Can Pain and Opioid Use Patterns Signal Early Disease Risk?

Mary Ogbuka kenneth

1 Background / Motivation

- Pain is a common early symptom of many chronic diseases, but it's often overlooked.
- When doctors prescribe strong opioid painkillers, it could be an early sign of a hidden health problem.

2 Objective

To find out if pain and opioid prescription patterns can help us predict serious diseases before they get worse.

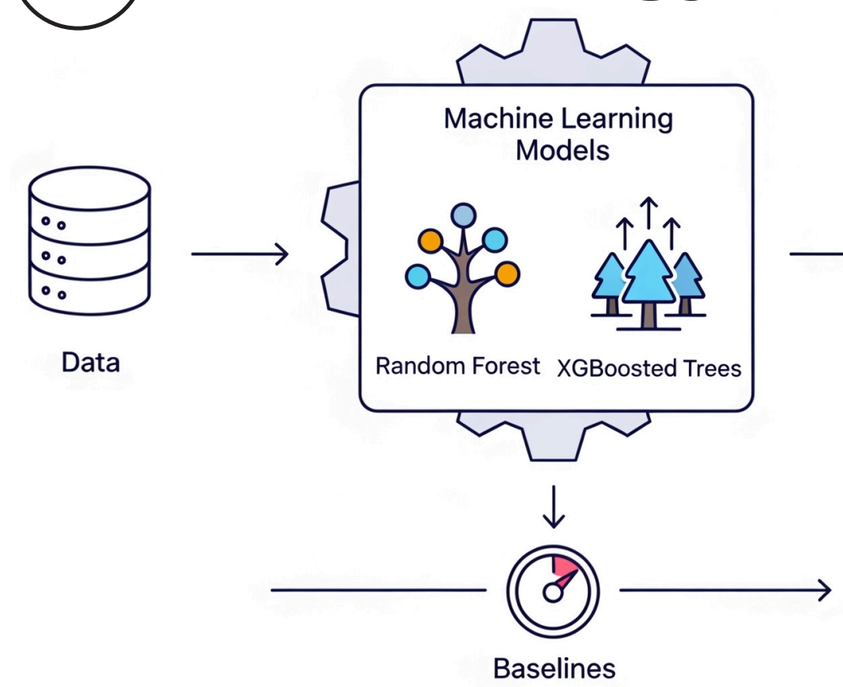
3 Data & Feature Engineering

Data Source: Mapped diagnoses to 445 Clinical Classifications Software Refined (CCSR) groups and 21 Body Systems.

What We Analysed

- Prescription timing and frequency (in 12 & 24-month windows).
- Dosage patterns using Morphine Milligram Equivalent (MME) - A standard measure to compare the potency of different opioids and assess overdose risk.
- ICD-10 diagnostic codes

4 Methodology



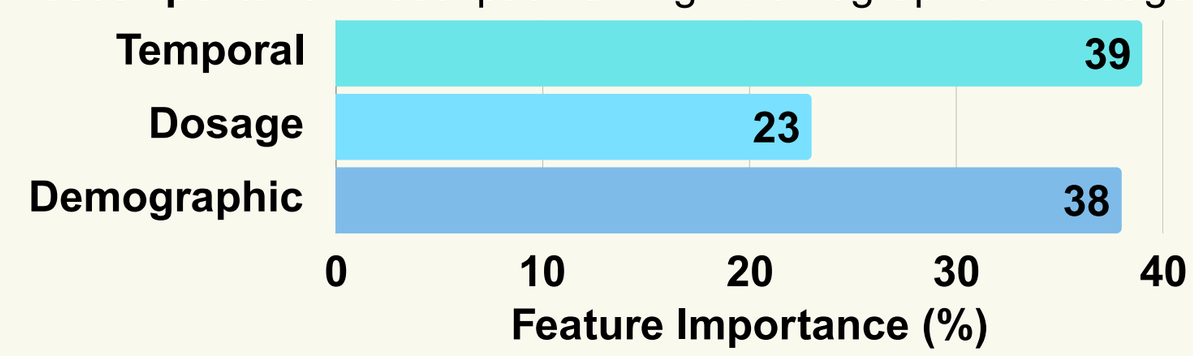
"Random guess" model & "demographics-only"

5 Results

Best Model: Random Forest Performance (Body System)

Method	ACC	Sensitivity	Specificity	AUC
Random baseline	10%	6%	94%	0.50
Demographics	17%	6%	95%	0.54
All Data	**23%**	**14%**	**95%**	**0.59**

Most Important: Prescription timing >Demographic > Dosage



Most Predictive Diseases:

Musculoskeletal (Score: 0.42) → osteoarthritis, spine disorders
Neoplasms (Score: 0.31) → pancreatic cancer, metastatic Cancer
Digestive (Score: 0.40) → inflammatory bowel disease, pancreatitis
Genitourinary (Score: 0.30) → kidney stones, endometriosis

6 Insights

💡Pain patterns predict disease before diagnosis
⏰When prescriptions occurred relative to diagnosis **>** How much
🤖 AI enables early screening

7 Conclusion

Pain-related features, especially opioid use patterns, serve as valuable early indicators for multiple disease categories.

8 Limitations & Future Directions

Limitation: Missing over-the-counter analgesic use may underestimate pain burden.

Next Steps:

- Integrate pharmacy/patient-reported data
- Validate models in clinical practice

Acknowledgements

Dr. Cynthia

Anastasia

Cecilia

Marirena

Thanks to this amazing lab family for all their support!

Image sources: Google Gemini

UK Dementia Research Institute

#10000 BLACK INTERNS

UK Health Data Research Alliance

HDRUK Health Data Research UK