Arab Republic of Egypt

Egyptian Pediatric Clinical Practice Guidelines Committee (EPG)
Pulmonology Group

Evidence-Based Clinical Practice Guideline for Diagnosis, Treatment & Prevention of Community Acquired Pneumonia in Pediatrics

Adapted with permission from
British Thoracic Society (BTS) Guideline, 2011,
Infectious Diseases Society of America (IDSA) Guideline,
2011 and WHO Guideline 2012-2014

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Disclaimer

Clinical Practice Guidelines (CPGs) are "systematically developed statements to assist health care professionals and patients in medical decision-making for specific clinical conditions" or they are "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options". It is in no way a substitute for a medical professional's independent judgment. Most of the content herein is based on literature reviews. In areas of uncertainty, professional judgment was applied.

This CPG is a working document that reflects the state of the art in the field and is based upon the accessible best-updated published evidence. Because rapid changes in this area are expected, periodic revisions are inevitable. We encourage medical professionals to use this information in conjunction with, and not as a replacement for, their best clinical judgment. The presented recommendations may not be appropriate in all situations. Any decision by practitioners to apply these guidelines must be made considering local resources and individual patient circumstances.

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Abbreviations

Adolopment	Adoption-Adaptation-Development
AFC	Armed Forces College of Medicine
AGREE II	Appraisal of Guidelines for Research and Evaluation Instrument
BTS	British Thoracic Society
CA-MRSA	Community- Associated Methicillin Resistant Staphylococcus Aureus
CAP	Community-Acquired Pneumonia
CAPGAG	Community Acquired Pneumonia Guideline Adaptation Group
COVID-19	COronaVIrus Disease of 2019
CPG	Clinical Practice Guideline
DHS	Demographic and Health Survey
ED	Emergency Department
EPG	Egyptian Pediatrics Clinical Practice Guidelines Committee
EPG CPG	EPG Clinical Practice Guideline
ERG	External Review Group
GAG	Guideline Adaptation Group
GDG	Guideline Development Group
GPS	Good Practice Statement
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HA	Hospital-Acquired Pneumonia
ICU	Intensive Care Unit
IDSA	Infectious Disease Society of America
PICO	population, intervention, comparison, and outcomes
PIPOH	Patient population, intervention, professionals, outcomes, and healthcare context
RIGHT	A Reporting Tool for Practice Guidelines in Health Care
WHO	World Health Organization

Glossary

Acceptability: Is the extent to which the users are likely to adopt a recommendation It is based on internal qualities such as clarity, comprehensiveness, and logical reasoning and on external factors such as the burden imposed on the process and system of care, patient and providers attitudes and beliefs and patients' needs expectations and preferences.

Adaptation (of guidelines): It is the systematic approach to considering the use and/or modification of guidelines produced in one cultural and organizational setting for application in different context. Adaptation can be used as an alternative to de novo guidelines development or for customizing existing guidelines to suit the local context.

Admission
Admission, for the purpose of this guideline, refers to a child being registered and entering inpatient care as a patient. This is distinguished from the term "enrolment", which is used for outpatient care.

Adoption (of guidelines): It is the acceptance of guidelines after the assessment of the quality, currency, and content. When health care providers (or other users of recommendations) use the adopted guidelines, they feel committed to change their practices in accordance with the recommendations of the guidelines.

Applicability: It is the extent to which the users can put a recommendation into practice, based on internal qualities such as a clearly defined eligible patient population that matches the population to which the intervention is targeted in the local setting and external factors such as the availability of the necessary knowledge, skills, provider time, staff, equipment, and other resources.

Applicability is sometimes taken as a synonym for feasibility:

- Feasibility of the acquisition of necessary skills and knowledge.
- Feasibility of the necessary increase in provider time, staff, equipment, and so on.

Culture: Culture represents the norms and values of a specific group, community or population.

Diffusion: It is a passive means of transferring knowledge; it is not directed towards a target audience (e.g. publication of articles in medical journals).

Dissemination : It is more active than diffusion in that it targets specific audients and involves tailoring the information for these audients (e.g. dissemination strategies including targeted mailings, presentations and press conferences.

Evidence-based principles: Evidence-Based Medicine (EBM) has been defined as the conscientious, explicit and judicious use of the current best evidence in making decisions about the care of individual patients. The practice of EBM means integrating individual clinical expertise with the best available external clinical evidence from systematic research.

Evidence tables: They are summaries of the most salient information from studies identified in the systematic review. The elements of evidence tables are dependent on the types of information in studies related to a particular topic but might include information such as the article reference, the study type (e.g. RCT or Cohort), the number of patients and their characteristics and the intervention, comparison arms, outcome measures and effect sizes.

Guidelines or Clinical Practice Guidelines (CPG): Systematically developed statements about specific health problems, intended to assist practitioners and patients in making decisions about appropriate health care.

Guidelines consistency: Agreement between the evidence and the recommendations, based on:

- Comprehensiveness of the study search and selection process.
- Coherence between the results of the studies and their interpretation by the guidelines authors.
- Transparency between interpretation and recommendations.

Guidelines content: In the ADAPTE Manual and Resource Toolkit for Guidelines Adaptation document, guidelines content refers to the recommendations in the source guidelines.

Guidelines currency: A CPG may be considered up to date when no new information on interventions, outcomes and performance justifies updating it.

Guidelines quality: By quality of clinical practice guidelines, we mean the confidence that the potential biases of guidelines development addressed adequately and that the recommendations are both internally and externally valid and are feasible for practice. This process involves considering the benefits, harms and costs of the recommendations as well as the practical issues attached to them. Therefore, the assessment of quality includes judgments about the methods used for developing the guidelines, the content of the final recommendations, and the factors linked to their uptake.

Guidelines topic: In the ADAPTE Manual and Resource Toolkit for Guidelines Adaptation document, the topic refers to the theme of the guidelines, as described in the guidelines title, for a targeted population (disease and patients) and intervention. The purpose, the audience, and the setting intended for the guidelines, although not necessarily explicitly stated in the title, are also part of the topic. A guideline on a given topic may contain more than one health question.

Health question or clinical question or key question

It is a precisely described health issue (e.g. clinical, professional practice or public health) relating to the topic of the guidelines? Guidelines may include one or more questions.

Implementation: Implementation includes methods to promote the uptake of research findings into routine healthcare in both clinical and policy contexts and hence to improve the quality and effectiveness of healthcare. It includes the study of influences on healthcare professional and organizational behaviour.

Intra-class correlations: Intra-class correlations provide a measurement of the extent to which two or more raters agree when rating the same set of things. It is a reliability index and

is typically a ratio of the variance of interest over the sum of the variance of interest plus error.

Recommendation: Recommendation is any statements that promote or advocate a particular course of action in clinical care.

Stakeholder: A stakeholder is an individual, group and/or organization with a stake in your decision to implement a guideline. Stakeholders include individuals or groups who will be directly or indirectly affected by the implementation of a guidelines.

Source guidelines: In the ADAPTE Manual and Resource Toolkit for Guidelines Adaptation document, source guidelines refer to those guidelines selected to undergo assessment of quality, currency, content, consistency, and acceptability/applicability and upon which an adapted guidelines may be based.

Executive Summary

Introduction

A new clinical guideline for Community-Acquired Pneumonia (CAP) in children has been adapted to fit the Egyptian healthcare system. This process of customizing existing evidence-based clinical practice guidelines for local contexts offers a practical alternative to creating new ones from scratch, potentially enhancing their usefulness while conserving resources. This guideline aims to detail the diagnosis, treatment, and prevention of CAP in children in Egypt, as well as the adaptation methods employed to create Egypt's first National Guideline for CAP in children using the Adapted ADAPTE method. The entire adaptation process, encompassing the setup, adaptation, and finalization phases, is thoroughly described. This involved a guideline adaptation group (GAG) and an external review group by experts in clinical content [1].

The GAG modified ten main categories of recommendations from three original Clinical Practice Guidelines (CPGs). These recommendations cover a range of aspects, including common symptoms, criteria for hospital and intensive care unit admission, lab tests and imaging for diagnosis, selection and duration of empiric antibiotic treatment for outpatients and hospitalized children with uncomplicated CAP, the use of influenza antiviral therapy, monitoring the response to treatment, managing cases that don't respond to initial treatment, criteria for safe patient discharge, and CAP prevention. Several tools were developed to enhance the implementation of these guidelines, including two clinical algorithms for managing uncomplicated and non-responsive CAP in children, a pathway for assessing CAP severity in primary care, medication tables, simplified Arabic patient information, a PowerPoint presentation for CAP management, and online resources [1].

The finalized adapted CPG provides pediatricians and healthcare workers in Egypt with practical, evidence-based instructions for managing community-acquired pneumonia in children. This initiative underscores the effectiveness of the Adapted ADAPTE method and emphasizes the significance of collaboration between clinical and methodological experts in adapting national guidelines [1].

Scope

This guideline focuses on prevention and management of community acquired pneumonia.

Guideline development process and methods

After reviewing all the inclusion and exclusion criteria and quality appraisal results, the GDG/ GAG recommended using the following source original clinical practice guidelines (CPGs):

1- British Thoracic Society (BTS) Guideline, 2011,
2- Infectious Diseases Society of America (IDSA) Guideline, 2011.
3- WHO Guideline 2012-2014.

We conducted Adolopment for these guidelines: (Adoption, Adaptation, and Development)

- Adoption for most of the guideline recommendations.
- Development of Good Practice Statements

Recommendations and Good Practice Statements (GPS)

This version of the CPG includes recommendations and good practice statements on the Diagnosis, Management & Prevention of Community acquired pneumonia in Children
The guideline covers children up to 14 years of age

We can summarize the guidelines' recommendations for community acquired pneumonia in the following:

Diagnosis

Clinical manifestations

- Children with CAP may present with fever, tachypnea, difficult breathing, cough, and wheeze, and/or chest pain. *(Very low- quality evidence, Conditional recommendation)*

Indications for hospitalization

- Moderate to severe CAP. *(High- quality evidence, Strong recommendation).*
- Infants 3–6 months of age with suspected bacterial CAP. *(Low-quality evidence, Strong recommendation).*
- If there is concern about careful observation at home or who are unable to comply with therapy or unable to be followed up. *(Low-quality evidence, Strong recommendation).*
- Documentation of CAP caused by a pathogen with increased virulence. *(Low-quality evidence, Strong recommendation).*

Indications for PICU admission

- Pulse oximetry measurement ≤92% with inspired oxygen of ≥0.50. *(Low-quality evidence, Strong recommendation).*
- Sustained tachycardia, inadequate blood pressure or need for pharmacologic support of blood pressure or perfusion. *(Moderate quality evidence, Strong recommendation)*

- Altered mental status, whether due to hypercarbia or due to hypoxemia as a result of pneumonia. *(Low-quality evidence, Strong recommendation).*
- Impending respiratory failure or need for assisted ventilation. *(Moderate quality evidence, Strong recommendation)*

Investigations

Laboratory

- Sputum culture and Gram stain (in hospitalized children who can produce sputum). *(Very low- quality evidence, Conditional recommendation).*
- Nasopharyngeal culture. *(High- quality evidence, Strong recommendation).*
- Blood culture. *(High- quality evidence, Strong recommendation).*
- Biochemical and immunological methods: *(High- quality evidence, Strong recommendation).*
    - Urine: Rapid detection of the capsular polysaccharide (CPS) antigen of S. pneumoniae.
    - PCR.

Plain chest X-ray

- Routine chest radiographs are not necessary for the confirmation of CAP diagnosis in the outpatient setting. *(High- quality evidence, Strong recommendation).*
- Chest radiographs (postero-anterior and lateral) should be obtained in all hospitalized patients with hypoxemia or significant respiratory distress to document the presence, size and character of parenchymal infiltrates and identify complications of pneumonia. *(Moderate-quality evidence, Strong recommendation).*
- Repeated chest radiographs are not routinely required in children who recover from CAP.
- Repeated chest radiographs should be obtained for children who fail to demonstrate clinical improvement and those who have clinical deterioration within 48-72 hours after initiation of therapy.
- Repeated chest radiographs 4–6 weeks after the diagnosis of CAP should be obtained in patients with recurrent pneumonia involving the same lobe and in patients with lobar collapse at initial chest radiography with suspicion of an anatomic anomaly, chest mass, or foreign body aspiration.

