APPENDICITIS MANAGEMENT PROTOCOL
Echazarreta-Gallego et al.

Surgery Department
Hospital Clínico Universitario de Zaragoza
APPENDICITIS MANAGEMENT PROTOCOL

AUTHORS

Echazarreta-Gallego, Estibaliz. MD
Elía-Guedea, Manuela. PhD
Córdoba-Díaz de Laspra, Elena. PhD
Ramírez-Rodríguez, Jose Manuel. PhD
Gracia-Solanas, Jose Antonio. PhD
Allué-Cabañuz, Marta. MD
Gascón-Domínguez, María de los Ángeles. MD
Millán-Gallizo, Guillermo. MD
Aguilella-Diago, Vicente. PhD
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APPENDICITIS MANAGEMENT PROTOCOL

1. INTRODUCTION

Acute appendicitis (AA) is the most common cause of abdominal emergency surgery. The lifetime risk of developing an AA is approximately 7% with an estimated incidence of 90-10 cases /100,000 inhabitants / year. It can occur in any decade of life, but it is more prevalent in adolescents and young adults. Surgical management is not free of complications and these strongly increase the morbidity associated with the process, being the most common: incisional infection with rates ranging from 3.3-10.3% and organ space infections (9.4%). Today there is great variability within the surgical management and outcome of AA based on: surgical approach and technique applied, type of antibiotic used, duration of antibiotic therapy, surgical wound closure, etc. Kelmer1 in 2012 published in *Annals of Surgery* that the standardization of cares can achieve significant results in terms of reducing surgical site infection, hospital stay and patient comfort.

1.2. HCUZ’S SITUATION:

In order to evaluate the results of a common emergency surgical procedure and searching for improvement areas, we carried out a retrospective review of all patients undergoing surgery for AA between January 2013 and March 2015 in the Department of Surgery of HCUZ (n = 415). Of the 415 appendectomy practiced during this period, 85 patients presented postoperative adverse events (20.5%), being the most common the postoperative ileus in 31 patients (7.5%). The rate of wound infection was of 4.8% with an incidence of intraabdominal abscess of 4.8%. We observed an increased frequency of incisional infection in open appendectomy group (OA) compared with laparoscopic appendectomy (LA) (2% vs 11.7%) being statistically significant (p <0.000). There was no significant difference in the incidence of intra-abdominal abscess when analyzing laparoscopic appendectomy (LA) 5.1% vs. open appendectomy (OA) 4.2% (p=0.692) nor in the presence of ileus (7.8% vs 6.7). The average length of hospital stay in days was of 3.82 days (+/- 3,707).

<table>
<thead>
<tr>
<th>Table 1: Subgroup analysis in relation to hospitalization (days):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average length of stay in days: 3.82 (+/- 3,707)</strong></td>
</tr>
<tr>
<td><strong>Surgical approach</strong></td>
</tr>
<tr>
<td>- Laparoscopic (LA)</td>
</tr>
<tr>
<td>- Open (OA)</td>
</tr>
<tr>
<td><strong>Postoperative complications</strong></td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td><strong>Intraoperative findings</strong></td>
</tr>
<tr>
<td>- Complicated appendicitis*</td>
</tr>
<tr>
<td>- No complicated appendicitis</td>
</tr>
</tbody>
</table>
* Complicated appendicitis included: gangrenous appendicitis, perforated appendicitis, appendicular "mass" or +/- presence of located or generalized peritonitis.

2. PROTOCOL’S OBJECTIVES

Currently, the goal of clinical practice include quality cares that improve patient’s safety. This system is based on reducing to an acceptable minimum all the unnecessary procedures or actions associated with health care that may cause harm. In this point the main aims of this protocol are:

- Standardizing the management of a common clinical practice, adapting this protocol to the evidence published in the literature.

