A Review of Predictive Modelling in Hypertension Based on Using Risk Factors to Predict Cardiovascular Consequences: A Targeted Literature Review (TLR)

Dennis Xuan, Lizheng Shi
Department of Health Policy and Management, School of Public Health and Tropical Medicine, Tulane University

Tulane
SCHOOL OF PUBLIC HEALTH AND TROPICAL MEDICINE

INTRODUCTION

- Hypertension is a chronic condition that if left unmanaged, will result in significant clinical, humanistic, social, and economic burdens for patients.
- These outcomes are closely associated with various socio-demographic variables, risk factors, comorbidities, and disease management/intervention strategies.[1,2]
- Predicting outcomes associated with hypertension is critical towards providing support for disease management and downstream event prevention and can be done via predictive modeling.
- Predictive modelling can provide this critical support for hypertension management and downstream event prevention but requires a deep understanding of the progression pathway as well as the association of risk factors with outcomes.

Figure 1.1 Predicting Outcomes and Disease Burden

- A targeted literature review (TLR) was thus conducted to study potential predictive variables and outcomes of interests as well as existing models to support the development of such a model based on patient characteristics.

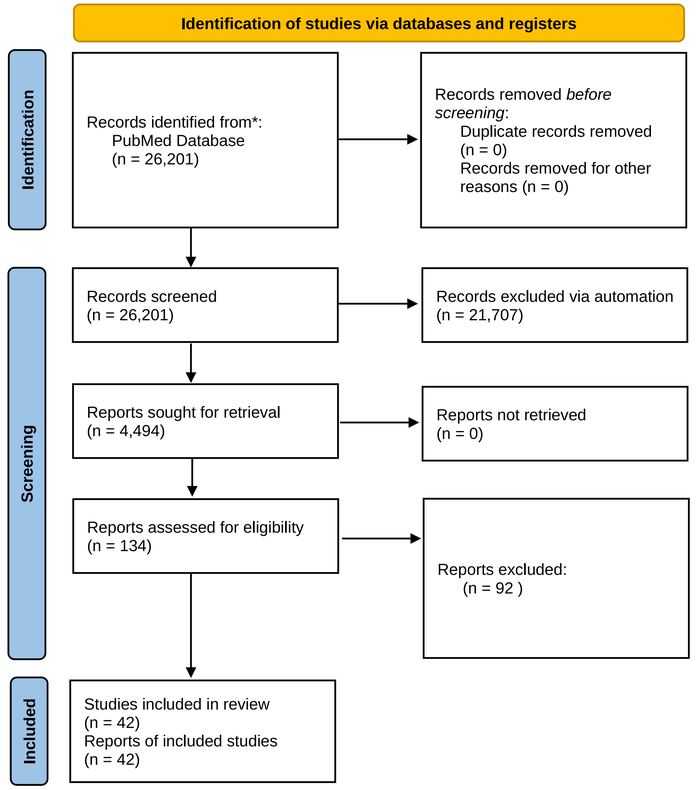
AIMS

- To describe the literature and scientific landscape of machine learning and predictive modeling with respect towards Hypertension
- To map a pathway of disease progression and highlight key risk factors associated with hypertension and downstream outcomes

METHODOLOGY

- A literature review was conducted through 2022 analyzing the disease burden of hypertension with a focus on existing tools for predictive economic outcome modeling and unmet needs in this space.
- The primary database searched was PubMed and the search window conducted spanned from January 1, 2017, to July 31, 2022.
- The search strategy combined terms for hypertension with terms for cardiovascular disease, obesity, machine learning, risk analysis, and predictive modelling.

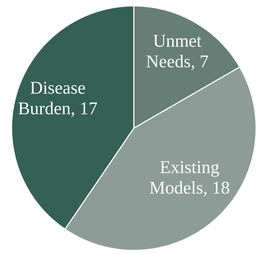
Figure 1.2 PRISMA Diagram



- After the initial screening of titles and abstracts, 25 references were selected for abstraction with an additional 17 papers added through hand searching.

RESULTS

Figure 1.3 Literature Distribution



- Risk Factors:
  - Age
  - Sex
  - BMI
  - Behaviors
  - Parental history
  - Diabetes
- Predictive models followed a cohort population and applied regression analysis onto patient characteristics and risk factors in determining the outcome of interest.
- Outcomes included but were not limited to
  - Stroke
  - Heart failure
  - Kidney disease
  - Death
- No model specifically focused on hypertension
- Generalized need in predictive models for external validation and constant calibration

CONCLUSIONS

- Hypertension and its outcomes have major global implications towards population health and economics.
- There is a capability gap in predicting the hypertension progression from patient characteristics and risk factors.
- Comprehensive and robust models would be invaluable towards shaping hypertension prevention, care, and management.

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To make a suggestion, contact: dxuan@tulane.edu

References

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