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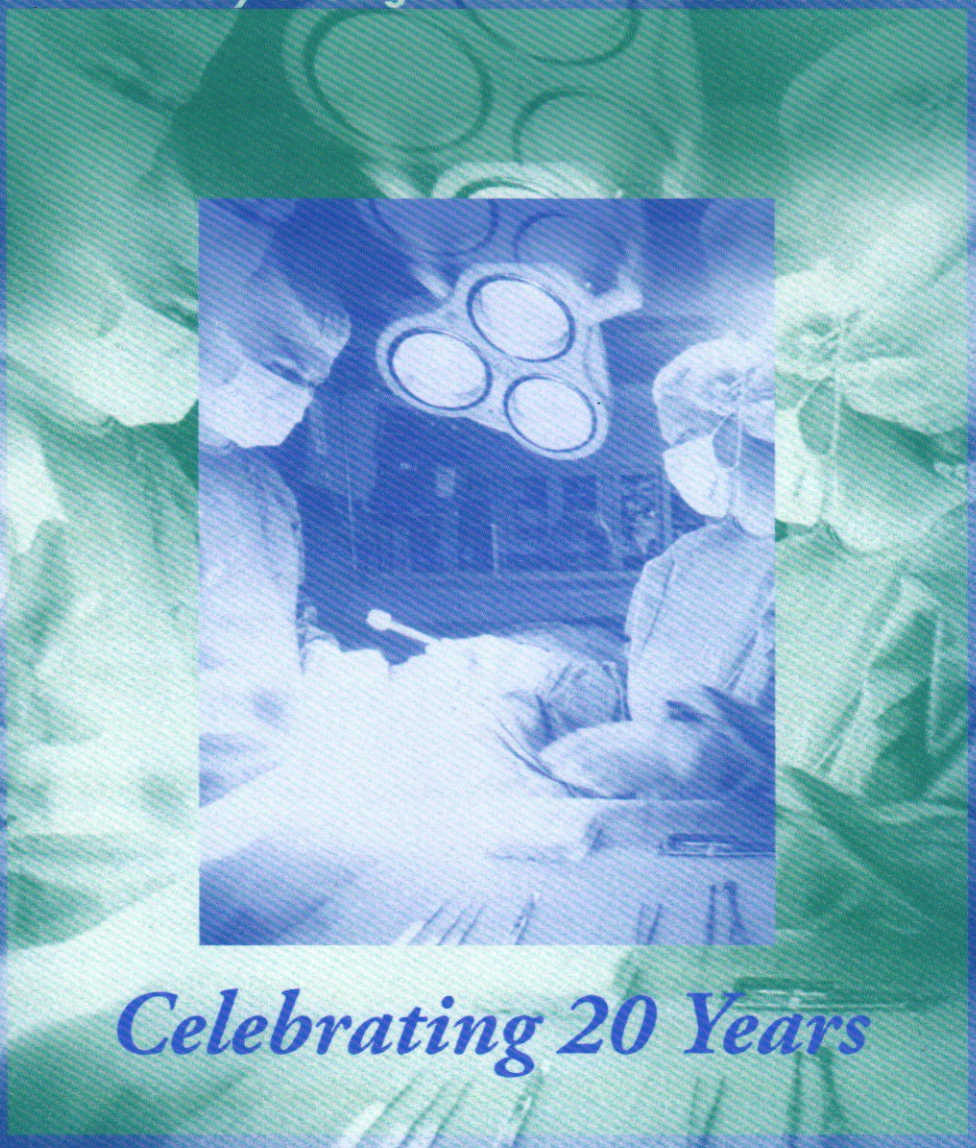

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Clinical Practice Guidelines in Complicated Intra-Abdominal Infection 2018: An Indonesian Perspective

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Abstract

Background: The occurrence of complicated intra-abdominal infections (cIAI) remains high despite system improvement in accordance with Joint Commission International because of heterogeneity of management. However, published clinical practice guidelines (CPGs) were not feasible to be implemented because these guidelines were not specific to Indonesian characteristics. Thus, a national CPG should be developed to minimize heterogeneity in the management of cIAI in Indonesia.

