# UNIVARIATE & MULTIVARIATE ANALYSES ON MOCCA TREATED PATIENTS +

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## Abstract

**The biometric analysis of survival time (measured from the date of diagnosis until the failure or censore) of 130 MOCCA treated patients who were observed at homatologia hospital with certain generalized plasmacytoma is investigated. Several common risk factors, such as hemoglobin, urea and Beta2M seem to influence the survival time. Both univariate and multivariate analyses were used. For univariate case, we have used Logrank and Gehan tests. The analysis of multivariate is based upon proportional hazard model.**

**المستخلص**

**التحليل الحيوي الاحصائي لزمن النجاة لبيانات 130 مريض المستحصل عليهم من احدى المستشفيات والذين كانو تحت فترة علاج يسمى موكا مقاس من زمن التشخيص الى حد الاخفاق او الفقدان للمرضه الذين يعانون من مرض سرطان الدم (بلاسيتوما خلايا مصل الدم) قد نوقشت احصائيا ، عدة عوامل خطرة مشتركة مثل الهيموكلوبين واليوريا و Beta2M يبدو لها تاثير في زمن النجاة . قمنا بعمل احصائيات وصفية كاملة مع التحليلين الاحادي والمتعدد ، في التحليل الاحادي استخدمنا اختبار Logrank وGehan اما في التحليل المتعدد فقد استخدمنا تحليل الانحدار المبني على أنموذج الخطورة النسبي Proportion hazard model. .**

## Introduction

In this paper a more detailed analysis is given to the data on 130 MOCCA treated patients who where observed at homatologia hospital. A major problem is to select from clinical covariables [1] measured at the time of diagnosis, important risk factors for survival time [2], that is the time from the treatment until the failure time, and to quantify their influences.

The data on 130 patients displayed in table 1 are given in the appendix. Although explanation below, the table should generally suffice, some further explanation on method of measurements will be given. All intake covariables from ($x_3$, … ,$x_{13}$) are measured just at time of diagnoses, the covariables are based on the median of 3 measurements.

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## Aim Of Research

The aim of this research is to predict the outcome of the respond covariable for particular individual from the outcomes of a selection of predicting 13 covariables. From these predicting covariables, we could recognize which of these covariables are giving better survival time than others or whether they give a negative or positive relationship with the survival time of patients by using Breslow [3] and Cox and Oakes [4] tests for univariate analysis and proportional hazard model (regression) [5,6,7] for multivariate analysis. Both analyses have been carried out by using statistical software BMDP [8].Descriptive statistics

(1) **Summary statistics**: In table $2^A$ a descriptive summary of data with respect to the most relevant covariables is given. It may be useful to have a look at it before attempting to select an appropriate set of predicting covariables [1]. From table $2^A$ one can see that BS and PP slightly are skewly distributed to the right. Almost all covariables have high and narrow peak and sharpest peak is at B2M, about 93 patient are greater than 60 years. The discrete covariables in table $2^B$, shows that most patients i.e. (about 70%) are censored, while only smaller fraction i.e. (30%) dead. The situation in filtration (ID) is more patients fall in category A and only 6 patients fall in category LP. About 129 patients out of 135 have normal area and very few patient (6) have exceeded their normality.

**Table 2.** Descriptive statistics of patients with MOCCA treatments

A. Continuous covariables

| Covariable | (min, M, max.) | SD | Skewness | Kurtosis |
|---|---|---|---|---|
| BS | (10, 80, 160) | 40.67 | 0.09 | 1.89 |
| HG | (12,115,152) | 21.10 | -1.08 | 5.76 |
| TP | (63, 89, 140) | 16.47 | 1.06 | 3.67 |
| PP | (8, 33.5, 96) | 18.55 | 0.77 | 3.06 |
| ID | (3, 30, 96) | 16.17 | 0.98 | 4.74 |
| AGE | (35, 60, 90) | 9.61 | -0.31 | 3.43 |

**B. Discrete covariables**

| **Covariables** | **percentage** | **category** |
|---|---|---|
| Infiltration | 9% | BL |
| | 33% | P |
| | 5% | LP |
| | 53% | A |
| Urea | 4.4% | high |
| | 95% | normal |
| Stage | 6.6% | I |
| | 48.1% | II |
| | 39.33% | III |
| | 5.9% | unknown |
| Censoring | 70% | censored |
| | 30% | dead |

(2) **Dependencies among covariables:** There may exist various associations among covariables. In tables $3^A$ and $3^B$ , the sample correlation

coefficients are displayed. Under hypothesis of independence between two covariables, the standard error of the sample correlation coefficient is given by $1/(n-1)^{1/2} = 0.0864$, regardless of the fact whether the joint distribution of these two covariables is continuous, discrete or mixed. Sample correlation coefficients in which at least twice this standard error are typed in bold face.

