

Assessment of readiness of academic emergency departments in the central region of Saudi Arabia to receive a sick child

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ABSTRACT

Objective: We sought to assess the readiness of general emergency departments (EDs) in academic hospitals in the central region of the Kingdom of Saudi Arabia (KSA) to manage pediatric patients using an international tool: The American Academy of Pediatrics, American College of Emergency Physicians, and Emergency Nurses Association guidelines, which include facilities, personnel, safety, and other components.

Methods: We assessed eligible centers during multiple visits from January 2016 to May 2016 in which we inspected the EDs and conducted interviews with their respective leadership in which we independently recorded our observations. We meet afterward to reach a consensus. Four centers were eligible for enrollment out of eight.

Results: 437,548 patient visits were recorded in 2015 in four academic EDs served by 176 beds. 193 parameters as well as basic demographic data were evaluated. The average travel time from an academic ED to an affiliated pediatric ED was 4.2 min (standard deviation: 1.25). Only two centers had a dedicated pediatric resuscitation bed and none had a separate pediatric crash cart. Overall performance for all centers was 53% in all test parameters. Average scores were 75% for administration and staffing and 49.6% for equipment and medications. None of the centers had a weighing scale or a hypothermia monitor, and all centers neither had policies for family-centered care nor care of children during disasters.

Conclusion: Evaluation of academic EDs in the central region of the KSA using an international tool revealed low overall scores with critical components needed for pediatric emergency care missing.

Keywords: Pediatric emergency medicine, emergency medicine, quality assurance, Riyadh emergency medicine

Introduction

The central region of the Kingdom of Saudi Arabia (KSA) is a term commonly used in reference to two provinces: Riyadh and Qassim. About 8 million people live in this region served by a complex health-care system composed of three main sectors: 65 Ministry of Health (MOH) hospitals, six other governmental agencies' hospitals, and 41 private hospitals; all of those 112 hospitals have emergency departments (EDs) open 24 h a day, 7 days a week.¹ The definition of a child in KSA is not informal; 18 years and younger is the definition in the Child Protection Law² and commonly used in legal contexts; yet individual hospitals have their own definition with the maximum age of 14. As such, demographic analysis of children's visits in hospital reported data tend to underestimate the true prevalence. The General Authority of Statistics report

demographic data with regard to age in a 5-year increment in its growth projection charts which estimates the under 15-year-old population to account for 24.6% of the total population in 2015.³ Most of the children's hospitals in the central region are located in medical cities with general hospitals on the same campus; general EDs, however, do not always have an access to children's hospitals, especially in the private sector. Furthermore, not all pediatric patients will go to children's hospitals either due to convince; sickness level with sicker children going to general EDs; and confusion of caregivers as some specialized pediatric departments operate inside general EDs.

Sick children pose a challenge to emergency medicine practitioners who do not see them on a regular basis. Infrequency of critically ill children visiting the ED and the great effort needed

for their care when they present create good media for medical error. Other commonly cited challenges for EDs to provide care for children include lack of equipment, low number of pediatric visits in general, and lack of pediatric on-call services.⁴

The Saudi Board of Emergency Medicine (SBEM) has eight training centers in the central region, all of which are in Riyadh city.⁵ In their 208 weeks of training, trainees are required to complete 24 weeks of mandatory pediatric emergency rotations under the direct supervision of a subspecialty consultant in an accredited training center; another 4 weeks of their training will be spent in a pediatric intensive care unit which means a graduate will spend 13.5% of his or her training in mandatory pediatric rotations.⁶

The MOH has published a book on ED guidelines in 2013.⁷ Scattered pediatric-oriented parameters are present throughout the book, especially in the equipment lists. The Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) is the national agency authorized to certify health-care institutions in the KSA with regard to quality and patient safety. The CBAHI periodically publishes the national hospital standards book (NHS) which represents the standard of care in the KSA.⁸ Although the NHS contains a specific section entitled (emergency care ER) which has 51 standards, none are pertinent to pediatric emergency care. The only vaguely stated standard that may relate to pediatric care is Standard No. ER 9.2.6 which requires policies and procedures to include “care of minors.”

