Sample Statistics Hypothesis Test | www.expertsmind.com | Statistics Assignment Help

BACKGROUND:

All major joint replacement surgery, such as Total Knee Replacement (TKR) and Total Hip Replacement (THR), will result in significant blood loss for patients with a resultant post-operative drop in Hb (haemoglobin) concentration. This may impact on the post-operative recovery phase and length of stay in hospital.

HYPOTHESIS:

Is there a statistically significant difference in the mean reduction of Hb following THR ($\mu 1$) in comparison to the mean reduction of Hb following TKR ($\mu 2$)?

The null hypothesis: $Ho = \mu 1 - \mu 2 = 0$

The alternative hypothesis: $H1 = \mu 1 - \mu 2 \neq 0$

METHODS OF DATA COLLECTION:

Data was collected by qualitative retrospective analysis of patient computer records using simple random sampling historically by date of the last n=30 male patients that had undergone TKR and the last n=30 male patients that had undergone THR in the hospital. Normal haemoglobin values differ for males and females, and therefore males only were selected for this study. The mean age of patients undergoing TKR was 69, with the mean age for THR being 65.

The pre-operative Hb was compared with the post-operative Hb in all patients, and the drop in Hb recorded.

RESULTS:

1. The mean Hb following THR was calculated at 2.68, with a standard deviation of 0.83. Thus μ1=2.68, S1= 0.83, n1=30

2. The mean Hb following TKR was calculated at 2.36, with a standard deviation of 0.78. Thus μ2=2.36, S2=0.78, n2=30

3. The level of significance was set at α=0.05

4. The test statistic for the hypothesis test about μ1-μ2 with σ1 and σ2 unknown, was computed at t=1.54

5. The degrees of freedom was calculated at 58.07 and was rounded down to 58

6. Using the t distribution table with t=1.54 at 58 degrees of freedom, the area in the upper tail to the right of t is between 0.10 and 0.05. Because this test is a two-tailed test, we double these values to conclude that the p-value is between 0.20 and 0.10

7. As this p-value is greater than α =0.05, we do not reject Ho

CONCLUSION:

Based on the sample studied, there is not a statistically significant difference in the mean reduction of haemoglobin concentration following THR in comparison to the mean reduction of Hb following TKR.

Solution:

Given:

Sample I

Sample size = n1 = 30

Sample mean = $\bar{x}_1$= 2.68

Sample standard deviation = s1 = 0.83

Sample II

Sample size = n2 = 30

Sample mean = $\bar{x}_2$= 2.36

Sample standard deviation = s2 = 0.78

To test:

Null hypothesis Ho: μ_1=μ_2

Alternative Hypothesis: H_1: $\mu_1 \neq \mu_2$

To find: Probability of type II error

Power of test.

The probability of type II error is the probability that we are not rejecting the null hypothesis when the alternative hypothesis is true.

In this case we have the alternative hypothesis H_1: $\mu_1 \neq \mu_2$, but this does not clearly mention that which are the values of population parameters μ_1 and μ_2, so standard method of finding type II error fails here. We handle this situation using following program in R software.

```
> m1=2.68                    # first sample mean
> m2=2.36                    # second sample mean
> sd1=0.83                   # first sample standard deviation
> sd2=0.78                   #second sample standard deviation
> num1=30                    # first sample size
> num2=30                    # second sample size
```



```
> se <- sqrt(sd1*sd1/num1+sd2*sd2/num2)          # finding standard error
> left <- qt(0.025,df=pmin(num1,num2)-1)*se# here qt() finds inverse probability at 0.025
> right <- -left
> tl <- (left-1)/se
> tr <- (right-1)/se
> probII <- pt(tr,df=pmin(num1,num2)-1) - pt(tl,df=pmin(num1,num2)-1)     #pt gives probability of t tistribution
> probII
[1] 0.004913492
```

This is the required probability of type II error.

Hence $\beta = 0.004913492$

Now we know that the power of test = 1 - β

```
> power <- 1-probII

> power

[1] 0.9950865
```

Hence the power of test = $1 – \beta = 0.9950865$.

Refer Link: http://www.expertsmind.com/statistics-homework-assignment-help.aspx