Pharmacokinetic models of performance impairment as assessed in experimental studies

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Objectives:
Assessment of performance impairment by medicaments by means of a meta-analytic approach using published experimental studies and kinetics. Depiction of dose-dependent and concentration-dependent dynamics.

Methods:
A search in data bases concerning experimental studies (hypnotics and sedatives, anxiolytic benzodiazepines, antidepressants, neuroleptics, antihistamines) with at least one performance test under the effect of a medicament and kinetic experiments was conducted. According to defined criteria about 1,500 studies with about 34,000 test results were statistically evaluated.

Results:
The meta-analytic approach had to be restricted to studies with single oral applications in healthy subjects. Including the calculation of kinetics for each substance a “pharmacokinetic profile” could be established: the dose- and time-dependent dynamics in terms of percentage of significantly impaired performance results. After a curve fitting, the results were compared with the equivalent impairment by known concentrations of alcohol. Thus, it was possible to present curves on the concentration-dependent dynamics of a substance (correlation between concentration and percentage of performance impairment).
The performance results after multiple applications in healthy subjects and studies with ill persons were assessed by reviews. The results seem to demonstrate less severe impairment.

Conclusion:
It is possible to give dose-dependent recommendations regarding the duration of impairment in patients. The “danger” of agents can be compared with defined alcohol levels. Concerning “reality” it must be considered that the traffic-related “danger” of a medicament depends on more influencing variables than only on its performance impairment. In addition, the possible improvement of the underlying disease by the medication should be kept in mind.