Original Article

Readmission Risk of Colonic Diverticulitis after Conservative Treatment: A 10-year Comprehensive National Cohort Study

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Key Words
Diverticulitis;
Recurrence;
Readmission;
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Purpose. The incidence of diverticulitis is increasing steadily every year. The majority of clinical doctors prefer to treat minor cases of diverticulitis conservatively. However, those who have undergo non-surgical treatment for the first episode of colonic diverticulitis may still require surgery if diverticulitis recurs. The aim of this study is to identify the rate and the risk factors for readmission for diverticulitis after conservative treatment.
Methods. This large cohort retrospective study used data from the Taiwan National Health Insurance Research Database for 2000-2010. The study included patients aged 18 years or older with the diagnosis code for colon diverticulitis (ICD-9 codes 562.11) as either a primary or secondary diagnosis. We used Clinical Classification Software codes (CCS) to identify the patients receiving colectomy with surgical complications or not. All patients were followed up until recurrence, death, or 2013/12/31.
Results. Of the 27,556 patients who admitted for diverticulum and received non-colectomy treatment with median 72.57 months were included for analysis. The readmission rate of diverticulitis was approximately 9.1% (2,518/27,556) patients after a median follow-up of 21.35 months. However, during the second episode of diverticulitis, it could be subsided in 2,162 patients (85.86%) with conservative treatment. Multivariate logistic regression analysis demonstrated that age > 32.5 years, male sex, Length of hospital stay (LOH) > 5 days, history of peptic ulcer disease, and hyperlipidemia were risk factors for readmission. When patient had more than 2 risk factors, it had 70.65% positive predict value, 95.90% negative predict value, 39.61% sensitivity and 98.85% specificity to predict the readmission for diverticulitis within 2 years (AUC = 0.583, $p < 0.001$).
Conclusions. In Taiwan, most of the patients receive conservative treatment during their first episode of diverticulitis. For those who receive conservative treatment, the readmission rate is 9.1%. The risk factors for readmission of diverticulitis are age > 32.5 years, male sex, LOH > 5 days, history of peptic ulcer disease, and hyperlipidemia were risk factors for readmission. Patients with 2 risk factors had 70.65% positive predict value to predict 2nd admission within 2 years. However, whether elective colectomy recommended or not still remains unclear.
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Diverticular disease is very common, and the overall incidence of diverticulitis has increased considerably over the past several decades in line with the increase in the aging population.[1,2] Diverticulitis represents a complication of diverticular disease leading to more than 300,000 hospital admissions per year[3] and nearly 2 billion US dollars of direct medical costs in the US.[4]

When diverticulitis is asymptomatic or minor, and in those who we expect to remain healthy without surgical intervention, the majority of clinical doctors prefer to either maintain observation or treat diverticulitis conservatively.[5] Despite this, in some situations, like colonic perforation with peritonitis, fecal containment, or those complicated with septic shock, a colectomy or colectomy with diversion enterostomy should be performed. However, patients who don't receive surgery in their first episode of diverticulitis, remain at risks of requiring an operation if recurrent diverticulitis occurs.

Some surgical societies recommend elective resection once the inflammatory process has resolved, with the rationale being that these patients are at high risk of recurrence and complications.[6,7]

The aim of this study was to identify the rate and risk factors of readmission for diverticulitis after conservative treatment. This will assist us with the decision making process in terms of elective operations for those who have risk factors of recurrence and avoid complications and diversion enterostomy.

Materials and Methods

Database and study sample

The protocol of this study was fully reviewed and approved by the Institutional Review Board of Buddhist E-da Hospital (EMRP-106-063). We claimed the dataset from Taiwan's National Health Insurance Research Database (NHIRD) (registered number NHIRD-103-246), which were provided by the National Health Insurance Administration and the Ministry of Health and Welfare. We extracted the data from the inpatient expenditures by admission (DD), and the registry for beneficiaries (ID) from the NHIRD database from January 1, 1996, to December 31, 2013 for analysis.

Data extraction

We extracted the admission data of 'with colonic diverticulitis disease' from the inpatient expenditures by admissions (DD) section of the NHIRD database. Colonic diverticulitis disease was defined by the ICD-9 diagnostic code (ICD-9 diagnostic code: 562.11) in the leading and second diagnosis of this admission. Patients less than 18 years old, and patients with undisclosed sex were excluded. Patients who were not admitted between 2000 and 2010 were also excluded. Also, patients who received colon resection, and those patients who died in 1st admission were excluded. Finally, 27,556 patients were enrolled for further analysis (Fig. 1).

