Idsa mrsa guidelines 2020

PDF Split View Article Content Figures and Tables Video Audio Additional Evidence Data Based On Guidelines for Managing Patients with Methicillin-Resistant Staphylococcus aureus (MRSA) Infections were prepared by an expert panel of the Society of Infectious Diseases of America (IDSA). The guidelines are intended to be used by medical professionals who care for adult and pediatric patients with MRSA infections. The guidelines discuss the management of various clinical syndromes associated with MRSA disease, including skin and soft tissue infections (SSTI), bacteriodia and endocarditis, pneumonia, bone and joint infections, and central nervous system (CNS) infections. Recommendations are provided for vancomycin supplementation and monitoring, treatment of infections due to MRSA strains with reduced susceptibility to vancomycin, and failures in the treatment of vancomycin. MRSA is the main cause of both health-related and community-related infections. This document is the first IDSA guidelines for the treatment of MRSA infections. The main purpose of these guidelines is to provide guidance on the management of some of the most common clinical syndromes faced by adult and pediatric doctors who care for patients with MRSA infections. Guidelines address issues related to the use of vancomycin therapy in the treatment of MRSA infections, including pre-monitoring and monitoring, ongoing limitations of susceptibility testing, and the use of alternative treatments for those patients with failure to treat vancomycin and infection due to strains with reduced susceptibility to vancomycin. The guidelines do not discuss active surveillance testing or other MRSA infection prevention strategies in health facilities, which are considered in previously published guidelines. Each section of the guidelines begins with a specific clinical question and is accompanied by moderate recommendations and a summary of the most relevant evidence to support the recommendations. Areas of contradiction in which data is limited or contradictory to each other and where more research is needed are listed throughout the document and highlighted in the Research Gaps section. The main recommendations are summarized below in the Executive Summary; each topic is discussed in more detail within the main body of the guidelines. Please note that specific recommendations for dosing and monitoring vancomycin are not discussed in sections for each clinical syndrome, but are collectively discussed in detail in Section VIII. SSTIs For to cutaneous incision and drainage is primary treatment (A-II). For simple abscesses or boils, incision and drainage are only likely to be adequate, but additional data are needed for determine the role of antibiotics, if any, in this environment. Antibiotic therapy is recommended for abscesses associated with the following conditions: severe or extensive diseases (e.g. involving multiple areas of infection) or rapid progression in the presence of associated cellulite, signs and symptoms of systemic diseases associated with comorbidities or immunosuppression, extremes of age, abscess in an area difficult to drain (e.g., face, arm, and genitalia) associated with septic tank For outpatients with plycing cellulite (e.g., cellulite associated with utocon drainage or exudate in the absence of drainage) is recommended. Empirical infection therapy due to β hemolytic streptococcus is likely to be unnecessary (A-II). Five to 10 days of therapy is recommended, but should be individualized based on the patient's clinical response. For outpatients with non-manipulative cellulite (e.g., cellulite without plyed drainage or exudate and without associated abscess) empirical infection therapy is recommended due to β-hemolytic streptococcus (A-II). The role of CA-MRSA is unknown. The empirical coverage of CA-MRSA is recommended for patients who do not respond to β-lactam therapy and may be considered in those with systemic toxicity. Five to 10 days of therapy is recommended, but should be individualized based on the patient's clinical response. For the empirical coverage of CA-MRSA in outpatient settings with SSTI, oral variants of antibiotics include: Clindamycin (A-II), trimeprem-sulfamexazole (TMP-SMX) (A-II), tetracycline (doxycycline or minocyline) (A-II) and linezolyid (A-II). If coverage for both β-hemolytic streptococcus and CA-MRSA is desirable, options include: Clindamycin only (A-II) or TMP-SMX or tetracycline in combination with β-lactam (e.g. amoxicillin) (A-II) or linezolid alone (A-II). The use of rifampin as a single agent or as an additional therapy for the treatment of SSTI is not recommended (A-III). For hospitalized patients with complex SSTI (cSSTI; defined as patients with deeper soft tissue infections, surgical/traumatic wound infection, major abscesses, cellulite, and infected ulcers and burns), in addition to surgical debridation and a wide range of antibiotics, MRSA empirical therapy should be considered in anticipation of crop data. Options include: intravenous (IV) vancomycin (A-I), oral (PO) or IV linezolid 600 mg twice a day (A-I), daptomycin 4 mg/kg/kg/dose IV once a day (A-I), telavancin 10 mg/kg/dose IV once a day (A-I), and clindamycin 600 mg IV or PO 3 times a day (A-III). Antibiotic β lactam (e.g. tsetazolin) can be considered in hospitalized with non-purulent cellulite with mrsA-active therapy modification, if there is no clinical response (A-II). (A-II). up to 14 days of therapy is recommended, but must be individualized based on the patient's clinical response. Cultures of abscesses and other pea SSTIs are recommended in patients treated with antibiotic therapy, patients with severe local infection or signs of systemic diseases, patients who have not responded adequately to initial treatment, and if there is concern about cluster or outbreak (A-III). Pediatric considerations 9. For children with minor skin infections (such as impetigo) and second infected skin lesions (such as eczema, ulcers or lacerations), mupirocin 2% topical ointment can be used (A-III).10. Tetracycline should not be used in children as young as 8 years old (A-II).11. In hospitalized children with KSTI recommended vancomycin (A-II). If the patient is stable without permanent bacteriology or intravascular infection, experiential therapy with clindamycin 10-13 mg/kg/dose IV every 6-8 hours (for the introduction of 40 mg/kg/day) is an option if the level of stability of klindamicin is low (e.g. lt;10%) switching to oral therapy if the strain is susceptible (A-II). Linezorid 600 mg PO/IV twice a day for children ≥12 years and 10 mg/kg/dose PO/IV every 8 hours for children of 12 years is an alternative (A-II). What is the management of periodic SSTIs MRSA? Recurring SSTIs 12. Preventive educational messages about personal hygiene and proper wound care are recommended for all patients with SSTI. Instructions should be provided:i. Keep drainage wounds covered with clean dry bandages (A-III).ii. Maintain good personal hygiene when bathing and cleaning your hands regularly with soap and water or alcohol-based gel, especially after touching contaminated skin or an object that is directly connected to a drainage wound (A-III). Avoid reusing or exchanging personal items (such as disposable razors, underwear and towels) that have been contacted by contaminated skin (A-III). Environmental hygiene measures should be taken into account in patients with recurrent SSTI at home or in community settings: i. Focus on high-touch surfaces (i.e. surfaces that come into frequent contact with people's bare skin every day, such as counters, doorknobs, bathtubs and toilet seats) that may come into contact with bare skin or detected infections (C-III). Commercially available cleaning products or detergents suitable for surface cleaning should be used in accordance with labeling instructions for routine surface cleaning (C-III).14 Decolonization can be considered in individual cases if:i. The patient develops periodic SSTI, despite optimizing wound care and hygiene (C-III). Continued transmission occurs among household members or close contact, despite the optimization of wound care and hygiene (C-III).15 Decolonization strategies should be offered in conjunction with continued strengthening of hygiene hygiene and may include: i. Decolonization of the nose with mupirocin twice a day for 5-10 days (C-III).ii. The decolonization of the nose with mupirocin twice a day for 5-10 days and topical schemes of decolonization of the body with antiseptic skin solution (e.g. chlorhexidine) for 5-14 days or dilute bleach. (For diluted bleach baths, 1 teaspoon per gallon of water (or 1/4 cup per 1/4 bath or 13 gallons of water) is given for 15 minutes twice a week for ~3 months can be considered.) (C-III).16. Oral antimicrobial therapy is recommended only for the treatment of active infection and is generally not recommended for decolonization (A-III). Oral agents combined with rifampin, if the strain is susceptible, can be considered for decolonization if infections are repeated despite the above measure (III).17. Where domestic or interpersonal transmission is suspected: i. Personal and environmental hygiene measures in the patient and contacts (A-III) are recommended. Contacts should be evaluated for evidence of S. aureus infection: a. Symptoms (A-III) should be evaluated and treated; Strategies for the decolonization of the nose and the actual body can be considered after the treatment of active infection (C-III).b. It is possible to consider the decolonization of the nasal and actual decolonization of the body of imptomatic household contacts (C-III).18. The role of cultures in managing patients with recurrent SSTI is limited: i. Pre-decolonization screening cultures are not generally recommended unless at least one of the previous infections has been documented as due to MRSA (B-III).ii. Post-decolonization surveillance cultures are generally not recommended in the absence of active infection (B-III). III. What is the management of MRSA bacterome and infectious endocarditis? Bacteremia and infectious endocarditis, native valve 19. For adults with uncomplicated bacteriology (defined as patients with positive blood culture results and the following: the elimination of endocarditis; No implanted prostheses; subsequent blood cultures performed on samples obtained 2-4 days after the initial set that do not grow MRSA; a delay of 72 hours from the onset of effective therapy; and no evidence of metastatic sites of infection, vancomycin (A-II) or dapttomycin 6 mg/kg/dose IV once a day (AI) for at least 2 weeks. In complex bacteriology (defined as patients with positive blood culture results that do not meet the criteria of simple bacteriology), 4-6 weeks of therapy is recommended, depending on the degree of infection. Some experts recommend higher doses of daptomycin at 8-10 mg/kg/dose IV once a day (B-III).20. Adults with infectious endocarditis are recommended IV vancomycin (A-II) or daptomycin 6 mg/kg/dose IV once a day (A-I) for 6 weeks. Some experts higher doses of daptomycin at 8-10 mg/kg/dose IV once a day (B-III).21. Adding Adding vancomycin is not recommended for bacterioma or native valve infection endocarditis (A-II).22. The addition of rifampin to vancomycin is not recommended for bacterimia or the native valve of infectious endocarditis (A-I).23. A clinical assessment should be carried out to identify the source and extent of infection with the elimination and/or debridation of other sites (A-II).24 Additional blood cultures 2-4 days after the initial positive crops and, as necessary thereafter, it is recommended to document the resolution of bacterimia (A-II).25. Echocardiography is recommended for all adult patients with bacteriology. Transesophageal Echocardiography (TEE) is preferable to transtoracal echocardiography (TTE) (A-II).26 Evaluation for valve replacement surgery is recommended if large vegetation (10 mm in diameter), the occurrence of ≥1 embolical event during the first 2 weeks of therapy, severe valve failure, valve perforation or dehisection, decompensated heart failure, perivalular or myocardial abscess, new heart block, or persistent fever or bacterience present (A-II). Infectious endocarditis, prosthetic valve 27. IV vancomycin plus rifampin 300 mg PO/IV every 8 hours for at least 6 weeks plus gentamicin 1 mg/kg/dose IV every 8 hours for 2 weeks (B-III).28. An early assessment for valve replacement surgery (A-II) is recommended. Pediatric considerations 29. In children, vancomycin 15 mg/kg/dose IV is recommended every 6 hours for the treatment of bacteriology and infectious endocarditis (A-II). The duration of therapy can vary from 2 to 6 weeks depending on the source, the presence of endovascular infection and metastatic pockets of infection. Data on the safety and efficacy of alternative agents in children are limited, although daptomycin 6-10 mg/kg/dose IV once a day may be an option (C-III). Clindamycin or linezorid should not be used if there is concern about infectious endocarditis or endovascular source of infection, but can be treated in children whose bacteremia is rapidly purified and is not associated with endovascular orientation (B-III).30. The data are not sufficient to support the regular use of combination therapy with rifampin or gentamicin in children with bacterioma or infectious endocarditis (C-III); the decision