WSES Guidelines e Farmacoeconomia in chirurgia addominale

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REVIEW Open Access

2013 WSES guidelines for management of intra-abdominal infections

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Classification and diagnosis

Abdominal sepsis

Source control

Antimicrobial therapy

Classification

Classification

Uncomplicated IAIs

Patients with uncomplicated infections can be treated with either surgical resection or antibiotics. When the infection is effectively resolved by surgical excision, 24-48 h short therapy is typically sufficient.

Complicated IAIs

Patients with complicated IAIs, can be treated with both source control and antibiotic therapy.

Peritonitis

Diffuse

Localized

Classification

Community-acquired IAIs

Healthcare associated IAIs

Infections acquired during the course of receiving healthcare.

- Hospital acquired infections
- Chronic care setting acquired infections
- Infections in patients using medical therapiesat home and perform invasive therapies (hemodialysis,chemotherapy, radiotherapy) in outpatient clinics

Diagnosis

Clinical presentation

Abdominal pain

It may be acute or insidious. Initially, the pain may be dull and poorly localized and often may progress to steady, severe, and more localized pain.

SIRS manifestations

Core body temperature > 38° C or < 36° C, heart rate > 90 beats per minute, respiratory rate > 20 breaths per minute (not ventilated) or PaCO2 < 32 mm Hg (ventilated), WBC > 12,000, < 4,000 or > 10% immature forms (bands).

Hypotension and hypoperfusion signs such as lactic acidosis, oliguria, and acute alteration of mental status are indicative of evolution to severe sepsis.

Abdominal rigidity

It suggests peritonitis and the need for urgent laparotomy.

CT abdomen

CT of the abdomen and the pelvis, when it is possible to perform it, remains the diagnostic study of choice for stable patients with intra-abdominal infections.

A negative CT generally indicates a very low probability of a process that can be reversed by surgical intervention

If the diagnosis of peritonitis is made clinically, a CT scan is not necessary and generally delays surgical intervention without offering clinical advantage.

Abdominal sepsis represents the host's systemic inflammatory response to bacterial or yeast peritonitis.

Definitions

Sepsis is defined as confirmed or suspected infection in the presence of the systemic inflammatory response syndrome (SIRS)

SIRS is primarily characterized by the presence of at least two of the following
Temperature > 38.6ºC or < 36ºC
Heart rate > 90 beats/minute
Respiratory rate > 30 breaths/minute
Leukocyte count > 12,000 cells/mm^3 or < 4,000 cells/mm^3.

Severe sepsis is defined as sepsis and organ dysfunction.

Septic shock is defined as severe sepsis and hypotension that does not respond to adequate fluid replacement.

Bone RC, Balk RA, Cerra FB, Dellinger RP, Fein AM, Knaus WA, Schein RM, Sibbald WJ: American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference: Definitions for sepsis and organ failure and guidlines for the use of innovative therapies in sepsis. *Chest* 1992, 101:1644-1655.

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Mortality rates increase dramatically in the event of severe sepsis and septic shock. Severe sepsis may be a reasonable approximation of the “tipping point” between stable and critical clinical conditions in the management of intra-abdominal infections.

Bone RC, Balk RA, Cerra FB, Dellinger RP, Fein AM, Knaus WA, Schein RM, Sibbald WJ: American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference: Definitions for sepsis and organ failure and guidlines for the use of innovative therapies in sepsis. *Chest* 1992, 101:1644-1655.

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Sepsis control

Patients with severe sepsis of abdominal origin require immediate hemodynamic support, source control, and antimicrobial therapy.

Sartelli M, Catena F, Di Saverio S, Ansaloni L, Malangoni M, Moore EE, Moore FA, Ivatury R, Coimbra R, Leppaniemi A, Biffl W, Kluger Y, Fraga GP, Ordonez CA, Marwah S, Gerych I, Lee JG, Tranà C, Coccolini F, Corradetti F, Kirkby-Bott J. Current concept of abdominal sepsis: WSES position paper. World J Emerg Surg. 2014 Mar 27;9(1):22.

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Fluid Resuscitation

The absence of clear benefits following the administration of colloid solutions compared to crystalloid, supports a high-grade recommendation for the use of crystalloid solutions in the initial resuscitation of patients with severe sepsis and septic shock.

Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, Sevransky JE, Sprung CL, Douglas IS, Jaeschke R, Osborn TM, Nunnally ME, Townsend SR, Reinhart K, Kleinpell RM, Angus DC, Deutschman CS, Machado FR, Rubenfeld GD, Webb S, Beale RJ, Vincent JL, Moreno R: Surviving Sepsis Campaign Guidelines Committee including The Pediatric Subgroup. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock, 2012. *Intensive Care Med* 2013 Feb,39(2):165-228.

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Fluid Resuscitation

The early hypovolemic phase of sepsis should be treated with high volume resuscitation. Intravascular volumes are the first parameters that should be assessed during hemodynamic optimization (by means of fluid therapy targeting).

- Central venous pressure: 8 - 12 mm Hg
- Mean arterial pressure (MAP): >65 mm Hg
- Urine output: >0.5 mL/kg/hr
- Central venous (superior vena cava) and mixed venous oxygen

.

Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, Sevransky JE, Sprung CL, Douglas IS, Jaeschke R, Osborn TM, Nunnally ME, Townsend SR, Reinhart K, Kleinpell RM, Angus DC, Deutschman CS, Machado FR, Rubenfeld GD, Webb S, Beale RJ, Vincent JL, Moreno R: Surviving Sepsis Campaign Guidelines Committee including The Pediatric Subgroup. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock, 2012. *Intensive Care Med* 2013 Feb,39(2):165-228.

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Fluid Resuscitation

In patients with generalized peritonitis, fluid resuscitation should be kept under control to avoid fluids overload, which may aggravate gut oedema and lead to increased intra-abdominal pressure.

Increasing intra-abdominal pressure causes progressive hypoperfusion of splanchnic circulation. Pathophysiological effects include gut oedema leading to bacterial translocation and release of cytokines, therefore aggravating the sepsis cascade.

Fluid Resuscitation

Repeated intravesical measurements of intra-abdominal pressure should be frequently performed in patients with severe sepsis or septic shock of abdominal origin, to identify patients at risk for intra-abdominal hypertension.

Vasopressor agents

Norepinephrine is now the first-line vasopressor agent used to correct hypotension in the event of septic shock. Norepinephrine is more efficacious than dopamine and may be more effective for reversing hypotension in patients with septic shock.

Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, Sevransky JE, Sprung CL, Douglas IS, Jaeschke R, Osborn TM, Nunnally ME, Townsend SR, Reinhart K, Kleinpell RM, Angus DC, Deutschman CS, Machado FR, Rubenfeld GD, Webb S, Beale RJ, Vincent JL, Moreno R: Surviving Sepsis Campaign Guidelines Committee including The Pediatric Subgroup. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock, 2012. *Intensive Care Med* 2013 Feb,39(2):165-228.

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Source control

Source control

Source control represents a key component of success in therapy of sepsis. It includes drainage of infected fluids, debridement of infected tissues, removal of infected devices or foreign bodies, and finally, definite measures to correct anatomic derangement resulting in ongoing microbial contamination and to restore optimal function.

Source control

Source control should be obtained as early as possible after the diagnosis of intra-abdominal sepsis has been confirmed. Inability to control the septic source is associated significantly with increase in mortality.

Uncomplicated appendicitis

Although the standard treatment for acute appendicitis has historically been the appendectomy, the medical community has recently seen a notable increase in the use of antibiotic therapy as a primary means of treatment.

Although non-operative, antibiotic treatment of uncomplicated appendicitis are associated with fewer complications, more manageable pain control, and shorter patient sick leave, conservative approach features high rates of recurrence.

Surgical approach

Several randomized trials have compared the diagnostic and therapeutic advantages of laparoscopic and conventional open appendectomies in the treatment of acute appendicitis.
Both open and laparoscopic appendectomies are viable approaches to surgical treatment of acute appendicitis

While the trials demonstrated a reduction in wound infections for the laparoscopic appendectomy group, they also exhibited a threefold increase in intra-abdominal abscesses.

Sauerland S, Jaschinski T, Neugebauer EA: Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev 2010, 6(10):CD001546.

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Appendicular abscess

For patients with acute appendicitis presenting with abscesses, the optimal management strategy is somewhat controversial.

Percutaneous drainage to address periappendiceal abscesses results in fewer complications and shorter overall hospitalization

Simillis C, Symeonides P, Shorthouse AJ, Tekkis PP: A meta-analysis comparing conservative treatment versus acute appendectomy for complicated appendicitis (abscess or phlegmon). Surgery 2010, 147(6):818–829

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Acute diverticulitis

Uncomplicated diverticultis

The routine use of antibiotics for patients with uncomplicated acute diverticulitis is a point of controversy in the medical community.

Relevant data regarding the use of antibiotics in mild or uncomplicated cases of diverticulitis were sparse and of poor methodological quality.

Outpatient treatment of uncomplicated acute diverticulitis depends on the condition and compliance of the patient as well as his or her availability for follow-up analysis.

The treatment involves orally administered antibiotics to combat Gram-negative and anaerobic bacteria. If symptoms persist or worsen, the patient should be admitted for more aggressive inpatient treatment.

Complicated diverticultis

The grade and stage of diverticulitis are determined by clinical severity and Hinchey classification of disease, and used to identify patents likely to fail medical management or require surgery.

Hinchey classification

- stage 1a - phlegmon
- stage 1b - diverticulitis with pericolic or mesenteric abscess
- stage 2 - diverticulitis with walled off pelvic abscess
- stage 3 - diverticulitis with generalised purulent peritonitis
- stage 4 - diverticulitis with generalised faecal peritonitis

Complicated diverticultis

For patients with diverticulitis complicated by peridiverticular abscesses, the size of an abscess is an important factor in determining the proper course of action and in deciding whether or not percutaneous drainage is the optimal approach

For patients with peridiverticular abscesses larger than 4 cm in diameter, observational studies indicate that CT guided percutaneous drainage is the treatment of choice

Diverticular diffuse peritonitis

Hartmann's resection is still suggested in the event of severe acute diverticulitis with generalized, purulent, or fecal peritonitis for patients with poor prognostic criteria.

In the event of diffuse peritonitis, resection with primary anastomosis and peritoneal lavage is a suitable approach for patients with promising prognostic criteria

Laparoscopic peritoneal lavage

Several case series and prospective studies have demonstrated that laparoscopic peritoneal lavage is a safe alternative to conventional management in the treatment of perforated diverticulitis with diffuse purulent peritonitis

Taylor CJ, Layani L, Ghusn MA, White SI: Perforated diverticulitis managed by laparoscopic lavage. ANZ J Surg 2006, 76:962–965.

Myers E, Hurley M, O'Sullivan GC, Kavanagh D, Wilson I, Winter DC: Laparoscopic peritoneal lavage for generalized peritonitis due to perforated diverticulitis. Br J Surg 2008, 95:97–101.

Favuzza J, Frield JC, Kelly JJ, Perugini R, Counihan TC: Benefits of laparoscopic peritoneal lavage for complicated sigmoid diverticulitis. Int J Colorectal Dis 2009, 24:799–801.

Karoui M, Champault A, Pautrat K, Valleur P, Cherqui D, Champault G: Laparoscopic peritoneal lavage or primary anastomosis with defuctioning stoma for Hinchey 3 complicated diverticulitis: results of a comparative study. Dis Colon Rectum 2009, 52:609–615.

