

Pneumonia

Setting: **Inpatient** Population: **Pediatric** Keywords: **pulmonary, viral, infection, bacterial**

Last Updated: 12/18/2019. Copyright Elsevier BV. All rights reserved.

Clinical Description

Care of the hospitalized child experiencing an infection of the pulmonary parenchyma that occurs as either a primary disease or as a complication of another condition.

Key Information

- Knowledge of previous antimicrobial therapy exposure and drug resistance patterns in the patient's local area may influence choice of empiric antimicrobial therapy (e.g., methicillin, beta-lactam, macrolide).
 - De-escalated (narrowing antibiotic therapy or changing from combination to monotherapy) rather than fixed antibiotic regimens are suggested for patients with hospital-acquired pneumonia and ventilator-associated pneumonia.
-

Clinical Goals

By transition of care

A. The patient will demonstrate achievement of the following goals:

- Fluid Balance
- Resolution of Infection Signs and Symptoms
- Effective Oxygenation and Ventilation

B. Patient, family or significant other will teach back or demonstrate education topics and points:

- Education: Overview
 - Education: Self Management
 - Education: When to Seek Medical Attention
-

Correlate Health Status

Correlate health status to:

- history, comorbidity, congenital anomaly
 - age, developmental level
 - sex, gender identity
 - baseline assessment data
 - physiologic status
 - response to medication and interventions
 - psychosocial status, social determinants of health
 - barriers to accessing care and services
 - child and family/caregiver:
 - health literacy
 - cultural and spiritual preferences
 - safety risks
 - family interaction
 - plan for transition of care
-

Fluid Imbalance (Pneumonia)

Signs/Symptoms/Presentation: Fluid Deficit

- capillary refill delayed
- eyes sunken
- fatigue
- fontanel sunken (infant)
- irritability
- listless
- mucous membranes dry
- peripheral pulse strength decreased
- skin turgor decreased
- tearing decreased or absent
- thirst
- urinary output decreased
- urine concentration increased

Signs/Symptoms/Presentation: Fluid Excess

- acute weight gain
- bounding pulses
- breath sounds change
- crackles in lungs
- edema
- neck and hand veins distended
- positive fluid balance
- restlessness
- shortness of breath
- wheezing

Vital Signs

- heart rate increased or decreased
- blood pressure increased or decreased

Laboratory Values

- BUN (blood urea nitrogen) abnormal
- Hct (hematocrit) abnormal
- serum sodium abnormal
- urine specific gravity abnormal

Problem Intervention(s)

Monitor and Manage Fluid Balance

- Assess fluid requirements and deficit to determine fluid therapy goal.
- Keep accurate intake, output and daily weight; monitor trends.
- Monitor laboratory value trends and need for treatment adjustment.
- Encourage oral intake, when able. If not able to meet requirements, determine need for intravenous fluid therapy to achieve fluid balance.
- Evaluate potential sources that may lead to fluid overload (e.g., oral, enteral, intravenous fluid, medication).
- Assess neurologic status frequently due to risk of hyponatremia.

Associated Documentation

- Fluid/Electrolyte Management
-

Infection (Pneumonia)

Signs/Symptoms/Presentation

- appetite change
- capillary refill delayed
- chest discomfort
- chills
- fatigue
- diaphoresis
- eating pattern and tolerance change
- irritability
- lethargic
- listless
- lymphadenopathy
- malaise
- mental status change
- night sweats
- pallor
- respiratory pattern change
- restlessness
- shivering
- skin cool and moist
- skin flushed
- skin mottled
- skin warm
- sleepiness
- urinary output decreased

Vital Signs

- heart rate increased
- respiratory rate increased
- blood pressure increased or decreased
- SpO₂ (peripheral oxygen saturation) decreased
- body temperature change from baseline
- body temperature elevated

Laboratory Values

- ABG (arterial blood gas) abnormal
- bands increased
- blood glucose level abnormal
- CRP (C-reactive protein) elevated
- culture positive (urine, blood, sputum)
- ESR (erythrocyte sedimentation rate) elevated
- gram stain positive
- serum lactate elevated
- WBC (white blood cell) count change

Diagnostic Results

- CXR (chest x-ray) abnormal

Problem Intervention(s)

Prevent Infection Progression

- Implement transmission-based precautions and isolation, as indicated, to prevent spread of infection.
- Obtain cultures prior to initiating antimicrobial therapy, when possible. Do not delay treatment for laboratory results in the presence of high suspicion or clinical indicators.
- Administer ordered antimicrobial therapy promptly; reassess need regularly.