to use combination therapy should be individualized.31 Echocardiogram is recommended in children with congenital heart defects, bacteriology lasting more than 2-3 days or other clinical findings, indicate endocarditis (A-III). What is MRSA Pneumonia Management? Pneumonia 32. For hospitalized patients with severe community pneumonia, defined by any of the following: (1) the requirement for admission to the intensive care unit (ICU), (2) necrotizing or polyteran infiltration, or (3) MRSA empiric therapy is recommended pending the results of spraying and/or blood culture (A-III).33. For health reasons MRSA (HA-MRSA) or CA-MRSA pneumonia, IV vancomycin (A-II) or linezolid 600 mg PO/IV twice a day (A-II) or clindamycin 600 mg PO/IV 3 times a day (B-III) if the strain is susceptible, is recommended for 7-21 days, depending on the degree of infection.34. In patients with MRSA pneumonia, complicated by empyema, antimicrobial therapy against MRSA should be used in combination with drainage procedures (A-III). Pediatric considerations 35. IN children, IV vancomycin (A-II) is recommended. If the patient is stable without a permanent bacteriology or intravascular infection, clindamycin 10-13 mg/kg/dose IV every 6-8 hours (for the introduction of 40 mg/kg/day) can be used as an empirical therapy if the level of resistance of clindamycin is low (e.g. lt;10%) switching to oral therapy if the strain is susceptible (A-II). Linezorid 600 mg PO/IV twice a day for children ≥12 years and 10 mg/kg/dose every 8 hours for children of 12 years is an alternative (A-II). V. What is the management of MRSA bone and joint infections? Osteomyelitis 36. Surgical debrication and drainage of associated soft tissue abscesses is the basis of therapy and should be carried out as far as possible (A-II).37. The optimal route for the introduction of antibiotic therapy has not been established. Parenteral, oral or initial parenteral therapy followed by oral therapy may be used depending on the individual circumstances of the patient (A-III).38 Antibiotics available for parenteral administration include IV vancomycin (B-II) and daptomycin 6 mg/kg/dose IV once a day (B-II). Some variants of antibiotics with parenteral and oral injection routes include: TMP-SMX 4 mg/kg/dose (TMP component) twice a day in combination with rifampin 600 mg once a day (B-II), linezorid 600 mg twice a day (B-II), and clindamycin 600 mg every 8 h (B-III).39. Some experts recommend adding 600 mg of rifampin daily or 300-450 mg of PO twice a day to the antibiotic chosen above (B-III). For patients with simultaneous bacteriology, rifampin should be added after cleaning of bacterimia.40. The optimal duration of MRSA osteomyelitis therapy is unknown. A minimum 8-week course (A-II) is recommended. Some experts suggest an additional 1-3 months (and possibly longer for chronic infection or if debridation is not performed) oral rifampina-based combination therapy with TMP-SMX, doxycycline-minocyline, clindamycin, or fluoroquinolone, selected based on susceptibility (C-III).41. Magnetic resonance imaging (MRI) with gadolin is the method of visualization of choice, especially for the detection of early osteomyelitis and related soft tissue diseases (A-II). Red blood cell deposition levels (ESR) and/or C-reactive protein (CRP) may be useful for leading the response to therapy (B-III). Septic arthritis 42. Drainage or dismantling spaces should always run (A-II).43. For The For артрит, относятся к выбору антибиотиков для остеомиелита (рекомендация 37 выше). Предлагается 3-4-недельный курс терапии (A-III). Устройства связанных остеоартикулярных инфекций 44. Для раннего начала<2 months= after= surgery)= or= acute= hematogenous= prosthetic= joint= infections= involving= a= stable= implant= with= short= duration= (≤3= weeks)= of= symptoms= and= debridement= (but= device= retention),= initiate= parenteral= therapy= (refer= to= antibiotic= recommendations= for= osteomyelitis)= plus= rifampin= 600= mg= daily= or= 300–450= mg= po= twice= daily= for= 2= weeks= followed= by= rifampin= plus= a= fluoroquinolone,= tmp-smx,= a= tetracycline= or= clindamycin= for= 3= or= 6= months= for= hips= and= knees,= respectively= (a-ii).= prompt= debridement= with= device= removal= whenever= feasible= is= recommended= for= unstable= implants,= late-onset= infections,= or= in= those= with= long= duration= (=>(3 недели) симптомов (A-II).45. Для ранних инфекций спинномозговых имплантатов (≤30 дней после операции) или имплантатов в активно зараженном месте рекомендуется начальная парентеральная терапия плюс рифампин с последующим длительным пероральной терапией (B-II). Оптимальная продолжительность парентеральной и устной терапии неясна; последнее следует продолжать до тех пор , пока не будет происходить слияние позвоночника (B-II). При поздних инфекциях (через >30 дней после размещения имплантата) рекомендуется удаление устройства по мере возможности (B-II).46. Долгосрочные устные подавляющих антибиотиков (например, TMP-SMX, тетрациклин, фторхинолон , который должен быть дан в сочетании с рифампина из-за потенциального появления устойчивости фторхинолона, особенно если адекватное хирургическое дебридирование не представляется возможным должно быть дано в сочетании с рифампина, или клиндамицин) с или без рифампина могут быть рассмотрены в отдельных случаях, особенно если устройство Педиатрические соображения 47. Для детей с острым гематогенным остеомиелитом MRSA и септическим артритом рекомендуется IV ванкомицин (A-II). Если пациент стабилен без постоянной бактериемии или внутрисосудистой инфекции, клиндамицин 10-13 мг/кг/доза IV каждые 6-8 ч (для введения 40 <10%) with= transition= to= oral= therapy= if= the= strain= is= susceptible= (a-ii).= the= exact= duration= of= therapy= should= be= individualized,= but= typically= a= minimum= 3–4-week= course= is= recommended= for= septic= arthritis= and= a= 4–6-week= course= is= recommended= for= osteomyelitis.48. alternatives= to= vancomycin= and= clindamycin= include= the= following:= daptomycin= 6= mg/kg/day= iv= once= daily= (c-iii)= or= linezolid= 600= mg= po/iv= twice= daily= for= children= ≥12= years= of= age= and= 10= mg/kg/dose= every= 8= h= for= children=></10%)> <12 years of age (C-III). VI. What is the management of MRSA infections of the CNS? Meningitis 49. IV vancomycin 2 weeks is recommended (B-II). Some experts recommend the addition of rifampin 600 mg daily or 300–450 mg twice daily years= of= age= (c-iii).= vi.= what= is= the= management= of= mrsa= infections= of= the= cns?= meningitis= 49. iv= vancomycin= for= 2= weeks= is= recommended= (b-ii).= some= experts= recommend= the= addition= of= rifampin= 600= mg= daily= or= 300–450= mg= twice= daily=></12 years of age (C-III). VI. What is the management of MRSA infections of the CNS? Meningitis 49. IV vancomycin for 2 weeks is recommended (B-II). Some experts recommend the addition of rifampin 600 mg daily or 300–450 mg twice daily > мг/кг/день) может быть использован в качестве эмпирической терапии, если уровень устойчивости клиндамицина низок (например,</2> (например,</2> include: linezolid 600 mg PO/IV twice a day (B-II) or TMP-SMX 5 mg/kg/dose IV every 8-12 h (C-III).51. For CNS bypass infection, bypass surgery is recommended and should not be replaced until the cerebrosdal fluid (CSF) culture is repeatedly negative (A-II). Brain abscess, subdural empyea, cerebrosal epidural abscess 52. A neurosurgical assessment for incision and drainage (A-II) is recommended. IV vancomycin for 4-6 weeks is recommended (B-II). Some experts recommend adding 600 mg daily or 300-450 mg twice a day (B-III).54. Alternatives include: linezolid 600 mg PO/IV twice a day (B-II) and TMP-SMX 5 mg/kg/dose IV every 8-12 hours (C-III). Septic thrombosis of cavernous or venous sinus 55. If possible, surgical assessment of the incision and drainage of adjacent areas of infection or abscess (A-II) is recommended. The role of anticoagulation is controversial.56 IV vancomycin for 4-6 weeks is recommended (B-II). Some experts recommend adding 600 mg daily or 300-450 mg twice a day (B-III).57. Alternatives include: linezolid 600 mg PO/IV twice a day (B-II) and TMP-SMX 5 mg/kg/dose IV every 8-12 hours (C-III). Pediatric considerations 58. FIRST vancomycin (A-II). Vii. What is the role of complementary therapy for MRSA infections? 59. Protein synthesis inhibitors (e.g. Clindamycin and linezorid) and intravenous immunoglobulin (IVIG) are generally not recommended as complementary therapies for invasive mrsA (A-III) diseases. Some experts may consider these agents in separate scenarios (e.g. necrotizing pneumonia or severe sepsis) (C-III). VIII. What are the recommendations for vancomycin and monitoring? These recommendations are based on a consensus statement by the American Society of Healthcare Pharmacists, IDSA and the Society of Infectious Disease Pharmacists on the guidelines for vancomicin dosing (3, 4). The adults are 60 years old. IV vancomycin 15-20 mg/kg/dose (actual body weight) every 8-12 hours, not exceeding 2 grams per dose, is recommended for patients with normal kidney function (B-III).61. In seriously ill patients (e.g. sepsis, meningitis, pneumonia or infectious endocarditis) with suspected MRSA infection can be considered a loading dose of 25-30 mg/kg (actual body weight). (Given the risk of red human syndrome and possible anaphylaxis associated with large doses of vancomycin, consideration should be given to extending the infusion time to 2 hours and using antihistamines until the dose load is administered.) (C-III).62. Concentrations of vancomycin in the trough are the most accurate and practical method of managing the dosing of vancomycin (B-II). Concentrations of the trough serum should be obtained in stable conditions up to the fourth or fifth dose. Monitoring of peak concentrations of vancomycin vancomycin (B-II).63. In serious infections such as bacteremia, infectious endocarditis, osteomyelitis, meningitis, pneumonia and severe SSTI (e.g. necrotizing fasciitis) due to MRSA, vancomycin in the trough concentration of 15-20 micrograms/ml is recommended (B-II).64. For most patients with SSTI who have normal kidney function and are not obese, traditional doses of 1 g every 12 hours are adequate, and trough monitoring is required (B-II).65 Monitoring of the vancomycin trough is recommended for serious infections and patients who are painfully obese, have renal dysfunction (including those who receive dialysis), or have fluctuating distribution volumes (A-II).66 Continuous infusion vancomycin schemes are not recommended (A-II). Pediatrics 67. The data is limited to the guidance of vancomycin in children. IV vancomycin 15 mg/kg/dose every 6 h is recommended in children with serious or invasive diseases (B-III).68. The efficacy and safety of orientation trough concentrations of 15-20 micrograms/ml in children requires further study, but should be considered in those with serious infections such as bacteremia, infectious endocarditis, osteomyelitis, meningitis, pneumonia, and severe SSTI (i.e., necrotizing fasciitis) (B-III). IX. How should I use the results of the test for susceptibility to vancomycin to guide therapy? 69. For minimal inhibitory concentration (MIC) ≤2 microgram/ml (e.g., susceptible in accordance with clinical and laboratory standards of the Institute of Break Points) clinical patient reactions should determine the further use of vancomycin, regardless of MIC (A-III).i. If the patient had a clinical and microbiological reaction to vancomycin, it may be a follow-up to the clinical and microbiological response to vancomycin. If the patient has not had a clinical or microbiological reaction to vancomycin, despite adequate scattering and removal of other pockets of infection, an alternative to vancomycin is recommended regardless of MIC.70. For MIC vancomycin isolates (e.g. vancomycin-intermediate S. aureus (VISA) or vancomycin-resistant S. aureus (VRSA), an alternative to vancomycin should be used (A-III). X. What is the management of persistent MRSA bacteria and the failure of vancomycin treatment in adult patients? It is recommended that other outbreaks, drainage or surgical debrication (A-III) be searched and removed. High-dose daptomycin (10 mg/kg/day) if isolate is susceptible, combined with another agent (e.g. gentamicin 1 mg/kg IV every 8 hours, rifampin 600 mg PO/IV daily or 300-450 mg PO/IV twice a day, linezoid 600 mg PO/IV BID, TMP-SMX 5 mg/kg IV twice a day, or beta-lactam antibiotic) should be considered (B-III).73. In reducing susceptibility to vancomycin and daptomycin, the following options are available: 7.5 mg/kg/dose IV every 8 h, TMP-SMX 5 mg/kg/dose IV twice a day, day, 600 mg PO/IV twice a day, or telavancin 10 mg/kg/dose IV once a day (C-III). These options can be given as a single agent or in combination with other antibiotics. XI. What is MRSA infection management in newborns? Neonatal pustule 74. In mild cases with localized disease, local treatment with mupirocin may be adequate in newborns and young children (A-III).75 For localized diseases in premature or very low birth weight or more extensive disease involving multiple sites in newborns for a full term, IV vancomycin or clindamycin is recommended, at least initially, until the bacterium is ruled out (A-II). Neonatal sepsis MRSA 76. IV vancomycin is recommended, dosing as stated in the Red Book (A-II) .77. Clindamycin and linezorid are