- There is no clinical or radiological way of reliability that can distinguish between the etiologicalagents. *(High-quality evidence, Strong recommendation).*

Treatment

Empiric antimicrobial agents in children with CAP in outpatient settings

- Antibiotics are not routinely recommended for children younger than 5 years with non- severe pneumonia (i.e. fast breathing with no chest indrawing or danger sign) with a wheeze but with no fever (temperature <38 c) as the cause is most likely to be viral. *(Low- quality evidence, Strong recommendation).*
- Amoxicillin (or amoxicillin clavulanic acid) should be used as first-line therapy in infants, children, and adolescents previously healthy and appropriately immunized with mild to moderate CAP, suspected to be of bacterial origin. *(Moderate- quality evidence, Strong recommendation).*
- Alternatives: cefaclor, erythromycin, azithromycin, and clarithromycin. *(Moderate- quality evidence, Strong recommendation).*
- Macrolide antibiotics should be prescribed for treatment of children (primarily school-aged children and adolescents) with findings compatible with CAP caused by atypical pathogens. *(Moderate- quality evidence, Strong recommendation).*

Influenza antiviral agents in infants and children with CAP in outpatient settings

(Moderate- quality evidence, Strong recommendation).

- Influenza antiviral therapy should be administered as soon as possible to children with moderate to severe CAP consistent with influenza virus infection, during widespread local circulation of influenza viruses, particularly for those with clinically worsening disease documented at the time of an outpatient visit.
- Because early antiviral treatment has been shown to provide maximal benefit, treatment should not be delayed for confirmation of positive influenza test results.
- Negative influenza diagnostic tests, especially rapid antigen tests, do not conclusively exclude influenza disease.
- Treatment after 48 hours of symptomatic infection may still provide clinical benefit to those with more severe disease.

Empiric antimicrobial therapy in children hospitalized with non-complicated CAP

- Ampicillin (or Ampicillin-Sulbactam) should be administered to the fully immunized patients. *(Moderate- quality evidence, Strong recommendation).*

- Third-generation parenteral cephalosporin's for Infants and children who are not fully immunized or those with life threatening infections. *(Moderate- quality evidence, Conditional recommendation).*
- A combination of a macrolide (oral or parenteral), and a β-lactam antibiotic, for whom M. pneumoniae and C. pneumoniae are significant considerations. Levofloxacin for children who reached growth maturity or who cannot tolerate macrolides. *(Moderate- quality evidence, Conditional recommendation).*
- Vancomycin or clindamycin should be provided in addition to β-lactam therapy if clinical, laboratory, or imaging characteristics are consistent with infection caused by CA-MRSA Alternative: levofloxacin; addition of vancomycin or clindamycin for suspected CA-MRSA. *(Low-quality evidence, Strong recommendation).*
- Antiviral therapy (Oseltamivir, Ribavirin). Influenza antiviral therapy should be administered as soon as possible to children with moderate to severe CAP consistent with influenza virus infection. *(High-quality evidence, Strong recommendation).*
- Treatment courses of 10 days in moderate and severe cases. Infections caused by certain pathogens, notably CA-MRSA, may require longer treatment than those caused by Strep. Pneumonia. *(Moderate-quality evidence, Strong recommendation).*

Para-pneumonic Effusion in children presenting with CAP

- Chest radiography should be used to confirm the presence of pleural fluid. If the chest radiograph is not conclusive, then further imaging with chest ultrasound or computed tomography (CT) is recommended. *(Moderate-quality evidence, Strong recommendation).*
    - The size of the effusion is an important factor that determines the management.
- The child's degree of respiratory compromise is an important factor that determines management of Para pneumonic effusions. *(Moderate-quality evidence, Strong recommendation)*
- laboratory testing for pleural fluid includes Gram stain and bacterial culture of pleural fluid, and analysis of the pleural fluid for white blood cell count with cell differential analysis is recommended primarily to help differentiate bacterial from mycobacterial etiologies and from malignancy. *(High-quality evidence, Strong recommendation).*

- When the blood or pleural fluid bacterial culture identifies a pathogenic isolate; antibiotic susceptibility should be used to determine the antibiotic regimen. *(High-quality evidence, Strong recommendation).*
- In case of negative culture of para pneumonic effusions, antibiotic selection should be based on the treatment recommendations for patients hospitalized with CAP. *(Moderate-quality evidence, Strong recommendation).*
- The duration of antibiotic treatment depends on the adequacy of drainage and on the clinical response of each patient. In most children, antibiotic treatment for 2–4 weeks is adequate. *(Low-quality evidence, Strong recommendation).*

Safe discharge of hospitalized children with CAP

- When they have documented overall clinical improvement, including level of activity, appetite, and decreased fever for at least 12–24 hours. *(Very low- quality evidence, Strong recommendation).*
- When they demonstrate consistent pulse oximetry measurements> 90% in room air for at least 12–24 hours. *(Moderate- quality evidence, Strong recommendation).*
- If they demonstrate stable and/or baseline mental status. *(Very low- quality evidence, Strong recommendation).*
- If they have documentation that they can tolerate their home anti- infective regimen, whether oral or intravenous, and home oxygen regimen, if applicable before hospital discharge. *(Low- quality evidence, Strong recommendation).*

Prevention

Role of vaccination in prevention of CAP *(High-quality evidence, Strong recommendation).*

- Children should be immunized with vaccines for bacterial pathogens, including Strep. Pneumonia, Haemophilus influenza type b, and Pertussis.
- All infants ≥6 months of age and all children and adolescents should be immunized annually with vaccines for Influenza virus to prevent CAP.
- High-risk infants should be provided immune prophylaxis against respiratory syncytial virus (RSV) – specific monoclonal antibodies to decrease the risk of severe pneumonia and hospitalization caused by RSV.

Role of zinc in preventing CAP in children

- In addition to antibiotics, oral zinc (10 mg/day for < 12 mo., 20 mg/day for ≥ 12 months given for 7 days) may reduce mortality among children in developing countries with clinically defined severe pneumonia. (GPS)

Guideline Registration

PREPARE (Practice guideline REgistration for transPAREncy), WHO Collaborating Center for Guideline Implementation and Knowledge Translation, EBM Center, University of Lanzhou, Lanzhou, China. **Registration Number:** ((submitted and in process)). Link: http://www.guidelines-registry.org/

Introduction

Community-acquired pneumonia (CAP) is a common pediatric infection [2]. It is defined as an acute infection of pulmonary parenchyma in a child caused by a pathogen acquired outside the hospital, that is, in the community [3]. The World Health Organization (WHO) estimates that approximately 2 million children under the age of 5 years die of pneumonia each year worldwide; the majority of these deaths occur in developing countries [4,5]. The mortality rate in developed countries is less than 1 per 1000 per year [6,7]. Africa experienced the highest disease burden with an estimated 0.27 pneumonia episodes per child-year [8]. In Egypt, it was estimated that 10% of childhood deaths below the age of 5 years is likely caused by pneumonia and other acute respiratory infections [9].

Nevertheless, community-acquired pneumonia is associated with enormous costs either directly through medical expenses or indirectly through loss of working hours by parents of sick children [10].

Although the specific etiologic agent is not identified in many cases of CAP in children, respiratory viruses such as RSV and Parainfluenza are detected in more than half of the cases [11]. Recently in 2019, COVID- 19 was discovered causing pandemic worldwide [12].

Pyogenic bacteria are detected in a relatively small proportion of CAP in children, but their early identification is critical, as they can cause severe.

and/or complicated pneumonia and even mortality [7]. Streptococcus pneumoniae is the most common bacterial cause of CAP. Mycoplasma pneumonia, Chlamydia pneumonia and Strep. pneumoniae are the predominant etiologies of CAP in school-aged children. Haemophilus influenza and group A Streptococci are fewer common causes [13].

The diagnosis is usually based on the clinical findings of fever, cough, respiratory distress (e.g. tachypnea, nasal flaring, intercostal, subcostal, and suprasternal retractions, and grunting), and/or radiologic evidence of an acute pulmonary infiltrate/consolidation [14, 15].

However, a reliable single test for identifying the specific pathogen (or pathogens) causing pneumonia does not exist, although an accurate and rapid etiologic diagnosis will result in improved care with focused antimicrobial therapy, fewer unnecessary tests and procedures and potentially shorter hospital stays in children with CAP [16].

The British Thoracic Society guidelines recommend that children with a clear clinical diagnosis of pneumonia should be treated with antibiotics, given that bacterial and viral pneumonia cannot be reliably distinguished from each other on clinical grounds [3].

Since the bulk of the global pneumonia disease burden occurs in countries with limited resources and weak health-care systems, a primary- care focused clinical case management approach was developed [17, 20]. The WHO acute respiratory infection case management strategy aimed to reduce child mortality by providing antibiotics to pneumonia cases and reducing inappropriate antibiotic use in children with upper respiratory tract infections [18].

Purpose:

The intention of this CPG is to enhance appropriate utilization of community resources, decrease hospitalization and avoiding PICU admission, optimize medical management of patients with community acquired pneumonia (CAP), and provide optimal pharmacotherapy to prevent or minimize adverse effects of therapy.

This section describes what is intended with the guideline or what it is intended to achieve. For example, assisting or guiding Member States on determining a course of action, based on evidence, and leading to improvements in health indicators (e.g., mortality and disease prevalence), quality of life, or cost savings.

Scope and target audience:

This CPG is intended to assist the practitioners, namely, pediatricians, primary health care (PHC) physicians, family practitioners, nurses, and clinical pharmacists to apply the best available evidence based researches to clinical decisions about the management of CAP in previously apparently healthy children older than 28 days up to 12 years.

This CPG is not intended to serve as a standard of medical care. Standards of care should be based on all the clinical data available for an individual case and are subjected to changes as scientific knowledge and technology advance in patterns of care evolve. The CPG recommendations will neither ensure a successful outcome in every case nor include all the proper methods of care. Also, they do not exclude other acceptable methods of care aimed at the same results.

The ultimate judgment must be made by the appropriate physician who is responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgment should only be made following discussion of the options with the patient, in light of the diagnostic and treatment choices available. However, it is advised that significant departures from the national CPGs or any local CPGs derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.

- The target audience or intended end-users of this CPG include physicians (pediatrics, pediatric pulmonology, infectious diseases, primary health care, family medicine), nurses, and clinical pharmacists who care for children with CAP in Egypt.

Methods

Methods of search:
A comprehensive search for guidelines was undertaken to identify the most relevant guidelines to consider for adaptation. Keywords used for search are: Adolescent, Anti-Bacterial Agents / therapeutic use, Child, Child, Preschool, Community-Acquired Infections / diagnosis, Community-Acquired Infections / drug therapy, Community-Acquired Infections / microbiology, Community-Acquired Infections / prevention & control, Humans, Infant, Infant, Newborn, Pneumococcal Vaccines, Pneumonia / diagnosis, Pneumonia / drug therapy, Pneumonia / microbiology, Pneumonia / prevention & control, Practice Guidelines as Topic, and Vaccines, Conjugate, Child, Child, Preschool, Community-Acquired Infections / drug therapy, Humans, Pneumonia / therapy, Editorial Policies, Evidence-Based Medicine, Practice Guidelines as Topic / standards, and Reproducibility of Results.