Methods: We developed a CPG on cIAI through the adaptation of published CPGs. The process proceeded in steps recommended by ADAPTE. Published CPGs were critically appraised using Appraisal of Guidelines for Research and Evaluation (AGREE) II critical appraisal tools. For a specific updated CPG, the analysis was performed using Checklist for the Reporting of Updated Guidelines (CheckUp). Appropriate statements and recommendations in selected CPGs were adapted into our CPG with consideration of Indonesian characteristics. The recommendations were established by the hierarchy of evidence on Grading of Recommendations Assessment, Development and Evaluation (GRADE). The approval of the recommendation draft was performed using the Delphi method.

Results: Sixty-eight full-text guidelines were downloaded from several sites. Thirty-three CPGs were related to intra-abdominal infection and 18 others were specific on CPG on intra-abdominal infection and cIAI. On review of these 18 CPGs, 13 were strongly recommended, three were recommended, and two were not recommended. On review updated CPGs, five updated CPGs were found, all with the same score. Two of the strongly recommended updated CPGs had been published in 2016 and 2017, i.e. recommendations by the World Society of Emergency Surgery 2016 consensus conference and revised CPG of the Surgical Site Infection Society. There were a total of 84 statements and recommendations developed and approved by the task force through using the Delphi method.

Conclusions: This guideline summarizes the definition, classification, pathophysiology, etiology, risk factors, assessments, and management of cIAI. Evidence-based recommendations have been developed with consideration of Indonesian-specific characteristics.

Keywords: clinical practice guidelines; complicated intra-abdominal infection

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Executive Summary

Complicated intra-abdominal infection (cIAI) remains a serious problem worldwide. Surgeons, intensivists, and physicians of other disciplines need clinical practice guidelines to treat patients with cIAI effectively, despite improvements in infection prevention programs. In particular, universal precautions should be in line with the Joint Commission International accreditation criteria for all Indonesian hospitals [1], the Surviving Sepsis Campaign [2,3], and antibiotic stewardship [4] in accordance with policies by Gyssens [5] and Bratzler et al. [6]. The prevalence of cIAI found in six tertiary hospitals in Indonesia in mid-2017 was approximately 10%, with mortality of 16.6% [7,8]. Accurate documentation of cIAI was the main obstacle to determining the prevalence of cIAI in Indonesia. The condition was not clearly documented in medical records, because cIAI, which is a clinical entity of sepsis syndrome [9–11] that develops in intra-abdominal organs, is not a diagnosis listed in the International Classification of Diseases, Tenth Revision (ICD-10) [12].

In emergency medicine worldwide, surgeons have focused on cIAI since the first clinical practice guidelines (CPG) were developed in 1992 [13,14] in accordance with the Institute of Medicine (IOM) [15] modern concept of guidelines. Such guidelines have been periodically updated throughout 2017; last year, two updates were published [16,17]. As a result of heterogeneity in management, cIAI mortality rates are high [13], not just in Indonesia, but worldwide, ranging from 3%–42% [18].

Thus, this CPG was developed to improve surgical care with the goal of reducing mortality and morbidity. The purpose of an Indonesia-specific guideline was to address Indonesia-specific characteristics, which were found to differ from those in well-developed countries. Most cases presenting in the six tertiary care centers were found to be similar, with advanced severity and delayed management. The diagnosis and initial management were also Indonesia-specific. From a patient perspective, the origins of disease were related to geography (archipelagic nation), financial status, or cultural beliefs. In addition, delayed treatment from medical/health providers in primary/secondary care centers (including diagnostic delay because of limited resources) was common. Thus, with these characteristics, recent CPGs on cIAI were not applicable in Indonesia [16,19].

In spite of different characteristics mentioned, several factors described in the literature negatively contribute to evidence-based practices, as commonly found in developing countries, including Indonesia: (1) insufficient studies with high level of evidence (meta-analysis, systematic review) in the region because medical record data used in daily practice are not designed for a research purpose, an issue that was found nationwide; (2) limitations in human resources in terms of the capability to translate knowledge to a clinical setting; (3) conflict of interest in research; (4) medical or healthcare research being the last component in a strategy of development; and (5) obstacles in the implementation of evidence-based policy [20]. In evidence-based medicine (EBM), level of evidence I (LOE 1) with a recommendation producing a standard (with a consequence should it not be followed) is only found from meta-analyses and systematic reviews with randomized controlled trials (RCT). Nonetheless, there were no surgical studies up to 2012 with LOE 1–2 in an EBM perspective because of ethical difficulties regarding randomization of surgical case/technique. Thus, in evidence-based surgery, the CPG recommendations were developed by the best possible evidence, predominately LOE 2–3 [21].