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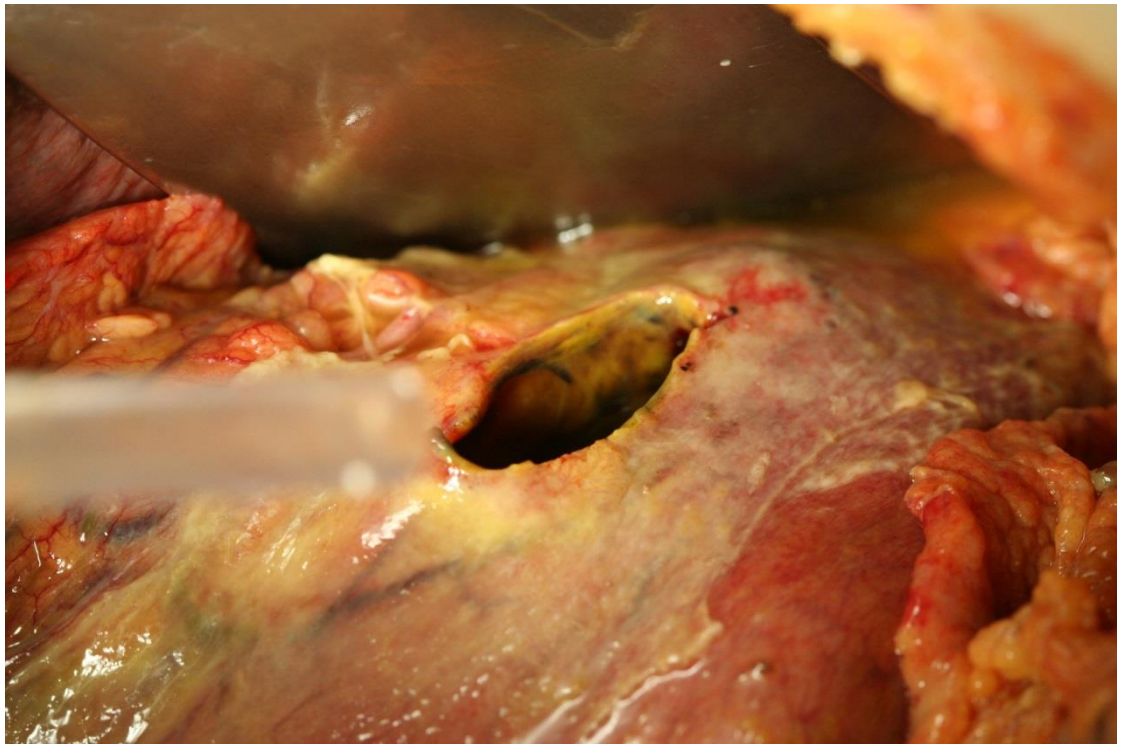
Gastroduodenal perforation



Gastro-duodenal perforation

In perforated peptic ulcer, surgery is the treatment of choice.
In selected cases (Pts yunger than 70 ys old, no shock, no peritonitis, lack of spillage of the water-soluble contrast medium at gastroduodenogram) non-operative management may be attempted.
After initial non operative management, no improvement of conditions within 24 hours or rapid deterioration are indication to surgery.

Gastro-duodenal perforation

Simple closure with or without an omental patch is a safe and effective procedure to address small perforated ulcers (< 2 cm) In the event of large perforated ulcers, concomitant bleeding or stricture, resectional gastroduodenal surgery may be required. Intraoperative assessment enables the surgeon to determine whether or not resection is the proper course of action

Laparoscopic approach

The p.o. outcome of laparoscopic approach to perforated peptic ulcer does not significantly differ from that of open surgery, except for lower analgesic p.o. request. In all studies the patients had small ulcers (mean diameter 1 cm) and all patients received simple suture, mostly with omental patch, or suturless repair; No experience is reported with emergency laparoscopic resection or laparoscopic repair of large ulcers.

Sanabria A, Villegas MI, Morales Uribe CH. Laparoscopic repair for perforated peptic ulcer disease. Cochrane Database of Systematic Reviews 2010 (Mar), Issue 4

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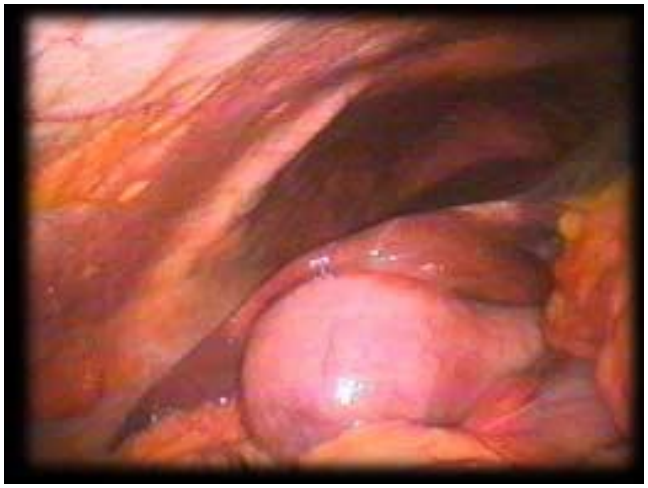
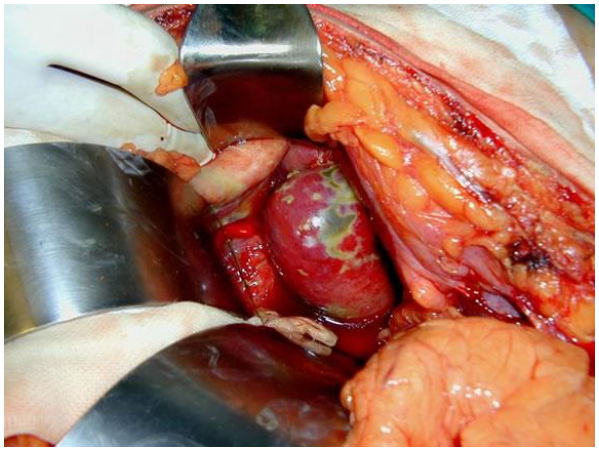
Cholecystitis





Laparoscopic cholecystectomy

Laparoscopic cholecystectomy is an effective treatment for acute cholecystitis

Kiviluoto T, Sirén J, Luukkonen P, Kivilaakso E. Randomised trial of laparoscopic versus open cholecystectomy for acute and gangrenous cholecystitis. Lancet. 1998 Jan 31;351(9099):321-5.

Johansson M, Thune A, Nelvin L, Stiernstam M, Westman B, Lundell L. Randomized clinical trial of open versus laparoscopic cholecystectomy in the treatment of acute cholecystitis. Br J Surg. 2005 Jan;92(1):44-9

Kum CK, Goh PMY, Isaac JR, Tekant Y, Ngoi SS. Laparoscopic cholecystectomy for acute cholecystitis. Br J Surg. 1994;81: 1651–1654

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Timing of cholecystectomy

Early cholecystectomy: Surgery + antimicrobial prophylaxis

Delayed Cholecystectomy: Antimicrobial therapy + delayed surgery

Timing of cholecystectomy

Evidence suggests that early laparoscopic cholecystectomy can reduce the total length of hospital stay and the risk of readmissions attributable to recurrent acute cholecystitis.

Gurusamy K, Samraj K, Gluud C, Wilson E, Davidson BR. Meta-analysis of randomized controlled trials on the safety and effectiveness of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Br J Surg. 2010 Feb;97(2):141-50.

Siddiqui T, MacDonald A, Chong PS, Jenkins JT. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a meta-analysis of randomized clinical trials. Am J Surg. 2008 Jan;195(1):40-7.

