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A computerized pneumococcal vaccination reminder system in the adult emergency department

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ABSTRACT

Background: Pneumococcal vaccination is an effective strategy to prevent invasive pneumococcal disease in the elderly. Emergency department (ED) visits present an underutilized opportunity to increase vaccination rates; however, designing a sustainable vaccination program in an ED is challenging. We examined whether an information technology supported approach would provide a feasible and sustainable method to increase vaccination rates in an adult ED.

Methods: During a 1-year period we prospectively evaluated a team-oriented, workflow-embedded reminder system that integrated four different information systems. The computerized triage application screened all patients 65 years and older for pneumococcal vaccine eligibility with information from the electronic patient record. For eligible patients the computerized provider order entry system reminded clinicians to place a vaccination order, which was passed to the order tracking application. Documentation of vaccine administration was then added to the longitudinal electronic patient record. The primary outcome was the vaccine administration rate in the ED.

Multivariate logistic regression analysis was used to estimate the odds ratios and their 95% confidence intervals, representing the overall relative risks of ED workload related variables associated with vaccination rate.

Results: Among 3371 patients 65 years old and older screened at triage 1309 (38.8%) were up-to-date with pneumococcal vaccination and 2062 (61.2%) were eligible for vaccination. Of the eligible patients, 621 (30.1%) consented to receive the vaccination during their ED visit. Physicians received prompts for 428 (68.9%) patients. When prompted, physicians declined to order the vaccine in 192 (30.9%) patients, while 222 (10.8%) of eligible patients actually received the vaccine. The computerized reminder system increased vaccination rate from a baseline of 38.8% to 45.4%. Vaccination during the ED visit was associated younger age (OR: 0.972, CI: 0.953–0.991), Caucasian race (OR: 0.329, CI: 0.241–0.448), and longer ED boarding times (OR: 1.039, CI: 1.013–1.065).

Conclusion: The integrated informatics solution seems to be a feasible and sustainable model to increase vaccination rates in a challenging ED environment.

1. Introduction

Streptococcus pneumoniae infections account for approximately 100,000–135,000 hospitalizations annually, and 14% of these hospitalizations result in death [1]. Pneumococcal vaccination is cost-effective [2], primarily reducing the burden associated with invasive pneumococcal disease. However, only 62% of patients 65 years and older are vaccinated against pneumococcal disease [3], much below the 90% goal set by Healthy People 2010 [4]. The Joint Commission has named pneumococcal vaccination as a core measure [5].

Each patient encounter with the health care system provides an opportunity to offer preventive care measures [6]. Because the emergency department (ED) accounts for a large proportion of health care encounters, it has been suggested as a suitable environment for a pneumococcal vaccination program [7,8]. However

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the ED is a challenging environment for implementing an effective and sustainable strategy for offering preventive care. The challenges of providing episodic care to an increasing older and sicker population, lacking pertinent patient information, and provider perception of the ED being an inappropriate setting for offering preventive care [9] are augmented by operational factors such as frequent overcrowding [10–13], shortages of nurses [14] and hospital beds [15].

Many patients at high risk for pneumococcal disease frequently seek care in the ED [11]. Of patients hospitalized with pneumococcal infections, 55% had an ED encounter in the previous 5 years [16]. In the US, only 266,000 patients received a pneumococcal vaccination in the ED [17]. An ED-based vaccination program can bridge a missed opportunity [9,18,19]; its implementation is feasible and can increase vaccination rates shown in both retrospective analyses and nurse-driven standing orders [7,16,20]. However, experiences in the ED setting remain scarce [19,21] and require substantial efforts and resources to achieve sustainability [20].

Computerized reminders have been successful at increasing vaccination rates in primary care and inpatient settings [22,23]; however, they have not been applied in an ED environment. We evaluated the impact of a team-oriented, pneumococcal reminder system that was embedded in the clinical workflow and included four different patient care information systems.

2. Methods

2.1. Setting

The adult ED at Vanderbilt University in Nashville, Tennessee is an urban, academic, level 1 trauma center with 41 beds. The ED staff includes 37 attending physicians, 34 resident physicians, and 93 full-time nurses who provide care for more than 55,000 patient visits annually. The study was approved by the Institutional Review Board.

