Machine Learning Algorithms: A New Screening Approach for Inpatient Violence

FUNDED BY THE UNIVERSITY OF WASHINGTON'S PATIENTS ARE FIRST INNOVATION PILOT 2022 GRANT

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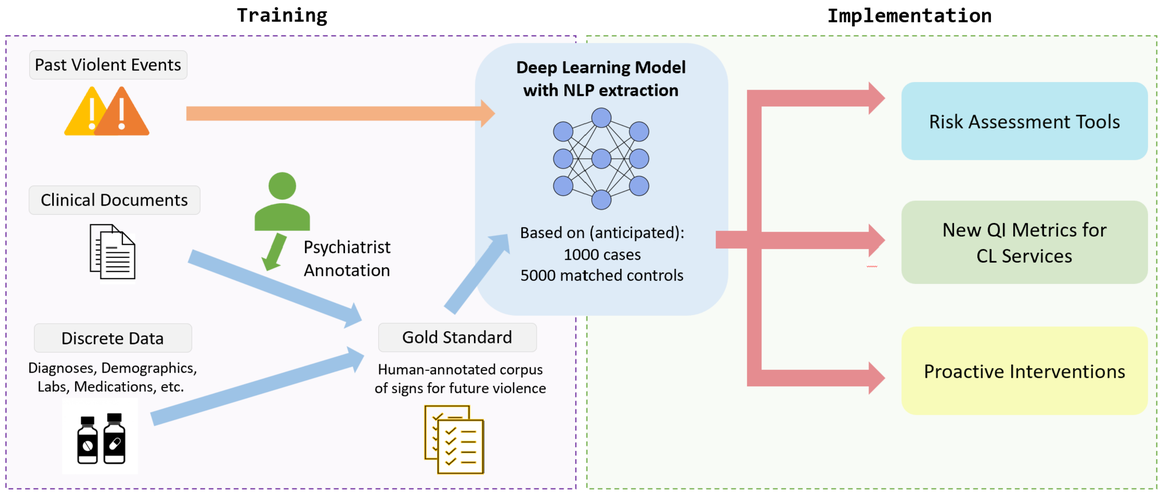
HYPOTHESIS

Violence risk against health care workers (HCW) can be **flagged and predicted ahead of time** by analyzing natural language descriptions of past patient events.

LITERATURE REVIEW

- Patient violence is a growing threat for health care worker (HCW) safety and workforce turnover[1]
- Violence risk is higher within clinical units that are under-staffed or under-coordinated[2]
- Restraints and indignities reflect HCW biases, varying by race, poverty, and psychiatric conditions[3]
- HCW inexperience, insecure attachment style,[4] and anxious affective state[5] increase victimization risk
- "Safety Risk Flagging," without better care, is ineffective and may actually trigger violence in certain subgroups[6]
- Effective risk mitigation relies on resource-intensive methods of surveillance,[7] behavioral liaison to HCWs[8] and administrative support[9]
- Algorithmic case-finding methods can prioritize clinical proactive consultations[8]
- Complex psychosocial risk factors that predict violent behavior are often found only in natural language[10]
- New tools sensitive to the dynamic patient-HCW relationship are needed for early identification of patients at risk of violent events to promote safe, equitable and dignified care[11]

METHODOLOGY



SAMPLE ANNOTATED CLINICAL NOTE AND VIOLENT EVENT (de-identified)

CHIEF CONCERN / IDENTIFICATION:

51-year-old male with a history of metastatic small cell lung carcinoma, COPD, TBI and methamphetamine use who presents from shelter with shortness of breath.

HISTORY OF PRESENT ILLNESS:
HPI limited due to patient respiratory distress.

He presents to the ED today due to shortness of breath that has been going on for "weeks" with cough productive of yellow sputum. Per EMR, he was recently admitted to the acute care service and at that time was noted to have 4 months of shortness of breath with productive cough. He had already been evaluated at an outside hospital in December and planned for outpatient bronchoscopy but did not follow up. The pulmonary team evaluated him and recommended an inpatient bronchoscopy as well as adrenal node biopsy due to concern for malignancy. Unfortunately, before he was able to undergo work-up he became agitated and left against medical advice. Pulmonary notes document that the team had expressed concerns regarding lung cancer, but it was unclear if he understood these conversations as he had no recollection of being told about the lung cancer on a later visit.

Code Gray Event Summary

Event Details
Date/Time call received: 1838
Location:

Reason for Code Gray: Elopement - Patient attempting to leave but had been determined to not have decisional capacity.

Provider Notification: Contacted

Interventions: Medication, Verbal de-escalation and Restraints- verbal redirection, 4 point restraints, haldol.

Psychiatry Liaison Service Consult: Yes

ITA Status: No

Disposition: Patient remained on unit

Family Present: No

Time Code Gray Completed: 1900

KEY:
Social determinants of health
Psychiatric diagnoses
Patient behaviors

CHALLENGES

- Risk prediction algorithms must be proactively surveilled for encoded biases that promote inequities and iatrogenic harms, including involuntary care
- Analysis of QI-protected information in HCW reports poses complex legal risks and is subject to strict administrative scrutiny
- Interventions to teach de-escalation skills and resilience in HCWs at risk of victimization may be mis-interpreted as blaming victims
- Risk-prediction tools based on high-dimensionality data require scaling by orders of magnitude, which will require standardized datasets, methods, and multi-center collaboration

POTENTIAL APPLICATIONS

- Generate a daily triage list for a proactive multidisciplinary psychosocial consultation team to deliver timely clinical interventions
- Identify targets for HCW support and education such as hand-off, de-escalation and resilience
- Create novel metrics for CL e.g., indignity for QI
- Highlight to hospital administrations the overlapping process, staffing and environmental factors in violence risk

REFERENCES (scan here)