- Monitor laboratory value, diagnostic test and clinical status trends for signs of infection progression.
- Identify early signs of sepsis, such as increased heart rate and decreased blood pressure, as well as changes in mental state, respiratory pattern or peripheral perfusion.
- Prepare for rapid sepsis management, including lactate level, intravenous access, fluid administration and oxygen therapy.
- Provide fever-reduction and comfort measures.

Associated Documentation

- Fever Reduction/Comfort Measures
 - Infection Management
 - Isolation Precautions
-

Respiratory Compromise (Pneumonia)

Signs/Symptoms/Presentation

- breath sounds abnormal
- breathing pattern altered
- breathlessness
- confusion
- cough impaired
- cough increased
- cyanosis
- feeding difficulty
- irritability
- restlessness
- shortness of breath
- sputum consistency change
- swallow function impaired
- work of breathing increased

Vital Signs

- heart rate increased
- respiratory rate increased
- SpO₂ (peripheral oxygen saturation) decreased

Laboratory Values

- ABG (arterial blood gas) abnormal

Diagnostic Results

- CXR (chest x-ray) abnormal

Problem Intervention(s)

Promote Airway Secretion Clearance

- Assess the effectiveness of pulmonary hygiene and ability to perform airway clearance techniques.
- Encourage early mobility or ambulation; match activity to ability and tolerance.
- Encourage deep breathing and lung expansion therapy to prevent atelectasis (e.g., incentive spirometry, positive airway pressure); adjust to patient's response.
- Anticipate the need to splint chest or abdominal wall with cough to minimize discomfort; assist if needed.
- Initiate cough-enhancement and airway-clearance techniques with instruction (e.g., active cycle breathing, positive expiratory pressure, suction); consider mechanical insufflation-exsufflation in the presence of neuromuscular weakness.
- Consider inhaled pharmacologic therapy (e.g., beta-2 agonist, mucolytic, corticosteroid, antimicrobial) to improve mucus clearance, inflammation, cough response and air flow.

Optimize Oxygenation and Ventilation

- Establish oxygenation and ventilation parameters and goals; consider home baseline values for chronic cardiac and lung conditions.
- Anticipate noninvasive and invasive monitoring (e.g., pulse oximetry, end-tidal carbon dioxide, blood gases, cardiovascular).

- Maintain optimal position to relieve discomfort, breathlessness and ventilation/perfusion mismatch.
- Provide oxygen therapy judiciously to avoid hyperoxemia; adjust to achieve oxygenation goal.
- Monitor fluid balance closely to minimize the risk of fluid overload.
- Implement noninvasive or invasive positive pressure to enhance alveolar ventilation.

Associated Documentation

- Breathing Techniques/Airway Clearance
- Cough And Deep Breathing

Associated Documentation

- Airway/Ventilation Management
- Head of Bed (HOB) Position

General Education

- admission, transition of care
- orientation to care setting, routine
- advance care planning
- diagnostic tests/procedures
- opioid medication management
- oral health
- medication management
- pain assessment process
- safe medication disposal
- tobacco use, smoke exposure
- treatment plan

Safety Education

- call light use
 - equipment/home supplies
 - fall prevention
 - harm prevention
 - infection prevention
 - MDRO (multidrug-resistant organism) care
 - personal health information
 - resources for support
-

Education: Overview

- description
 - signs/symptoms
-

Education: Self Management

- activity
 - fluid/food intake
 - immunizations
 - infection prevention
 - medication management
 - pulmonary hygiene
 - tobacco use, smoke exposure
 - VTE prevention
-

Education: When to Seek Medical Attention

- unresolved/worsening symptoms
 - VTE symptoms
-

Population-Specific Considerations

Age-Related

- Blood cultures may not be reliable in the diagnosis of pneumonia in children.