- Improving clinical results by reducing postoperative complications. The percentage of patients who presented complications was 20.5\% (n = 85). The most frequent complications were: postoperative ileus (n=31 patients, 7.5\%), wound infection (n= 20, 4.8\%) and intra-abdominal abscess (n= 20, 4.8\%). Global data about surgical site infection are similar to those reported in the literature, however if wound infection is analyzed in specific subgroups we observed it was significantly more frequent (2\% vs 11.7\%) in the OA versus LA group (p <0.000). On the other hand there was no significant difference (p 0.692) when analyzing the incidence of intra-abdominal abscess depending on the surgical approach (5.1\% LA vs 4.2\% OA). At this point the purpose of our guide is to reduce the rate of surgical wound infection and intra-abdominal abscess by encouraging the use of the laparoscopic access and applying the antibiotic prophylaxis recommendations established by our hospital PROA group.

- Improving length of hospital stay. The average stay is an indicator of effectiveness that evaluates the time that the hospital needs to perform the diagnosis and treatment of diseases. The average stay of our series was of 3.82 days (+/- 3.707). Comparing days of hospitalization in the different subgroups described in table n° 1 we observed higher hospitalization in OA (4.01 days +/- 4,855) vs 3.75 days +/- 3,129 in LA group; we also found higher hospital stay in the group of patients who had suffered postoperative complications (7.49 ± 6.019) vs does who had not undergone postoperative complications (2.88 ± 1.91), and in those patients defined as "complicated appendicitis" grouped in the intraoperative finding (5.45 +/- 4,855 days) vs those described as "no complicated" (2.39 +/- 1.369 days). We consider this parameter an important value of the clinical effectiveness, since complications and adverse effects prolong the hospitalization.

In response to these issues, we propose three paths:

- Early discharge within 24 hours that has proven to be safe and feasible if adequate patient selection is made. We consider that this range of action will benefit patients with non-complicated appendicitis and no comorbidities, even though nowadays, some series describe a rapid discharged similar to an
ambulatory process (<12h) with good results in terms of readmission and morbidity.

- Hospitalization increases with postoperative complications, so the introduction of measures such as: optimization of the patient, appropriate antibiotic treatment, laparoscopic approach etc. would decrease complications resulting in a reduction of stay.
- In our series comparing with the literature, there was a high rate of AA defined as **complicated appendicitis** that is directly related with a longer hospitalization rate. Another purpose for the implementation of this protocol is to adequate timings and medical care, decreasing the interval from the evaluation of the patient to diagnosis by trained personnel at the emergency department, offering early consultation with the surgical team on guard that should be prepared to apply a suitable surgical care.

Another parameter we think should be considered to evaluate the quality of care is the costs of the process. Appendectomy is a surgical procedure with an average cost of 3.106,00€ (SALUD INFORMA). Each day of hospitalization represents 685,00€, a specialized care consultation 49,00€ and consultation in the emergency department 136,00€. In our series 330 patients (79.5%) showed no postoperative complications with 2.88 (± 1.91) hospitalization days, in this group of patients, globally 424,974€ could be save, considering a 24 hours reduction stay. On the other side, it is well known that postoperative complications increases health spending. So surgical site infection or intaabdominal infection involves additional costs resulting local treatment, antibiotics, prolonged hospital stay and/or requiring in some cases reoperation.

Many factors contribute in the pathogenesis of adverse events, some of which are hard-coded (comorbidities, age, time between beginning of process and consultation), but it is also well known that many others could contribute to improve a safer clinical practice reducing costs when applying adequate corrective actions or improvement areas.
### 3. CARE PROCESS. DIAGRAM