International assessment measures and benchmarks for pediatric care in EDs are numerous; the most famous of which is the American Academy of Pediatrics (AAP), the American College of Emergency Physicians (ACEP), and the Emergency Nurses Association (ENA) joint policy statement that were originally published in 2001⁹ and further revised in 2009.¹⁰ Their guidelines were endorsed by most of the major medical associations and colleges in North America and they are considered a benchmark for EDs whether in a general or a children’s hospital.

Although health-care systems in the KSA and the USA are different in many regards, the components of the AAP, ACEP, and ENA guidelines can be used to give a rough estimate on the current situation of EDs in the KSA. Until locally developed guidelines are available, the AAP, ACEP, and ENA guidelines are the best alternative available for policymakers to guide local development and improvement of care provided.

The objective of this cross-sectional study is to assess the readiness of general EDs in academic hospitals in the central region of the KSA to receive, stabilize, and treat pediatric patients using the AAP, ACEP, and ENA guidelines.

Methods

We visited and screened all emergency medicine training centers in the central region for eligibility. Eligibility criteria

were: (1) Presence of an approved emergency medicine training program and (2) absence of pediatric emergency specialists’ coverage; four departments were eligible.

We conducted subsequent visits from January 2016 to May 2016 to eligible centers in which we interviewed EDs chairpersons, nursing chiefs, and other staff members present during our visits. We inspected departmental and institutional policies, general department setup, equipment, emergency medical services stations, and we simulated a trip of traveling from the ED’s front door to the affiliated children ED’s front door while recording the time during average traffic with no prior knowledge of directions. We independently recorded our observations and meet afterward to reach a consensus. If a conflict still exists after the meeting, we revisited the center and reexamined the items related to our conflicting observations.

Our observations were recorded as follows: Present or absent for every item mentioned in the AAP, ACEP, and ENA guidelines, and we added six more items including: 2015 census, 2015 pediatric census, number of active ED beds, presence or absence of a pediatric resuscitation bed, presence or absence of a pediatric crash cart, and the time required to travel from the front door of the ED to the front door of the affiliated children’s hospital ED. All observations were recorded by hand and later transcribed into an electronic data sheet using Microsoft Excel® 2016. The same application was used to calculate the mean, median, mode, standard deviation (SD), interquartile range, and average as needed for abstracting results.

All items in the guidelines were counted as they appeared in the original publication excluding our added items; subgroup items were counted as separate items making the overall number 193. We divided the items in the guidelines into five categories: Administration and staffing; quality and safety; policies, procedures, and protocols (PPPs); equipment and medications; and demographic data added to the guidelines by the authors. Source of information for the first four categories were administration staff’s verbal report during the interviews supplemented by written evidence if applicable. As of medications and equipment, the authors accompanied by house staff physically inspected every item; if an item is not located in the clinical area, it was considered not available; if it is stored in a storage area inside or immediately adjacent to the clinical area, it was not counted unless it meets two conditions: (1) The storage area has no lock and (2) its presence in the storage area was known to most of the staff present when we visited the ED.

Both authors are not employed by the included EDs and did not receive any funds for the study. An Institutional Board Review approval was granted by King Fahad Medical City with the log No. 15-436.

Results

437,548 patient visits were recorded in the preceding year's census in the four centers included in the study; pediatric visits are not recorded as a separate parameter in two hospitals. Three hospitals are located within the same campus as a specialized pediatric hospital and the fourth one had direct written agreements with a specialized pediatric hospital across the street. The average travel time using a private car from the ED front door to the pediatric ED front door was 4.2 (SD: 1.25) min for all centers. One hospital has a drive-through triage to redirect pediatric patients and patients with respiratory symptoms to an appropriate care area; the three other hospitals require patients to enter the ED by foot to be triaged to the pediatric hospital if they do not go directly there, but none of them had a connecting structure for pedestrians between the ED and the pediatric ED. The total number of operational ED beds in all centers is 176; only two centers had a dedicated pediatric resuscitation bed and none had a pediatric specific crash cart.