Note that it is difficult to determine which population coefficient is larger than other ones. Besides it is difficult to give a clear interpretation of such assertion if these corresponding marginal distributions are of different type.

**Table 3**. Pearson correlation matrix

A. continuous covariables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. BS | 1 | | | | | | |
| 2. Hg | **0.366** | 1 | | | | | |
| 3. TP | **-0.366** | 0.013 | | | | | |
| 4. PP | **-0.309** | **-0.271** | **-0.415** | | | | |
| 5. ID | -0.103 | **0.416** | 0.091 | -0.162 | 1 | | |
| 6. Age | 0.034 | 0.065 | **-0.233** | 0.021 | -0.043 | 1 | |
| 7. B2M | -0.061 | **-0.244** | 0.000 | 0.055 | **-0.265** | -0.157 | 1 |

"In sample correlation matrix that differs at least 2 standard error are typed in bold face"

B. Discrete covariables

| | 8 | 9 | 10 |
|---|---|---|---|
| 8. Urea | 1 | | |
| 9. Sex | -0.066 | 1 | |
| 10. Stage | -0.043 | -0.006 | 1 |

C. Between continuous & discrete

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 8. Urea | -0.133 | 0.005 | 0.112 | 0.081 | -0.268 | 0.080 | 0.020 |
| 9. Sex | -0.011 | 0.126 | 0.136 | -0.201 | 0.182 | -0.077 | 0.067 |
| 10. Stage | 0.016 | 0.116 | -0.880 | -0.106 | -0.077 | 0.126 | 0.168 |

From table $3^A$ one can see that at least the following associations seem to be manifestly present in the population. PP is lower when Hg (r = -0.271) is higher, and TP (r = -o.415) is higher. Age and PP are negatively correlated with TP and BS respectively. If one takes a look at table $3^B$ for correlation among discrete covariables, one can see that there exists no single relation.

Again take a look at table $3^C$ for correlation between continuous and discrete covariables. Urea is negatively correlated with B2M (r = 0.269), where sex has two associations with continuous covariable. The result of table 3(A,B,C) is summarized in the following table:

Table 4.

| Covariable | number | with | sign of r |
|---|---|---|---|
| 1. BS | (3) | (2,3,4) | (+,-,-) |
| 2. Hg | (3) | (4,5,6) | (-,+,-) |
| 3. TP | (3) | (1,4,6) | (-,-,-) |
| 4. PP | (3) | (1,2,3) | (-,-,-) |
| 5. ID | (3) | (2,5,9) | (+,-,-) |
| 6. Age | (2) | (3,5) | (-,-) |
| 7. Urea | (1) | (7) | (-) |
| 8. Sex | (2) | (2,5) | (-,+) |
| 9. Stage | (0) | ----- | ------ |
| 10. B2M | (2) | (2,5) | (-,-) |

**Theoretical Approach**

1) Selecting a set of predicting covariables: the selection of an appropriate set of predicting covariables is an important step before entering the stage of making prediction. There is a course much similar to selecting variables in ordinary regression problem, for which wide literature exists. Main complications are the occurrence of censoring and infinite dimensional nuisance parameter S(t/0) [9]. These complications are dealt with by considering asymptotic theory of the partial likelihood function[4,10]

$$L(B) = \Pi_{j=1}^{n} (\exp(B^{t} z_j)/Q_j(B)^{\delta j})$$

with

$$Q_j(B) = \sum_{h \in R(t_j)} \exp(B^t z_h)$$

Here, $t_j$ is the observed life time (i.e. time to failure or censore) and $z_j = (z_{1j},...,z_{kj})$ is the vector of covariate patient $j$, while $d_j$ indicates whether $(d_j = 1)$ or not $(d_j = 0)$ Failure occurred before censoring. As usual $R(t_j)$ denotes the risk set of time $t_j$, i.e. the set of patients with life larger than or equal to $t_j$. The denominator $Q_j(B)$ will be called the partition function.

The dependence of $L(B)$ and $Q(B)$ on $z_1,...,z_n$ and $d_1,....,d_n$ is suppressed in the notation. Several investigators have argued or proven that this partial likelihood may be treated as ordinary likelihood [4,10].

There are at least two separate points of views to assess the relative importance of the various covariates in predicting the survival time.

**<u>View point 1</u>**

A covariate $z_j (i = 1,...,k)$ is considered to be statistically significant if the null hypothesis $H_0 : b_i = 0$ can not be rejected at 5% level in a model. No exact theory being available, one resorts to asymptotic methods for testing this hypothsis.

