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### Comparison of Accuracy Scores between CLOC and RSCLO Scoring Systems in Predicting the Risk of Preoperative Laparoscopic Cholecystectomy Conversion at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia

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#### ABSTRACT

**Background:** Cholecystectomy is a surgical therapy for cholelithiasis which can be performed by open cholecystectomy or laparoscopic cholecystectomy. Not all laparoscopic cholecystectomy procedures work properly. Sometimes it requires conversion from laparoscopic cholecystectomy to open cholecystectomy. A risk factor scoring system has been developed and validated using a large prospective cholecystectomy database and can accurately predict the likelihood of conversion with the conversion from laparoscopic to open cholecystectomy (CLOC) score and risk score for conversion from laparoscopic to open cholecystectomy (RSCLO). This study aimed to compare the accuracy value between CLOC and RSCLO in predicting the risk of preoperative laparoscopic cholecystectomy conversion at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia. **Methods:** This study was an observational study with a cross-sectional approach. A total of 183 research subjects participated in this study. Observation of CLOC and RSCLO scores was carried out in this study. Univariate and bivariate data analysis was carried out using SPSS. The analysis of the value of sensitivity, specificity, positive predictive value, and negative predictive value were carried out using Medcalc software. **Results:** A CLOC score > 5.5 has a greater conversion risk than a CLOC score ≤ 5.5. Meanwhile, an RSCLO score > -2 has a greater conversion risk than an RSCLO score ≤ -2. Sensitivity value CLOC for the prediction of preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy obtained 75% and a specificity of 74.85%, with value negative predictive value, which is higher than a positive predictive value and 74.86% accuracy. The sensitivity value RSCLO for the prediction of preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy was obtained at 75% and a specificity of 77.78%. With value negative predictive value, which is higher than the positive predictive value and 74.86% accuracy. **Conclusion:** The CLOC and RSCLO scores were equally accurate in predicting preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy.

#### 1. Introduction

Cholecystectomy is a surgical therapy for cholelithiasis which can be performed by open cholecystectomy or laparoscopic cholecystectomy. Laparoscopic cholecystectomy is not an easy procedure for a surgeon to perform. Experience is an important factor in determining the results of

operations. Despite having a higher degree of difficulty, laparoscopic cholecystectomy has lower morbidity and mortality than open cholecystectomy. Laparoscopic cholecystectomy is preferred by patients due to minimizing postoperative pain, quick start of oral diet, a relatively short length of stay, better surgical wound cosmetically, lower risk of surgical

wound infection and lung infection, as well as a faster healing period.<sup>1-5</sup>

Not all laparoscopic cholecystectomy procedures work properly. Sometimes it requires conversion from laparoscopic cholecystectomy to open cholecystectomy. This can be caused by an unclear anatomical structure or bleeding that is difficult to control. Conversion has also been associated with complications including death, bile duct injury, gallbladder leak, bleeding, and requiring reoperation or transfusion. Identifying risk factors for conversion to open cholecystectomy is better done for the safety of the procedure and the planning of surgical procedures. Systematic assessment of preoperative factors allows for determining whether open cholecystectomy surgery should be performed early, avoiding the potential intraoperative complications of laparoscopic cholecystectomy.<sup>6-9</sup>

A risk factor scoring system has been developed and validated using a large prospective cholecystectomy database and can accurately predict the likelihood of conversion with the Conversion from laparoscopic to open cholecystectomy (CLOC) score. Apart from CLOC scoring, there is another scoring that can be used in the form of a risk score for conversion from laparoscopic to open cholecystectomy (RSCLO).<sup>10,11</sup> This study aimed to compare the accuracy value between the conversion from laparoscopic to open cholecystectomy (CLOC) score and risk score for conversion from laparoscopic to open cholecystectomy (RSCLO) in predicting the risk of preoperative laparoscopic cholecystectomy conversion at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia.

## 2. Methods

This study was an analytic observational study with a cross-sectional approach and used secondary data sourced from medical records at the Medical Records Installation of Dr. Hasan Sadikin General Hospital, Bandung, Indonesia. A total of 183 research subjects participated in this study, where the research subjects met the inclusion criteria. The criteria for

research subjects were cholelithiasis patients with or without cholecystitis who underwent laparoscopic cholecystectomy at Dr. Hasan Sadikin, Bandung, for the period January 1<sup>st</sup>, 2016 – December 31<sup>st</sup>, 2021. This study was approved by the Research Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran/Dr. Hasan Sadikin General Hospital, Bandung, Indonesia (No: LB.02.01/X.6.5/55/2022).

