Efficacy of Rapid Diagnostic Testing for Influenza in Reducing Laboratory Tests and Improving Patient Management in the Pediatric Emergency Department

Influenza Tanısında Hızlı Tanı Testi kullanımının, Acil Servis Kalış Süresi ve Laboratuar İncelemelerine Olan Etkisi

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Abstract

Objective: To determine the influence of rapid diagnosis of influenza on patient management and laboratory tests as well as the length of the stay in the emergency department of children presenting with influenza-like illness (ILI) without signs of focal infection.

Material and Method: A cross-sectional study was conducted in the pediatric emergency department of Vakif Gureba Hospital, Istanbul, between December 2008 and March 2009, including patients aged 8 months to 11 years presenting with fever and cough, coryza, myalgias,and /or malaise. After obtaining informed consent, patients were allocated into two groups. Group 1: physician informed about the rapid influenza test result; or Group 2; physician not informed of the rapid influenza test result. Nasopharyngeal swabs obtained from all patients were immediately tested with Influenza A/B Rapid Test® for influenza A and B. Laboratory tests ordered and length of stay in the emergency department were compared between the resultant influenza-positive groups (informed and not informed). After initial presentation, a control visit check was carried out 1 month later.

Results: One hundred and fifty children were enrolled, (mean age 4.2±3.8 years years, male/female ratio1.2) among whom 72 (48%) tested positive for influenza. Comparison of the groups revealed that the number of tests ordered and length of stay in the emergency department were significantly lower in the first group (12 versus 35 cases, and 62 versus 145 minutes respectively, (p<.0001). Clinical presentation symptoms were not significantly different between two groups.

Conclusion: During the influenza season, rapid diagnosis of influenza may allow a reduction of additional laboratory tests and decreased length of time to discharge in a pediatric emergency department.

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Key words: Rapid influenza test, children, patient management, emergency

Özet

Amaç: Bu çalışmanın amacı, hızlı influenza tanı testinin, çocuk acil servisine influenza benzeri hastalık bulgularıyla gelen çocuklarda, hastaların acil serviste kalış süreleri ve istenen laboratuar incelemelerine olan etkisini araştırmaktır.

Gereç ve Yöntem: Bu kesitsel çalışma, yaşları 8 ay-11 yıl arasında değişen ve influenza benzeri hastalık şikayetler ile Eylül 2008- Mart 2009 tarihleri arasında İstanbul Vakıf Gureba Hastanesi Çocuk Acil Polikliniğine başvuran hastalarda yapılmıştır. Hastalar, ailelerinin onamı alındıktan sonra 2 gruba ayrılmıştır. Grup 1; muayene öncesi hızlı influenza tanı testi uygulanıp sonucu doktora bildirilen hastalar, Grup 2; muayene öncesi hızlı influenza tanı testi uygulanıp sonucu doktora bildirilmeyen hastalar. Hastalara influenza tanısı, nazofarenksden alınan akıntı sürüntülerinin, hızlı influenza tanı testi A/B kitleriyle incelenmesiyle konuldu. Hastalardan istenen laboratuvar testleri ve acilde kalış süreleri her iki grup arasında karşılaştırıldı.

Bulgular: Influenza benzeri hastalık tanısı alan, ortalama yaşları 4.2±3.8 yıl arasında değişen 150 hastanın 72 (%48)'inde, hızlı influenza tanı testi pozitif olarak bulundu. Grup 1 hastalarında, istenilen laboratuar testleri ve acilde kalış süresi açısından istatistiksel anlamlılık gösteren düşüklük tespit edildi (sırasıyla 12' ye karşı 35 olgu, 62'ye karşı 145 dakika, p <.0001).

Sonuç: Influenzanın sık görüldüğü mevsimde, hızlı influenza tanı testi kullanılarak influenzanın teşhis edilmesi, influenza benzeri hastalık bulgularıyla gelen çocuk hastalarda, acil serviste istenilen laboratuvar testlerinde ve hastaların acil servis kalış sürelerinde önemli oranda azalma yapabilir.

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Anahtar kelimeler: Hızlı influenza tanı testi, çocuk, acil servis, hasta takibi

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Introduction

Influenza virus types A and B are common respiratory pathogens in the pediatric population and may cause a wide range of symptoms and complications (1,2). Two prospective cohort studies from Istanbul, Turkey, including children under 15 year of age demonstrated outpatient visits attributable to influenza ranging from 8%-36% (3,4) Infection with influenza virus leads to a significant increase in primary care visits, and also anincrease in emergency department utilization during wintertime epidemics (5). Rapid diagnostic test kits for influenza types A and B are currently available for outpatient use and have proven to be both sensitive and specific (6,7). Some studies have reported that the introduction of rapid confirmation tests of influenza in the pediatric emergency department, which are sensitive and specific for influenza, could potentially decrease use of other invasive diagnostic tests, thereby reducing associated patient charges and length of stay in the emergency department (8,9). Febrile children with confirmed viral infection are at lower risk for occult bacteremia (10), and less likely to undergo further invasive tests for evaluation of serious bacterial infection.

