# Diagnosis of diverticulitis is associated with increased risk of surgical wound dehiscence, compared to laparotomy for other intestinal indications: A cross-validated scoring system to predict patients at risk

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER

*Chathurika S Dhanasekara, MBBS, PhD[1]; Erin Morris, BS[1]; Chanaka Kahathuduwa, MBBS, PhD[2]; and Sharmila Dissanaike, MD, FACS[1]*

[1.] *Department of Surgery, Texas Tech University Health Science Center, Lubbock, Texas, USA*
[2.] *Department of Psychiatry, Texas Tech University Health Science Center, Lubbock, Texas, USA*

SAGES 2021

## Introduction

Surgical wound dehiscence (WD) is a relatively common complication associated with an increased hospital stay, morbidity, and mortality. Factors that are commonly associated with diverticulitis (e.g. impaired nutritional status, systemic inflammation, diabetes) are also known risk factors for WD. However, the risk of laparotomy WD in diverticulitis has not been established. Furthermore, risk factor-based models to identify patients with diverticulitis who are likely to develop post-laparotomy WD are unfounded. We aimed to address these limitations in the literature in a secondary data analysis.

## Methods

De-identified data of patients with and without diverticulitis who have undergone open laparotomy for intestinal surgery were extracted from the Cerner Health Facts® Database along with their age, sex, race, and BMI, presence of laparotomy wound infection, and history of diabetes and hypertension. Those with a concurrent or prior malignant cancer diagnosis were excluded. Continuous variables were transformed into multiple overlapping categorical variables. The relative risk of WD in patients with vs. without diverticulitis was computed. The data of patients with diverticulitis was randomized into three subsets. A 10-fold cross-validated elastic net model was applied on subset1 to predict WD using all available predictors using the caret package in R. A scoring system was developed and validated using subset2 and subset3, respectively.

References

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Wu KL, Lee KC, Liu CC, Chen HH, Lu CC. Laparoscopic versus Open Surgery for Diverticulitis: A Systematic Review and Meta-Analysis. Dig Surg. 2017;34(3):203-215. doi: 10.1159/000450683. Epub 2016 Dec 10. PMID: 27941315.

## Results

*Table 1. Demographics and Complications*

| | Diverticulitis (n=1527) (Mean ± SD/n (%) | Control (n=35563) (Mean ± SD/n (%) | t-statistic/ $\chi 2$ | p value |
|---|---|---|---|---|
| **Age** | 59.93 ± 16.71 | 59.58 ± 16.71 | -0.849 | 0.396 |
| **BMI** | 31.07 ± 8.64 | 28.76 ± 7.87 | -7.610 | <0.001 |
| **Male** | 716 (46.89 %) | 15852 (44.59 %) | 3.051 | 0.081 |
| **White** | 1177 (78.31 %) | 27724 (79.44 %) | 1.049 | 0.306 |
| **Hypertension** | 985 (64.51 %) | 18633 (52.39 %) | 85.708 | <0.001 |
| **Diabetes** | 265 (17.35 %) | 4554 (12.81 %) | 26.399 | <0.001 |

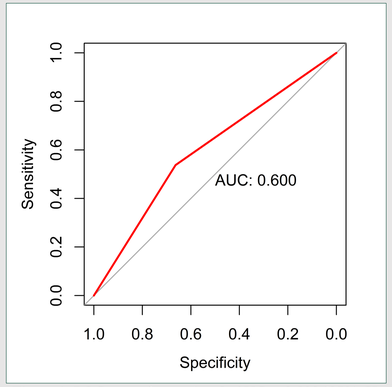



*Figure 1. ROC curve from subset3. AUC = 0.600 [95% CI = 0.539-0.662]. AUC - area under the curve; ROC - Receiver operating characteristic; CI- confidence interval.*

*Table 2. Contingency Table*

| | | Wound Dehiscence | | $\chi 2$ | p-value |
|---|---|---|---|---|---|
| | | Present | Absent | | |
| **Diverticulitis** | Present | 522 | 1005 | 10.335 | 0.001 |
| | Absent | 10770 | 24793 | | |
| **OR= 1.196 [1.071, 1.334]** | | | | | |

*Table 3: Scoring criteria predicting laparotomy with dehiscence in diverticulitis*

| Parameter | Score (range -1 to +6) |
|---|---|
| BMI < 18.5 kgm$^2$ | + 2 |
| Age > 40 years | + 1 |
| Age > 70 years | + 1 |
| Hypertension | + 1 |
| White | + 1 |
| BMI > 40 kgm$^2$ | - 1 |

## Results

Out of a sample of 37,090 patients who underwent laparotomy 30% patients without diverticulitis, and 34% patients with diverticulitis had WD (Table 2). The relative risk of WD in diverticulitis was 1.13 [1.06, 1.20]. Scoring criteria were developed based on the predictive model (Table 3). A score of >3 was determined as the best threshold to predict laparotomy WD in diverticulitis (Table 3). In subset3 (i.e. testing subset), sensitivity, specificity, positive and negative predictive values of the scoring system were 79%, 40%, 37%, and 82%, respectively (Figure 1).

## Conclusion

Diverticulitis appears to increase the risk of laparotomy related WD by 13%. Underweight, age >70 years, hypertension, and White emerged as risk factors for WD in laparotomy patients with diverticulitis. These risk factors and our scoring criteria should facilitate clinicians to identify at-risk patients to improve the outcomes of laparotomy in diverticulitis.