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Original Research Article

Factors associated with recurrent appendicitis after nonoperative management

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ABSTRACT

Background: The objective of this study is to identify predictors for recurrent appendicitis in patients with appendicitis previously treated nonoperatively.
Methods: This is a prospective cohort study of all adult patients with appendicitis treated at a tertiary care hospital. Patient demographics, radiographic information, management, and clinical outcomes were recorded. The primary outcome was recurrent appendicitis within 6 months after discharge from the index admission. Given the competing risk of interval appendectomy, a time-to-event competing-risk analysis was performed.
Results: Of the 699 patients presenting with appendicitis, 74 were treated nonoperatively (35 [47%] were women; median [IQR] age, 48 [33,64] years), and 21 patients (29%) had recurrent appendicitis. On univariate and multivariate analysis, presence of an appendicolith on imaging was the only factor associated with a higher risk of recurrent appendicitis ($p = 0.02$).
Conclusions: The presence of appendicolith was associated with an increased risk of developing recurrent appendicitis within 6 months.

1. Introduction

Appendicitis is one of the most common surgical emergencies with nearly 400,000 diagnoses per year in North America.[1] Urgent appendectomy has been the standard of care for treatment of appendicitis for decades and continues to be with 95% of cases treated operatively.[2] Nonoperative management (NOM) has been proposed as an alternative treatment strategy and has appeal due to patient preference, the ability to treat patients who may not be good surgical candidates, and cost-effectiveness.[3] Multiple randomized controlled trials have demonstrated the safety of nonoperative management, primarily for uncomplicated appendicitis.[4–6] However, one of the concerns regarding NOM of appendicitis is the rate of recurrent appendicitis, which has been reported in 12–39% of patients.[7–9]

To date, there is little data examining the predictors of recurrence. Previous studies have identified appendicolith, duration of symptoms, appendiceal diameter, elevated temperature, and increased Alvarado scores as predictors of failure of NOM.[4,10,11] However, few have looked at predictors of recurrent appendicitis in adults after successful NOM.[12–15]

For those patients who are treated with NOM, they may undergo routine interval appendectomy following initial presentation to prevent recurrence. There is debate among general surgeons as to the utility of the interval appendectomy after NOM given that not all patients will experience recurrent episodes.[7,16,17] In addition, recent reports suggest that the rate of neoplasia in complicated appendicitis treated with NOM, may be as high as 30%,[18–20] which may impact the decision for interval appendectomy. Understanding which patients are at higher risk for recurrent appendicitis can help counsel on NOM, decide which patients would benefit from interval appendectomy, and decrease morbidity associated with frequent recurrent symptoms.

The aim of this study was to determine predictive factors of recurrent

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appendicitis within 6 months for patients initially treated nonoperatively.

2. Patients and methods

We conducted a prospective cohort study of all adult patients with appendicitis treated nonoperatively at Vancouver General Hospital, a large tertiary care hospital. Patients were identified at the time of consultation by the general surgery team between May 2019 and April 2021 and collected in a prospective database. Patient demographics, radiographic findings, treatment plans, and clinical outcomes were recorded. This project was approved by the University of British Columbia's Clinical Research Ethics Board (H19-01711).

Patients with appendicitis treated nonoperatively were included. Appendicitis was diagnosed clinically, and management of appendicitis was left to the discretion of the treating surgeon. NOM consisted of patients treated with antibiotics and drainage in select cases, either by interventional radiology or surgically. Those who failed NOM and required an appendectomy during the index admission were excluded from the analysis. Complicated appendicitis was defined as appendicitis with clinical or radiologic evidence of rupture, abscess or phlegmon.

The primary outcome was recurrent appendicitis within 6 months after discharge from the index appendicitis episode. Recurrence was defined as re-presentation to a healthcare institution with symptoms of appendicitis. Recurrence of appendicitis was captured using a provincial electronic health system recording all visits to healthcare facilities. Interval appendectomy was defined as an elective appendectomy performed during follow-up.