an alternative to non-vascular infections (B-II). The prevalence of MRSA has been steadily increasing since the first clinical isolate was described in 1961, with an estimated 94,360 cases of invasive MRSA disease in the United States in 2005. Originally almost exclusively health care-related, by the mid-1990s, MRSA strains were reported as causing infections among previously healthy people in the community who did not have health care-related risk factors. Unlike HA-MRSA, these so-called CA-MRSA isolates are susceptible to many non-lactam antibiotics. In addition, they are genetically different from HA-MRSA isolates and contain a new cassette element, SCCmec IV and exotoxin, Panton-Valentine leukocidin (PVL). THE epidemiology of MRSA is becoming increasingly complex as ca-MRSA and HA-MRSA strains have mixed in both the community and health facilities. Not suddenly, MRSA disease had an enormous clinical and economic effect. A wide range of diseases caused by MRSA include SSTIs, bacteremia and endocarditis, pneumonia, bone and joint infections, CNS disease, and toxic shock and sepsis syndromes. CA-MRSA was the most common cause of SSTI in a geographically diverse network of emergency departments in the United States; however, there may be differences in local epidemiology in the implementation of these guidelines. SSTIs can range in clinical presentation from simple abscess or cellulite to deeper soft tissue infections such as piomiositis, necrotizing fasciitis, and mediatritis as a complication of retrofaring abscess. Bacteremia accompanies the majority (75%) cases of invasive MRSA disease. Many manifestations of diseases have been described, including, but not limited to, infectious endocarditis; myocardium, peri-jade, liver and abscess slut; septic thrombophlebitis with and without pulmonary embolism; necrotizing pneumonia (17-21 years); osteomyelitis, complicated abscesses; venous thrombosis and persistent bacteremia (16, 22, 23); severe eye infections, infections, Endofthalmite (24); sepsis with purpura fulminamines (and Waterhouse-Friedericsen syndrome. III. What is the management of MRSA bacterome and infectious endocarditis?IV. What is the management of MRSA pneumonia?V. What is the management of MRSA bone and joint infections?VI. What is the management of MRSA CNS infections? Vii. What is the role of complementary therapy for MRSA infections? VIII. What are the recommendations for vancomycin and monitoring? IX. How should the test results be used for vancomycin susceptibility to guide therapy?X. What is the management of persistent MRSA bacteria and the failures of the treatment of vancomycin? XI. What is MRSA management in newborns? PRACTICE GUIDELINES are systematically designed by applications to assist practitioners and patients in making decisions about appropriate care for specific clinical circumstances. The attributes of good guidelines include validity, reliability, reproducibility, clinical applicability, clinical flexibility, clarity, interdisciplinary process, review of evidence and documentation. METHODOLOGY Group Makeup IDSA Standards and Practice Steering Committee (SPGC) has convened adult and pediatric infectious disease experts in patient management with MRSA. A review of the literature and analysis of the 2010 guidelines by the Panel of Experts completed a review and analysis of data published since 1961. The computerized literary searches for PUBMED English literature were conducted from 1961 to 2010 using the terms methicillin-resistant Staphylococcus aureus or MRSA and focused on human studies, but also included studies of experimental animal models and data in vitro. Several abstracts from national meetings were included. Several randomized clinical trials have been conducted; many of the recommendations were based on observations or small thematic series, combined with the views of panel members. Reviewing the evidence-based evaluation of MRSA management, the Panel followed the process used in the development of other IDSA guidelines. This process included systematically weighing the quality of the evidence and evaluating recommendations (table 1). Table 1.The strength of the recommendation and the quality of the Evidence Category/Assessment Definition of Strength recommendations Are Good Evidence to support recommendations for or against use. B Moderate evidence to support the recommendation for or against use. C Bad evidence to support the recommendation. The quality of the evidence that I have evidence from ≥1 properly randomized, Test. II Evidence from ≥1 ≥1 Clinical trials, without randomization; of cohort or case-controlled analytical studies (preferably a centre); From several time series; or the dramatic results of uncontrolled experiments. III Evidence from the opinions of respected authorities based on clinical experience, descriptive studies or reports of expert committees. Consensus Development Based Evidence Group held in 7 cases through a teleconference to complete the work of the manual and the 2007 annual meeting of IDSA and the 2008 Joint Interscience Conference on Antimicrobial Agents and Chemotherapy/IDSA Meeting. The purpose of the meetings was to discuss issues that needed to be addressed, to submit written assignments and to discuss recommendations. All members of the team participated in the preparation and review of the draft guidelines. Feedback from external expert reviews has been received. The guidance was reviewed and approved by the Society for Pediatric Infectious Diseases, the American College of Emergency Physicians and the American Academy of Pediatrics. This guidance was reviewed and approved by IDSA SPGC and the IDSA Board of Directors prior to distribution. The Guidelines and Conflicts of Interest All members of the Panel of Experts have complied with IDSA's conflict of interest policy, which requires disclosure of any financial or other interests that may be construed as representing an actual, potential or obvious conflict. Members of the Panel of Experts were presented with an IDSA statement of conflict of interest and were asked to establish links with companies by developing products that might be affected by the publication of the manual. Information on employment, advice, stock ownership, fees, research funding, expert testimony and membership in company advisory committees was requested. The Panel decides on a case-by-case basis as to whether a person's role as a result of the conflict should be limited. Potential conflicts are listed in the Confessions section. LITERATURE OVERVIEW Antimicrobial Therapy Clindamycin. Clindamycin is approved by the U.S. Food and Drug Administration (FDA) to treat serious infections due to S. aureus. Although not specifically approved to treat MRSA infection, it has become widely used to treat SSTI and has been successfully used to treat invasive susceptible CA-MRSA infections in children, including osteomyelitis, septic arthritis, pneumonia, and lymphadenitis (22, 29-31). Since it is bacteriostatic, it is not recommended for endovascular infections such as infectious endocarditis or septic thrombophlebitis. Clindamycin has excellent tissue penetration, especially in bones and abscesses, although penetration into CSF is limited. In vitro, the susceptibility to clindamycin is higher among CA-MRSA than among HA-MRSA, there are differences in geographical region (29, 36, 37). The d-zone test is recommended for detecting the non-responsive resistance of clindamycin in erythromycin-resistant, clindamycin-susceptible isolates and is now readily available. Diarrhea is the most common side effect and occurs in up to 20% of patients, and Clostridium difficile-related diseases may occur more frequently compared to other oral agents. Oral suspension is often not well tolerated in children, although this can be overcome with the addition of flavors. This is a category B pregnancy. Daptomycin. Daptomycin is a lipopeptide-grade antibiotic that disrupts the function of the cell membrane through calcium-dependent binding, resulting in bactericide activity in a concentration-dependent fashion. It is approved by the FDA for adults with the S. aureus bacterium, right-sided infectious endocarditis and cSSTI. It should not be used to treat NEMATOgenic pneumonia MRSA, as its activity is suppressed by pulmonary surfactant. It is highly protein-related (91%) and is highly protein-related (91%). and re-released. The point of rupture of susceptibility to daptomycin for S. aureus is ≤1 microgram/ml. Unceptable isolates appeared during therapy due to the failure of treatment (42-45). Although the mechanism of resistance is not clear, single-hour mutations in mprF, the gene of lisylphosphatiglycerol synthease, are often present in such strains. Prior to the exposure to vancomycin and elevated vancomycin, MIC was associated with an increase in MIC-daptomycin, indicating possible cross-resistance (45, 47, 48). Rises in creatinine phosphokinase (CPK), which rarely cures, have occurred in patients receiving 6 mg/kg/day, but not in those who receive 4 mg/kg/day of daptomycin (49, 50). Patients should be observed for developing muscle pain or weakness and have weekly levels of CPK determined, with more frequent monitoring in those with renal failure or who receive accompanying statin therapy. Several cases of deptomycin-induced eosinophil pneumonia have been described. Pharmacokinetics, the safety and efficacy of daptomycin in children have not been established and are under investigation. Daptomicin is a pregnancy category B. Linezolid Linezolid is a synthetic oxazolydinone and inhibits the initiation of protein synthesis in ribosomes 50S. It is approved by the FDA for adults and children for the treatment of SSTI and nosocomial pneumonia due to MRSA. It has in vitro activity against VISA and VRSA (53-55). It has 100% oral bioavailability; Hence, parenteral therapy should only be given if there is a problem with gastrointestinal absorption or if the patient is unable to take oral medication. Resistance to linesolid is rare, although an outbreak of MRSA resistant to the zolid line has been described. Resistance usually occurs during the use with mutation mutation 23S ribosome RNA (rRNA) binding place for linisolide (57) or cfr gene-mediated methylation of adenosine at position 2503 in 23SrRNA (58, 59). Long-term use is limited by hematological toxicity, with thrombocytopenia more common than anemia and neutropenia, peripheral and optical neuropathy and milk acidosis. Although myelosuppression is generally reversible, peripheral and optical neuropathy is not reversible or only partially reversible. Linezolid is a weak, non-selective, reversible monoamine oxidase inhibitor and has been associated with serotonin syndrome in patients taking simultaneously selective serotonin receptor inhibitors. Linezolid causes less bone marrow suppression in children than causes in adults. The most common side effects in children are diarrhea, vomiting, loose stools and nausea. Linezolid suspension may not be allowed due to taste and may not be available in some pharmacies. Pregnancy category C. Kvinupristin-Dalfopristin is considered. Cuinupristin-dalfopristin is a combination of 2 antibiotics strepthogramin and suppresses protein synthesis. It is approved by the FDA for cSSTI in adults and children of 16 years. It has been used as a lifesaving therapy for invasive MRSA infections in the face of failed treatment of vancomycin in adults and children (64-66). Toxicity, including artralgia, myalgia, nausea and reactions associated with infusion, limited its use. Kvinupristin-Dalfopristin is considered to be a pregnancy category B. Rifampin. Rifaping has bactericide activity against S. aureus and reaches high intracellular levels, in addition to penetrating biofilms (67-69). Due to the rapid development of resistance, it should not be used as a monotherapy, but can be used in conjunction with another active antibiotic in separate scenarios. The role of rifampin as an additional therapy for MRSA infections has not been definitively established, and there is no adequate nutrition in the literature, controlled clinical studies. The potential use of rifampin as an additional therapy for MRSA infections is discussed in various sections throughout these guidelines. It should be noted rifampin dosing is highly variable throughout the literature, ranging from 600 mg daily in one dose or in 2 divided doses to 900 mg per day in 2 or 3 divided doses (70-74). The range of rifampin doses in these guidelines is proposed on the basis of limited published data and is considered reasonable on the basis of expert opinion. More research is needed to determine the role and optimal dosing of rifampin in THE management of MRSA infections. Telavancin. Telavancin is a parenteral lipolycopepide that inhibits cell wall synthesis by binding to precursors of the peptidoglycan chain, causing cell membrane. It is bactericide against MRSA, VISA and VRSA. This is FDA-approved for cSSTI in adult adults Is Pregnancy Category C. Creatine levels should be monitored, and dosage should be adjusted based on creatinine clearance, because nephrotoxicity is more common among individuals treated with telavancin than among those treated with vancomycin in two clinical trials (monitoring serum levels are unavailable. tetracycline. which are caused by MRSA. Although tetracyclines have activity in vitro, data on the use of tetracycline to treat MRSA infections are limited. tetracyclines appear to be effective in treating STIs, but data are lacking to support their use in more invasive infections. Although the tetracycline in THE CAS-MRSA isolates is primarily associated with the aunt. without any effect on the susceptibility of minocycline. Thus, minocycline can be a potential alternative in such cases. Minocycline is