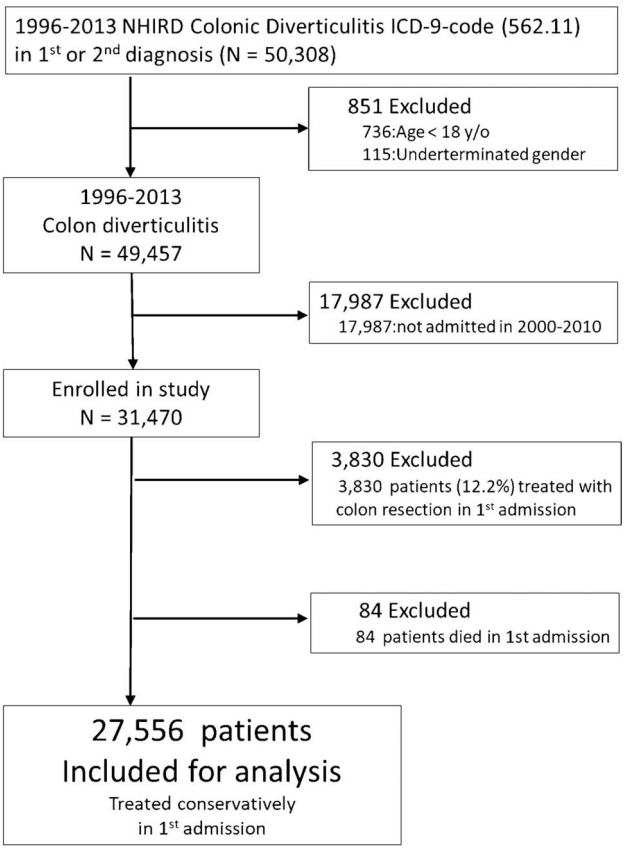

Fig. 1. Study sample and data extraction, including inclusion and exclusion criteria. NHIRD: Taiwan's National Health Insurance Research Database.

Evaluation of readmission for diverticulitis after conservative treatment

The primary end point of this study was readmission for diverticulitis. Patients who received conservative treatment and were discharged were followed until the primary end point of this study, death, or to the end of the study (2013/12/31).

Covariant assessment

The general condition of patients was evaluated by their characteristics and comorbidities. Previously published risk factors for predicting mortality, including age and sex, were evaluated. Any admission records in the NHIRD database before the index admission were used to identify patient comorbidities, and specific comorbidities were defined based on the diagnostic codes of the Charlson comorbidity index (CCI).[8] Other comorbidities, including hypertension (401-405), hyperlipidemia (571.2, 571.4-6, 572.2-8, 456.0-456.21), and obesity (410, 412), were identified as covariates.

Outcomes evaluation of first and second admission for diverticulitis

The discharge condition was identified from the extracted admission data. Patients with a discharge code of death or discharge due to terminal illness were considered as mortality here. In order to identify patients who underwent colectomy and had specific complications during admission, we searched the diagnoses and procedures based on the categories of Clinical Classification Software codes (CCS), which collapsed all ICD-9-CM's diagnosis and procedure codes into the following clinically meaningful categories that were useful for presenting descriptive statistics:[9] Colectomy (CCs-Multiple-Procedure 9.10.x and 9.11) and several complications,[10] including acute myocardial infarction (CCs-Multiple-Diagnosis 7.2.3), pneumonia (CCs-Multiple-Diagnosis 8.1), calculous cholecystitis (CCs-Multiple-Diagnosis 9.7.1), acalculous cholecystitis (CCs-Multiple-Diagnosis 9.7.5), urinary tract infection (CCs-Multiple-Diagnosis 10.1.4), gastrointestinal bleeding (CCs-Multiple-Diagnosis 9.10), acute renal insufficiency (CCs-Multiple-Diagnosis 10.1.2.1), wound bleeding (CCs-Multiple-Diagnosis 16.10.2.5), infection complications (CCs-Multiple-Diagnosis 16.10.2.6), and other complications (CCs-Multiple-Diagnosis 16.10.2.7).

