



Original article

Predicting acute respiratory infection in Chinese healthy individuals: A effective way of patient care

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ABSTRACT

Several anti-infective agents are available in the treatment of acute respiratory infection. Use of anti-infective agents has hardly been directed by laboratory finding. We hypothesis the clinical fore casters of acute respiratory can assist in making right treatment decision and avoid needless use of antibiotic. This nurse led care research designed to observe predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. In this retrospective study, medical records of adults and who were suffering from acute respiratory infection and had influenza like symptoms which includes high body temperature, body ache, muscle pain, cough, and sore throat. Based on the signs and symptoms, patients were subjected in laboratory examination and culture test. Medical records of Chinese patients with confirm diagnosis of influenza was selected. We also assessed the medical records of patients with no influenza based on laboratory investigation. Correlation of signs and symptoms with laboratory examination was performed to identify the best predictive factors of acute respiratory infection which can assist in making right treatment decision and avoid needless use of antibiotic. Medical records of 1220 adults who were suffering from influenza like symptoms at baseline were reviewed by nurse. Of total subjects, a total of 824 (67.5%) were identified to have acute respiratory infection (influenza). We observed significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza). The results of this nurse led care research suggested that Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in patients with acute respiratory infection (influenza). Prediction of acute respiratory infection based on early symptoms is one of the effective ways of patient care. Our study results will assist in making right treatment decision and avoid needless use of antibiotic.

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1. Introduction

Acute respiratory infection is one of the foremost causes of emergency department (ED) visits. There has been a significantly steady increase in the number of emergency department (ED) visits among patients with acute respiratory infection in China over

the past decades and this continues to increase each year (Calder et al., 2015; Sauvin et al., 2013). This may be attributed to many reasons such as lack of consistent access to general physicians which often forces caretakers to seek medical attention at emergency departments. The most common reasons for unscheduled ED return visits are inadequate symptom relief, misdiagnosis, deterioration of condition, and inappropriate management, including and not limited to, inadequate patient education and patient related factors (Keith et al., 1989; Nunez et al., 2006; Chiu-Lung et al., 2008; Wu et al., 2010). Hence, focusing on factors associated with ED visits and appropriate resolution could reduce revisit rates and help improve patient satisfaction, clinical outcomes and reduce healthcare costs. Among the possible reasons of unscheduled re-visit, Gordon et al. have suggested that the diagnosis at

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the time of first visit could be one of key predictors of early ED return; inappropriate diagnosis may be one of chief correctable reasons of unscheduled returns to ED (Gordon et al., 1998).

For patients who re-visit ED within a short period of time after discharge, the most common reason assumed is that their initial diagnosis and/or treatment were inadequate (Tresch, 1987; Fox, 1988; O'dell, 1988). The diseases with vague or non-specific signs and symptoms are more likely to be misdiagnosed at the initial visit in a high volume healthcare setting like the ED. Patients suffering from infectious diseases often present with vague symptoms (Gambert and Escher, 1988; Gupta et al., 1988) and may only begin to show text-book signs through further evolution of the disease process. Patients with such non-specific presentations are at a high risk of being misdiagnosed resulting in early release from the ED; this can eventually lead to an unscheduled return to ED within a short duration after discharge (Gambert and Escher, 1988; Gupta et al., 1988).

Prediction of acute respiratory infection based on early symptoms is one of the important achievements in current medical practice. For the optimal care and success of medical treatment, prediction of outcome of diseases condition with some accuracy plays a vital role in achieving success of medical intervention, and it is helpful for patients and consulting physician. Early prediction in outcome helps to improve healing potentials, and give chance to take decision about the future treatments and care intensity and to avoid ineffective diagnostic procedure. Moreover, the understanding of forthcoming consequences of patients' illness is the mainstay of the regaining process [8–13]. Early prediction of outcomes is very important in diseases with high disability rate, and plays a vital role in avoiding emergency conditions associated with diseases. In the emergency setting, clinical decision based on the patient's condition or illness has high impact on mortality and death among patients of critical illness (Gambert and Escher, 1988; Gupta et al., 1988).

Several anti-infective agents are available in the treatment of acute respiratory infection. Use of anti-infective agents has hardly been directed by laboratory finding. We hypothesis the clinical forecasters of acute respiratory can assist in making right treatment decision and avoid needless use of antibiotic. We therefore designed this nurse led care research designed to observe predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. Our study may serve the basis for conducting large multi-centric, multi-country, clinical study which assesses predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic.