available in oral and parenteral compositions. Tigecycline is a glycylicyl, a derivative of tetracycline, and is approved by the FDA in adults for cSSTIs and intraabdominal infections. It has a large distribution volume and reaches high concentrations in tissues and low concentrations in serum (1 microgram/ml). For this reason, and because it exhibits bacteriotic activity against MRSA, caution should be used in the treatment of patients with bacteriology. The FDA recently issued a warning to consider alternative agents in patients with serious infections due to increased mortality from all causes noted during Phase III/IV clinical trials. Tetracyclines are a category D pregnancy and are not recommended for children as young as 8 years old due to the possibility of tooth enamel discoloration and reduced bone growth. TMP-SMX. TMP-SMX is not approved by the FDA for the treatment of any staph infections. However, since 95%-100% of CA-MRSA strains are susceptible in vitro (81, 82), this has become an important option for outpatient SSTI treatment (83-85). Several studies, primarily involving methicillin-susceptible S. aureus (MSSA), have suggested a role in bone and joint infections (86-88). Several reports of cases (89) and 1 randomized trial indicate potential efficacy in the treatment of invasive staphylococcal infections such as bacteremia and endocarditis. TMP-SMX is effective for treating plyed SSTI in children. It has not been evaluated for the treatment of invasive CA-MRSA infections in children. Caution is recommended when using TMP-SMX to treat elderly patients, especially those receiving simultaneous renin-angiotensin system inhibitors and those with chronic renal failure, due to increased risk TMP-SMX is not recommended for pregnant women in the third trimester of pregnancy when it is considered a category C/D pregnancy, or in children younger than 2 months. Vancomycin. Vancomycin was the basis of parenteral therapy for MRSA infections. However, its effectiveness has come into question, with concerns about its slow bactericide activity, the emergence of resistant strains, and possible MIC creep among susceptible strains .93-95. Vancomycin kills staphylococcus more slowly than β lactam in vitro, especially in higher inoculas (107-109 units of colonies) and is clearly inferior to β-lactam bacteriology and infectious endocarditis. Tissue penetration is highly variable and depends on the degree of inflammation. Specifically, it has limited penetration into the bone, the light epithelial lining of the fluid (103) and CSF (104, 105). Vancomycin is considered a category C pregnancy. Vancomycin testing, monitoring and susceptibility are discussed in Sections VIII and IX.3 RECOMMENDATIONS FOR MANAGEMENT PATIENTS WITH SERVICES CAUSED BY MRSA I. What is the management of SSTIs in the era of CA-MRSA? SSTI 1. For cutaneous abscess, incision and drainage is the main treatment (A-II). For simple abscesses or boils, incision and drainage are only likely adequate, but additional data are needed to further determine the role of antibiotics, if any, in this setting.2 Antibiotic therapy is recommended for abscesses associated with the following conditions: severe or extensive diseases (e.g. involving multiple areas of infection) or rapid progression in the presence of associated cellulite, signs and symptoms of systemic diseases associated with comorbidities or immunosuppression, extremes of age, abscess in an area difficult to drain (e.g., face, arm, and genitalia) associated with septic tank For outpatients with plycing cellulite (e.g., cellulite associated with utocon drainage or exudate in the absence of drainage) is recommended. Empirical infection therapy due to β haemolytic streptococcus is probably not needed (A-II). Five to 10 days of therapy is recommended, but it should be individualized based on the patient's clinical response4. For outpatients with non-manipulative cellulite (e.g., cellulite without plyed drainage or exudate and without associated abscess) empirical infection therapy is recommended due to β-hemolytic streptococcus (A-II). The role of CA-MRSA is unknown. The empirical coverage of CA-MRSA is recommended for patients who do not respond to β-lactam therapy and may be considered in those with systemic toxicity. Five to 10 days of therapy is recommended, but it should be individualized based on the patient's clinical response5. For CA-MRSA's empirical coverage With SSTI, oral variants of antibiotics include: Clindamycin (A-II), TMP-SMX (A-II), tetracycline (doxycycline or minocycline) (A-II), and linezolid (A-II). If coverage for both β-hemolytic streptococcus and CA-MRSA is desirable, options include: Clindamycin only (A-II) or TMP-SMX or tetracycline in combination with β-lactam (e.g. amoxicillin) (A-II) or linezolid only (A-II).6. The use of rifampin as a single agent or as an additional therapy for the treatment of SSTI is not recommended (A-III).7. For hospitalized patients with complex SSTI (CSSTI: defined as patients with deeper soft tissue infections, surgical/traumatic wound infection, major abscesses, cellulite, and infected ulcers and burns) SSTI, in addition to surgical debridement and a wide range of antibiotics, empirical therapy for MRSA should be considered in anticipation of crop data. Options include: IV vancomycin (A-I), linezolid 600 mg PO/IV twice a day (A-I), daptomycin 4 mg/kg/dose IV once a day (A-I), telavancin 10 mg/kg/dose IV once a day (A-I), clindamycin 600 mg IV/PO three times a day (A-III). Antibiotic β lactam (e.g. cekasolin) can be considered in hospitalized patients with nonpurulent cellulite with MRSA-active therapy modification, if there is no clinical response (A-II). Seven to 14 days of therapy is recommended, but it should be individualized based on the patient's clinical response8. Cultures from abscesses and other pea SSTI are recommended in patients treated with antibiotic therapy, patients with severe local infection or signs of systemic diseases, patients who have not responded adequately to initial treatment, and if there is concern about cluster or outbreak (A-III). Pediatric considerations 9. For children with minor skin infections (such as impetigo) and second infected skin lesions (such as eczema, ulcers or lacerations), mupirocin 2% topical ointment can be used (A-III).10. Tetracycline should not be used in children as young as 8 years old (A-II).11. In hospitalized children with KSTI recommended vancomycin (A-II). If the patient is stable without permanent bacteriology or intravascular infection, experiential therapy with clindamycin 10-13 mg/kg/dose IV every 6-8 hours (for the introduction of 40 mg/kg/day) is an option if the level of stability of klindamicin is low (e.g. lt;10%) switching to oral therapy if the strain is susceptible (A-II). Linezorid 600 mg PO/IV twice a day for children ≥12 years and 10 mg/kg/dose PO/IV every 8 hours for children of 12 years is an alternative (A-II). Evidence Summary The emergence of CA-MRSA has led to a sharp increase in emergency room visits and hospitalizations for SSTIs (106, 107). With minor skin infections (such as impetigo) and second infected skin lesions (such as eczema, ulcers or lacerations) mupirocin 2% of local ointment may be In cokenous abscesses, the main treatment is incision and drainage. For small boils, the moist heat that helps promote drainage may be enough. It remains debatable whether antibiotics provide any clinically significant added benefit, but incision and drainage are probably adequate for most simple abscesses. Multiple, mostly observational studies show a high rate of cure (85%-90%) whether an active antibiotic is used (11, 81, 110-112). Two recently published randomized clinical trials involving adult and pediatric patients showed no significant difference in treatment levels when TMP-SMX was compared with placebo; however, it has been suggested that antibiotics may prevent the short-term development of new lesions. Two retrospective studies show an improvement in treatment rates if an effective antibiotic is used (85, 115). We hope that additional promising large-scale studies that are already under way will provide more definitive answers to these questions. Antibiotic therapy is recommended for abscesses related to conditions listed in Table 2 (83, 116). Conditions in which antimicrobial therapy is recommended after incision and drainage of abscess due to community-associated methicillin-resistant Staphylococcus a severe or extensive disease (e.g. involving multiple sites of infection) or rapid progression in the presence of associated cellulite Signs and symptoms of systemic diseases Associated comorbidities or immunosuppression (diabetes, human immunodeficiency virus infection / AIDS, neoplasm) Extreme age abscess in an area difficult to drain completely (e.g. face, hand, and genitalia) Associate septic phlebitis No reaction to incision and drainage only Table 3.Recommendations for the treatment of methicillin-resistant Staphylococcus aureus (MRSA) Manifestation Treatment Adult Dose Baby Dose Classa Skin Comment and Soft Tissue Infection (SSTI) Abscess, boils, carbuncle incision and drainage Please refer to Table 2 for conditions in which antimicrobial therapy is recommended after incision and drainage of the abscess due to CA-MRSA. Auld cellulite (defined as cellulite, associated with purt drainage or exudate in the absence of drained abscesses) Clindamycin 300-450 mg PO TID 10-13 mg/kg/dose PO every 6-8 hours, does not exceed 40 mg/kg/day AII Clostridium difficile-associated disease may occur more often than other oral agents. TMP-SMX 1-2 DS TAB PO BID Trimethoprim 4-6 mg/kg/dose, sulfamethoxazole 20-30 mg/kg/dose PO every 12h AII TMP-SMX is a category C/D pregnancy and is not recommended for women in the third trimester of pregnancy and for children of 2 months. Doxycycline 100 mg PO BID PO every 12 qgt;45kg: Adult doses of AII tetracycline are not recommended for children under 8 years of age and pregnancy category D. Minocycline 200 mg × 1, then 100 mg PO BID 4 mg/kg PO × 1, then 2 mg/kg/dose PO every 12h AII Linezolid 600 mg PO BID 10 mg/kg/dose PO every 8 hours, do not exceed 600 mg/dose AII More expensive compared to other alternatives to non-purple cellulite (defined as cellulite without zoul drainage or exudate and without associated abscess) β-lac (e.g. cephalexin and dicloxacillin) 500 mg PO SID Please refer to the Red Book AII empirical therapy for β-hemolytic streptococcus recommended (AII). The empirical coverage of CA-MRSA is recommended for patients who do not respond to β-lactam therapy and may be considered in those with systemic toxicity. Clindamycin 300-450 mg PO TID 10-13 mg/kg/dose PO every 6-8 hours, Do not exceed 40 mg/kg/day AII Provide coverage for both β-hemolytic streptococcus and CA-MRSA β-lactam (e.g. amoxicillin) and/or TMP-SMX or tetracycline Amoxicillin: 500 PO mg TID See above for TMP-SMX and tetrakine dosing, Please Refer to the Red Book See above for TMP-SMX and Tetracycline Dosing AII Provide coverage for both β-hemolytic streptococcus and CA-MRSA Linezolid PO BID 10 mg/kg/dose PO every 8 hours to not exceed 600 mg/dose AII Provide coverage as B-hemolytic streptococcus and CA-MRSA Complex SSTI Vancomycin 15-20 mg/kg/dose IV every 8-12 hours 15 mg/kg/dose IV every 6 h AI/AII Linezolid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours , do not exceed 600 mg/dose of AI/AI for children ≥12 years, 600 mg PO/BID IV. Pregnancy category C Daptomycin 4 mg/kg/dose IV DD Current AI/ND Dose study in children, 5 mg/kg (age 12-17 years), 7 mg/kg (age 7-11 years), 9 mg/kg (age 2-6 years) (Clinicaltrials.gov NCT 00711802). Pregnancy category B. Telavancin 10 mg/kg/dose IV ND AI/ND Pregnancy category C C Clindamycin 600 mg PO/IV TID 10-13 mg/kg/dose PO/IV every 6-8 hours, Do not exceed 40 mg/kg/day AIII/AII Pregnancy Category B Bacteremia and Infectious Endocarditis Baccomicemia 15-20 mg/kg/dose IV every 8-12 h 15 mg/kg/dose IV every 6 h AII Adding Gentamicine (AI) or rifampin (II) to vancomycin is not generally recommended. Daptomycin 6 mg/kg/dose IV DD 6-10 mg/kg/dose IV ET/CIII For adult patients, some experts recommend higher doses of 8-10 mg/kg/dose IV DD (BIII). Pregnancy category B. Infectious endocarditis, native valve Just as in bacterimia infectious endocarditis, vancomycin prosthetic valve and gentamicin and rifampin 15-20 mg/kg/dose IV every 8-12 h 15 mg/kg/dose IV every 6 mg BIII 1 mg/kg/dose IV every 8 h 1 mg/kg/dose IV every 8h 300 mg PO/IV every 8h 5 mg/kg PO/IV every 8 Bacteremia Please See the text pneumonia Vancomycin 15-20 mg/kg /dose IV every 8-12 h 15 mg/kg/dose IV every 6 h AII Linezolid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, does not exceed 600 mg/dose AII For children ≥12 years, 600 mg IV Pregnancy category C. Clindamycin 600 mg PO/IV TID 10-13 mg/kg/dose PO/IV every 6-8 hours, Do not exceed 40 mg/kg/day BIII/AII Pregnancy Category B. Bone and joint infections Osteomyelitis Vancomycin 15-20 mg/kg/dose IV