Impact on Antimicrobial Utilization in the Emergency Department of a Point of Care Polymerase Chain Reaction Compared to Antigen Testing for Influenza

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Abstract (revised)

Introduction: Due to poor sensitivity, the FDA mandated that rapid influenza antigen (IAT) must be phased out by 2018. At our institution an on-site rapid influenza PCR (PCR) was implemented in emergency departments (ED) at the start of the 2016-2017 influenza season.

Objective: To examine the impact of influenza PCR testing on antimicrobial utilization in the ED.

Methods: The study was conducted in a 4- hospital system which included adults over the age of 50 who were tested for influenza, and discharged from the ED. Subjects were matched 2:1 by age, sex, month of testing, and ED site. The pre-implementation group had IAT (Jan-Apr 2016) and the post-implementation had PCR testing (Jan-Apr 2017). The primary outcome was antiviral utilization. Secondary outcomes included diagnostic yield, test turnaround time (TAT), receipt of antibiotics, and 30-day revisit.

Results: The PCR group of 127 patients (pts) were matched to 252 pts in IAT group. Positive results for influenza were reported in 41.% of PCR versus 18% of IAT groups (p=<0.001).Oseltamivir was initiated in the ED in 20% of PCR vs. 10% of IAT group (p=0.008). An additional 28% in PCR group received oseltamivir at ED discharge vs. 14% in IAT group (p=0.001). Antibiotics were administered in the ED to 8% in PCR group vs. 14% in the IAT group (p=0.071). A positive influenza test was associated with less antibiotic use OR 0.374 (95% CI 0.178—0.810), while abnormal chest radiograph (CXR) and WBC was associated with increased antibiotic use OR 3.406 (95% CI 1.776—6.959).
The 30-day revisit was 4% and 10% in the PCR vs. IAT groups respectively (p=0.026).

Conclusion: Replacing IAT with PCR testing increased diagnostic yield for influenza and receipt of oseltamivir, and decreased antibiotic utilization in the ED and 30 day revisits.
Independent predictors for antibiotic use were abnormal CXR and elevated WBC, while positive influenza testing was protective.

Introduction

- Due to poor sensitivity, the FDA mandated that rapid influenza antigen (IAT) must be phased out by 2018.
- At our institution an on-site rapid influenza PCR (PCR) was implemented in emergency departments (ED) at the start of the 2016-2017 influenza season.
- The purpose of this study was to examine the impact of influenza PCR testing on antimicrobial utilization in the ED.

Methods

- The study was conducted in a 4-hospital system at 9 ED sites which included adults over the age of 50 who were tested for influenza, and discharged from the ED.
- Subjects were matched 2:1 by age, sex, month of testing, and ED site.
- The pre-implementation group had IAT (Jan-Apr 2016) and the post-implementation had PCR testing (Jan-Apr 2017).
- The primary outcome was antiviral utilization.
- Secondary outcomes included diagnostic yield, test turnaround time (TAT), receipt of antibiotics, and 30-day revisit.

Results

- The PCR group of 127 patients (pts) were matched to 252 pts in IAT group.
- Positive results for influenza were reported in 41.% of PCR versus 18% of IAT groups (p=<0.001).
- Oseltamivir was initiated in the ED in 20% of PCR vs. 10% of IAT group (p=0.008).
- An additional 28% in PCR group received oseltamivir at ED discharge vs. 14% in IAT group (p=0.001).
- Antibiotics were administered in the ED to 8% in PCR group vs. 14% in the IAT group (p=0.071).
- A positive influenza test was associated with less antibiotic use OR 0.374 (95% CI 0.178—0.810)
- An abnormal chest radiograph (CXR) and elevated WBC was associated with increased antibiotic use OR 3.406 (95% CI 1.776—6.959).
- The 30-day ED revisit was 4% and 10% in the PCR vs. IAT groups respectively (p=0.026).

