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Aim:

To present a case series of 25 patients who presented to Hawkes Bay Fallen Soldier's Memorial Hospital with suspected appendicitis during the hospital's COVID-19 alert level change.

Background:

The presence of SARS-associated coronavirus in peritoneal fluid was reported in 2003 (1). As a member of the coronavirus family, similar concerns were held regarding SARS-CoV-2 (COVID-19) which were later confirmed (2). A theoretical risk of transmission during aerosol generating surgical procedures, particularly gas evacuation following laparoscopy, prompted early recommendations to minimise healthcare worker exposure risk. These early recommendations included limiting laparoscopic procedures and specifically advocated for the conservative management of simple appendicitis (3, 4). Models to predict perforated appendicitis are limited (5) or rely heavily on imaging modalities (6)

The efficacy of conservative vs operative management for appendicitis remains an ongoing debate, even in recent years. In children, conservative management of uncomplicated appendicitis was successful in 54 – 90% of cases (7, 8) with pooled relapse rates on meta-analysis up to 15% noted (7). The same debate is present in the adult sphere regarding effectiveness, complication rate, length of stay and (9 - 11). There are further concerns regarding the increasing presence of appendiceal neoplasms in this group (9).

The non-inferiority of antibiotic treatment prompted collegial bodies to make their initial recommendations. Overseas centres have now been able to report their outcomes during the COVID-19 pandemic with mixed success, ranging from 46 – 74% (12 - 14). It is suggested that patients have been presenting later during the pandemic, and with advanced pathology (13). One centre (15) is advocating for appendectomy due to its definitive treatment in order to reduce the hospital burden.

Methods:

A retrospective review of all admissions to the Hawkes Bay Fallen Soldier's Memorial Hospital during the hospital's COVID-19 level 4 management period (30/3/20 – 5/9/20). Cases were identified from electronic records as patients with a presumed diagnosis of appendicitis. Baseline demographics, clinical/biochemical results and outcomes during the index admission were recorded. Cases were reviewed at 6 months to check for readmission using local and national databases.