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTION</th>
<th>RELATED PERSONAL</th>
</tr>
</thead>
</table>
| Diagnosis             | History and examination + analysis.  
- Consider imagining (US or CT)  
Patient information and consent form.                                                                                                                                  | Surgeon, Emergency department |
| Management strategy   | **Preoperative period**  
Antibiotic prophylaxis  
Hair removal  
Consider thromboembolism prophylaxis on high risk patients.                                                                                                                                                     | Surgeon, Nurse      |
|                       | **Intraoperative period**  
Skin preparation and operative field  
Normothermia  
- Blood glucose  
- Surgical approach: laparoscopic vs open  
  - Laparoscopic surgery  
  - Open surgery  
  - Peritoneal fluid cultures  
  - Antibiotic prophylaxis dosage repeat during surgery  
  - Irrigation and aspiration of the operation field (OA + AL).  
  - Drains  
  - Local anesthetic infiltration: laparoscopic ports/Abdominal external oblique fascia (OA).                                                   |                     |
| Postoperative period  | • Oxygenotherapy  
• Postoperative antibiotics  
• Oral intake  
• Analgesia  
• Early mobilization  
• Thromboembolism prophylaxis  
• Respiratory physiotherapy  
• Nausea and vomiting treatment. Ileus                                                                                                                                   | Surgeon, Nurse      |
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<table>
<thead>
<tr>
<th>Discharged</th>
<th>prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Depending on severity:</td>
<td></td>
</tr>
<tr>
<td>- Non complicated: 24 h</td>
<td></td>
</tr>
<tr>
<td>- Complicated appendicitis: once they tolerate a regular diet and there is no other complication</td>
<td></td>
</tr>
<tr>
<td>• Offer care instruction</td>
<td></td>
</tr>
<tr>
<td>• Surgical postoperative consultation appointment</td>
<td></td>
</tr>
</tbody>
</table>

4. PROTOCOL DEVELOPMENT

4.1 Diagnosis

The ideal diagnostic method for appendicitis, which offers high accuracy while avoiding adverse effects (radiation), has not been achieved yet despite the variety of available tools. The percentage of negative appendectomies was located historically in the 15% having reduced to 10% after the introduction of computed tomography (CT) in the diagnosis.

- Physical examination: throughout history, there have been described numerous clinical signs associated with AA that facilitate the diagnostic, however they lack adequate sensitivity and specificity.
- Blood analysis: No analytical marker has a sensitivity and specificity adequate to confirm the diagnosis. The moderate increase of leukocytes with left shift is the most common finding, present in 80% of patients. Other markers of acute inflammation such as C-reactive protein CRP or procalcitonin PCT may be useful. It is recommended to perform a pregnancy test in the differential diagnosis in all women of childbearing age.
- Risk scales: these scales combine different parameters trying to get a more accurate diagnosis. Among the most widely used scale is Alvarado (Annex 1), several studies have demonstrated a high sensitivity but low specificity. The latest AIR score (Appendicitis Inflammatory Response) (Annex 2) has greater precision than the scale of Alvarado.


- Ultrasound: the data that best relates to AA is an image of cecal appendix > 6 mm. The US in the diagnosis of AA has moderate sensitivity (86%- 95%, CI 83-88) and specificity (81%, CI 78-84).

TC: image findings suggestive of acute appendicitis is appendiceal thickening greater than 6 mm and/or occlusion of light, appendiceal wall thickening, rarefaction of periappendiceal fat appendicolith presence (25% of patients). The sensitivity of this imaging test is 93%.

In this diagram we propose the attitude for diagnostic and therapeutic management in patients having pain in right lower quadrant. (Annex 3)

PATIENT INFORMATION

Once established the indication for surgery the patient must be informed of the treatment options available and the possible risks arising. The information provided must be adapted to the characteristics of the patient.

4.2 TREATMENT

Appendectomy remains the gold standard treatment of appendicitis approved in all clinical guidelines and recommended by the American College of Surgeons, the Association of Digestive Tract Surgery and the World Society of Emergency Surgery. The alternative non-operative approach (conservative antibiotic treatment) has been studied in detail in many meta-analyses and systematic reviews, including Cochrane 2011, whose authors concluded that appendectomy remains the standard treatment and antibiotic treatment would be relegated to patients or specific conditions in which the surgery is contraindicated.


4.2.1 Preoperative period

4.2.1.1 Antibiotic prophylaxis
The administration of prophylactic antibiotics is critical in the prevention of surgical wound infection and intra-abdominal abscess. The most common flora in this pathology is the enteric gram-negative bacilli, anaerobes and enterococci (E. coli, Klebsiella, Proteus and Bacteroides). We recommend the following instructions:

- **Risk criteria for E. coli or Klebsiella ESBL spp productor**: severe / shock sepsis, previous use of quinolones or cephalosporins, repetitive urinary tract infection, urinary catheter, diabetes mellitus

Amoxicillin-clavulanate 2gr ev 5 min (before surgery)
Risk of ESBL*: ertapenem ev 1g
Allergic patients: Clindamicine 600 mg + Gentamicine 2 mg/kg (30 min before anhestesic induction).

