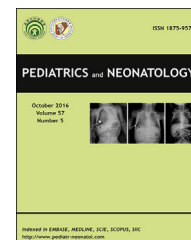


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ORIGINAL ARTICLE

Comparisons between Full-time and Part-time Pediatric Emergency Physicians in Pediatric Emergency Department



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Key Words

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Background: Pediatric emergency medicine is a young field that has established itself in recent decades. Many unanswered questions remain regarding how to deliver better pediatric emergency care. The implementation of full-time pediatric emergency physicians is a quality improvement strategy for child care in Taiwan. The aim of this study is to evaluate the quality of care under different physician coverage models in the pediatric emergency department (ED). **Methods:** The medical records of 132,398 patients visiting the pediatric ED of a tertiary care university hospital during January 2004 to December 2006 were retrospectively reviewed. Full-time pediatric emergency physicians are the group specializing in the pediatric emergency medicine, and they only work in the pediatric ED. Part-time pediatricians specializing in other subspecialties also can work an extra shift in the pediatric ED, with the majority working in their inpatient and outpatient services. We compared quality performance indicators, including: mortality rate, the 72-hour return visit rate, length of stay, admission rate, and the rate of being kept for observation between full-time and part-time pediatric emergency physicians. **Results:** An average of 3678 ± 125 [mean \pm standard error (SE)] visits per month (with a range of 2487–6646) were observed. The trends in quality of care, observed monthly, indicated that the

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72-hour return rate was 2–6% and length of stay in the ED decreased from 11.5 hours to 3.2 hours over the study period. The annual mortality rate within 48 hours of admission to the ED increased from 0.04% to 0.05% and then decreased to 0.02%, and the overall mortality rate dropped from 0.13% to 0.07%. Multivariate analyses indicated that there was no change in the 72-hour return visit rate for full-time pediatric emergency physicians; they were more likely to admit and keep patients for observation [odds ratio = 1.43 and odds ratio = 1.71, respectively], and these results were similar to those of senior physicians.

Conclusion: Full-time pediatric emergency physicians in the pediatric ED decreased the mortality rate and length of stay in the ED, but had no change in the 72-hour return visit rate. This pilot study shows that the quality of care in pediatric ED after the implementation of full-time pediatric emergency physicians needs further evaluation.

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1. Introduction

Quality of care is important in all health care services, including pediatric emergency care. Pediatric care has its own unique characteristic needs as the risk of medication errors can especially increase harm to patients in the pediatric emergency department (ED).¹ In the past, most pediatric ED patients were seen by a resident and a physician not specializing in pediatric emergency medicine. Leadership is a critical factor in implementing change and quality improvement initiatives.² The late chair of our board commented: “How can we treat the most seriously ill patients with inexperienced physicians?” In July 2003, the ED scheduled full-time pediatric emergency physicians and moved to total coverage in the subsequent 3 years. Instead of implementing extra ED rotating shifts with other pediatric subspecialists, the implementation of full-time pediatric emergency subspecialists is a quality improvement strategy in pediatric ED. In developed countries such as Canada and the United States, most pediatric EDs are staffed by full-time pediatric ED-trained and credentialed attending physicians.³ Previous studies focusing on legal issues reported a decrease in malpractice claims and disbursements in a pediatric ED with full-time attending physician coverage;⁴ most studies of the quality of pediatric ED care have examined differences between residents and attending physicians or between emergency and pediatric physicians.^{5–9}

The aim of quality in health care is “the degree to which health care services for individuals and populations increase the likelihood of desired health care outcomes and are consistent with current professional knowledge” as defined by the Institute of Medicine.¹⁰ The six dimensions of quality are care that is effective, safe, efficient, timely, equitable, and patient-centered.¹⁰ We expect the implementation of full-time pediatric emergency physicians to have better professionalism in patient- and family-centered care in order to reduce practice variations, and to provide the right care in the right place at the right time in an efficient and timely way.¹¹

The aim of this study was to evaluate the quality of care in a pediatric ED with pediatric emergency physicians.

2. Methods

2.1. Study design

The present study was a retrospective cohort study.

2.2. Setting

The patients were drawn from a pediatric ED affiliated with a tertiary care university hospital. The 24-hour pediatric ED has approximately 45,000 visits annually. The hospital has a total of 360 inpatient beds, including 200 ward beds, 30 pediatric intensive care unit beds, and 130 neonatal intensive care unit beds.