Lau H, Lo CY, Patil NG, Yuen WK. Early versus delayed-interval laparoscopic cholecystectomy for acute cholecystitis: a metaanalysis. Surg Endosc. 2006 Jan;20(1):82-7.

Papi C, Catarci M, D'Ambrosio L, Gili L, Koch M, Grassi GB, Capurso L. Timing of cholecystectomy for acute calculous cholecystitis: a meta-analysis. Am J Gastroenterol. 2004 Jan;99(1):147-55.

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Cholecystostomy in elderly and critically ill patients

Some reports (case-series studies) have studied the effectiveness and safety of percutaneous transhepatic gallbladder drainage as the treatment of first choice for acute cholecystitis in elderly patients, particularly in those with comorbid conditions, and they indicate its usefulness.

Avrahami R, Badani E, Watemberg S, Nudelman I, Deutsch AA, Rabin E, et al. The role of percutaneous transhepatic cholecystostomy in the management of acute cholecystitis in high-risk patients. *Int Surg.* 1995;80:111–14.

Davis CA, Landercasper J, Gundersen LH, Lambert PJ. Effective use of percutaneous cholecystostomy in high-risk surgical patients: techniques, tube management, and results. *Arch Surg.* 1999;134:727–31.

Lee KT, Wong SR, Cheng JS, Ker CG, Sheen PC, Liu YE. Ultrasound-guided percutaneous cholecystostomy as an initial treatment for acute cholecystitis in elderly patients. *Dig Surg.* 1998;15:328–32.

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Post-operative peritonitis

Post-operative peritonitis

The most common cause of postoperative peritonitis is anastomotic failure/leak.

Post-operative peritonitis

Organ failure and/or subsequent re-laparotomies that have been delayed for more than 24 hours both result in higher rates of mortality for patients affected by postoperative intra-abdominal infections.

Physical and laboratory tests are of limited value in diagnosing abdominal sepsis. CT scans typically offer the greatest diagnostic accuracy. Early re-laparotomies appear to be the most effective means of treating post-operative peritonitis

Torer N, Yorganci K, Elker D, Sayek I: Prognostic factors of the mortality of postoperative intraabdominal infections. Infection 2010, 38(4):255–260.

Koperna T, Schulz F: Prognosis and treatment of peritonitis. Do we need new scoring systems? Arch Surg 1996, 131(2):180–186.

Re-laparotomy strategy

Re-laparotomy strategy

Three methods of local mechanical management of abdominal sepsis following initial laparotomy for source control are currently debated:

(1) Open-abdomen
(2) planned relaparotomy,
(3) on-demand relaparotomy

Re-laparotomy strategy

Given the procedure's ability to streamline healthcare resources, reduce overall medical costs, and prevent the need for further re-laparotomies, the on demand re-laparotomy is recommended for patients with severe peritonitis.

van Ruler O, Mahler CW, Boer KR, Reuland EA, Gooszen HG, Opmeer BC, de Graaf PW, Lamme B, Gerhards MF, Steller EP, van Till JW, de Borgie CJ, Gouma DJ, Reitsma JB, Boermeester MA; Dutch Peritonitis Study Group. Comparison of on-demand vs planned relaparotomy strategy in patients with severe peritonitis: a randomized trial. JAMA. 2007 Aug 22;298(8):865-72.

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Open abdomen

The open abdomen remains a viable option for treating intra-abdominal sepsis. The benefits of maintaining an open abdomen include

•Subsequent exploration and control of abdominal contents

•Reduced risk of intra-abdominal hypertension and abdominal compartment syndrome

•Fascial preservation to ensure proper closure of the abdominal wall.

However, prolonged exposure of abdominal viscera can result in additional complications, including infection, sepsis, and fistula formation

Open abdomen

Temporary closure

VAC

- Vacuum pack
- Artificial burr
- Mesh/sheet
- Zipper
- Silo
- Skin closure
- Dynamic retention sutures (DRS)

Boele van Hensbroek P, Wind J, Dijkgraaf MG, Busch OR, Goslings JC. Temporary closure of the open abdomen: a systematic review on delayed primary fascial closure in patients with an open abdomen. World J Surg. 2009 Feb;33(2):199-207. doi: 10.1007/s00268-008-9867-3

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Open abdomen

Ideal temporary closure

- Protect the abdominal contents
- Prevent evisceration
- Allow removal of infected or toxic fluid from the peritoneal cavity
- Prevent the formation of fistulas
- Avoid damage to the fascia
- Preserve the abdominal wall domain, make reoperation easy and safe
- Facilitate definitive closure

Antimicrobial therapy

Inappropriate choice of initial antibiotic therapy in sIAI patients leads to more clinical failure resulting in a longer hospital stay and higher costs of hospitalization compared with appropriate initial antibiotic therapy.

Cattan P, Yin DD, Sarfati E et al. Cost of care for inpatients with community-acquired intra-abdominal infections. Eur J Clin Microbiol Infect Dis 2002; 21: 787–93.

Montravers P, Gauzit R, Muller C et al. Emergence of antibiotic-resistant bacteria in cases of peritonitis after intraabdominal surgery affects the efficacy of empirical antimicrobial therapy. Clin Infect Dis 1996; 23: 486–94.

Mosdell DM, Morris DM, Voltura A et al. Antibiotic treatment for surgical peritonitis. Ann Surg 1991; 214: 543–9.

Sturkenboom MC, Goettsch WG, Picelli G et al. Inappropriate initial treatment of secondary intra-abdominal infections leads to increased risk of clinical failure and costs. Br J Clin Pharmacol 2005; 60: 438–43.

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Antimicrobial therapy

An insufficient, or otherwise, inadequate antimicrobial regimen is one of the variables most strongly associated with unfavorable outcomes. On the other hand excessive antimicrobial use has contributed to the emergence and spread of drug-resistant micro organisms. By optimizing the use of antibiotics, clinicians improve patient outcomes and minimize the chance of further antibiotic resistance

Risk stratification

The definition of "risk" in intra-abdominal infections remains vague.

“High risk” is generally intended to describe patients with a high risk for treatment failure. Effective management of high risk patients requires the early use of appropriate, broad-spectrum empirical antimicrobial therapy.

