

1. Answer the following questions regarding the study in Exercise 6.20. (Data file: Chapter 6/ex6-20.csv)

- (a) Present a short description of the study and the data, including summary statistics for each variable.

A study is reported on the influence of alpha interferon administration in the treatment of patients with multiple myeloma (MM). Twenty newly diagnosed patients with MM were entered into the study. Ten patients were treated with both intermittent melphalan and sumiferon (treatment group), whereas the remaining ten patients were treated only with intermittent melphalan. The Serum beta-2 microglobulin (SB2M) levels were measured after a certain period of treatment.

Variables:

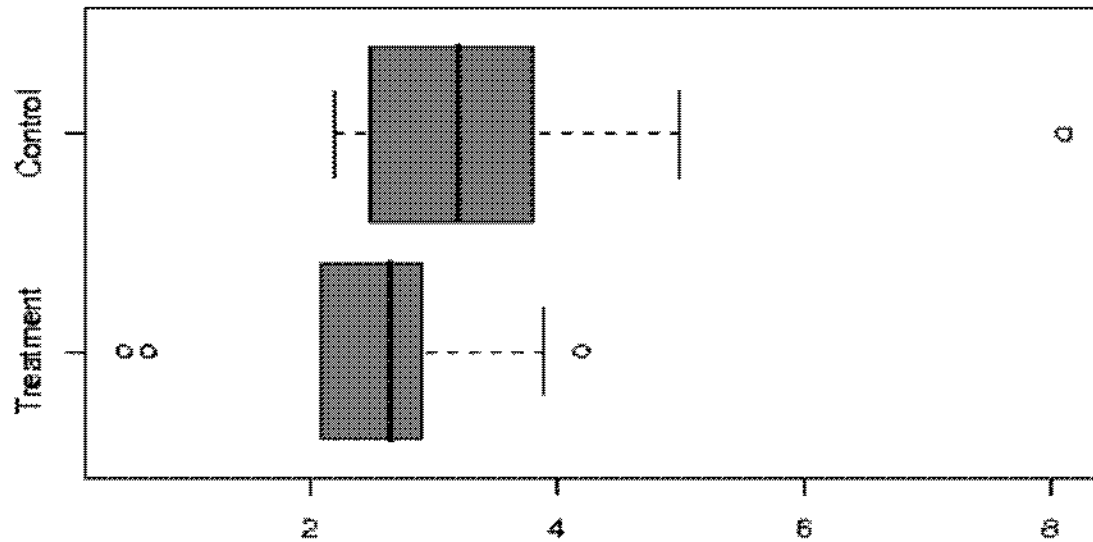
Treatment: SB2M levels of patients treated with both intermittent melphalan and sumiferon.

Control: SB2M levels of patients treated only with intermittent melphalan.

Summary statistics:

Variable	Mean	S.D	L.Quartile	Median	U.Quartile
Treatment	2.45	1.181571	2.125	2.65	2.85
Control	3.68	1.764968	2.6	3.2	3.75

(b) Present the comparison of the two groups in boxplot. Then comment on the data based on the visualization.



SB2M levels in Control group appear to be higher.

Sizable proportion of the data in treatment group is considered as outliers. Thus, it is difficult to justify the normality assumption.

