

Dynamics of ice Ih films upon methanol adsorption : quasielastic neutron scattering experiments and molecular dynamics simulations

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Predictive models for drug-induced myopathy

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Abstract

Drug-induced myopathy is a serious adverse event that can lead to rhabdomyolysis and acute kidney injury. We developed predictive models using machine learning algorithms trained on clinical and genetic data to identify patients at risk. Our best model achieved an AUC of 0.87 on a held-out test set.

Introduction

Statins are among the most widely prescribed medications worldwide. While generally well tolerated, they can cause myopathy ranging from mild muscle pain to severe rhabdomyolysis.

Figure 1. Incidence of statin-associated myopathy by dose.

Risk factors include advanced age, female sex, polypharmacy, and genetic variants in SLCO1B1.

Methods

We used a retrospective cohort of 12,400 patients. Features included demographics, concomitant medications, laboratory values, and genotype.

$$\text{AUC} = \int_0^1 \text{TPR}(\text{FPR}^{-1}(x))\,dx$$

We compared logistic regression, random forest, and gradient boosting.

Figure 2. Receiver operating characteristic curves.

Results

Gradient boosting outperformed the other models. Calibration was acceptable after isotonic regression.

Model	AUC	Sensitivity	Specificity
Logistic regression	0.81	0.74	0.78
Random forest	0.85	0.79	0.82
Gradient boosting	0.87	0.81	0.84

Table 1. Performance on the held-out test set.

Figure 3. Calibration plot for the gradient boosting model.

Discussion

Our models can support clinical decision-making by flagging high-risk patients before therapy is initiated. Limitations include the retrospective design and missing genotype data for 18% of patients.

Conclusion

Machine learning models can accurately predict drug-induced myopathy and may help reduce preventable harm.

References

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