Inclusion / exclusion criteria followed in the search and retrieval of guidelines to be adapted:
• Selecting only evidence-based guidelines (guideline must include a report on methodology of development including the systematic literature searches and explicit links between individual recommendations and their supporting evidence)
• Selecting national and/or international guidelines
• Specific range of dates for publication (using Guidelines published or updated 2013 and later or the last 5 years)
• Selecting peer-reviewed publications only
• Selecting guidelines written in English language

• Excluding guidelines written by a single author
The following three categories of databases and websites were searched:

1. *CPG databases and libraries (e.g., GIN, ECRI, SIGN, DynaMed, BIGG-REC PAHO)*
2. *Bibliographic databases (e.g., PubMed, Google Scholar)*
3. *Specialized professional societies (related to the pediatric subspecialty)*

All retrieved Guidelines were screened and appraised using AGREE II instrument (www.agreetrust.org) by at least two members. The panel decided a cut-off point or rank the guidelines (any guideline scoring above 60% on the rigor dimension was retained)
After reviewing all the previous criteria the GDG/ GAG recommended using 3 guidelines:

1- British Thoracic Society (BTS) Guideline, 2011,
2- Infectious Diseases Society of America (IDSA) Guideline, 2011,
3- WHO Guideline 2012-2014.

We did Adolopment for these guidelines: (Adoption, Adaptation, and Development)

- Adoption for most of the guideline recommendations.
- Development of Good Practice Statement

Contributors to the guideline development process:
Guideline Development Group (GDG)/ Guideline Adaptation Group (GAG):
The GDG/ GAG included two subgroups; the clinicians/ healthcare providers subgroup and the guideline methodologists' subgroup.
Clinicians Subgroups
The clinicians' subgroup or clinical panel for this guideline included experts with a range of knowledge, technical skills and diverse perspectives in the field of pulmonology.
The main functions of the clinical panel were adolopment of community acquired pneumonia Guidelines, determining the scope of the guideline and guideline, reviewing the evidence, and formulating evidence-informed recommendations in case of changing strength of recommendations.
Guideline Methodologists Subgroup
There were 7 guideline methodologists with expertise in guidelines development, adaptation, GRADE and translation of evidence into recommendations. Methodologists provided orientation and overview of evidence-informed guideline development processes using the GRADE approach, guideline adaptation using the Adapted ADAPTE, provided AGREE II assessment of the source guidelines in collaboration with the clinicians subgroup, generation of the EtD frameworks whenever applicable.
External Review Group:
The External Review Group for this guideline comprises 4 clinical national experts who have interest and expertise in as well as eminent international reviewers…….
They were identified by Egyptian Pediatric Clinical Practice Guidelines Committee (EPG) as people who can provide valuable insights during the guideline development process.
The External Review Group was asked to comment on (peer review) the final guideline to identify any criticism on the content and to comment on clarity and applicability as well as issues relating to implementation, dissemination, ethics, regulations, or monitoring, but not to change the recommendations formulated by the GDG/ GAG. The members of the External Review Group were required to submit declarations of interest before the peer review process.
Guideline Development/ Adaptation Group meetings:
GDG/ GAG meetings were organized virtually (weekly/bimonthly). Due to the extensive scope of

the guideline, EPG was responsible for overseeing the adolopment process. the timetable and objectives of each meeting. GDG/ GAG meetings were also attended by members of the methodologists. Working rules for each contributor type were outlined by the chair at the start of each meeting, covering aspects such as vocal rights, voting, and evidence to decision and recommendation formulating processes.

Declarations of interests:

Prospective members of the GDG/ GAG were asked to fill in and sign the standard WHO declaration of interest and confidentiality undertaking forms. All guideline members and methodologists were also asked to fill in and sign the standard WHO declaration-of-interests. Members of the external review group will be asked to fill in and sign the standard WHO declaration-of-interests form before the peer review process.

Evidence for the guideline:

We used the GRADE system (Grading of Recommendations, Assessment, Development and Evaluation) for assigning the quality of evidence and strength of recommendations that includes the following definitions [13]. Informed by the evidence required for the GRADE Evidence to Decision (EtD) framework(s) was(were) done while considering changing strength of recommendations according to availability of some resources in the recommendations (both ETD and changing strength of recommendation were not done in this guideline).

Description of the interpretation of the GRADE four levels of certainty of evidence:

Table 1. Classification of the Quality of Evidence

High	We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate	We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low	Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
Very Low	We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect.

GRADE EtD's contextual factors, criteria and considerations that link to the strength of recommendations:

Criteria and Considerations:

1. Benefits and harms: When a new recommendation is developed, desirable effects (benefits) need to be weighed against undesirable effects (risks/harms), considering any previous recommendation or another alternative. The larger the gap or gradient in favor of the desirable effects over the undesirable effects, the more likely that a strong recommendation will be made.

2. Certainty of the evidence about the effects: The higher the certainty of the scientific evidence base, the more likely that a strong will be made.

3. Values and preferences: If there is no important uncertainty or variability in how much people value the main outcomes, it is likely that a strong recommendation will be made. Uncertainty or variability around these values that could likely lead to different decisions, is more likely to lead to a conditional recommendation.

4. Economic implications: Lower costs (monetary, infrastructure, equipment or human resources) or greater cost-effectiveness are more likely to support a strong recommendation.

5. Equity and human rights: If an intervention will reduce inequities, improve equity or contribute to the realization of human rights, the greater the likelihood of a strong recommendation.

6. Feasibility: The greater the feasibility of an intervention to all stakeholders, the greater the likelihood of a strong recommendation.

7. Acceptability: If a recommendation is widely supported by health workers and program managers and there is widespread acceptance for implementation within the health service, the likelihood of a strong recommendation is greater.

Table 2. Classification of the Strengths of Recommendations

Strong	The desirable effects of an intervention clearly outweigh the undesirable effects (or vice versa), so most patients should receive the recommended course of action.
Conditional	There is uncertainty about the trade-offs. The clinician and patient need to discuss the patient's values and preferences, and the decision should be individualized.

Developing good practice statements:

The GDG/ GAG also developed good practice statements for this guideline, which are actionable messages relevant to the guideline questions. The justification for each good practice statement was carefully considered by the GDG/ GAG with an emphasis that they are clearly needed. Good practice statements were developed, guided by the following GRADE criteria:

1- Message is really necessary with regard to actual healthcare practice
2- Have large net positive consequence (relevant outcomes and downstream consequences) (GRADE EtD domains)
3- Collecting and summarizing the evidence is a poor use of time and resources
4- Include awell-documented, clear rationale connecting indirect evidence
5- Are clear and actionable statements.

The GDG/ GAG collectively drafted and finalized good practice statements with relevant justifications and remarks to help with their interpretation, with close support and input from the consultant and guideline methodologists.

We have used the Reporting Items for Practice Guidelines in Healthcare (RIGHT) extension for adapted guidelines (RIGHT-Ad@pt Tool) as a reporting checklist for this guideline adaptation process as recommended by the EQUATOR network.

Recommendations

N	Health questions	Source Guideline	Recommendations *(Quality of evidence, Strength of Recommendation)*
Diagnosis			
Q1	In infants and children with CAP, what are the common clinical manifestations?	BTS 2011	Children with CAP may present with fever, tachypnea, difficult breathing, cough, and wheeze, and/or chest pain *(Very low- quality evidence, Conditional recommendation)*
Q2	In infants and children with CAP, what are the indications for hospitalization?	IDSA 2011	1. Moderate to severe CAP *(High- quality evidence, Strong recommendation).*
			2. Infants 3–6 months of age withsuspected bacterial CAP *(Low-quality evidence, Strong recommendation).*
			3. If there is concern about carefulobservation at home or who are unable to comply with therapy or unable to be followed up *(Low-quality evidence, Strong recommendation).*
			4. Documentation of CAP causedby a pathogen with increased virulence (Low-quality evidence, Strong recommendation).
Q3	In infants and children with CAP, what are the indications for PICU admission?	IDSA 2011	1. Pulse oximetry measurement ≤92% with inspired oxygen of ≥0.50 *(Low-quality evidence, Strong recommendation).*
			2. Sustained tachycardia, inadequate blood pressure or need for pharmacologic support of blood pressure or perfusion *(Moderate quality evidence*
			4. Altered mental status, whether due to hypercarbia or due to hypoxemia as a result of pneumonia *(Low-quality evidence, Strong recommendation)*
			6. Impending respiratory failure or need for assisted ventilation *(Moderate-quality evidence, Strong recommendation)*

Q4	In infants and children with CAP, what are the indications for micro-biological investigations?	BTS 2011	Microbiological investigations should not be considered routinelyin those with milder disease or those treated in outpatient settings. Microbiological diagnosis shouldbe attempted in children with severe pneumonia requiring pediatric intensive care admission, or those with complications of CAP *(Very low- quality evidence, Conditional recommendation).*
Q5	In infants and children presenting with CAP, which investigations are helpful in identifying a bacterial cause?	IDSA 2011	1. Sputum culture and Gram staining for hospitalized children who can produce sputum *(Low-quality evidence, Conditional recommendation).*
		BTS 2011	2. Nasopharyngeal culture 3. Blood culture. 4. Biochemical and immunological methods: a. Urine: Rapid detection of thecapsular polysaccharide (CPS) antigen of S pneumoniae. b. PCR. *(High- quality evidence, Strong recommendation).*
Q6	In infants and children presenting with CAP, **6a.** What are the indications for blood culture?	IDSA 2011	1. Blood cultures should not be routinely performed in nontoxic, fully immunized (including Streptococcal & H. influenza) children with CAP managed in the outpatient setting *(Moderate-quality evidence, Strong recommendation).*
			2. Blood cultures should be obtained in children requiring hospitalization for presumed bacterial CAP that is moderate to severe, particularly those with complicated pneumonia *(Low quality evidence, Strong recommendation).*

			3. Blood culture should be obtained in children who fail to demonstrate clinical improvement and in those who have progressive symptoms or clinical deterioration after initiation of antibiotic therapy *(Moderate-quality evidence, Strong recommendation).*
			4. Repeated blood cultures should be obtained in children with bacteremia caused by S. aureus, to document resolution of bacteremia regardless of the clinical status *(Low-quality evidence, Strong recommendation).*
	6b. Are testing for viral pathogens recommendedfor diagnosis?	IDSA 2011	Sensitive and specific tests for therapid diagnosis of respiratory viruses should be used in the evaluation of children with CAP. A positive influenza test may decrease the need for additional diagnostic studies and antibiotic use, while guiding appropriate use of antiviral agents in both outpatient and inpatient settings *(High-quality evidence, Strong recommendation).*
	6c. which investigations are helpful for identifying atypical bacteria?	IDSA 2011	Children with signs and symptoms suspicious for Mycoplasma pneumonia should betested to help guide antibiotic selection *(Moderate-quality evidence, Conditional recommendation).*
		BTS 2011	1. Diagnostic testing for Chlamydia pneumoniae is not recommended as a reliable and 2. readily available diagnostic test. *(High-quality evidence, Strong recommendation).*
			3. Paired serology (rising titers in antibody complement fixation tests) remains the mainstay for diagnosing M pneumoniae and C pneumoniae infections *(Moderate-quality evidence, Strong recommendation).*

Q7	In infants and children presenting with CAP what are the indications for complete blood cell count (CBC)?	IDSA 2011	A complete blood cell count should be obtained for patients with severe pneumonia, to be interpreted in the context of theclinical examination and other laboratory and imaging studies *(Low-quality evidence, Conditional recommendation).*
Q8	In infants and children presenting with CAP, are the acute phase reactants helpful in distinguishing between viral and bacterial causes?	IDSA 2011	1. Acute phase reactants cannot be used alone to distinguish between viral and bacterial causes of CAP *(High-quality evidence, Strong recommendation).*
			2. Acute-phase reactants need not be routinely measured in fully immunized children with CAP who are managed as outpatients, although for a more serious disease, acute-phase reactants may provide useful information for clinical management *(Low-quality evidence, Strong recommendation).*
			3. In patients with more serious diseases, such as those requiring hospitalization or those with pneumonia-associated complications, acute-phase reactants may be used in conjunction with clinical findings to assess response to therapy *(Low-quality evidence, Conditional recommendation).*
Q9	In infants and children presenting with CAP, are testing of electrolytes necessary for admitted patients?	BTS 2011	Plasma sodium, potassium, urea and/or creatinine should be measured at baseline and at least daily when on intravenous fluids *(Low-quality evidence, Conditional recommendation).*

