ABSTRACT

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Title: Developing and Testing the Usability of a Novel Child Abuse Clinical Decision Support Tool
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Background: About 30% of children who suffered serious injuries from abuse were previously evaluated for injuries not recognized to have been due to abuse. Electronic health record (EHR)-based clinical decision support (CDS) has the potential to improve recognition of physical abuse. We developed and validated a natural language processing (NLP) algorithm to identify high-risk injuries suggestive of abuse in emergency department (ED) notes in the EHR that could be linked to a child abuse-specific CDS tool (CA-CDS).

Objective: To develop and test the usability of an NLP-based CA-CDS to help ED clinicians recognize possible physical abuse in infants presenting with high-risk injuries.

Methods: A team of stakeholders including experts in child abuse, ED, and health informatics developed a prototype that alerted providers to the presence of a high-risk injury via a digital “card” that linked to a “protocol” with evidence-based questions, actions to consider, and space to document decision-making. The content was customized for medical and nursing providers and also differentiated between initial and subsequent exposure to the alert.

To assess usability and refine the CA-CDS, we conducted semi-structured interviews with 23 general and pediatric ED nurses and medical providers and asked them to think aloud about their impressions as they interacted with the prototype within a model EHR. Interviews were transcribed and coded by the research team using conventional content analysis.

Results: From the interviews, 5 main categories emerged:
1. **CA-CDS benefits** included providing an extra layer of protection, customization to provider type, and inclusion of evidence-based recommendations.
2. **User-centered, workflow-compatible design** included soft-stop alert configuration, editable and automatic documentation, and easy re-access of protocol.
3. **Recommendations for improvement** included clearer design features, adding a link to extra resources, and consolidating text.
4. **Facilitators for completion** included reappearance at discharge, showing value of NLP-based CA-CDS, and stakeholder buy-in.
5. **Barriers to implementation** included alert fatigue, hesitancy to change, and infringement on provider autonomy.

The prototype was iteratively refined based on suggestions from the interviewees (Figure 1).

Conclusion: With its high usability and user-centered design, our CA-CDS can aid providers in real-time recognition and evaluation of child physical abuse.

Word Count: 349
Figure 1. Final Versions of CA-CDS Prototype. A) Medical Provider Initial Provider Version, B) Medical Provider Subsequent Provider Version, C) Nursing Provider Initial Provider Version, D) Nursing Provider Subsequent Provider Version. Card is smaller box on the right and Protocol (renamed to Pathway) is bigger box on left.