

## Mortality after Major Trauma – An Analysis of the Factors that Impact Trauma Survivorship between India and the United Kingdom

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### ABSTRACT

**BACKGROUND:** Major trauma following road traffic accidents (RTA) is the largest cause of death and permanent disability in children and adults below 40 years of age worldwide. Various factors at both a pre-hospital and in-hospital settings play a major role in the survivorship. This study critically evaluated and suggested changes that could potentially improve the survivorship of patients based on the provision of pre-hospital and in-hospital care.

**METHODS:** We researched epidemiological, economical, mortality and injury figures following RTAs in India and the UK and compared their trends from 2000-2015. We also analysed the factors that could have influenced the mortality rates, including the pre-hospital and

in-hospital care in these two countries and emphasised the role of various factors that influences the post injury mortality rate.

**RESULTS:** In the UK, the number of RTA injuries recorded in 2000 was 320,000. This decreased by 41.8% to 186,189 in 2015. The number of RTA associated deaths recorded in the UK in 2000 was 3409, decreased by 49.2% to 1730 in 2015. The establishment of trauma networks contributed to significant reduction in mortality in the UK. In India, the number of RTA injuries recorded in 2000 was 399,265 and this increased by 20.8% in 2015 to 482,389. However the number of RTA associated deaths in India increased exponentially by 88.5% from 78,911 in 2000 to 148,707 in 2015.

**CONCLUSION:** Our study revealed the exponential increase in mortality rate when compared to the number of injuries and highlighted the need for improving pre-hospital and in-hospital care India. The lessons learnt from the UK, especially with setting up of trauma networks, focussed training and establishment of major trauma centres, could bring a significant improvement in the survival rate of this young productive population in India. Though there is a long way to achieve the target set by 'Brazilia Declaration', India being a signatory has an obligation to its citizens and the world to reach the target.

**Key words:** Trauma; Road traffic accidents; Mortality; Deaths following RTA; Trauma networks; Major trauma centres

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### INTRODUCTION

Road traffic accidents are a public health problem, with an estimated 1.25 million deaths and around 50 million non-fatal injuries per year worldwide<sup>[1]</sup>. A clear disparity exists between the morbidity and mortality burden between countries, with a clear correlation between

survivorship and a countries' income. 74% of road traffic deaths occur in middle-income countries such as India, which account for only 53% of the world's registered vehicles. On the contrary high-income countries like the UK have 46% of world vehicles and contribute only 10% of the deaths<sup>[2]</sup>. The chance of dying in a road traffic accident is 17% in South East Asia when compared to Europe where it is 9.3%. RTA's can lead to economic loss of around 5% of GDP in lower and middle income countries. 73% of all road traffic deaths occur among young males under the age of 25 years<sup>[1,2]</sup>.

While prevention should rightly remain the main focus, strategies to improve the survivorship after trauma should be universally practised to reduce the currently unacceptable variability in morbidity and mortality in various parts of the world. The aim of this study is to critically analyse the factors that potentially affect survivorship post trauma between India and the United Kingdom. Besides the article emphasises the changes that could facilitate the target suggested by the 'Brazilia declaration'. The senior authors (KK, VK) had first-hand experience in managing these complex injuries in India and UK.

## MATERIALS AND METHODS

The data on the incidence of injuries and deaths related to trauma, with a focus on RTAs, were accessed for India and the UK between 2001 and 2015. Information was also sought about the factors that could have contributed to morbidity and mortality in the post-trauma period. Regarding the pre-hospital environment, we assessed emergency access telephone numbers, the availability and type of ambulance services and the level of roadside medical care available. The potential transfer destination of trauma patients was investigated, including the access to trauma networks and the numbers and organisation of trauma centres. We also evaluated the provision of in-hospital trauma care in terms of the assessment and resuscitation of patients by dedicated trauma teams and their levels of specialist training.

