Title
Tracking Resident Cognitive Maturation with Natural Language Processing

Permalink
https://escholarship.org/uc/item/7fq5d0xj

Journal
Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health, 19(4.1)

ISSN
1936-900X

Authors
Lui, A
Chary, M
Yoneda, N
et al.

Publication Date
2018

License
CC BY 4.0
Tracking Resident Cognitive Maturation with Natural Language Processing


Background: Cognitive maturation, the development of the ability to manage patients independently, is an important goal of graduate medical education. In contrast to assessments of procedural competency or knowledge base, there is no structured transparent scalable way to track the cognitive maturation of residents. An important component of residency training is the solicitation of evaluations by attending physicians to gauge a resident’s performance and provide actionable feedback. These evaluations provide insight into cognitive maturation, but their analysis is time-consuming and subjective.

Educational Objectives: We developed software to analyze freetext evaluations of residents that attendings conducted after each clinical shift in the Emergency Department. The software uses natural language processing to automatically identify areas for improvement or commendation, based on milestones set by the Accreditation Council for Graduate Medical Education and American Board of Emergency Medicine. Our underlying conceptual hypothesis is that linguistic markers track the development of medical decision making, which we term cognitive maturation. The software is written in Python and freely available, with extensive documentation, on GitHub.

Curricular Design: In this proof-of-concept study we simulated faculty evaluations from 100 residents over the course of one year. The resident performance was created from four archetypes, the rock star, the late bloomer, the laggard, and the work horse. The tone of the faculty evaluation was created from four faculty archetypes: laconic, effusive, disapproving, or diligent. It correctly identified 22/25 notes where the “laggard” archetype predominated.

Impact/Effectiveness: Ours is the first demonstration of natural language processing to use faculty evaluations to track the cognitive maturation of residents. This innovation may help facilitate automatic pervasive real-time tracking of resident progress, identifying competency-based developmental progression or deficits and allowing for early initiation of tailored educational interventions. Automation also provides an opportunity to include novel data streams, such as clinical documentation, in tracking resident progression.