Q10	In infants and children presenting with CAP, **10a.** Is routine plain chest radiography (postero-anterior and lateral) necessary to confirm the diagnosis in the outpatient setting?	IDSA 2011	Routine chest radiographs are not necessary for the confirmation of CAP diagnosis in the outpatient setting *(High- quality evidence, Strong recommendation).*
	10b. Should plain chest radiographs be obtained in all patients hospitalized for management?	IDSA 2011	Chest radiographs (postero-anterior and lateral) should be obtained in all hospitalized patients with hypoxemia or significant respiratory distress to document the presence, size and character of parenchymal infiltrates and identify complications of pneumonia *(Moderate- quality evidence, Strong recommendation).*
	10c. Are repeated chest radiographs routinely required?	IDSA 2011	Repeated chest radiographs are notroutinely required in children who recover from CAP. Repeated chest radiographs shouldbe obtained for children who fail to demonstrate clinical improvement and those who have clinical deterioration within 48-72 hours after initiation of therapy. Repeated chest radiographs 4–6 weeks after the diagnosis of CAP should be obtained in patients with recurrent pneumonia involving thesame lobe and in patients with lobar collapse at initial chest radiography with suspicion of an anatomic anomaly, chest mass, or foreign body aspiration *(Moderate-quality evidence, Strong recommendation).*
	10d. Is lung ultrasound recommended for the diagnosis of pneumonia?	IDSA 2011	Lung ultrasound has significantlyhigh sensitivity & specificity compared to chest x-ray for the diagnosis of pediatric CAP *(GPS)* [19].

	10e. Is CT chest indicated in children with CAP?	IDSA 2011	CT chest is only indicated if the plain chest radiograph is not conclusive to confirm the presence of pleural fluid *(High-quality evidence, Strong recommendation).*
Q11	In infants and children with CAP, can clinical or radiological features distinguish between viral, bacterial, and atypical pneumonia?	BTS 2011	There is no clinical or radiologicalway of reliability that can distinguish between the etiological agents *(High-quality evidence, Strong recommendation).*
Treatment			
Q12	In infants and children with CAP managed in outpatient settings, **12a.** which empiric anti-biotic therapy should beprovided?	WHO 2012-2014	Antibiotics are not routinely recommended for children younger than 5 years with non- severe pneumonia (i.e. fast breathing with no chest indrawingor danger sign) with a wheeze butwith no fever (temperature <38 c) as the cause is most likely to be viral *(Low- quality evidence, Strong recommendation).*
		IDSA 2011	Amoxicillin (or amoxicillin clavulanic acid) should be used asfirst-line therapy in infants, children, and adolescents previously healthy and appropriately immunized with mild to moderate CAP, suspectedto be of bacterial origin *(Moderate-quality evidence, Strong recommendation).*
		BTS 2011	*Alternatives:* cefaclor, erythromycin, azithromycin, and clarithromycin *(Moderate-quality evidence, Strong recommendation).*

		IDSA 2011	Macrolide antibiotics should beprescribed for treatment of children (primarily school-aged children and adolescents) with findings compatible with CAPcaused by atypical pathogens *(Moderate-quality evidence, Conditional recommendation).*
	12b. What is the role of influenza antiviral therapy?	IDSA 2011	1. Influenza antiviral therapy should be administered as soon as possible to children with moderateto severe CAP consistent with influenza virus infection, during widespread local circulation of influenza viruses, particularly for those with clinically worsening disease documented at the time of an outpatient visit. 2. Because early antiviral treatment has been shown to provide maximal benefit, treatment should not be delayed for confirmation of positive influenza test results. 3. Negative influenza diagnostic tests, especially rapid antigen tests, do not conclusively exclude influenza disease. 4. Treatment after 48 hours of symptomatic infection may still provide clinical benefit to those with more severe disease. *(Moderate-quality evidence, Strong recommendation)*
Q13	In infants and children hospitalized with non-complicated CAP, **13a.** what empiric antimicrobial therapy should be started?	WHO 2012-2014	1. Ampicillin (or Ampicillin-Sulbactam) should be administered to the fully immunized patients *(Moderate- quality evidence, Strong recommendation).*

		IDSA 2011	2. Third-generation parenteral cephalosporin's for: a. Infants and children who are notfully immunized. b. Infants and children with lifethreatening infections. *(Moderate-quality evidence, Conditional recommendation)*
			3. A combination of a macrolide (oral or parenteral), & a β-lactam antibiotic, for whom M. pneumoniae and C. pneumoniae are significant considerations. Levofloxacin for children who reached growth maturity or who cannot tolerate macrolides *(Moderate-quality evidence, Conditional recommendation).*
			4. Vancomycin or clindamycin should be provided in addition to β-lactam therapy if clinical, laboratory, or imaging characteristics are consistent with infection caused by CA-MRSA Alternative: levofloxacin; addition of vancomycin or clindamycin for suspected CA-MRSA *(Low-quality evidence, Strong recommendation).*
			5. Antiviral therapy: • Oseltamivir • Ribavirin Influenza antiviral therapy should be administered as soon as possible to children with moderateto severe CAP consistent with influenza virus infection *(High-quality evidence, Strong recommendation).*

	13b. What is the appropriate duration of empiric anti-infective therapy?	IDSA 2011	1. Treatment courses of 10 days inmoderate and severe cases. 2. Infections caused by certain pathogens, notably CA-MRSA, may require longer treatment than those caused by Strep. Pneumonia *(Moderate-quality evidence, Strong recommendation).*
		WHO 2012 - 2014, and IDSA 2011	Duration of treatment at least 5 days for mild disease managed onan outpatient basis *(Moderate-quality evidence, Strong recommendation).*
	13c.When parenteral antibiotics can be shifted to oral therapy?	IDSA 2011	Transition to oral therapy can takeplace as early as 2-3 days after thestart of parenteral therapy if: Improvement in fever, cough, tachypnea, and supplemental oxygen dependency and Increased activity and appetite; supported by reduction in peripheral leukocyte counts and/or CRP or other acute phase reactantsand absence of bacteremia *(Low-quality evidence, Strong recommendation).*
Q14	In infants and children hospitalized with non-complicated CAP, what is the role of chest physiotherapy?	BTS 2011	Chest physiotherapy is not beneficial and should not be performed in children with pneumonia *(High- quality evidence, Strong recommendation).*
Q15	In infants and children presenting with CAP, what are the common complications of CAP?	BTS 2011	1. Parapneumonic effusion is thought to develop in 1% of patients with CAP but, in those admitted to hospital, effusion maybe found in as many as 40% of cases *(Moderate-quality evidence, Strong recommendation).*

			2. A clinician should consider empyema when a child has a persistent fever beyond 7 days or a fever not settling after 48 hours of antibiotics (Moderate-quality evidence, Strong recommendation).
			3. Suspicion of abscess or necrosis is often raised on the chest X-ray and diagnosis can be confirmed by CT scanning (Low-quality evidence, Conditional recommendation).
Q16	In infants and children presenting with CAP, how should a para pneumonic Effusion be identified?	IDSA 2011	Chest radiography should be used to confirm the presence of pleural fluid. If the chest radiograph is not conclusive, then further imaging with chest ultrasound or computed tomography (CT) is recommended *(High-quality evidence, Strong recommendation).*
Q17	In infants and children with CAP and parapneumonic effusion, **17a.** what factors are important in determining whether drainage of the parapneumonic effusion is required?	IDSA 2011	1. The size of the effusion is animportant factor that determines the management. 2. The child's degree of compromise is an important factorthat determines management of Para pneumonic effusions. *(Moderate-quality evidence, Strong recommendation)*

	17b. what are the drainage options for parapneumonic Effusions?	IDSA 2011	1. Small*, uncomplicated parapneumonic effusions shouldnot routinely be drained and can be treated with antibiotic therapyalone. 2. Moderate** parapneumoniceffusions associated with respiratory distress, large*** parapneumonic effusions, or documented purulent effusionshould be drained. *(Moderate-quality evidence, Strong recommendation).*
	17c. what laboratory testing should be performed on pleural fluid?	IDSA 2011	1. Gram stain and bacterial cultureof pleural fluid should be performed whenever a pleural fluid specimen is obtained *(High-quality evidence, Strong recommendation).*
			2. Antigen testing or nucleic acid amplification through PCR increase the detection of pathogensin pleural fluid and may be useful for management *(Moderate-quality evidence, Strong recommendation).*
			3. Analysis of pleural fluid parameters, such as pH and levelsof glucose, protein, and lactate dehydrogenase, rarely change patient management andare not recommended *(Very low-quality evidence, Conditional recommendation).*
			4. Analysis of the pleural fluid forwhite blood cell count with cell differential analysis is recommended primarily to help differentiate bacterial from mycobacterial etiologies and frommalignancy *(Moderate-quality evidence, Conditional recommendation).*

	17d. what antibiotic therapy, and duration, is indicated for the treatment of parapneumonic effusion/ empyema?	IDSA 2011	1. When the blood or pleural fluidbacterial culture identifies a pathogenic isolate; antibiotic susceptibility should be used to determine the antibiotic regimen *(High-quality evidence, Strong recommendation).*
			2. In case of negative culture- ofPara pneumonic effusions, antibiotic selection should be based on the treatment recommendations for patients hospitalized with CAP *(Moderate-quality evidence, Strong recommendation).*
			3. The duration of antibiotic treatment depends on the adequacyof drainage and on the clinical response of each patient. In most children, antibiotic treatment for 2–4 weeks is adequate *(Low-quality evidence, Strong recommendation).*
	17e. when should a chest tube be removed either after primary drainage or VATS?	IDSA 2011	A chest tube can be removed in the absence of an intra-thoracic air leak and when pleural fluid drainage is <1 ml/kg/24 hours, usually calculated over the last 12 hours *(Very low - quality evidence, Strong recommendation).*
Q18	In infants and children presenting with CAP, how should the clinicians follow up the child for the expected response to therapy?	IDSA 2011	Children on adequate therapy should demonstrate clinical and laboratory improvement within 48–72 hrs. Further investigationsshould be performed if no improvement within 48–72 h's orthe condition deteriorates after admission and initiation of antimicrobial therapy *(Moderate- quality evidence, Strong recommendation).*

Q19	In infants and children with CAP not responding to treatment, what further management should be performed?	BTS 2011	If a child remains feverish or unwell 48 hours after treatmenthas commenced, re-evaluation should be performed with consideration given to possible complications. Answers to the following questions should be sought: 1. Is the patient having appropriatedrug treatment and an adequate dosage? 2. Is there a lung complication of pneumonia as collection of pleuralfluid with the development of empyema or evidence of lung abscess? 3. Has the patient a complication as immuno-suppression or coexistent disease as cystic fibrosis? 4. Is there a penicillin-resistant Strep. Pneumonia? *(Very low -quality evidence, Conditional recommendation).*
Q20	In infants and children with CAP, when hospitalized children can be safely discharged?	IDSA 2011	1. When they have documented overall clinical improvement, including level of activity, appetite, and decreased fever for atleast 12–24 hours *(Very low- quality evidence, Strong recommendation).* 2. When they demonstrate consistent pulse oximetry measurements > 90% in room air for at least 12–24 hours (Moderate-quality evidence, Strong recommendation). 3. If they demonstrate stable and/or baseline mental status *(Very low-quality evidence, Strong recommendation).*

			4. If they have documentation that they can tolerate their home anti- infective regimen, whether oral or intravenous, and home oxygen regimen, if applicable before hospital discharge *(Low-quality evidence, Strong recommendation).*
Prevention			
Q2 1	In infants and children what is the role of vaccination in prevention of CAP?	IDSA 2011	1. Children should be immunizedwith vaccines for bacterial pathogens, including Strep. Pneumonia, Haemophilus influenza type b, and Pertussis *(High-quality evidence, Strong recommendation).*
			2. All infants ≥ 6 months of age and all children and adolescents should be immunized annually with vaccines for Influenza virus to prevent CAP *(High-quality evidence, Strong recommendation).*
			3. Parents and caretakers of infants <6 months of age, including pregnant adolescents, should be immunized with vaccines for Influenza virus and Pertussis to protect the infants from exposure *(low-quality evidence, Strong recommendation).*
			4. High-risk infants should be provided immune prophylaxis against respiratory syncytial virus (RSV) – specific monoclonal antibodies to decrease the risk of severe pneumonia and hospitalization caused by RSV *(High-quality evidence, Strong recommendation).*
Q2 2	In infants and children what is the role of zinc in preventing CAP		In addition to antibiotics, oral zinc (10 mg/day for < 12 mo., 20 mg/day for ≥ 12 months given for 7 days) may reduce mortality among children in developing countries with clinically defined severe pneumonia (GPS) [28].