## RESULTS

### Demographics

Census data from 2016 estimates the population of India to be 1.3 billion, conferring a population density of 445 people per square kilometre, and the population of the UK 63.6 million<sup>[3]</sup>, with a density of 271 people per square kilometre<sup>[3]</sup>. The World Bank estimates the Indian Gross Domestic Product (GDP) to be 2.2 trillion USD with the UK GDP at 2.6 trillion USD in 2016. However, when taking into account the difference in populations, the GDP per capita is estimated as 1,670 USD in India and 42,330 USD in the UK<sup>[3]</sup>. The World Bank estimates on GDP spent on healthcare and per capita expenditure on healthcare in UK and India was compared to the rest of world (Table 1).

This data is significant in terms of investments in pre-hospital care, In-hospital care, establishment of trauma networks and Major Trauma Centres. Per capita health expenditure in India is almost 25 times less than the world average. India, one of the fastest growing economies in the world, needs to invest more to protect the young productive population.

### Road Traffic Accident data

The latest available data regarding RTA injuries and deaths was obtained from the government sources of each country Injury and mortality data was available for both the countries between 2000 and 2015<sup>[4,5]</sup>. This is summarised in Table 2.

**Table 1** GDP spent on healthcare.

	GDP spent on Healthcare (%)		Per capita health expenditure (USD)	
	2000	2014	2000	2014
World	5.2	5.9	492	1058.5
India	4.3	4.6	19.6	74.9
UK	6.9	9.1	1763.4	3934.8

**Table 2** RTA injuries and deaths in India and UK from 2000-2015.

Year	UK Injuries	India Injuries	UK Deaths	India Deaths
2000	320,000	399265	3,409	78911
2001	313,000	405216	3,450	80888
2002	303,000	408711	3,431	84674
2003	291,000	435122	3,508	85,998
2004	281,000	464521	3,221	92,618
2005	271,000	465282	3,201	94,968
2006	258,000	496481	3,172	105,749
2007	248,000	513340	2,946	114,444
2008	231,000	523193	2,538	119,860
2009	222,000	515458	2,222	125,660
2010	209,000	527512	1,850	134,513
2011	204,000	511394	1,901	142,485
2012	196,000	509667	1,754	138258
2013	181,957	494893	1,713	137572
2014	194477	493474	1775	139,671
2015	186189	500279	1,730	148,707
Average number of injuries and death	244351	478988	2,614	114,061
% Increase or decrease between 2000 and 2015	-41.80%	20.80%	-49.20%	88.50%

**Table 3** Average yearly increase or decrease of injuries/deaths between 2000 and 2015, India Vs UK.

Average increase or decrease	India	UK
Injuries between 2000 and 2015	1.60%	-3.50%
Deaths between 2000 and 2015	4.40%	-4.20%
Injuries between 2010 and 2015	-1%	-2.20%
Deaths between 2010 and 2015	2.10%	-1.20%

In UK the number of RTA injuries recorded in 2000 was 320,000. This decreased by 41.8% to 186189 in 2015. The number of RTA associated deaths recorded in 2000 was 3409, which decreased by 49.2% to 1730 in 2015<sup>[5]</sup>. RTA associated deaths were the 36<sup>th</sup> ranked cause of death in the UK in 2014. On an average between 2000 and 2015, the chances of dying after a road traffic injury in the UK is 1.1%, compared to India where it is 23.9%.

In India the number of RTA injuries recorded in 2000 was 399,265. This increased by 20.8% to 482389 in 2015. The number of RTA associated deaths recorded in 2000 was 78,911, increasing by 88.5% to 148,707 in 2015. Besides deaths due to RTA's moved from 10<sup>th</sup> to 8<sup>th</sup> rank among the most common cause of death in India between 2014 and 2016<sup>[4]</sup>.

### Emergency access numbers

The world's oldest emergency telephone access number 999 was launched in London in the UK in 1937<sup>[6]</sup>. In the UK this number is a free single point of access for ambulance services, the police, fire brigade, coastguard etc. Calls to the pan-Europe 112 emergency access numbers are also routed through to the 999 control channels.