* Risk criteria for E. coli or Klebsiella ESBL spp productor: severe / shock sepsis, previous use of quinolones or cephalosporins, repetitive urinary tract infection, urinary catheter, diabetes mellitus

The Cochrane systematic review on "Antibiotic treatment vs placebo in the prevention of infection postappendectomy" concluded that:

a) Antibiotic prophylaxis in the prevention of postoperative complications in appendectomy is effective if it is administered pre, per or postoperatively. It should be considered for routine use in emergency appendectomy.

b) The results of the meta-analysis showed that a single antibiotic dose has the same impact as multiple doses. In order to reduce costs, toxicity and the risk of developing bacterial resistance it is desirable to establish the shortest and effective prophylactic regimen to prevent postoperative complications.

c) In patients in whom perforated appendicitis is suspected, empirical antibiotic treatment will be administrated following the above recommendations and it must be adjusted if necessary to culture results.

4.2.1.3 Time intervention

According to the latest "Up to date" recommendation published, once the diagnosis of appendicitis is established early surgery should be advised in order to prevent progression to perforation. Prior to surgery, hydration fluid must be provided, and electrolyte disturbances should be corrected.


However, some epidemiological studies have found no correlation between a delay of 6-12 hours from the time of hospital admission and surgery with the rate of perforation and/or postoperative complications.


Drake FT, Mottey NE, Farrokhi ET. Time to appendectomy and risk of perforation in acute appendicitis. JAMA Surg 2014;149:837—44.

4.2.1.3 Hair Removal

Hair removal has not been shown to reduce the incidence of surgical infections. In cases where necessary, clippers are recommended instead of conventional shaving.


4.2.2 INTRAOPERATIVE

4.2.2.1 Preparation of the skin and surgical field

Skin antisepsis must be made in concentric circles around surgical incision with chlorhexidine-alcohol 1% solution.

It is recommended to make skin antisepsis with an agent that contains alcohol unless there is a contraindication. Alcohol is a powerful bactericide, effective in skin antisepsis but not if used alone. It could be achieved a quick, effective and cumulative antisepsis in combination with chlorhexidine or iodine-solution.


Normothermia reduces some surgery related complications as intraoperative bleeding or SSI (surgical site infection), decreasing the hospital stay. Hypothermia impairs the action of neutrophils and causes subcutaneous tissue vasoconstriction and hypoxia. All these facts could increase blood loss, the development of bruising in the wound, aspects that increase the rate of SSI. The use of warming devices is recommended to prevent hypothermia.

4.2.2.3 Glycaemia

Postoperative hyperglycemia increases complications rate. During surgery, blood glucose should be monitored. The maintenance of normoglycemia has a positive outcome in the postoperative period. The goal of treatment of postoperative hyperglycemia in diabetic patients is not formally defined, however values below 110 mg / dl or greater than 150 mg / dl seem to be detrimental and should be avoided.

4.2.2.4 Technique

**Laparoscopic vs open approach**

The laparoscopic approach (LA) has gradually increased in recent years. The latest Cochrane review published in 2010 concluded that laparoscopy offers advantages over open surgery (OA) if the clinical circumstances, surgical team and proper equipment is available. The use of laparoscopy is especially recommended for young women, obese and active workers.

There have also been observed advantages with the LA in elderly population. Harrel (observational cohort) described in **uncomplicated appendicitis** a lower hospital stay (4.6 versus 7.3 days), less requirement of intermediate care (91 versus 79%), less complications (13 versus 22%) and lower mortality (0.4 versus 2.1%) in the laparoscopy group compared with OA. He also described in the group of patients with perforated appendicitis treated by LA a

**References**


decreased hospital stay (6.8 versus 9.0 days) a lower rate of intermediate care when discharge home (87 versus 71%) with equivalent rates of mortality when compared to OA.