Normally distributed data is presented as mean with standard deviation (SD) and non-normally distributed data as median with interquartile range (IQR). Missing data were treated as missing at random and imputation was not performed. For univariate and multivariate analysis of predictors for recurrent appendicitis, a time-to-event analysis was performed. Time to recurrent appendicitis was determined from the date of discharge of the index appendicitis episode to the date of the recurrent episode (days). Given the concern for competing risk with interval appendectomy, a competing-risks regression using the Fine and Gray method was done.[21] Potential predictors of recurrent appendicitis were evaluated in a univariate screen and those with a p-value <0.20 were include in the multivariate model. A sensitivity analysis where patients who were censored before 6 months were assumed to not have any recurrence at 6 months was performed. Outcomes were presented as subdistribution hazard ratios (SHR), 95% confidence intervals (CI) and p-values. Post-hoc analyses were performed comparing patients with uncomplicated versus complicated appendicitis, patients with evidence of malignancy on imaging versus those without, and patients who experienced early ($\leq$14 weeks) versus late (>14 weeks) recurrent appendicitis. Subgroup analyses looking at predictors of recurrent appendicitis separately in uncomplicated and complicated appendicitis were performed. Continuous variables were analyzed using the Student T-test or Wilcoxon Rank Sum test and categorical data were analyzed using the Fisher's exact test. A p-value of <0.05 was used for statistical significance. Statistical analysis was performed using Stata, version 17.0 (StataCorp, Texas, USA).

3. Results

Over the two-years study period, 699 patients presented with appendicitis. Eighty patients (11%) were initially treated nonoperatively, of which 6 patients required same-admission appendectomy, leaving 74 patients in the cohort (Fig. 1). The median age of these patients was 33 years and 35 (47%) were women (Table 1). There were 45 patients (65%) with complicated appendicitis and 15 patients (20%) had radiographic evidence of an appendicolith. Initial antibiotic treatment consisted of oral antibiotics alone in 70% (52/74) and combination intravenous antibiotics in 30% (22/74) of patients. A total of 12 patients (16%) required drainage—7 by interventional radiology and 5 surgically.

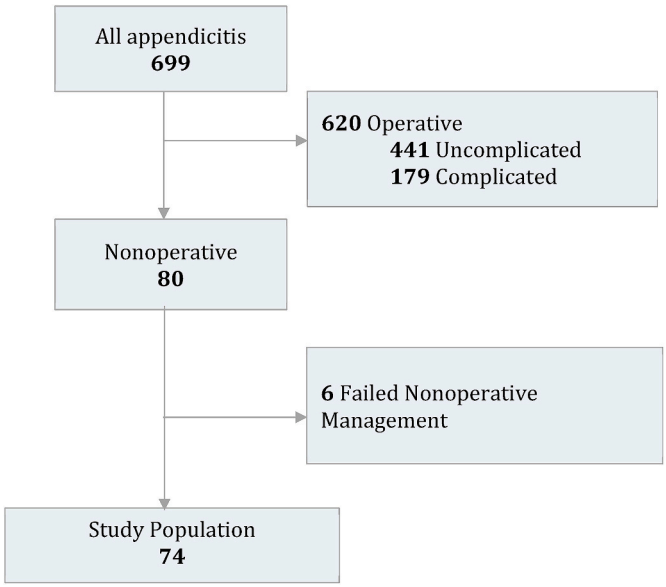

Fig. 1. Flowchart of appendicitis patients.

Table 1
Baseline characteristics of patients with appendicitis managed nonoperatively.

Characteristic	Total n = 74
Age, median [IQR]	48 [33, 64]
Female, n (%)	35 (47)
Complicated, n (%)[a]	45 (61)
Socioeconomic status, n (%)[b]	
High	14 (19)
Middle	57 (78)
Low	2 (3)
Admission, n (%)	51 (69)
Diabetes, n (%)	3 (4)
Duration of symptoms, days, median [IQR]	3 [1, 7]
Delayed presentation, n (%)[c]	42 (57)
Initial WBC, 10^9/L, mean (SD)	11.8 (4.5)
Imaging modality, n (%)[d]	
Ultrasound	16 (22)
Computed Tomography	63 (85)
Magnetic Resonance Imaging	3 (4)
Positron Emission Tomography	1 (1)
Radiographic Findings	
Abscess, n (%)	28 (38)
Phlegmon, n (%)	32 (43)
Size of abscess, mm, mean (SD)	45.9 (14.5)
Appendiceal diameter $\geq$10 mm, n (%)	47 (64)
Appendicolith, n (%)	15 (20)
Intraabdominal fluid, n (%)	21 (28)
Suspicion of malignancy, n (%)	10 (14)