At the time of writing up of this article (January 2018), India

did not have a national emergency access number coordinating all emergency services. However the government is in the process of setting up 112 as a national emergency number. The telecom ministry started the process in 2016, however it's still in nascent stage. Currently, in India's capital city New Delhi, there are around 20 different numbers for emergencies, the details could be accessed in the Indian government's National Health Portal<sup>[7]</sup>. The police can be accessed via 100 nationally, access numbers to medical and ambulance services are variable depending on location. 108 is the medical helpline in 11 states managed by the Emergency Management and Research Institute. 102 is listed as an ambulance helpline in other areas including Delhi, as is 1092 and 1066. Further to this the Centralised Accident and Trauma Services are listed with the number 1099. Again taking Delhi as a specific example, a further 14 extended numbers (containing 10 or 11 digits) are listed for ambulance services associated with specific hospitals, and a further 3 for independent private ambulance services.

### First Responders

The UK is covered by a network of ambulance services arranged into 14 regions commissioned by the NHS. The biggest of these is the London Ambulance Service<sup>[8]</sup> staffed by over 4500 people and controlling around 900 ambulances and 100 rapid-response units, responding to over 1.5 million calls per year. The service is supported by the British Association for Immediate Care, providing doctors and nurses to the scenes of major accidents to supplement the paramedics<sup>[9]</sup>. The skill set on offer includes the ability to provide life-saving procedures at the roadside including endotracheal intubation and thoracotomy. Also providing support are 41 air support vehicles distributed nationally, consisting mainly of helicopters working as air ambulances. All but 4 of these are funded through charitable donations without the support of NHS funds. In UK, the standard response time for the ambulance service to arrive the scene is 8 minutes after receiving a call for major trauma.

Emergency service provision in India is non-centralised, and has been left to the formation of small regional networks. Gaps between these services are filled or superseded by private ambulances affiliated to hospitals and institutions. The scale of the deficiency is difficult to assess, given the lack of official data on the numbers of ambulances, the training level of operating staff, and the areas covered. A report in the Wall Street Journal in 2014 hints at the level of cover, suggesting Delhi, with a population of around 22 million, is serviced by only 152 government ambulances<sup>[10]</sup>. Advanced life support facilities are available in 21 of these, and basic life support in a further 10, meaning the remainder are essentially transportation vehicles. As described above, 15 services associated with hospitals or acting as independent providers are also available, although it is unclear how well equipped and staffed these are, as well as their total numbers.

### Trauma networks/centres

National Confidential Enquiry into Patient Outcome and Death (NCEPOD) found in 2007 found quality deficits for 60% of severely injured patients in UK<sup>[11]</sup>. The study identified issues related to suboptimal management in relation to quality, clinical intervention and organisation of care and suggested establishment of Major Trauma Centres. Pioneered in London in 2010, and then launched nationwide in 2012, Major Trauma Centres (MTCs) have revolutionised trauma management in England<sup>[12]</sup>. MTCs have all the facilities and specialties required to treat patients with any type of injury in any combination. Patients who have injury severity score

(ISS) greater than 8 are triaged to and treated in an MTC. A network of 27 MTCs now exists in UK, and each MTC has its own network of feeder Trauma Units from which patients meeting certain criteria can also be transferred. Patients are received 24 hours a day by an appropriately trained consultant-led trauma team which consists of the representatives of emergency medicine, general surgery, trauma & orthopaedics and anaesthetics as the least. Consultants from other specialities such as Neurosurgery, Vascular surgery, Cardiothoracic surgery, Plastic surgery, Maxillofacial surgery, ENT surgery, Anaesthetics, Interventional radiology and Intensive care are available on site within 30 minutes when required. All diagnostic services and emergency theatres are available round the clock for these patients and are managed senior surgeons. The coordination, standardisation, and centralisation of services through MTC networks have had a direct impact on the survivorship of RTA patients. Evaluation in London after 5 years of establishing MTCs showed that the Survival rates increased by 50% between 2010 and 2015, saving an estimated 610 lives<sup>[13]</sup>. This primarily highlights the improvements in the timely delivery of specialist multidisciplinary trauma care and reduction in the mortality.

