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Surgical Procedure Analysis Report

Research Objective: An experimental surgical procedure is being studied as an alternative to the existing method. Twelve surgeons perform the operation on two different patients matched by sex, age and other relevant factors. The time to complete the procedure for each technique is listed in the table below. Determine whether or not the new procedure is faster than the existing procedure. Alpha is .01 Utilize the six step process to test the hypothesis the new procedure is faster the than the old procedure. One tailed test to the left.

Time to Complete	1	2	3	4	5	6	7	8	9	10	11	12
New Procedure	14	12	14	13	10	13	12	10	13	13	18	27
Old Procedure	29	42	30	32	56	31	27	19	23	28	26	29

Problem Definition –

Is the new surgical procedure faster than the existing surgical procedure?

Hypothesis –

H_0: $\mu_d \geq 0$

H_1: $\mu_d < 0$

Decision Rule –

If T critical ratio greater than -2.718 reject the null hypothesis.

Test –

Paired T-Test and CI: New Procedure, Old Procedure

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
New Procedure	12	14.08	4.56	1.32
Old Procedure	12	31.00	9.60	2.77

Estimation for Paired Difference

Mean	StDev	SE Mean	99% Upper Bound for μ_difference
-16.92	11.47	3.31	-7.92

μ_difference: mean of (New Procedure - Old Procedure)

Test

Null hypothesis	H_0: μ_difference = 0
Alternative hypothesis	H_1: μ_difference < 0

T-Value	P-Value
-5.11	0.000

Conclusion –

1. T Critical ratio of -2.718 is > than the critical value of -5.11. Reject the null, there is a 1% chance that T1 error has occurred.
2. The upper bound confidence interval of -7.92 does not contain zero, reject null.
3. Pvalue of 0.000 is < alpha of 0.01 = Reject Null.

Interpretation –

Compared to the old procedure the new procedure was completed in 7.92 minutes or less. The new procedure should be adopted for all surgical procedures due to its faster completion time.

Assumptions –

The graph median falls almost at the center at the center of the mid-spread along with the sample mean and hypothesized mean. The whiskers at either end of the plot indicate the distribution is skewed to the negative but the samples are too small, so we give them the benefit of the doubt.