

A key traumatic brain injury initiative in India

A silent epidemic of traumatic brain injury has taken hold in low- and middle-income countries, especially those undergoing widespread socioeconomic change. It is time to react and, in India, one group is tackling the problem head on. Adrian Burton investigates.



Nobody doubts that traumatic brain injury (TBI) is a leading cause of death and disability worldwide. It is often quoted that it kills or hospitalises 10 million people every year, with low- and middle-income countries disproportionately affected. Indeed, the incidence of TBI in these nations is said to be growing, especially in those experiencing rapid economic transformation. Across Asia, for example, emerging wealth has led to a huge increase in motorised transport (especially motorcycles), and the accidents that go with it. Falls, injury from violence, and a growing number of work accidents also take their toll. In few countries is the situation more pressing than in India. With a very conservative estimate of 1.6 million people across the subcontinent now seeking hospital care for TBI every year, with over 200 000 associated deaths and over 1 million survivors requiring rehabilitation, the problem is placing growing strain on the country's already overstretched health-care system and throwing ever more families into economic uncertainty through loss of income and the cost of caring for disabled loved ones. Something needs to be done, not only to reduce the incidence of TBI, but also to improve both short-term and long-term clinical outcomes. A new coalition, The Indian Traumatic Brain Injury Consortium, formed by US and Indian neurosurgeons at a meeting in New Delhi in December, 2013, and which includes members of the American Association of Physicians of Indian Origin, the Neurotrauma Society of India, and other organisations, has taken up the challenge. But it has no easy task on its hands.

First, although the literature suggests that India's TBI crisis is

worsening, no-one knows how big it really is. "It is hard to get any truly reliable figures even from routinely collected data", explains Suresh Kumar Kamalakannan of the London School of Hygiene and Tropical Medicine (London, UK). "For example, mortality statistics in India have no information on the exact cause of death, unless someone dies in a hospital. The majority of information [available] is from hospital-based registries covering only a few hospitals with no clear catchment area—but it is not mandatory for hospitals to share this information with registries. Additionally, under-reporting of road traffic deaths by the National Crime Records Bureau, which maintains information about [traffic accident investigations] in India, is well documented. Informing policy without good figures is a difficult proposition." A position paper on the development of trauma care sciences and injury care in India, produced by the Academic College of Emergency Experts in India's Indo-US Joint Working Group, recently reiterated the need for reliable, standardised records. Without them, the size of the country's TBI problem, and the effects of potentially corrective interventions, will remain difficult to quantify.

Second, the standard of basic critical care for trauma victims in India can vary widely and be disorganised. "Training needs to be made available if staff are to provide evidence-based TBI care", explains Monica Vavilala (Director of the Harborview Injury Prevention and Research Center, University of Washington, Seattle, WA, USA), a lead voice in the Consortium. "But it is also common for deaths to occur because the simple things are sometimes missed. Patients in smaller district

hospitals may die because their blood pressure is not controlled or because they bleed out for the lack of suturing of a scalp laceration. Sometimes patients are not triaged upon arrival and so are not attended to quickly enough. When triage does occur, the wrong conclusions are sometimes reached and patients that could have been dealt with locally are sent off to more specialised centres, only to die on the way. These kinds of problem could easily be prevented by the implementation or better use of triage processes."

But even then, there is often no protocol in place to tell attending physicians what to do next. "Having a protocol to follow could certainly save lives", says Vavilala. And she has the figures to back her up. In the recent Collaborative Head Injury and Adherence to Guidelines (CHIRAG) study, she and her team examined the effect of early intensive care unit adherence to the 2007 Brain Trauma Foundation Guidelines for TBI at the Harborview Medical Center (Seattle, WA, USA) and the Jay Prakash Narayan Apex Trauma Centre—a flagship trauma hospital in New Delhi (India). Better adherence reduced in-hospital deaths at the latter, but overall, no significant differences were seen between the hospitals in terms of adherence or predischarge mortality, strongly suggesting that India's more sophisticated trauma centres (at least) can easily achieve excellent results in these areas. Importantly, following guidelines need not always increase costs, as Vavilala reports in other work.