The overall performance of all hospitals in administration and staffing parameters was 75%. 3 hospitals have a pediatric emergency care physician coordinator with subspecialty training in pediatric emergency medicine (PEM); none of the hospitals had a nursing coordinator for pediatric emergency care. All shifts in all hospitals included were covered at minimum by a board-certified emergency physician and nursing staff with adequate experience and qualifications. Continuous education in all aspects of care including PEM is offered to staff in all centers, and although scientific re-contract requirements were variable between centers, all of them had pediatric care standards with variable depth as per each institutions' policy. Quality and performance improvement plans of all centers included lacked pediatric-specific indicators. Out of the 12 parameters of pediatric safety, the mode score was 11 (interquartile range: 2.25); the parameter that none of the included centers did pass was the overall safety of children in clinical areas and the implementation of family-centered care.

With regard to clinical PPPs, the average performance of all centers was 56%. Prominent missing PPPs are related to: Family presence during resuscitation, social and mental issues, death of a child in the ED, and bereavement counseling. None of the disaster PPPs included a section pertinent to pediatric-specific issues including: Minimization of parent-child separation and access to mental and social support services. Prominent present PPPs are those pertinent to referral and transfer of pediatric patients including diagnostic radiology services.

The final category which included equipment and medications had 140 parameters; the mode score was 73 (interquartile range: 9.5) for all included centers. None of the included centers had a hypothermia monitor or a weighing scale, and continuous end-tidal CO₂ monitors were consistently missing.

Simple airway interventions for infants were not available at all centers which included: Nasal cannulas and simple face masks. Umbilical vein catheters were present in one center only. The summary of scores for all centers is shown in Table 1, and the top five missing components in all centers are shown in Box 1.

Discussion

Keeping a separate census for pediatric patients visiting the ED is the first step in quantifying the needed effort and resources for improving care. Two of the centers we visited lacked this vital tool and as a result it was difficult to draw conclusions to the size of the target population. Higher volumes of pediatric ED visits were associated with better performance as reported in the literature,¹¹ a fact that was not replicated in our investigation. One of the centers had a calculated daily pediatric visit on an average of 22 with 1 patient triaged as level 1 or 2 on the Pediatric Canadian Triage and Acuity Scale every other day while scoring 53% in its overall performance and 51% in medications and equipment alone.

The absence of a pediatric care nursing coordinator is reflected on the overall low performance of all centers included as it has been shown that their presence improves readiness.¹¹ A pediatric care physician coordinator was missing in one center which had the lowest performance scores in all categories; this finding has been reported previously which highlights the need for this important role in EDs.¹¹

The SBEM has 38 core clinical competencies specifically related to PEM built to increase structured pediatric population exposure of trainees,⁶ which has been shown to increase physician's comfort in treating a sick child.¹² Although the training standards and knowledge base required for graduating the SBEM are fairly similar to their counterparts in the USA, whether or not graduates specifically gained the confidence in managing pediatric patients as sole providers has not been studied. Two centers required all ED physicians to have an active certificate in Pediatric Advanced Life Support for re-contract, a requirement that is discouraged by the ACEP.¹³ Unlike in the USA,¹⁴ there are no national training courses or examinations for PEM nursing in the KSA; centers included rely on international training courses with specific emphasis on triage and resuscitation.

Family-centered care and family presence during resuscitation are two universally missing PPPs from all centers. Both ACEP and AAP advocate for institutional policies that support a family-centered care approach which include: Recognizing the family as key decision makers in the patient's medical care; acknowledging the interdependence of child and parent; and encouraging family member's presence.^{15,16} Children represent a significant portion of the Saudi population, and in case of a disaster, their involvement is inevitable; yet their needs and requirements are substantially different than that of adults;¹⁷ a fact that was not reflected in PPPs related to disasters in all centers in our investigation.