Statistical analysis

Statistical analysis was performed using SPSS software (IBM, Chicago, IL, USA) for descriptive statistics and contingency tables for data analysis. The Student *t* test and Mann Whitney *U* test were used for continuous variables. The chi-square test was used to compare the categorical variables, such as age group, sex, and comorbidities between surgical groups and the non-surgical group, and the contingency table was generated. The cut-off values for continuous variables (age, CCI and LOH) were determined from the ROC curve. All plausible variables for predicting readmission for diverticulitis were analyzed by a univariate logistic regression model. All variables that demonstrated modest ($p < 0.2$) relationships with mortality in univariate analysis were included in a multivariate backward stepwise logistic regression model in order to calculate the hazard ratio. A p-value of < 0.05 was considered statistically significant.

Results

27,556 patients were enrolled for further analysis with a median follow-up of 72.57 months. Between them, 2,518 (9.1%) patients suffered from 2nd admission for diverticulitis after a median follow-up of 21.35 months. The clinical characteristics of the included patients were listed in Table 1. Compared with those who received colectomy in first admission (Supplement Table 1), patients who received conservative treatment had younger age (51.77 vs. 57.38 years, $p < 0.001$), lower male-to-female ratio (M/F 55.4%/44.6% vs. 58.9%/41.1%, $p < 0.001$), and lower Charlson Comorbidity index (0.67 vs. 0.83, $p < 0.001$). Moreover, they had lower 30-day in-hospital mortality (0.2% vs. 2.1%, $p < 0.001$) and overall hospital mortality (0.3%

Table 1. Demographic characteristics and outcome of included patients

Clinical characteristics	All included patients (N = 27,556)
Age in 1st admission (y), mean (SD)	51.70 (17.73)
Sex	
Male	15,255 (55.4%)
Female	12,301 (44.6%)
Charlson Score in 1st admission	
Mean (SD)	0.66 (1.54)
Median (range)	0 (0-17)
LOH in 1st admission	
Mean (SD)	6.15 (8.92)
Median (range)	5 (0-659)
Comorbidities	
MI	388 (1.4%)
CHF	1,064 (3.9%)
PVascuD	231 (0.8%)
CerebralD	1,714 (6.2%)
Dementia	154 (0.6%)
COPD	1,930 (6.9%)
Rheuma	154 (0.5%)
PUD	3,043 (10.7%)
Liver disease	0 (0)
DM	2,273 (8.2%)
Hemiplegia	338 (1.2%)
RenalD	944 (3.4%)
Ca	943 (3.4%)
SevereLD	190 (0.7%)
MetaCa	202 (0.7%)
AIDS	3 (0.0%)
HTN	4,528 (16.4%)
HyperLipid	1,645 (6.0%)
Obese	34 (0.1%)

LOH: length of hospital stay, MI: myocardial infarction, CHF: congestive heart failure, VasuD: vascular disease, CVA: cerebrovascular disease, COPD: chronic obstructive pulmonary disease, Rheuma: rheumatic disease, PUD: peptic ulcer disease, LiverD: liver disease, DM: diabetes mellitus, RenalD: renal disease, Ca: malignancy, SevereLD: severe liver disease, MetaCa: malignancy with metastasis, AIDS: acquired immune deficiency syndrome, HTN: hypertension, HyperLipid: hyperlipidemia.

vs. 3.2%, $p < 0.001$), lower length of hospital stay (LOH) (6.22 days vs. 17.42 days, $p < 0.001$), lower complications (8.3% vs. 20.3%, $p < 0.001$) and lower overall costs (USD 939.21 vs. 5283.33, $p < 0.001$).

Among included patients, 356 (14.1%) patients received surgery when recurrent diverticulitis occurred (Table 2). Significantly shorter followed-up period (conservative group: 33.15 months; colon resection group: 22.21 months; $p < 0.001$) but similar mean Charlson score (conservative group: 1.09; colon resection group: 0.84; $p = 0.092$) as the colon resection group were identified. Similar in-hospital mortality (conservative group: 0.8%; colon resection group: 2.0%, $p = 0.073$) but lower complication rate (conservative group: 11.4%; colon resection group:16.0%, $p = 0.017$) in conservative group were identified. Moreover, the mean hospital stay (conservative group: 6.74 days; colon resection group: 16.73 days; $p < 0.001$), and mean cost during admission (conservative group: 946.86 USD; colon resection group: 4,653.58 USD, $p < 0.001$) were all significantly lower in the conservative group than the colon resection group.

