Diagnostic Consistency Between Referring and Receiving Physicians: An Opportunity for the Pediatric Transport Team

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Abstract

Objectives: To quantify the rate of clinically significant change in the diagnosis of transported pediatric patients between referring and receiving physicians, and to determine the potential impact on patient care, especially with regard to under-treatment and over-treatment by referring facilities.
Methods: The study sample consisted of a subset of 313 incoming patients with an initial respiratory diagnosis who were transported by a pediatric transport team from community facilities to Children's National Medical Center (CNMC), an urban tertiary-care pediatric hospital. Diagnosis data were obtained retrospectively from the transport database, the Emergency Department and inpatient medical records of CNMC, and hospital billing information. The referring and final diagnoses were compared and categorized.
Results: A clinically significant change in diagnosis was noted for 31 of the 313 patients (9.9%). Of these, 12 (38.7%) were under-treated at the referring facility, 13 (41.9%) were over-treated, and 6 (19.4%) were incorrectly treated for their final diagnosis. The most common clinically significant changes involved under- and over-diagnosis of pneumonia, which were associated with under- and over-use of antibiotics, respectively.
Conclusions: Incorrect referring diagnoses are not unusual and may impact on interventions before and during transport. Identifying common errors in referral diagnosis will assist transport services in focusing their outreach educational activities.

MeSH Words: Pediatric transport, misdiagnosis, diagnosis, interfacility transport, quality of care

Introduction

The care provided by interfacility patient transport teams is generally based on the working diagnosis assigned by the referring physician. The accuracy of this diagnosis is important for all phases of the team's work: triage, with immediate transport of the most seriously ill or injured, and routing to either air or ground transport; treatment; and disposition and placement at the accepting facility. In addition, accurate diagnostic information helps the team maintain necessary isolation and infection control measures during transport.

Another major role of the pediatric specialty transport team is to work collaboratively with the referring healthcare teams by providing post-transport feedback for purposes of education and improving performance. The aim of the present study was to quantify the rate of clinically significant change in diagnosis between referring and receiving physicians, and to determine the potential impact on patient care, especially with

regard to under-treatment and over-treatment by referring facilities. Our ultimate goal was to identify areas for improvement in referring hospitals that would be amenable to outreach educational programs.

Methods

The study was based on the experience of a single, urban, academic, tertiary care pediatric hospital, the Children's National Medical Center (CNMC), Washington, DC. The specialty transport team studied completes approximately 4,900 pediatric (~3900) and neonatal (~ 1000) interfacility transports annually.

Owing to the retrospective chart-review design of the study, it was classified as exempt from approval by the Institutional Review Board.

Initially, all patient transports during the six-month period between January 1, 2005 and June 30, 2005 were reviewed, excluding neonatal transports. After review of the data, we determined that respiratory diseases were the area with the most discrepancies in diagnosis. Therefore, we focused our analyses on the 16% of patients with a respiratory diagnosis. We further limited our analyses to incoming transports.

Diagnosis data were obtained retrospectively as follows: referring diagnosis from the transport database, Emergency Department (ED) diagnosis from the CNMC ED record, and principal, secondary, and additional discharge diagnoses from the CNMC inpatient medical record as well as from billing information.

The referring hospital diagnosis was compared with the final diagnosis at discharge from the receiving hospital (CNMC). When a discrepancy was identified between diagnoses, the medical records from both hospitals were reviewed. These medical records were initially reviewed by the principal investigator (J.S.F.), who then prepared a synopsis of each case for review with the other investigators. A consensus regarding categorization was achieved; if consensus could not be achieved, the case was categorized as indeterminate and eliminated from further analyses. The final diagnosis at the receiving hospital served as the reference standard.

Transports were categorized into one of four categories: no change, clinically insignificant change, clinically significant change, or indeterminate. No change was defined as the same referring and final diagnosis, including those with semantic differences only (such as "upper respiratory infection" and "cold"). Clinically insignificant diagnostic changes were defined as a difference between the referring and final diagnosis that did not impact on treatment. Clinically significant diagnostic changes were defined as a final diagnosis potentially requiring different treatment from the referring diagnosis.