2. Materials and methods

2.1. Study design and patients

This nurse led care research designed to observe predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. We hypothesis the clinical forecasters of acute respiratory can assist in making right treatment decision and avoid needless use of antibiotic. In this retrospective study, medical records of adults who visited at and who were suffering from acute respiratory infection and had influenza like symptoms which includes high body temperature, body ache, muscle pain, cough, and sore throat. Based on the signs and symptoms, patients were subjected in laboratory examination and culture test. Medical records of Chinese patients with confirm diagnosis of influenza was selected. We also assessed the medical records of patients with no influenza based on laboratory investigation. Correlation of signs and symptoms with laboratory examination was performed to identify the best predictive factors of acute respiratory

infection which can assist in making right treatment decision and avoid needless use of antibiotic. The patients with any other condition which confound the study results as per the discretion on investigator were excluded. We have contacted the patients whose data were selected in our study. The subjects who were not willing to give their written consent to participate in this study were excluded during screening.

Inform consent (telephonic confirmation) was taken from each patient or their relative to participate in this trial whose data were selected in our study. During enrollment phase, medical records of all the identified patients were reviewed to confirm inclusion of data in our study. Since, this was a retrospective, observational chart review study, and patients whose medical records reviewed were contacted, the requirement for obtaining formal informed consent was waived by ethics committee. This study was approved by institutional ethics committee of China for consultation were recorded using validated questionnaire. The following data were collected from each enrolled patients: Demographic data (age, height, weight, and ethnicity) and other patient's characteristic such as education levels (in years), socio economic status, and family and medical history. In addition, signs and symptoms before treatment was recorded, and severity of reported symptoms was assessed using four point severity scale. Presence of absence of respiratory infection was assessed using polymerase chain reaction method or culture test. Univariate analyses were performed to relate the observed signs and symptoms with the diagnosis of respiratory infection. Multivariate analyses were conducted to confirm the results of univariate analysis. The parameters which were found to have positive and significant relationship with the diagnosis of respiratory infection were subjected in Multivariate analyses to confirm the relationship with the diagnosis of respiratory infection. In case of any suspect of bias or confounding variable, then data were analyzed using Analysis of Covariance (ANCOVA) model with gender, age and other potential confounding variables as covariates. Numerical variables were shown as mean (standard deviation). Qualitative outcome were shown as absolute number (percentage) of individuals in each category.

2.2. Statistical analysis

Statistical analysis was performed using version 6.2 of Graph Pad Prism.

3. Results

Medical records of total of 1500 adults who were suffering from influenza like symptoms were screened phase during Jan 2012 to Dec 2016 (4 year data). Of these, a total of 1220 adults who were suffering from influenza like symptoms who attended our hospital at the time of their consultation were selected for data analysis. All the selected subjects agreed to use their data in our study. The mean (SD) age of identified subjects with respiratory tract infection (influenza) was 32.23 (1.4) years, whereas mean (SD) age of identified subjects without respiratory tract infection (influenza) was 33.13 (2.2) years, who were visited during Jan 2012 to Dec 2016 were studied. The proportion of male patients was higher in both the groups. Majority of patients had symptoms onset time within 36 h. Also the patients who had respiratory tract infection (influenza), majority of them were diagnosed with type B followed by type A and both. There were few patients in respiratory tract infection (influenza) group who had unidentified type of influenza. Also Demographic and clinical characteristic of identified subjects are presented in Table 1.

Medical records of 1220 adults who were suffering from influenza like symptoms at baseline were reviewed by nurse. Of total

Table 1
Demographic and baseline characteristics.

Variable	Subject with respiratory tract infection (influenza) N = 824	Subject with no respiratory tract infection (influenza) N = 369
Age, mean(SD)	32.23 (1.4)	33.13 (2.2)
Gender (Male/Female), %	76/24	70/30
Symptoms onset time, %		
<24 h	40	46
24 hr to 36 hr	45	49
>36 h	21	32
Type of respiratory tract infection (influenza)		
Type A	25	00
Type B	50	00
Both- Type A and Type B	12	00
Unidentified type	13	00

subjects, a total of 824 (67.5%) were identified to have acute respiratory infection (influenza). As indicated in [Table 2](#), significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Among the reported baseline symptoms, fever and cough were found most common among patients who were diagnosed with acute respiratory infection (influenza). The most common reported symptoms among patients who diagnosed with respiratory tract infection (influenza) are weakness, muscle pain, cold and cough. In subjects who were not diagnosed with respiratory tract infection (influenza) reported to have weakness and muscle pain as most commonly reported signs and symptoms. The subjects with respiratory tract infection (influenza) were more likely to have cough, high body temperature fever than subject who were not diagnosed with respiratory tract infection (influenza) ([Table 3](#)).