Let $\hat{B} = (\hat{b}_1, ..., \hat{b}_i)$ and $\tilde{B} = (\tilde{b}_1, ..., \tilde{b}_{i-1})$ be the parameter vectors maximizing the partial likelihood function for model based on covariables $z_1, ..., z_i$ and $z_1, ..., z_{i-1}$ respectively. The information matrix

$$I(B) = -\left(\frac{\partial^2}{\partial B \partial B^t}\right) \ln L(B)$$

is assumed to be non-singular in a sufficiency large neighborhood of $\hat{B}$. The null hypothesis $H_0$ is rejected if

(i) $$\hat{b} / S\hat{E}(\hat{b}_i) > U_{a/2}$$

or $U_a$ if one-sided testing is allowed. The standard error being estimated by square root of $(I^{-1})_{ii}(\hat{B})$.

(ii) the score statistics

$$U_1(\tilde{B}, 0) = \left(\frac{\partial}{\partial b_1}\right) \ln L(B) \Big|_{B = (\tilde{B}, 0)}$$

is large with respect to its estimated standard error $\{(I^{-1})_{ii}(\tilde{B}, 0)\}^{-1/2}$

(iii) $$-2\{\ln L(\tilde{B}, 0) - \ln L(\hat{B})\} > c^2_{1;a}$$

Although under suitable regularity conditions, these three methods are asymptotically equivalent, for finite sample sizes they may lead to different result in a concrete situation, it is sometimes useful to apply more than one of them.

**View point 2**

Again considering the patients as a sample from large population, the covariate can be looked upon as a random variables and will be denoted by capitals. A covariate $Z_i$ is considered to be more relevant for prediction than another covariate $Z_h$, if

$|\hat{b}_i| S\hat{D}(Z_i) > |b_h| S\hat{D}(Z_h)$, where $S\hat{D}(Z_i)$ denotes the estimated standard deviation of covariate $Z_i$. The motivation of this point of view is as follows: let us call patient for whom the i[th] covariate differs one sample standard deviation from the estimated mean $\bar{Z}_i$ moderately deviant (with respect to the covariate $Z_i$. Then a moderately deviant patient will have a point estimated hazard rate which differs by a factor $\exp(|\hat{b}_i| S\hat{D}(Z_I))$ from that of a typical patient with covariate $Z_i$ and the same other covariates.

Note that for normally distributed covariates about 1/3 of the patients are at least moderately deviant. For dichotomous covariate $(Z_i = 0 or 1)$, it is convenient to look at relative risk associative with two possible values of covariate, which is $\exp(\hat{b}_i)$. If this covariate is approximately symmetrically distributed (i.e. $E(Z_i) = 0.5$), then, to close approximation, $SD(Z_i) = 0.5$. Therefore, in practice, if some covariates are dichotomous with $E(Z)$ not close to (o or 1) and other not, it is natural to compare quantities $\exp(b_i D_i)$, where $D_i = 0 or 1$ for dichotomous covariate and $D = 2SD(\hat{Z})$ for other covariates, the two points of view, concentrate on different aspects.

View point 1 relates the estimated effects $\hat{b}_i$ to their statistical uncertainty, which strongly depends on the effective sample size, whereas view point 2 roughly evaluate whether one risk factor is likely to be a more important predictor for survival time of new patient arriving at the hospital than some other factor. If for some covariate, adequacy of the proportional hazard model is considered dubious, the stratified model may be used. In that case $r = 1,...,s$ denoting the level of the stratifying variable:

$L(B) = X_{r=1}^{S} L_r(B)$, where $L_r(B)$ is based on all observations in the stratum.

**Results:**

The actual calculations were performed by using the Bio-Medical Data Processor Package [8].

(1) **Univariate analysis**: The results of univariate analysis to sub-sample consist of 45 out of 135 randomly selected with 9 dead and the rest are censored as shown in table 5, where separate effects of various covariates are indicated by giving Approximately the two-sided P-values of the Gehan and Longrank tests with Wilcoxon and Savage score respectively. It is tested, for example, whether the patient with normal Hg has the same survival curve as a patient with lower Hg. The test of Gehan attaches gives more weight to early differences in the samples than Longrank test does.

The direction or the (significant) effects can be seen from the arrows in the fourth column, which refer to sub-samples indicated in the first column. The sample size of the smaller of the two sub-samples together with corresponding number of dead is displayed in the last column. We take the first line as an example: patient with higher Hg have significantly worse survival than patient with lower Hg. The smallest sub-sample consists of 7 patients with 0 dead, and consequently, the largest sub-sample of 38 patients with 9 dead. From the information about the sub-sample one can construct familiar 2 x 2 contingency tables which have to be considered with extreme caution of the censoring.