every 8-12 h 15 mg/kg/dose IV every 6 h BII/AII Surgical debridation and drainage of associated soft tissue abscesses is the basis of therapy. (AII). Some experts recommend adding 600 mg of yD or 300-450 mg of BID to the selected antibiotic (BIII). Linezolid 600 mg PO/IV BID should be used for children of ≥12 years of age. The single and DS tablet TMP-SMX contains 80 mg and 160 mg of TMP, respectively. For an adult weighing 80 kg 2 DS tablets reach a dose of 4 mg/kg. Daptomycin 6 mg/kg/day IV DD 6-10 mg/kg/day IV DD BII/CIII Linezolid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, Do not exceed 600 mg/dose of BII/III Clindamycin 600 mg PO/IV TID 10-13 mg/kg/dose PO/IV every 6-8 hours, do not exceed 40 mg/kg/day BIII/AII TMP-SMX and rifampin 3.5-4.0 mg/kg/po/IV dose every 8-12h ND BII/ND 600 mg PO septic arthritis vancomycin 15-20 mg/kg/dose IV every 8-12 h 15 mg/kg/dose IV every 6 h BII/AII Drainage or disriding of joint space should always be performed (AII). Daptomycin 6 mg/kg/day IV DD 6-10 mg/kg/dose IV DD BII/CIII Linezorid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, Do not exceed 600 mg/dose of BII/III Clindamycin 600 mg PO/IV TID 10-13 mg/kg/dose PO/IV every 6-8 hours, Do not exceed 40 mg/kg/day BIII/AII TMP-SMX 3.5-4.0 mg/kg/dose PO/IV every 8-12 h ND BIII/ND Joint Prosthetics, Spinal implant infection Please see the text of Central Nervous System Infection Meningitis Vancomycin 1 15-20 mg/kg/dose IV every 8-12 hours 15 mg/dose IV every 6 h BII Some experts recommend the addition of rifampin 600 mg of ed or 300-450 mg of IDE to vancomycin for adults (BIII). For children ≥12 years old, linezolid 600 mg BID. Linezorid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, no more than 600 mg/dose BII TMP-SMX 5 mg/kg/dose PO/IV every 8-12h ND III/ND Braincess abscess, subdural empyum, cerebrospinal epidural abscess Vancomycin 15-20 mg/kg/dose IV every 8-12 hours 15 mg/kg/dose IV every 6 h BII Some experts recommend the addition of rifampin 600 mg yD or 300-450 mg of BED to vancomycin for adult patients (BIII). For children ≥12 years old, linezolid 600 mg BID. Linezorid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, no more than 600 mg/kg/dose PO/IV every 8-12 h ND III/ND Septic thrombosis of cavernous or dural venous sinus vancomicin 15-20 mg/kg/dose IV every 8-8-1 2 h 15 mg/kg/dose IV every 6 h BII Some experts recommend adding rifampin 600 mg DD or 300-450 mg of BID to vancomycin for adult patients (BIII). For children ≥12 years old, linezolid 600 mg BID Linezolid 600 mg PO/IV BID 10 mg/kg/dose PO/IV every 8 hours, Do not exceed 600 mg/dose of BII TMP-SMX 5 mg/kg/dose PO/IV every 8-12 h ND III/ND Oral antibiotics that can be used as empirical therapy for CA-MRSA include TMP-SMX, doxycycline (or minociclin), clindamicin and linezoid. Several observational studies (85, 117) and one small randomized study show that TMP-SMX, doxycycline and minocycline are effective for such infections. Clindamycin is effective in children with CA-MRSA SSTI (91, 118). Linezolid is approved by the FDA for SSTI, but does not surpass the less expensive alternatives. Due to the likely development of resistance, rifampin should not be used as a monotherapy to treat MRSA infections. Additional use of rifamping with another active drug for SSTI treatment is not recommended in the absence of data to support the benefit. The need to include coverage against β-hemolytic streptococcus in addition to CA-MRSA is controversial and may vary depending on local epidemiology and type SSTI as discussed below. Although TMP-SMX, doxycycline and minocycline are well active in vitro against CA-MRSA, their activity against β-hemolytic streptococcus is not clearly defined .121-123. Clindamycin is active against β hemolytic streptococcus, although MRSA susceptibility rates may vary by region (85, 124, 125). The d-zone test is recommended for erythromycin-resistant, clindamycin-susceptible isolates to detect the independent resistance of clindamycin. The clinical significance of the unexplained resistance of clindamycin is unclear, because the drug may still be effective for some patients with mild infections; however, its presence should prevent the use of clindamycin for more serious infections. Outpatient patients fringing purulent cellulite (cellulite associated with purulent drainage or exudate in the absence of drained abscesses) should empirically receive oral antibiotics active against CA-MRSA in anticipation of cultural data. Among patients presenting ply SSTI in 11 emergency departments across the United States, CA-MRSA was the dominant organism isolated from 59% of patients, followed by MSSA (17%); β-hemolytic streptococcus accounted for a much smaller proportion (2.6%) of patients. these infections. In non-purple cellulite (cellulite without plyed drainage or exudate and without associated abscess) ultrasound can be considered excluded abscess (126, 127). In non-purulent cellulite, the lack of cult material material an integral challenge to our ability to determine microbiological etiology and make decisions about empirical antibiotic therapy. In the pre-CA-MRSA era, microbiological studies using needle aspiration or a culture of biopsy punch of non-purple cellulite identified β-hemolytic streptococcus and S. aureus as the main pathogens. In most cases, bacterial etiology was not identified, but MSSA was the most common pathogen among those who had a positive culture (128-133). A retrospective study to monitor cases in children with non-purple cellulite showed that wedgemy did not provide any additional benefits than β-lactams, while TMP-SMX was associated with a slightly higher failure rate. The only prospective study of unflappable cellulite among hospitalized inpatients showed that β-hemolytic streptococcus (diagnosed with acute and convalescent phase serological testing for antistreptolisin-O and anti-DNase-B antibodies or positive blood culture results) accounted for 73% of cases; despite the absence of identifiable etiology in 27% of cases, the overall clinical response rate for β-lactam therapy was 96%. Although more research is needed to characterize the microbiology of non-purple cellulite, current evidence suggests that β hemolytic streptococcus may be a major pathogen. The relative contribution of CA-MRSA, compared to β-hemolytic streptococcus and MSSA, remains unknown, but the empirical coverage of CA-MRSA is recommended in those who have not responded to monotherapy β-lactam and can be considered in those with systemic toxicity. Patients with systemic toxicity and/or a rapidly progressing or deteriorating infection, despite receiving appropriate oral antibiotics, are recommended hospital treatment and surgery. Several antibiotics with MRSA activity are approved by the FDA for the treatment of adult patients with cSSTI, such as deep soft tissue infections, surgical and/or traumatic wound infections, major abscesses, cellulite, infected ulcers, and burns: vancomycin, linezolyde, daptomycin, thygecycline, and telavancin Due to a recent FDA warning indicating an increased risk of death from all causes with thigecycline compared to the drug comparator in a pool analysis of clinical trials, the drug was not included in these guidelines. Ceftarolin, a new antibiotic cephalosporin, may become available in the near future for the treatment of CSTI, pending an FDA review. Compared to vancomycin, none of these new agents demonstrated superiority in the primary result of clinical treatment. There are limited published data on Clindamycin in adults with cSSTI due to MRSA. Treatment options for CTI in children include clindamycin and linezorid (13, 139). For hospitalized patients with cellulite, β-lactam antibiotic (e.g. cephalusolin) can be considered with a modification of MRSA-active agent, if there is no clinical response . The duration of SSTI therapy was not clearly defined, although no differences in outcome were observed among adult patients with uncomplicated cellulite receiving 5 to 10 days of therapy in a randomized, controlled trial. In FDA licensing trials for CSSTI, patients are usually treated within 7-14 days. The duration of therapy should be individualized based on the patient's clinical response. What is the management of periodic SSTIs MRSA? Recurring SSTIs 12. Preventive educational messages about personal hygiene and proper wound care are recommended for all patients with SSTI. Instructions should be provided:i. Keep drainage wounds covered with clean dry bandages (A-III).ii. Maintain good personal hygiene when bathing and cleaning your hands regularly with soap and water or alcohol-based gel, especially after touching contaminated skin or an object that is directly connected to a drainage wound (A-III). Avoid reusing or exchanging personal items (such as disposable razors, underwear and towels) that have been contacted by contaminated skin (A-III). Environmental hygiene measures should be taken into account in patients with recurrent SSTI at home or in community settings: i. Focus on high-touch surfaces (i.e. surfaces that come into frequent contact with people's bare skin, counters, door handles, bathtubs and toilet seats) that may come into contact with bare skin or detected infections (C-III) every day. Commercially available cleaning products or detergents suitable for surface cleaning should be used in accordance with labeling instructions for routine surface cleaning (C-III).14 Decolonization can be considered in individual cases if:i. The patient develops periodic SSTI, despite optimizing wound care and hygiene (C-III). Continued transmission occurs among household members or other close contacts, despite the optimization of wound care and hygiene (C-III).15 Decolonization strategies should be offered in conjunction with the continued strengthening of hygiene measures and may include: i. Decolonization of the nose with mupirocin twice a day for 5-10 days (C-III). The decolonization of the nose with mupirocin twice a day for 5-10 days and topical schemes of decolonization of the body with antiseptic skin solution (e.g. chlorhexidine) for 5-14 days or dilute bleach. (For diluted bleach baths, 1 teaspoon per gallon of water (or 1/4 cup per 1/4 bath or 13 gallons of water) is given for 15 minutes twice a week for ~3 months can considered.) (C-III).16. Oral antimicrobial therapy is recommended only for the treatment of active infection and is generally not recommended for decolonization (A-III). An oral agent combined with a rifampin, if susceptible, can be considered for decolonization if infections are repeated despite the above measure (III).17. Where domestic or interpersonal transmission is suspected: i. Personal and environmental hygiene measures in the patient and contacts (A-III) are recommended. Contacts should be evaluated for evidence of S. aureus infection: a. Symptoms (A-III) should be evaluated and treated; Strategies for the decolonization of the nose and the actual body can be considered after the treatment of active infection (C-III).b. It is possible to consider the decolonization of the nasal and actual decolonization of the body of imptomatic household contacts (C-III).18. The role of cultures in managing patients with recurrent SSTI is limited: i. Pre-decolonization screening cultures are not generally recommended unless at least one of the previous infections has been documented as due to MRSA (B-III).ii. Post-decolonization surveillance cultures are generally not recommended in the absence of active infection (B-III). Summary of evidence There are several studies to guide the development of evidence-based recommendations for the management of periodic CA-MRSA SSTI. Although there is no standardized definition, most experts define a recurrent disease as 2 or more separate episodes of SSTI in different locations over a 6-month period. The pathogenesis of recurrent infection is unclear and probably involves complex interactions between pathogen, host colonization, patient behavior and environmental impact. The group proposes a multifaceted approach that actively engages the patient in personal and environmental hygiene measures applicable to the household or community, taking into account individual preferences. Infected skin and drainage wounds should be covered, and the exchange of personal items should be avoided. Commercially available cleaning products or detergents should be used for surfaces that come into frequent contact with people's bare skin every day. Given the potential role of colonization in the pathogenesis of recurrent STIs, prevention strategies also focus on decolonization, the use of antimicrobial or antiseptic drugs to suppress or eliminate S. aureus transportation as a means of preventing automatic infection or transmission. Decolonization measures can be considered for patients with multiple recurrent SSTI, despite hygiene measures or when there is ongoing transmission in a clearly defined, closely related cohort. Although decolonization strategies are often used, there is no published data to support its effectiveness in patients with recurrent MRSA SSTI. The optimal regime, frequency of use and duration of therapy are unclear. It is also unknown whether he will choose more resistant or more dangerous strains to replace. Although mupirocin appears to be in reducing the colonization of MRSA, it's not it has been shown to prevent infections among nasal