Abbreviations: IQR, interquartile range; SD, standard deviation.
[a] Defined by radiographic evidence of perforation.
[b] Determined based on patient postal code area and correlation with socioeconomic status in British Columbia by local health area.[41]
[c] Presented to the emergency department 72 h or more after beginning of symptoms.
[d] Does not add up to 100% because some patients had multiple imaging tests.

We identified 21 patients (29%) with recurrent appendicitis within 6 months. Of those with recurrent appendicitis, median time to recurrence was 17 days (IQR [7–66]). Most patients (71%) were managed operatively for their recurrence—13 underwent laparoscopic appendectomy, 1 open appendectomy and 1 ileocectomy due to extensive inflammation. Of these patients, median length of stay for the recurrent episode was 2

days (range 0–8) and 3 patients had postoperative ileus, Clavien-Dindo grade I. All 6 patients treated nonoperatively for their recurrence had resolution of symptoms with antibiotics.

By 6 months, 32 patients, 44% (95% CI [33–57%]), had their appendix removed—15 for recurrent appendicitis, 15 with interval appendectomy and 2 patients with right hemicolectomy for malignancy. Of the 15 patients who underwent interval appendectomy, 67% (10/15) had same-day discharge and median length of stay was 0 (IQR [0–2]). There were no intraoperative complications, and one patient had a postoperative complication which was ileus, Clavien-Dindo grade I.

In our population, 14% (10/74) of patients had pathology-confirmed neoplasias of the appendix: 6 had low grade appendiceal mucinous neoplasms, 2 had adenocarcinomas, and 2 had adenomas. Initially during the index appendicitis episode, 10 patients had suspicion of malignancy on imaging. Of these patients, none of them had recurrent appendicitis. All patient characteristics, except for initial white blood count, were the same for patients with or without suspicion of malignancy on imaging (Supplementary Table 1). For investigation and treatment of suspected malignancy, 2 patients had right hemicolectomies for malignancy, 4 had elective interval appendectomies, 2 had normal colonoscopies and 2 opted to forego further investigation due to severe comorbidities. Of the four patients who underwent interval appendectomy due to concern for malignancy on imaging, 3 had low grade appendiceal mucinous neoplasm and 1 was of benign etiology. Of the 10 patients with confirmed neoplasia, only 5 of them had suspicion of tumor on diagnostic imaging.

The 6-month incidence of appendectomy was 67% (95% CI [38–88%]) among those with an appendicolith and 38% (95% CI [26–52%]) among those without an appendicolith. On univariate and multivariate analysis, presence of an appendicolith on imaging was the only factor associated with a statistically significant higher risk for recurrent appendicitis (SHR 2.71, 95% CI [1.20–6.13], p = 0.02) (Table 2). A sensitivity analysis in which all patients who did not have a recurrence were censored at 6 months revealed a similar conclusion where radiographic evidence of an appendicolith was the only risk factor identified with recurrent appendicitis (SHR 2.81, 95% CI [1.24, 6.40], p = 0.01).

Most of the patients in our cohort had complicated appendicitis. As expected, patients with complicated appendicitis had higher admission rates ($p < 0.01$) and longer duration of symptoms ($p < 0.01$) compared to those with uncomplicated appendicitis (Table 3). Table 3 summarizes the difference between these two groups. In a subgroup analysis, among patients with complicated appendicitis, appendicolith was still a risk factor for recurrent appendicitis on multivariate analysis (SHR 2.74, 95% CI [1.01, 7.44], $p < 0.05$) (Table 4). However, among patients with uncomplicated appendicitis, no risk factors were identified for recurrent appendicitis (Table 4).