With such characteristics, the quality of surgical care in Indonesia could not be stratified using parameter(s) applied in well-developed countries. As such, to improve surgical care, particularly in cIAI management in Indonesia, an Indonesia-specific CPG is required. Using an Indonesia-specific CPG, the quality of surgical care may be evaluated accurately. Such evaluations are important, because when dealing with high mortality in difficult cases such as those in Indonesia, quality was not necessarily subpar. Nonetheless, treatment may fail, despite good surgical quality, if other cIAI management recommendations are not well implemented. Hence, our purpose was to develop homogeneous cIAI detection and management guidelines, supported by Indonesia-specific evidence, to achieve better quality of surgical care. Thus, in selected recommendations in this CPG document, there are recommendations identified as Ungraded (UG) that are based upon expert opinion and do not have supportive clinical evidence.

Methods

The development of CPG began with the establishment of scope and purpose. Clinical questions were formulated by panels comprising surgeons and non-surgeons (including a microbiologist, pathologist, and community medicine specialist) in early 2017. The scope of the CPG was cIAI in adults. The clinical questions were:

1) Complicated intra-abdomincal infection:
   a. What is the definition of cIAI?
   b. What is the classification of cIAI?
   c. What is the pathophysiology and pathogenesis of cIAI?
   d. What is the etiology of cIAI?
   e. Who is at risk for cIAI?
   f. What are the complications from cIAI?
2) How is cIAI detected clinically, in the laboratory, and by imaging?
   a. What is the clinical indicator of cIAI?
   b. What is the laboratory indicator of cIAI?
   c. What is the imaging indicator of cIAI?
   d. Is there a practical scoring system that can be used for diagnosis and evaluation in the management of cIAI?
3) Is there a practical prognostic factor that can be used in cIAI management?
4) What are the basic principles in the management of cIAI?
   a. Surgical intervention
   b. Pre-operative measures
5) What is the basic principle in antibiotic management in cIAI with regards to indication and timing?
   a. What antibiotic should initially be used for empiric treatment?
   b. What antibiotic should be used as a therapeutic treatment in cIAI management?
   c. How should anaerobic infection in Indonesia be managed?

6) How should cIAI caused by fungal infection be treated in Indonesia?
7) How can we evaluate success of cIAI management in Indonesia?

Adaptation

At an early date we realized it would be impossible to develop a CPG de novo [22] based on high-quality local evidence from developing countries, particularly in Asia [23,24], therefore, the CPG was developed by adapting recent CPGs. This adaptation was carried out in accordance with ADAPTE recommendations, using the Resource Toolkit for Guideline Adaptation version 2.0 [25]. The process consisted of three steps: the setup phase, adaptation phase, and final phase.

In addition to CPG, a search of the Cochrane Library and previously mentioned sites was performed out to find supporting articles, such as meta-analyses, systematic reviews, and other studies, using the same key words. After CPGs were identified, we narrowed down our selection based on duplication, inclusion, and full-text availability.

In addition, critical appraisal was performed [26–28] using Appraisal of Guidelines for Research and Evaluation (AGREE) II critical appraisal tools, namely, AGREE II Tools (My AGREE PLUS platform) online. For a particular updated CPG, the analysis was performed using a specific tool for updates, namely, the Checklist for the Reporting of Updated Guidelines (CheckUp) [29].

There were 68 full-text guidelines downloaded from several sites. On examination, 33 CPGs were related to intra-abdominal infection and 18 others were specifically on CPG on intra-abdominal infection and cIAI. Appraisal by the AGREE II tools revealed that of these 18 CPGs, 13 were strongly recommended, three were recommended, and two were not recommended. The next step was the evaluation of the updated CPGs using CheckUp, which found five updated CPGs, all with the same score [30]. Two of the strongly recommended CPGs were updated, having been recently published in 2017.

In the early stages of CPG development, we used these two selected CPGs to answer clinical questions, with consideration of Indonesia-specific characteristics [31]. Each panel member reviewed the draft through electronic communication. Appropriate statements and recommendations were then adapted into our CPG. The recommendations were established by the hierarchy of evidence used by Huguet et al. [32] and Guyatt et al. [33] using Grading of Recommendations Assessment, Development and Evaluation (GRADE), considering the changes of the descriptor (2012 and 2016), appropriateness to Indonesia-specific characteristics, benefit and risk, and cost [34]. For an Indonesian CPG, we used the GRADE format, modified from Guyatt et al. [35].