2.3. Selection of participants

The computerized medical records of all pediatric patients aged ≤ 17 years, with the exception of trauma cases, visiting the ED between January 2004 and December 2006 were reviewed. The physicians included in this study analysis were all credentialed attending physicians working in pediatrics. The full-time pediatric emergency physicians' group means physicians who work in the pediatric ED for 120–156 hours a month without inpatient and outpatient duties, and have 1–8 years of experience in pediatric emergency medicine. By contrast, the part-time pediatricians' group means physicians who work an extra shift in the pediatrics ED for 12–36 hours a month, in addition to providing routine inpatient and outpatient services in their subspecialty. Part-time pediatricians do not specialize in pediatric emergency medicine and have 1–2 years of pediatric emergency experience. During the study period, one attending physician together with one resident treated patients in a 12-hour shift; the attending physicians supervised the residents, assessed and managed patients with complicated medical conditions, and assumed responsibility for the management and the final placement of the patients.

2.4. Methods of measurement

The outcomes were quality measurements of pediatric ED performance. We used the most useful and common performance indicators including length of stay and the 72-hour return visit rate;¹² the other most common indicator was admission rate.¹² The indicators we developed and collected in this study were the mortality rate, within 48 hours of admission and total, and rate of being kept for observation. In addition, information on patient characteristics (gender and age), physician characteristics (status and seniority), the volume of patient visits, triage classification, and time of ED visit (season and time of day) were collected.

2.5. Primary data analysis

The incidence of patient death after admission to the pediatric ED was aggregated into yearly data, due to the small number of deaths. The full-time pediatric emergency physicians and part-time pediatricians were compared on the indicators using Chi-square tests for discrete variables and *t* tests for continuous variables. The variables were coded as gender (0 = male, 1 = female), age (continuous in years), physician status (0 = part-time pediatricians, 1 = full-time pediatric emergency physicians), physician seniority (0 = < 3 years of experience, 1 = > 3 years of experience), season (0 = winter, 1 = spring, 2 = summer, 3 = fall), time of arrival at the ED (0 = 0:00 AM–7:59 AM, 1 = 8:00 AM–3:59 PM, 2 = 4:00 PM–11:59 PM), triage classification (0 = Class IV, 1 = Class I, 2 = Class II, 3 = Class III), length of stay for observation (continuous in minutes), admission to the ward (0 = no, 1 = yes), 72-hour return visit (0 = no, 1 = yes), and kept for observation (0 = no, 1 = yes).

2.6. Sensitivity analyses

Variables that showed a statistically significant ($p < 0.001$) difference between full-time pediatric emergency physicians and part-time pediatricians were followed up with logistic regression analyses. The dependent variables were admission rate, the rate of being kept for observation, and 72-hour return visit rate. The significance level for inclusion in the analysis was 0.05 and 0.1 for exclusion. Adjusted odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated. SPSS 11.0 (SPSS Inc., Chicago, IL, USA) for Mac OS X software was used for the statistical analyses. The study was approved by the Institutional Review Board of the subject hospital.

3. Results

3.1. Patient characteristics

We reviewed the records of 132,398 ED patients aged ≤ 17 years who visited the ED between January 2004 and December 2006. The average total number of monthly visits was 3678 ± 125 [mean ± standard error (SE); range, 2487–6646]. A spike in patient visits was observed following the December 2004 tsunami in South Asia. In July 2005, the

national health insurance policy raised the copayment for ED visits by US\$3, and as a consequence, patient volume plummeted and remained low. More than half of the patients were < 3 years old. Figure 1 shows the fluctuation in monthly patient volume. The number of patients in triage Classes I and II fluctuated with patient volume and made up 40–50% of the total visits (Figure 2). The full-time pediatric emergency physicians' ratio was 40–50% in the first 18 months of the study period, then fluctuated between 100% and 70% in the subsequent 12 months and stabilized at 100% after July 2006. During the study period, the admission rate increased from 15–20% to 18–25%, the incidence of being kept for observation increased from 15–25% to 35–45%, and 72-hour return visit rate fluctuated between 2% and 6% with a slight downward trend.