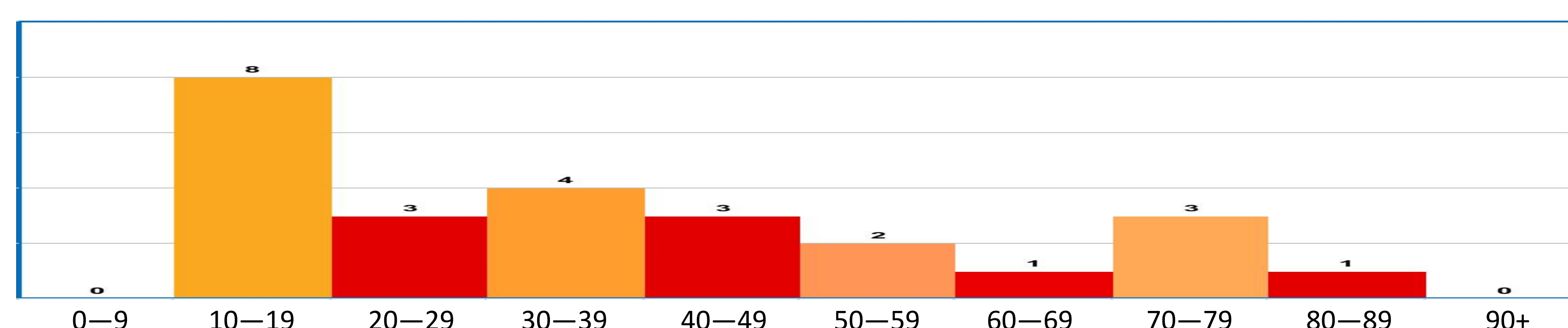


Figure 1: Histogram of patient ages, split by decade

| Age | Gender | Symptom duration | Diagnosis | Fever | WCC | Neut. | CRP | Admission length | Initial Management | Time to OT | Complications/ Findings |
|-----|--------|------------------|----------------------|-------|------|-------|------|------------------|--------------------|------------|-------------------------|
| 74 | F | 6 | CT | No | 10.6 | 8.3 | 90 | 2 | Conservative | | No |
| 12 | F | 4 | Clinical | No | 16.0 | 14.2 | 261 | 8 | OT | 0 | Perforated, 4Q pus |
| 55 | F | 14 | CT | Yes | 14.4 | 9.1 | >320 | 3 | Conservative | | No |
| 39 | F | 1 | USS | No | 16.4 | 14.6 | 34 | 3 | Conservative | | No |
| 22 | F | 4 | CT(F) ^(a) | Yes | 24.2 | 21.3 | 95 | 4+1 | Conservative | | Readmitted D17 |
| 11 | M | 2 | Clinical | Yes | 11.8 | 8.0 | 12 | 0+1 | Conservative | 2 | Readmitted D2 |
| 16 | M | 1 | Clinical | No | 12.5 | 9.5 | 30 | 0+6 | Conservative | 3 | Readmitted D2 |
| 44 | M | 1 | CT | No | 8.2 | 4.9 | 81 | 2 | Conservative | | No |
| 18 | F | 1 | Clinical | No | 17.3 | 16.5 | 4 | 2 | OT | 1 | Simple appendicitis |
| 53 | F | 1 | CT | No | 13.8 | 12.6 | 10 | 2 | OT | 1 | Simple appendicitis |
| 49 | F | 5 | CT | No | 15.8 | 13.2 | 12 | 1 | OT | 0 | Simple appendicitis |
| 19 | M | 0 | Clinical | No | 17.7 | 15.1 | <3 | 1 | OT | 0 | Simple appendicitis |
| 17 | M | 0 | Clinical | No | 11.1 | 8.5 | 7 | 2 | OT | 1 | Simple appendicitis |
| 32 | M | 4 | CT | No | 15.1 | 11.9 | 153 | 3 | Conservative | | No |
| 61 | M | 3 | CT | No | 8.1 | 5.8 | 224 | 1+4 | Conservative | 54 | Readmitted D54 |
| 35 | F | 1 | Clinical | Yes | 18.5 | 15.9 | 62 | 3 | OT | 1 | Perforated, 2Q pus |
| 70 | M | 2 | CT | Yes | 19.1 | 16.3 | 89 | 3 | OT | 1 | Gangrenous |
| 17 | M | 3 | Clinical | No | 14.6 | 11.8 | 55 | 3 | OT | 1 | Gangrenous |
| 36 | M | 0 | Clinical | Yes | 10.8 | 8.1 | 17 | 2 | OT | 1 | Simple appendicitis |
| 18 | M | 0 | Clinical | No | 19.1 | 17.0 | 16 | 2 | OT | 1 | Simple appendicitis |
| 44 | M | 0 | Clinical | Yes | 24.4 | 19.8 | 38 | 12 | OT | 1 | Perforated, pelvic pus |
| 82 | F | 2 | CT(F) | Yes | 18.0 | 16.2 | 228 | 5 | OT | 0 | Perforated, pelvic pus |
| 74 | M | 0 | CT ^(b) | No | 15.9 | 13.8 | 10 | 31 | Conservative | 16 | Perforated, carcinoid |
| 21 | M | 0 | Clinical | No | 13.7 | 11.1 | <3 | 1 | Conservative | | No |
| 24 | F | 3 | Clinical | No | 12.1 | 6.7 | 4 | 1 | Conservative | | No |

Table 1: Characteristics of cases. (F) denotes faecalith on CT. (a) was initially managed as tubo-ovarian abscess. (b) had a myocardial infarction preceding admission

