



US DEPARTMENT OF DEFENSE
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Open Globe Injuries

Open Globe Injury Patient Identification

Researchers at the Vision Center of Excellence conducted a study to develop methods for comprehensive and reliable open globe injury (OGI) patient identification. They used clinical data in the Defense and Veterans Eye Injury Registry (DVEIVR) which is derived from Department of Defense and Veterans Affairs medical systems (Figure 1). OGIs are one of the most devastating injuries resulting from combat-related eye trauma, including blast exposure, and proper identification and early treatment are often critical to saving sight. The challenges of this task included low incidence rate, idiosyncratic military ophthalmology vocabulary, extreme brevity of notes, specialized abbreviations, etc. DVEIVR modeled this problem as a text classification task and utilized a combination of supervised learning manner and word embedded learning in an unsupervised manner, achieving precision of 92.5 percent and a recall of 89.83 percent (Figure 2). This approach is applicable to patient cohort identification with limited training data and low incidence rate (Apostolova *et al.* 2017b, 2017a).

This study illustrates the ability to properly identify patients with OGIs in DVEIVR that will support the effectiveness of early interventions and following treatments to restore and/or retain visual function.

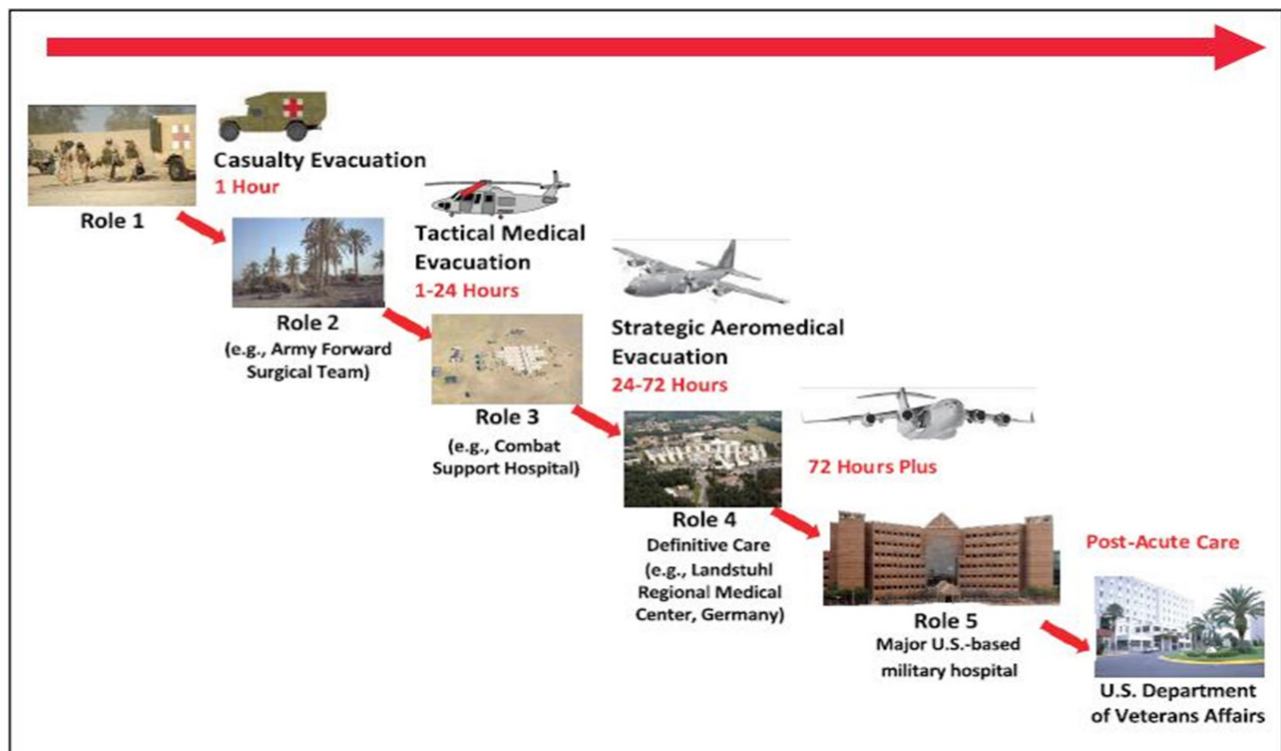


FIGURE 1: OGI Identification in Aggregated Theater Eye Injury Data Registry. (Figure used with permission from the authors)





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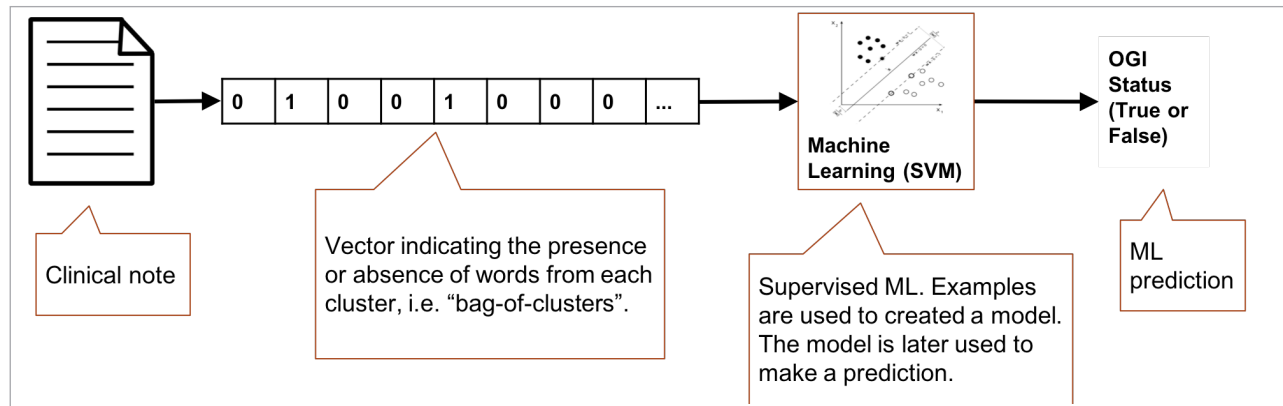


FIGURE 2: Clinical notes are classified into OGI/not OGI using machine learning ML. The text of the note is tokenized, i.e. converted to words. The unique words across all training examples constitute the model vocabulary. The note words are converted into vectors. The length of each vector is equal to the vocabulary size. Each vector slot indicates the presence or absence of the vocabulary word in the document (0 or 1). In practice, instead of 0/1, the frequency of the word in the text is used, offset by the frequency of the words across all texts (tf-idf weighing scheme). In this study 12,377 notes were used as training data and the dimension of the vocabulary was 4,032. This “bag of words” approach resulted in a precision of approximately .9 and recall of .88. (Figure used with permission from the authors)

REFERENCES:

- Apostolova, E., White, H., Morris, P., Eliason, D., and Velez, T. 2017. “Open Globe Injury Patient Identification in Warfare Clinical Notes.” Annual Meeting of American Academy of Ophthalmologists, New Orleans, LA, November 11-14, 2017
- Apostolova, E., White, H., Morris, P., Eliason, D., and Velez, T. 2017. “Open Globe Injury Patient Identification in Warfare Clinical Notes.” Annual Symposium of the American Medical Informatics Association, Washington, DC, November 04 - 08, 2017.

