Identification of Risk Factors for Anti-osteoporosis Drug Use: An Autoencoder Model for Feature Detection

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BACKGROUND

Patterns of drug use in actual clinical practice are not well-understood.

We propose a data-driven approach to detect features from a set of clinical risk factors related to anti-osteoporosis drug (AOD) use.

Our aim is to identify under-studied population sub-groups, so as to ultimately inform regulatory decision making.

METHODS

Source – The SIDIAP Database (anonymized, electronic primary care medical records for >80% of the population of Catalonia, Spain).

Data – Data from 37,996 incident users of AOD (2007-2014) with complete data on fracture risk factors was analysed.

Variables – 12 risk factors (based on NICE guidelines): age, gender, body mass index, smoking, alcohol drinking, Charlson index, fracture history, and current use of steroids, sedatives, HRT/contraceptives, anticoagulants, and aromatase inhibitors.

Methods – An unsupervised machine learning model called autoencoder was used to detect important features of the population. An autoencoder learns which of a given set of risk factors (features) "characterise" a dataset by attempting to reconstruct (i.e. estimating the identity function $f(x) = x$).

CONCLUSION

Our study proposed a novel approach for determining the characteristics of a population of AOD users. Further research is needed on the use of this method for drug utilisation research, especially for high-volume, high-dimensional data.

Features of the AOD population

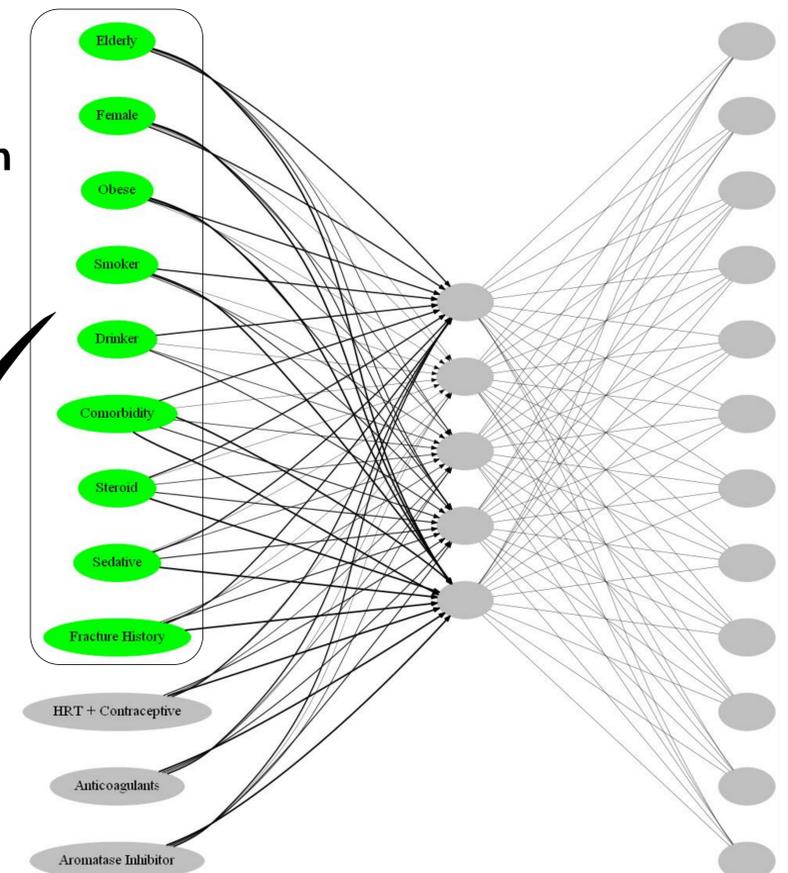In agreement with independent clinical expert opinion ✓

Figure. A 12-5-12 autoencoder model with an input, hidden, and output layer.

RESULTS

The autoencoder model detected 9 risk factors as important features: age, gender, body mass index, smoking, alcohol drinking, fracture history, co-morbidity, sedative use, and steroid use. Anticoagulants, aromatase inhibitors, and HRT/contraceptives were not considered important features. **Results agreed with that of independent clinical expert opinion, on factors considered by GPs when prescribing AODs.**

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