Solomkin JS, Mazuski JE, Bradley JS, Rodvold KA, Goldstein EJ, Baron EJ, O'Neill PJ, Chow AW, Dellinger EP, Eachempati SR, Gorbach S, Hilfiker M, May AK, Nathens AB, Sawyer RG, Bartlett JG: Diagnosis and management of complicated intra-abdominal infection in adults and children: guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. *Clin Infect Dis* 2010, 50(2):133-64.

Risk factors

Infection risk factors

- Hospital acquired infections
- Recent exposure to antibiotics

Intrinsic risk factors

- High severity of illness (APACHE II score >15)
- Advanced age
- Comorbidity and degree of organ dysfunction
- Low albumin level
- Poor nutritional status
- Immunodepression
- Presence of malignancy

Source control risk factors

- Delay in the initial intervention (>24 h)
- Inability to achieve adequate source control

Clinical condition risk factors

Empirical treatment

Initial antimicrobial therapy for patients with IAIs is typically empirical in nature because they need immediate treatment, and microbiological data (culture and susceptibility results) can require up to 24-72 hours before they are available for a targeted therapy; especially in critically ill patients, empiric therapy should be initiated immediately

Antimicrobial regimen

The empirically designed antimicrobial regimen depends on

- The underlying severity of infection
- The pathogens presumed to be involved
- The risk factors indicative of major resistance patterns

Community-acquired IAIs
Vs
Healthcare-associated IAIs

Community-acquired IAIs

The major pathogens involved in community-acquired intra-abdominal infections are Enterobacteriaceae (especially *E. coli, K pneumoniae*, *Enterobacter*) Streptococcus species, and anaerobes (especially *B. fragilis*).

MDRO = multi-drug resistant organisms

MRSA
VISA
VRSA

VRE

ESBL (*Enterbacteriaceae*)

KPC (*Klebsiella pneumoniae*)

Metallo Beta Lactamases
- *Pseudomonas aeruginosa*
- *Acinetobacter baumannii*
- *Stenotrophomonas maltophilia*

Biliary infections

Knowledge of mechanisms of secretion of antibiotics into bile may be helpful in designing the optimal therapeutic regimen for patients with biliary-related intra-abdominal infections

Sartelli M, Viale P, Catena F, Ansaloni L, Moore E, Malangoni M, Moore FA, Velmahos G, Coimbra R, Ivatury R, Peitzman A, Koike K, Leppaniemi A, Biffl W, Burlew CC, Balogh ZJ, Boffard K, Bendinelli C, Gupta S, Kluger Y, Agresta F, Di Saverio S, Wani I, Escalona A, Ordonez C, Fraga GP, Junior GA, Bala M, Cui Y, Marwah S, Sakakushev B, Kong V, Naidoo N, Ahmed A, Abbas A, Guercioni G, Vettoretto N, Díaz-Nieto R, Gerych I, Tranà C, Faro MP, Yuan KC, Kok KY, Mefire AC, Lee JG, Hong SK, Ghnnam W, Siribumrungwong B, Sato N, Murata K, Irahara T, Coccolini F, Lohse HA, Verni A, Shoko T. 2013 WSES guidelines for management of intra-abdominal infections. World J Emerg Surg. 2013 Jan 8;8(1):3.

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Antimicrobial therapy in critical ill patients

De-escalated approach

Patients with severe sepsis or septic shock may benefit from aggressive antimicrobial treatment in order to curb the spread of the multiple organ dysfunction syndrome caused by an ongoing peritoneal trigger.
For these patients, a de-escalated approach may be the most appropriate strategy

Empirical antifungal therapy

The rising incidence of candidaemia and deep-seated infections, due to Candida (i.e. invasive candidiasis-IC) is paralleling the increasing complexity of surgical procedures, the larger patient populations at risk of infection, as well as changes in patient demographic characteristics.

Bassetti M, Taramasso L, Nicco E, Molinari MP, Mussap M, Viscoli C. Epidemiology, species distribution, antifungal susceptibility and outcome of nosocomial candidemia in a tertiary care hospital in Italy. PLoS One. 2011;6(9):e24198. doi:10.1371/journal.pone.0024198 PONE-D-11-11350 [pii].

Pfaller MA, Jones RN, Doern GV, Sader HS, Hollis RJ, Messer SA. International surveillance of bloodstream infections due to Candida species: frequency of occurrence and antifungal susceptibilities of isolates collected in 1997 in the United States, Canada, and South America for the SENTRY Program. The SENTRY Participant Group. J Clin Microbiol. 1998;36(7):1886-9.

Weinstein MP, Towns ML, Quartey SM, Mirrett S, Reimer LG, Parmigiani G et al. The clinical

significance of positive blood cultures in the 1990s: a prospective comprehensive evaluation of the microbiology, epidemiology, and outcome of bacteremia and fungemia in adults. Clin Infect Dis. 1997;24(4):584-602.

Edmond MB, Wallace SE, McClish DK, Pfaller MA, Jones RN, Wenzel RP. Nosocomial bloodstream infections in United States hospitals: a three-year analysis. Clin Infect Dis. 1999;29(2):239-44.

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WSES guidelines

Community acquired extrabiliary IAI
No critically ill patient
No risk factors for ESBL

AMOXICILLIN/CLAVULANATE
Daily schedula: 2.2 g every 6 hours (Infusion time 2 hours)
OR (Allergy to beta-lactams)
CIPROFLOXACIN + METRONIDAZOLE
Daily schedula: 400 mg every 8 hours (Infusion time 30 min)
Daily schedula: 500 mg every 6 hours (Infusion time 1 hour)

Community acquired extrabiliary IAI
No critically ill patient
Risk factors for ESBL

ERTAPENEM
Daily schedula: 1 g every 24 hours (Infusion time 2 hours)
OR
TIGECYCLINE
Daily schedula: 100 mg LD then 50 mg every 12 hours
(Infusion time 2 hours)

Community acquired extrabiliary IAI
Critically ill patient
No risk factors for ESBL

PIPERACILLIN/TAZOBACTAM
Daily schedula: 16 g by continuous infusion or
4 g every 6 hours (infusion time 4 hours)

Community acquired extrabiliary IAI
Critically ill patient
Risk factors for ESBL

MEROPENEM
Daily schedula: 500 mg every 6 hours (Infusion time 6 hours)
OR
IMIPENEM
Daily schedula: 500 mg every 4 hours (Infusion time 3 hours)
(Infusion time 2 hours)
+/-
FLUCONAZOLE
Daily schedula: 600 mg LD then 400 mg every 24 hours (Infusion time 2 hours)

Community acquired biliary IAI
No critically ill patient
No Risk factors for ESBL

