Manganese (Mn) over-exposure in occupational settings is associated with basal ganglia toxicity and a movement disorder characterised by parkinsonism (i.e., the signs and symptoms of Parkinson disease). A simple test to help non-neurologists identify workers with clinical Mn neurotoxicity represents an unmet need.

Methods Using a cohort of 536 Mn-exposed workers, age ≤65 years, from welding worksites, with extensive clinical data, we developed a linear regression model to predict the Unified Parkinson Disease Rating Scale motor subscale part 3 (UPDRS3) score. We primarily considered factors easily obtainable in a primary care or occupational medicine clinic, including timed motor task results and selected symptoms/conditions. Secondarily we considered other demographic variables and welding exposure. We selected the model based on simplicity for clinical application, biologic plausibility, and statistical significance and magnitude of regression coefficients.

Results The final model contained age, timed motor task scores for each hand, and indicators of action tremor, speech difficulty, anxiety, depression, loneliness, pain and current cigarette smoking. When we examined how well the model identified workers with clinically significant parkinsonism (UPDRS3 ≥15), the receiver operating characteristic area under the curve (AUC) was 0.72 (95% confidence interval [CI] 0.67, 0.77). With a cut point that provided 80% sensitivity, specificity was 52%, the positive predictive value in our cohort was 29%, and the negative predictive value was 92%. Using the same cut point for predicted UPDRS3, the AUC was nearly identical for UPDRS3 ≥10, and was 0.83 (95% CI: 0.76 to 0.90) for UPDRS3 ≥20.

Conclusion Since welding exposure data were not required after including its putative effects, this model may help identify workers with clinically significant Mn neurotoxicity in a variety of settings, as a first step in a tiered occupational screening program.