Appendicitis is the most frequently performed emergency surgical procedure worldwide and in the US [16]. Acute appendicitis presents in two forms: complicated and uncomplicated. To date the management of uncomplicated acute appendicitis has been surgical with emergent appendectomy. Antibiotic treatment alone of uncomplicated acute appendicitis has been proven to be effective [7, 9, 11, 16, 17] however has not gained wide acceptance in US medical practice. Complicated appendicitis has been successfully treated with antibiotics and when needed percutaneous drain placement [5].

With viable nonoperative options for treatment of uncomplicated appendicitis, accurate prediction of pathologically complicated appendicitis is necessary. With varying success, some authors have attempted to predict this pathological outcome using combinations of clinical, laboratory, and/or radiographic values. [2,6,12]

Some of these predictive mechanisms rely on laboratory values that may not be part of initial workup of abdominal pain; for example, reactive protein (CRP) [12], fibrinogen [2], or calprotectin level [6] may play a predictive role but are not ubiquitously available.

While abscess or purulent peritonitis on CT are evidence of complicated appendicitis, other CT evidence of appendicitis such as perforation or appendicectomy is likely to be predictive [19]. Adding another layer of complexity, CT evidence of appendicitis may limit nonoperative treatment success of uncomplicated appendicitis. [14] Finally, effective scoring systems and/or physician clinical gestalt may obviate the need for radiographic diagnosis of appendicitis. [10]

Our goal was to develop a scoring system based on ubiquitous or simplified clinical and laboratory values to distinguish pathologically uncomplicated appendicitis from complicated appendicitis. An effective predictive scoring system can guide use of nonoperative management of appendicitis. We also examined the association of appendiceal diameter and presence of appendicitis to uncomplicated and complicated appendicitis.

Methods

A retrospective analysis of patients who had been admitted for appendicitis between December 29, 2009 and December 31, 2014 at St. Barnabas Hospital, Bronx, NY was performed. St. Barnabas Hospital is a for-profit acute-care community teaching hospital 450 bed hospital and level I trauma center located in the south central Bronx.

The electronic medical record (EMR) was then queried using International Classifications of Diseases, Ninth Revision (ICD 9) codes to select cases for relating to appendicitis.

The diagnosis of acute appendicitis was established with physical examination, laboratory tests, ultrasound examination and/or abdominal computed tomography. This was further corroborated with operative reports and pathologic findings when applicable.

Study Variables

We abstracted demographic data, including gender, age, body mass index (BMI), and number of self-reported comorbid conditions. We recorded time onset of abdominal or gastrointestinal symptoms to clinical presentation (in days), using physician and nursing documentation.

Vital sign data were collected from the first set of recorded vitals. Laboratory data was abstracted from first blood draw in the emergency department and included white blood cell count (WBC) and total bilirubin. We tabulated the number of systemic inflammatory response syndrome (SIRS) criteria met and defined the presence SIRS as two SIRS criteria (WBC > 12,000/mm3 or < 4000/mm3, RR > 20, HR > 90, Temperature >100.4°F or < 96°F) being present.

We also abstracted outcome data, including postoperative length of stay, days of intravenous antibiotics, days until resumption of regular diet and postoperative complications. Postoperative complications included early readmission (i.e. within 30 days of diagnosis), mortality (i.e. within 90 days of diagnosis of appendicitis) and revisit rates; defined as clinic or emergency room visits after the first post-operative visit within 30 days of diagnosis.

Simplied radiographic data were abstracted, including width of the appendix and presence of appendicitis.

Complicated appendicitis was defined as phlegmon, peri-appendiceal abscess or suppuration of the appendix, intra-abdominal abscess, gangrene/necrosis, perforation, diffuse purulent peritonitis, carcinoma or mucinous neoplasm. This was determined by review of radiographic specimens, operative findings, or computed tomography findings if no procedure was performed.

Statistical Analysis

We performed a two-tailed two-sample unequal variance t test on our study variables comparing them in complicated and uncomplicated appendicitis. All analyses were done using Excel for Mac 2011 version 14 (Microsoft Corporation). Based on convention, the significance level was set as P < .05.

Table 1: Exclusion criteria

Table 2: Type of appendicitis with number of subjects

Table 3: Mean ± standard performance mean for uncomplicated vs complicated appendicitis.

Table 4: Scoring tool for complicated appendicitis

Table 5: Stratification of subjects using predictive model