3.2. Main results

The average length of stay in the pediatric ED decreased during the study period from 11.5 hours to 3.2 hours, as observed in 6-month intervals (Figure 3). The mortality rate decreased relative to the increase in patient number. The annual mortality rate within 48 hours of admission from the ED increased from 0.04% in 2004 to 0.05% in 2005, but decreased to 0.02% in 2006, and the overall mortality rate dropped from 0.13% to 0.07%.

Between-group differences were measured using Chi-square and independent-sample *t* tests, and multivariate logistic regression analyses were used to determine the variables that were significantly associated with ward admission, extended observation, and 72-hour return visit. The comparisons of patient characteristics and care information between the two physician groups are shown in Table 1. A statistical difference between physician groups was further examined in a multivariate logistic regression (Table 2). Full-time pediatric emergency physicians were found to recommend admission more often and spend more time observing the patient (ORs = 1.43 and OR = 1.71, respectively), controlling for other variables. Senior physicians also had higher admission, and extended observation than junior physicians (OR = 1.14 and OR = 1.05, respectively). There was no significant difference between full-time pediatric emergency physicians and part-time

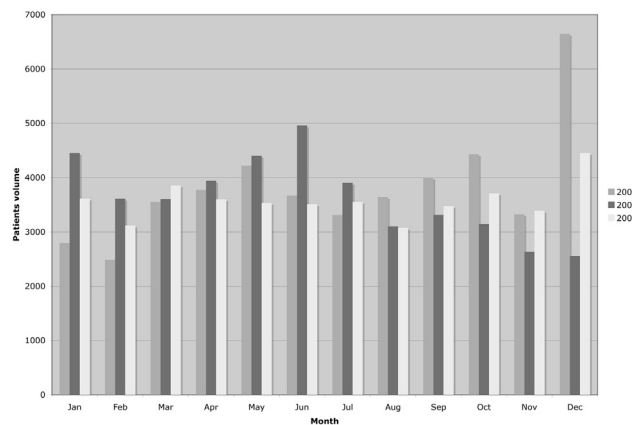


Figure 1 Patient visits volume of pediatric emergency department (ED) between 2004 and 2006.

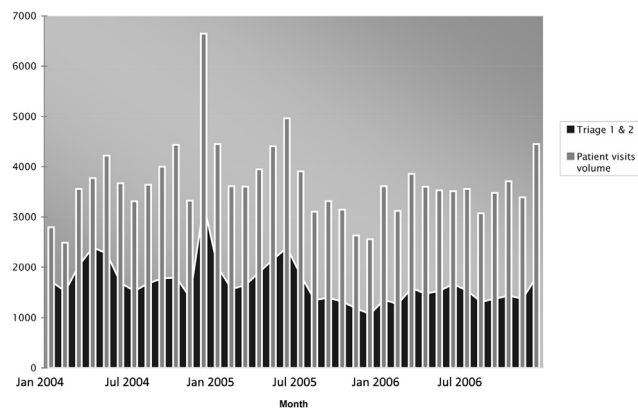


Figure 2 The severity of coming patients: triage Classes I and II number of patients with total patient visits in pediatric emergency department (ED) monthly during 2004–2006.

pediatricians in return rates within 72 hours, after controlling for other variables. Patients who returned to the ED within 72 hours had higher odds of being admitted (OR = 2.50) and being kept for observation (OR = 1.59). As age increased, patients were less likely to be admitted (OR = 0.98) or to return within 72 hours (OR = 0.95), but were more likely to be kept for observation (OR = 1.02). Patients who were kept for observation had a higher admission rate (OR = 1.14). Winter was the seasonal reference group: patients arriving in the spring were more likely to be admitted and had higher 72-hour return rates; summer patients were more likely to be kept for observation and to return within 72 hours, and fall patients had higher rates in all three categories. Patients who arrived at the ED between midnight and early morning were the reference group: patients who visited the ED during the day (8:00 AM–4:00 PM) had a significantly higher admission rate (OR = 2.26), observation rate (OR = 1.56), and 72-hour return rate (OR = 1.46). Patients who arrived at night (4:00 PM–00:00 AM) had higher odds of being admitted, staying for observation, and returning within 72 hours than those who arrived in the early morning. However, they were less likely to be admitted, to be kept for observation, or to return in 72 hours compared to patients who arrived during