A statement or recommendation considered to be inappropriate to Indonesian conditions was not adapted, in accordance with Indonesian data. The approval of the recommendation draft was carried out using the Delphi method [36].

The final step was developing a report in accordance with the GRADE format. This report was externally reviewed by the Association of Indonesian Digestive Surgeons (IKABDI) and one expert from the Ethics Committee of the Faculty of Medicine, Universitas Indonesia. Mazuski and Sartelli, the authors of the two CPGs, granted us permission to adapt our CPG from theirs. Our CPG will be published in both Indonesian and English languages.

This clinical practice guideline was developed in accordance with the guidelines supported by evidence to minimize heterogeneity in management of cIAI infection in Indonesia. However, we do not intend for it to be used uniformly, because decisions regarding medical treatment are specific to individual situations and conditions.

Statements and Recommendations

1. Complicated intra-abdominal infection

a. Definition

1) Intra-abdominal infection is an infection of intra-peritoneal organ(s) with a wide spectrum of clinical entities, involving clinical condition, extent of anatomic derangement, involved micro-organisms, risk factors, and management (Recommendation 1C).

b. Classification

2) Intra-abdominal infection is classified based on two perspectives, i.e., clinical and healthcare. Clinically, intra-abdominal infection is classified as uncomplicated or complicated. From a healthcare perspective, intra-abdominal infection is classified as community-acquired intra-abdominal infection (CA-IAI) or hospital-acquired intra-abdominal infection (HA-IAI) (Recommendation 1C).
3) In Indonesia, all cIAI cases in referral centers (tertiary healthcare or type A hospitals) are categorized as high-risk cIAI, whereas those managed in peripheral centers (secondary healthcare, as well as types C and D hospitals) are categorized as low risk (Recommendation UG).

c. Pathophysiology

4) Complicated intra-abdominal infection is a logical consequence of a defect (integrity disorder) in a hollow, intra-abdominal organ that allows commensal micro-organisms from the lumen to contaminate the peritoneum (secondary peritonitis), and/or translocate to the circulation (bacteremia) from which they are systemically distributed through lymphatic drainage (Recommendation 2B).
5) In the development of intra-abdominal infection, host factors (i.e., risk factors and comorbidities) play an important role, in addition to pathogenic virulence (Recommendation 2B).

d. Etiology

6) Primary peritonitis infection is monomicrobial, whereas secondary peritonitis is polymicrobial and typically the result of commensal bacteria. Tertiary peritonitis is caused by bacteria found in secondary peritonitis plus resistant micro-organisms, anaerobes, and fungi/yeast (Recommendation UG).
7) If the etiology of primary peritonitis is tuberculosis, it is included in the category of cIAI, because management should include a surgical approach and antituberculosis agents (Recommendation UG).

8) Classification into HAI and CAI is not the focus of interest in this guideline, because patients in these categories have equal potential of risk of IAI incidence (Recommendation UG).

e. Risk factors

9) The elderly, undernourished, as well as those with comorbidities or compromised immunity are more likely to have cIAI (Recommendation 2B).
10) Patients with delays in presentation, diagnosis, resuscitation, or initiation of empirical antibiotic therapy are at high risk to have treatment failure (Recommendation 1B).

f. Complication

11) Common complications of cIAI are organ dysfunction and delayed closure of abdominal incision (Recommendation 1B).

2. Clinical findings, laboratory tests, imaging, and scoring systems

a. Clinical examination

12) Physical examination plays an important role in directing the surgeon's diagnostic assessment and management plans (Recommendation 1C).
13) The need for simple laboratory and imaging tests depends on clinical findings, age, and resource availability (Recommendation 1C).