The clinically significant category was further subdivided into under-treatment, over-treatment, or incorrect treatment at the referring facility in terms of the final diagnosis. The incorrect treatment subcategory included cases in which the referring and final diagnoses were profoundly different, warranting completely different therapies, such as asthma instead of diabetic ketoacidosis.

Results

Of the 1,745 children transported to CNMC in the six-month period of the study, 335 had a respiratory diagnosis. Further limitation of the study sample to incoming transports yielded a dataset of 313 children.

Patients ranged in age from 21 days to 20 years (median 2 years). They were referred from a total of 35 regional hospitals.

Of the 313 cases reviewed, 14 (4.5%) had a clinically insignificant change in diagnosis, 31 (9.9%) had a clinically significant change in diagnosis, and 11 (3.5%) were indeterminate. In the remaining 257 cases (82.1%), no change in diagnosis was found. A synopsis of the clinically significant changes in diagnosis is presented in Table 1. The most common clinically significant changes involved over- and under-diagnosis of pneumonia. Of the 31 patients with a clinically significant change in diagnosis, 13 (41.9%) were over-treated, 12 (38.7%) were under-treated, and 6 (19.4%) were wrongly treated. The most common errors in treatment involved over- and under-use of antibiotics, in accordance with the over- and under-diagnosis of pneumonia.

Type of misdiagnosis/mistreatment	N (%)	Referring diagnosis	Final diagnosis
Over-diagnosis/over-treatment of pneumonia	13 (41.9%)	Pneumonia	Other
Under-diagnosis/under-treatment of pneumonia	9 (29.0%)	Other	Pneumonia
Under-diagnosis/under-treatment of sepsis/septic shock	3 (9.7%)	Other	Sepsis/septic shock
Other diagnosis requiring different treatment 6 (9.7%)		Bronchiolitis	Congenital heart disease
		Status asthmaticus	Diabetic ketoacidosis
		Epiglottitis	Gastroesophageal reflux
		Fever	RSV bronchiolitis
		Cough, shortness of breath, abdominal pain	Congenital heart disease

Table 1. Clinically significant changes in diagnosis (n = 31) between referring and receiving hospitals.

Discussion

Our study of children transferred by an interhospital pediatric transport team shows that in most cases, the diagnoses assigned by the referring facility matched the final diagnoses made at the receiving facility. However, in at least 9.9% of cases, there was a clinically significant change in diagnosis that potentially affected the treatment administered before and/or during transport. The most common clinically significant changes were under-diagnosis and over-diagnosis of pneumonia, which were associated with under- and over-use of antibiotics, respectively. In several cases, missed diagnoses were potentially life threatening, such as septic shock, congenital heart disease, **and** diabetic ketoacidosis (Table 1). In other cases, an incorrect diagnosis – for example, of epiglottitis – may have prompted inappropriately aggressive treatment and/or modes of transport.

Very little has been published regarding the quality of care provided to children prior to interhospital transport. In a study from Philadelphia, Sacchetti et al. [1] found no significant differences in care between the referring general ED and the accepting tertiary children's hospital. However, in a prospective study of pediatric patients from Australia, Henning and McNamara [2] noted frequent problems with care prior to transport, and they judged that improved education of referring doctors could prevent up to 24% of the problems detected.

Our study complements previous ones that identified various deficiencies in the emergency care of children. Regarding under-diagnosis and under-treatment, for example, Nadel and coworkers [3] at St. Mary's Hospital in London, England discovered that delayed recognition and/or suboptimal management of meningococcal disease occurred frequently in pediatric patients. Even more importantly, there was a direct relationship between the duration of symptoms before treatment and mortality in the subgroup with meningococcal septicemia. Similarly, Han et al. [4] reported that in infants and children who presented to community hospitals with septic shock (due to various infectious etiologies), survival was significantly improved when the community hospital physicians implemented shock-reversal therapy before the arrival of the Children's Hospital of Pittsburgh transport team. As for over-treatment,

Stallworth et al. [5], in a study from the state of Georgia, examined the administrative claims data for children treated in a variety of practice settings (i.e., not just EDs). They found that asthmatic patients were prescribed antibiotics significantly more often than nonasthmatic patients, even for conditions more likely to have a viral etiology.