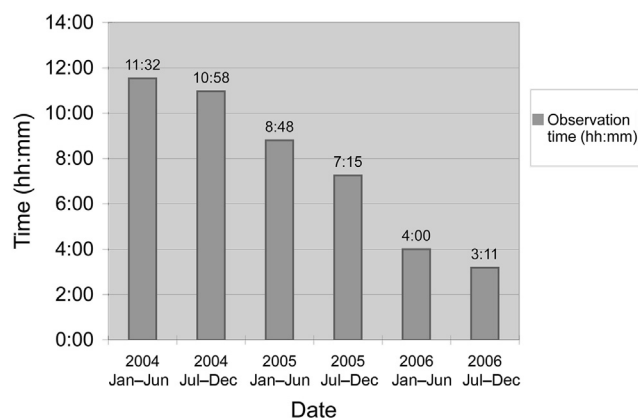


Figure 3 Length of stay at pediatric emergency department (ED) in 6-month intervals during 2004–2006.

Table 1 Selected characteristics of patients at pediatric emergency department (ED) and stratified according to full-time/part-time pediatric emergency physicians' groups during 2004–2006.

Variables	Full-time group (n = 82,385)		Part-time group (n = 50,013)		p*
	n	%	n	%	
Gender					
Male	47,429	57.57	28,901	57.79	0.438
Female	34,956	42.43	21,112	42.21	
Age (y)					
0–3	45,139	54.79	26,779	53.54	< 0.001
4–7	24,093	29.24	15,709	31.41	
8–11	7374	8.95	4659	9.32	
> 11	5779	7.01	2866	5.73	
Season					
Spring	16,987	20.62	17,508	35.01	< 0.001
Summer	22,144	26.88	10,592	21.18	
Fall	23,770	28.85	7658	15.31	
Winter	19,484	23.65	14,255	28.50	
Timing of arrival					
8:00 AM–16:00 PM	30,122	36.56	9440	18.88	< 0.001
4:00 PM–12:00 AM	31,787	38.58	23,991	47.97	
12:00 AM–8:00 AM	20,476	24.85	16,582	33.16	
Triage classification					
Class I life-threatening	17,212	20.89	11,644	23.28	< 0.001
Class II emergent	19,495	23.66	12,296	24.59	
Class III urgent	45,588	55.34	26,021	52.03	
Class IV non-urgent	87	0.11	47	0.09	
Admission	18,424	22.36	7664	15.32	< 0.001
No	63,961	77.64	42,349	84.68	
Observation	29,906	36.30	11,818	23.63	< 0.001
No	52,479	63.70	38,195	76.37	
72-hour return	3695	4.49	1930	3.86	< 0.001
No	78,690	95.51	48,083	96.14	

* Statistical significance of Chi-square test.

the day. Finally, patients with acute or severe conditions, Classes I or II in the triage system, had higher odds of being admitted, being kept for observation, and returning within 72 hours than did those classified as Class III or IV.

4. Discussion

Both length of stay in the pediatric ED and mortality rate decreased during the study period, indicating that the quality of medical care improved. Spaite et al¹³ reported that waiting time was highly related to patient satisfaction. A decrease in the length of stay in the pediatric ED is beneficial for both the patient and the physician. The ED is not an ideal setting for patient rest and recovery, and the ED physician should make the appropriate diagnosis as quickly as possible and admit or release the patient.

Mortality rate is seldom discussed in the pediatric emergency care literature. Chamberlain et al¹⁴ reported a mortality rate of 0.1% in 16 pediatric EDs in Washington,

Table 2 Logistic regression of admission, observation, and 72-hour return.

Variable	Admission		Observation		72-hour return	
	OR	95% CI	OR	95% CI	OR	95% CI
Pediatric emergency physicians (yes = 1)	1.43*	1.38–1.48	1.71*	1.67–1.76	1.10	1.04–1.16
Physician seniority (yes = 1)	1.14*	1.10–1.18	1.05*	1.02–1.08		
72-hour return (yes = 1)	2.50*	2.36–2.65	1.59*	1.51–1.68		
Age	0.98*	0.97–0.98	1.02*	1.01–1.02	0.95*	0.94–0.95
Gender (female = 1)			1.04*	1.02–1.07		
Length of stay	1.14*	1.13–1.14				
Season† (Winter)						
Spring	1.09*	1.05–1.14	1.02	0.98–1.05	1.31*	1.21–1.42
Summer	0.97	0.93–1.01	1.12*	1.08–1.15	1.54*	1.42–1.66
Fall	1.14*	1.09–1.19	1.20*	1.16–1.24	1.27*	1.17–1.38
Timing† (0:00–8:00)						
8:00–16:00	2.26*	2.17–2.35	1.56*	1.51–1.61	1.46*	1.36–1.57
16:00–0:00	1.48*	1.43–1.54	1.10*	1.07–1.14	1.22*	1.14–1.31
Triage† (Classes III & IV)						
Class I	1.30*	1.26–1.35	1.29*	1.25–1.33	1.16*	1.08–1.24
Class II	1.21*	1.16–1.25	1.20*	1.17–1.24	1.10	1.03–1.18