References

- (2019). Walsh, B. K (Eds.), *Neonatal and pediatric respiratory care* . St. Louis: Elsevier. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]
- Alobaidi, R.; Morgan, C.; Basu, R. K.; Stenson, E.; Featherstone, R.; Majumdar, S. R.; Bagshaw, S. M. Association between fluid balance and outcomes in critically ill children: A systematic review and meta-analysis. *JAMA Pediatrics* . 2018;172(3), 257-268. doi:10.1001/jamapediatrics.2017.4540 [Metasynthesis, Meta-analysis, Systematic Review]
- Auger, C.; Schapiro, E.; Galmiche, H.; Denis, C. Review of reimbursement for instrumental techniques used for assisted coughing and thoracic expansion. A French National Health Authority Assessment (HAS). *Revue Des Maladies Respiratoires*. 2016;33(10), 853-864. doi:10.1016/j.rmr.2016.01.006 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]
- Avena, M. J.; Luz Gonçalves Pedreira, M.; Herman, T. H.; Gutiérrez, M. G. Respiratory nursing diagnoses: Presenting evidence for identification of the defining characteristics in neonatal and pediatric populations. *International Journal of Nursing Knowledge*. 2016;27(4), 184-192. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]
- Barlam, T. F.; Cosgrove, S. E.; Abbo, L. M.; MacDougall, C.; Schuetz, A. N.; Septimus, E. J.; Srinivasan, A.; Dellit, T. H.; Falack-Ylter, Y. T.; Fishman, N. O.; Hamilton, C. W. Implementing an antibiotic stewardship program: Guidelines by the Infectious Disease Society of American and the Society for Healthcare Epidemiology of America. *Clinical Infectious Diseases*. 2016;62(10), e51-e77. doi:10.1093/cid/ciw118 Source [Quality Measures, Clinical Practice Guidelines]
- Bradley, J. S.; Byington, C. L.; Shah, S. S.; Alverson, B.; Carter, E. R.; Harrison, C.; Kaplan, S. L.; Mace, S. E.; McCracken Jr., G. H.; Moore, M. R.; St Peter, S. D.; Stockwell, J. A.; Swanson, J. T. The management of community-acquired pneumonia in infants and children older than 3 months of age: Clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. *Clinical Infectious Diseases*. 2011;53(7), e25-e76. doi:10.1093/cid/cir531 Source [Quality Measures, Clinical Practice Guidelines]
- Canada, T. W.; Tajchman, S. K.; Tucker, A. M.; Ybarra, J. V. (2015). *A.S.P.E.N. Fluids, electrolytes, and acid-base disorders handbook* . Silver Spring, MD: American Society of Parenteral and Enteral Nutrition. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]
- Chatwin, M.; Toussaint, M.; Gonçalves, M. R.; Sheers, N.; Mellies, U.; Gonzales-Bermejo, J.; Sancho, J.; Fauroux, B.; Andersen, T.; Hov, B.; Nygren-Bonnier, M.; Lacombe, M.; Pernet, K.; Kampelmacher, M.; Devaux, C.; Kinnett, K.; Sheehan, D.; Rao, F.; Villanova, M.; Berlowitz, D.; Morrow, B. M. Airway clearance techniques in neuromuscular disorders: A state of the art review. *Respiratory Medicine*. 2018;136, 98-110. doi:10.1016/j.rmed.2018.01.012 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Chaves, G. S. S.; Freitas, D. A.; Santino, T. A.; Nogueira, P. A. M. S.; Fregonezi, G. A. F.; Mendonça, K. M. P. P. Chest physiotherapy for pneumonia in children. *Cochrane Database of Systematic Reviews*. 2019;(1) doi:10.1002/14651858.CD010277.pub3 [Metasynthesis, Meta-analysis, Systematic Review]

College of Respiratory Therapists of Ontario. (2013). *Oxygen therapy clinical best practice guideline*. Source [Quality Measures, Clinical Practice Guidelines]

Collins, J. A.; Rudenski, A.; Gibson, J.; Howard, L.; O'Driscoll, R. Relating oxygen partial pressure, saturation and content: The haemoglobin-oxygen dissociation curve. *Breathe (Sheffield, England)*. 2015;11(3), 194-201. doi: 10.1183/20734735.001415 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Cuello-Garcia, C. A.; Mai, S. H. C.; Simpson, R.; Al-Harbi, S.; Choong, K. Early mobilization in critically ill children : A systematic review. *Journal of Pediatrics*. 2018;203, 25-33. doi:10.1016/j.jpeds.2018.07.037 Source [Metasynthesis, Meta-analysis, Systematic Review]