The CLOC score is a risk score to predict the conversion of laparoscopic cholecystectomy to open cholecystectomy. Low CLOC score if any value  $\leq 6$ . If the score is  $> 6$ , there is a risk of conversion. The variable risk factors for CLOC consist of age, gender, surgical indication, ASA value, gallbladder wall thickening, and diameter of the common bile duct. The RSCLO score is a risk score to predict the conversion of laparoscopic cholecystectomy to open cholecystectomy. RSCLO score is low if the value is  $< -3$ . If the score  $> -3$  is at risk of conversion. Risk factor variables consisted of age, gender, previous upper abdominal surgery, abdominal tenderness, gallbladder wall, acute cholecystitis, constant  $-20$ . Data analysis was carried out using SPSS software version 25. Univariate analysis was performed to present the frequency distribution of each test variable. Bivariate analysis of CLOC and RSCLO scores on the conversion of surgical laparoscopic cholecystectomy was performed using the Chi-square test,  $p < 0.05$ . To predict the risk of preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy from scoring results, CLOC and RSCLO used analysis using receiver operating characteristic (ROC). In addition, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) tests were carried out using Medcalc software.

## 3. Results

Table 1 presents the characteristics of the research subjects. The majority of research subjects are female and aged less than 60 years. The majority of study subjects underwent laparoscopic cholecystectomy for indications of colic or pancreatitis. The majority of research subjects have the ASA II category. The study

subjects showed that the majority did not have gallbladder wall thickening and normal common bile duct diameter. The majority of study subjects showed

no history of previous surgery, no acute cholecystitis, and no abdominal tenderness.

Table 1. Characteristics of research subjects.

Characteristics		Total (N=183)	Cholecystectomy laparoscopy	
			Not Conversion (N=171)	Conversion (N=12)
Gender	Male	57 (31%)	50 (88%)	7 (12%)
	Female	126 (69%)	121 (96%)	5 (4%)
Age	< 60 years	152 (83%)	143 (94%)	9 (6%)
	≥ 60 Years	31 (17%)	28 (91%)	3 (9%)
Indication	Colic/Pancreatitis	171 (93%)	164 (96%)	7 (4%)
	Cholecystitis	12 (7%)	7 (54%)	5 (46%)
ASA	ASA I	47 (26%)	45 (96%)	2 (4%)
	ASA II	126 (69%)	117 (93%)	9 (7%)
	ASA III +	10 (5%)	9 (90%)	1 (10%)
Gallbladder wall	Normal	136 (74%)	133 (97%)	3 (3%)
	Thicken	47 (26%)	38 (83%)	9 (17%)
Diameter CBD	Normal	183 (100%)	171 (94%)	12 (6%)
	Dilation	0 (0%)	0 (0%)	0 (0%)
Previous operation history	Yes	0 (0%)	0 (0%)	0 (0%)
	No	183 (100%)	171 (94%)	12 (6%)
Acute cholecystitis	Yes	12 (4%)	7 (58%)	5 (42%)
	No	171 (96%)	164 (95%)	7 (5%)
Abdominal tenderness	Yes	68 (38%)	59 (87%)	9 (13%)
	No	115 (62%)	112 (97%)	3 (3%)

Table 2 presents the area under the curve (AUC) data. The area under the curve (AUC) CLOC and RSCLO obtained values of 82.9% and 81.1% (p-value <0.01), which shows that the CLOC and RSCLO scores

have good diagnostic value for predicting preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy.

Table 2. The area under the curve (AUC).

Variable	AUC (%)	p-value
CLOC score	82,9	< 0,01
RSCLO score	81,1	< 0,01

Figure 1 presents the ROC graphs and sensitivity-specificity graphs. The ROC curve is above the 50% line, so this curve has a good probability value. On the sensitivity and specificity curve scores CLOC, the optimal intersection point is at point 7, so this point is taken as a value cut-off point. At number 7, it is 5.5 with a sensitivity value of 75.0% and a specificity of 74.9%. This means patients with a value CLOC > 5.5 predicts preoperative conversion. On the sensitivity

and specificity curve scores RSCLO, the optimal cut point is between point 7 and point 8. At number 7, it is -5, with a sensitivity value of 75.0% and a specificity of 74.3%. At number 7, it is -2 with a sensitivity value of 75.0% and a specificity of 77 8%. Then point 8 is chosen as the value cut-off point. This means patients with a value RSCLO > -2 predict preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy.