Clinical indicator for cIAI

14) Clinical indicators of cIAI are clinically documented sepsis syndrome as well as signs and symptoms of peritonitis (Recommendation 2B).

b. Laboratory tests

15) Intra-peritoneal tissue is considered to be a representative specimen for diagnostic purposes (with a minimum volume of 1–2 g tissue), taken intraoperatively from infected organs, collected by appropriate procedures, and sent to the laboratory for gram staining, microbiologic culture examination, and antimicrobial sensitivity tests, in accordance with standard regulations (Recommendation 1C).
16) Routine culture of micro-organisms and antibiotic sensitivity test are recommended in critically ill patients and high-risk cIAI cases who are at risk of infection with resistant micro-organisms (history of broad-spectrum antibiotic use) (Recommendation 1B).
17) Routine culture of micro-organisms and antibiotic sensitivity tests are not recommended in low-risk cIAI (Recommendation 1B).
18) For epidemiologic purposes in developing a guideline for antibiotic stewardship in a referral hospital, micro-organism cultures and antibiotic sensitivity tests of intra-peritoneal specimens are recommended (Recommendation 2C).
19) Culture of micro-organisms and antibiotic sensitivity test of intra-peritoneal specimens are recommended in each re-laparotomy procedure (Recommendation 1C).
20) Leukocytosis, C-reactive protein (CRP), and procalcitonin (PCT) are markers for inflammatory responses but not for infection (Recommendation 1B).
21) Organ function testing is required to assess degree of severity (Recommendation 2A).

Laboratory indicator for cIAI

22) Micro-organism cultures and antibiotic sensitivity tests of intra-peritoneal specimens may be used as indicators for choosing the appropriate antimicrobial agent (Recommendation 1A).

c. Imaging

23) Imaging is not used routinely to detect intra-abdominal pathology in cIAI. Should cIAI be detected clearly by physical examination, imaging is not indicated. However, imaging is indicated when physical examination findings are in doubt (Recommendation 2A).
24) Plain erect abdominal radiograph may have radiolucent features in the sub-diaphragm, i.e., the summit of the intra-abdominal cavity where free air is distributed after proximal gastrointestinal perforation (Recommendation 2B).
25) Ultrasound is the first method of choice to detect pathologic intra-abdominal fluid collection on cIAI (Recommendation 1A).
26) If no pathologic intra-abdominal fluid collection on cIAI is detected using ultrasound, computed tomography (CT) scan is then indicated (Recommendation 1C).
27) Magnetic resonance imaging (MRI) is indicated to detect pathologic intra-abdominal fluid collection on cIAI with pregnancy (Recommendation 1A).

Imaging indicator for cIAI

28) Plain abdominal radiograph in an erect position showing radiolucent features in right sub-diaphragm; ultrasound and CT scan showing pathologic intra-abdominal fluid collection in affected sites (Recommendation UG).

d. Practical scoring system in cIAI assessment

29) The available scoring systems that may practically be used are peritonitis-specific score (Boey scores), intensive care unit (ICU) score (Acute Physiology and Chronic Health Evaluation [APACHE]), and general organ failure severity scores (Sequential Organ Failure Assessment [SOFA]). These scores may facilitate the clinician in assessment and evaluation of critically ill patients in the ICU (Recommendation UG).

3. Prognosis and prognostic factor

30) Prognosis of cIAI is poor in high-risk patients, as well as those with delayed detection and delayed management longer than 24 hours (Recommendation 1C)
31) Patients are considered to be high risk if they experienced any of the following: hospitalization for at least 48 hours within the past 90-day period, home care by a professional caregiver within the past 30 days, intravenous treatment, wound care, renal replacement therapy within the past 30 days, broad-spectrum antibiotic use within the past 90 days, post-operative infection, known infection with a resistant pathogen, potential infection with resistant and/or opportunistic micro-organisms,

and documented APACHE II score ≥10 (Recommendation 2B).