**Table 5:** Influence of single (dichotomous) factors on the survival of MOCCA treatment.

| Covariant | P-values Gehan | Longrank | Effect | Smallest sub-sample Size | Dead |
|---|---|---|---|---|---|
| | | | | Total 45 | 9 |
| Hg (normal=0, high=1) | ** | ** | ↓ | 07 | 0 |
| TP (normal=0, high=1) | *** | *** | ↓ | 15 | 3 |
| PP (lower=0, higher=1) | *** | *** | ↓ | 16 | 3 |
| IQ (BL=0, (P,A,LP)=1) | | | | 03 | 2 |

| Two sided P-values | | Effect | |
|---|---|---|---|
| *** : | P > 0.15 | ↓ : | Patients with this character have worse prognosis. |
| ** : | 0.05 < P < 0.15 | - : | Test uninformative due to small sub-sample size. |
| * : | 0.001 < P < 0.005 | ↑ : | Patients with this character have better prognosis. |
| . : | P < 0.0001 | | |

(2) **Multivariate regression analysis**: For multiple regression analysis based on Cox'proportional hazard model, we decided to take separately the continuous and discrete covariables in order to avoid the multidimensionality and because the covariate B2M has missing values of 30 patients out of 130 cases. The results of the first round are presented in table 6. from view point 1, one can see that the Hg and B2M are highly significant, whereas the infiltration is just significant if one-sided test is allowed. The negative coefficient $b'$ decreases the value of the hazard function and therefore indicates a positive relationship with survival whereas the positive $b'$ has reverse interpretation.

**Table 6:** Multiple regression analysis based on PH model (round 1).

| **Covariable** | $b'$ | $b' / SE(b')$ | $\exp(b'D)$ |
|---|---|---|---|
| BS | -0.0121 | -1.1183 | 0.3737 |
| Hg | -0.0307 | -3.6379 | 0.2737 |
| TP | 0.0161 | 1.4172 | 1.6997 |
| PP | -0.0041 | -0.3634 | 0.8589 |
| Age | -0.0076 | -0.4424 | 0.8641 |
| ID | -0.0251 | -1.9190 | 0.4441 |
| B2M | 0.0975 | 5.5791 | 4.9288 |

" D = $2SD$ if Z is continuous covariable"

The results of the second round for discrete covariables are summarized in table 7. One can see that the urea and the stage are just significante if one-sided test is allowed with positive coefficient which increases the value of the hyazard function and therefore indicates negative relationship with survival.

**Table 7:** Multiple regression analysis based on PH model (round 2) [2].

| **Covariable** | **β** | **β/SE(β)** | **exp(βD)** |
|---|---|---|---|
| Urea | 0.6953 | 1.6591 | 1.6383 |
| Sex | -0.0900 | -0.2628 | 0.9139 |
| Stage | 0.3814 | 1.6328 | 1.7148 |

D = 1 if Z is dichotomous covariable

Note that from view point 2, the TP and B2M in continuous case can be considered as relavant covariable for production, urea and stage in discrete case as well.

## Conclusions & Suggestions

### Conclusion

The results of univariate analysis to sub-sample of 45 out of 130 randomly selected with 9 dead and the rest are censored are shown in table 5. In this table the row of effect the patient with higher Hg ,TP, PP, B2M, Sex, and stage have worse prognosis, whereas Urea has better prognosis by using **Gehan** and **Logrank** tests [9],[11].

The results of multiple regression analysis based on Cox proportional hazard [7],[11] are shown in tables 6 and 7. for continuous case, the covariables TP and B2M (table 6) can be considered as relevant covariables for prediction, whereas for discrete case (table 7) the Urea and stage as well.

### Suggestion:

From the medical point of view, the MOCCA treatment gives longer survival time than any other treatments, especially for the cancer patients. So we advice the doctors who are working on cancer research take into account the covariables which are most relevant for prediction such as Urea, stage, TP, and B2M.