The cumulative incidence curve suggests that there is an early differentiation of experiencing recurrent appendicitis between people who had appendicoliths and those who did not (Fig. 2). Patients who experienced early recurrent appendicitis were more likely female (60% vs 9%, p = 0.02), had lower rates of admission (40% vs 82%, $p < 0.05$), and lower initial white blood count (9.7 vs 13.2, p = 0.03) compared to those who had late recurrent appendicitis. They did not differ significantly in terms of presence of appendicolith on imaging (30% vs 45%, p = 0.47).

Table 2
Potential factors associated with recurrent appendicitis within 6 Months.

Factor	Univariate Analysis		Multivariate Analysis	
	SHR (95% CI)	*P* value	SHR (95%CI)	*P* value
Age	0.98 (0.96, 1.01)	0.15	0.98 (0.95, 1.00)	0.08
Female	0.61 (0.24, 1.52)	0.29	-	-
Complicated	2.19 (0.81, 5.93)	0.12	2.28 (0.89, 5.79)	0.09
Socioeconomic Status		0.35	-	-
High	Reference		-	-
Middle	0.55 (0.22, 1.37)		-	-
Low	1.38 (0.16, 11.67)		-	-
Diabetes	2.48 (0.25, 24.70)	0.44	-	-
Delayed Presentation	1.71 (0.71, 4.13)	0.23	-	-
Initial WBC	0.98 (0.90, 1.07)	0.62	-	-
Radiographic Findings				
Diameter ≥10 mm	0.88 (0.36, 2.15)	0.79	-	-
Phlegmon	1.70 (0.72, 4.02)	0.23	-	-
Abscess	1.32 (0.56, 3.11)	0.53	-	-
Intra-abdominal fluid	0.53 (0.18, 1.55)	0.25	-	-
Appendicolith	2.73 (1.16, 6.46)	0.02	2.71 (1.20, 6.13)	0.02

Abbreviations: SHR, subdistribution hazard ratio; CI, confidence interval; WBC, white blood count.

4. Discussion

In this single-center prospective cohort study, patients with appendicitis treated nonoperatively were analyzed and potential predictive factors for recurrent appendicitis were identified. The rate of recurrent appendicitis within 6 months from discharge of the initial episode of appendicitis was 29%. Presence of appendicolith on imaging was the only factor associated with increased risk of recurrent appendicitis. This is comparable to other studies which identified appendicolith as a predictor of recurrent appendicitis.[12,22] The rate of recurrence from this center is also in keeping with the published data, which reports a

Table 3
Comparing characteristics of patients with uncomplicated and complicated appendicitis.

Characteristic	Uncomplicated Appendicitis n = 29	Complicated Appendicitis n = 45	*P* value
Age, median [IQR]	45 [28, 56]	51 [37, 65]	0.09
Female, n (%)	14 (48)	21 (47)	0.89
Socioeconomic status, n (%)[a]			0.69
High	4 (14)	10 (23)	
Middle	24 (83)	33 (75)	
Low	1 (3)	1 (2)	
Admission, n (%)	11 (38)	40 (89)	<0.01
Diabetes, n (%)	1 (3)	2 (4)	0.83
Duration of symptoms, days, median [IQR]	1 [1, 2]	6 [3, 10]	<0.01
Initial WBC, 10^9/L, mean (SD)	10.9 (5.1)	12.3 (4.0)	0.20
Imaging modality, n (%)[b]			
Ultrasound	10 (35)	6 (13)	0.03
Computed Tomography	21 (72)	42 (93)	0.01
Magnetic Resonance Imaging	2 (7)	1 (2)	0.32
Positron Emission Tomography	1 (3)	0 (0)	0.21
Radiographic Findings			
Abscess, n (%)	0 (0)	28 (62)	<0.01
Phlegmon, n (%)	0 (0)	32 (71)	<0.01
Appendiceal diameter ≥10 mm, n (%)	11 (38)	36 (80)	<0.01
Appendicolith, n (%)	4 (14)	11 (24)	0.27
Intraabdominal fluid, n (%)	3 (10)	18 (40)	0.01
Suspicion of malignancy, n (%)	3 (10)	7 (16)	0.52

Abbreviations: IQR, interquartile range; SD, standard deviation.
aDefined by radiographic evidence of perforation.
[a] Determined based on patient postal code area and correlation with socioeconomic status in British Columbia by local health area.[41]
[b] Does not add up to 100% because some patients had multiple imaging tests.