In the 11<sup>th</sup> five year plan for India (2007-2012) the planning commission suggested developing Trauma Care Facilities on National Highways. The objective of the scheme is to bring down preventable deaths from road accidents to 10 per cent by developing a pan-India trauma care network in which no trauma victim has to be transported for more than 50 kilometers and a designated trauma center is available at every 100 Km. As this could not be completed, this was then extended during the 12<sup>th</sup> five year Plan (2012-2017) to complete the pending works in the existing facilities and setting up a robust trauma registry & injury surveillance mechanism. However this initiative is still in its nascent stage.

The Jai Prakash Narayan Apex Trauma Centre (JPNATC) run by the All India Institute of Medical Sciences Delhi is the first and only officially recognised Level 1 trauma centre in India<sup>[14]</sup>. It became fully functional in 2007 with 152 inpatient beds including 30 casualty beds. JPNATC appears to be the only fully integrated service with most of the required specialities on-site as well as a formal referral network of satellite hospitals. While other private institutions have claims of a trauma service, their services are not available for the common man and many could not afford the care provided in the private hospitals. There were no objective data on changes in mortality observed after the introduction of the trauma centre. Regarding the procedures followed in other hospitals receiving trauma patients, it is difficult to speculate on the likely varying levels of coordination and training among receiving teams, as well as the different specialities, facilities, and onward referral options available. The authors could not find any nationally agreed major trauma protocol, national trauma registry or any work in progress from the government websites.

### Trauma Education and training

Timely effective care is vital to reduce the mortality of trauma. Internationally standardised training for medics who deliver care in the pre-hospital environment is available in the UK in the form of Pre-Hospital Trauma Life Support-PHTLS<sup>[15]</sup>. The course is aimed at ambulance personnel, emergency medical technicians, registered nurses, registered medical practitioners, military medics and offshore medics. The course teaches the rapid assessment and resuscitation of patients in the pre-hospital environment, factors in decision making regarding the destination and mode of delivery of cases, and the management of trauma scenes, including mass-casualty scenarios. The course is not available in India, nor were we able to find access

to any equivalent pre-hospital trauma courses.

In UK the trauma patients are managed by a dedicated accident and emergency medicine team (A&E). This speciality was introduced in UK in 1972, before that emergency departments were led by orthopaedics and dealt primarily with injuries. After completing medical school the candidates were trained for 8 years (including foundation years) before becoming a consultant. They are trained in emergency medicine, acute medicine, pre-hospital care, anaesthetics and intensive care medicine, paediatric emergency medicine ([www.rcem.ac.uk](http://www.rcem.ac.uk)). As most of the road traffic accident patients are multiply injured, training in the above mentioned specialities makes the A&E team in the best position to provide appropriate care for these multiply injured patients. Besides in UK most of the universities offer Masters of Science programmes solely dedicated to trauma in the UK, as well as numerous others teaching the generality of Trauma & Orthopaedics. A trauma and orthopaedic team is an integral part of A&E team that manages RTA patients. Recently the Royal Colleges has started a new sub-specialty area of medical practice focusing on the specialist provision of on-scene and in-transit critical care called Pre-Hospital Emergency Medicine (PHEM)<sup>[16]</sup>. This sub-specialty is developed to reduce the mortality during rescue & extrication, supporting emergency preparedness in trauma centres and providing pre-hospital emergency medical care and safe transfer.

In India emergency medicine is at a primitive stage. In most of the government hospitals the emergency service is provided in "Casualty Centres" staffed by physicians who have no postgraduate qualifications and the post is temporary in most circumstances. The Medical Council of India recognised emergency medicine as a speciality in 2009 & National Board of Examinations (NBE) in 2014 and currently there are around 100 approved training seats throughout India. Some of the private hospitals in India collaborate with the Royal College of Emergency Medicine, UK to provide training. However there is no structured training or common curriculum for the trainees. The Majority of hospitals in India have orthopaedic teams to manage the RTA patients. Orthopedic trainees are required to complete one of three post-graduate qualifications to pursue a career in orthopaedics; either a Masters degree (MS Orth), a Diploma course in orthopaedics leading to the award of D.Orth, or Diplomate of National Board Course leading to award of a DNB (Orthopaedics) degree<sup>[17]</sup>. These are taken in conjunction with a residency programme of 2-3 years duration affiliated with an institution. The curriculum and structure of training varies considerably between hospitals and states. The concept of workplace based assessments and logbook is non-existent in most of the places that offer the training.