## APPENDIX

**TABLE 1**. Survival data of 135 MOCCA treatmented patients.

| $X_0$ | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ | $X_6$ | $X_7$ | $X_8$ | $X_9$ | $X_{10}$ $X_{12}$ | $X_{11}$ $X_{13}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 042 | 0 | 040 | 120 | 090 | 45 | 40 | 1 | 5.20 | 0 2 | 3 60 |
| 2 | 024 | 0 | 083 | 105 | 074 | 23 | 14 | 0 | 3.30 | 0 1 | 3 60 |
| 3 | 033 | 0 | 095 | 090 | 072 | 26 | 20 | 2 | 4.50 | 0 2 | 4 76 |
| 4 | 045 | 0 | 059 | 096 | 078 | 15 | 50 | 2 | 2.60 | 0 2 | 1 70 |
| 5 | 036 | 0 | 033 | 141 | 007 | 18 | 10 | 1 | 6.00 | 0 2 | 2 60 |
| 6 | 096 | 0 | 095 | 120 | 088 | 25 | 35 | 1 | 5.30 | 0 1 | 2 59 |
| 7 | 072 | 0 | 115 | 130 | 078 | 25 | 28 | 4 | 2.30 | 0 2 | 2 61 |
| 8 | 176 | 0 | 100 | 120 | 080 | 35 | 15 | 1 | 2.80 | 1 2 | 2 59 |
| 9 | 012 | 1 | 032 | 120 | 083 | 33 | 18 | 1 | 22.1 | 0 1 | 3 73 |
| 10 | 020 | 1 | 135 | 110 | 123 | 50 | 35 | 1 | 16.8 | 0 1 | 3 77 |
| 11 | 026 | 0 | 120 | 110 | 100 | 40 | 38 | 1 | 2.60 | 0 2 | 2 67 |
| 12 | 061 | 0 | 155 | 115 | 087 | 36 | 30 | 2 | 2.40 | 0 2 | 2 56 |
| 13 | 045 | 0 | 022 | 140 | 080 | 12 | 08 | 2 | 4.00 | 0 1 | 2 70 |
| 14 | 048 | 1 | 043 | 138 | 088 | 22 | 15 | 2 | 3.40 | 0 2 | 2 69 |
| 15 | 024 | 0 | 150 | 087 | 105 | 62 | 20 | 1 | 3.00 | 0 1 | 4 60 |
| 16 | 033 | 0 | 088 | 092 | 072 | 64 | 25 | 1 | 3.90 | 0 1 | 4 69 |
| 17 | 029 | 0 | 021 | 122 | 068 | 15 | 53 | 1 | 5.70 | 0 2 | 3 54 |
| 18 | 072 | 0 | 140 | 087 | 077 | 90 | 55 | 2 | 2.30 | 0 2 | 3 56 |
| 19 | 048 | 1 | 126 | 114 | 088 | 27 | 17 | 1 | 8.30 | 0 1 | 1 77 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 034 | 0 | 110 | 115 | 080 | 35 | 19 | 2 | 1.00 | 0 | 3 |
| | | | | | | | | | | 2 | 55 |
| 21 | 105 | 0 | 020 | 149 | 080 | 09 | 03 | 2 | 2.60 | 0 | 1 |
| | | | | | | | | | | 1 | 55 |
| 22 | 022 | 0 | 022 | 095 | 072 | 12 | 22 | 2 | 2.20 | 0 | 2 |
| | | | | | | | | | | 2 | 40 |
| 23 | 057 | 0 | 022 | 130 | 072 | 15 | 10 | 2 | 3.90 | 0 | 1 |
| | | | | | | | | | | 2 | 79 |
| 24 | 072 | 0 | 038 | 130 | 078 | 30 | 15 | 2 | 7.90 | 0 | 3 |
| | | | | | | | | | | 2 | 63 |
| 25 | 066 | 0 | 107 | 122 | 077 | 22 | 34 | 2 | 2.50 | 0 | 2 |
| | | | | | | | | | | 1 | 50 |
| 26 | 033 | 0 | 060 | 130 | 078 | 15 | 10 | 4 | 2.70 | 0 | 2 |
| | | | | | | | | | | 1 | 58 |
| 27 | 057 | 0 | 035 | 135 | 078 | 15 | 10 | 2 | 2.40 | 1 | 1 |
| | | | | | | | | | | 1 | 74 |
| 28 | 039 | 0 | 040 | 115 | 068 | 29 | 10 | 4 | 1.70 | 0 | 4 |
| | | | | | | | | | | 2 | 49 |
| 29 | 021 | 0 | 035 | 117 | 084 | 35 | 13 | 1 | 3.00 | 1 | 2 |
| | | | | | | | | | | 1 | 64 |
| 30 | 057 | 0 | 160 | 097 | 120 | 31 | 40 | 2 | 4.70 | 0 | 4 |
| | | | | | | | | | | 2 | 64 |
| 31 | 069 | 0 | 016 | 138 | 100 | 26 | 20 | 1 | 5.40 | 0 | 3 |
| | | | | | | | | | | 1 | 73 |
| 32 | 045 | 0 | 070 | 125 | 095 | 40 | 65 | 2 | 1.40 | 0 | 3 |
| | | | | | | | | | | 2 | 60 |
| 33 | 058 | 1 | 030 | 128 | 078 | 15 | 10 | 1 | 3.80 | 0 | 4 |
| | | | | | | | | | | 2 | 47 |
| 34 | 029 | 0 | 115 | 130 | 113 | 75 | 25 | 4 | 2.20 | 0 | 3 |
| | | | | | | | | | | 1 | 50 |