Table 4
Potential factors associated with recurrent appendicitis in patients with uncomplicated and complicated appendicitis.

Factor	Uncomplicated Appendicitis				Complicated Appendicitis			
	Univariate Analysis		Multivariate Analysis		Univariate Analysis		Multivariate Analysis	
	SHR (95% CI)	*P* value	SHR (95%CI)	*P* value	SHR (95% CI)	*P* value	SHR (95%CI)	*P* value
Age	0.96 (0.90, 1.02)	0.23	-	-	0.98 (0.95, 1.01)	0.24	-	-
Female	0.31 (0.04, 2.67)	0.29	-	-	0.72 (0.26, 2.01)	0.53	-	-
Socioeconomic Status								
High	Reference		Reference		Reference			
Middle/Low	0.26 (0.05, 1.30)	0.10	0.84 (0.28, 2.53)	0.76	0.83 (0.28, 2.48)	0.74	-	-
Diabetes	-	-	-	-	3.71 (0.33, 42.07)	0.29	-	-
Delayed Presentation[a]	2.20 (0.41, 11.82)	0.36	-	-	1.01 (0.37, 2.73)	0.99	-	-
Initial WBC	0.95 (0.76, 1.18)	0.63	-	-	0.97 (0.87, 1.08)	0.59	-	-
Radiographic Findings								
Diameter ≥10 mm	0.38 (0.05, 3.05)	0.36	-	-	0.67 (0.21, 2.11)	0.50	-	-
Phlegmon	-	-	-	-	1.07 (0.33, 3.42)	0.91	-	-
Abscess	-	-	-	-	0.82 (0.32, 2.13)	0.69	-	-
Intra-abdominal fluid	-	-	-	-	0.45 (0.15, 1.36)	0.16	0.38 (0.12, 1.23)	0.11
Appendicolith	4.08 (0.79, 21.14)	0.09	2.23 (0.82, 6.07)	0.12	2.28 (0.84, 6.19)	0.11	2.74 (1.01, 7.44)	<0.05

Abbreviations: SHR, subdistribution hazard ratio; CI, confidence interval; WBC, white blood count.
[a] Presented to the emergency department 72 h or more after beginning of symptoms.

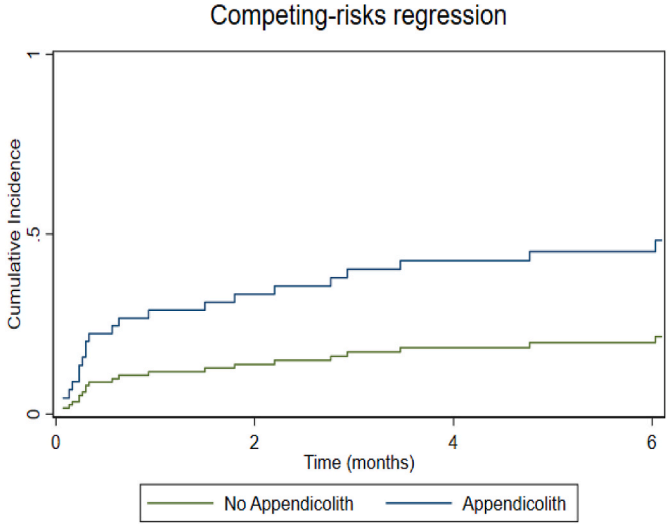

Fig. 2. Cumulative incidence functions for recurrent appendicitis.