Laparoscopic approach

The patient is placed supine on the operating table with his left arm positioned along the body. The monitor is located on the right side of the patient.

- Placement of ports: there are several options but all of them must respect the principle of triangulation of instruments and appendix. One method is to place a 12 mm periumbilical port and two-port of 5 mm in left lower quadrant and suprapubic midline. For retrocecal appendicitis better exposure is achieved by situating a 5mm trocar in the epigastric region.

- Mobilization and resection:

After identifying the appendix, adhesions if necessary are released and the structure is continued until its insertion in the cecal base. It is then identified the appendiceal artery and sectioned by hemoclips, coagulation or stapler (GIA). In case of using the stapler for mesoappendix ligation, a single reload including mesoappendix and appendix must be used whenever possible.

The method for closing and transecting the appendix stump depends on the intraoperative findings and experience of the surgeon. The use of endoloops has demonstrated safe results comparable to the endo-stapler in observational studies.

Evaluating the effectiveness cost, the use of endoloops or clips is recommended in single appendiceal inflammation conditions with appendicular based less than 16 mm. If there is inflammation of the base of the cecum it is advisable to employ endo-stapler.

- Removing the surgical specimen in bag

It is recommend to extract the surgical specimen in a plastic bag to prevent contamination of the surgical wound trocar.

Open approach

- A curvilinear incision on McBurney point in the outer third of the line between the superior iliac spine and the navel is recommended. Some authors recommend a transverse incision, easily to extend. It is recommended to examine the patient after anesthetic induction and if
any palpable mass corresponded to the inflammatory process appendicular incision must be done above that mass.

- Mobilization and resection: after dissection of the subcutaneous tissue, longitudinally sectioned external oblique fascia and muscle fibers are splitted to expose the peritoneum, which is elevated prior section to prevent intestinal damage. The appendix is located, the mesoappendix dissected and sectioned after making a ligature with an absorbable suture 3/0. The cecal appendix is cut with a scalpel and the stump tied with a 2/0 absorbable suture stump mucosa is coagulated with electrocautery. The appendiceal stump is inverted into the cecal base with a purse string suture.

- Closure of surgical wound is performed by planes with a continuous 2/0 absorbable suture. Wash-saline irrigation of each plane is performed and primary closure of the wound with subcuticular sutures or staples are recommended.

4.2.2.5 Peritoneal fluid cultures

Taking peritoneal fluid cultures systematically in each intervention is controversial. It is advisable to take in patients in whom there is a risk of ESBL or a possibility of failure of focus control. However, in our hospital, we propose peritoneal fluid culture to identify the responsible local flora and arrange epidemiological study.


4.2.2.6 Re-dosing antibiotic if necessary.

Although it is unusual in this type of intervention, it is recommended to re-dose if time exceed twice the average life of the antibiotic or excessive blood loss occurs.


4.2.2.7 Irrigation and aspiration operative field

Irrigation / aspiration of the surgical field with saline solution is recommended in both open and laparoscopic appendectomy. Volume of irrigation will be in relation with the degree of peritonitis.

4.2.2.8 Drains

The use of drains is not recommended because they have not shown to decrease the rate of wound infection and intra-abdominal abscess, increasing the length of hospital stay.
4.2.2.3 Infiltration with local anesthetic

Although the studies are very heterogeneous it is convenient to infiltrate laparoscopic ports or external oblique fascia in order to reduce the need for postoperative analgesia.

4.2.3 POSTOPERATIVE

4.2.3.1 Oxygen therapy

It is suggested to maintain adequate oxygen saturation. Infection of surgical wound is favored in an atmosphere with low oxygen concentrations due to decreased microvascular flow that alters the leukocyte function. Some studies have postulated that increasing the fraction of inspired oxygen might improve neutrophil function by decreasing the incidence of surgical wound infection.