AMOXICILLIN/CLAVULANATE
Daily schedula: 2.2 g every 6 hours (Infusion time 2 hours)
OR (Allergy to beta-lactams)
CIPROFLOXACIN + METRONIDAZOLE
Daily schedula: 400 mg every 8 hours (Infusion time 30 min) + Daily schedula: 500 mg every 6 hours (Infusion time 1 hour)

Community acquired biliary IAI
No critically ill patient
Risk factors for ESBL

TIGECYCLINE

Daily schedula: 100 mg LD then 50 mg every 12 hours (Infusion time 2 hours)

Community acquired biliary IAI
Critically ill patient
No risk factors for ESBL

PIPERACILLIN/TAZOBACTAM
Daily schedula: 16 g by continuous infusion or
4 g every 6 hours (Infusion time 4 hours)

Community acquired biliary IAI
Critically ill patient
Risk factors for ESBL

PIPERACILLIN
Daily schedula: 16 g by continuous infusion or
4 g every 6 hours (Infusion time 4 hours)
+
TIGECYCLINE
Daily schedula: 100 mg LD then 50 mg every 12 hours (Infusion time 2 hours)
+/-
FLUCONAZOLE
Daily schedula: 600 mg LD then 400 mg every 24 hours (Infusion time 2 hours)

Hospital-acquired extra-biliary IAIs

Hospital acquired extrabiliary IAI
No critically ill patient

PIPERACILLIN
Daily schedula: 16 g by Continuous Infusion
Or
4 g every 6 hours by Infusion Time: 4 hours
+
TIGECYCLINE
Daily schedula: 100 mg LD then 50 mg every 12 h by infusion Time: 2 hours
+
FLUCONAZOLE
Daily Schedula: 600 mg LD then 400 mg every 24 h by infusion time: 2 hours

Hospital acquired extrabiliary IAI
Critically ill patient

MEROPENEM

Daily Schedula: 500 mg every 6 h by infusion time: 6 hours

or

IMIPENEM

Daily Schedula: 500 mg every 4 h by Infusion time: 3 hours

or

DORIPENEM

Daily Schedula: 500 mg every 8 h by Infusion time: 4 hours

+

ECHINOCANDIN

+

TEICOPLANIN

Daily Schedula: LD 12 mg/kg/12h for 3 doses then 6 mg/kg every 12 h

(with TDM corrections – PD target 20-30 mg/L)

Daily schedula: 1,6 g by continuous infusion or

400 mg every 6 hours (infusion time 4 hours)

Zentralbl Chir. 2011 Feb;136(1):66-73. doi: 10.1055/s-0030-1247469. Epub 2011 Feb
18.

[Interventions by clinical pharmacists on surgical wards - impact on antibiotic therapy].

Weber A(1), Schneider C, Grill E, Strobl R, Vetter-Kerkhoff C, Jauch KW.

Using the example of antibiotic therapy we showed that pharmaceutical counselling on surgical wards influences various aspects of antibiotic therapy, increases drug safety and reduces cost by having an effect on duration of therapy and timely switch from intravenous to oral preparations.

De Simone *et al. World Journal of Emergency Surgery* (2015) 10:18
DOI 10.1186/s13017-015-0013-x

WJES WORLD JOURNAL OF EMERGENCY SURGERY

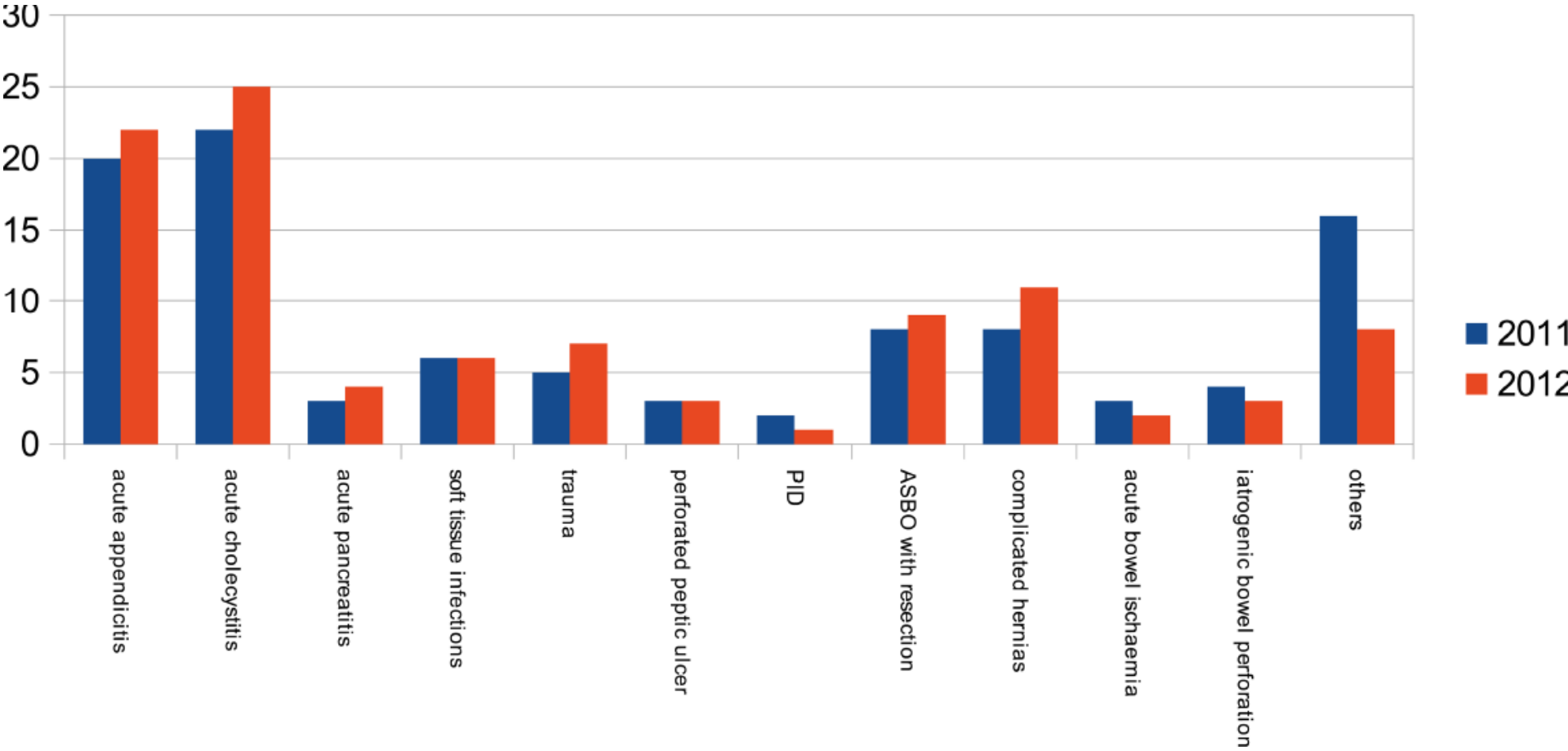
RESEARCH ARTICLE Open Access

Benefits of WSES guidelines application for the management of intra-abdominal infections