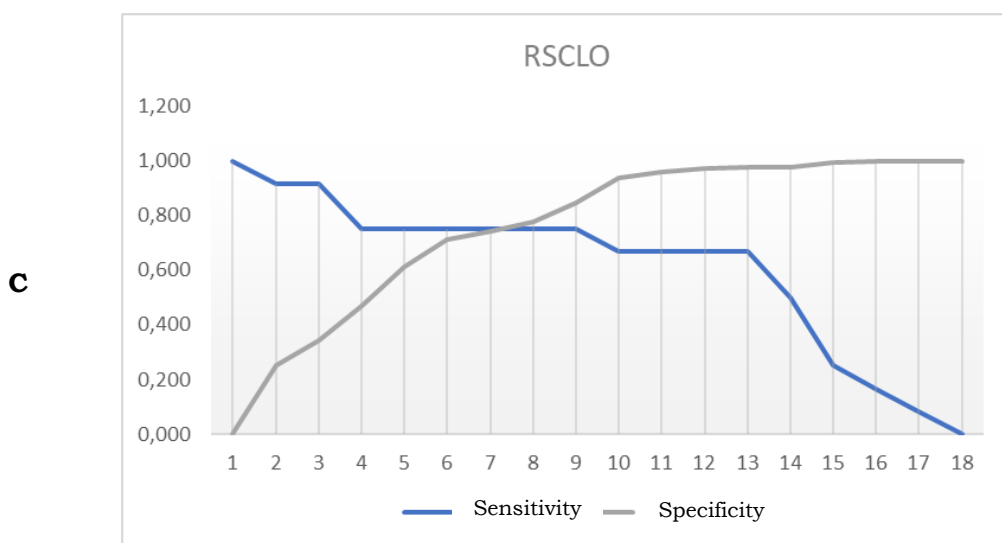
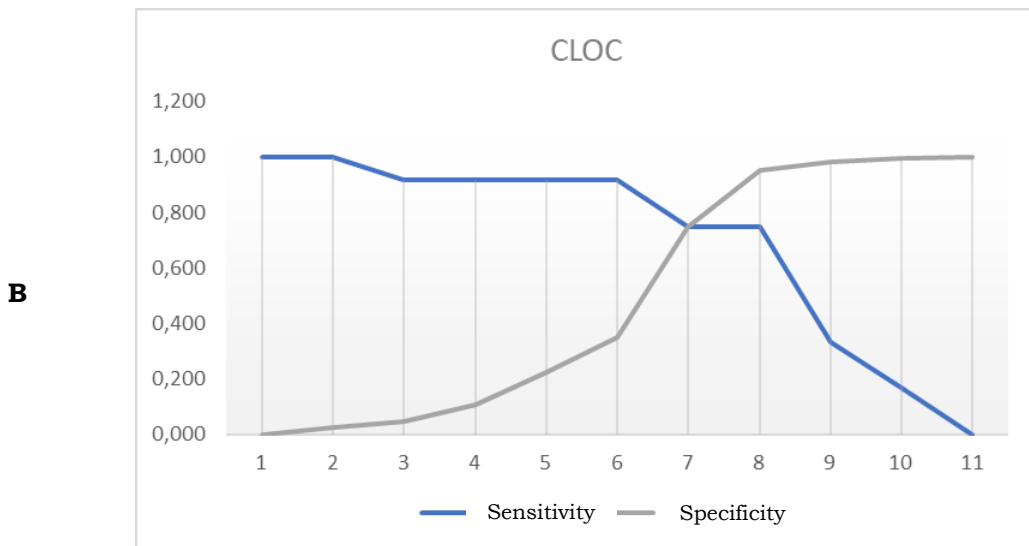
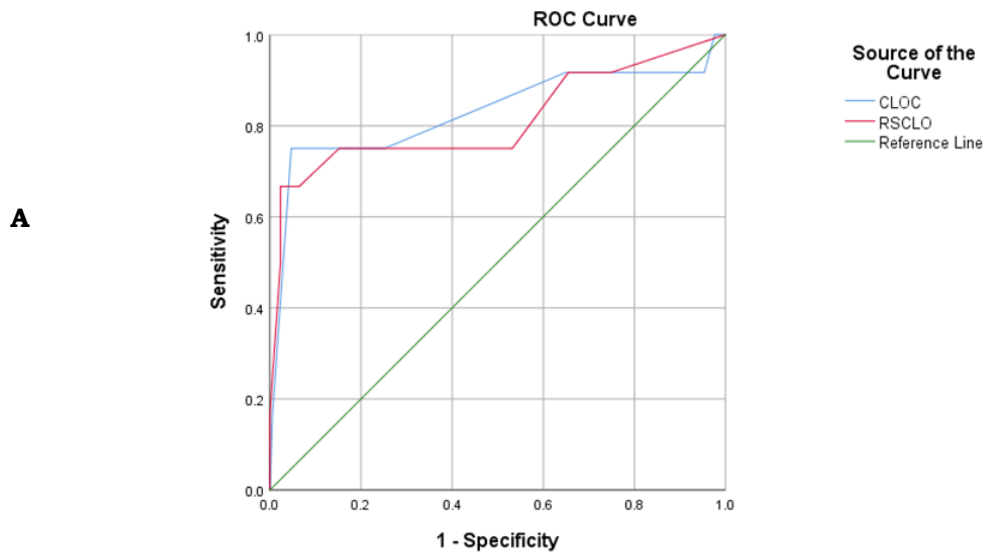


