Original Article

Survey of the current state of emergency care in Chennai, India

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BACKGROUND: On July 21, 2009, the Medical Council of India officially recognized the specialty of emergency medicine in India. The city of Chennai with over six and a half million people is the fourth largest on the subcontinent and has already been a prominent city of interest in the specialty's development. However, there is no standardization of the resources found in the city's emergency departments. This study was to survey the equipment, training, and certification of Chennai area emergency departments and their staff.

METHODS: We conducted a cross-sectional survey of emergency department staff from 38 Chennai area hospitals. The survey instrument contained 44 questions pertaining to hospital demographics, staff training and certification, and ED equipment and supplies. The items on the survey were specifically chosen to represent only the most basic and common resources necessary to practise emergency medicine.

RESULTS: The survey found a majority of hospitals are privately operated but there is a wide range in terms of size and volume of patients. A minority of both doctors and nurses are certified in BLS, ACLS, PALS, and ATLS. While almost all departments surveyed had the basic code medications, a number of basic equipment items were lacking from a large percentage of the EDs surveyed.

CONCLUSION: The newly established EP community in Chennai will have the responsibility to establish standards for both training and resources so that the specialty may grow and provide a higher standard of emergency care moving into the future.

KEY WORDS: Emergency medicine; India; Health resources

World J Emerg Med 2011;2(3):169-174

DOI: 10.5847/wjem.j.1920-8642.2011.03.002

INTRODUCTION

Located on the South Asian Subcontinent, the country of India is the second most populous in the world with a population approaching 1.2 billion people.^[1] There are 22 official languages not counting English spoken among its people.^[2] The majority of the population follows Hinduism, 80.5%, but Islam, Christianity, and Sikhism are also practiced by a significant number of its citizens. Its landmass spans some 3 million square kilometers between the Arabian Sea to the west and the Bay of Bengal to the east, ranking it as the seventh largest and is politically divided into 28 states and 7

union territories.^[1]

The state of Tamil Nadu is found on the most southeastern tip of the Indian peninsula. It is the eleventh largest in terms of landmass, but the sixth most populous, and is the most urbanized state in all of India.^[3, 4] Its capital city, Chennai, and its surrounding urban area has a population of 6.6 million people making it the fourth largest city in India.^[5] Chennai started the first privatized emergency department (ED) modeled on the "American Community Hospital Emergency System" and has hosted one of the very few postgraduate training programs in emergency medicine (EM) in the

entire country since 2001, making it a prominent city of interest in the development of EM.^[6] Emergency care in the city has in the past largely been provided by four large government hospitals with medical college affiliations.^[7] In recent years, there have been an increasing number of private institutions offering 24-hour emergency care. However, there is no categorization or standardization of any of these hospitals pertaining to what exact resources they possess to handle emergency medical conditions, and to our knowledge there has never been a previously published survey to identify what resources may be lacking, only unpublished results of a survey done in January of 2000.^[8]

As the number of EDs throughout the city continues to grow, we sought to begin an initiative to evaluate and improve emergency care in Chennai. The first step of this initiative was to survey the current state of emergency care available to the public of Chennai and identify areas of focus for future development. The American College of Emergency Physicians' (ACEP) Policy Statement regarding ED planning and resources dictates that EDs must possess all the resources necessary to evaluate and resuscitate all individuals who present to the ED to meet the emergency care needs of the individual and the community.^[9,10] We wanted to see if the EDs in Chennai possessed this basic equipment, training, and certification necessary for the operation of an emergency department.

History of emergency medicine in Chennai

On July 21, 2009, the Medical Council of India, the body responsible for establishing standards for postgraduate medical education in India, released a notification of amendment to "Postgraduate Medical Education Regulations, 2000" that formally recognized emergency medicine as a specialty in the country.^[9] With this announcement, the second largest nation with over a billion people passed a major milestone in the development of emergency medicine into a mature specialty.^[10] However before significant progress can be made, an examination of the state of EM leading up to the present in each community is necessary to identify areas of focus for change and improvement.

Until now, emergency departments were said to be largely staffed by physicians waiting to take the All-India Examination with no postgraduate training whatsoever. Moreover, the very definition of an emergency department varies between hospitals and usually consists of only a simple casualty or accident ward lacking specialty-specific training and resources.^[6] With official recognition of the specialty in 2009, there will soon be an

influx of freshly trained emergency medicine physicians (EPs) ready to lead and grow the specialty.

