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Correlate the first day of laboratory values with length of stay among patient admitted in intensive care unit

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Abstract

Introduction: Laboratory test results are a valuable source of information and essential to patient care and diagnosis. Early detection and response to abnormal laboratory values is a crucial in critical care. Critical illness leading to prolonged length of stay in an intensive care unit is associated with significant mortality.

Materials and Methods: Non-experimental correlational research design was carried out with 30 samples that met the inclusion criteria were selected using convenience sampling technique. Demographic variables were collected variables were collected by using multiple choice questionnaire followed by first day of laboratory values were taken from investigations report. The participants were followed for number of days in the intensive care unit. The data were tabulated and analyzed by descriptive and inferential statistics.

Results: The finding of the study reveals that all the first day of laboratory values of were not statistically significant correlate with length of stay in intensive care unit at the level of $p < 0.05$ and almost majority 15(50%) were staying in the intensive care unit for 6-10 days.

Conclusion: Clinical laboratory services are most cost effective, least invasive source of the objective information used in clinical decision making. Clinical laboratory services have a direct impact on many aspects of patient care including length of stay, patient safety, resource utilization and patient satisfaction.

Keywords: Laboratory values, length of stay, intensive care unit, critical illness

Introduction

Critical illness leading to prolonged length of stay in an intensive care unit is associated with significant mortality and resource utilization. Several factors influence the length of stay among intensive care unit (ICU) patients. The type of severity of patient's illness can directly affect length of stays. Knaus *et al.* found that 78% of the variation in length of ICU stays and 90% of the variation in in-hospital mortality rates were attributable to patients' characteristics at the time of admission. In a prospective study by Wong *et al.* for patients in a Medical surgical ICU were neuromuscular weakness, pneumonia, multiple trauma, and septic shock, in that order. Respiratory arrest, postoperative mechanical ventilation, congestive cardiac failure, cardiac arrest, airway protection or obstruction, and exacerbation of chronic obstructive pulmonary disease were the next most common indications for ICU admission in these patients. Ling Li *et al.* 2015, stated that laboratory testing has a direct effect on patient's length of stay in emergency department. Laboratory test results are a valuable source of information and essential to patient care and diagnosis. Early detection and response to abnormal laboratory values is a crucial in critical care. Nurses need to assess laboratory test results as

part of the physical assessment of their patients. Comparison of laboratory test results and changes with abnormal physical findings provides the basis for changes in the nursing care plan and to know the patient length of stay in hospital. Progressive monitoring of laboratory results and prompt interventions might lessen the seriousness of the health problem. In intensive care units, the initial group of laboratory test serves as a baseline for assessing additional test results. Several reference values are important, particularly the electrolytes (potassium, sodium, and calcium), glucose, BUN, creatinine and albumin. Incorporating laboratory test results into the plan and evaluation of care will result in safer and more effective patient care. Many quality improvement and cost containment initiatives are being pursued in today's health care industry. Outcomes assessments are now being actively promoted to ascertain whether patients have truly benefited from their care. Hence the present study was conducted with the aim to correlate the first day of laboratory values with length of stay of patients admitted in intensive care unit.

Materials and methods

Non-experimental correlational research design was adopted

to correlate the first day of laboratory values with length of stay among 30 patients admitted in Intensive Care Unit. The study was conducted after obtaining formal permission from hospital authority. The samples who met the inclusion criteria were selected by using convenience sampling technique. After selecting the samples investigators introduced themselves and explained the purpose of the study to the participants and their family member. Informed consent was obtained after assuring confidence. Demographic variables and clinical variables were collected by using multiple choice questionnaire followed by first day of laboratory values were taken from investigations report. The laboratory values are sodium, potassium, PH, bicarbonate, creatinine, glucose, hemoglobin, and lactate. The participants were followed for number of days in the intensive care unit. They were assured about their

confidentiality and anonymity throughout the study. The collected data prepared for analysis using Microsoft excel and were analyzed by using descriptive and inferential statistics. P values less than 0.05 were considered statistically significant.

Results

Regarding demographic variables, The table 1 shows that, maximum 13(43.34%) were in the age group of >60 years, 20(66.67%) were male, 17(56.67%) had illness for less than 3 months, 19(63.33%) had a body temperature in the range of 97°F to 99°F, 15(50%) had a respiratory of >20 breaths/min, 14(46.67%) had heart rate of 60-100 beats/min. Almost 13(43.34%) were GCS of (3-7), 24(80%) were using inotropes, 20(66.67%) were on mechanical ventilator.

Table 1: Frequency and percentage distribution of demographic variables of patients admitted in intensive care unit

Demographic Variables	Frequency	Percentage
Age in years		
<30	3	10
31 – 45	4	13.33
46 – 60	10	33.33
> 61	13	43.34
Gender		
Male	20	66.67
Female	10	33.33
Duration of illness		
Less than 3 months	17	56.67
3 to 6 months	2	6.67
6 to 9 months	3	10
10 to 12 months	1	3.33
Above 1 year	7	23.33
Temperature		
<97°F	3	10
97°F to 99°F	10	63.33
>99°F	8	26.67
Respiratory rate		
<12 breaths /min	1	6.67
12 – 20 breaths/min	15	50
>20 breaths /min	13	26.67
Heart rate		
<60	4	13.33
60 -100	14	46.67
>100	12	40
GCS		
15	4	13.33
14	3	10
8-13	10	33.33
3-7	13	43.34
Use of Inotropes		
Yes	24	80
No	6	20
Use of Mechanical Ventilation		
Yes	20	66.67
No	10	33.33