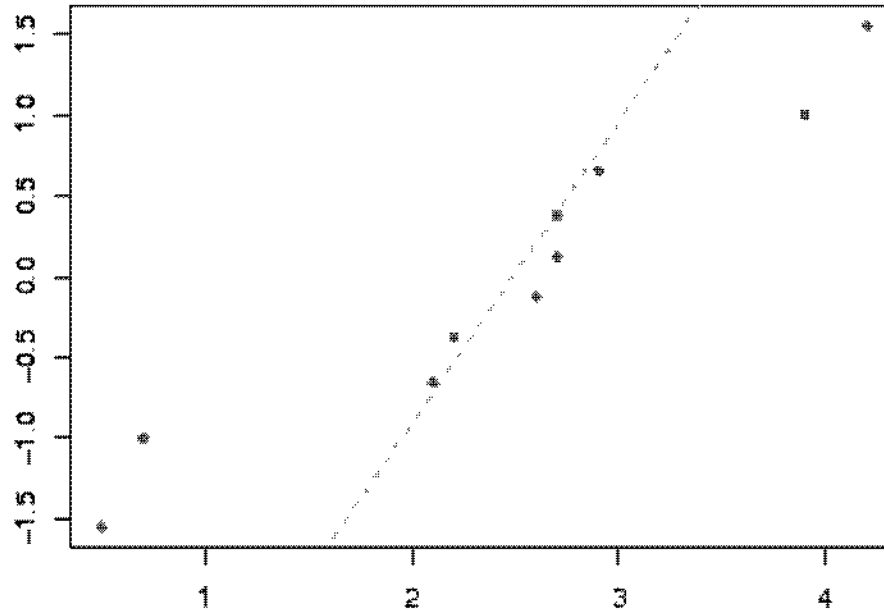
(c) Construct the null and the alternative hypothesis to determine whether there is a difference in the distribution of SB2M for the two groups.

Null hypothesis is that the distribution of treatment group is equal to that of control group.

Alternative hypothesis is that they are different.

(d) Construct QQ normal plot for each group. Based on the findings in the plots, which procedure, t-test or Wilcoxon test, appears more appropriate for comparing the two groups?

QQ plot for treatment group

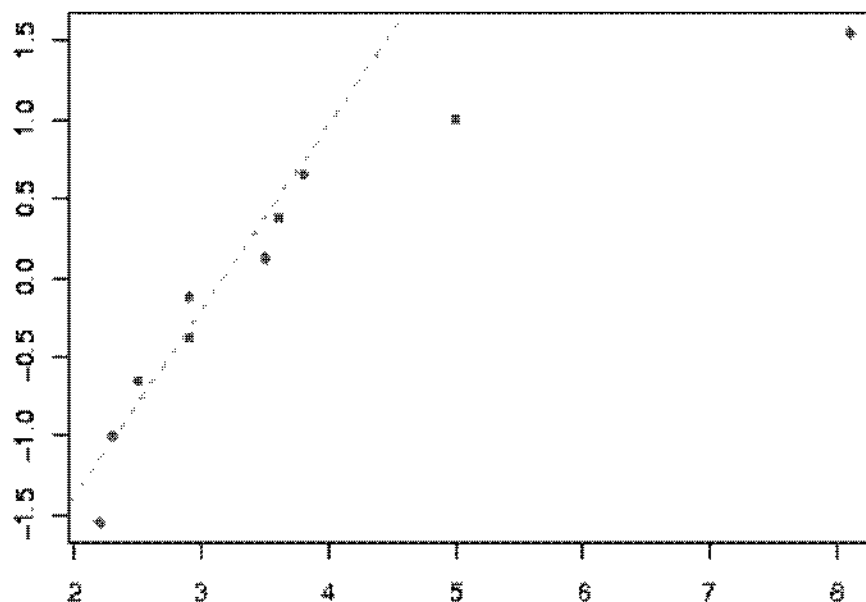


QQ plot indicates a sizable portion of data is off the straight line.

Normality assumption cannot be justified.



QQ plot for control group



Wilcoxon test would be more appropriate.

(e) Discuss your findings on the evaluation of the influence of alpha interferon.

Result of Wilcoxon test

lower bound	upper bound	p.value
-2.099968	0.09994508	0.129702

90% C.I. for the shift

The result is not significant. There is no statistical evidence to support the difference.

Result of t -test

Procedure	lower bound	upper bound	p.value
General	-2.403926	-0.05607	0.086078
Pooled	-2.394695	-0.06531	0.083661

90% C.I. for the mean difference
 $\mu_1 - \mu_2$

The p-values from t -test are slightly smaller. But they may not be reliable as guaranteed by the theory.

The reason is that the data do not follow normal distribution and the sample size is small.

We recommend further study with larger sample size.