3 being former union health secretaries and the rest public health experts from leading public health institutions. This team divided itself into groups that visited 2 districts in each of 13 states: 1 district chosen by the state concerned, the other selected by the review mission. Each district was inspected for 2 or 3 days, and then the group finally met and produced the report.

The gist is that there has been an improvement in the performance of the health system, with increasing attendance at the medical facilities and better quality of care. There is no constraint on funds now, but many states have been unable to utilize the funds placed at their disposal. Even Bihar, acknowledged by the CRM to be one of the weakest performers, has improved its performance beyond all expectations. Block PHC OPD attendance rose from 39 per month 2 years ago to 2500 per month now. Deliveries in government institutions rose from 7000 in October 2006 to more than 100 000 in October 2007.

Are you getting impatient? Why is all this being listed in a Letter from Chennai? Let me come to the point. In almost all the aspects studied by the CRM, Tamil Nadu came at the top of the list. This was reiterated by the Union Health Minister at a press conference he held on a visit to Chennai. While feeling proud of our achievements, I could not help feeling depressed, because if Tamil Nadu, with all its failings, is the best of the pack, how bad must be those states that are considered really bad? The Health Minister wants many aspects of Tamil Nadu's programme to be replicated in other states, especially in 18 (he did not name them) he said were particularly backward. The NRHM seems to be an initiative that has yielded results, and we can hope things will get better.

SORRY, WRONG NUMBER

On 17 March 2008, the Director of Public Health and Preventive Medicine, Chennai, issued GO (Ms) 90, introducing a grievance redressal system in government hospitals. Recognizing that 'corruption is one of the important reasons for the delay in provision of care', the GO announced the introduction of a 'Grievances Redressal System in all Government Hospitals in the state'. This would cover all government hospitals, from PHCs to medical college hospitals, and would be manned 24 hours a day, 365 days a year. The existing ambulance control room would be used to receive grievances and suggestions through its toll free number 1056. Panels of officers were nominated for this purpose, at the city and district levels. Wide publicity was given; the newspapers of 8 April 2008 carried the information that the system 'has been put in place'. I was delighted. I firmly believe that if we could eliminate corruption from the working of our government institutions, we have all the arrangements, the rules and the infrastructure for an extremely efficient system that would rival the best anywhere in the world.

I set out to test the system. Soon after the advertisement when I called the number provided, I was told to 'Please check the number you have dialled' and, for good measure, this message was repeated in Tamil. I wish the implementation of our systems would also improve.

M. K. MANI

Letter from North America

ARTIFICIAL HEART IN ASIA

'Artificial heart is the ultimate evidence that medical profession has lost its *"heart and soul"* and became mechanical.'

This quote caught my eye while reading a blog. Artificial heart has been in the news both in Asia and in the USA for the past couple of months. In the USA, Robert Jarvik, the inventor of an artificial heart, participated in multiple television and newspaper advertisements promoting the use of atorvastatin (Lipitor), Pfizer's cholesterol-lowering drug. Pfizer reportedly spent US$ 258 million on the Jarvik–Lipitor campaign and paid Dr Jarvik US$ 1.35 million (annual sale of Lipitor US$ 12.7 billion). In January 2008, the US House of Representatives' Energy and Commerce Committee began investigating the Jarvik–Lipitor advertisements as part of a larger inquiry into the use of celebrities to promote prescription drugs. In February, Pfizer cancelled advertisements after the committee's investigation was widely covered in the American media. In India, Asia's first artificial heart was implanted in Narayana Hrudayalaya, Bangalore on 20 March 2008. The surgery was performed by a team of doctors under the guidance of their collaborators from the University of Minnesota, USA invoking curiosity among the media and public.

The use of mechanical circulatory support for heart failure management dates back to 1950 with the invention of the intra-aortic balloon pump (IABP). Since its first reported clinical use in 1968, IABP has been widely used in the management of advanced ischaemic heart disease complicated by cardiogenic shock; the largest experience was reported from the Massachusetts General Hospital and included 4000 patients. Extracorporeal membrane oxygenation (ECMO) is another advanced technology, commonly used in neonatal and paediatric units, which uses conventional cardiopulmonary bypass technology to support the circulation with continuous non-pulsatile cardiac output and extracorporeal oxygenation. Ventricular Assist Device (VAD), now a commonly used circulatory support device in North America, is a mechanical blood pump that serves to augment the function of either the left or right ventricle. VADs are used as a bridge to myocardial recovery in acute heart failure, a bridge to heart transplantation in chronic heart failure; and as long-lasting therapy for end-stage chronic heart failure, also known as destination therapy. These devices are surgically implanted and commonly require cardiopulmonary bypass to implant. The devices could delay the need for a transplant by 10–15 years. The US Food and Drug

Administration (FDA) approved the first VAD in 1994, and two more received approval in 1998. The advantage of a VAD is that the patient can keep the natural heart, which can receive signals from the brain to increase and decrease the heart rate as needed. Percutaneous assist devices are also commercially available, e.g. Tandem Heart, Cardiac Assist, Pittsburgh and the Impella Recover percutaneous VAD (Abiomed, Danvers, MA). While the original VADs emulated the pulsating heart, the newer versions, such as the Heartmate II, provide continuous flow. Several continuous flow VADs have been approved for use in the European Union and are undergoing clinical trials for FDA approval in the USA.