Belinda De Simone[1*], Federico Coccolini[2], Fausto Catena[1], Massimo Sartelli[3], Salomone Di Saverio[4], Rodolfo Catena[5], Antonio Tarasconi[6] and Luca Ansaloni[2]

Type of patient	*Hospital acquired IAIs*	*Hospital extra-biliary acquired IAIs*
Non critical pts; risk factors for MDR	*Piperacillin* *+* *Tigecycline* *+* *fluconazole*	
Critically ill pts; risk factors for MDR		*Piperacillin* *+* *Tigecycline* *+* *Echinocandin (caspofungin,anidulafungin ,micofungin)* *Or* *Meropenem* *Imipenem* *Doripenem* *+* *Teicoplanin* *+* *echinocandin*

Type of patient	*Community acquired extra-biliary IAIs*	*Community acquired biliary IAIs*
Stable pts; no risk factors for ESBL	*Amoxicillin/clavulanate* *Or, if pt allergic to beta-lactams* *Ciprofloxacin+ metronidazole*	*Amoxicillin/clavulanate* *Or, if pt allergic to beta-lactams* *Ciprofloxacin+ metronidazole*
Stable pts; risk factors for ESBL	*Ertapenem* *Or* *Tigecycline*	*Tigecycline*
Critically ill pts; no risk factors for ESBL	*Pipericillin/tazobactam*	*Pipericillin/tazobactam*