4.2.3.2 Postoperative antibiotic

- The use of postoperative antibiotics on uncomplicated appendicitis is NOT suitable. Uncomplicated cases of appendicitis are considered contaminated clean-surgery when the infection site is removed, and therefore only require prophylaxis. Prolongation of antibiotic
treatment has not proven useful in preventing the onset of SSI and it may instead promote the development of resistant microorganism and adverse effects such as diarrhea by antibiotics.

|---|

• In **complicated appendicitis** it is appropriated to extend the empirical antibiotic treatment administration for 5 days. The Clinical Antibiotic Treatment Guide of our Hospital (HCUZ) recommends the following administration:

The administration can be oral when

- Clinical syndrome is controlled and tolerance is present.
- The antimicrobial must have good oral bioavailability.

- Amoxicillin Clavulanate 1 g/8 h or (Cefotaxime 1 gr/8 h + metronidazole 500 mg/8h) +/- gentamicine 5 mg/kg/day or amikacin 15 mg/kg/day

- Risk of ESBLs ESBL spp productor: severe / shock sepsis, previous use of quinolones or cephalosporins, repetitive urinary tract infection, urinary catheter, diabetes mellitus: Ertapenem 1 gr/24 h ev

- Penicillin allergic: aztreonam 1 gr/ 8 h + metronidazole 500 mg/8h or tigecicline 100 mg 1 dose followed by 50 mg/12 h

4.2.3.3 Diet

In patients with **uncomplicated appendicitis** diet might be started 6-8 hours after surgery.

Patients with peritonitis often associate postoperative ileus. Ileus is a temporary deficiency (at least three days) of intestinal motility characterized by abdominal distension, absent bowel sounds, accumulation of gas and liquid in bowel and delayed expulsion of flatus and defecation. The only drug that has proven useful in the management of this adverse event is the Almipovan (opioid antagonist), provided they are involved in the etiopathogenesis opiates. In these patients the start of the diet is recommended when the intestinal motility is secured.
4.2.3.4 Analgesia

Postsurgical analgesia intravenous regimen based on Paracetamol + NSAIDs. Promote the employ of visual analog scale.

4.2.3.5 Early mobilization

Immobilization after surgery is related to the occurrence of cardiovascular, respiratory and thromboembolic complications and therefore prolonged hospital stay. Early mobilization has been related with reduction of these complications and hospitalization time. Mobilization of the patient is recommended after the first six hours postoperative.

4.2.3.6 Thromboembolic prophylaxis

The risk of postoperative deep vein thrombosis is not unifactorial. Its development is influenced by patients intrinsic factors such as history, comorbidities etc. and others from the surgical procedure itself. Despite many attempts to quantify this risk, there is no universal method accepted. Caprini modified scale (Annex 4) was established by the guide ACCP11 in 2012 to build the risk of postoperative thromboembolic events.

Early mobilization is mandatory for patients with very low risk (Caprini 0). For low-risk (Caprini 1-2) mechanical prophylaxis with pneumatic compression stockings is prescribed. If the risk is moderate (Caprini 3-4) the recommendation is based in the use of low molecular weight heparins. When the risk is high (Caprini equal to or greater than 5) the use of low molecular weight heparins with elastic stockings or mechanical compression is suggested.

4.2.3.7 Treatment of nausea and vomiting

Prophylaxis of nausea and vomiting during surgery should be performed after individual evaluation with Apfel scale (Annex 5). If the patient has received prophylaxis, treatment should begin with a different antiemetic drug from the initial one. If the patient has not required any antiemetic drug, treatment might be started with low dose of ondansetron.
5. CONCLUSION

For uncomplicated appendicitis it is recommended early discharge within 24 hours if no signs of complication or no presence of comorbidities that could contraindicated it. In complicated appendicitis discharge will vary depending on the patient’s progress and the presence of adverse events, but in all cases it should be proved the restoration of intestinal transit and the absence of signs of complication.

Patients at discharge should be informed of the care to be followed at home and monitoring which are having and will be needing in next days. Adequate information, favored by the development of standardized documents, reduces the readmission rate and increases patient satisfaction.