recurrence rate of 16.0%–30.4%.[9,11–13,15,23–25] Our rate is on the higher end; this could be due to the longer and complete follow-up period of 6 months for all patients, the use of symptomatic recurrence rather than interval appendectomy as the primary endpoint, the inclusion of patients with appendicoliths and the percentage of patients with complicated appendicitis. In previous studies, follow-up intervals varied from 22 days to over 10 years and were not standardized in some of the retrospective studies.[4,11,13–15,26]

Surgical dogma has favored operative management for appendicitis with an appendicolith, therefore, many clinical trials comparing appendectomy to antibiotics excluded those with appendicolith on imaging.[5,6] Vons et al.'s trial included this population and found that appendicoliths were associated with increased risk of complicated appendicitis and failure of antibiotic treatment.[27] The Comparison of Outcomes of Antibiotic Drugs and Appendectomy (CODA) trial is the largest randomized controlled trial comparing NOM to appendectomy that included patients with appendicoliths and perforated appendicitis. They found that patients with an appendicolith had higher risk of adverse events than those without an appendicolith. In addition, a recent follow-up study from the CODA trial found appendicolith to be associated with 30-day rate of appendectomy.[22] They were unable to distinguish if appendectomies were due to persistent symptoms, surgeon preference or recurrent appendicitis. Our study specifically used the clinical endpoint of symptomatic recurrent appendicitis to bridge this gap in the evidence. Similarly to the CODA trial, our study included patients with appendicoliths and complicated appendicitis, however, our population had more severe appendicitis (61% had complicated appendicitis compared to 9%) and a longer follow-up time (6 months compared to 90 days in the original trial) which could explain the higher rate of appendectomies (44% vs 29%). Our study removes surgeon bias towards appendicoliths from the endpoint and still found appendicoliths to be associated with increased risk of recurrent appendicitis.

It has been suggested that the underlying pathophysiology behind appendicitis with and without an appendicolith is different. Some studies have grouped patients with appendicolith into the definition of complicated appendicitis,[27,28] though not in our study. The literature surrounding this topic is scarce. In terms of histopathologic features, there have been differences identified between appendicolith appendicitis and uncomplicated appendicitis.[29] This is in support of the theory that appendicitis with an appendicolith may be a different entity and should be managed differently. Clinically, patients with appendicitis and appendicoliths treated nonoperatively experience increased risk of failure of antibiotic treatment,[27,28,30] appendectomy,[22,23] complications,[22,27] and greater risk of recurrence—this data should be used to tailor patient selection for NOM and provide more information to patients during shared decision-making.

We found that 48% of people with recurrent appendicitis occurred in the first 2 weeks after discharge from the hospital, defined as early recurrence in this study. We found that patients with early compared to late recurrent appendicitis did not differ significantly for most characteristics, including presence of appendicolith, except for sex and initial white blood count. Previous studies have commonly looked at 30-day recurrence rates or 1-year recurrence rates.[9,27,31–33] We chose 14 days as the cut-off for early recurrence versus late recurrence to distinguish that the former could represent incompletely treated appendicitis initially, whereas the latter may represent true recurrent appendicitis episodes after completely cured initial appendicitis.[12] In a similar study performed in a pediatric population, all of their recurrences were late recurrences and on univariate analysis, found that appendicoliths were significantly associated with recurrence.[34] Our study further corroborates their findings using a competing-risk time-to-event analysis in an adult population.

Though historically uncomplicated and complicated appendicitis have been thought to be different entities, this has not been corroborated with definitive data. In our study, we did not find any obvious differences in patient characteristics between those with uncomplicated versus complicated appendicitis, apart from characteristics implied in