As the training and education standards are established for EPs, so too must standards for hospital EDs be established. The development of formal prehospital emergency medical services has been ongoing in India, but still only about 2% of patients are transported to an ED by ambulance.^[11] Because the vast majority of prehospital care is performed by bystanders in what has been described as the scoop-and-run approach where patients are dropped off at the closest area hospital, there is a need for hospital ED categorization and standardization that is currently lacking.^[12] The standardization of the essential equipment and resources necessary for the practice of emergency medicine must be formally established if these newly trained EPs are to fully realize their training and lead the specialty into the next era of development.

METHODS

The purpose of this study is to describe the basic characteristics of the hospitals, staff, and equipment found at Chennai area emergency departments. We conducted a cross-sectional survey of emergency department staff from a sample of 38 hospitals in the city of Chennai and its surrounding metropolitan area in March 2010. The hospitals selected were a convenience sample, but care was taken to choose a broad and representative sample of hospitals. In order to be eligible for inclusion in the study, the hospital had to advertise an emergency department that was open to the general public 24 hours a day for both medical and surgical emergencies.

The survey instrument (Figure 1) used in this study was designed by the principle investigator (JK) following basic guidelines for scientific survey design. The survey consisted of a standardized set of 46 questions including hospital and ED demographics (6 questions), staff training and certification (8 questions), and ED equipment and supplies (32 questions). The items included on the survey were chosen based on a consensus among the authors of this study that they represented the most common and basic items necessary to practice emergency medicine [i.e. Advanced Cardiovascular Life Support (ACLS), Pediatric Advanced Life Support (PALS), and Advanced Trauma Life Support (ATLS) certification, multiparameter monitors, defibrillators, large-bore IVs, ACLS medications, airway equipment, etc.] using policies by ACEP, the Society for Academic Emergency Medicine, and the American Academy of Pediatrics as a guide.^[13-15]

Demographical Information for hospital and staff training/certification:

What is the PIN code for your hospital? _____
 Is your hospital public or private? _____
 Is your hospital teaching or non-teaching? _____
 How many inpatient beds are in your hospital? _____
 How many ED beds are in your hospital? _____
 What is the annual ED patient volume at your hospital? _____
 What is the total number of doctors staffed by your ED? _____
 How many of the doctors on staff have completed PG training? _____
 How many of the doctors on staff are ACLS certified? _____
 How many of the doctors on staff are PALS certified? _____
 How many of the doctors on staff are ATLS certified? _____
 What is the total number of nurses staffed by your ED? _____
 How many of the nurses on staff are BLS certified? _____
 How many of the nurses on staff are ACLS certified? _____

Kindly respond Yes/No as to whether the following items are regularly present in your ED.

1. Triage Protocol: Yes ☐ No ☐
 2. Cardiac Monitor: Yes ☐ No ☐
 3. Oxygen Saturation Monitor: Yes ☐ No ☐
 4. Blood Pressure Monitor: Yes ☐ No ☐
 5. Defibrillator: Yes ☐ No ☐
 6. 12-Lead ECG Machine: Yes ☐ No ☐
 7. Portable X-ray machine: Yes ☐ No ☐
 8. Glucometer: Yes ☐ No ☐
 9. Suction Apparatus: Yes ☐ No ☐
 10. ACLS Medications:
 - a. Adrenaline: Yes ☐ No ☐
 - b. Atropine: Yes ☐ No ☐
 - c. Vasopressin: Yes ☐ No ☐
 - d. Lignocaine/Xylocard: Yes ☐ No ☐
 - e. Amiodarone: Yes ☐ No ☐
 - f. Calcium Chloride/Gluconate: Yes ☐ No ☐
 - g. Sodium Bicarbonate: Yes ☐ No ☐
 - h. Dextrose (D25 or D50): Yes ☐ No ☐
 11. Supplemental Oxygen: Yes ☐ No ☐
 12. Nasal Canula and/or Venturi Mask: Yes ☐ No ☐
 13. Non-Rebreather Mask: Yes ☐ No ☐
 14. Bag Valve Mask:
 - a. Adult: Yes ☐ No ☐
 - b. Pediatric: Yes ☐ No ☐
 15. Intubation Equipment (i.e. laryngoscope, ET tubes):
 - a. Adult: Yes ☐ No ☐
 - b. Pediatric: Yes ☐ No ☐
 16. Large bore peripheral IV's (i.e. 14 or 16 gauge): Yes ☐ No ☐
 17. Central Venous Catheters: Yes ☐ No ☐
 18. Pressure Bag: Yes ☐ No ☐
 19. Infusion Pump: Yes ☐ No ☐
 20. Dressing Materials: Yes ☐ No ☐
 21. Suturing Materials: Yes ☐ No ☐
 22. Splinting Materials: Yes ☐ No ☐
 23. Cervical Collar: Yes ☐ No ☐
- Comments/Feedback (kindly include any items you feel may have been omitted that should be regularly present in an ED setting): _____