**Small effusion*: <10mm on lateral decubitus radiograph or opacifies less than one fourth of hemithorax

***Moderate effusion*: >10mm rim of fluids but opacifies less than half of hemithorax

****Large effusion*: Opacifies more than half of hemithorax

Evidence to recommendations: Considerations

The GDG/ GAG was guided by the results of the AGREE II appraisals of the eligible CPGs and thoroughly reviewed the recommendations of the original source WHO CPGs in consideration of local contextual factors related to the national Egyptian health system like burden of the disease, equity, acceptability, feasibility, and other relevant factors. The GDG decided through an informal consensus process to adopt most recommendation. Also, GDG/ GAG develops group of good practice statements to improve acceptability and feasibility.

Implementation Tools and Considerations

To improve healthcare provision, quality, safety, and patient outcome, evidence-based recommendations must not only be developed, but also disseminated and implemented at national and local levels and integrated into clinical practice.

Dissemination involves educating related healthcare providers to improve their awareness, knowledge and understanding of the guideline's recommendations. It is one part of implementation, which involved translation of evidence-based guidelines into real life practice with improvement of health outcomes for the patients.

Implementation requires an evidence-based strategy involving professional groups and stakeholders and should consider the local cultural and socioeconomic conditions. Cost-effectiveness of implementation programs should be assessed.

Specific steps need to be followed before clinical practice recommendations can be integrated into local clinical practice, particularly in low resource settings.

Steps of implementing community acquired pneumonia diagnosis, treatment, and prevention strategies into the Egyptian health system:

1. Develop a multidisciplinary working group.
2. Assess the status of nutritional care delivery, care gaps and current needs.
3. Select the material to be implemented, agree on the main goals, identify the key recommendations for diagnosis, treatment and prevention and adapt them to the local context or environment.
4. Identify barriers to, and facilitators of implementation.
5. Select an implementation framework and its component strategies.
6. Develop a step-by-step implementation plan:
    - Select the target populations and evaluate the outcome.
    - Identify the local resources to support the implementation.
    - Set timelines.
    - Distribute the tasks to the members.
    - Evaluate the outcomes.
7. Continuously review the progress and results to determine if the strategy requires modification.

Guideline implementation strategies will focus on the following: -

1. **For Practitioners**
    - Educational meetings: conferences, lectures, workshops, grand rounds, seminars, and symposia.
    - Educational materials: printed or electronic information (software).
    - Web-based education: computer-based educational activities.
    - A trained person meets with providers in their practice setting to provide information with the intention of changing the provider's practice. The information may include feedback on the performance of the provider(s).

- Reminders: the provision of information verbally, on papers or on a computer screen to prompt a health professional to recall information or to perform or avoid a particular action related to patient care.
- Optimize professional-patient interactions, through mass media campaigns, reminders, and education materials.
- Practice tools: tools designed to facilitate behavioral/practice changes, e.g., flow charts.

2. **For Patients and care givers**
    - Patient education materials (Arabic booklet): Printed/electronic information aimed at the patient/consumer, family, caregivers, etc.
    - Reminders: the provision of information verbally, on papers or electronically to remind a patient/consumer to perform a particular health-related behaviors.
    - Mass media campaigns.
3. **For Nurses**
    - Educational meetings: lectures, workshops or traineeships, seminars, and symposia.
    - Educational materials: printed.
    - A trained person meets with nurses in their practice setting to provide information with the intention of changing the provider's practice.
    - Reminders: the provision of information verbally, on paper or on a computer screen to prompt them to recall information or to perform or avoid a particular action related to patient care.
    - Practice tools: tools designed to facilitate behavioral/practice changes.
4. **For Stakeholders**

    Plans have been made to contact with all the health sectors in Egypt including all sectors of the Ministry of Health and Population, National Nutrition Institute, University Hospitals, Ministry of Interior, Ministry of Defense, Non-Governmental Organizations, Private sector, and all Health Care Facilities.
    - Information and communication technology: Electronic decision support, order sets, care maps, electronic health records, office-based personal digital assistants, etc.
    - Any summary of clinical provision of health care over a specified period may include recommendations for clinical action. The information is obtained from medical records, databases, or observations by patients. Summary may be targeted at the individual practitioner or the organization.
    - Administrative policies and procedures.
    - Formularies: Drug safety programs, electronic medication administration records.
5. **Other activities to assist the implementation of the adapted guideline's recommendations include:**
    - **International initiative:** Dissemination of the presented adapted CPG internationally via sending the final adapted CPG to the Guidelines International Network (GIN) Adaptation Working Group and contacting the CPG developers.
    - **Gantt chart** has been designed to manage the dissemination and implementation stages for the adapted CPG over an accurate time frame (Appendix).

Guideline Implementation Tools

Educational materials based on this Adapted CPG for treatment of CAP in children have been made available in several forms including:

1. Pathway for assessment of severity of CAP in Primary Care Facilities.
2. Algorithm for treatment of CAP in Acute Care Facilities (Emergency Rooms).
3. Power Point Presentation Lectures for diagnosis, treatment & prevention of CAP

Figure 1. Management of CAP in children

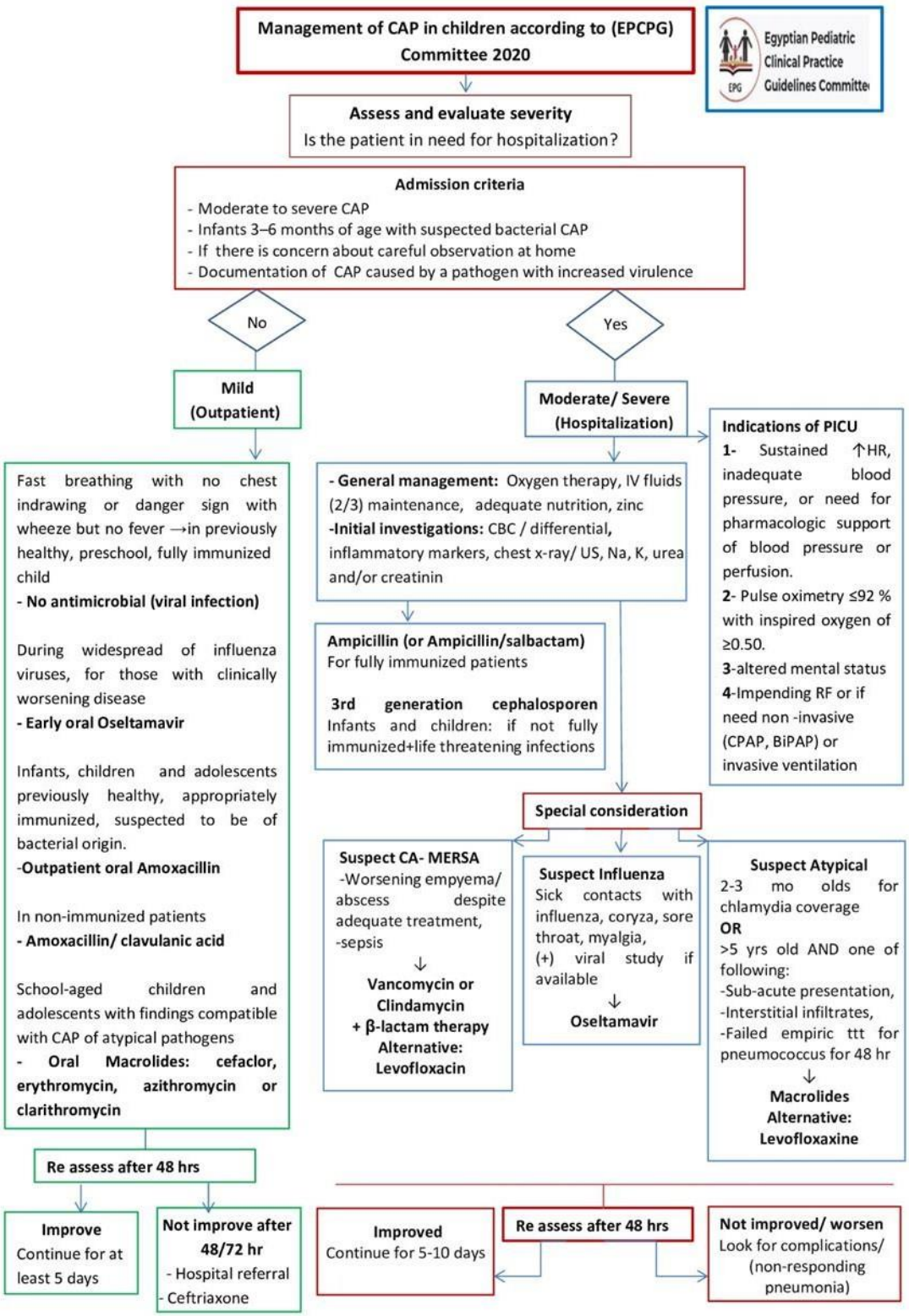

Figure 2.