the definition of complicated appendicitis (longer duration of symptoms, elevated WBC, radiographic findings of perforation). Most of our patients treated nonoperatively had complicated appendicitis. This is likely due to growing evidence suggesting that nonoperative management in patients with complicated appendicitis leads to better outcomes, thus influencing the surgical team's management decision.[35,36] However, in uncomplicated appendicitis, nonoperative management has not been proven to be superior and the standard of care is still appendectomy. Given the difference between these two groups, we performed subgroup analysis looking at predictors of recurrent appendicitis in each. Different predictors have been identified for recurrent appendicitis based on whether the study population included patients with uncomplicated appendicitis, complicated appendicitis, or both. Predictors identified for uncomplicated appendicitis include diabetes[26]; in complicated appendicitis include age, abscess size, ASA score, COVID-19 infection, diabetes, history of appendicitis, and appendicolith[12,13,15]; and in mixed populations both sex and appendicolith have been identified.[14,17,22] These heterogenous studies were either lacking valid clinical outcomes, complete defined follow-up, or a sample size larger than 50. In addition, none of the studies accounted for the effect of interval appendectomy in their analysis. Our study addresses all these concerns and adds to the growing evidence of potential predictors of recurrent appendicitis. In the subgroup analysis looking only at patients with uncomplicated appendicitis, no risk factors for recurrent appendicitis were found to be statistically significant. However, this is likely due to the small sample size of this subgroup and lack of power to detect predictors. In our complicated appendicitis subgroup, presence of an appendicolith on imaging was still a risk factor for recurrence. Further prospective studies with larger sample size are needed to compare both types of appendicitis to determine whether the predictors of recurrent appendicitis vary.

In our study, we found 14% of patients to have suspicion of malignancy on initial imaging. Surgeons may be biased towards treating these patients nonoperatively to perform a thorough oncologic workup before operating. This could partially explain the elevated neoplasia rate, up to 29.4%, reported in retrospective studies of patients who undergo interval appendectomy.[18,19] A randomized controlled trial comparing interval appendectomy to watchful waiting after NOM for periappendicular abscess excluded patients with suspicion of tumor on diagnostic imaging and still found a neoplasia rate of 20%.[20] Our study population had a 14% rate of neoplasia and only half of them had suspicion of tumor on diagnostic imaging. The reported rates of neoplasia in patients treated nonoperatively is substantial and should be taken into consideration when following patients treated nonoperatively. Moreover, diagnostic imaging may not detect neoplasias initially. In addition to monitoring patients after NOM for recurrent appendicitis, oncologic investigation should be strongly considered, especially in patients above 40 years old.[20]

To our knowledge, this is the first study examining socioeconomic status as a predictor of recurrent appendicitis. Though we did not find it to be significantly associated with increased risk of recurrent appendicitis, our study may be underpowered given the small number of patients who have low socioeconomic status in our population. Previous research has shown that patients from disadvantaged socioeconomic backgrounds have worse postoperative outcomes and difficulty accessing healthcare services.[37,38] These disparities are present both in countries with predominantly private health insurance and countries with universal health coverage.[39,40] In the context of management of appendicitis, the postoperative risk of appendectomy must be balanced against the more extensive follow-up required in NOM. In this higher risk population, shared-decision making with the patient considering socioeconomic and clinical factors is needed.

This study has several strengths. First, this prospective study included patients with appendicitis diagnosed clinically by physicians allowing greater capture of nuanced presentations of appendicitis. This could partly explain the higher rate of complicated appendicitis in our study. Second, recurrent appendicitis was reliably captured using the provincial electronic health record. Finally, this is the first study examining this question that used a competing risk analysis which is crucial to account for routine interval appendectomy.

Nevertheless, our study needs to be interpreted considering several limitations. This is a single-institution study which limits its generalizability. Our study is susceptible to selection bias given that appendicitis management was determined by the treating team. As mentioned previously, 48% of recurrent appendicitis patients presented to a healthcare institution with symptoms of appendicitis within 14 days. Given their early presentation, it is possible that these patients had failure of nonoperative management rather than truly recurrent appendicitis. Given our small sample size, our subgroup analyses looking separately at uncomplicated and complicated appendicitis may be underpowered. This analysis was also performed post-hoc and is therefore only exploratory. Future studies could investigate if both types of appendicitis have different factors associated with symptomatic recurrence.[20]

5. Conclusions

In patients with appendicitis successfully treated nonoperatively, presence of an appendicolith on imaging is a risk factor for developing recurrent appendicitis in the first six months. This information can be used to provide more information to patients during shared decision-making and tailor patient selection for interval appendectomy after nonoperative management.

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Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amjsurg.2023.03.005.

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