2.2. Study design

We performed a prospective interventional study of a team-oriented, computerized reminder system designed to increase pneumococcal vaccination rates among elderly in an adult ED. The reminder was evaluated over a one-year study period from January 31, 2006 to January 31, 2007.

2.3. Participants

During ED triage all patients aged 65 years and older and seeking care in the ED were eligible and screened for inclusion. We excluded patients with life-threatening conditions defined as patients who were assigned the most severe acuity based on the 5-level Emergency Severity Index [24,25]; patients without physician-entered orders in the computerized provider order entry system; and patients without computerized triage documentation, such as patients who left without being seen or were referred to another clinic prior to the triage process. All visits from patients seeking care in the ED more than once during the study period were eligible, as each visit provides an opportunity to offer vaccination, and it is conceivable that the patient's clinical condition and acuity may influence the likelihood of a patient agreeing to receive a preventive care measure during an ED visit. The baseline pneumococcal vaccination rate was determined by patient reporting, i.e., the number of ED patients that were already vaccinated at the time of their ED encounter.

All consenting attending and resident physicians providing care in the ED were eligible for inclusion in the study, including resident physicians from other departments rotating through the ED.

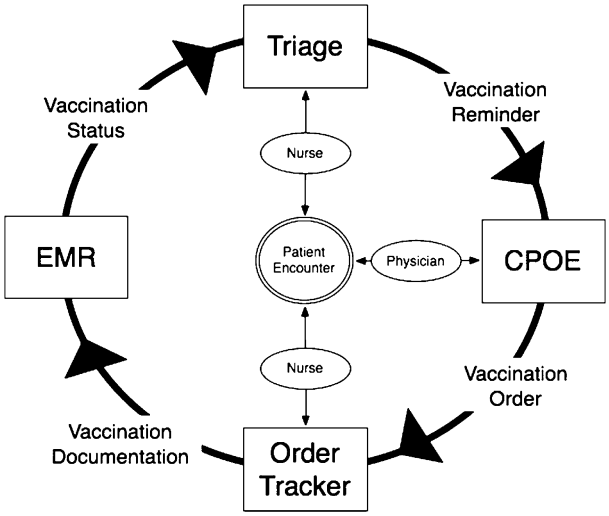

Fig. 1. Team-oriented workflow in the emergency department. The outer circle contains the ED information systems. Inside the circle shows the patient and provider interactions with each other and the system. CPOE: computerized provider order entry, EMR: electronic medical record.

The investigators provided eligible emergency medicine physicians information about the study during faculty and resident meetings, and rotating physicians during monthly orientation sessions. Only consenting physicians identified in the information system through the login credentials received the intervention. Among the 144 physicians who consented to participate during the course of the study, 75 were ED resident or attending physicians. The ED nurses were informed about the study at staff meetings.

2.4. Intervention

Prior to the study the adult ED did not have a pneumococcal vaccination policy and had not implemented systematic approaches to provide eligible patients with the vaccine. The intervention integrated the clinical workflow between the triage nurse, physician, and ED bedside nurse. The process of pneumococcal vaccination involves multiple ED team members which are responsible for different aspects of patient care. The computer-based pneumococcal reminder system included four different information systems (Fig. 1): the electronic medical record [26,27], the computerized triage application [28], the computerized provider order entry system [29], and the order tracking application. The four information system components are part of a homegrown ED information system infrastructure that integrates hospital-wide information systems (electronic medical record and computerized provider order entry) with ED specific systems (computerized triage and order tracking application) [30].

The institution's longitudinal electronic medical record includes a patient problem list consisting of semi-structured and free-text sections for current and past medical history, medications, major procedures, and preventive care measures. The free-text preventive care section includes information about completed screening exams and the patient's current vaccination status.

The computerized triage application captures patient data in mostly coded format. To support the triaging process the application embeds sections of the patient problem list at appropriate places. The triage nurse completes an initial assessment of the patient's vaccination status while having access to the preventive care section of the patient's problem list. To document pneumococcal vaccination status, the nurse documents whether and when the patient received the pneumococcal vaccine, reconciling information from the electronic medical record, the patient, and, if