The aim of this study was to evaluate the influence of rapid influenza testing on patient management parameters in children with influenza like illness (ILI) without any signs of focal infection presenting to the pediatric emergency departmentduring the influenza season..

Material-Methods

Subjects

Diagnosis of ILI was made according to the following criteria: Fever of >37.8ºC for the last 48 hours, presence of at least one systemic finding including myalgia, headache, fatigue, and presence of one or more respiratory tract symptoms including cough and rhinorrhea. All children who presented to the pediatric emergency department, were eligible if they: 1) had a temperature of 37.8°C or higher, 2) had cough, coryza, malaise, headache, rhinorrhea and/ or myalgias, 3) had a symptom duration of 48 hours or less, 4) absence of signs and symptoms of focal infection (sore throat, painful cervical lymhadenopathy, exudative tonsillopharyngitis, purulant nasal discharge). Children receiving antibiotic or systemic steroids, positive history of vaccination during the previousweek, or a known chronic disease were excluded. Following approval by the Hospital Ethics Commission, the study was started. Informed consent for participation was obtained from families of all children enrolled in the study.

Study design

Rapid diagnostic testing for influenza is not the standard of care in our emergency department for evaluation of patients presenting with ILI. The study was undertaken to determine the impact of the rapid diagnosis of influenza on physician decision-making and patient management. Study endpoints included: 1) the number of laboratory and radiographic tests and 2) length of time to discharge from emergency. Enrollment began on December 9, 2008, and ended on March 25, 2009.

This prospective controlled study evaluated 2 groups of pediatric patients; Group1 included patients whose physician was informed about the rapid influenza test results and Group 2 included patients whose physician was not informed about the rapid test results before examination. The principal investigator (EÖ), decided to make a rapid influenza test after a initial examination of eligible patients for ILI in the Group 1. However, this investigator did not provide care for any patients to reduce potential study bias. Test results for Group 1 patients were available within 20 minutes and were placed on the patient's chart before evaluation by thephysician. The rapid influenza test was performed for Group 2 after physical examination, including further laboratory workup (such as urinalysis, blood cell count, serum C-reactive protein, chest radiography, and blood culture,). If the influenza rapid test result was detected as positive, the physician in charge was able to modify the protocol regarding further diagnostic tests and observation in the pediatric emergency department. Further investigations and treatment were performed for patients who had negative test results for the influenza.

Influenza diagnosis

Following a detailed explanation of the test procedures to the patients' relatives and obtaining their consent, nasopharyngeal specimens were collected. The specimen was obtained by inserting a swab through the posterior nasopharynx by an experienced microbiology technician who was blinded to the group of the patient. Specimens were tested using Influenza A/B rapid test kits (Roche Diagnostics Gmbh, Manhaim, Germany) according to the manufacturer's recommendation. Positive and negative test results were determined by use of the visual key provided within the test kits. Rapid influenza test results were not confirmed by other methods. Test results were then transferred to the authorized physician for re-evaluation.

For each patient, the following data were recorded: demographic characteristics, symptoms and physical examination findings, additional tests ordered and length of stay in the emergency department. All patients with positive rapid test results were scheduledfor a control visit 1 month later.

Statistical Analysis

Comparisons of demographic characteristics and patient management practices for ILI (additional test ordered and length of stay) were made among patients with positive

influenza test result. Continuous data were analyzed using theStudent *t* test. Categorical data were examined using the χ^2 test or the Fisher's exact test. All tests were two-sided and a p value lower than 0.05 was considered statistically significant. All analyses were performed using SPSS V.11.5 for Windows (SPSS Inc., Chicago, IL, USA).

Results

During the course of the study, a total of 150 cases meeting the inclusion criteria were tested for influenza and 72 (48%) were positive for influenza A or B. Distribution of the demographic features and clinical symptoms of the patients are summarized in Table 1. The most frequent symptoms causing hospital admission were determined to be fever and rhinorrhea. Patient groups were found to be identical in terms of symptom distribution. There was a total of 72 patient who were rapid influenza test positive and completed the emergency department visit. Allocation status subdivided these patients into 2 groups; the physician informed about the rapid influenza test result (n=37), and the physician not informed about the rapid influenza test result (n=35), during the visit. Comparison of these groups for laboratory tests and radiographs ordered and their length of stay in the emergency department are shown in Table 2. Workup studies, including blood tests, urinalysis, chest radiography and lumbar puncture for cerebrospinal fluid analysis, were significantly less frequently ordered by the physicians informed about therapid influenza test result (p<0.0001). The mean length of stay in the pediatric emergency department was also significantly shorter and fewer children were admitted for observation in the emergencydepartment in the group whose physician was informed about the rapid influenza test result. There were no influenza-positive children in either group who had positive blood, urine or cerebrospinal fluid bacterial cultures. Chest radiographic findings in all of the rapid test positive children were read as either normal or consistent with viral lower respiratory tract disease. There were no cases of lobar pneumonia.