Davis, A. L.; Carcillo, J. A.; Aneja, R. K.; Deymann, A. J.; Lin, J. C.; Nguyen, T. C.; Okhuysen-Cawley, R. S.; Relvas, M. S.; Rozenfeld, R. A.; Skippen, P. W.; Stojadinovic, B. J.; Williams, E. A.; Yeh, T. S.; Balamuth, F.; Brierley, J.; de Caen, A. R.; Cheifetz, I. M.; Choong, K.; Conway Jr., E.; Cornell, T.; Doctor, A.; Dugas, M. A.; Feldman, J. D.; Fitzgerald, J. C.; Flori, H. R.; Fortenberry, J. D.; Graciano, A. L.; Greenwald, B. M.; Hall, M. W.; Han, Y. Y.; Hernan, L. J.; Irazuzta, J. E.; Iselin, E.; van der Jagt, É. W.; Jeffries, H. E.; Kache, S.; Katyal, C.; Kissoon, N.; Kon, A. A.; Kutko, M. C.; MacLaren, G.; Maul, T.; Mehta, R.; Odetola, F.; Parbuoni, K.; Paul, R.; Peters, M. J.; Ranjit, S.; Reuter-Rice, K. E.; Schnitzler, E. J.; Scott, H. F.; Torres Jr., A.; Weingarten-Abrams, J.; Weiss, S. L.; Zimmerman, J. J.; Zuckerberg, A. L. American College of Critical Care Medicine Clinical Practice Parameters for Hemodynamic Support of Pediatric and Neonatal Septic Shock. *Critical Care Medicine*. 2017;45(6), 1061-1093. doi:10.1097/CCM.0000000000002425 [Quality Measures, Clinical Practice Guidelines]

Davis, M. D.; Walsh, B. K.; Sittig, S. E.; Restrepo, R. D.. AARC clinical practice guideline: Blood gas analysis and hemoximetry. *Respiratory Care*. 2013;58(10), 1694-1703. [Quality Measures, Clinical Practice Guidelines]

Dellinger, R. P.; Levy, M. M.; Rhodes, A.; Annane, D.; Gerlach, H.; Opal, S. M.; Sevransky, J. E.; Sprung, C. L.; Douglas, I. S.; Jaeschke, R.; Osborn, T. M.; Nunnally, M. E.; Townsend, S. R.; Reinhart, K.; Kleinpell, R. M.; Angus, D. C.; Deutschman, C. S.; Machado, F. R.; Rubenfeld, G. D.; Webb, S. A.; Beale, R. J.; Vincent, J. L.; Moreno, R. Surviving sepsis campaign: International guidelines for management of severe sepsis and septic shock: 2012. *Critical Care Medicine*. 2013;41(2), 580-637. doi:10.1097/CCM.0b013e31827e83af [Quality Measures, Clinical Practice Guidelines]

Feld, L. G.; Neuspiel, D. R.; Foster, B. A.; Leu, M. G.; Garber, M. D.; Austin, K.; Basu, R. K.; Conway, E. E.; Fehr, J. J.; Hawkins, C.; Kaplan, R. L.; Rowe, E. V.; Waseem, M.; Moritz, M. L. Clinical practice guideline: Maintenance intravenous fluids in children. *Pediatrics*. 2018, Dec;142(6), e20183083. doi:10.1542/peds.2018-3083 [Quality Measures, Clinical Practice Guidelines]

Fuchs, J.; Adams, S. T.; Byerley, J. Current issues in intravenous fluid use in hospitalized children. *Reviews on Recent Clinical Trials*. 2017;12(4), 284-289. doi:10.2174/1574887112666170816145122 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Gulanick, M.; Myers, J. L. (2017). *Nursing care plans: Diagnoses, interventions and outcomes*. St. Louis: Mosby, Elsevier. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Hahn, A.; Heffren, J.; Abo, A. Improving evidence based care of community acquired pneumonia in children. *Clinical Pediatric Emergency Medicine*. 2018;19(1), 24-32. doi:10.1016/j.cpem.2018.02.011 Source [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Harris, M.; Clark, J.; Coote, N.; Fletcher, P.; Harnden, A.; McKean, M.; Thomson, A. British Thoracic Society guidelines for the management of community acquired pneumonia in children: Update 2011. *Thorax*. 2011;66(Suppl 2), ii1, ii23. doi:10.1136/thoraxjnl-2011-200598 [Quality Measures, Clinical Practice Guidelines]

