Clinical Decision Support in the Electronic Health Record: A Template to Improve Tetanus Immunization Rates
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Clinical Issue/Practice Problem

- Tetanus is a noncommunicable disease that occurs in open wounds or intact skin allowing the Clostridium tetani spores to thrive, and though incidence has decreased, it remains a potentially fatal disease (CDC, 2011).
- Missed opportunities for immunization are a major problem both locally and nationally (CDC, 2015).
- Clinical decision support (CDS) in the electronic health record (EHR) is not being used optimally by providers when providing care to patients.
- The purpose of this quality improvement project was to determine if the use of a CDS immunization template (based upon CDC (2016) guidelines) embedded into the EHR improved tetanus immunization rates in the urgent care setting.

Summary of the Supporting Literature

- Focused on issues of improving immunizations by reviewing the evidence supporting use of a CDS in the EHR
- Databases used were Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed/Medline, Ovid MEDLINE, Inventory of Evaluation Publication, Cochrane Database of Systematic Reviews, Psych Info, and the American Medical Informatics Association.
- Eight studies met inclusion requirements for the literature review, four were most helpful:
  - Au et al. (2010) found that electronic templates with pre-loaded immunization records and EHR alerts increased significantly the immunization rates in children from 65% to 76% (p < .000)
  - Austin et al. (1994), meta-analysis of 3 RCT’s of physician reminder-information interventions significantly improved compliance. OR 2.819, 95% CI [2.644-2.975].
  - Dexheimer et al. (2011), used a computerized provider order entry system reminder for pneumococcal vaccination rates in the emergency department (ED), with 0.8% increase in vaccine rates among elderly ED patients.
  - Loo et al. (2002); improved pneumococcal and influenza vaccines in the elderly, supporting use of EHR reminder pneumococcal vaccine: unadjusted OR 2.05; 95% CI [1.31-3.23]; p < .002; and Influenza: unadjusted OR 1.68; 95% CI [1.34-2.10]; p < .001.

Key References


Project Implementation

- Quality of Health Care framework (Donabedian 2003) guided this project, organizing information by structure, process, and outcome.
- Stakeholders: patients, providers, urgent care and the clinic, nursing staff, Information Technology (IT), and Business and Clinical Intelligence (BCI) departments
- IRB approval obtained from University of Illinois COM at Peoria
- Steps in implementation process:
  - met with IT and BCI regarding project feasibility
  - developed EHR template based on CDC (2014) guidelines
  - identified ICD-10 diagnoses requiring tetanus coverage
  - obtained IRB approval and 15 providers (MDs, APNs, and PAs) signed informed consent
  - conducted project education sessions with providers and nursing staff
- population of patients in study: those 19 years and older presenting to urgent care with ICD-10 diagnoses requiring up-to-date (UTD) tetanus coverage
- pre-template comparison data collected between Feb. 28 and April 30, 2016 (n = 308)
- post-template comparison data collected during same timeframe in 2017 (n = 245)
- Data analysis included descriptive statistics on the pre and post template timeframes, as well as Chi-square ($x^2$) test of independence.

Outcomes

- The first dependent variable was the percentage of patients meeting inclusion criteria in which the provider documented discussion with the patient regarding tetanus immunization status.
- Prior to implementation of the template (2016) discussion of tetanus immunization status was documented 44.8% of the time; and in 2017, with use of the template documentation increased to 72.2%.

<table>
<thead>
<tr>
<th>Rates of discussion of tetanus status</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-template 2016</td>
</tr>
<tr>
<td>Discussion of Tetanus status</td>
<td>n</td>
</tr>
<tr>
<td>Yes</td>
<td>138</td>
</tr>
<tr>
<td>No</td>
<td>170</td>
</tr>
<tr>
<td>TOTAL</td>
<td>308</td>
</tr>
</tbody>
</table>

$x^2 = 41.99, df = 1, p < .001, power = .999$

Clinical Implications for Practice and Next Steps

- The second dependent variable was the percentage of patients requiring and subsequently receiving a tetanus immunization.
- Prior to implementation of the template (2016) 73.3% of patients received tetanus immunization when indicated. In 2017, the percentage of patients receiving tetanus immunization increased to 87.4%.

<table>
<thead>
<tr>
<th>Rates of tetanus immunizations given</th>
<th>Group</th>
<th>2016</th>
<th>2017</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetanus immunization</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Given</td>
<td>226</td>
<td>73.3</td>
<td>214</td>
<td>87.4</td>
</tr>
<tr>
<td>Not given</td>
<td>82</td>
<td>26.7</td>
<td>31</td>
<td>12.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>308</td>
<td>100</td>
<td>245</td>
<td>100</td>
</tr>
</tbody>
</table>

$x^2 = 7.064, df = 1, p < .008, power = .818$

Future versions of the EHR that was just launched is capable of a colored template that is identical to the CDC table, and this may replace the current tetanus template.
- The Donabedian Framework can be used to guide future development of EHR CDS templates.
- This quality improvement project impacted clinical practice through incorporation of the CDC recommendations that promoted better patient health care outcomes by improved tetanus immunization rates in the urgent care setting.
- The results of this project support the use of the computerized CDS systems, and CDS should be provided to clinicians through the EHR, when possible in their practice settings.
- Future incorporation of this template format into the electronic health record may be beneficial, but more research should be conducted to provide the evidence needed for guidelines.

Acknowledgments

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