6. OTHER REFERENCES


7. ANNEXED

7.1 Alvarado Score

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migratory/right iliac fossa pain</td>
<td>1</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>1</td>
</tr>
<tr>
<td>Anorexia</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderness in right iliac fossa</td>
<td>2</td>
</tr>
<tr>
<td>Rebound tenderness in right iliac fossa</td>
<td>1</td>
</tr>
<tr>
<td>Elevated temperature</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory findings</th>
<th></th>
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<tbody>
<tr>
<td>Leucocytosis</td>
<td>2</td>
</tr>
<tr>
<td>Shift to the left of neutrophils</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total** 10

- 5-6: Possible
- 7-8: Probable
- >9 Very probable

7.2 APPENDICITIS INFLAMMATORY RESPONSE (AIR) SCORE

<table>
<thead>
<tr>
<th>Vomiting</th>
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<tbody>
<tr>
<td>Pain in right iliac fossa</td>
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</tr>
<tr>
<td>Rebound tenderness or muscular defense</td>
<td>1</td>
</tr>
<tr>
<td>Light</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>3</td>
</tr>
<tr>
<td>Strong</td>
<td></td>
</tr>
<tr>
<td>Body temperature &gt; 38,5</td>
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</tr>
<tr>
<td>Polymorphonuclear leucocytes</td>
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</tr>
<tr>
<td>70-84%</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 85%</td>
<td></td>
</tr>
<tr>
<td>WBC count</td>
<td>1</td>
</tr>
<tr>
<td>&gt;10.0-14.9 x 10^9/l</td>
<td>2</td>
</tr>
<tr>
<td>&gt;15 x 10^9 /l</td>
<td></td>
</tr>
<tr>
<td>CRP concentration</td>
<td>1</td>
</tr>
<tr>
<td>10-49 g/l</td>
<td>2</td>
</tr>
<tr>
<td>&gt;50 g/l</td>
<td></td>
</tr>
</tbody>
</table>

**Total score** 12
7.3 DIAGRAM THERAPEUTIC DIAGNOSIS

ACUTE RIGHT Iliac FOSSA PAIN

Clinic history and examination
Blood test (including pregnancy test)
AIR or Alvarado score

Low clinical risk
Intermediate clinical risk
High clinical risk

Imagining
Consider if other pathology/complication is suspected

Ultrasound
CT

Observation
Equivocal

NO appendicitis
Other pathology
Acute Appendicitis

Discharged
Alternative treatment
Appendectomy

Apendicular mass Abscess

Antibiotic management
Consider radiological (surgical) drainage of abscess
7.4 CAPRINI SCORE MODEL

Each risk factor represents 1 point
Age 41-60
Minor surgery
Obesity IMC >25
Swollen legs (current)
Varicose veins
Sepsis (<1 month)
Serious lung disease including pneumonia (< 1 month)
Abnormal pulmonary function (COPD)
Acute myocardial infarction
Congestive heart failure (<1 month)
History of inflammatory bowel disease
Medical patient currently at bed rest

Each risk factor represents 1 point (only women)
Oral contraceptives or hormone replacement therapy
Pregnancy or postpartum (< 1 month)
History of unexplained stillborn infant, recurrent spontaneous abortion (>3), premature birth with toxemia or growth-restricted infant

Each risk factor represents 2 points
Age 61 -74 years
Arthroscopic surgery
Major surgery (>45 min)
Laparoscopic surgery (>45 min)
Malignancy (present or previous)
Patient confined to bed (> 72 hours)
Cental venous access
Plaster cast (< 1 month)

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
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<tr>
<td>Moderate</td>
<td>3-4</td>
</tr>
<tr>
<td>High</td>
<td>&gt; 4</td>
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</table>

7.5 APFEL SCORE

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>1</td>
</tr>
<tr>
<td>Nonsmoker</td>
<td>1</td>
</tr>
<tr>
<td>History of PONV or motion sickness</td>
<td>1</td>
</tr>
<tr>
<td>Use of opioids &gt; 100 mcg fentanyl or equivalent</td>
<td>1</td>
</tr>
<tr>
<td>Low risk</td>
<td>0 or 1</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>2</td>
</tr>
<tr>
<td>High</td>
<td>3 or 4</td>
</tr>
</tbody>
</table>