Management of non-responding pneumonia

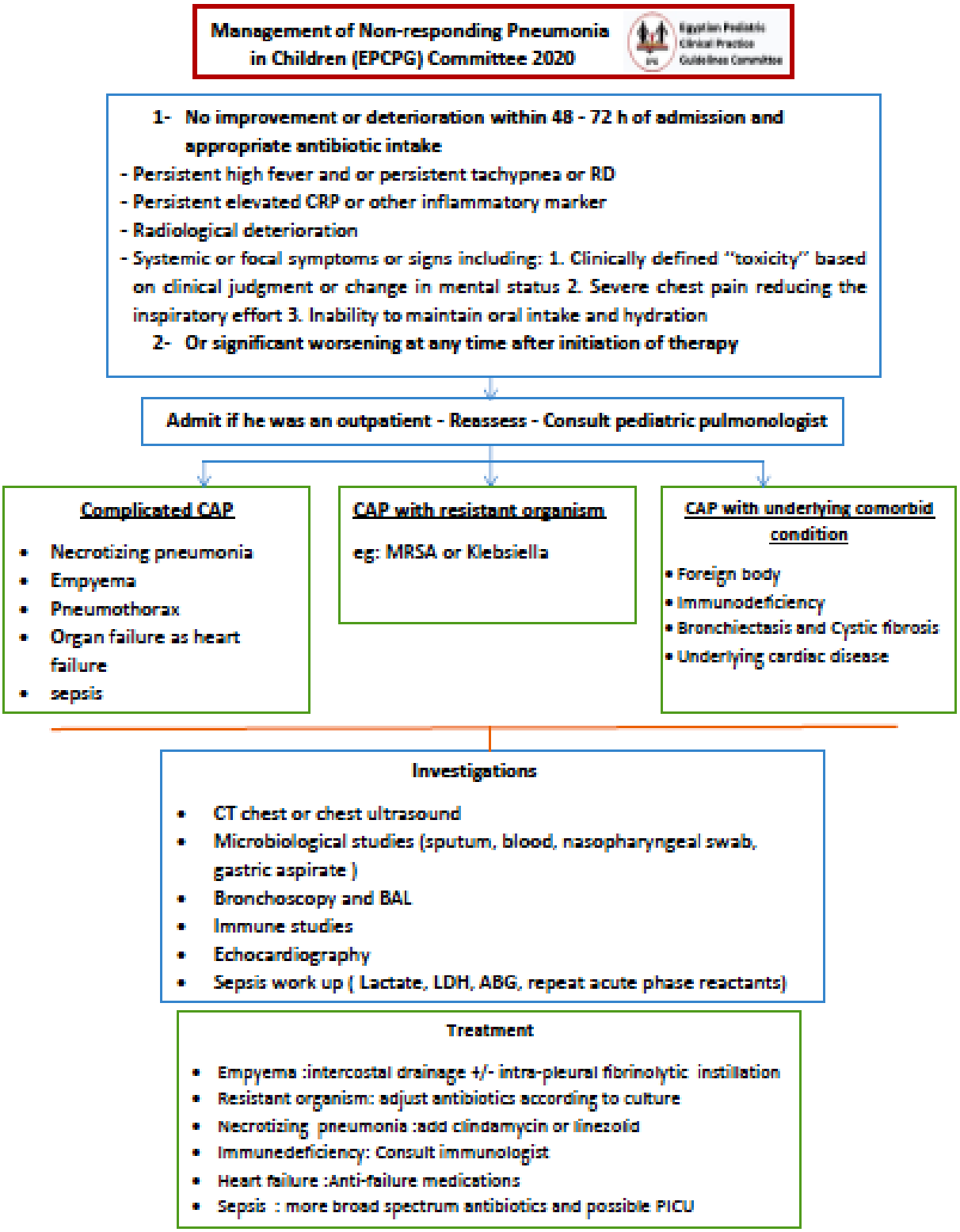

Table 4. Tachypnea According to WHO [29]

If the child is:	The child has fast breathing if you count:
Younger than 2 months	**60** breaths per minute or more
2 months up to 12 months	**50** breaths per minute or more
12 months up to 5 years	**40** breaths per minute or more.

Note: The child who is exactly 12 months old has fast breathing if youcount 40 breaths per minute or more. A pediatrician measured the respiratory rate by observing the child's chest movements for one minute while the child rested withno crying or fever.

Table 5. Severity Assessment of Pneumonia [30]

Severity Assessment	Mild	Moderate	Severe
Effort of breathing	Nil or Mild Increase	Moderate increase	Severe increase
Respiratory Rate	Within normal range for age	Above range for age	Continuing to rise, and/or evidence of Exhaustion
Oxygen Saturation	≥95% in room air	<95% in room air	Failing to maintain SpO2 ≥95% in 6L Oxygen OR > 90% in air
Circulation	No tachycardia	Tachycardia Capillary Refill ≥ 3 sec	Tachycardia/shock in the Cap Refill ≥ 3 secs

Table 6. Oral Anti-infective Doses [31]

Antibiotics	Doses	Notes	Sensitive Organisms
Amoxicillin	90 mg/kg/day in 2 doses		Streptococcus pneumoniaeGroup A Streptococcus Haemophilus influenza
Amoxicillin clavulanate	Amoxicillin component, 90 mg/kg/day in 2 doses		Streptococcus pneumonia Haemophilus influenza
Azithromycin	10 mg/kg on day 1, followed by 5 mg/kg/day once daily ondays 2–5	Maximum of 500 mg on day 1, followed by250 mg on days 2–5	Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Clarithromycin ororal	15 mg/kg/day in 2 doses for 7-14 days	Maximum of 1 g/day	Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Erythromycin	40 mg/kg/day in 4 doses		Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Doxycycline	2-4 mg/kg/day in 2doses	Children more than7years old	Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Second- or third-generation cephalosporin (cefpodoxime, cefuroxime, cefprozil)			Streptococcus pneumonia Haemophilus influenza
Cephalexin	75–100 mg/kg/day in 3 or 4 doses		Staphylococcus aureus, methicillin susceptible

Levofloxacin	16–20 mg/kg/day in 2doses for children 6 months to 5 years old8–10 mg/kg/day once daily for children 5 to 16years old	Maximum daily dose,750 mg	Streptococcus pneumonia S. pneumoniae resistant to penicillin Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Moxifloxacin	400 mg once daily	For adolescents withskeletal maturity,	Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Linezolid	30 mg/kg/day in 3 dosesfor children less than12 years old 20 mg/kg/day in 2 doses for children morethan12 years old		Streptococcus pneumoniae S. pneumoniae resistant to penicillin S. aureus, methicillin resistant, susceptible to clindamycin Aureus, methicillin resistant,resistant to clindamycin
Clindamycin	30–40 mg/kg/day in 3 doses	Resistance appears to be increasing in certain geographic areas among S. pneumoniae and S. aureus infections.	S. pneumoniae resistant to Penicillin Group A Streptococcus Staphylococcus aureus, methicillin susceptible S. aureus, methicillin resistant, susceptible to clindamycin
Oseltamivir	0–8 months old: 6 mg/kg/day in 2 doses;premature infants: 2 mg/kg/day in 2 doses	For a 5-day course treatment	

	9–23 months old: 7 mg/kg/day in 2 doses; more than24 months old: 4 mg/kg/day in 2 doses		

Table 7. Parenteral Anti-infective Doses [31]

Antibiotics	Doses	Notes	Sensitive Organisms
Ampicillin	150–200 mg/kg/day every 6 hours 300–400 mg/kg/day (every 6 hours) for S. pneumoniae resistant to penicillin		Streptococcus pneumonia S. pneumoniae resistant to penicillin Group A Streptococcus Haemophilus influenza
Penicillin	200 000–250 000 U/kg/day every 4–6 h		Streptococcus pneumoniae Group A Streptococcus
Ceftriaxone or Cefotaxime	50–100 mg/kg/day every 12–24 hours 150 mg/kg/day every 8hours		Streptococcus pneumoniae S. pneumoniae resistant to penicillin Group A Streptococcus Haemophilus influenza,
Clindamycin	40 mg/kg/day every 6–8hours		Streptococcus pneumoniae S. pneumoniae resistant to penicillin Group A Streptococcus S. aureus, methicillin susceptible S. aureus, methicillin resistant,susceptible to clindamycin
Vancomycin	40–60 mg/kg/day every 6–8 hours		Streptococcus pneumonia S. pneumoniae resistant to penicillin Group A

			Streptococcus S. aureus, methicilli n susceptibl e S. aureus, methicillin resistant,susceptible to clindamycin S. aureus, methicillin resistant, resistant to clindamycin
Levofloxacin	6 months to 5 years: 16–20 mg/kg/day every 12 5–16 years: 8–10 mg/kg/day once daily	maximum daily dose, 750 mg)	S. pneumoniae resistant to penicillin Haemophilus influenza Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia
Linezolid	<12 years:30 mg/kg/day every 8 hours More than 12 years : 20 mg/kg/day		S. pneumoniae resistant to penicillin S. aureus, methicillin resistant,susceptible to clindamycin S. aureus, methicillin resistant, resistant to clindamycin
Cefazolin	150 mg/kg/day every 8 Hours		Staphylococcus aureus, methicillin susceptible
Semisyntheti cpenicillin, e.g. oxacillin	150–200 mg/kg/day every 6–8 hours		Staphylococcus aureus,methicillin susceptible
Ciprofloxacin	30 mg/kg/day every 12 hours		Haemophilus influenza
Azithromycin	10 mg/kg / day		Mycoplasma pneumonia Chlamydia trachomatis or Chlamydia pneumonia

NB: For the child allergic to amoxicillin (choice is depending on the antimicrobial susceptibility of the pathogen). Use alternatives as clindamycin, trimethoprim- sulfamethoxazole or macrolides.

Limitations and suggestions for further research needs

Future research recommendations for the management of community acquired pneumonia in children in the Egyptian context could include:

- Assessment of Antibiotic Resistance Patterns: Research focusing on the evolving patterns of antibiotic resistance in CAP pathogens in Egypt. This can help in updating and optimizing antibiotic therapy guidelines specific to the region.
- Evaluating the Impact of Air Quality on CAP Incidence: Investigating the correlation between air pollution levels in different regions of Egypt and the incidence or severity of CAP in children.
- Cultural and Socioeconomic Factors in Treatment Adherence: Studying how cultural beliefs, socioeconomic status, and health literacy among parents and caregivers in Egypt affect adherence to CAP treatment guidelines. This research could lead to more effective, culturally tailored health education and intervention strategies.

These recommendations aim to address specific challenges and characteristics of the Egyptian context, potentially leading to more effective prevention and management strategies for CAP in children.

Strengthen the evidence base of the next update of this guideline by generating GRADE summary of finding tables, evidence profiles, and EtD frameworks.

Monitoring and evaluating the impact of the guideline.

The following are three performance measures or indicators for implementing this adapted CPG for community acquired pneumonia in children:

1. **Adherence to Antibiotics Guidelines**
   - *Numerator:* Number of children with community acquired pneumonia who received treatment as per guideline recommendations.
   - *Denominator:* Total number of children diagnosed with community-acquired pneumonia.
   - *Data Source:* Hospital or clinic patient records.
2. **Duration of Hospital Stay**
   - *Numerator:* Total number of hospital stay days for children with CAP.
   - *Denominator:* Total number of children admitted with CAP.
   - *Data Source:* Hospital admission and discharge records.
3. **Rate of Readmission**
   - *Numerator:* Number of children readmitted with symptoms of CAP within a certain period (e.g., 30 days) after discharge.
   - *Denominator:* Total number of children initially admitted with CAP.
   - *Data Source:* Hospital readmission records.

These key performance indicators are designed to measure the effectiveness and adherence to the guidelines, the efficiency of the treatment in terms of resource utilization (hospital stay), and the success of the treatment in preventing further complications (readmissions).

Updating of the guideline

The EPG CAP GAG has decided to conduct the next review of this adapted CPG for updates after five years. This should be carried out in 2029 after checking for updates in the source CPGs, consultation of expert opinion on the changes needed for updating according to the newest evidence and recommendations published in this area and the clinical audit and feedback from implementation efforts in the aforementioned local healthcare settings except if any breakthrough evidence- based recommendations are published before that date. The process will be guided by the Checklist for the Reporting of Updated Guidelines (CheckUp) Tool that is freely provided by the AGREE Enterprise and by the Reporting Items for Practice Guidelines in Healthcare (RIGHT) extension for adapted guidelines RIGHT-Ad@pt Checklist.

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Annexes

Annex Table 1.
Declaration of Conflict of Interests

The members of the guideline development/ adaptation group and the external review group have no academic, financial, or competing interests to declare and none of them were involved in the development of the original source guideline(s).
Any identified potential COI has been reported below.