With regard to the demographical data recorded, hospitals were asked to classify themselves as either public meaning operated by the government or private meaning operated by some entity in the private sector. A hospital was considered teaching if it had at least one post-graduate training program in any specialty present. Regarding items pertaining to staff, participants were asked to provide the proportion of doctors and nurses who had completed certain training and certifications essential to the practice of EM. The number and percentage of doctors on staff who have completed some form of post-graduate training, i.e. specialty training beyond medical school and internship, was recorded. The number of doctors on staff who had completed certification in ACLS, PALS, and ATLS or their equivalents was also collected. Additionally, the number of nurses on staff who had completed training and certification in Basic Life Support (BLS) and ACLS or their equivalents was surveyed.

For questions concerning equipment and supplies, participants were asked to respond either yes or no as to whether those items were regularly present in their ED. Those resources that may be frequently used by the ED but are typically located outside the ED and are under the purview of an outside department such as a blood bank, pharmacy, or computed tomography scanner were not included in the survey as our focus was on those items that were uniquely possessed and maintained for use in the ED. Triage protocol is defined as any form of predefined system for prioritizing patients based on the severity of illness. Large bore IVs included either 14 or 16 gauge angiocatheters. Intubation equipment is defined as possessing laryngoscopes, blades, and endotracheal tubes in sizes for adults and/or pediatrics. Only medications expected to be found in a crash cart were included on the survey as other medications must typically be purchased by the patients' family from the hospital pharmacy, which is not under the purview of the ED.

The surveys were completed by either ED staff physicians, ED nurses, or hospital administrators during an in-person unannounced visit to the hospital. In all cases an attempt was made to confirm responses regarding ED equipment on the survey by visual confirmation during our visit. Additionally if we could not visually confirm the results, a second staff member was individually asked to confirm the responses. For omitted items an attempt was made to contact additional staff for a response. It was explained in an introductory letter prior to the administration of the survey that the

Figure 1. Chennai emergency preparedness initiative: survey of the current state of emergency care in Chennai

individual hospitals would remain anonymous in our reporting of the results. Participation in the survey was on a voluntary basis. The study was approved by the Institutional Review Board at the Sundaram Medical Foundation in Chennai, India.

RESULTS

Description of emergency medicine in Chennai

First, we sought to describe and characterize the hospitals included in the study (Table 1). A total of 38 Chennai area hospitals were surveyed. The vast majority, 92%, was privately operated; however more than a third, 40%, had some form of postgraduate training program present. The number of ED stretchers present ranged from 2 to 45 with an average of 8 stretchers per ED. The number of inpatient beds ranged from 40 to 1250 with a mean of 251 beds. The annual ED volume ranged from 2373 to 73 000 patients with an average of 17 494 patients per year. Despite a significant majority of hospitals being categorized as private, the hospitals surveyed demonstrate a diverse group in terms of both size and volume.

The staff of each ED was surveyed with respect to the number of doctors and nurses and their training and certification credentials (Table 2). The average ED staff consists of 6 doctors. Of these, a mean of 20% have completed some form of postgraduate training, 22% are

ACLS certified, 10% are PALS certified, and 11% are ATLS trained. An average of 11 nurses is on staff with a mean of 27% BLS trained and 10% ACLS certified. The survey found a minority of both doctors and nurses have received training in the fundamental life support algorithms inherent to the practice of EM.

Each ED was surveyed as to whether or not it contained basic supplies that would generally be necessary in order to practice EM (Table 3). A large majority of EDs possessed items such as oxygen saturation monitors, cardiac monitors, defibrillators, EKG machines, glucometers, large bore intravenous catheters, dressing materials, suturing supplies, and splinting materials. However, items such as triage protocols, blood pressure monitors, portable X-ray machines, central venous catheters, pressure bags, infusion pumps, and cervical collars were less often regularly stocked. A surprising number of basic ED equipment was lacking in a significant number of EDs surveyed.