Hockenberry, M. J.; Wilson, D.; Rodgers, C. C. (2019). *Wong's nursing care of infants and children*. St. Louis: Mosby, Elsevier. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Hull, J.; Aniapravan, R.; Chan, E.; Chatwin, M.; Forton, J.; Gallagher, J.; Gibson, N.; Gordon, J.; Hughes, I.; McCulloch, R.; Russell, R. R.; Simonds, A.. British Thoracic Society guideline for respiratory management of children with neuromuscular weakness. *Thorax*. 2012;67(Suppl 1), i1-i40. doi:10.1136/thoraxjnl-2012-201964 [Quality Measures, Clinical Practice Guidelines]

Jochum, F.; Moltu, S. J.; Senterre, T.; Nomayo, A.; Goulet, O.; Iacobelli, S.; Braegger, C.; Bronsky, J.; Cai, W.; Campoy, C.; Carnielli, V. ESPGHAN/ESPEN/ESPR/CSPEN guidelines on pediatric parenteral nutrition: Fluid and electrolytes. *Clinical Nutrition*. 2018;37(6), 2344-2353. doi:10.1016/j.clnu.2018.06.948 Source [Quality Measures, Clinical Practice Guidelines]

Kreitmeyr, K.; von Both, U.; Pecar, A.; Borde, J. P.; Mikolajczyk, R.; Huebner, J. Pediatric antibiotic stewardship: Successful interventions to reduce broad-spectrum antibiotic use on general pediatric wards. *Infection*. 2017;45(4), 493-504. doi:10.1007/s15010-017-1009-0 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Lanks, C. W.; Musani, A. I.; Hsia, D. W. Community-acquired pneumonia and hospital-acquired pneumonia. *Medical Clinics*. 2019;103(3), 487-501. doi:10.1016/j.mcna.2018.12.008 Source [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Lauwer, E.; Ides, K.; Van Hoorenbeeck, K.; Verhulst, S. The effect of intrapulmonary percussive ventilation in pediatric patients: A systematic review. *Pediatric Pulmonology*. 2018;53, 1463-1474. doi:10.1002/ppul.24135 [Metasynthesis, Meta-analysis, Systematic Review]

Mathur, S.; Fuchs, A.; Bielicki, J.; Van Den Anker, J.; Sharland, M. Antibiotic use for community-acquired pneumonia in neonates and children: WHO evidence review. *Paediatrics and International Child Health*. 2018;38(Suppl 1), S66-S75. doi:10.1080/20469047.2017.1409455 [Metasynthesis, Meta-analysis, Systematic Review]

National Institute for Health and Care Excellence (NICE). (2014). *NICE quality standard: Infection prevention and control*. Manchester, England: National Institute for Health and Care Excellence (NICE). [Quality Measures, Clinical Practice Guidelines]

National Institute for Health and Care Excellence (NICE). (2019). *Pneumonia (hospital-acquired): Antimicrobial prescribing. NICE guideline [NG139]*. Manchester, England: National Institute for Health and Care Excellence (NICE). Source

National Institute for Health and Care Excellence. (2015). *Intravenous fluid therapy in children and young people in hospital. (NICE guideline [NG29])*. Source [Quality Measures, Clinical Practice Guidelines]

National Institute for Health and Care Excellence. (2016). *Sepsis: Recognition, diagnosis and early management. (NICE guideline [NG51])*. Source [Quality Measures, Clinical Practice Guidelines]

Rhodes, A.; Evans, L. E.; Alhazzani, W.; Levy, M. M.; Antonelli, M.; Ferrer, R.; Kumar, A.; Sevransky, J. E.; Sprung, C. L.; Nunnally, M. E.; Rochwerg, B.; Rubenfeld, G. D.; Angus, D. C.; Annane, D.; Beale, R. J.; Bellinghan, G. J.; Bernard, G. R.; Chiche, J. D.; Coopersmith, C.; De Backer, D. P.; French, C. J.; Fujishima, S.; Gerlach, H.; Hidalgo, J.