We applied cox-regression analysis in order to identify the risk factors of recurrent diverticulitis. The univariant factors were age more than 32.5 years old (HR 1.392, $p < 0.001$), male (HR 1.193, $p < 0.001$), CCI score > 0 (HR 1.248, $p < 0.001$), LOH > 5 (HR 1.521, $p < 0.001$), Peripheral vascular disease (HR 1.490, $p = 0.043$), chronic obstructive pulmonary disease (HR 1.243, $p = 0.006$), peptic ulcer disease (HR 1.365, $p < 0.001$), renal disease (HR 1.312, $p = 0.009$), hypertension (HR 1.232, $p < 0.001$), and hyperlipidemia (HR 1.409, $p < 0.001$) (Table 3). Multivariate logistic regression analysis showed that age more than 32.5 years (HR 1.289, $p < 0.001$), male (HR 1.211, $p < 0.001$), LOH > 5 days (HR 1.472, $p < 0.001$), peptic ulcer disease (HR 1.208, $p = 0.003$), and hyperlipidemia (HR 1.242, $p = 0.007$) were risk factors for readmission for those who received conservative treatment in first episode of colonic diverticulitis. For those patients who had more than 2 risk factors, it had 70.65% positive predict value and 95.90% negative predict value, to predict the readmission for diverticulitis within 2 years (AUC = 0.583, $p < 0.001$).

Discussion

The current study demonstrated that more than half of the patients in Taiwan with diverticulitis received conservative treatment. In our study, we collected data from 31,470 patients who were admitted

Table 2. Demographic characteristics and outcome of second diverticulitis admission

	2nd Admission (Total: 2,518)		
Clinical characteristics	Conservative (N = 2,162)	Colon resection (N = 356)	*p*
Followed-up period (M), mean (SD)	33.15 (31.49)	22.21 (30.44)	< 0.001
Sex			0.116
Male	1,268 (41.4%)	131 (36.8%)	
Female	894 (58.6%)	225 (63.2%)	
Charlson Score			0.092
Mean (SD)	1.09 (1.91)	0.84 (1.54)	
Median (range)	0 (0-15)	0 (0-11)	
Outcome			
30-days hospital death	15 (0.7%)	3 (0.8%)	0.732
Overall hospital death	18 (0.8%)	7 (2.0%)	0.073
LOH			< 0.001
Mean (SD)	6.74 (6.35)	16.73 (28.02)	
Median (range)	5 (0-74)	13 (5-502)	
Cost (USD)	946.86 (1488.37)	4,653.58 (6433.61)	< 0.001
Complications	246 (11.4%)	57 (16.0%)	0.017
AMI	2 (0.1%)	2 (0.6%)	0.098
Pneumonia	62 (2.8%)	14 (3.9%)	0.313
Calculous acute cholecystitis	8 (0.4%)	1 (0.3%)	1.000
Acalculous acute cholecystitis	10 (0.5%)	1 (0.3%)	1.000
Acute renal failure	5 (0.2%)	4 (1.1%)	0.028
UTI	100 (4.6%)	19 (5.3%)	0.589
GI bleeding	65 (3.0%)	7 (2.0%)	0.389

Table 3. Risk factor analysis of readmission for diverticulitis after conservative treatment

	Univariant analysis			Multivariate analysis		
	HR	95% CI	*p*	HR	95% CI	*p*
Age >32.5	1.392	(1.227-1.580)	< 0.001*	1.289	(1.134-1.466)	< 0.001*
Male	1.193	(1.098-1.297)	< 0.001*	1.211	(1.113-1.316)	< 0.001*
CCI Score > 0	1.248	(1.141-1.366)	< 0.001*	0.979	(0.849-1.129)	0.769
LOH > 5	1.521	(1.401-1.652)	< 0.001*	1.472	(1.355-1.599)	< 0.001*
MI	0.986	(0.698-1.398)	0.936			
CHF	0.939	(0.755-1.167)	0.571			
PVascuD	1.490	(1.013-2.191)	0.043*	1.231	(0.834-1.818)	0.296
CerebralD	1.071	(0.908-1.264)	0.417			
Dementia	1.073	(0.629-1.832)	0.795			
COPD	1.234	(1.062-1.432)	0.006*	1.022	(0.873-1.197)	0.784
Rheuma	1.318	(0.805-2.159)	0.272			
PUD	1.365	(1.211-1.537)	< 0.001*	1.208	(1.068-1.367)	0.003*
DM	1.002	(0.863-1.163)	0.982			
Hemiplegia	1.004	(0.692-1.456)	0.983			
RenalD	1.312	(1.070-1.608)	0.009*	1.051	(0.851-1.299)	0.643
Ca	0.985	(0.785-1.235)	0.893			
SevereLD	1.041	(0.639-1.694)	0.872			
MetaCa	0.854	(0.521-1.426)	0.547			
HTN	1.232	(1.109-1.368)	< 0.001*	1.014	(0.896-1.146)	0.831
HyperLipid	1.409	(1.208-1.643)	< 0.001*	1.242	(1.060-1.455)	0.007*
Obese	1.326	(0.467-3.768)	0.596			

