Detecting health outcomes from medical text records

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**Introduction**
An Outcome is a measurement or an observation used to capture and assess the effect of a treatment [1]. Automating Outcome Detection (OD) could speed up access to evidence necessary in health care decision making. Given a sentence, “There was no significance between group difference in the incidence of wheezing or shortness of breath”, OD extracts outcomes such as those underlined and in bold font.

OD has however previously been hindered by an absence of a consensus on how outcomes should be reported and classified. Moreover, datasets like EBM-NLP [2] supporting OD have been found erroneous [3] with flaws like,

- **Flaw 1**: Inclusion of unnecessary text. - statistical metrics e.g. mean arterial pressure - Clinical measurement tools e.g. “Quality of life Questionnaire”
- **Flaw 2**: Failure to identify independent and granular outcomes. e.g. “cardiac arrest and heart failure”
- **Flaw 3**: Imprecise outcome annotations. e.g. “Suicidal Ideations” annotated as a depression.

**Methodology**

**Rule based syntactic chunking** will eliminate un-necessary text including metrics, contextually comparative POS, punctuations.

\[
\text{lower}[\text{NIR}]\text{maternal/}[\text{NN}]\text{attachment/}[\text{NN}].
\]

**spaCy POS tagger** pre-trained on 6,700 medline sentences annotated with 60 POS tags.

\[
\ldots \text{lower maternal attachment} \ldots
\]

**Figure 1:** Part-Of-Speech (POS) Tagging and Rule-based Chunking to build EBM-NLP

**Table 1:** F1 (%) for OD on original and revised version of EBM-NLP, including when only Flaw 2 is corrected.

**Table 2:** F1 (%) for OD using in-domain CLMs

**Conclusion**

ODD identifies an outcome span \(t_{oa} \in Y\) for \(\mathcal{D}\) where, \(|N| \leq M\)

\[
h_n = \text{BioBERT}(w_n) + \frac{1}{|\mathcal{D}|} \sum_{i=1}^{\mathcal{D}} \text{BioBERT}(w_n)\]

\[
E' = A(1) h_n^\top + A(2) h_n^2
\]

\[
L_{osd} = -\sum_{n=1}^{N} \sum_{i=1}^{|\mathcal{D}|} y_{ni} \log(\hat{y}_{ni}).
\]

**Table 3:** OD and OC performance F1 (%) on EBM-COMET

**References**