Table 1. Demographic characteristics and clinical findings of study groups

	Group 1 Physician aware of rapid test result (N=37)	**Group 2 Physician unaware of rapid test result (N=35)**	**P**
mean age (years) (range)	3.7± 4.2* (8month-11years)	4.05±3.02* (1-11 years)	0.671
beginning of the symptoms mean(hours)	20±8.5*	23±5.0*	0.647
male/female	21/16	21/14	0.783
fever (ºC)mean (range)	38.2±0.9*	39.0±0.6* (38.2-39.7)	0.603 (38.8-39.8)
myalgia(%)	21 (56)	18 (51)	0.783
cough (%)	25 (67)	23 (65)	0.867
rhinorrhea (%)	30 (81)	28 (80)	0.860
tiredness(%)	17 (46)	19(54)	0.902
headache	19 (51)	21 (60)	0.479

*Mean±SD

Table 2. Comparison of study groups according to the test performed and time to discharge

	Group1 Physician aware of rapid test result (N=37)	**Group2 Physician unaware of rapid test result (N=35)**	**p**
Urinanalysis, no (%)	4 (11)	30 (85)	<0.001
Blood Tests, no (%)(hemogram, C-reactive protein,and blood culture)	12 (32)	35 (100)	<0.001
Lumbar puncture, no (%)	0	5 (14)	0.023
Chest radiography, no (%)	3 (8)	12 (34)	0.006
Stay in the observation unit, no (%)	2 (5)	17 (48)	<0.001
Length of emergency department stay, minutes, mean (±SD)	62±12	145±9	<0.001

A similar percentage of patients in both groups returned to the emergency department after a few days (8% versus 11%) and in 7 patients (3 in Group 1 and 4 in Group 2), the diagnosis was made of otitis media (in 5 cases), and pneumonia (in 2 cases). All influenza -positive children showed a favorable clinical course. A control visit was made 1-month later. During this visit, neithersecondary bacterial infection nor persisting clinical symptom was observed among patients with positive rapid tests.

Discussion

This study demonstrates that rapid diagnostic tests resulted in significant alteration of physician-decision making and management of influenza-positive pediatric patients Our study also showed that the use of Rapid Influenza Test A/B kit at the pediatric emergency care settings during the influenza season in children presenting with fever without focus and in the absence of toxic signs, significantly decreased the need for other workup studies and reduced the length of stay in the emergency department. Mainly due to their high cost (180€-25/ test), limited availability, lack of physician familiarity with rapid diagnostic test technology and reimbursement issues, these tests are not routinely used at the emergency and outpatient departments.

Traditional diagnosis of influenza by viral culture or by serologic reaction is too lengthy to be useful in generating patient management at the emergency level. Recent advances in technology have led to development of rapid diagnostic tests, both sensitive to and specific for diagnosis of influenza types A and B (11,12). This test, in the setting of the influenza season or high clinical suspicion, would be best used as a confirmatory test because the positive predictive value is greater than 95% and the number of false-positive cases are small (1). Obtaining laboratory tests and radiographs in children presenting with ILI would be expected to increase length of stay in the emergency room, particularly during winter periods with overcrowded, saturated emergency departments (13). In a previous study comparing 96 influenza-positive patients (aged 2 months to 21 years), whose emergency department physicians were informed about the result of the rapid test, with 106 influenza-positive patients whose physician were not informed, a significantly reduced number of laboratory tests and radiographs and decreased length of time to discharge was found (8). In our study and others (14), children with influenza confirmed by rapid test had a shorter stay in the emergency room, mainly due to the decrease in laboratory tests and need of observation.

In our hospital, where both a resident and attending physicians see the patient, it is difficult to measure overall length of stay in the emergency department because of the numerous factors that influence patient flow. It is customary for a resident to see the patient and check out to attending physician, who is ultimately responsible for patient management and disposition. For these reasons, we chose to measure the length of time from when the patient was first seen by the attending physician until discharge from the emergency department. We demonstrated that a statistically significant decrease in the length of time passed from initial examination until discharge from the emergency department for patients with influenza whose physician was informed about the rapid test results.

Children with influenza often appear quite ill and present with a variety of symptoms. In the setting of the emergency department, ill-appearing infants and children with fever and vague symptoms often have extensive testis performed to rule out serious bacterial illnesses such as bacteriamia, pneumonia, meningitis and urinary tract infection. A point of clinical concern to physician is the coexistence of such bacterial illness in children who also test positive for influenza. On the other hand, it has been shown that febrile children confirmed to have influenza have a very low frequency of bacteriamia (15). Although the number of influenza-positive patients that were tested for additional laboratory tests was low, they had no positive cultures, which parallels previous research demonstrating that children with an acute viral illness are less prone to have a serious bacterial infection (16,17). In our study, 3 influenza rapid test positive patients had a clinical diagnosis of bacterial infection (otitis media 2, and pneumonia 1) when they returned to the emergency department a few days later. Both diseases are well-known complications of influenza virus infection and none of these patients required hospitalization.

In conclusion, use of rapid testing for influenza in children presenting with fever and ILI with no obvious focus of infection in the emergency department during the influenza season, significantly reduces the number of laboratory tests and decreases the length of stay in the emergency department and charges in the subset of children testing positive for influenza.

Conflict of Interest

No conflict of interest is declared by the authors.

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