MI: myocardial infarction, CHF: congestive heart failure, VasuD: vascular disease, CVA: cerebrovascular disease, COPD: chronic obstructive pulmonary disease, Rheuma: rheumatic disease, PUD: peptic ulcer disease, LiverD: liver disease, DM: diabetes mellitus, RenalD: renal disease, Ca: malignancy, SevereLD: severe liver disease, MetaCa: malignancy with metastasis, HTN: hypertension, HyperLipid: hyperlipidemia.

with at least one diverticulitis episode. 27,640 patients (87.8%) could be subsided with conservative treatment, and only 3,830 patients (12.2%) should receive surgery during their first episode of diverticulitis. In addition, the readmission rate of colonic diverticulitis after conservative treatment was approximately 9.1% (2,518 patients) after a median follow-up of 21.35 months. During the second episode of diverticulitis, 2,162 patients (85.9%) could be subsided with conservative treatment. The percentage of conservative treatment was similar in patients with a second episode of diverticulitis compared to those with a first episode of diverticulitis.

Olivier P. et al. found that 15% of the patients who had an initial episode of diverticulitis required surgical intervention at admission; this was reduced to 5.8% in the recurrence group.[11] This result is consistent with our finding that recurrent diverticulitis was generally treated conservatively. They also reported that recurrent episodes of diverticulitis do not increase the risk of complications or conservative treatment failure compared with the initial episode.[11] Furthermore, Ville S. et al. highlighted that even if a patient has several former episodes of diverticulitis, this is unlikely to increase the risk for complicated recurrence.[12] This might be one of the reasons that the majority of clinical physicians choose conservative treatment for recurrent cases. They also proposed that prophylactic colectomy has only a minor uncomplicated recurrence rate. It seems not being effective in preventing complicated recurrence rate.[12]

We also demonstrated that age more than 32.5 years, male sex, length of hospital stay (LOH) > 5 days, history of peptic ulcer disease, and hyperlipidemia were risk factors of readmission for colonic diverticulitis. This is in contrast to previous studies that indicated that C-creative protein,[13] age over 50 years,[14] age less than 50 years,[15] Charlson comorbidity index,[14] history of diverticulitis,[12,15] family history of diverticulitis,[16] male sex,[17] corticosteroid use,[12,18] retroperitoneal abscess,[12,16] smoking,[19,20] obesity,[19,20] and complicated initial disease[20] were associated with recurrence. Although most of the previous studies showed that younger age diverticulitis patients were at higher risk for the recurrence of diverticulitis,[19,20] El-Sayed C, et al. found those who were under 30 years old had lower recurrence rate compared with the 30 to 45 years group.[19] This result is corelated to our finding that the patients more than 32.5 years old were under higher risk of readmission of diverticulitis. Another reason why our result conflicts with most previous studies may be that we use the leading and second diagnostic code, which may lead to the inclusion of those who were readmitted for other unrelated disease using the second diagnostic code but still logged in with diverticulitis code as second diagnostic code. However, once we use the first diagnostic codes only, we may miss those patients who was admitted with sepsis caused by diverticulitis and with the leading diagnosis of "sepsis" instead of "diverticulitis". Because we cannot be sure that every readmission was caused by diverticulitis, we used the term with "Re-admission" instead of "Recurrence". Besides, the study published by El-Sayed C, et al. also mentioned of dyslipidemia as one of the risk factors of recurrent diverticulitis,[19] which was showed in our result as well.

Furthermore, it is found that the incidence of colonic diverticula for the population of age older than 50 years is higher in those who have duodenal diverticula (20~50%).[21] Besides, most of the secondary or false diverticula are caused by duodenal ulceration.[21] This maybe the reason why we found history of peptic ulcer disease to be one of the risk factors of readmission for colonic diverticulitis.

