Research in Surgery

Epidemiological Metrics: Risk, Absolute Risk, Relative Risk, and Risk Reduction

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Abstract:

Risk is defined as the probability of a specific health outcome occurring within a specified population over a defined period. Absolute risk quantifies the incidence of an outcome within a group, while relative risk provides a comparative measure between two distinct populations, such as exposed and unexposed groups. These metrics are fundamental in clinical research for assessing disease prevalence and determining the efficacy of interventions.[1,2,4]

Introduction

Absolute risk represents the probability that an event will occur within a specified population over a designated timeframe. It measures the actual burden of a condition and is expressed as the proportion of affected individuals relative to the total population at risk. For example, if 20 out of 100 workers in a factory develop back pain, the absolute risk is 20%. In other words, absolute risk is defined as the number of people affected divided by the number of people at risk.[1,3,4,5]

Relative risk (RR) is a statistical measure used to compare the risk of an event between two groups. It is expressed as the ratio of the risk in the exposed (or intervention) group to the risk in the control (or unexposed) group. RR is a primary metric in longitudinal studies, including cohort and prospective designs.[1-3]

For instance, consider two cohorts: in the first factory, 20 out of 100 workers experience back pain, and in the second, 30 out of 150 workers experience the same. Relative risk is expressed as a ratio; thus, the relative risk ratio comparing workers in the first factory to those in the second is (20/100) ÷ (30/150) = 1.0.[1-3]

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If an intervention—such as a daily 30-minute exercise program—is implemented in the first factory and the incidence of back pain declines to 8 out of 100 workers, the risk in the intervention group becomes 0.08. Compared to the control group risk of 0.20, the relative risk is 0.40. This indicates that the risk of back pain in the intervention group is 40% of that observed in the control group, representing a 60% relative reduction in risk.[4,5]

Risk Reduction Measures: The effectiveness of an intervention is quantified using two primary metrics:

a. Absolute Risk Reduction (ARR): ARR represents the arithmetic difference in risk between the control group and the intervention group. In this case, the intervention resulted in an absolute risk reduction of 12%.[1,2,4,6]

b. Relative Risk Reduction (RRR): The RRR quantifies the proportional decrease in risk compared to the control group. Consequently, the intervention resulted in a 60% relative reduction in risk.[1,2,4,6]

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