9. The Nonparametric Approach

The F-test applied to our data has the underlying assumptions of normality and equal variances for the five experimental groups. However, the graphical displays studied in Section 4 indicate that the assumptions might be violated. On the other hand, the numbers of observations in some groups (1, 4, and 5) are very small (below 10); it is difficult to detect nonnormality or departures from the equal variances assumption in such cases.

Under these circumstances, the nonparametric Kruskal-Wallis test procedure provides a very good alternative. This test finds frequent use whenever sample sizes are small and it may be less sensitive to departures from the assumption of equal variances, as compared to the F-test.

The Kruskal-Wallis test output in SPSS for our experiment is displayed below.

Kruskal-Wallis 1-Way Anova

VOLUME
by CODE

Mean Rank	**Cases**	**Group Code**
25.08	6	CODE = 1
30.35	10	CODE = 2
16.50	19	CODE = 3
5.00	1	CODE = 4
17.70	5	CODE = 5
Total	41	

Chi-Square	D.F.	Significance
11.6451	4	.0202

The p-value of the test is reported as 0.0202 indicating strong evidence against the assumption of no differences in the group means. This is consistent with the results obtained with the F-test.

Pooling over the cause of death the groups 1 and 2, and 4 and 5, we will obtain the following ANOVA table:

Kruskal-Wallis 1-Way Anova

VOLUME
by POOLED

Mean Rank	Cases	Group Code
28.38	16	POOLED = 1
16.50	19	POOLED = 2
15.58	6	POOLED = 3
Total	41	

Chi-Square	D.F.	Significance
9.9820	2	.0068

The variable POOLED was defined to pool the groups 1, 2 and 4, 5 over causes of death. As you can see, the small p-value of the test indicates strong evidence against the assumption of no differences in the group means.