Egyptian Pediatric Clinical Practice Guidelines Committee (EPG) ***Guideline Adaptation Group (Clinical subgroup)***		
Name	**Affiliation, Area of expertise / Role, Country / Primary location [work]**	**Declaration of interests**

		Interest identified	Management plan & decision
Prof. Abla Saleh Mostafa	Professor of Pediatrics, Cairo University, Egypt	None	Not Applicable
Prof. Amal Ibrahim Hassanain	Professor of Child Health, National Research Center, Egypt	None	Not Applicable
Prof. Dina Hossam-Eldine Hamed	Ass. Prof. of Pediatrics, Cairo University, Egypt	None	Not Applicable
Prof. Dina Tawfeek Sarhan	Ass. Professor of Pediatrics, Zagazig University, Egypt	None	Not Applicable
Prof. Eman Mahmoud Fouda	Professor of Pediatrics, Ain Shams University, Egypt	None	Not Applicable
Prof. Fekry Gharib Bassiouny	Consultant of Pediatrics and Neonatology, MOHP, Egypt	None	Not Applicable
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Prof. Hoda M. Salah El Din Metwally	Professor of Pediatrics, Faculty of medicine-Girls, Al-Azhar University, Egypt	None	Not Applicable
Prof. Magda Hassab Allah Mohamed	Professor of Pediatrics, Faculty of medicine Girls, Al-Azhar University, Egypt	None	Not Applicable
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Prof. Mona Mohsen Elattar	Professor of Pediatrics, Cairo University, Egypt	None	Not Applicable
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Pharmacist, Sarah Naeem Bartella Hebish	Senior clinical pharmacist, Pediatric oncology, ICU Department, National Cancer Institute, Cairo University, Egypt	None	Not Applicable
Prof. Shahenaz Mohamoud Hussien	Professor of Pediatrics, Al-Azhar University, Egypt	None	Not Applicable
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Guideline Adaptation Group (Methodology Subgroup)			
Prof. Ashraf Abdel Baky	Professor of Pediatrics Ain Shams University, Egypt Founder and Chair of EPG	None	Not Applicable
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External Review Group			
Prof. Karima Abd-Alkhalek	Prof. of Pediatric pulmonology, Ain Shams University, Egypt	None	Not Applicable

Prof. Zeinab Radwan	Prof. of Pediatric pulmonology, Cairo University, Egypt	None	Not Applicable
Prof. Tharwt Deraz	Prof. of Pediatric pulmonology, Ain Shams University, Egypt	None	Not Applicable
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Web annexes

The following annexes can be added as a package of standalone supplementary documents.

Keywords: The MeSH terms for "Guideline for the prevention and management of community-acquired pneumonia in children " on PubMed are: Adolescent, Anti-Bacterial Agents / therapeutic use, Child, Child, Preschool, Community-Acquired Infections / diagnosis, Community-Acquired Infections / drug therapy, Community-Acquired Infections / microbiology, Community-Acquired Infections / prevention & control, Humans, Infant, Infant, Newborn, Pneumococcal Vaccines, Pneumonia / diagnosis, Pneumonia / drug therapy, Pneumonia / microbiology, Pneumonia / prevention & control, Practice Guidelines as Topic, and Vaccines, Conjugate, Child, Child, Preschool, Community-Acquired Infections / drug therapy, Humans, Pneumonia / therapy, Editorial Policies, Evidence-Based Medicine, Practice Guidelines as Topic / standards, and Reproducibility of Results.

The health questions included: 11 questions for diagnosis, 8 for treatment, and two for prevention of CAP in children (see recommendations table).

PIPOH Model Items

- P (patients, target population): This management pathway is intended primarily for use in previously healthy children aged 28 days -12 years presenting with community acquired pneumonia in primary health care centers, governmental hospitals private hospitals or private clinics. Exclusion: Hospital acquired pneumonia (HAP). Ventilator associated pneumonia (VAP), Patients who have underlying serious medical conditions which may affect their respiratory status (e.g. underlying lung disease, immunocompromised child, neuromuscular disorders), and Patients in need for PICU admission. Aspiration pneumonia.
- I (interventions and practices considered/ guidelines category): Community acquired pneumonia management (Diagnosis, treatment, and prevention).
- P (Professionals/ intended or target users and clinical specialties): Physicians: Pediatricians, Primary Health Care Physicians (PHC), Family Practitioners, nurses and clinical pharmacist.

- O (major outcomes considered): Primary outcome: Improvement of symptoms and decrease use of unnecessary medication in children with CAP. Secondary outcome: Improvement of patients' outcome, decreased rate of hospital admission, decreased need to ICU admission with a net result of decreasing morbidity, mortality and optimizing health resources use.

- H (Healthcare settings): Primary health care centers, Pediatricians at hospitals, and Pediatricians in private clinics in the Egyptian Healthcare system.

Annex Table 2. Inclusion and Exclusion (Eligibility Criteria)
Inclusion/Exclusion Selection Criteria for BTS Guideline 2011

	Include	Exclude	
Methods of development	√	-----	Evidence- Based CPG
	√	-----	Consensus -Based CPG(Expert opinion)
Author(s)	√		Organization
	-----	-----	Single author
Country	-----	-----	National
	√	-----	International
Date of publication	2011	-----	Range of years(preferably not older than 5 years)
	-----	-----	One year
Language(s)	√	-----	English
	-----	-----	Arabic
	-----	-----	Other
Status	√	-----	Original source CPG
	-----	----	Adapted
Comments	It is developed in 2002 & scheduled to be reviewed every 3 years, but the last updatewas at 2011		

Inclusion/Exclusion Selection Criteria for WHO Guideline 2012-2014

	Include	Exclude	
Methods of development	√	------	Evidence- Based CPG
	---	------	Consensus -Based CPG(Expert opinion)
Author(s)	√		Organization
	-----	-----	Single author
Country	-----	----	National
	√	-----	International
Date of publication	2012-2014	---	Range of years(preferably not older than 5 years)
	--	----	One year
Language(s)	√	----	English
	------	----	Arabic
	-----	-----	Other
Status	√	-----	Original source CPG
	---	----	Adapted
Comments	Revised at health facilities2014, it contains recommendations for treatment only doesn't include recommendations for diagnosis or prevention		

Inclusion/Exclusion Selection Criteria for IDSA Guideline 2011

	Include	Exclude	
Methods of development	√	------	Evidence- Based CPG
	√	------	Consensus -Based CPG(Expert opinion)
Author(s)	√		Organization
	-----	-----	Single author
Country	-----	----	National
	√	-----	International
Date of publication	2011	----	Range of years(preferably not older than 5 years)
	-----	----	One year
Language(s)	√	----	English
	------	----	Arabic
	-----	-----	Other
Status	√	-----	Original source CPG
	-----	----	Adapted
Comments			

Annex Table 3. Results of the AGREE II assessment of the three source guidelines for CAP.

AGREE II/ CPGs	**BTS**	**IDSA**	**WHO**
Domain 1 (Scope)	90.74%	92.59%	77.78%
Domain 2 (Stakeholder)	83.33%	88.88%	76.39%
Domain 3 (Rigour)	81.25%	77.77%	76.56%
Domain 4 (Clarity)	94.44%	72.22%	81.95%
Domain 5 (Applicability)	84.72%	34.72%	70.83%
Domain 6 (Independence)	91.67%	91.66%	75%
Overall assessment 1	83.33%	83.33%	70.83%
Recommend for use (Overall assessment 2)	Yes with modifications	Yes with modifications	Yes with modifications

Annex Table 4. Annex Nurses and Parents Educational Guide in Arabic

البرنامج التعليمي لمرضى الالتهاب الرئوي

يُعد الالتهاب الرئوي عدوى تؤدي إلى التهاب الحويصلات الهوائية في إحدى الرئتين أو كلتيهما. قد تُملأ الحويصلات الهوائية بالسوائل أو بالصديد (مادة قيحية)، الأمر الذي يسبب السعال المصحوب بالبلغم أو الصديد والحمى والقشعريرة وصعوبة في التنفس.

يمكن لمجموعة من الكائنات الحية المختلفة بما في ذلك البكتيريا والفيروسات والفطريات أن تسبب الالتهاب الرئوي.

الالتهاب الرئوي يسبب حوالى 15% من مجموع وفيات الأطفال دون سن الخامسة وتشير التقديرات إلى انه أودى بحياة نحو 920136 طفلا في عام 2015.

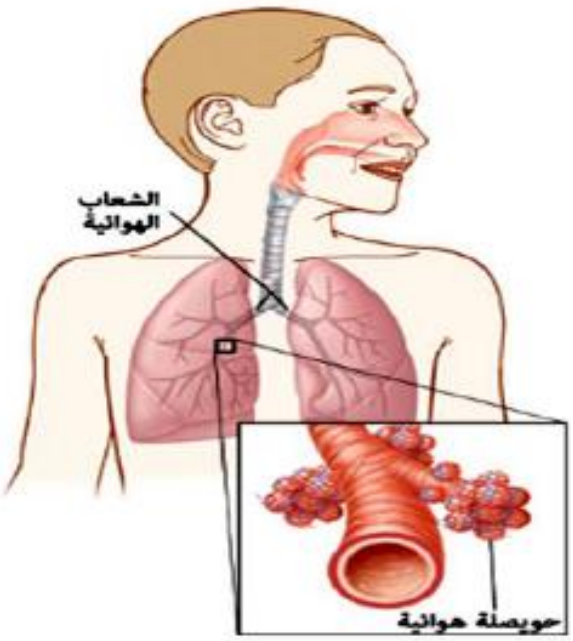
تتراوح شدة الالتهاب الرئوي بين الخفيفة و شديدة الخطورة فتهدد حياة المريض. و الالتهاب الرئوي أكثر خطورة على الرضع والأطفال الصغار والأشخاص الذين يعانون من مشاكل صحية أو ضعف في جهاز المناعة

أعراض الالتهاب الرئوي:

تتراوح علامات وأعراض الالتهاب الرئوي بين الخفيفة والشديدة، وذلك بناءً على عوامل مثل نوع الجرثومة المُسبّبة للعدوى والعمر والحالة الصحية العامة الخاصة بالمريض. عادةً ما تتشابه العلامات والأعراض الخفيفة مع علامات وأعراض نزلة البرد أو الإنفلونزا ولكنها تستمر لفترة أطول.

في الأطفال دون سن الخامسة، الذين يعانون من سعال مع أو بدون صعوبة في التنفس أو حمى، يتم تشخيص الالتهاب الرئوي من خلال سرعة التنفس أو انغماد أسفل جدار الصدر إلى الداخل، أثناء الشهيق (على عكس الشخص السليم الذي يتسع صدره أثناء الشهيق). الأزيز أكثر شيوعاً في حالات العدوى الفيروسية.

صورة للجهاز التنفسى



قد تتضمن علامات وأعراض الالتهاب الرنوى ما يلى:

- السعال والذي قد ينتج عنه البلغم
- ضيق النفس
- ألمًا في الصدر عند التنفس أو السعال
- ارتفاع فى درجة الحرارة والتعرق وا الارتجاف
- الإرهاق
- غثيانًا أو قيئًا أو إسهالاً
- ضعف الشهية

أسباب الالتهاب الرنوى

يمكن للعديد من الجراثيم أن تسبب الالتهاب الرئوي. تعتبر البكتيريا والفيروسات او العدوى بالفيروس و البكتيريا معا (و هى الاكثر شيوعا) الموجودة في الهواء الذي نتنفسه من أهم اسباب الاصابة بالالتهاب الرءوى. يمنع الجسم عادة هذه الجراثيم من إصابة الرئتين. ولكن يمكن لهذه الجراثيم في بعض الأحيان التغلب على الجهاز المناعي.

الالتهاب الرئوى المكتسب من المجتمع

يعتبر الالتهاب الرئوي المكتسب من المجتمع النوع الأكثر شيوعًا للالتهاب الرئوي. وهو يحدث خارج المستشفيات أو غيرها من مرافق الرعاية الصحية. وقد ينجم عما يلي:

التهاب بكتيري:

- البكتيريا العقدية الرئوية هي أكثر أسباب الالتهاب الرئوي الجرثومي شيوعا لدى الأطفال.
- المستدمية النزلية من النمط "ب" هي ثاني أكثر أسباب الالتهاب الرئوي الجرثومي شيوعا لدى الأطفال.

التهاب فيروسي:

- الفيروس التنفسي الخلوي هو اكثر الأسباب شيوعا بين الفيروسات المسببة للالتهاب الرئوي.

يمكن لبعض الفيروسات التي تسبب الزكام والإنفلونزا أن تؤدي إلى التهاب رئوي.

تعتبر الفيروسات السبب الأكثر شيوعًا للالتهاب الرئوي لدى الأطفال الذين تقل أعمارهم عن خمس سنوات وعادة ما يكون الالتهاب الرئوي الفيروسي خفيفًا. ولكنه قد يصبح في بعض الحالات خطيرًا للغاية.