carriers (143, 144), although most studies have included patients in health care settings where evidence in favor is limited to certain high-risk groups. The Cochrane review found that mupirocin was associated with a reduction in nosocomial S. aureus infections (mainly MSSA), primarily among patients undergoing surgical procedures or receiving dialysis. No use has been seen in two studies that involved nonsurgical patients and MRSA carriers (146, 147). The combination of mupirocin and chlorhexidine soap has reduced the rate of surgical site infections among MSSA nasal carriers. Only 1 small clinical trial examined the role of mupirocin in the management of recurrent MSSA SSTI; A 5-day course of mupirocin and then re-use on a monthly basis for 1 year, a decrease in the prevalence of nasal colonization and the number of recurrent SSTI cases. A study conducted in the CA-MRSA era found that although mupirocin reduced the prevalence of nasal colonization, it did not reduce the incidence of first-time SSTI, compared to placebo. While this does not appear to be widespread, the high prevalence of mupirocin resistance has been reported among MRSA isolates in some settings communities. Due to the FDA's lack of break points for mupirocin, along with the limited availability of commercial tests in the United States, we are unable to provide specific recommendations for a test for mupirocin susceptibility to individual patients at this time. Clinical laboratories looking to test for susceptibility may consider testing prepared analyses, such as polymerase chain reaction or disk diffusion analysis. The role of other colonization sites in the development of infection or recurrent diseases is unknown, and the elimination of nasal colonization may in itself be insufficient. Colonization in non-insal areas such as groin, axima and rectum is more common among those with CA-MRSA than among those with CA-MSSA or HA-MRSA (153), although it may be difficult to distinguish true colonization from temporary contamination in these places due to active infection. The potential effectiveness of topical skin antiseptics, such as chlorhexidine and hexachlorofen, is extrapolated from community outbreak data, which, combined with other interventions, prevents ongoing transmission and infection. When used alone, chlorhexidine does not appear to be effective; A recent randomized study found no effect of glargexidine-soaked napkins on SSTI rates (159), and at best appears to have a transitional effect on colonization, with recolonization occurring shortly after discontinuation. Hexachlorophane should not be used at the age of 2 months, because it has been associated with adverse neurological outcomes in newborns. Teh Teh Bath water bleach has previously been used to treat recurrent SSTI in children with eczema. In the test tube, sodium hypochlorite in concentration, Some experts suggest that the bleach bath in concentration of 1 teaspoon per gallon of water in the bath (1/4 cup per 1/4 bath) of water kills CA-MRSA after ~ 5 minutes. Given the potential for skin irritation, if not sufficiently diluted, clear instructions should be provided. Neither clinical trials evaluated the role of oral antimicrobials to treat recurrent CA-MRSA SSTI. The Cochrane review found no benefit from oral antibiotics to eradicate MRSA colonization among patients in health care compared to placebo, untreated, or topical antibiotics; none of these studies have studied their effect on infection rates. A systematic review of comparative controlled trials found that a rifampin-based combination, compared to monotherapy with other oral antibiotics, was more likely to eradicate the transport of S. aureus, but again, no studies did study infection rates as a result. Both reviews noted the emergence of rifampin resistance and adverse events associated with systemic agents. In anticipation of guidance from ongoing clinical trials, the Panel offers only mupirocin or a combined strategy of mupirocin and topical antiseptics (e.g. chlorhexidine and diluted bleach baths) if decolonization is considered. The optimal dosage and duration of such regimens is unknown; the proposed doses are based on several ongoing clinical trials (166-168). Oral antimicrobials are not usually recommended for decolonization; they should only be treated in patients who continue to have infections despite other measures. When prescribing for decolonization, the optimal regime and duration are unknown, although a rifampin-based combination (e.g. with TMP-SMX or doxycycline) is proposed and introduced in short courses (e.g. 5-10 days) to reduce resistance potential. Hygiene measures should be strengthened and oral treatment can be offered in conjunction with topical antiseptics such as chlorhexidine. More research is needed to prevent recurrent STIs. III. What is the management of MRSA bacterome and infectious endocarditis? Bacteremia and infectious endocarditis, native valve 19. For adults with uncomplicated bacteriology (defined as patients with positive blood culture outcomes and the following: elimination of endocarditis; lack of implanted prostheses; subsequent blood cultures, on samples obtained 2-4 days after the initial set, which do not grow MRSA; deferral within 72 hours of initiating effective therapy; and no evidence of metastatic sites of infection, infection), (A-II) or daptomycin 6 mg/kg/dose IV once a day (AI) for at least 2 weeks. In complex bacteriology (defined as patients with positive blood culture results that do not meet the criteria of simple bacteriology), 4-6 weeks of therapy is recommended, depending on the degree of infection. Some experts recommend higher doses of daptomycin at 8-10 mg/kg/dose IV once a day (B-III).20. Adults with infectious endocarditis are recommended IV vancomycin (A-II) or daptomycin 6 mg/kg/dose IV once a day (A-I) for 6 weeks. Some experts recommend higher doses of daptomycin at 8-10 mg/kg/dose IV once a day (B-III).21. The addition of gentamicin to vancomycin is not recommended for bacterioma or the native valve of infectious endocarditis (A-II).22. The addition of rifampin to vancomycin is not recommended for bacterimia or the native valve of infectious endocarditis (A-I).23. A clinical assessment should be carried out to identify the source and extent of infection with the elimination and/or debridation of other sites (A-II).24 Additional blood cultures 2-4 days after the initial positive crops and, as necessary thereafter, it is recommended to document the resolution of bacterimia (A-II).25. Echocardiography is recommended for all adult patients with bacteriology. TEE is preferable to TTE (A-II).26. Evaluation for valve replacement surgery is recommended if large vegetation (10 mm in diameter), the occurrence of ≥1 embolical event during the first 2 weeks of therapy, severe valve failure, valve perforation or dehisection, decompensated heart failure, perivalular or myocardial abscess, new heart block, or persistent fever or bacterience present (A-II). Infectious endocarditis, prosthetic valve 27. IV vancomycin plus rifampin 300 mg PO/IV every 8 hours for at least 6 weeks plus gentamicin 1 mg/kg/dose IV every 8 hours for 2 weeks (B-III).28. An early assessment for valve replacement surgery (A-II) is recommended. Pediatric considerations 29. In children, vancomycin 15 mg/kg/dose IV is recommended every 6 hours for the treatment of bacteriology and infectious endocarditis (A-II). The duration of therapy can vary from 2 to 6 weeks depending on the source, the presence of endovascular infection and metastatic pockets of infection. Data on the safety and efficacy of alternative agents in children are limited, although daptomycin 6-10 mg/kg/dose IV once a day may be an option (C-III). Clindamycin or linezolid should not be used if there is concern about infectious endocarditis or endovascular source of infection, but can be treated in children whose bacteremia is rapidly purified and is not associated with endovascular orientation (B-III).30. Data is not enough to support the regular use of rifampin combination therapy Gentamicin in children with bacteriomy or infectious endocarditis (C-III); the decision to use combination therapy should be recommended in children with congenital heart defects, bacteriome lasting more than 2-3 days or other clinical findings, indicate endocarditis (A-III). Evidence Summary of MRSA Bacteriology and Infectious Endocarditis are serious diseases associated with high morbidity, and mortality is 30%-37% in MRSA endocarditis (170, 171). In addition to antimicrobial therapy, the source and extent of infection, including embolic or metastatic hearths, should be determined through careful history and physical examination and imaging, with removal or debridation whenever possible. Vancomycin was the basis of MRSA and endocarditis therapy. However, according to β agents, vancomycin is less effective for treating MSSA and endocarditis (98, 99). Although rifampin or gentamicin is sometimes used in conjunction with vancomycin to improve outcomes, clinical evidence does not support this practice. In one study, the duration of bacteriology was greater in the rifampina-combined therapy group than in the vancomicine monotherapy group. The use of rifampic combination therapy in the study of the native valve endocarditis S. aureus did not improve outcomes, but was associated with liver side effects, drug interactions and the emergence of resistance. Short-term, low-dose gentamicin in combination with vancomycin for MRSA bacteromemy and valve endocarditis was associated with an increased risk of nephrotoxicity (49, 174); the duration of bacteriology was comparable to what was observed with vancomycin monotherapy. The recommendation for the treatment of the MRSA endocarditis prosthetic valve with vancomycin, gentamicin and rifampin is based on small retrospective studies of methicillin-resistant coagulaase-negative staphococcus (175, 176) and 2005 American Heart Association (AHA) Infectious Endocardit Guidelines. Daptomycin 6 mg/kg/dose IV once a day is an alternative to vancomycin for adults in the treatment of MRSA bacterimia or endocarditis. In a randomized trial, it was noninferior for the initial low dose of gentamicin plus either vancomycin or antistaphylococcus penicillin. The appearance of reduced susceptibility to daptomycin was observed in several patients with daptomycin who experienced a failed therapy, most of whom had deep-rooted infections or left-sided endocarditis. Because it exhibits concentration-dependent killings, some experts recommend doses of up to 8-10 mg/kg, which appear to be safe, although more research is needed (177, 178). Whether this higher dosing strategy prevents resistance (179-181) or improved results is unknown and is under investigation. Although daptomycin should not be used in patients with Due to pulmonary surfactanent inactivation, it can be used in septic pulmonary embolisms. Safety and efficacy of daptomycin daptomycin дети не были установлены, но это может быть эффективным, когда дано в сочетании с другими агентами у детей с распространенными инфекциями MRSA, связанные с длительной бактериемией . Дозы 8-10 мг/кг, как представляется, безопасны у детей, хотя необходимо дополнительное исследование. Квинопристин-дальфопристин, линезолид, TMP-SMX и телаванцин не рекомендуются в качестве терапии первой линии для бактериемии MRSA. Их роль в качестве спасательных агентов для стойких бактериемии MRSA обсуждается в разделе X.Продолжительность терапии бактериемии MRSA основана на нескольких факторах. <14 days= of= therapy,= including= those= with= catheter-associated= bacteremia,= had= success= rates= that= were= lower= than= those= for= patients= who= received= a= longer= course= [186,= 187].= for= adults,= the= recommended= minimum= duration= of= therapy= for= uncomplicated= bacteremia= is= 2= weeks,= as= defined= by:= (1)= exclusion= of= endocarditis,= (2)= no= implanted= prostheses= (eg,= prosthetic= valves,= cardiac= devices,= and= arthroplasties),= (3)= follow-up= cultures= of= blood= samples= drawn= 2–4= days= after= the= initial= set= that= do= not= grow= mrsa,= (4)= defervescence= within= 72= h= of= therapy,= and= (5)= no= evidence= of= metastatic= sites= of= infection= [49,= 188].= if= the= above= criteria= are= not= met,= 4–6= weeks= of= therapy= is= recommended= for= complicated= bacteremia= depending= on= the= extent= of= infection;= longer= durations= of= therapy= may= be= needed= in= those= who= are= slow= to= clear= their= bacteremia.= whether= the= entire= course= must= be= given= parenterally= is= unknown;= there= are= limited= data= on= the= use= of= oral= ciprofloxacin= in= combination= with= oral= rifampin= primarily= in= patients= with= mssa= right-sided= endocarditis= [189,= 190].= in= the= absence= of= additional= studies= among= patients= with= mrsa,= transition= from= parenteral= to= oral= therapy= should= be= done= cautiously= and= only= in= those= with= uncomplicated= bacteremia.tee= is= preferred= in= adults= with= mrsa= bacteremia= because= of= its= superiority,= compared= with= tte,= for= the= detection= of= vegetations= [191–193]= and= identification= of= complications,= such= as= intracardiac= abscess= and= valvular= perforation= [194].= in= young= children,= tte= is= likely= adequate,= given= their= thin= chest= wall.