CI = confidence interval; OR = odds ratio.

* Statistical significance at $p = 0.001$.

† Reference group in parenthesis.

DC, USA. Morbidity or mortality, secondary to medical error, is reported the most useful performance indicator in a consensus-established study in pediatric ED, but not commonly measured.¹² We designed and examined the mortality rate within 48 hours of admission from the ED to evaluate the early resuscitation ability of physicians in the pediatric ED. Mortality decreased yearly, and the 48-hour mortality rate was $< 0.05\%$. We found that the quality of early resuscitation improved under similar patient volume and percentage of triage Classes I and II cases, providing the evidence that ED treatment had improved. Resuscitation rate could not be analyzed due to limited numbers during the study period.

Several advantages of full-time pediatric emergency physicians over part-time pediatricians can be identified. Full-time pediatric emergency physicians are familiar with the medical care process, quality, teamwork, and organizational culture of the pediatric ED. Furthermore, full-time pediatric emergency physicians have more experience in handling emergency cases, allowing them to develop better diagnostic and treatment skills. Dedicated pediatric emergency physicians train residents and help improve their knowledge and skills in emergency care, and generate emergency medicine research papers based on their extensive hands-on experience. Finally, by having full-time pediatric emergency physicians, the hospital management team can set up training roadmaps for those who want a subspecialty in pediatric emergency care.

Taiwan instituted a National Health Insurance program in 1995 that covers 99.6% of the population. The program has comprehensive benefit coverage (including emergency care, intensive care, dental care, and the cost of medications) and unlimited access to specialists and high technology equipment. Health care providers are forbidden from balance billing or from refusing or transferring patients without providing appropriate treatment.

Copayment of a visit to a pediatric ED is approximately US\$8 for patients < 3 years old and US\$22 for older patients. The pediatric ED used in the present study is in a university hospital that has excellent facilities, with 360 beds available for pediatric admission and 25 beds in the ED observation unit. Our finding that full-time and senior physicians had higher admission and observation rates may be the result of a higher quality of care with sufficient medical supplies and fully insured patients.^{14–16} Pileggi et al¹⁶ reported an average admission rate of 15% in an Italian pediatric ED, and Claudet et al¹⁷ reported that a quarter of the patients who visited a pediatric resuscitation room in Toulouse, France were admitted.

In the present study, the trend analysis indicated that the 72-hour return rate fluctuated between 2% and 6%. A return visit within 72 hours was more common for younger patients and less frequent for patients admitted in the winter and midnight to early morning. Goldman et al¹⁸ reported that the rate of a return visit within 72 hours was 5.2% at the Hospital for Sick Children in Toronto, Canada during 2003; Zimmerman et al¹⁹ reported a 72-hour repeat visit rate of 3% at the Robert Wood Johnson University Hospital in New Brunswick, NJ, USA between July 1, 1992 and June 30, 1993; Chamberlain et al¹⁴ from the Children's National Medical Center of Washington, DC reported an unscheduled return rate within 72 hours of 6.1% in 16 pediatric EDs in Washington, DC. Return visits within 72 hours of discharge are not a desirable outcome of an ED visit, and many researchers regard this as an indicator of the ED quality of care.^{18–20} However, DePiero et al²¹ found that most repeat visits to the pediatric ED that ended in hospital admission were the result of disease progression rather than medical errors. This finding raises questions about the validity of repeat visits as a measure of quality improvement in pediatric EDs. Moreover, several studies found no difference in the return visit rate in patients seen by

residents and those seen by attending physicians or between patients of emergency and of pediatric physicians.^{5–7} We also question that repeat visits within 72 hours may not be a valid indicator for assessing pediatric ED performance.²¹ Return visit rate within 72 hours is the most common measured performance indicator, but return visit rate within 72 hours with critical diagnosis might be more useful.¹²