Although no previous studies showed long hospital stay as one of the risk factors for the recurrence or readmission of colonic diverticulitis, complicated initial disease was one of the risk factors found in the previous study. According to other studies, perforated diverticulitis patients require longer hospitalization due to higher possibility to become complicated diverticulitis.[22] Yoo T, et al. found that the finding of diverticulitis with perforation on the CT scan as a factor associated with long hospital stay, which is longer than 6 days.[22] In our study, we could not identify the severity of the disease from the database we use, but we concluded LOH > 5 days as one of risk factors for readmission.

Moreover, Chauyems RC, et al. suggested that those who were treated non-operatively at a young

age (≤ 50 years old), and had severe diverticulitis by computed tomography during the first episode, should receive elective colectomy, because these patients had a higher risk of remote complications (persisting or recurring diverticulitis) and poor outcomes.[23] Several studies also found that patients who were treated with conservative treatment had a higher recurrence and rehospitalization rates than those who received surgery.[24-27] In the past, prophylactic colectomy was suggested for patients < 40 years with one episode of diverticulitis, or those who had two episodes of uncomplicated diverticulitis.[28-32] However, the current recommendations do not suggest that elective colectomy is best suited for uncomplicated diverticulitis, because the effectiveness of reducing the recurrence rate and emergency surgery is uncertain.[33-36] Recently, there has also been an international comparison of elective colon resection after acute diverticulitis; it showed a 13% elective colectomy rate for the USA, 5.4% for England, and 3.4% for Australia.[37] These figures reflect that the majority of clinical physicians worldwide tend to choose a less invasive way to treat diverticulitis. According to the data we collected (Table 4), the same trend is apparent in Taiwan.

Although colonic diverticulitis can be initially treated by antibiotics and conservative treatment, and it is expected that the management of non-operative intent is safe,[4] in some situations, such as Hinchey III or IV, colectomy is the only solution. However, emergent colectomy is usually insufficient in complicated peritonitis of diverticulitis cases, and diversion colostomy or ileostomy with colectomy represent the best methods to avoid worsening of the peritonitis. However, most of the patients hesitate to receive enterostomy creation.

The optimal long-term management strategy for patients with diverticulitis complicated by abscess continues to change. Although initial non-operative management has become standard, the need for elective resection after the first episode remains unclear.

Limitations

This study has some limitations. First the risk of miscoding exists; in the NHI database, upon admission, the diagnosis and procedures performed were recorded according to ICD-9. However, surgeons in Taiwan are used to a different coding system, the Health Insurance Surgical Orders from the Taiwan NHI payment system, which directly relates to the revenue earned by surgeons. Second, according to the ICD-9 coding system, we cannot clearly determine the severity of diverticulitis when the patient first arrives at hospital, which may influence the treatment decision by the surgeon. Third, we could not exclude the patients who was readmitted due to unrelated disease but still using diverticulitis as second diagnostic code. Thus, we used the term "Re-admission" instead of "Recurrence". But if we use the first diagnostic codes only, we may miss the patients who were admitted with sepsis caused by diverticulitis, in which the leading code would be "sepsis" instead of "diverticulitis". Therefore, we believed that using 1st and 2nd diagnostic code can gather most patients with diverticulitis.

Conclusion

In Taiwan, 87.8% of the patients with a first episode of colonic diverticulitis were treated with conservative treatment, and 9.1% of these patients were re-hospitalized due to recurrence. The majority treatment of 2nd admission is conservative treatment with similar in-hospital mortality but lower complications. It seems that for most of the patients who present with

Table 4. Overall admissions and treatment choices of all patients with diverticulitis from 2000-2010

Year	Admission times	Surgical treatment	Conservative treatment	Surgical treatment rate
2000	1482	272	1210	18.35%
2001	1670	297	1373	17.78%
2002	1989	332	1657	16.69%
2003	2126	347	1779	16.32%
2004	2549	383	2166	15.03%
2005	2882	383	2499	13.29%
2006	3239	341	2898	10.53%
2007	3603	396	3207	10.99%
2008	3656	366	3290	10.01%
2009	3994	357	3637	8.94%
2010	4280	356	3924	8.32%

recurrent colonic diverticulitis, conservative treatment is sufficient. The risk factors for readmission of diverticulitis are age > 32.5 years, male sex, LOH > 5 days, history of peptic ulcer disease, and hyperlipidemia. Patients with 2 risk factors had 70.65% positive predict value to predict 2nd admission within 2 years. Whether elective colectomy should be recommended after conservative treatment for the first episode of colonic diverticulitis remains unclear.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Supplement