Since its introduction in 1980 Advanced Trauma Life Support® (ATLS®) has become the gold standard in trauma teaching in terms of the rapid assessment, resuscitation, and investigation of acute trauma patients<sup>[18]</sup>. A recent review highlighted how participation in courses improved clinicians' knowledge of poly-traumatised patients, as well as their organisational and clinic skills<sup>[19]</sup>. We should consider that other valid trauma courses are equally applicable, with Petroze *et al* (2015) showing that after the teaching of ATLS and the Canadian Network for International Surgery Trauma Team Training (TTT) course mortality reduced in their low income institutional setting in Rwanda<sup>[20]</sup>. Overall mortality reduced from 8.8% to 6.3% and in the highest mortality sub-group (patients with a Glasgow Coma Scale of 3-8) mortality improved from 58.5% to 37.1%. A search on the relevant provider websites for each country showed that while 44 ATLS provider courses are available in India in 2016, there are 260 courses planned in the UK during the same period<sup>[21,22]</sup>. In UK, it's compulsory for orthopaedic trainee to have valid ATLS

(Advance Trauma Life Support) certification to practise trauma and orthopaedics. However in India there is no such regulatory requirement.

## DISCUSSION

The Decade of Action for Road Safety (2011-2020) was established by UN General Assembly (UNGA) Resolution to accelerate coordinated international action aimed at reducing the number of deaths due to road traffic injuries<sup>[23]</sup>. As a signatory of the "Brasilia Declaration on Road Safety", India has committed to the World Health Organisation reduce the road traffic deaths by 50% in 2020<sup>[24]</sup>. The Post-crash response of the Brasilia declaration urges all the member states to strengthen pre-hospital care, including emergency health services and the immediate post-crash response, hospital and ambulatory guidelines for trauma care, and rehabilitation services<sup>[25]</sup>. Which could be achieved through the implementation of appropriate legislation, capacity building and improvement of timely access to integral health care, and using the services of WHO to support Member States to achieve these goals. Besides the declaration also recommended governments and road safety agencies to continue and enhance their activities of international cooperation in order to share best practices, and lessons learned, transfer knowledge, promote access to innovative and sustainable technologies and build capacity, in line with the Global Plan for the Decade of Action for Road Safety 2011-2020 and the 2030 Agenda for Sustainable Development. Our article analyses the current post-crash practices between the two countries and will be immensely helpful for the respective governments to transfer knowledge, share best practices and to achieve the goal of Brasilia declaration.

In the last three years the plateau in road traffic deaths worldwide, set against a 4% increase in global population and 16% increase in motorization, suggests that road safety efforts have saved lives. On the contrary the RTA deaths has exponentially increased during that period in India. The average annual increase or decrease in road injuries and deaths shows an interesting trend (Table 3, Figure 1&2). Though the injuries have reduced from 2010 to 2015 by 1% every year in India the death rate increased by 2.1%. This reveals that significant improvements are needed to reduce the mortality of the RTA victims following major trauma. 1,898,893 people could die in the Indian roads between 2016 and 2025, if the present trend continues. Besides we also have to take into consideration that a lot of deaths and injuries go unreported<sup>[26]</sup>.

The analysis of road accident data in 2015 revealed that about 1,374 accidents and 400 deaths take place every day on Indian roads, which further translates into 57 accidents and loss of 17 lives on an average every hour. About 54.1 per cent of all persons killed in road accidents are in the 15 - 34 years age group as identified during the year 2015 (Road accidents in India, 2015). Although the ultimate goal is prevention, much could be done to minimize the disability and ill-health arising from the injuries that do occur despite the best prevention efforts. Appropriate treatment of patients with non-fatal injuries can prevent future fatalities and reduce the amount of short-term and long-term disability. The study conducted by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) showed that Indian economy loses 3% GDP every year due to road traffic accidents, which is over \$58,000 million in terms of value<sup>[2]</sup>. On the contrary, in UK, because of road accidents everyday there were 5 fatalities and 61 seriously injured and the government loses 1%GDP every year due to RTA.