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Table 1: Characteristics of Antigen and PCR groups

Variables	PCR (n=127)	Antigen (n=252)	P-value
Sex (male)	57 (44.9)	106 (42.2)	0.623
Age, mean (SD)	61.0 +/-8.8	61.6 +/- 9.3	0.583
BMI, mean (SD)	29.6 +/- 6.5	29.9 +/- 7.2	0.618
Race			0.003
African-American	103 (83.1)	177 (72)	
Caucasian	13 (10.5)	55 (22.4)	
Hispanic	0 (0)	7 (2.8)	
Other	8 (6.5)	7 (2.8)	
Active smoker	30 (23.6)	76 (31.3)	0.122
Symptoms			
Fever	50 (39.4)	97 (38.5)	0.868
Sore throat	27 (21.3)	61 (24.5)	0.483
Cough	101 (79.5)	198 (78.6)	0.830
Rhinorrhea	41 (32.3)	87 (34.7)	0.644
Myalgia	34 (26.8)	92 (37.1)	0.045
Nausea	26 (20.5)	65 (25.8)	0.252
Vomiting	26 (20.5)	50 (19.8)	0.885
Diarrhea	13 (10.2)	37 (14.7)	0.227
Sick Contacts	20 (15.7)	41 (16.3)	0.229
Tmax (Celsius), mean (SD)	37.1 +/- 0.81	37.1 +/- 0.86	0.839
HR (bpm) , mean (SD)	89.8 +/- 18.2	89.1 +/- 16.1	0.706
RR, mean (SD)	18.8 +/- 3.1	19.0 +/- 3.5	0.600
Systolic BP, mean (SD)	132.7 +/- 21.2	135.7 +/- 21.4	0.195
WBC	6.2 (5.2—8.7)	6.8 (5.1—9.3)	0.523
Abnormal CXR	11 (10.5)	37 (17.1)	0.117
Any SIRS criteria	31 (24.6)	33 (13.3)	0.006
Symptom duration (days)	3 (1—4)	2 (1—4)	0.994
Charlson Score	1 (0—2)	1 (0—2)	0.483

Results (contd.)

Table 2: Outcomes of Antigen and PCR groups

Outcomes	PCR (n=127)	Antigen (n=252)	P-value
Positive test	52 (40.9)	44 (17.5)	<0.001
Turnaround time (minutes), median (IQR)	56.5 (44—83)	34 (32—49)	<0.001
Oseltamivir given in ED	25 (19.7)	25 (9.9)	0.008
Oseltamivir script at discharge	35 (27.6)	35 (13.9)	0.001
Antibiotics given in ED	10 (7.9)	36 (14.3)	0.071
Antibiotic script at discharge	20 (15.9)	61 (24.2)	0.063
Antibiotics at any time	25 (19.8)	70 (27.8)	0.094
30-day ED revisit	4 (3.3)	25 (9.9)	0.026
ED LOS (hours)	6.3 (4.7—8.5)	5.7 (4.3—7.6)	0.017

Table 3: Bivariate and multivariate analyses for risk of receipt of any antibiotic

N (%)	Any abx (n=95)	No abx (n=284)	P-value	OR (95% CI)	Adjusted OR (95% CI)
Positive test	12 (12.6)	83 (29.3)	0.001	0.348 (0.181-0.672)	0.374 (0.178-0.810)
Abnormal CXR	22 (26.5)	26 (11.0)	<0.001	2.927 (1.551-5.524)	3.406 (1.776-6.959)
WBC (cells/cc, IQR)	6.8 (5.5-10.7)	6.4 (4.8-8.1)	0.008		1.12 (1.03-1.21)

Conclusion

- Replacing IAT with PCR testing increased diagnostic yield for influenza and receipt of oseltamivir.
- Antibiotic utilization decreased with implementation of influenza PCR in the ED.
- Emergency Department 30 day revisits was reduced with replacement of IAT with PCR.
- Independent predictors for antibiotic use were abnormal CXR and WBC whereas a
  a positive influenza was protective.