Commentary

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Epidemiological investigation of prognosis

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Epidemiological investigation of prognosis

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Occupational epidemiology is most commonly used to investigate causes of disease or illness and to plan and evaluate preventive strategies. However, another important application lies in identifying and characterizing predictors of future outcomes so that risks can be better managed. For example, in deciding whether, and at what stage, a forklift truck driver who has suffered a single generalized epileptic seizure should be allowed to resume his job, we need to know the probability that he will experience a further sudden loss of consciousness while driving. This will depend on various prognostic indices, some more important than others.

Aetiological and prognostic investigations both explore the relation of an outcome (eg, the occurrence of a disease or some other adverse event) to risk factors, often using multivariate modeling. However, the optimal strategy for multivariate analysis differs according to the purpose of the study.

In an aetiological investigation, the aim is to estimate the causal impact of a risk factor, usually in terms of a relative risk or odds ratio. The risk that we would like to establish is that which would be found in a theoretical infinite randomized experiment. To this end, we adjust risk estimates from observational data for known and suspected confounders, these being factors that are statistically associated with the risk factor under investigation, and which independently determine the risk of the relevant health outcome. An ideal statistical model would adjust risk estimates for all confounding factors, but not for other variables which are not confounders.

In prognostic investigations, causation and confounding are irrelevant. It does not matter why a risk factor is related to an outcome, only the extent to which its occurrence or level is associated with a different probability of the outcome. The best analytical model will include those risk factors which, in combination, predict individual probabilities of the outcome most efficiently. This entails a trade-off between the increased discrimination of risk, when an extra risk factor is incorporated in the statistical model, and the added costs that would be entailed in ascertaining or measuring that risk factor if it were to be used in clinical practice. Even if they are significantly related to the outcome of interest, risk factors may not be worth including in a prognostic model if they are expensive to measure or associated with little difference in the probability that the outcome will occur.

The paper by Detaille et al (1) describes a systematic review of prognostic factors for work disability among employees with various chronic diseases. Knowing the important predictors of disability in such workers would be of practical value when making decisions about their employment; the review points to several factors that might be useful for such a prediction. However, the method of analysis has major limitations and the discussion of future research needs is misleading.

The authors synthesized the evidence according to a grading system, based on the number of identified relevant studies, and the proportions of those that showed statistically significant positive or negative associations between a risk factor and the outcome under consideration. Detaille et al adopted this approach because they felt it combined the "statistical rigor" of meta-analyses to synthesize qualitative findings and the "flexibility" of traditional narrative reviews. However, unlike a good narrative review, the method did not take into account the potential magnitude and direction of bias in individual studies. Moreover, no consideration was given to the predictive value of risk factors, either alone or in combination. Thus, a risk factor could be classed as a strong predictor of an outcome if at least three relevant studies were found, with more than half of them showing a significant association in the same direction, and the rest finding no significant association

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in either direction. It would not matter that the probability of the outcome in someone with the risk factor was little different from that in someone without the risk factor, provided the difference was demonstrated in studies of sufficient size that it was statistically significant. Furthermore, if additional, small, and uninformative studies were published, in which there were no statistically significant associations, the level of evidence could be downgraded, even if two very large and well-conducted investigations had found the risk factor to be a powerful predictor. Given this limitation, little weight can be given to the reported grading of predictors, and risk factors identified in the review cannot be considered more than candidates for future research.

In their recommendations for further research, the authors advocate "a combination of strategies" with "more efficient control of confounding". As already explained, confounding is irrelevant in studies of prognosis. The need is for studies that systematically explore the probabilities (with associated confidence intervals) of poor employment outcome for combinations of risk factors that can reasonably be ascertained in routine clinical practice. For a predictive algorithm to be of practical value, the absolute differences in risk that it discriminates must be sufficiently large and they must apply to sufficient numbers of workers.

References

1. Detaille SI, Heerkens YF, Engels JA, van der Gulden JWJ, van Dijk FJH. Common prognostic factors of work disability among employees with a chronic somatic disease: a systematic review of cohort studies. Scand J Work Environ Health. 2009;35(4):261–281.