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Comparison of outcomes of patients with acute appendicitis between an acute care surgery model and traditional call coverage model in the same community



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Surgical model

Abstract

BACKGROUND: This study compared outcomes, patient flow, and cost between an acute care surgery (ACS) and traditional call model (TRAD) for acute appendicitis in the same community and time period.

METHODS: Patients who underwent appendectomy from 7/1/2012 to 6/30/2014 were retrospectively reviewed. An ACS and TRAD were compared. Demographic data, outcomes, cost, and time intervals were compared.

RESULTS: Of the 945 patients reviewed, the ACS group had more perforated appendicitis on preoperative computed tomography scan (9% vs 3%, $P < .001$) and pathology (23% vs 10%, $P < .001$). The TRAD group had more negative appendectomies (6% vs 1%, $P < .001$). In nonperforated appendicitis, time to discharge was shorter with ACS (16.4 vs 30.2 hours, $P < .001$), and mean cost was less ($P < .001$). Complications were similar.

CONCLUSIONS: ACS was superior for management of acute appendicitis with shorter time from consultation to operation, shorter time to discharge if nonperforated, and decreased cost.

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The acute care surgery (ACS) model is a combination of trauma surgery, emergency general surgery, and surgical critical care that can provide 24/7, in-house availability to manage a wide range of surgical needs. The ACS model for coverage of emergency general surgery has been

implemented at many hospitals worldwide. This has been in response to issues of both emergency department general surgical coverage and decreasing operative intervention on patients with traumatic injuries by trauma surgeons. The alternative to this is a traditional general surgery call model in which a rotating general surgeon on call is responsible for emergency general surgical care while also over-seeing office consults and elective surgery, sometimes occurring outside the hospital. An emergent consult in this situation can be disruptive to an already full calendar and presents the challenge of finding time in a busy operating room schedule.

Appendectomy for acute appendicitis is the most common nonelective procedure performed by general

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surgeons.¹ The frequency of appendicitis as well as the consistent presentation and natural course of the disease make it an ideal disease model to evaluate. Several studies have reported outcomes of appendectomy for acute appendicitis after the implementation of an ACS model, and these contain conflicting results in regard to complications and patient flow issues.²⁻⁷ These have all been single-institution, crossover comparisons of before and after implementation of an ACS model. To our knowledge, no comparisons have been performed between 2 institutions with similar technology and antibiotics in the same community over the same period of time.

The purpose of this study was to compare outcomes, patient flow, and cost between an ACS model and traditional general surgical call model for patients who undergo appendectomy for acute appendicitis. Our hypothesis is that an ACS model of care for patients with acute appendicitis will decrease hospital length of stay, and therefore costs, with similar or improved outcomes compared with a traditional general surgery call model.

Methods

A retrospective review was performed with comparison of patients who underwent appendectomy for acute appendicitis from July 1, 2012 to June 30, 2014 at 2 institutions within the Community Medical Centers hospital system in the Fresno/Clovis metropolitan area of central California, Community Regional Medical Center (CRMC), and Clovis Community Medical Center. CRMC is a 650 bed hospital, American College of Surgeons verified level I trauma center. Coverage is provided with an ACS model including in-house trauma surgical faculty and surgical residents who provide 24/7 urgent assessment and treatment of emergency general surgical patients. The ACS surgeons do not perform elective surgical cases while providing coverage for the ACS service. Clovis Community Medical Center is a 208 bed hospital with a traditional general surgery call coverage model. Board certified and eligible general surgeons provide on call emergency surgical consultation. General surgical residents are not involved in the care of patients at this institution, and there is not 24 hour in-house surgical coverage.

Patients who underwent incidental or scheduled appendectomy, interval appendectomy, or had initial nonoperative management were excluded. We also excluded patients who underwent appendectomy but were not evaluated in the emergency department before being taken to the operating room. Data included patient demographics, and outcomes included time from surgical consultation to operating room, length of stay after surgery, surgical site infections, 30-day complications, and operative approach (laparoscopic, open, or laparoscopic converted to open procedures). The pathology reports of all patients were reviewed to compare perforation and negative appendectomy rates. Preoperative

computed tomography (CT) scans were reviewed for those with perforated appendicitis on pathology report to evaluate for preoperative radiographic evidence of perforation. All data were obtained from the electronic medical record.

The time intervals of surgical consultation to operating room, operative time, and operation completion to discharge were also compared. The time of surgical consultation was identified via emergency department notes. The time of operation start was evaluated with "day" defined as 07:00 to 17:00 hours, "evening" defined as 17:01 to 22:00 hours, and "night" defined as 22:01 to 06:59 hours. Hospital cost, not charges, obtained from Community Medical Centers accounting department of each patient's care was compared.

Statistics were performed using the Statistical Package for Social Sciences (SPSS 23.0, IBM). Continuous data are reported as mean \pm standard deviation, and categorical data are reported as percentages. Univariate analysis was performed using Mann-Whitney *U* test and chi-square test. Logistic regression analysis was used to adjust for confounding variables. Significance was attributed to *P* values less than .05. This study was approved by the UCSF Fresno/Community Medical Centers Institutional Review Board.

Results

During the 2-year study period, 1,188 patients underwent appendectomy. Of these, 19 patients underwent an interval appendectomy, 144 patients had an incidental appendectomy during an operation performed for reasons other than acute appendicitis, 18 patients were not seen in the emergency department before their appendectomy, 15 patients underwent scheduled appendectomy, and complete data could not be obtained from 18 patients. In addition, 29 patients underwent initial nonoperative management. This left 945 patients that met inclusion criteria and underwent analysis; 440 patients treated via a traditional general surgery call coverage model (traditional call model [TRAD] model) and 505 patients treated via an ACS model.

The TRAD model had more women (48% vs 39%; $P = .004$), and the patients were older (37 vs 30 years; $P < .001$). The ACS group had more perforated appendicitis on pathology report (23% vs 10%; $P < .001$). Preoperative CT scans were reviewed for those with perforated appendicitis. All 45 TRAD patients with perforated appendicitis had preoperative CT scans whereas 106 of the 118 ACS patients with perforated appendicitis underwent preoperative CT scanning. Three times as many patients in the ACS group had preoperative radiographic evidence of perforated appendicitis (9% vs 3%; $P < .001$). The TRAD group also had a higher rate of negative, or noninflamed, appendectomies after review of pathology reports (6% vs 2%; $P < .001$).

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