A logistic regression was performed for all the baseline signs and symptoms, and model was run which showed, fever and cough were found to be finest explanatory variables. Parameters such as headache and muscle pain which is having been poor explanatory variables were excluded from the model. The symptom “Feverishness” has not been included as the term “fever” has already been included in this analysis. Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza). Our study results suggested that Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in patients with acute respiratory infection (influenza). Univariate

Table 2
Baseline symptom assessment by nurse for the selected patients.

Baseline symptom	Subject with respiratory tract infection (influenza) N = 824	Subject with no respiratory tract infection (influenza) N = 369
High body temperature (Fever), %	98	74
Fever like symptoms, %	92	32
Cough, %	93	45
Running Nose, %	88	63
Faintness/weakness, %	91	84
Appetite loss, %	82	52
Pain in throat, %	75	35
Muscle pain, %	92	82
Headache, %	39	79

Table 3
Univariate analysis for predicting acute respiratory infection (influenza) among patients with acute respiratory infection (influenza).

Baseline symptom	Odd ratio	P value
High body temperature (Fever), %	3.4	0.001
Fever like symptoms, %	2.4	0.0007
Cough, %	3.9	0.0013
Running Nose, %	1.3	>0.05
Faintness, %	1.1	>0.05
Appetite loss, %	1.2	>0.05
Pain in throat, %	0.9	>0.05
Muscle pain, %	0.5	>0.05
Headache, %	1.9	>0.05

Table 4
Multivariate analysis for predicting acute respiratory infection (influenza) among patients with acute respiratory infection (influenza).

Baseline symptom	Odd ratio	P value
High body temperature (Fever), %	4.4	<0.005
Fever like symptoms, %	3.2	<0.005
Cough, %	4.2	<0.005
Running Nose, %	0.83	>0.05
Faintness, %	0.91	>0.05
Appetite loss, %	0.92	>0.05
Pain in throat, %	0.99	>0.05
Muscle pain, %	1.95	>0.05
Headache, %	0.94	>0.05

analysis revealed that the patients who had high body temperature (Fever) and cough were more likely to have acute respiratory infection (influenza).

The similar trend was observed in analysis conducted by multivariate analysis ([Table 4](#)). Multivariate analysis also revealed that the patients who had high body temperature (Fever) and cough were more likely to have acute respiratory infection (influenza). This indicates that the that Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in patients with acute respiratory infection (influenza). We observed significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza).

4. Discussion

Prediction of acute respiratory infection based on early symptoms is one of the effective ways of patient care. For the optimal care and success of medical treatment, prediction of outcome of diseases condition with some accuracy plays a vital role in achieving success of medical intervention, and it is helpful for patients and consulting physician. Early prediction in outcome helps to improve healing potentials, and give chance to take decision about the future treatments and care intensity and to avoid ineffective diagnostic procedure. Moreover, the understanding of forthcoming consequences of patients' illness is the mainstay of the regaining process ([Tresch, 1987; Fox, 1988; O'dell, 1988](#)). In the emergency setting, clinical decision based on the patient's condition or illness has high impact on mortality and death among patients of critical illness ([O'dell, 1988](#)). Several anti-infective agents are available in the treatment of acute respiratory infection. Use of anti-infective agents has hardly been directed by laboratory finding. We

hypothesis the clinical forecasters of acute respiratory can assist in making right treatment decision and avoid needless use of antibiotic. We therefore designed this nurse led care research designed to observe predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. Our study may serve the basis for conducting large multi-centric, multi-country, clinical study which assesses predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. This nurse led care research designed to observe predictive factors this can assist in making right treatment decision and avoid needless use of antibiotic. In this retrospective study, medical records of adults who visited at our hospital and who were suffering from acute respiratory infection and had influenza like symptoms which includes high body temperature, body ache, muscle pain, cough, and sore throat. Based on the signs and symptoms, patients were subjected in laboratory examination and culture test. Medical records of Chinese patients with confirm diagnosis of influenza was selected. We also assessed the medical records of patients with no influenza based on laboratory investigation. Correlation of signs and symptoms with laboratory examination was performed to identify the best predictive factors of acute respiratory infection which can assist in making right treatment decision and avoid needless use of antibiotic.