4. Basic principles in cIAI management

a. Surgical intervention

32) In initial source control planning and administration of empirical antibiotic agents, consider patient characteristics (in relation to high risk of treatment failure) and possible post-operative infection (Recommendation 2C).
33) Source control is the routine surgical procedure of draining infectious fluids and removing infected tissue to prevent further contamination in patients with cIAI. Most cIAI patients require source control, unless there is a contraindication for surgery and there is strong evidence that non-surgical treatment would result in a better outcome (Recommendation 1A)
34) Source control should proceed within 24 hours after cIAI is established, unless there is strong evidence that non-surgical treatment or delay would result in a better outcome (Recommendation 1B).
35) Source control should proceed immediately in patients with sepsis and septic shock (Recommendation 2C).
36) For adequate source control, a less invasive method may be used as temporary treatment in patients with intra-abdominal infection (Recommendation 1B).
37) Consider alternatives or temporary methods for source control in patients with hemodynamic instability (severe physiologic derangement), diffuse infection, and intestinal ischemia who are at risk for initial source control failure (Recommendation 2B).
38) A stepwise laparotomy procedure of source control (damage control surgery) with temporary abdominal closure should be considered in critical cIAI patients, particularly those with predicted intra-abdominal hypertension, severe physiologic derangement, as well as those in who adequate initial source control is not possible or when a second look by laparotomy in mesenteric ischemia is planned (Recommendation 1B).
39) Planned (scheduled) re-laparotomy as a routine procedure should be avoided in high-risk patients and those with severe peritonitis if adequate source control can be accomplished. On-demand re-laparotomy results in a better outcome than planned (scheduled) re-laparotomy (Recommendation 1B).
40) In laparotomy procedures, conspicuous debris and contaminants should be removed, continuing with adequate dilution using crystalloid before abdominal closure (Recommendation 2B).

b. Pre-operative measures

41) Early detection of sepsis and appropriate fluid resuscitation is necessary. Restoration of mean systemic arterial pressure (MAP) at 65–70 mm Hg is the first goal to achieve hemodynamic stability in patients with sepsis (Recommendation 1A).
42) Fluid overload should be avoided in patients with diffuse peritonitis (Recommendation 1C).

5. Antibiotic management

a. Empirical antibiotic use in cIAI

a1. General principles

43) Empirical antibiotic agents should be administered intravenously within an hour after cIAI is established (Recommendation 2C).
44) Empirical antibiotics should be administered in consideration of epidemiologic surveillance, risk factors, disease severity, and source of infection (Recommendation 1C).
45) Considerations in the selection of empirical antibiotics include infection with resistant microorganisms, toxicity, organ function, and cost (Recommendation 2C).
46) Factors to be considered in antibiotic selection for empiric use are: disease severity, local ecology, and host factors. Those treated previously with antibiotic agents are at risk for development of multi-drug–resistant organisms (MDROs). Broad-spectrum antibiotics are recommended in patients with septic shock, MDRO, and previous antibiotic treatment (Recommendation 1B).
47) Efficacy of empirical antibiotic agents should be assessed within 48–72 hours after initiation. If a broad-spectrum antibiotic was used initially, the antibiotic should be adjusted to a narrower spectrum (Recommendation 2B).
48) Administration of antibiotics should be in accordance with the available national formulary in Indonesia (Recommendation 1C).

a2. Empirical antibiotics in cIAI

a2.1. General approach

49) Assess for possible infection with *Enterococcus* spp., methicillin-resistant *Staphylococcus aureus* (MRSA), resistant gram-negatives, and *Candida* spp. (Recommendation 2B).
50) Use broad-spectrum antibiotic agents as initial empirical therapy in high-risk patients. Consider using additional antibiotic agents as empirical therapy in those suspected of infection with *Enterococcus* spp., MRSA, resistant gram-negatives, and *Candida* spp. (Recommendation 2B).

a2.2. Empirical antibiotic choice in cIAI

51) Use aminoglycosides for first-line empirical therapy, but not routinely, so as to avoid overuse of antibiotic agents (Recommendation 1B).

From a pharmacologic perspective with consideration to drug availability in Indonesia, follow the antibiotic therapy guidelines below:

52) Use meropenem in high-risk cIAI (Recommendation 1A).
53) Use ertapenem for empirical therapy in low-risk IAI (Recommendation 1A).
54) Use doripenem for empirical therapy in high-risk cIAI (Recommendation 2C).
55) Use imipenem-cilastatin for empirical therapy in high-risk cIAI (Recommendation 2C).
56) Do not use tigecycline for a common empirical therapy in high-risk cIAI (Recommendation 1B).

