclusion, the TN-STEMI programme should serve as a stellar pilot study for implementation across other parts of India to improve STEMI outcomes. The generalization of the programme to other states in India would depend largely on the availability of government-sponsored insurance coverage, ambulance services and introduction of the STEMI technology kit. Additional measures to include in the programme would be public education to decrease the time to first medical contact through multimedia campaigns and community intervention programmes and educating the general physician who is most often the first point of contact.[4]

Conflicts of interest. None declared

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