The first artificial heart in a living being was implanted in a dog at the Cleveland Clinic in 1957; the dog survived about 90 minutes. In 1964, the National Institutes of Health started the Artificial Heart Program, with the goal of implanting a man-made cardiac device into a human by the end of the decade. In December 1982, retired dentist Barney Clark became the first recipient of an artificial heart. Clark had developed end-stage heart failure, and had reached the point at which he could barely walk a few steps. The first artificial heart implantation (Jarvik-7) was widely publicized in newspapers where 'Clark's heart would be removed, and replaced with an aluminum and polyurethane device connected to a 400-pound air compressor with the size of a refrigerator that would accompany Clark for the rest of his life'. Following artificial heart implantation, Clark was alert and responsive—eliciting intense curiosity and interest from around the world. However, during the 112 days before his eventual death, Clark suffered from complications including seizures, heart valve malfunction, confusion and suicidal thoughts. Clark's operation was criticized by ethicists saying the risks outweighed the benefits, consent was ambiguous, and that Clark experienced undue pain and discomfort in his final days. After Clark died, there was a period of public disenchantment with artificial organs. In May 1988, the *New York Times* dismissed the entire concept of an artificial human heart as the 'Dracula of medical technology'. The newspaper's editorialists opined: 'The Federal project to create an implantable artificial heart is dead.' In 1990, the US FDA withdrew permission to manufacture any more Jarvik-7 hearts.

In the past decade, several modifications were undertaken and the modern version of Jarvik-7 artificial heart is the CardioWest temporary total artificial heart (SynCardia Systems Inc., Tuscon, Arizona) which was implanted in over 700 patients. This total artificial heart was used as a bridge-to-heart transplant device for transplant-eligible patients dying from end-stage biventricular failure, with a success rate of 79%. This device was the only FDA approved total artificial heart until Massachusetts-based Abiomed announced in February that it had received a new FDA approval for its AbioCor artificial heart, a 'fully implantable mechanical heart replacement'. Its tiny rotary motor pushes hydraulic fluid from one of the AbioCor's ventricles to the other, back and forth, 100 000 times a day, pumping blood slowly but steadily to the lungs and body. A miniature electronic 'controller' adjusts the flow level according to need, keeping the blood flow smooth when a patient is sleeping or strolling. The AbioCor was implanted in 14 severely ill patients from 2001 to 2004 in clinical trials. These patients were the sickest of the sick, with just weeks to live if they had had no intervention. All the patients died, but the average survival time was more than 4 months, more than quadruple their life expectancy before the trial. One Kentucky tyre dealer survived 17 months and lived the last 9 months at home with his family.

The incidence of heart failure in the USA is on the rise, in part the result of ageing of the baby boomer generation. The national supply of human hearts for transplants is about 2200—5% of what the population with heart failure needs. The National Heart, Lung, and Blood Institute (NHLBI) estimated that there are 35 000 potential candidates for an artificial heart each year. At a cost of US$ 150 000 per implant, the procedure could add US$ 2.5 billion to US$ 5 billion to the United States' medical bill. On the other hand, a recent study from the NHLBI estimated that the artificial heart can add 54 months to a person's life and improve the quality of life and thereby reduce the societal burden. These benefits are not without associated morbidity such as severe infection and coagulopathy that may result in stroke.

India, dubbed as the diabetes capital of the world with 32 million patients of diabetes, is projected to have nearly 70 million people with diabetes by 2025. Further, the number of patients with hypertension is estimated to rise from 118 million in 2000 to 214 million in 2025. The number of reported incidents of coronary heart disease in adults has risen 4-fold over the past 40 years in India. These statistics are not limited to affluent or urban areas. In rural areas, the prevalence of heart disease has doubled over the past 3 decades. Obesity, increasing incidence of diabetes, high-stress lifestyles and excessive smoking has led to an epidemic of heart diseases. Cardiac surgery in India is reportedly registering a 15% annual growth rate. With this high incidence of acquired heart diseases, the incidence of acute and chronic heart failure in India is bound to rise in the near future. The projected cost of the artificial heart device in India was nearly Rs 45 lakh (US$ 100 000), including 35 lakh for the device and 10 lakh for the procedure. The first artificial heart implantation in Bangalore is sure to provoke a medical arms race among established healthcare institutions. In addition, the well-known ethical argument during the initial phases of organ transplantation in India—the costs of advancing science by making the highest possible treatment available, while the basic preventive measures are being implemented in the rest of the country—may be revisited in the near future.

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