The progressive increase in injuries and mortality in India



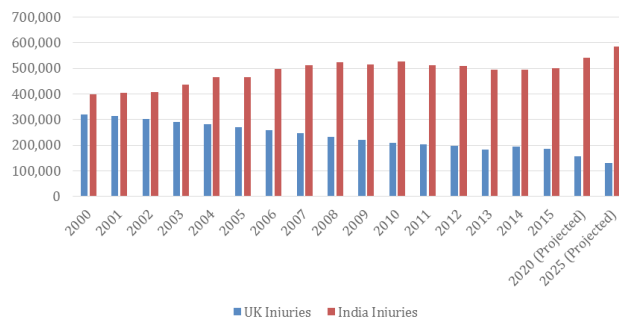
correlates with its economic growth, with an associated increase in the number of newly affordable vehicles being bought. Efforts and strategies for improved road safety and their progress are well documented in the World Health Organisation, Global status report on road safety (2015) and further discussion on prevention strategies is beyond the scope of this report. However, we can hypothesise that the increased motorisation observed has not been matched by improvements in trauma care, which may have contributed to the increasing mortality rates observed. To assess this further, we need the data on mortality figures at the roadside versus that for deaths occurred after admission to the hospital, in addition to the times taken for first attenders to arrive, their level of training, and the times taken for the hospital transfer. Further research could also focus on the facilities available at the destination institution.

The disparity in absolute mortality is stark and concerning. The most recent year for which data is available for both countries is 2015 where there were **148,707** RTA deaths in India and 1730 in the UK. The population of India is over 19 times that of the UK. Extrapolating from the 1730 observed deaths in the UK, we would expect approximately 32,870 deaths in a country with the population the size of India, but what we actually observed is a figure 4.5 times. The reasons for this disparity are clearly multifactorial but are likely to include the differences in the timing and effectiveness of trauma care in the post injury period.

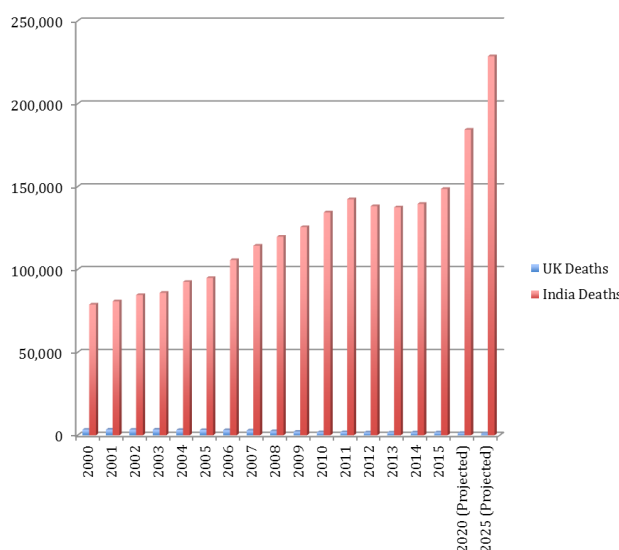
The concept of the golden hour was developed by R. Adams Cowley, an Army and thoracic surgeon working in the United States in 1959. The principle behind the theory is the critical time period from the point of injury during which assessment and intervention may be most decisive, including in the pre-hospital environment. Systematic reviews by Harmsen *et al* (2015) and Henry *et al* (2012) highlighted the reduction in the odds of mortality for those with neurotrauma and penetrating injury causing haemodynamic instability when transferred swiftly to hospital<sup>[27,28]</sup>. Besides the implementation of prehospital care can reduce risk of death in injured patients by 25%. Given the lack of a common emergency access number, coordinated emergency medical services, and the variability in skill level of the first responders, it is difficult to imagine these principles are being effectively applied in a timely fashion post trauma in India.