| 35 | 024 | 1 | 085 | 119 | 102 | 60 | 40 | 3 | 9.20 | 1 | 2 |
| | | | | | | | | | | 2 | 68 |
| 100 | 080 | 110 | 40 | 45 | 3 | 7.40 | 0 | 3 | 36 | 036 | 1 |
| | | | | | | | | | | 2 | 60 |
| 37 | 030 | 1 | 105 | 092 | 102 | 50 | 50 | 1 | 15.0 | 0 | 4 |
| | | | | | | | | | | 2 | 60 |
| 38 | 062 | 0 | 130 | 120 | 078 | 48 | 45 | 2 | 2.70 | 0 | 3 |
| | | | | | | | | | | 2 | 76 |
| 39 | 018 | 1 | 096 | 151 | 095 | 29 | 26 | 4 | 58.8 | 0 | 2 |
| | | | | | | | | | | 1 | 70 |
| 110 | 072 | 61 | 56 | 1 | 1.00 | 0 | 3 | 40 | 024 | 1 | 058 |
| | | | | | | | | | | 1 | 60 |
| 41 | 030 | 1 | 100 | 110 | 090 | 35 | 30 | 1 | 26.2 | 0 | 2 |
| | | | | | | | | | | 1 | 59 |
| 42 | 036 | 0 | 055 | 088 | 084 | 15 | 60 | 1 | 5.00 | 0 | 3 |
| | | | | | | | | | | 1 | 61 |
| 43 | 055 | 0 | 134 | 120 | 109 | 63 | 10 | 2 | 2.80 | 0 | 3 |
| | | | | | | | | | | 2 | 59 |
| 44 | 022 | 0 | 038 | 127 | 081 | 28 | 17 | 1 | 6.80 | 0 | 2 |
| | | | | | | | | | | 2 | 73 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 084 | 1 | 039 | 129 | 089 | 35 | 30 | 1 | 2.30 | 0 | 3 |
| | | | | | | | | | | 2 | 77 |
| 46 | 036 | 1 | 135 | 108 | 118 | 65 | 30 | 1 | 6.00 | 0 | 2 |
| | | | | | | | | | | 2 | 67 |
| 47 | 028 | 1 | 100 | 097 | 090 | 35 | 40 | 2 | 3.70 | 0 | 3 |
| | | | | | | | | | | 2 | 36 |
| 48 | 060 | 1 | 064 | 115 | 077 | 26 | 35 | 1 | 6.70 | 0 | 2 |
| | | | | | | | | | | 2 | 70 |
| 49 | 060 | 1 | 078 | 085 | 078 | 10 | 43 | 2 | 5.20 | 0 | 3 |
| | | | | | | | | | | 1 | 69 |
| 50 | 066 | 1 | 070 | 119 | 090 | 40 | 35 | 2 | 2.70 | 0 | 4 |
| | | | | | | | | | | 1 | 60 |
| 51 | 097 | 1 | 097 | 130 | 139 | 82 | 38 | 2 | 4.30 | 0 | 3 |
| | | | | | | | | | | 1 | 69 |
| 52 | 018 | 1 | 014 | 131 | 070 | 16 | 04 | 3 | 3.70 | 0 | 3 |
| | | | | | | | | | | 1 | 54 |
| 53 | 082 | 0 | 080 | 080 | 078 | 10 | 80 | 1 | 1.70 | 0 | 2 |
| | | | | | | | | | | 1 | 56 |
| 54 | 042 | 0 | 066 | 141 | 093 | 25 | 10 | 1 | 13.8 | 0 | 2 |
| | | | | | | | | | | 1 | 77 |
| 55 | 072 | 0 | 130 | 110 | 117 | 26 | 37 | 2 | 0.50 | 0 | 3 |
| | | | | | | | | | | 1 | 55 |
| 56 | 024 | 0 | 100 | 139 | 095 | 30 | 15 | 2 | 5.80 | 0 | 2 |
| | | | | | | | | | | 2 | 55 |
| 57 | 016 | 1 | 080 | 109 | 080 | 40 | 20 | 2 | 18.5 | 0 | 2 |
| | | | | | | | | | | 2 | 40 |
| 58 | 042 | 0 | 050 | 110 | 072 | 35 | 20 | 1 | 2.90 | 0 | 3 |
| | | | | | | | | | | 2 | 79 |
| 59 | 048 | 1 | 059 | 116 | 080 | 29 | 06 | 1 | 5.20 | 0 | 2 |
| | | | | | | | | | | 1 | 63 |
| 60 | 037 | 0 | 143 | 135 | 090 | 70 | 49 | 1 | 1.70 | 0 | 3 |
| | | | | | | | | | | 1 | 50 |
| 61 | 047 | 0 | 044 | 148 | 087 | 27 | 12 | 1 | 3.90 | 0 | 2 |
| | | | | | | | | | | 1 | 58 |
| 62 | 048 | 1 | 043 | 083 | 072 | 15 | 35 | 2 | 13.9 | 0 | 2 |
| | | | | | | | | | | 2 | 74 |
| 63 | 036 | 0 | 060 | 110 | 076 | 20 | 35 | 1 | 13.9 | 0 | 3 |
| | | | | | | | | | | 2 | 49 |
| 64 | 073 | 0 | 070 | 125 | 090 | 45 | 30 | 1 | 2.90 | 0 | 3 |
| | | | | | | | | | | 2 | 64 |
| 65 | 036 | 1 | 055 | 103 | 087 | 25 | 18 | 1 | 8.70 | 0 | 2 |
| | | | | | | | | | | 1 | 64 |