Essential airway management equipment was surveyed at each ED (Table 4). A large majority of

Table 1. Description of hospitals

Parameters	Results
EDs studied	38
Public hospitals	8%(3/38)
Private hospitals	92%(35/38)
Teaching hospitals	40%(15/38)
Non-teaching hospitals	60%(23/38)
ED stretchers (mean)	8 (313/38)
Inpatient beds (mean)	251 (9288/37)
Annual ED volume (mean)	17 494 (647 273/37)

Table 2. Description of ED staff

Parameters	Results
ED physicians (mean)	6 (242/38)
Completed post-graduate training	20%
ACLS certified	22%
PALS certified	10%
ATLS certified	11%
ED nurses (mean)	11 (398/37)
BLS certified	27%
ACLS certified	10%

Table 3. General ED supplies and equipment (%)

Parameters	Results
Triage protocol	24 (9/38)
Oxygen saturation	76 (29/38)
Cardiac monitor	71 (27/38)
BP monitor	58 (22/38)
Defibrillator	71 (27/38)
EKG	97 (37/38)
Portable X-ray	62 (23/37)
Glucometer	95 (36/38)
Large bore IVs	79 (30/38)
Central venous catheters	32 (12/38)
Pressure bag	45 (17/38)
Infusion pump	37 (14/38)
Dressing material	100 (38/38)
Suturing material	100 (38/38)
Splinting / casting material	68 (26/38)
Cervical collar	61 (23/38)

Table 4. Airway management supplies and equipment (%)

Parameters	Results
Bedside suction	95 (36/38)
Supplemental oxygen	100 (38/38)
Nasal cannula / venturi mask	100 (38/38)
Non-rebreather mask	47 (18/38)
Bag valve mask (adult size)	89 (34/38)
Bag valve mask (pediatric size)	53 (20/38)
Intubation equipment (adult sizes)	87 (33/38)
Intubation equipment (pediatric sizes)	53 (20/38)

Table 5. Code medications (%)

Parameters	Results
Epinephrine	92 (35/38)
Atropine	92 (35/38)
Vasopressin	38 (14/37)
Lidocaine	89 (34/38)
Amiodarone	42 (16/38)
Calcium (chloride or gluconate)	87 (33/38)
Bicarbonate	89 (34/38)
Dextrose (D25 or D50)	95 (36/38)

departments possessed items such as suction, supplemental oxygen, nasal cannulas or venturi masks, adult bag valve masks, and adult intubation equipment. However, items such as non-rebreathing masks and pediatric sized bag valve masks and intubation equipment were lacking in a significant proportion of those surveyed. While most EDs were ready to handle airway emergencies in adults, many were not as prepared for the pediatric population.

Finally, medications necessary to run codes were surveyed (Table 5). Essential medications such as epinephrine, atropine, lidocaine, calcium, bicarbonate, and dextrose were found in almost all the EDs studied. However, secondary choices like vasopressin and amiodarone were less commonly present. The EDs surveyed possessed almost all code medications necessary to follow ACLS protocols.

DISCUSSION

The city of Chennai has been an early adopter of the specialty of emergency medicine in India. In order for the specialty to evolve, development of both academic programs designed to educate providers as well as proper facilities with resources essential to the practice of EM must be created. As the already established postgraduate programs achieve official accreditation to train EPs, the future will yield a higher percentage of EM residency trained physicians staffing the EDs in the city with the responsibility to lead the growth of the specialty in India.

Training standards must be established for all ED providers. We found currently only a minority of doctors and nurses are certified in the essential protocols of ACLS/BLS, PALS, and ATLS. A concerted effort among leadership within the EM community in India will be necessary to create certification programs that will allow for the training of all ED providers in these fundamental courses.

In addition to the further development of training

and certification criteria for the practice of EM, the creation of resource standards for ED facilities will be necessary. We found Chennai's hospitals to be diverse in terms of size and volume. The classification of EDs with respect to their resources and capabilities will need to be established and advertised to the general public. We identified several basic items that are frequently not stocked, and such deficiencies will need to be addressed in order to provide a better standard of care as EM develops into the future in Chennai.

It will be the responsibility of the new generation of EPs to establish standards and define the specialty to both patients and colleagues who have not been exposed to the practice of emergency medicine. It is our hope that this initiative to evaluate and report on the state of EM in Chennai will continue and grow as a collaboration among the EP community for the betterment of the specialty and the community. Chennai has the foundation to take the lead and set the standard in EM for the rest of the country. More importantly, it is Chennai's citizens who will benefit most from the establishment of standards that will provide better emergency care to the community.

Funding: None

Ethical approval: None

Conflicts of interest: The authors have no financial or other conflicts of interest regarding this article.

Contributors: Jay Khadpe is the primary author and was involved in study conception, design, data collection, data analysis, and manuscript drafting and revision. Tausif Thangalvadi was involved in study conception, design, data collection, and manuscript revision. Parivalavan Rajavelu was involved in study conception, design, data analysis, and manuscript revision. Richard Sinert was involved in data analysis and manuscript drafting and revision. All authors have agreed on the final version of the article to submit for publication.

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Received April 10, 2011

Accepted after revision August 16, 2011