Table 2: Distribution of first day of laboratory values of patients and length of stay of patients admitted in intensive care unit

Demographic Variables	Frequency	Percentage	Mean	SD
Sodium			134.06	11.83
<125 mEq/L	2	6.67		
126 – 135 mEq/L	10	33.33		
136 – 145 mEq/L	12	40		
>146 mEq/L	6	20		

Potassium			4.96	2.10
1-3.4 mEq/L	6	20		
3.5 -5 mEq/L	5	16.67		
5.1 – 7 mEq/L	18	60		
>7.1 mEq/L	1	3.33		
PH			7.53	0.507
<7.25	2	6.67		
7.26 -7.35	17	56.66		
7.36 – 7.45	7	23.33		
>7.46	4	13.33		
Bicarbonate			23.96	1.27
<22 mEq/L	9	30		
22-28 mEq/L	12	40		
> 28 mEq/L	9	30		
Creatinine			6.23	3.18
0.6 -1.5 mg/dl	6	20		
1.6-2.5 mg/dl	8	26.67		
2.6 -3.5 mg/dl	10	33.33		
>3.6 mg/dl	6	20		
Glucose			140.26	82.18
<45mg/dl	1	3.33		
46-75 mg/dl	7	23.33		
76-105 mg/dl	6	20		
>106 mg/dl	16	53.34		
Lactate			6.36	3.63
1-3 mmol/L	8	26.67		
4-6 mmol/L	17	56.67		
>7 mmol/L	5	16.66		
Hemoglobin			6.36	3.63
3.5 – 7.5 g/dL	4	13.33		
7.6-11 g/dL	17	56.67		
11.6 -15.5 g/dL	9	30		

The above table 2 depicts the first day of laboratory values of patients admitted in intensive care unit. Majority 12(40%) of patient had sodium level of 126-135 mEq/L with mean score of 134 ± 11.83 , 80(60%) had potassium level of 5.1 -7 mEq/L with mean score of 4.96 ± 2.1 , 17(56.66%) had pH of 7.26-7.35 with mean score of 7.53 ± 0.5 , 12(40%) had bicarb level of 22-28 mEq/L with mean score of 23.96 ± 1.27 , 10(33.33%) had creatinine level of 2.6-3.5 mg/dl with mean score of $6.23 \pm 3.1.8$, 16(53.34%) had the blood glucose level of >106mg/dL with mean score of 140.26 ± 82.18 , 17(56.67%) had the lactate level of 4-6mmol/L with mean score of 6.36 ± 3.63 , and 17(56.67%) had the haemoglobin

level of 7.6-11 g/L with mean score of 6.36 ± 3.63 .

Table 3: Frequency and percentage distribution of length of stay of patients admitted in intensive care unit

Length of Stay in ICU	Frequency	Percentage
1-5 days	8	26.27
6 – 10 days	16	53.33
11-16 days	4	13.33
> 17 days	2	6.66

Almost majority 15(50%) were staying in the intensive care unit for 6-10 days as depicts in Table 3.

Table 4: Correlation of first day of laboratory values with length of stay of patients admitted in intensive care unit

Laboratory Values	Mean \pm SD	Karl Pearson's r Value
Sodium	134 \pm 11.83	r= -0.0013
		p=0.943
		NS
Potassium	4.96 \pm 2.1	r=0.1627
		p=0.39
		NS
pH	7.53 \pm 0.5	r=-0.1247
		p=0.511
		NS
Bicarbonate	23.96 \pm 1.27	r=-0.132
		p=0.0174
		NS
Creatinine	6.23 \pm 3.1.8	r=-0.3161
		p=0.088
		NS
Glucose	140.26 \pm 82.18	r=0.1737

		p=0.03
		NS
		r=0.033
Lactate	6.36±3.63	p=0.759
		NS
		r=-0.3289
Hemoglobin	6.36±3.63	p=0.1082
		NS

NS-Not Significant

The Table-4 portrays that all the first day of laboratory values of were not statistically significant correlate with length of stay in intensive care unit at the level of $p < 0.05$.

Discussion

Critically ill patients have numerous laboratory abnormalities. A primary goal in intensive care is to decrease length of stay when medically appropriate in order to both improve the quality of medical care and reduce cost and excess use of resources. The current study found that there is no statistically significant correlation between the first laboratory result and the length of stay. Moreover there is negative correlation between the length of stay with sodium, pH, bicarbonate, creatinine and haemoglobin. Most of the participants were intubated and on inotropic support. The study was supported by Patrick *et al.* 2018 ^[1], who examined the laboratory values of critically ill patients over a 12-year period to explore the association between laboratory values of interest and mortality and found that all laboratory values for the best outcome group differed significantly from those in the worst outcome group. Both the best and worst outcome group curves revealed little overlap with and marked divergence from the reference range. Another study by Oguz Kilickaya concluded that laboratory values for the best outcome group differed significantly from those in the worst outcome group. \both the best and worst outcome group curves revealed little overlap with marked divergence from the reference range.

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Conflict of interest

Authors declare no conflict of Interest.

Conclusion

Laboratory information enables physicians and other health care professionals to make appropriate evidence-based diagnostic of therapeutic decisions for their patients. Clinical laboratory services are most cost effective, least invasive source of the objective information used in clinical decision making. Clinical laboratory services have a direct impact on many aspects of patient care including length of stay, patient safety, resource utilization and patient satisfaction.

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