| 66 | 055 | 0 | 101 | 115 | 100 | 50 | 40 | 1 | 2.50 | 0 | 3 |
| | | | | | | | | | | 2 | 73 |
| 67 | 077 | 0 | 063 | 128 | 078 | 20 | 20 | 2 | 2.40 | 0 | 2 |
| | | | | | | | | | | 2 | 60 |
| 68 | 034 | 0 | 033 | 130 | 078 | 25 | 15 | 2 | 1.80 | 0 | 2 |
| | | | | | | | | | | 2 | 47 |
| 69 | 043 | 0 | 028 | 138 | 080 | 28 | 20 | 1 | 11.7 | 0 | 2 |
| | | | | | | | | | | 1 | 64 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 033 | 0 | 074 | 087 | 076 | 40 | 30 | 1 | 2.50 | 0 | 3 |
| | | | | | | | | | | 2 | 62 |
| 71 | 054 | 0 | 100 | 100 | 074 | 80 | 40 | 2 | 2.00 | 0 | 2 |
| | | | | | | | | | | 1 | 63 |
| 72 | 024 | 1 | 090 | 110 | 074 | 20 | 30 | 1 | 42.0 | 0 | 2 |
| | | | | | | | | | | 1 | 61 |
| 73 | 060 | 1 | 068 | 119 | 077 | 15 | 40 | 1 | 3.90 | 0 | 3 |
| | | | | | | | | | | 2 | 65 |
| 74 | 027 | 1 | 079 | 120 | 115 | 18 | 45 | 3 | 5.50 | 0 | 3 |
| | | | | | | | | | | 1 | 58 |
| 75 | 042 | 0 | 070 | 115 | 095 | 30 | 70 | 1 | 7.50 | 0 | 3 |
| | | | | | | | | | | 1 | 50 |
| 76 | 048 | 0 | 150 | 084 | 130 | 70 | 45 | 1 | 3.60 | 0 | 2 |
| | | | | | | | | | | 1 | 62 |
| 77 | 060 | 0 | 131 | 122 | 115 | 56 | 38 | 1 | 2.10 | 0 | 3 |
| | | | | | | | | | | 1 | 61 |
| 78 | 018 | 0 | 102 | 134 | 101 | 72 | 42 | 1 | 2.50 | 0 | 2 |
| | | | | | | | | | | 1 | 62 |
| 79 | 180 | 1 | 090 | 124 | 090 | 50 | 35 | 1 | 6.80 | 0 | 2 |
| | | | | | | | | | | 2 | 70 |
| 80 | 033 | 0 | 070 | 105 | 078 | 10 | 30 | 1 | 1.30 | 0 | 3 |
| | | | | | | | | | | 2 | 78 |
| 81 | 141 | 0 | 080 | 112 | 090 | 35 | 25 | 2 | 6.10 | 0 | 2 |
| | | | | | | | | | | 2 | 66 |
| 82 | 054 | 1 | 025 | 126 | 078 | 20 | 10 | 1 | 2.50 | 0 | 2 |
| | | | | | | | | | | 1 | 55 |
| 83 | 033 | 0 | 078 | 120 | 095 | 54 | 38 | 1 | 21.0 | 0 | 3 |
| | | | | | | | | | | 2 | 53 |
| 84 | 040 | 1 | 043 | 115 | 112 | 50 | 39 | 1 | 26.0 | 0 | 3 |
| | | | | | | | | | | 2 | 71 |
| 85 | 074 | 0 | 136 | 108 | 128 | 41 | 35 | 1 | 9.60 | 0 | 3 |
| | | | | | | | | | | 1 | 85 |
| 86 | 056 | 0 | 130 | 110 | 112 | 50 | 42 | 2 | 4.60 | 0 | 3 |
| | | | | | | | | | | 1 | 65 |
| 87 | 055 | 0 | 070 | 125 | 090 | 40 | 45 | 2 | 3.00 | 0 | 2 |
| | | | | | | | | | | 1 | 65 |
| 88 | 109 | 0 | 100 | 129 | 071 | 15 | 15 | 1 | 30.0 | 0 | 2 |
| | | | | | | | | | | 1 | 56 |
| 89 | 064 | 0 | 025 | 135 | 078 | 35 | 28 | 1 | 3.70 | 0 | 2 |
| | | | | | | | | | | 2 | 63 |
| 90 | 048 | 1 | 092 | 103 | 114 | 73 | 25 | 3 | 0.00 | 0 | 3 |
| | | | | | | | | | | 1 | 61 |
| 91 | 072 | 1 | 080 | 105 | 105 | 40 | 30 | 1 | 0.00 | 0 | 3 |
| | | | | | | | | | | 2 | 69 |
| 92 | 036 | 1 | 150 | 082 | 140 | 41 | 26 | 2 | 0.00 | 0 | 3 |
| | | | | | | | | | | 2 | 90 |
| 93 | 047 | 0 | 108 | 126 | 078 | 42 | 20 | 3 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 81 |
| 94 | 049 | 0 | 100 | 095 | 107 | 40 | 38 | 2 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 64 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 057 | 0 | 120 | 092 | 134 | 90 | 14 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 73 |
| 96 | 021 | 0 | 103 | 112 | 099 | 40 | 30 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 77 |