Supplement Table 1. Demographic characteristics and outcome of first admission for colon diverticulitis

	1st Admission (Total: 31,470)		
Clinical characteristics	Conservative (N = 27,640)	Colon resection (N = 3,830)	*p*
Age (y), mean (SD)	51.77 (17.75)	57.38 (17.39)	< 0.001
Sex			< 0.001
Male	15,300 (55.4%)	2,257 (58.9%)	
Female	12,340 (44.6%)	1,573 (41.1%)	
Charlson score			< 0.001
Mean (SD)	0.67 (1.55)	0.83 (1.62)	
Median (range)	0 (0-17)	0 (0-13)	
Outcome			
30-days hospital death	64 (0.2%)	81 (2.1%)	< 0.001
Overall hospital death	84 (0.3%)	124 (3.2%)	< 0.001
LOH			< 0.001
Mean (SD)	6.22 (8.92)	17.94 (17.42)	
Median (range)	5 (0-747)	13 (0-243)	
Cost (USD)	939.21 (1592.36)	5283.33 (6848.77)	< 0.001
Complications	2282 (8.3%)	778 (20.3%)	< 0.001
AMI	19 (0.1%)	12 (0.3%)	< 0.001
Pneumonia	434 (1.6%)	154 (4.0%)	< 0.001
Calculous acute cholecystitis	50 (0.2%)	10 (0.3%)	0.319
Acalculous acute cholecystitis	110 (0.4%)	20 (0.5%)	0.281
Acute renal failure	80 (0.3%)	54 (3.4%)	< 0.001
UTI	1016 (3.7%)	130 (3.7)	0.407
GI bleeding	531 (1.9%)	98 (2.6%)	0.010
Dead before recurrence	3437 (12.4%)		
Total recurrence	2518 (9.1%)		
Average time to recur (SD) (M)	32.45 (32.43)		
Median to recur (M)	21.35 (1.03-164.73)		

LOH: length of hospital stay, AMI: acute myocardial infarction, UTI: urinary tract infection, GI bleeding: gastrointestinal bleeding.

原　著

結腸憩室炎保守治療後再入院之發生率及風險因子：國內 10 年全國統計分析

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目的　憩室炎的發病率每年都在逐步上升。對於較輕微的憩室炎病例，大多數臨床醫生還是選擇保守治療。然而，一旦憩室炎再復發，對第一次接受非手術治療的病人，還是可能需要手術治療。因此，本研究的目的為分析保守治療後憩室炎再入院的發生率及其危險因子。

方法　這項大型回溯性研究使用了台灣國家健康保險研究數據庫 2000-2010 年的數據。該研究對象以年齡在 18 歲以上且診斷為結腸憩室炎 (ICD-9 代碼 562.11) 的患者作為主要及再復發診斷。我們使用臨床分類軟體代碼 (CCS) 來識別患者是否接受結腸切除術及術後有無手術併發症。對所有患者進行追蹤，直至 2013/12/31 或復發、死亡。

結果　在 27,556 例患有憩室炎並接受了保守治療的患者中，9.1% (2,518/27,556) 的患者於中位數 21.35 個月後再次因憩室炎住院。然而，因第二次憩室炎發作住院之病患中，仍有 2,162 (85.86%) 位患者經保守治療後出院。多元邏輯回歸分析顯示年齡超過 32.5 歲、男性、首次住院超過 5 天、潰瘍病史和高脂血症是再入院的危險因素。當患者擁有超過兩個危險因子以上時，預測兩年內再因憩室炎住院的陽性預測值 (PPV) 為 70.65%，陰性預測值為 95.90% (AUC = 0.583, $p < 0.001$)。

結論　在台灣，對於接受保守治療的患者，再入院率為 9.1%。風險因素是年齡超過 32.5 歲、男性、首次住院超過 5 天、潰瘍病史和高脂血症。當患者擁有超過兩個危險因子以上時，預測兩年內再因憩室炎住院的陽性預測值 (PPV) 為 70.65%。是否推薦選擇性結腸切除術仍無定論，還是需要再進一步研究。

關鍵詞　憩室炎、復發、再入院、結腸切除術、結腸造口術。