57) Consider using tigecycline in cIAI patients infected with resistant pathogens only if the other antibiotic was shown to be inappropriate (Recommendation 2B).

b. Definitive (therapeutic) antibiotics in cIAI

58) Factors to be considered in selecting antibiotics to be used in critically ill patients are: (1) disease severity, (2) local conditions, and (3) host risk factors. The use of a broad-spectrum antibiotic, and/or combination of antibiotic agents is recommended in cIAI with septic shock, MDRO, and previous antibiotic use (Recommendation 1B).
59) Duration of antibiotic use in critically ill patients is determined based on a multidisciplinary team evaluation (Recommendation 1B).
60) Short-term antibiotic treatment of 3–5 days is recommended in low- and moderate-risk IAI with adequate source control (Recommendation 1A).
61) Post-operative antibiotic use is not necessary in uncomplicated IAI (acute appendicitis and cholecystitis) (Recommendation1A).
62) In persistent IAI, the decision to continue, change antibiotic/mode of administration, or stop antibiotic treatment is determined based on clinical findings and laboratory tests (Recommendation 1A).

c. Oral antibiotics

63) Oral antibiotics with high bioavailability may be administered selectively as a substitute for intravenous antibiotic agents in cIAI patients with adequate gastrointestinal function. Short-term treatment to complete antibiotic course should not exceed recommendations (Recommendation 1B).

d. Antibiotics for anaerobic infection

64) Anaerobic infection is a logical consequence of prolonged high-dose antibiotic treatment used to eradicate aerobic micro-organisms (Recommendation 1B).
65) Metronidazole is the first-choice antibiotic to treat anaerobic micro-organism infection (Recommendation 2C).
66) Metronidazole is an anti-anaerobic option that is used in combination with other antibiotic agents for empirical therapy (Recommendation 1B).
67) Do not use clindamycin as an anti-anaerobic in combination with other antibiotic agents for empirical treatment, unless metronidazole use is not available/contraindicated (Recommendation 2B).

6. Fungal cIAI

68) For intra-abdominal specimen cultures, a specific culture for fungi (yeast), especially *Candida* spp., should always be requested (Recommendation 2A).
69) Objectively found *Candida* spp. in intra-peritoneal specimens indicate a poor prognosis (Recommendation 1C).
70) Specimens taken from a drainage tube have no diagnostic value, other than evidence of colonization (Recommendation 2C).
71) Systemic antifungal agents should be considered if an adequate intraperitoneal specimen (intra-operative or via 24-hour external drainage) indicates *Candida*, regardless of the concentration or bacterial growth (Recommendation 2A).
72) Routine antifungal use for empirical therapy in cIAI is not recommended, except in those with documented risk factors, i.e., infection in previous surgeries, anastomosis leaks, necrotizing pancreatitis, and antibiotic failure (Recommendation 2C).
73) Antifungal agents should not be administered based on positive culture of a specimen taken from a drain that has been in place for more than 24 hours (Recommendation UG).
74) Routine antifungal use for empirical therapy in high risk IAI is not recommended (Recommendation 1B).
75) Consider using antifungals for empirical therapy in critically ill, infected patients with upper gastrointestinal tract source of infection (Recommendation 2B).

6.1. Fungal cIAI: Antifungal agents, indication and timing

76) Routine use of amphotericin B or its lipid formula as empirical therapy or therapy for candidiasis cIAI is not recommended (Recommendation 2B).
77) Consider using fluconazole preemptively and for management of infection with *Candida albicans* strains in non-critical IAI patients (Recommendation 2B).
78) Consider using voriconazole as empirical therapy or for management of insensitive strains of *Candida* (Recommendation 2B).
79) Consider using echinocandin (anidulafungin or micafungin) for empirical therapy or management of infection with *Candida* spp. in critical cIAI patients (Recommendation 1B).

7. Treatment evaluation

a. Risk factors of treatment failure

80) In evaluating cIAI management with a focus on treatment failure, factors to be considered include sepsis or septic shock, extreme ages, comorbidities, degree of cIAI severity, adequacy of initial source control, as well as resistant and/or opportunistic micro-organisms (Recommendation 1B).
81) Patients with inadequate source control and critical cIAI with organ dysfunction have a poor prognosis (Recommendation 1B).
82) Patients with two risk factors, diffuse peritonitis, delayed initial antibiotic therapy, and inadequate initial source control are at high risk of treatment failure (Recommendation 2B).
83) Patients are considered to be at high risk of treatment failure if they experience any of the following: hospitalization for at least 48 hours within the past 90-day period; home care by a professional caregiver within the past 30 days; intravenous treatment, wound care, renal replacement therapy within the past 30 days; broad spectrum antibiotic within the past 90 days; post-operative infection; known infection with a resistant pathogen; and potential infection with resistant and/or opportunistic micro-organisms (Recommendation 2B).

84) Patients with a documented APACHE II score ≥10 are at risk for treatment failure (Recommendation 1B).

Author Disclosure Statement

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