The limitation of this study is that the data is from a single hospital, and so a return visit to another hospital by the patient was possible, although no other pediatric ED within travel time of 30 minutes from this study's hospital location area was available. We did not analyze the issues including the patients' satisfaction degree, ability to resuscitate, and the cost effectiveness between full- and part-time pediatric emergency physicians. Determination of the disease severity was another limitation of the present study. The triage classification for the patient severity is objectively defined, and the admission, observation, and return visit within 72-hour rates were significantly related to the triage classification. Although most studies have found such triage systems to be safe and effective,^{22–24} other studies suggest that these systems are inadequate for predicting hospital admission.^{25–27} Several studies have investigated the reliability and validity of new triage algorithm in pediatric patients.^{28–32}

In summary, the present study showed that full-time pediatric emergency physicians in the pediatric ED are associated with decreased mortality and decreased length of stay. These findings support the advantage of full-time pediatric emergency physicians in the pediatric ED. Both full-time ED physicians and senior physicians are more likely to admit patients and keep them for observation. The major difficulty associated with the part-time pediatrician staffing is that while in the ED, part-time pediatricians may need to attend to their inpatients or another subspecialty activity at the expense of ED patient care. Patients in the ED expect high-quality health care and service with limited risk; this means hospital management must develop and implement practices that meet the needs of patients. New and better means to evaluate the quality of pediatric ED care that objectively predict and measure outcomes and risks should be developed. The present study was a single-hospital qualitative study and further comparative studies are indicated as being necessary. We encourage other hospitals to report measurements of the quality of care in their pediatric ED and to implement a policy to develop a pediatric emergency subspecialty workforce policy agenda in pediatric emergency care.³³

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

Acknowledgments

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References

1. Committee on Pediatric Emergency Medicine, American Academy of Pediatrics, Krug SE, Frush K. Patient safety in the pediatric emergency care setting. *Pediatrics* 2007;**120**:1367–75.
2. Glickman SW, Baggett KA, Krubert CG, Peterson ED, Schulman KA. Promoting quality: the health-care organization from a management perspective. *Int J Qual Health Care* 2007;**19**:341–8.
3. Shaw KN, Ruddy RM, Gorelick MH. Pediatric emergency department directors' benchmarking survey: Fiscal year 2001. *Pediatr Emerg Care* 2003;**19**:143–7.
4. Press S, Cantor J, Russell S, Jerez E. Full-time attending physician coverage in a pediatric emergency department. Effect on risk management. *Arch Pediatr Adolesc Med* 1994;**148**:578–81.
5. Chang YC, Ng CJ, Chen YC, Chen JC, Yen DH. Practice variation in the management for non-traumatic pediatric patients in the ED. *Am J Emerg Med* 2010;**28**:275–83.
6. Chang YC, Lo HC, Tzeng YM, Yen DH, Jeng MJ, Huang CI, et al. Comparative clinical practice of residents and attending physicians who care for pediatric patients in the emergency department. *Pediatr Emerg Care* 2008;**24**:364–9.
7. Seow VK, Lin AC, Lin IY, Chen CC, Chen KC, Wang TL, et al. Comparing different patterns for managing febrile children in the ED between emergency and pediatric physicians: Impact on patient outcome. *Am J Emerg Med* 2007;**25**:1004–8.
8. Cimpello LB, Khine H, Avner JR. Practice patterns of pediatric versus general emergency physicians for pain management of fractures in pediatric patients. *Pediatr Emerg Care* 2004;**20**:228–32.
9. Isaacman DJ, Kaminer K, Veligeti H, Jones M, Davis P, Mason JD. Comparative practice patterns of emergency medicine physicians and pediatric emergency medicine physicians managing fever in young children. *Pediatrics* 2001;**108**:354–8.
10. Lohr KN. *Institute of Medicine. Medicare: A Strategy for Quality Assurance*, Volume 1. Washington, DC: National Academy Press; 1990.
11. Khan NS, Jain S. Quality initiatives in the emergency department. *Curr Opin Pediatr* 2010;**22**:262–7.
12. Hung GR, Chalut D. A consensus-established set of important indicators of pediatric emergency department performance. *Pediatr Emerg Care* 2008;**24**:9–15.
13. Spaite DW, Bartholomeux F, Guisto J, Lindberg E, Hull B, Eyherabide A, et al. Rapid process redesign in a university-based emergency department: decreasing waiting time intervals and improving patient satisfaction. *Ann Emerg Med* 2002;**39**:168–77.
14. Chamberlain JM, Joseph JG, Patel KM, Pollack MM. Differences in severity-adjusted pediatric hospitalization rates are associated with race/ethnicity. *Pediatrics* 2007;**119**:e1319–24.
15. Chamberlain JM, Patel KM, Pollack MM. Association of emergency department care factors with admission and discharge decisions for pediatric patients. *J Pediatr* 2006;**149**:644–9.
16. Pileggi C, Raffaele G, Angelillo IF. Paediatric utilization of an emergency department in Italy. *Eur J Public Health* 2006;**16**:565–9.
17. Claudet I, Bounes V, Fédérici S, Laporte E, Pajot C, Micheau P, et al. Epidemiology of admissions in a pediatric resuscitation room. *Pediatr Emerg Care* 2009;**25**:312–6.
18. Goldman RD, Ong M, Macpherson A. Unscheduled return visits to the pediatric emergency department—one-year experience. *Pediatr Emerg Care* 2006;**22**:545–9.