= echocardiogram= is= not= routinely= recommended= for= young= children= except= in= those= with= congenital= heart= disease,= bacteremia= of=>Пациенты, получающие продолжительность от 2 до 3 дней, или другие клинические заключения, наводя на такие признаки эндокардита. У пациентов с бактериемией MRSA и инфицированными внутрисосудистыми или протезными устройствами более высокий уровень рецидива и смертности был связан с неспособностью удалить инфицированные материалы (196, 197). Управление сердечно-сосудистых устройств, with infections was recently reviewed in the 2010 AHA guidelines on cardiovascular implantable electronic device infections (198). Patients with endocarditis should be evaluated for valve replacement based on clinical and echocardiographic criteria in accordance with AHA guidelines (74, 199); data shows that the data shows that the data Staphylococcus endocarditis can benefit from early surgery (200-204). What is MRSA Pneumonia Management? Pneumonia 32. For hospitalized patients with severe community pneumonia determined by any of the following: (1) the requirement for hospitalization in IIT, (2) necrotizing or polytaric penetration, or (3) empyema, MRSA empiric therapy is recommended in anticipation of the results of sputum and/or blood culture (A-III).33. For HA-MRSA or CA-MRSA pneumonia, IV vancomycin (A-II) or linezolid 600 mg PO/IV twice a day (A-II) or clindamycin 600 mg PO/IV three times a day (B-III) if the strain is susceptible is recommended for 7-21 days, depending on the degree of infection.34. In patients with MRSA pneumonia, complicated by empyema, antimicrobial therapy against MRSA should be used in combination with drainage procedures (A-III). Pediatric considerations 35. IN children, IV vancomycin (A-II) is recommended. If the patient is stable without a permanent bacteriology or intravascular infection, clindamycin 10-13 mg/kg/dose IV every 6-8 hours (for the introduction of 40 mg/kg/day) can be used as an empirical therapy if the level of resistance of clindamycin is low (e.g. lt;10%) switching to oral therapy if the strain is susceptible (A-II). Linezorid 600 mg PO/IV twice a day for children ≥12 years and 10 mg/kg/dose every 8 hours for children of 12 years is an alternative (A-II). Evidence Summary While it remains a rare etiology of community-acquired pneumonia (CAP), MRSA has caused severe CAP (17-21), especially in the context of prior or simultaneous flu-like diseases, although not exclusively so. MrsA empirical therapy should be considered in patients with severe CAP determined by any of the following: (1) the requirement for taking ICU, (2) necrotizing or polythiral penetrates, or (3) empyema. The empirical coverage of MRSA should be discontinued if the sputum or blood culture does not grow the body. High failure rates were observed in the treatment of MRSA pneumonia, especially pneumonia associated with the ventilator (VAP) (VAP) (VAP) (VAP) (206-208), due to poor penetration of vancomycin into the pulmonary tissue and epithelium lining of the lungs. Adding rifampin to vancomycin for HA-MRSA seems to improve clinical outcomes compared to vancomycin-only treatment, in a small randomized open-label trial, and this warrants further research. Linezolid is an alternative to vancomycin to treat MRSA pneumonia, reaching higher levels in the fluid epithelial lining of the lungs than in plasma. Linezorid and vancomycin were associated with comparable treatment rates in 2 prospective studies involving adult patients with nosocomial pneumonia (212, 213); retrospective analysis of MRSA case subgroups in these studies found higher rates of treatment and survival in the .214 golden arm line. A randomized study of linezorid against vancomycin for MRSA VAP found no significant difference in early microbiological reactions. Therefore, it is unclear whether one drug definitively surpasses the other for mrsa VAP treatment, and additional research is ongoing. Linezolid is not compared to vancomycin for the treatment of VAPE in children. Clindamycin is an alternative to vancomycin for the treatment of MRSA pneumonia in children, and there is limited evidence of its use in adults. The data are not sufficient to recommend for or against the use of protein synthesis inhibitors (e.g. toxins) such as clindamycin or linezolid as an additional therapy for the treatment of MRSA pneumonia; This topic is further discussed in Section VII. fluoroquinolones may have activity against some CA-MRSA isolates, but they are usually not recommended because resistance can occur with monotherapy. One small randomized study showed that TMP-SMX was effective as a prevention of MRSA VAP in burns patients, but additional research is needed to determine its role in MRSA pneumonia. V. What is the management of MRSA bone and joint infections? Osteomyelitis 36. Surgical debrication and drainage of associated soft tissue abscesses is the basis of therapy and should be carried out as far as possible (A-II).37. The optimal route for the introduction of antibiotic therapy has not been established. Parenteral, oral or initial parenteral therapy followed by oral therapy may be used depending on the individual circumstances of the patient (A-III).38 Antibiotics available for parenteral administration include IV vancomycin (B-II) and daptomycin 6 mg/kg/dose IV once a day (B-II). Some variants of antibiotics with parenteral and oral injection routes include: TMP-SMX 4 mg/kg/dose (TMP component) twice a day in combination with rifampin 600 mg once a day (B-II), linezorid 600 mg twice a day (B-II), clindamycin 600 mg every 8 hours (B-III).39. Some experts recommend adding 600 mg of rifampin daily or 300-450 mg of PO twice a day to the antibiotic chosen above (B-III). For patients with simultaneous bacteriology, rifampin should be added after cleaning of bacterimia.40. The optimal duration of MRSA osteomyelitis therapy is unknown. A minimum 8-week course (A-II) is recommended. Some experts suggest an additional 1-3 months (and possibly longer for chronic infection or if debridation is not performed) oral rifampina-based combination therapy with TMP-SMX, doxycycline/minocycline, clindamycin, or fluoroquinol, selected based on susceptibility (C-III).41 MRI with gadolinium is a visualization of modality of choice, especially for the detection of early osteomyelitis and related soft tissue diseases The level of ESR and/or CRP can be useful for leading the response to therapy (B-III). Septic Septic 42. Дренаж или демонтаж совместного пространства всегда должны выполняться (A-II).43. Для септического артрита, обратитесь к антибиотикам выбор для остеомиелита (#37 выше). Предлагается 3-4-недельный курс терапии (A-III). Устройства связанных остеоартикулярных инфекций 44. Для раннего начала<2 months= after= surgery)= or= acute= hematogenous= prosthetic= joint= infections= involving= a= stable= implant= with= short= duration= (≤3= weeks)= of= symptoms= and= debridement= (but= device= retention),= initiate= parenteral= therapy= (refer= to= antibiotic= recommendations= for= osteomyelitis)= plus= rifampin= 600= mg= daily= or= 300–450= mg= po= twice= daily= for= 2= weeks= followed= by= rifampin= plus= a= fluoroquinolone,= tmp-smx,= a= tetracycline= or= clindamycin= for= 3= or= 6= months= for= hips= and= knees,= respectively= (a-ii).= prompt= debridement= with= device= removal= whenever= feasible= is= recommended= for= unstable= implants,= late-onset= infections,= or= in= those= with= long= duration= (=>(3 недели) симптомов (A-II).45. Для ранних инфекций спинномозговых имплантатов (≤30 дней после операции) или имплантатов в активно инфицированном месте рекомендуется начальная парентеральная терапия плюс рифампин с последующим длительным пероральным лечением (B-II). Оптимальная продолжительность парентеральной и устной терапии неясна; последнее следует продолжать до тех пор , пока не будет происходить слияние позвоночника (B-II). При поздних инфекциях (через >30 дней после размещения имплантата) рекомендуется удаление устройства по мере возможности (B-II).46. Долгосрочные пероральные подавлятельные антибиотики (например, TMP-SMX, тетрациклин, фторхинолон , который следует дать в сочетании с рифампином из-за потенциального появления устойчивости фторхинолона, особенно если адекватное хирургическое дебридирование невозможно, или клиндамицин) с или без рифампина могут быть рассмотрены в отдельных случаях, особенно если удаление устройства не представляется возможным (B-III). Педиатрические соображения 47. Для детей с острым гематогенным остеомиелитом MRSA и септическим артритом рекомендуется IV ванкомицин (A-II). Если пациент стабилен без постоянной бактериемии или внутрисосудистой инфекции, клиндамицин 10-13 мг/кг/доза IV каждые 6-8 ч (для введения 40 <10%) with= transition= to= oral= therapy= if= the= strain= is= susceptible= (a-ii).= the= exact= duration= of= therapy= should= be= individualized,= but= typically= a= minimum= 3–4-week= course= is= recommended= for= septic= arthritis= and= a= 4–6-week= course= is= recommended= for= osteomyelitis.48. alternatives= to= vancomycin= and= clindamycin= include= the= following:= daptomycin= 6= mg/kg/day= iv= once= daily= (c-iii)= or= linezolid= 600= mg= po/iv= twice= daily= for= children= ≥12= years= of= age= and= 10= mg/kg/dose= every= 8= h= for= children=></10%)> <12 years of age (C-III). Summary MRSA bone and joint infections arise from hematogenous seeding, a contiguous focus of infection, or direct inoculation from trauma or a medical procedure. years= of= age= (c-iii).= evidence= summary= mrsa= bone= and= joint= infections= arise= from= hematogenous= seeding,= a= contiguous= focus= of= infection,= or= direct= inoculation= from= trauma= or= a= medical= procedure.=></12 years of age (C-III). Evidence Summary MRSA bone and joint infections arise from hematogenous seeding, a contiguous focus of infection, or direct inoculation from trauma or a medical procedure. > мг/кг/день) может быть использован в качестве эмпирической терапии, если уровень устойчивости клиндамицина низок (например,</2> (например,</2> Therapy requires surgical debrication of necrotic bone or joint space and drainage of adjacent abscesses, along with antimicrobial therapy (217, 218). Current treatment strategies are based mainly on incomparable series of cases, animal case reports and models, and are extrapolated from MSSA infection strategies. The optimal route of administration (parenteral vs. oral versus initial parenteral therapy followed by oral therapy) is not clearly defined; this decision should be based on the individual circumstances of the patient after weighing the pros and cons of each approach. Compared to oral therapy, parenteral therapy can offer the potential for better matching, superior serum levels for certain drugs, and greater historical experience, albeit through increased, patient inconvenience, and potential for a line of related complications (e.g., infection, faulty lines, and thrombophlebitis). Despite concerns about poor bone penetration and relative inefficiency in animal models, vancomycin remains the main treatment for MRSA osteomyelitis (218-220). Failure rates of up to 35%-46% were reported (221-223), and compared to β-lactam therapy, patients with osteomyelitis S. aureus treated with vancomycin had a 2 times higher recurrence rate. These unsatisfactory responses to vancomycin led some experts to recommend the addition of rifampin due to its excellent bone penetration and biofilm. In animal models of osteomyelitis S. aureus therapy with rifampin in combination with a second agent is more effective than therapy with an accompanying agent given alone. There are no controlled trials of MRSA OSEMYOL, but 2 small trials of MSSA OSEMIomyelitis suggested higher treatment rates were associated with receiving rifampina combination therapy (73, 225). Retrospective studies of rifampin-based circuits for MRSA osteomyelitis have yielded mixed results, with 1 study pointing to a level of treatment of up to 80% (226); however, 1 study showed no added benefit of rifampin if debridement occurred. For patients with simultaneous bacteriology, rifampin should be added to the treatment regimen after the registration of bacteriology. Daptomycin is a parenteral alternative to vancomycin. In an incomparable study involving adults with osteomyelitis treated with daptomycin, clinical improvement was observed in ~90%, with better results of 6 mg/kg/day than in lower doses. Daptomycin may have the advantage of adding to standard therapy in children with fireproof invasive disease MRSA if osteomyelitis is present. Testing for susceptibility should be performed because daptomycin-unspicuous isolates have been described in cases of treatment failure (42, 43, 229-231). Oral therapy, administered in Primary or step-down therapy seems to be a suitable alternative to long-term parenteral therapy. In a randomized trial involving adult adults in chronic non-vertebrate osteomyelate MSSA equivalent treatment rates ~90% were achieved within 8 weeks of oral TMP-SMX (7-8 mg/kg/day of the TMP component) plus rifampin 600 mg once a day and 6-week IV cloxicillin regimen followed by 2 weeks of oral therapy (86); there is no data on TMP-SMX plus rifampin involving children with osteomyelitis. In another study by MSSA and MRSA osteomyelitis, similar results were observed in those patients who received long-term parenteral therapy and those who received oral step-down therapy (50% of the circuits included rifampin in combination