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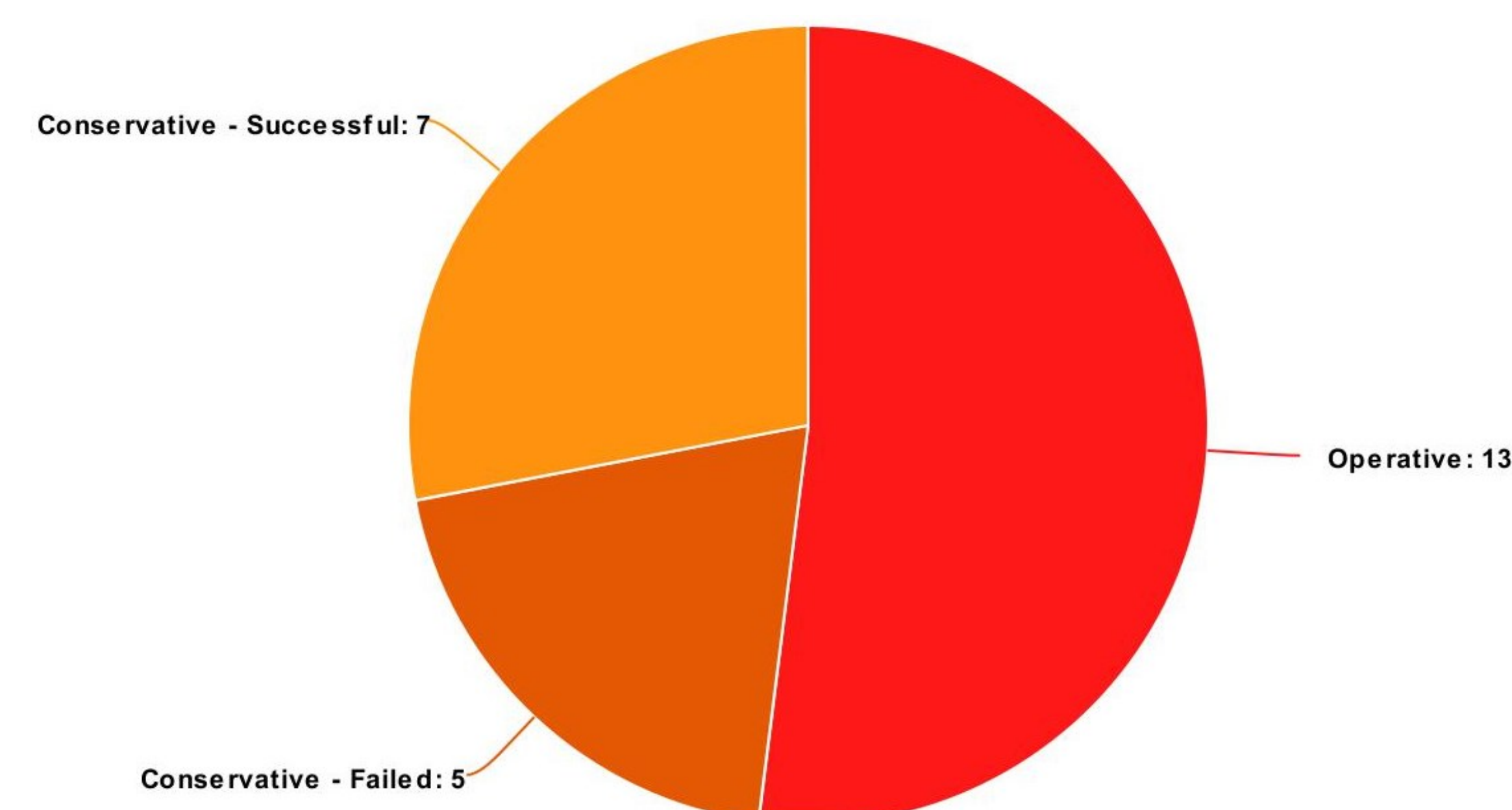


Figure 2: Pie chart demonstrating the breakdown of operatively and successful/unsuccessful conservatively managed patients

Results:

25 patients (14M, 11F) were admitted to the department with presumed appendicitis across the 5-week review period. Individual characteristics are summarised in table 1. The median age was 35 ± 21.5 years (Figure 1). Despite attempts to manage conservatively, 13 patients ultimately underwent appendectomy during the index admission. 12 patients were discharged conservatively, of which 5 were readmitted and subsequently proceeded to the operating theatre. In total, 7 patients were successfully managed non-operatively. Statistical significance could not be inferred due to low sizes.

Discussion:

The results suggest that patients presenting with appendicitis to regional hospitals in New Zealand are at a high risk of failing conservative therapy. While the failure rate was higher than pre-COVID studies, it is concordant with other centres at similar times (12, 14). While any cases managed exclusively in primary care missed, the burden of hospital presentation has been accurately captured.

Delayed presentation may partially account the high rate of failure, the average duration of symptoms was 2.28 days, consistent with reports of >2 days being associated with complicated appendicitis(6). Larger efficacy studies conducted during the pandemic have revolved around metropolitan centres and are not comparable to regional New Zealand hospitals. Access to regional healthcare is likely a barrier to presentation as Hawkes Bay DHB services a population density of just 11 people/sq km (whereas larger centres approach several thousand ppl/sq km). Individual patient behaviours were also different at these points as New Zealand was under government mandated social lockdowns compared to other centres under distance recommendations only.

Clinicians should review their treatment goal when considering the appropriateness of antibiotic therapy. While proponents argue that index admissions are shorter, the likelihood of relapse with second admission and more severe pathology is significant. Despite attempts for conservative management, clinical factors such as inadequate response to treatment led to early operative management for prompt and definitive treatment.

Conclusion:

Conservative management of acute appendicitis had high failure rate over the COVID-19 lockdown period. This is a good opportunity for other DHBs to review their own outcomes during the lockdown period.