In this study, medical records of adults who were suffering from influenza like symptoms at baseline were reviewed by nurse. Of total subjects, 67% of enrolled patient were identified to have acute respiratory infection (influenza). We observed significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza). Majority of patients had symptoms onset time within 36 h. Also the patients who had respiratory tract infection (influenza), majority of them were diagnosed with type B followed by type A and both. There were few patients in respiratory tract infection (influenza) group who had unidentified type of influenza. Significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Among the reported baseline symptoms, fever and cough were found most common among patients who were diagnosed with acute respiratory infection (influenza). The most common reported symptoms among patients who diagnosed with respiratory tract infection (influenza) are weakness, muscle pain, cold and cough. In subjects who were not diagnosed with respiratory tract infection (influenza) reported to have weakness and muscle pain as most commonly reported signs and symptoms. The subjects with respiratory tract infection (influenza) were more likely to have cough, high body temperature fever than subject who were not diagnosed with respiratory tract infection (influenza). A logistic regression was performed for all the baseline signs and symptoms, and model was run which showed, fever and cough were found to be finest explanatory variables. Parameters such as headache and muscle pain which is having been poor explanatory variables were excluded from the model. The symptom "Feverishness" has not been included as the term "fever" has already been included in this analysis. Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza). Our study results suggested that Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in

patients with acute respiratory infection (influenza). Univariate analysis revealed that the patients who had high body temperature (Fever) and cough were more likely to have acute respiratory infection (influenza). The similar trend was observed in analysis conducted by multivariate analysis (Table 4). Multivariate analysis also revealed that the patients who had high body temperature (Fever) and cough were more likely to have acute respiratory infection (influenza). This indicates that the Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in patients with acute respiratory infection (influenza). We observed significantly higher incidence of cough, high body tem (fever) and both was noted among the patients who had acute respiratory infection (influenza) compared to those patients with no acute respiratory infection (influenza). Mixed model analysis revealed high correlation of two symptoms (cough and fever) with acute respiratory infection (influenza).

5. Conclusion

The results of this nurse led care research suggested that Chinese patients who experienced cough and fever within first 48 h of onset of acute respiratory infection are more likely to have influenza, and thus appropriate antiviral therapy is recommended in patients with acute respiratory infection (influenza). Prediction of acute respiratory infection based on early symptoms is one of the effective ways of patient care. Our study results will assist in making right treatment decision and avoid needless use of antibiotic.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Chiu-Lung, Wu, Wang, Fa-Tsai, Chiang, Yao-Chiu, et al., 2008. Unplanned emergency department revisits within 24 hours in a referral hospital. *J. Emerg. Crit. Care Med.* 19 (4), 146–153.
- Fox, R.A., 1988. Atypical presentation of geriatric infections. *Geriatrics* 43, 58–68.
- Sauvin, Gabrielle, Freund, Yonathan, Saïdi, Khaled, et al., 2013. Unscheduled return visits to the emergency department: consequences for triage. *Acad. Emerg. Med* 20, 33–39.
- Gambert, S.R., Escher, J.E., 1988. Atypical presentation of endocrine disorders in the elderly. *Geriatrics* 43, 69–78.
- Gordon, J.A., An, L.C., Hayward, R.A., et al., 1998. Initial emergency department diagnosis and return visits: risk versus perception. *Ann. Emerg. Med.* 32, 569–573.
- Gupta, K.L., Dworkin, B., Gambert, S.R., 1988. Common nutritional disorders in the elderly: atypical manifestations. *Geriatrics* 43, 87–97.
- Keith, K.D., Bock, J.J., Kobemick, M.S., et al., 1989. Emergency department revisits. *Ann. Emerg. Med.* 18, 964–968.
- Calder, Lisa, Pozgay, Anita, Riff, Shena, et al., 2015. Adverse events in patients with return emergency department visits. *BMJ Qual. Saf.* 24 (2), 142–148.
- Nunez, S., Hexdall, A., Aguirre-Jaime, A., 2006. Unscheduled returns to the emergency department: an outcome of medical errors?. *Qual. Saf. Health Care* 15, 102–108.
- O'dell, C., 1988. Atypical presentations of neurological illness in the elderly. *Geriatrics* 43, 35–37.
- Tresch, D.D., 1987. Atypical presentations of cardiovascular disorders in the elderly. *Geriatrics* 42, 31–46.
- Wu, C.L., Wang, F.T., Chiang, Y.C., et al., 2010. Unplanned emergency department revisits with 72 hours to a secondary teaching referral hospital in Taiwan. *J. Emerg. Med.* 38, 512–517.