Several studies from the United States have attempted to compare the care delivered between general and pediatric EDs or between general emergency medicine practitioners and physicians with subspecialty training in pediatric emergency medicine. Schweich et al. [6] used a survey design to determine usual treatment practices for common childhood conditions, including asthma, bronchiolitis, croup, and seizures. The results showed that compared to pediatric emergency physicians, general emergency medicine physicians were less likely to administer oral

steroids for asthma, more likely to prescribe steroids for bronchiolitis, and less likely to admit febrile infants less than 4 weeks of age. Isaacman et al. [7] reported a lower tendency for general emergency medicine physicians to adhere to published practice guidelines for fever management in 3- to 36-month-old children. Hampers et al. [8] found higher rates in general than in pediatric EDs for lumbar puncture, antibiotic use, and admission or transfer for children presenting with first-time, simple, febrile seizures.

In view of these divergences in care and given that the majority of pediatric emergencies are treated in general and not in pediatric EDs, we believe that efforts to optimize child emergency health should be directed especially at nonspecialty hospitals [9]. It is important first to determine the specific needs of general EDs in this context. As such, the present study provided our hospital with a unique opportunity to identify some areas that would be amenable to targeted educational programs for its own referring facilities with regard to one population of sicker children in our region. Along these lines, Oakley et al. [10] described a partnership that was established between a tertiary care children's hospital and a general hospital in Melbourne, Australia in an effort to enhance pediatric care in the general hospital's ED. A dedicated pediatric area was constructed within the general ED, and a pediatric-trained emergency physician and nurse were provided for education and training.

In addition, pediatric clinical practice guidelines were developed. The authors found that staff decision-making and documentation, as well as parent and staff satisfaction, improved following the implementation of these initiatives. In a follow-up study to the aforementioned article from St. Mary's Hospital in London [3], Booy et al. [11] reported decreasing mortality from meningococcal disease between 1992 and 1997. One of the factors to which they attributed this finding was an outreach educational program focused on the recognition and treatment of meningococcal disease, in addition to improved initial management at the referring hospital following telephone consultation with the receiving intensivist, pediatric critical care transport, and centralized care at a pediatric intensive care unit with particular expertise in severe meningococcal disease**.**

Limitations of our study include those related to the accuracy of the final diagnosis. Diagnostic decision-making involves a significant degree of professional judgment, and the error rates of the physicians (and coders) at our receiving facility are unknown. In addition, there are known limitations to retrospective chart review, including inaccurate and missing documentation. It is also possible that some conditions, such as congenital heart disease, could not be definitively diagnosed until after transport and evaluation by a pediatric subspecialist, even though they may have been suspected – albeit not diagnosed – earlier. While it is possible that the clinical status of some children may have truly deteriorated between initial diagnosis at the referring hospital and discharge from CNMC, this explanation of our findings seems unlikely based on our review of the medical records. Finally, this study was confined to patients with respiratory diagnoses. However, both anecdotally and by initial data review, we found that respiratory complaints were the most likely to be associated with changes in diagnosis.

Regarding future directions, additional diagnosis groups should be investigated, and studies should be conducted using a prospective design. Also, research is necessary to determine the impact of the physician who takes the initial referral call on the referring diagnosis as well as on pre-transport and transport interventions. There are potential roles for telemedicine and teleradiology in transport medicine. For example, Han et al. [4] suggested that decisions regarding the initial management of the child in shock could be improved through interactive conversations between the community physician and the telemedicine control physician. Teleradiology should also help prevent under- and over-diagnosis of pneumonia, the most common clinically significant changes in our study.

The information from our study will be used to formulate educational and performance-improvement activities for referring physicians and clinical staff, as well as for CNMC transport team members. We plan to evaluate the effectiveness of these interventions.

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