| 97 | 045 | 0 | 126 | 122 | 090 | 55 | 32 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 63 |
| 98 | 047 | 0 | 082 | 152 | 067 | 16 | 15 | 1 | 0.00 | 0 | 3 |
| | | | | | | | | | | 1 | 71 |
| 99 | 041 | 0 | 122 | 129 | 109 | 55 | 18 | 2 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 60 |
| 100 | 033 | 0 | 039 | 130 | 086 | 08 | 15 | 2 | 3.50 | 0 | 1 |
| | | | | | | | | | | 2 | 70 |
| 111 | 021 | 0 | 060 | 089 | 066 | 18 | 30 | 2 | 0.00 | 0 | 3 |
| | | | | | | | | | | 1 | 80 |
| 112 | 039 | 0 | 088 | 106 | 077 | 30 | 40 | 2 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 67 |
| 113 | 033 | 0 | 111 | 151 | 102 | 20 | 03 | 1 | 2.50 | 0 | 1 |
| | | | | | | | | | | 1 | 36 |
| 114 | 033 | 0 | 101 | 121 | 086 | 46 | 35 | 2 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 65 |
| 115 | 177 | 0 | 130 | 110 | 072 | 60 | 50 | 2 | 2.50 | 0 | 3 |
| | | | | | | | | | | 1 | 80 |
| 116 | 043 | 0 | 108 | 126 | 078 | 30 | 28 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 72 |
| 117 | 030 | 1 | 100 | 120 | 080 | 30 | 30 | 2 | 2.10 | 0 | 2 |
| | | | | | | | | | | 2 | 65 |
| 118 | 024 | 1 | 080 | 012 | 090 | 10 | 45 | 1 | 0.00 | 0 | 3 |
| | | | | | | | | | | 1 | 66 |
| 119 | 021 | 0 | 136 | 120 | 092 | 55 | 18 | 1 | 0.00 | 0 | 3 |
| | | | | | | | | | | 1 | 55 |
| 120 | 079 | 0 | 063 | 123 | 080 | 15 | 12 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 71 |
| 121 | 069 | 0 | 100 | 125 | 100 | 40 | 38 | 1 | 21.0 | 0 | 2 |
| | | | | | | | | | | 1 | 59 |
| 122 | 104 | 0 | 100 | 130 | 090 | 45 | 35 | 1 | 0.00 | 0 | 1 |
| | | | | | | | | | | 1 | 68 |
| 123 | 021 | 0 | 037 | 130 | 089 | 25 | 15 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 60 |
| 124 | 021 | 0 | 048 | 135 | 088 | 40 | 30 | 2 | 0.00 | 0 | 2 |
| | | | | | | | | | | 1 | 59 |
| 125 | 021 | 0 | 040 | 130 | 080 | 13 | 20 | 2 | 0.00 | 1 | 1 |
| | | | | | | | | | | 2 | 50 |
| 126 | 037 | 0 | 059 | 094 | 080 | 25 | 50 | 4 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 58 |
| 127 | 045 | 0 | 146 | 085 | 093 | 40 | 17 | 3 | 0.00 | 0 | 3 |
| | | | | | | | | | | 2 | 35 |
| 128 | 090 | 0 | 151 | 073 | 106 | 50 | 52 | 3 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 64 |
| 129 | 031 | 0 | 070 | 092 | 075 | 43 | 25 | 1 | 0.00 | 0 | 2 |
| | | | | | | | | | | 2 | 58 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 130 | 042 | 1 | 097 | 077 | 094 | 57 | 25 | 1 | 0.00 | 0 2 | 2 70 |

$X_2$: Follow up (censored = 0, dead = 1), $X_3$: Blood sedimentation (FW), $X_4$ = Hemoglobin (Hg), $X_5$: Total protein (TP), $X_6$: Para-protein (PP), $X_7$: Plasma cell infiltration, $X_8$: Infiltration quality {A=1 Asynchron, PL=4 Plasma blast P=2 Plasmocytic, LP=3 Lympho Plasmocytic}, $X_9$: Beta 2 Microglobulli B2M (0: means the patient had not been undergone test), $X_{10}$: Urea U (Normal=0, high=1), $X_{11}$: Stage (stage 1=I, stage 2=II, stage 3=III), $X_{12}$: Gender (Male=1, Female=2), $X_{13}$: Age.

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