مسببات البكتيريا: يمكن للفطريات الرئوية أيضًا أن تسبب التهابًا رئويًا. وعادة ما تنتج أعراض أكثر اعتدالاً من الأنواع الأخرى للالتهاب الرئوي.

يصعب التفريق بين الاصابة بعدوى بكتيرية او فيروسية حيث أنه لا يوجد اختلاف بين أعراض الالتهاب الرئوي الفيروسي والالتهاب الرئوي البكتيرى

عوامل الخطورة

- الأطفال البالغين من العمر عامين أوأقل
- تتضمن عوامل الخطر الأخرى ما يلي:
  - المرضى في وحدة العناية المركّزة وخاصةً المتصل منهم بجهاز يساعده على التنفس (جهاز التنفس الصناعي)
  - الاشخاص المصابون بامراض مزمنة مثل بالربو أو مرض الانسداد الرئوي المزمن أو أحد أمراض القلب.

- المدخنون فالتدخين يدمر الدفاعات الطبيعية في الجسم ضد البكتيريا والفيروسات التي تسبب الالتهاب الرئوي.

- مرضى ضعف جهاز المناعة أو كبته. المرضى المصابون بمرض فيروس نقص المناعة البشرية (الإيدز) أو الذين خضعوا لزراعة الأعضاء أو يتلقون العلاج الكيميائي أو الستيرويدات طويلة الأجل معرضون لخطر الإصابة بالالتهاب الرئوي.

مضاعفات **الالتهاب الرئوي**

حتى مع تناول العلاج، فإن بعض الأشخاص المصابين بالتهاب رئوي، وخاصةً المجموعات المعرضة لخطورة عالية، قد يتعرضون لمضاعفات، بما في ذلك

- تجرثم الدم (انتشار البكتيريا في مجرى الدم). يمكن أن تنتشر البكتريا التي تدخل إلى مجرى الدم من الرئتين العدوى إلى الأعضاء الأخرى مما قد يسبب احتمال فشل هذه الاعضاء.

- صعوبة في التنفس إذا كان الالتهاب الرئوي شديدا أو كان هناك مرض خطير مزمن في الرئة.

- الارتشاح البلوري (تراكم السوائل حول الرئتين). يمكن أن يسبب الالتهاب الرئوي تجمع السوائل في الفراغ بين طبقات النسيج الذي يفصل بين الرئتين وتجويف الصدر (الغشاء البلورى). إذا انتقلت العدوى الى هذا السائل، فربما يحتاج إلى تصريفه من خلال أنبوب يوضع في الصدر أو إخراجه جراحيًا.

- خراج الرئة. يمكن أن يحدث الخراج إذا تشكل الصديد في أحد تجويفات الرئة. يتم علاج الخراج عادة باستخدام المضادات الحيوية وفي بعض الأحيان يكون من اللازم التدخل الجراحي أو التصريف باستخدام إبرة طويلة أو أنبوب طويل يوضع في الخراج لإزالة الصديد.

علاج الالتهاب الرئوى

عادةً ما يتم علاج الالتهاب الرئوي الناجم عن البكتيريا باستخدام المضادات الحيوية مثل الأموكسيسيلين ومن المفترض أن يبدأ المريض في التحسن في خلال يومين ويزول الالتهاب الرئوي خلال أسبوعين.

الالتهاب الرئوي الناجم عن الفيروس لا يستجيب للمضادات الحيوية وقد يستمر إلى **4** أسابيع.

يوصى بإدخال الحالات الشديدة فقط إلى المستشفى حيث تُعطى المضادات الحيوية عن طريق الحقن.

متى تزور الطبيب

قم بزيارة الطبيب إذا كان الطفل يعاني من صعوبة في التنفس أو ألمًا في الصدر أو حمى مستمرة تصل إلى 39 درجة مئوية أو أعلى، أو السعال المستمر أو في حالة عدم الاستجابة للعلاج.

الوقاية من الالتهاب الرئوي

التطعيمات: تتوفر التطعيمات للوقاية من بعض أنواع الالتهاب الرئوي والإنفلونزا. تحدث مع طبيبك حول طرق الحصول على هذه الجرعات. تأكد من مراجعة حالة التطعيم مع طبيبك حتى إذا كنت تتذكر تلقي لقاح الالتهاب الرئوي حيث إن إرشادات التطعيم تغيرت بمرور الوقت.

تأكد من تلقي الأطفال التطعيم. يوصي الأطباء بتطعيم مختلف للالتهاب الرئوي في الأطفال الذين تقل أعمارهم عن سن سنتين (2) وفي الأطفال الذين تتراوح أعمارهم بين 2 و5 سنوات الذين هم عرضة بشكل خاص لمرض المكورات الرئوية. يجب أن يتلقى الأطفال الذين يذهبون إلى مركز رعاية أطفال جماعي التطعيم أيضًا. يوصي الأطباء أيضًا بإعطاء جرعات تطعيم الإنفلونزا للأطفال الأكبر من 6 أشهر.

النظافة الجيدة: ممارسة نظافة جيدة حماية من عدوى الجهاز التنفسي التي غالبًا ما تؤدي إلى الالتهاب الرئوي. اغسل يديك بانتظام أو استخدم مطهرًا لليدين يحتوي على الكحول.

عدم التعرض للتدخين: التعرض للتدخين يدمر الدفاعات الطبيعية للرئة ضد عدوى الجهاز التنفسي.

Appendix Table 5. The RIGHT-Ad@pt checklist

7 sections, 27 topics, and 34 items		Assessment	Page(s)*	Note(s)
BASIC INFORMATION				
Title/subtitle				
1	Identify the report as an adaptation of practice guideline(s), that is include "guideline adaptation", "adapting", "adapted guideline/recommendation(s)", or similar terminology in the title/subtitle.	☒ Yes ☐ No ☐ Unclear		
2	Describe the topic/focus/scope of the adapted guideline.	☒ Yes ☐ No ☐ Unclear		
Cover/first page				
3	Report the respective dates of publication and the literature search of the adapted guideline.	☒ Yes ☐ No ☐ Unclear		
4	Describe the developer and country/region of the adapted guideline.	☒ Yes ☐ No ☐ Unclear		
Executive summary/abstract				
5	Provide a summary of the recommendations contained in the adapted guideline.	☒ Yes ☐ No ☐ Unclear		
Abbreviations and acronyms				
6	Define key terms and provide a list of abbreviations and acronyms (if applicable).	☒ Yes ☐ No ☐ Unclear		
Contact information of the guideline adaptation group				
7	Report the contact information of the developer of the adapted guideline.	☒ Yes ☐ No ☐ Unclear		
SCOPE				
Source guideline(s)				
8	Report the name and year of publication of the source guideline(s), provide the citation(s), and whether source authors were contacted.	☒ Yes ☐ No ☐ Unclear		
Brief description of the health problem(s)				
9	Provide the basic epidemiological information about the problem (including the associated burden), health systems relevant issues, and note any relevant differences compared to the source guideline(s).	☒ Yes ☐ No ☐ Unclear		
Aim(s) and specific objectives				
10	Describe the aim(s) of the adapted guideline and specific objectives, and note any relevant differences compared to the source guideline(s).	☒ Yes ☐ No ☐ Unclear		
Target population(s)				
11	Describe the target population(s) and subgroup(s) (if applicable) to which the recommendation(s) is addressed in the adapted guideline, and note any relevant differences compared to the source guideline(s).	☒ Yes ☐ No ☐ Unclear		
End-users and settings				
12	Describe the intended target users of the adapted guideline, and note any relevant differences compared to the source guideline(s).	☒ Yes ☐ No ☐ Unclear		
13	Describe the setting(s) for which the adapted guideline is intended, and note any relevant differences compared to the source guideline(s).	☒ Yes ☐ No ☐ Unclear		
RIGOR OF DEVELOPMENT				
Guideline adaptation group				

Appendix Table 5. The RIGHT-Ad@pt checklist

7 sections, 27 topics, and 34 items		Assessment	Page(s)*	Note(s)
14	List all contributors to the guideline adaptation process and describe their selection process and responsibilities.	☒ Yes ☐ No ☐ Unclear		
Adaptation framework/methodology				
15	Report which framework or methodology was used in the guideline adaptation process.	☒ Yes ☐ No ☐ Unclear		
Source guideline(s)				
16	Describe how the specific source guideline(s) was(were) selected.	☒ Yes ☐ No ☐ Unclear		
Key questions				
17	State the key questions of the adapted guideline using a structured format, such as PICO (population, intervention, comparator, and outcome), or another format as appropriate.	☒ Yes ☐ No ☐ Unclear		
18	Describe how the key questions were developed/modified, and/or prioritized.	☐ Yes ☒ No ☐ Unclear		
Source recommendation(s)				
19	Describe how the recommendation(s) from the source guideline(s) was(were) assessed with respect to the evidence considered for the different criteria, the judgements and considerations made by the original panel.	☐ Yes ☒ No ☐ Unclear		
Evidence synthesis				
20	Indicate whether the adapted recommendation(s) is/are based on existing evidence from the source guideline(s), and/or additional evidence.	☐ Yes ☒ No ☐ Unclear		
21	If new research evidence was used, describe how it was identified and assessed.	☐ Yes ☒ No ☐ Unclear	NA	
Assessment of the certainty of the body of evidence and strength of recommendation				
22	Describe the approach used to assess the certainty/quality of the body/ies of evidence and the strength of recommendations in the adapted guideline and note any differences (if applicable) compared to the source guideline(s).	☐ Yes ☒ No ☐ Unclear	NA	
Decision-making processes				
23	Describe the processes used by the guideline adaptation group to make decisions, particularly the formulation of recommendations.	☒ Yes ☐ No ☐ Unclear		
RECOMMENDATIONS				
Recommendations				
24	Report recommendations and indicate whether they were adapted, adopted, or *de novo*.	☒ Yes ☐ No ☐ Unclear		
25	Indicate the direction and strength of the recommendations and the certainty/quality of the supporting evidence and note any differences compared to the source recommendations(s) (if applicable).	☒ Yes ☐ No ☐ Unclear		
26	Present separate recommendations for important subgroups if the evidence suggests important differences in factors influencing recommendations and note any differences compared to the source recommendations(s) (If applicable).	☒ Yes ☐ No ☐ Unclear		
Rationale/explanation for recommendations				
27	Describe the criteria/factors that were considered to formulate the recommendations or note any relevant differences compared to the source guideline(s) (if applicable).	☒ Yes ☐ No ☐ Unclear		
EXTERNAL REVIEW AND QUALITY ASSURANCE				

Appendix Table 5. The RIGHT-Ad@pt checklist

7 sections, 27 topics, and 34 items		Assessment	Page(s)*	Note(s)
External review				
28	Indicate whether the adapted guideline underwent an independent external review. If yes, describe the process.	☒ Yes ☐ No ☐ Unclear		
Organizational approval				
29	Indicate whether the adapted guideline obtained organizational approval. If yes, describe the process.	☒ Yes ☐ No ☐ Unclear	SNS & NEBMC	
FUNDING, DECLARATION, AND MANAGEMENT OF INTEREST				
Funding source(s) and funder role(s)				
30	Report all sources of funding for the adapted guideline and source guideline(s), and the role of the funders.	☒ Yes ☐ No ☐ Unclear		
Declaration and management of interests				
31	Report all conflicts of interest of the adapted and the source guideline(s) panels, and how they were evaluated and managed.	☒ Yes ☐ No ☐ Unclear		
OTHER INFORMATION				
Implementation				
32	Describe the potential barriers and strategies for implementing the recommendations (if applicable).	☒ Yes ☐ No ☐ Unclear		
Update				
33	Briefly describe the strategy for updating the adapted guideline (if applicable).	☒ Yes ☐ No ☐ Unclear		
Limitations and suggestions for further research				
34	Describe the challenges of the adaptation process, the limitations of the evidence, and provide suggestions for future research.	☐ Yes ☒ No ☐ Unclear	--	

Guideline Registration: PREPARE-2023CN225.