Critically ill pts; risk factors for ESBL	*Meropenem* *Or* *Imipenem* *+/-* *fluconazole*	*Piperacillin* *+* *Tigecycline* *+/-* *fluconazole*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20
15
10
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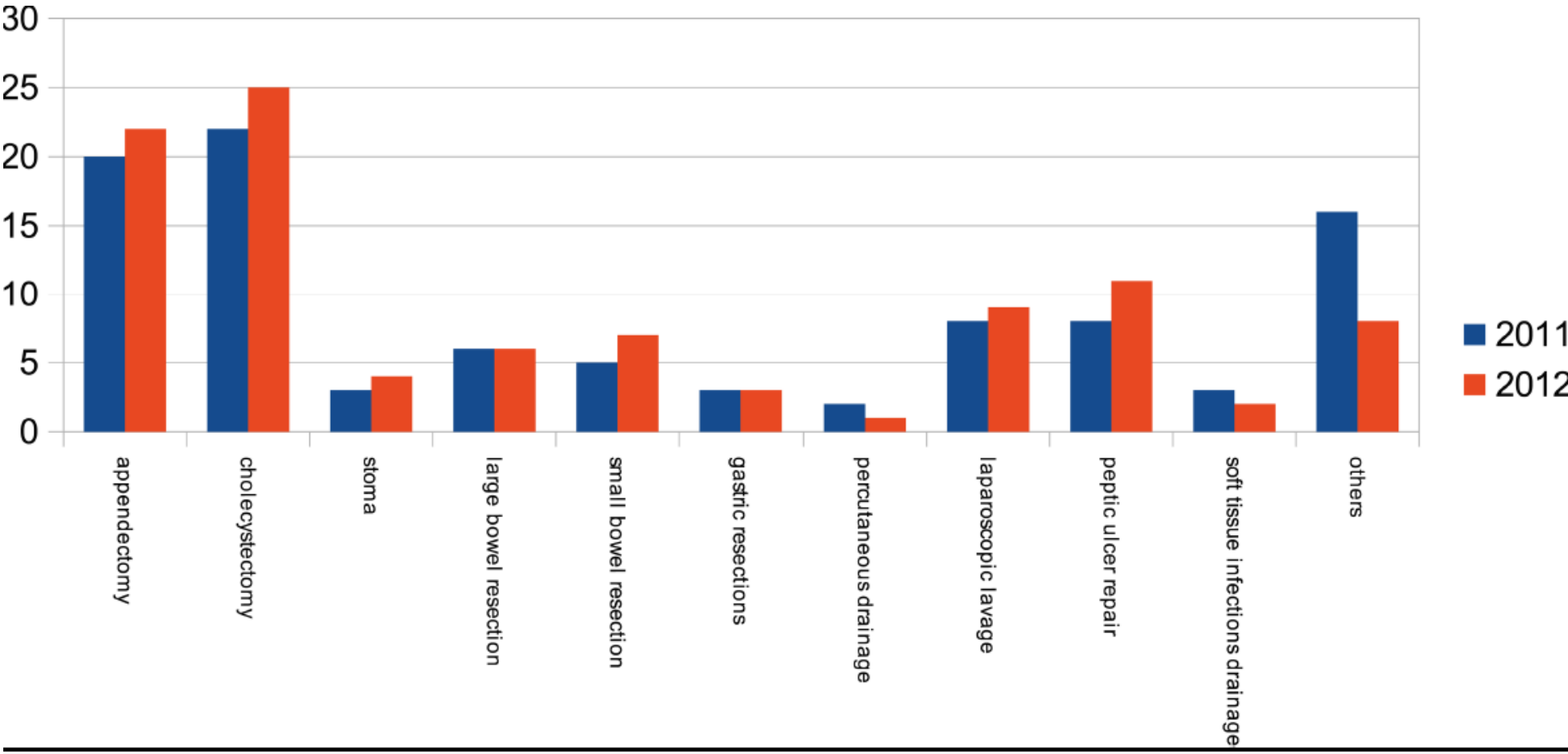
acute appendicitis
acute cholecystitis
acute pancreatitis
soft tissue infections
trauma
perforated peptic ulcer
PID
ASBO with resection
complicated hernias
acute bowel ischaemia
iatrogenic bowel perforation
others
2011
2012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appendectomy
cholecystectomy
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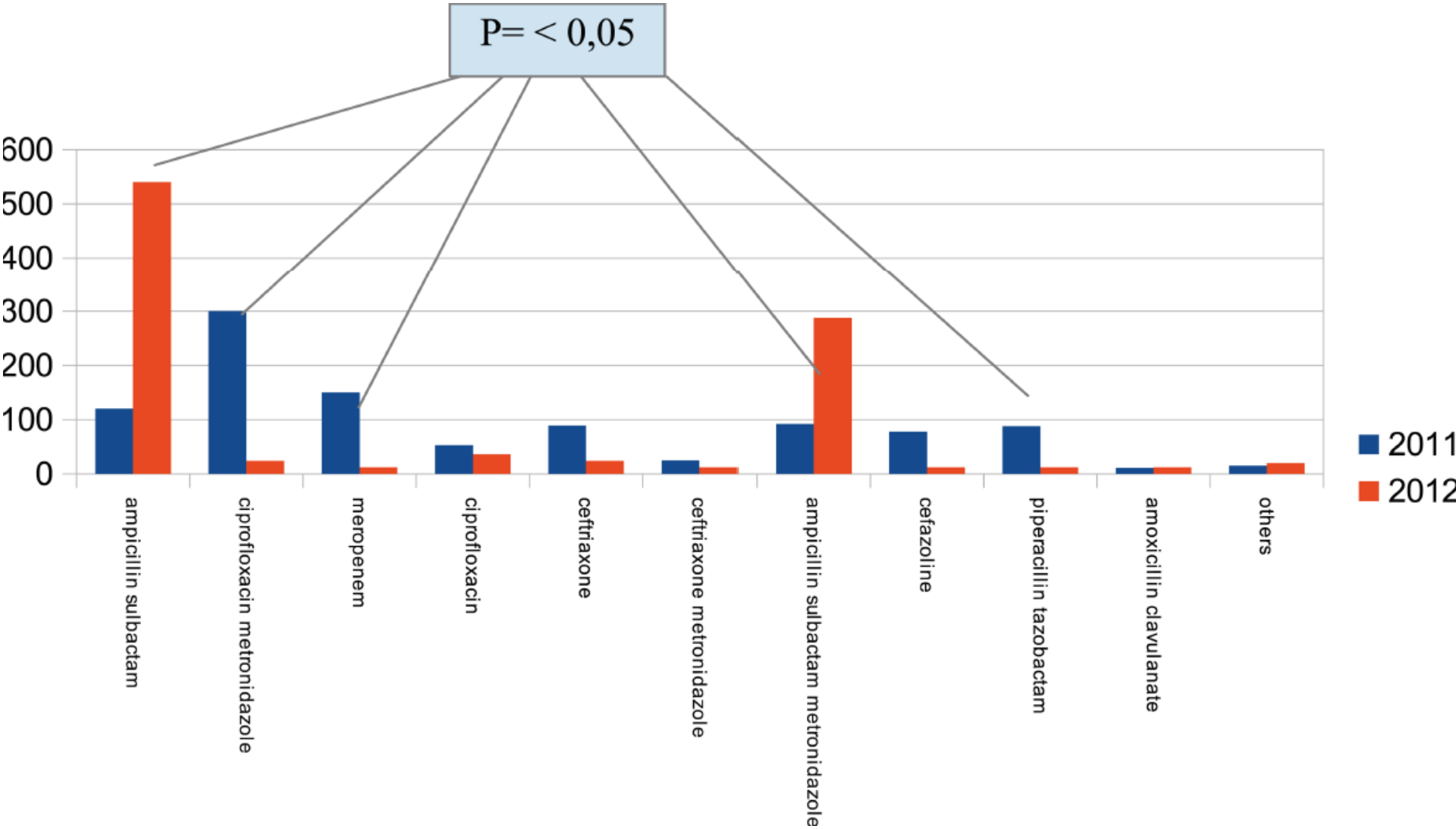
large bowel resection
small bowel resection
gastric resections
percutaneous drainage
laparoscopic lavage
peptic ulcer repair
soft tissue infections drainage
others
2011
2012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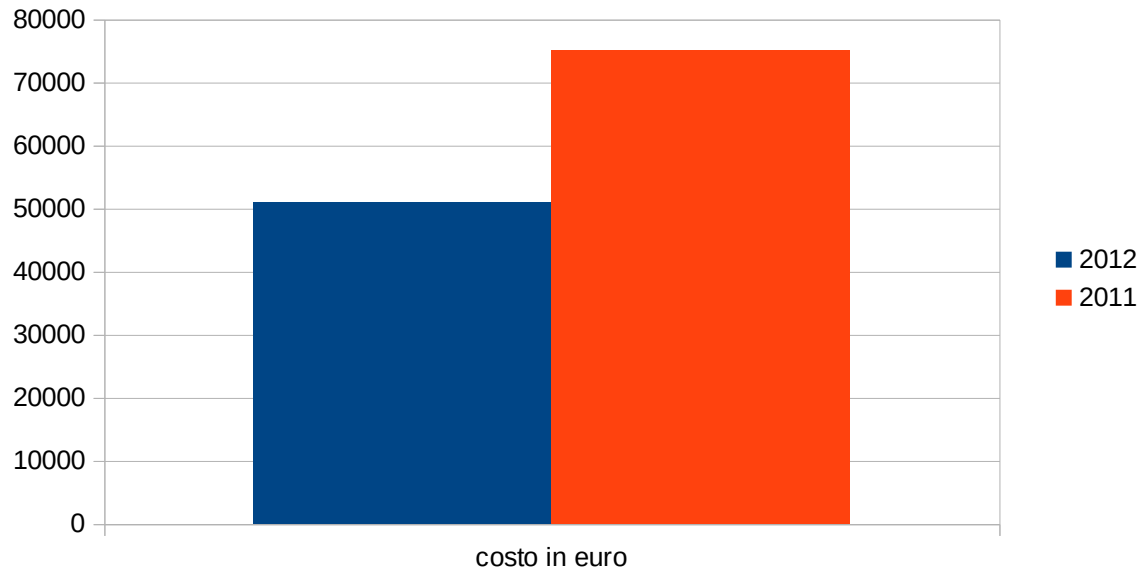
ceftriaxone metronidazole
ampicillin sulbactam metronidazole
cefazoline
piperacillin tazobactam
amoxicillin clavulanate
others
2011
2012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costo in euro
2012
2011

Thanks

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