In England the 22 MTC network prospectively records patient data and outcomes, which are submitted to the Trauma Audit and Research Network (TARN), a national body that is responsible for its collation. In 2015 TARN reported that the odds of surviving major trauma in England had increased by 63% since the introduction of MTCs<sup>[29]</sup>. In London specifically a reduction in mortality of 50% was observed. While no objective mortality data was found after the introduction of the JPNATC in Delhi, this is likely to represent a lack of publication rather than there being a lack of effect. While patient outcome data collection is duty bound by trauma centres in the UK, this does not appear to be the case in India.

A disparity exists in the availability of trauma related courses between the UK and India. This deficit was acknowledged by the Indian Army, where they highlighted the lack of training opportunities in relation to pre-hospital environment<sup>[30]</sup>. While multiple courses exist focussing on in-hospital management, the availability of ATLS in particular is concerning, given its recognised status as the standard for initial trauma care internationally. Post-graduate degree opportunities appear in abundance in India in the generality of Orthopaedics, although it is difficult to assess the weighting and teaching allocated to the management of major trauma specifically. It is also therefore difficult to compare the trauma content and quality compared to the trauma-specific Masters degrees available in the



**Figure 1** RTA injuries from 2000 to 2015, India Versus UK with future projections.



**Figure 2** RTA deaths from 2000 to 2015, India Versus UK with future projections.

UK, which are not available in India except in the single institution mentioned.

India's deficiency in trauma care appears to be being recognised at the highest levels. In 2014 S. Rajasekaran, the then head of the Indian Orthopaedic Association issued a petition resulting in a judgement from the supreme court of India<sup>[31]</sup>. This reports the pertinent differences between the UK and India in peri-trauma care. Describing data from 2009/10 they report that the total number of accidents in India (430654) is around three times that of the UK (164300), while the number of deaths in India (126896) is 50 times more than the UK (2222). The difference in mortality between countries is therefore not attributable simply to differences in the incidence of trauma, but rather in its management. The conclusion of the judgement attributes the difference directly to the inadequacies of pre-hospital care and the infrastructure of treating hospitals. The honourable supreme court of India also observed that a life is lost every three minutes in Indian roads and in 2015-2016 financial year the insurance companies spent Rupees 11,480 crores (£1.32 billion) on compensation following road accidents. The most recent report from Ministry of Road Transport "Road Accidents in India-2016" shows that a total number of road accidents in 2016 has reduced by 4.1% to 4,80,652 when compared to 2015<sup>[32]</sup>. However the number of deaths has risen by 3.2% to 1,50,785 and 4,94,624 persons were left with grievous injuries. This again highlights the need for strengthening the pre-hospital and in-hospital care.

Our analysis has its limitations. All authors currently live and work in the UK, practicing in the same Major Trauma Centre; although

the senior authors have had previous experience in delivering trauma care in India. Our knowledge and perception of trauma systems in UK and India are therefore likely to have been biased by our recent experiences. Naturally our knowledge on UK trauma system is likely to be wider than that of current trauma systems in India. We acknowledge that the UK trauma system is still relatively young and still in development, and there is much we could learn from systems in other countries. We appreciate there may be much information which is not available in the public domain, but may be accessible to medical teams working within the system. However, we hope that this study would allow us to mutually improve trauma care in both countries with the aim of reducing the immense morbidity and mortality burden associated with RTAs.

## CONCLUSION

India, being a signatory of the 'Brazilia declaration', has an obligation to reduce the road traffic deaths by 50%. In order to achieve this target, Indian healthcare will have to bring significant improvements in the trauma care provided. The priorities in the area of pre-hospital care include establishing a nationwide single emergency access number, setting up of institutions that provide curriculum based training of ambulance workers and paramedics, providing with standardised and well-equipped ambulances and establishing a national trauma network. The improvements in the in-hospital care could focus on are establishing a network of strategically placed Major Trauma Centres, creating a National Trauma Registry, incorporation of major trauma care in the training curriculum of all speciality surgical doctors, and provision of appropriate infrastructure and specialists in these centres. In addition, a collaborative approach with other well established trauma care systems will help improve standards of care through implementation of best practice and shared learning, resulting in marked reduction of deaths due to road traffic accidents.

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