Table 1: Performance of academic EDs in the central region of the KSA with regard to pediatric care

Parameter	Hospital A	Hospital B	Hospital C	Hospital D	Average (SD)
2015 census (total 437,548) visits per year	83,644	150,128	58,458	145,318	109,387 (39393.31)
2015 pediatric census	373	7,948	Not recorded	Not recorded	-
Calculated average daily pediatric visits	1	22	-	-	-
Operational ED beds (total 176) beds	24	61	39	52	44 (13.94)
Number of pediatric resuscitation beds	1	0	0	1	0.5 (0.5)
Number of dedicated pediatric crash carts	0	0	0	0	0
Travel time from the ED door to the pediatric ED door (min).	4	6	3	4	4.2 (1.25)
Performance in:					
Administration and staffing parameters (5)	4 (80%)	4 (80%)	3 (60%)	4 (80%)	3.75 (0.4) {75%}
Quality and patient safety parameters (14)	11 (78.6%)	8 (57.1%)	11 (78.6%)	11 (78.6%)	10.25 (1.3) {73%}
PPPs parameters (34)	18 (52.9%)	18 (52.9%)	20 (58.8%)	20 (58.8%)	19 (1.0) {55.9%}
Equipment and medication parameters (140)	71 (50%)	73 (51.4%)	61 (42.9%)	73 (51.4%)	69.5 (5.0) {49.6%}
Overall performance in all tested parameters (193)	104 (54%)	103 (53.3%)	95 (49.2%)	108 (56%)	102.5 (4.71) {53%}

SD: Standard deviation, PPPs: Policies, procedures, and protocols, ED: Emergency department, KSA: Kingdom of Saudi Arabia

Box 1: Major components needed for emergency pediatric care missing from all tested centers

- Nursing coordinator for pediatric emergency care
- Pediatric-specific indicators in the quality improvement plan of the department
- A policy for child death in the ED
- A policy for family presence during all aspects of care, especially during resuscitation
- Integration of pediatric care in disaster preparation and planning

Box 2: Critical equipment for emergency pediatric care missing from all tested centers

- Hypothermia thermometer
- Continuous end-tidal CO₂ monitoring device
- Weighing scale
- A physical restraining device
- Umbilical vein catheters (found in one center only)

A median of 91% equipment and medications for pediatric care in the ED availability was reported in the USA¹¹ in a marked improvement over earlier reports.¹⁸ In our investigation, the median availability was 37%. Box 2 lists critical equipment that was not available in all centers; one particular item, weighing scale, deserves specific attention as it was missing from all centers creating good media for medical errors. Broselow tape[®] is a length-based estimation tool used for medication dosing and equipment sizing¹⁹ which we found available in all centers. Broselow tape[®] is an estimation tool that should not be overused as it has been found not to be accurate in young obese children and adolescents.²⁰

Strengths of our instigation include: Physical visits to record data, being the first of its kind in the KSA and using well-known guidelines. Our instigation has three shortcomings that should be considered. First, we examined teaching hospitals that have pediatric hospitals in the vicinity which may play a role in their low scores as they are not expected to see large number of pediatric patients; however, without pediatric

census reported, this remains speculative. Second, most hospitals in the KSA are stand-alone general hospitals with no direct relationships with a pediatric hospital which may differentiate their performance from centers included in our instigation. Finally, we assigned every item an equal weight for the final score calculation even though some parameters are more important than others. We elected to do so as this investigation is meant to be a primer in its field in the KSA, and assigning variable scores to components will require local expert consensus on national needs and requirements. Future efforts should focus on developing a local standard for PEM care.

Recommendations

Academic hospitals in the central region of the KSA should keep a pediatric census in their EDs. Keeping a separate crash cart for pediatric patients would ease their care in the chaotic resuscitation environment. A dedicated pediatric resuscitation bed might be utilized in high pediatric volume EDs with emphasis on safety and ease of access to resuscitation devices and medications. A dedicated pediatric emergency care nursing coordinator will improve the overall care for children. A review of all PPPs, as they pertain to pediatric emergency care, is critically needed, and a review of pediatric-specific supplies and equipment is equally important. A weighing scale should be readily available with sufficient quantity and quality; as well as a continuous end-tidal CO₂ monitoring device.

Conclusions

The average score in the ACEP, AAP, and ENA guidelines for hospitals in the central region of the KSA with teaching programs in emergency medicine was 52%.with some critical components needed for pediatric care missing; examples of which are: Family-centered care policy, death of a child in

the ED protocol, pediatric-specific sections in disaster plans, weighing scales, and simple airway devices for infants.

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