Third, the CHIRAG study confirmed the need in India for better post-discharge care and rehabilitation, if late TBI-associated deaths are to be avoided and quality of life improved. A remarkable difference was seen in



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For more on the **increasing rates of TBI in India** see *Asian J Neurosurg* 2016; **11**: 143–45

For more on the **difficulties associated with TBI epidemiology in India** see *Ann Indian Acad Neurol* 2015; **18**: 66–70

For more on the **development of trauma care in India** see *Int J Crit Illn Inj Sci* 2014; **4**: 114–30

For more on the **CHIRAG study** see *World Neurosurg* 2016; **89**: 169–79



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how patients from the two centres fared over the 12 months after discharge, with significantly more from the Indian centre deteriorating. "There is an absolutely clear need to improve what goes on after patients leave hospital", says Vavilala.

So what can the Consortium do about all this? Certainly, it sees the development of a new TBI registry as an important step in translating and implementing trauma care programmes. "In the absence of national or state-wide surveillance programmes and good reporting systems, developing a defined brain injury registry seems to be an obvious choice", explains Gopalakrishna Gururaj, Head of Epidemiology at the National Institute of Mental Health and Neurosciences, Bangalore, India. "This needs to build on what is currently available in patient records and identify additional information to be documented. A preliminary analysis has revealed a present system that is mainly physician-driven for day to day monitoring of patients, rather than a uniform system based on a defined protocol. Such a system needs to be developed based on a prior understanding of collecting data in a uniform and standardised manner using digital technology on an agreed methodology, obviously covering the pre- and post-intervention periods in order to understand the impact of interventions."

In an effort to show how guideline adherence can improve patient outcomes, the Consortium has been disseminating the results of the CHIRAG study at national and international meetings, through the press, and through discussions with stakeholders. "What we learned about trauma care systems when we developed TBI guidelines in the US should be helpful in India", says Raj Narayan (Professor and Chair of Neurosurgery, Hofstra Northwell School of Medicine, New York, NY, USA). But the Consortium is also developing guidelines more suited to the Indian setting, especially for rural areas that lack trauma care infrastructure. Indeed, plans are well underway for a pilot project in the southern Indian state of Andhra Pradesh to implement and test guidelines. "This is a monumental effort by multiple groups, particularly the State Government of Andhra Pradesh", says Jogi Pattisapu, a paediatric neurosurgeon at the Arnold Palmer Hospital for Children (Orlando, FL, USA). "We plan to test how guideline implementation can improve TBI care at King George Hospital in Visakhapatnam and its surrounding smaller hospitals." The focus will be on improving in-hospital outcomes through early triage and diagnosis, rapid referral to King George Hospital from outlying hospitals when required, guideline adherence during care, and specific on-site training as needed. The pilot project should launch before the end of 2016 and take 3 years to complete. Periodic data analysis will be done to examine implementation fidelity and outcome changes. It is hoped that the lessons learned will be useful in designing similar projects to run in Tanjavur, Ranchi and Jaipur, plus others areas to be named.

But clinical success will bring other problems. How might the rehabilitation needs of an increasing number of patients that require it be met? With just a handful of centres across the entire

nation offering neurorehabilitation, they cannot be met even now. "In reality, due to a paucity of rehabilitation specialists and poor awareness among health care professionals, TBI patients are discharged without addressing their rehabilitation needs", explains Anupam Gupta, Head of Neurological Rehabilitation at the National Institute of Mental Health and Neurosciences. "The Consortium hopes to make stakeholders understand that rehabilitation following TBI represents a continuum of management rather than an add-on or optional facility. A good way to begin improving rehabilitation care on the ground in a vast country like India would be to identify centres in all the districts that could work as nodal rehabilitation centres, and refer all TBI patients to them. Human resources development and the training of medical professionals in the field should run parallel so that rehabilitation needs are more easily met." But even though rehabilitation could be cost-effective by getting people back to work, equipping new rehabilitation centres, training staff to run them, and extending a whole new layer of care to a nation of over 1.3 billion people will come with a huge price tag. "Maybe. But what is the price of doing nothing?" asks Gupta.

Preventing TBIs occurring in the first place requires the making of better roads, the introduction and enforcement of new road safety laws, and the development of other injury-related legislation. And in-hospital care can only improve so far without new technological and financial resources being made available. But hopefully the results of the pilot project in Andhra Pradesh will convince future funders (probably government-private sector partnerships) that high quality TBI care is worth investing in and is an achievable goal for India and perhaps beyond. Concludes Narayan: "What we learn in the Indian setting could, in the future, help the rest of the developing world."

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