19. Zimmerman DR, McCarten-Gibbs KA, DeNoble DH, Borger C, Fleming J, Hsieh M, et al. Repeat pediatric visit to a general emergency department. *Ann Emerg Med* 1996;**28**:467–73.
20. Pierce JM, Kellerman AL, Oster C. "Bounces": an analysis of short-term return visits to a public hospital emergency department. *Ann Emerg Med* 1990;**19**:752–7.
21. Depiero AD, Ochenschlager DW, Chamberlain JM. Analysis of pediatric hospitalizations after emergency department release as a quality improvement tool. *Ann Emerg Med* 2002;**39**:159–63.
22. Derlet R, Nishio D, Cole LM, Silva Jr J. Triage of patients out of the emergency department: Three-year experience. *Am J Emerg Med* 1992;**10**:195–9.
23. Wilson LO, Wilson Jr FP, Canales L. Algorithm-directed triage in a pediatric acute care facility: a retrospective study. *Ann Emerg Med* 1981;**10**:427–31.
24. Gadowski AM, Perkis V, Horton L, Cross S, Stanton B. Diverting managed care Medicaid patients from pediatric emergency department use. *Pediatrics* 1995;**95**:170–8.
25. Brillman JC, Doezema D, Tandberg D, Sklar DP, Davis KD, Simms S, et al. Triage: Limitations in predicting need for emergent care and hospital admission. *Ann Emerg Med* 1996;**27**:493–500.
26. Birnbaum A, Gallagher J, Utkewicz M, Gennis P, Carter W. Failure to validate a predictive model for refusal of care to emergency-department patients. *Acad Emerg Med* 1994;**1**:213–7.
27. Lowe RA, Bindman AB, Ulrich SK, Norman G, Scaletta TA, Keane D, et al. Refusing care to emergency department of patients: evaluation of published triage guidelines. *Ann Emerg Med* 1994;**23**:286–93.
28. van Veen M, Steyerberg EW, Ruige M, van Meurs AH, Roukema J, van der Lei J, et al. Manchester triage system in paediatric emergency care: prospective observational study. *BMJ* 2008;**337**:a1501.
29. Baumann MR, Strout TD. Triage of geriatric patients in the emergency department: validity and survival with the Emergency Severity Index. *Ann Emerg Med* 2007;**49**:234–40.
30. Baumann MR, Strout TD. Evaluation of the Emergency Severity Index (version 3) triage algorithm in pediatric patients. *Acad Emerg Med* 2005;**12**:219–24.
31. Mistry RD, Brousseau DC, Alessandrini EA. Urgency classification methods for emergency department visits: do they measure up? *Pediatr Emerg Care* 2008;**24**:870–4.
32. Brousseau DC, Mistry RD, Alessandrini EA. Methods of categorizing emergency department visit urgency: a survey of pediatric emergency medicine physicians. *Pediatr Emerg Care* 2006;**22**:635–9.
33. Jewett EA, Anderson MR, Gilchrist GS. The pediatric subspecialty workforce: public policy and forces for change. *Pediatrics* 2005;**116**:1192–202.