MAKING ONE-SIDED INFERENCES IN TWO-SIDED MULTIPLE SIGNIFICANCE TESTING DO WE, NEED WE, CONTROL THE FAMILY-WISE-ERROR RATE?

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In clinical trials, it is customary to use two-sided statistical tests at 0.05 level of significance when comparing treatment groups, for example, comparing a new drug vs. placebo. This essentially ensures that the type-1 error for a one-sided inference is 0.025 (as it is customary to split type-1 error equally). When multiple endpoints are used, a control of the Family-Wise- Error (FWE) is indicated. If the single endpoint scenario of controlling the one-sided inference is desired, then an approach of controlling the probability of at least one false rejection in favor of an active drug vs. placebo at 0.025 will ensure the control of the FWE at 0.025. In this presentation we focus attention on some popular simple multiple tests procedures, including the single-step and step-down and step-up Bonferroni, procedures. We show both theoretically, and using simulation, that while the single-step, and step-down Bonferroni procedures indeed control the FWE at the desired level for the one-sided inference, the step-up Bonferroni procedures do not, if used in conjunction with two-sided tests. To have control of the one-sided inference at 0.025, one can use the one-sided version of these procedures.