Figure 1. ROC curve, sensitivity curve, and specificity curve. A. ROC curve. B. Sensitivity and specificity curve of CLOC score. C. Sensitivity and specificity curve of RSCLO score.

Table 3 describes the relationship between CLOC and RSCLO scores in predicting the risk of preoperative laparoscopic cholecystectomy conversion. A CLOC score > 5.5 has a greater

conversion risk than a CLOC score ≤ 5.5. Meanwhile, an RSCLO score > -2 has a greater conversion risk than an RSCLO score ≤ -2.

Table 3. Relationship between CLOC and RSCLO scores with predictions of preoperative laparoscopic cholecystectomy conversion.

Variable	Total	Conversion		p-value*
		Yes	No	
CLOC				
> 5,5	52	9 (17,3)	43 (82,7)	< 0,01
≤ 5,5	131	3 (2,3)	128 (97,7)	
RSCLO				
> -2	47	9 (19,1)	38 (80,9)	< 0,01
≤ -2	136	3 (2,2)	133 (97,8)	

\*Chi-square, p<0,05.

Table 4 shows the sensitivity and specificity of the CLCO and RSCLO scores. The sensitivity value CLOC for the prediction of preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy obtained 75% and a specificity of 74.85%. With value negative predictive value, which is higher than a positive predictive value and 74.86% accuracy. The

sensitivity value RSCLO for the prediction of preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy obtained 75% and a specificity of 77.78%, with value negative predictive value, which is higher than the positive predictive value and 74.86% accuracy.

Table 4. Sensitivity and specificity of the CLOC score and RSCLO score.

Statistic	CLOC score (95%CI)	RSCLO score (95%CI)
Sensitivity	75% (42,81% - 94,51%)	75% (42,81% - 94,51%)
Specificity	74,85% (67,66% - 81,16%)	77,78% (70,80% - 83,77%)
Positive predictive value	17,31% (12,13% - 24,10%)	19,15% (13,34% - 26,70%)
Negative predictive value	97,71% (94,10% - 99,13%)	97,79% (94,31% - 99,16%)
Accuracy	74,86% (67,93% - 80,97%)	77,60% (70,86% - 83,42%)

#### 4. Discussion

Another study stated that the characteristics of the CLOC scores had a sensitivity of 73% and a specificity of 87%. In this study, the sensitivity and specificity CLOC scores each obtained 75% and 74.85%. The results obtained from this study are similar to previous studies. Other studies showed that the level of sensitivity and specificity RSCLO scores in predicting conversion by 100% and 96%, while the sensitivity and specificity scores RSCLO in this study each obtained 75% and 77.78%. The difference in the results of this study with other studies is due to the fact that this study has a larger number of samples.<sup>12-</sup>

From the results, the area under the curve (AUC) CLOC obtained a value of 82.9% (p-value <0.01). It means that CLOC, when used to predict preoperative conversion of laparoscopic cholecystectomy to open cholecystectomy in 100 patients with the results of 83 people results was right and correct. From the results of the area under the curve (AUC), RSCLO obtained a value of 81.1% (p-value <0.01), meaning that the RSCLO score when used to predict preoperative conversion from laparoscopic cholecystectomy to open cholecystectomy of 100 patients, 81.1 of the results were correct and correct. Thus, these two scores have good value in predicting preoperative conversion from

laparoscopic cholecystectomy to open cholecystectomy.<sup>17-20</sup>

## 5. Conclusion

Accuracy scores between scoring systems CLOC (Conversion from laparoscopic to open cholecystectomy) and RSCLO (Risk score for conversion from laparoscopic to open cholecystectomy) at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia, in predicting the risk of conversion to laparoscopic cholecystectomy, the results showed that there was no difference between the accuracy values of the two scorings.

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