L.; Hollenberg, S. M.; Jones, A. E.; Karnad, D. R.; Kleinpell, R. M.; Koh, Y.; Lisboa, T. C.; Machado, F. R.; Marini, J. J.; Marshall, J. C.; Mazuski, J. E.; McIntyre, L. A.; McLean, A. S.; Mehta, S.; Moreno, R. P.; Myburgh, J.; Navalesi, P.; Nishida, O.; Osborn, T. M.; Perner, A.; Plunkett, C. M.; Ranieri, M.; Schorr, C. A.; Seckel, M. A.; Seymour, C. W.; Shieh, L.; Shukri, K. A.; Simpson, S. Q.; Singer, M.; Thompson, B. T.; Townsend, S. R.; Van der Poll, T.; Vincent, J. L.; Wiersinga, W. J.; Zimmerman, J. L.; Dellinger, R. P. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock: 2016. *Intensive Care Medicine*. 2017;43(3), 304-377. doi:10.1007/s00134-017-4683-6 [Quality Measures, Clinical Practice Guidelines]

Rider, A. C.; Frazee, B. W. Community-acquired pneumonia. *Emergency Medicine Clinics*. 2018;36(4), 665-683. doi:10.1016/j.emc.2018.07.001 Source [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Ruben, D.; Restrepo, M. D.; Hirst, K. R.; Wittnebel, L.; Wettstein, R. AARC clinical practice guideline: Transcutaneous monitoring of carbon dioxide and oxygen. *Respiratory Care*. 2012;57(11), 1955-1962. [Quality Measures, Clinical Practice Guidelines]

Schmidt, G. L. (2015). In Fluids and electrolytes. Corkins, M. R (Eds.), *The ASPEN pediatric nutrition support core curriculum*. Silver Spring, MD: American Society of Parenteral and Enteral Nutrition. [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Scott, J. A. G.; Wonodi, C.; Moïsi, J. C.; Deloria-Knoll, M.; DeLuca, A. N.; Karron, R. A.; Bhat, N.; Murdoch, D. R.; Crawley, J.; Levine, O. S.; O'Brien, K. L.; Feikin, D. R. The definition of pneumonia, the assessment of severity, and clinical standardization in the Pneumonia Etiology Research for Child Health study. *Clinical Infectious Diseases*. 2012;54(Suppl 2), S109-S116. doi:10.1093/cid/cir1065 Source [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]

Siegel, J. D.; Rhinehart, E.; Jackson, M.; Chiarello, L.; Healthcare Infection Control Practices Advisory Committee. Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings. *American Journal of Infection Control*. 2007, June;35, S64-S164. [Quality Measures, Clinical Practice Guidelines]

Smith, M. J.; Gerber, J. S.; Hersh, A. L. Inpatient antimicrobial stewardship in pediatrics: A systematic review. *Journal of the Pediatric Infectious Diseases Society*. 2015;4(4), 1-9. doi:10.1093/jpids/piu141 [Metasynthesis, Meta-analysis, Systematic Review]

Sterling, S. A.; Miller, R.; Pryor, J.; Puskarich, M. A.; Jones, A. E. The impact of timing of antibiotics on outcomes in severe sepsis and septic shock: A systematic review and meta-analysis. *Critical Care Medicine*. 2015;43(9), 1907-1915. [Metasynthesis, Meta-analysis, Systematic Review]

Stern, A.; Skalsky, K.; Avni, T.; Carrara, E.; Leibovici, L.; Paul, M. Corticosteroids for pneumonia. *Cochrane Database of Systematic Reviews*. 2017;(12) doi:10.1002/14651858.CD007720.pub3 [Metasynthesis, Meta-analysis, Systematic Review]

Strickland, S. L.; Rubin, B. K.; Drescher, G. S.; Haas, C. F.; O'Malley, C. A.; Volsko, T. A.; Branson, R. D.; Hess, D. R. AARC clinical practice guideline: Effectiveness of nonpharmacologic airway clearance therapies in hospitalized patients. *Respiratory Care*. 2013;58(12), 2187-2193. doi:10.4187/respcare.02925 [Quality Measures, Clinical Practice Guidelines]

Strickland, S. L.; Rubin, B. K.; Haas, C. F.; Volsko, T. A.; Drescher, G. S.; O'Malley, C. A. AARC clinical practice guideline: Effectiveness of pharmacologic airway clearance therapies in hospitalized patients. *Respiratory Care*. 2015;60(7), 1071-1077. [Quality Measures, Clinical Practice Guidelines]

Warnapura, C.; Peiris, M. Intravenous fluid therapy in adults and children. Sri Lankan Journal of Anaesthesiology. 2017;25(1) doi:10.4038/slja.v25i1.8202 [Review Articles, Expert/Committee Opinion, Core Curriculum, Position Statements, Practice Bulletins]