with another agent) after initial parenteral therapy within 2 weeks. Oral antibiotics that were used after the initial parenteral therapy to treat osteomyelitis include: clindamycin, linezolid, fluoroquinolone, and doxycycline or minocycline with or without rifampin (221, 222, 226). Clindamycin achieves good bone concentrations and is very effective for treating non-critically ill children with MRSA osteomyelitis (34, 232); there is limited data on its use in adults. Linezolid reaches good concentrations in infected bones; Small series of cases involving adults and children with MRSA osteomyelitis, septic arthritis, or prosthetic joint infections suggest that it is effective .233-237 Weekly monitoring of full blood tests is recommended if therapy exceeds 2 weeks; ophthalmological examination should be performed within 1 month after the start of therapy, because visual neurotic can occur with long-term treatment (119, 236, 237). There is limited evidence on the use of tetracycline for the treatment of osteomyelitis S. aureus (76, 226), and although fluoroquinolones can be effective, they should only be used in combination with rifampine because of the potential for resistance. The optimal duration of osteomyelitis therapy is unknown. Antibiotic therapy for 8 weeks, compared to shorter durations, was associated with improved outcomes in those with S. aureus osteomyelitis (226, 238), while inseparable abscesses and inadequate debridation were associated with relapses of 30%-60%, underscoring the importance of surgical therapy (227, 239). Some experts suggest oral consolidation treatment after a course of parenteral therapy for an additional 1-3 months and possibly longer to treat chronic infection if debridation is not performed or if inflammatory markers, such as ESR and CRP levels, remain elevated. In a study of vertebral osteomyelitis, this approach gave an 83% treatment rate (226). In a randomized study of staphylococcal prosthetic infections of the hip and knee joints (which did not include infections due to MRSA) in patients with early onset (lt;2 months after surgery) infections, implants and zlt; 3 weeks of symptoms, 3-6 months combination based on rifampina rifampina plus surgical debridation without removing the device has been found to be effective. Rifampin dosing in studies of staphylococcal prosthetic joint infections is variable ranging from 600 mg daily to 300-450 mg twice a day (72, 240, 241). Removal and removal of devices using stage 2 arthroplasty exchange is recommended for late infections, unstable implants, or long duration (3 weeks) of symptoms. For early spinal implant infections (≤30 days after implant placement), 6 weeks of parenteral therapy followed by long oral overwhelming therapy before the fusion of the spine resulted in improved results. In late infections (30 years after implant placement) the removal of implants is crucial to success. For ankle fractures, 6 weeks of therapy after removing equipment seems to be effective. Draining and debridation of the intra-brained cavity is essential for effective treatment of septic arthritis. In children, surgical hip debridation is recommended, while artrosthesis may be sufficient for other infected joints. Although a randomized study in children with septic arthritis showed that 10 days of antibiotics were not ininferior up to 30 days of comparable therapy, only 35 episodes of S. aureus arthritis, none of which involved MRSA, were treated within 10 days; in 3 of these cases, the therapy was extended to 20 days due to an inadequate response. Most experts offer treatment for 3-4 weeks and longer if adjacent osteomyelitis, noted up to 30% of children, is present . The clinical response should guide the decision to convert from parenteral to oral therapy; In one study, switching to oral therapy in 7 days, compared to switching for 18 days, led to similar results. VI. What is MRSA CNS Infection Management? Meningitis 49. IV vancomycin for 2 weeks is recommended (B-II). Some experts recommend adding 600 mg daily or 300-450 mg twice a day (B-III).50. Alternatives include: linezolid 600 mg PO/IV twice a day (B-II) or TMP-SMX 5 mg/kg/dose IV every 8-12 hours (C-III).51. For CNS bypass infection, bypass surgery is recommended and should not be replaced until CSF cultures are repeatedly negative (A-II). Brain abscess, subdural empyea, cerebrosal epidural abscess 52. A neurosurgical assessment for incision and drainage (A-II) is recommended. IV vancomycin for 4-6 weeks is recommended (B-II). Some experts recommend adding 600 mg daily or 300-450 mg twice a day (B-III).54. Alternatives include: linezolid 600 mg PO/IV twice a day (B-II) and TMP-SMX 5 mg/kg/dose IV every 8-12 hours (C-III). Septic thrombosis or venous sinus 55. If possible, surgical assessment of the incision and drainage of adjacent areas of infection or abscess (A-II) is recommended. Role Role is controversial.56. IV vancomycin for 4-6 weeks is recommended (B-II). Some experts recommend adding 600 mg daily or 300-450 mg twice a day (B-III).57. Alternatives include: linezolid 600 mg PO/IV twice a day (B-II) and TMP-SMX 5 mg/kg/dose IV every 8-12 hours (C-III). Pediatric considerations 58. FIRST vancomycin (A-II). Evidence summary of CNS infections caused by MRSA occur as a complication of the neurosurgical procedure, due to the adjacent focus of infection, or hematogenically, as a complication of bacteriology or infectious endocarditis. Treatment is hampered by the critical location of these infections and the gemougefphaly barrier that limits the penetration of systemically administered antibiotics to the site of infection. Thus, surgical drainage of focal abscesses and removal of any other body, such as an infected shunt, should be performed whenever possible. Resistance to multiple antibiotics and the inability of many antibiotics to reach therapeutic concentrations in CSF severely limit the choice for antimicrobial therapy of MRSA CNS infections. CSF vancomycin penetration is poor, approximately 1% and 5% for uneated and inflamed galvanic, respectively, with a maximum concentration of CSF 2-6 micrograms/ml (248-250). The csF linen has good CSF penetration, reaching 66%, with the peak of CSF and trough concentrations of 7-10 micrograms/ml and 2.5-6.0 micrograms/ml, respectively. CsF penetration of TMP-SMX is similar for unconverted and inflamed overs, 13%-53% for TMP and 17%-63% for SMX; CSF concentrations are 1.9-5.7 micrograms/ml for TMP and 20-63 micrograms/ml for SMX after dosage of 10 mg/kg/day and dosage of 50 mg/kg/day, respectively, 254, 255. CSF rifamping penetration is 22% and is similarly inflamed and inflamed meninga, and bactericidal concentrations are achievable in CSF. A 600-mg dose in adults without an inflamed wheel is produced by CSF concentrations of 0.57-1.24 micrograms/ml. In the model of rabbit meningitis, the penetration of CFC in daptomycin was 5%-6% at concentrations of 3.2-4.0 micrograms/ml; values were halved for unlit possic toss (256, 257). Promising randomized trials to treat MRSA CNS infections do not exist. Vancomycin was the drug of choice, but the results were very poor when it was used as a monotherapy (258, 259). Due to the limited penetration of vancomycin through even inflamed hams, concentrations in CSF (and presumably other parts of the central nervous system, as well) may be insignificant when the drug is administered intravenously in standard doses. As it reaches microbicide concentrations in CSF, some experts recommend rifampin in combination with vancomycin for meningitis and other CNS infections, despite the paucity of clinical data demonstrating the benefits of the 120, 260-262 combination. High dose, continuous infusion of vancomycin be considered in patients who do not respond to standard methods of dosing. CSF penetration was increased and concentrations were almost doubled compared to standard dosing, when vancomycin was injected as a 15 mg/kg load dose, followed by a continuous infusion of 50-60 mg/kg/day for patients with normal kidney function. The regime was well tolerated, although nephrotoxicity was associated with high doses. Several reports on the successful use of linesolide (264-267), TMP-SMX (255, 268) and daptomycin (269) for the treatment of MRSA CNS infections require additional research to determine their role in the treatment of such infections. For meningitis due to cnricular bypass, the removal of bypass surgery with the placement of external ventricular runoff is crucial for therapy (270-273). CSF cultures must be repeatedly negative before placing a new bypass. The persistence of infected shunts is associated with high failure rates, despite the intake of both intraventricular and systemic antibiotics. Once the shunt has been removed, systemic antimicrobial therapy is usually effective. Although there is very limited data for manual use, intraventricular vancomycin (248, 275) or daptomycin (276) can be considered in patients who have ventricular access or who do not respond to systemic antimicrobial therapy. Significant spores around the use of systemic anticoagulation for septic cavernous or bad sinus thrombosis due to the risk of intracranial hemorrhage (277, 278). If anticoagulation is used, heparin should be used because it is reversible, and images must be performed to rule out lesions that predispose to hemorrhage. Vii. What is the role of complementary therapy for MRSA infections? 59. Protein synthesis inhibitors (e.g. clindamycin and linezorid) and IVIG are generally not recommended as complementary therapies for invasive diseases MRSA (A-III). Some experts may consider these agents in separate scenarios (e.g. necrotizing pneumonia or severe sepsis) (C-III). The relevant sections of the text discuss evidence that provide specific recommendations for combined antibiotic therapy for individual organizations with disease. This section will focus on the use of protein synthesis inhibitors and IVIG as an additional therapy. The data is insufficient to recommend the for or against the use of protein synthesis inhibitors as an additional therapy for invasive diseases caused by MRSA. Limited in vitro data indicate that Clindamycin and linezolid inhibit the production of staphylococcal toxic shock syndrome toxin type 1 and PVL (279-281) and that linezolid suppresses alpha and beta-hemolytisine, staphic enterotokine A and B, as well as protein A. clindamycin or linezorid in combination with vancomycin can be antagonistic in vitro (283-286), and only vancomycin was effective than vancomycin plus linezolid in the model of rabbit endocarditis. Existing clinical data are limited to reports of cases of patients with staph toxic shock syndrome (281) and necrotizing/polythirne pneumonia (205, 288), and more research is needed. The role of IVIG in the management of MRSA invasive diseases is even less clear. IVIG neutralizes staphylococcal exotoxins, including PVL (289), although staphylococcal superantigens and exotoxins are less effectively suppressed by IVIG than streptococcal superantigens. Children with invasive diseases have a higher concentration of antibodies to PVL than children with SSTIs (291); it is unclear whether the antibody to PVL in IVIG offers additional benefits. In fact, one study shows that antibodies to PVL can be harmful (292). Meta-analyses of the use of IVIG in sepsis and septic shock showed the benefits of mortality, but no benefit was observed when only high-quality studies (293-296) were included in the analyses. Given the available data, IVIG is not recommended in the management of MRSA disease, although its use may be considered in children with severe MRSA sepsis. VIII. What are the recommendations for vancomycin and monitoring? These recommendations are based on a consensus statement from the American Society of Healthcare Pharmacists, IDSA and the Society of Infectious Disease Pharmacists on the guidelines for vancomycin, the dossier. The adults are 60 years old. IV vancomycin 15-20 mg/kg/dose (actual body weight) every 8-12 hours, not exceeding 2 grams per dose, is recommended for patients with normal kidney function (B-III).61. In seriously ill patients (e.g. sepsis, meningitis, pneumonia or infectious endocarditis) with suspected MRSA infection can be considered a loading dose of 25-30 mg/kg (actual body weight). (Given the risk of red human syndrome and possible anaphylaxis associated with large doses of vancomycin, consideration should be given to extending the infusion time to 2 hours and using antihistamines until the dose load is administered.) (C-III).62. Concentrations of vancomycin in the trough are the most accurate and practical method of managing the dosing of vancomycin (B-II). Concentrations of serum trough should be obtained in a stable condition, up to the fourth or fifth dose. Monitoring of peak concentrations of vancomicine is not recommended (B-II).63. In serious infections such as bacteremia, infectious endocarditis, osteomyelitis, meningitis, pneumonia and severe SSTI (e.g. necrotizing fasciitis) due to MRSA, vancomycin in the trough concentration of 15-20 micrograms/ml is recommended (B-II).64. For most patients with SSTI who have normal kidney function and are not obese, traditional doses of 1 g every 12 hours are adequate and trough monitoring is required (B-II).65. Monitoring the vancomycin trough for serious infections and patients who are painfully painful renal dysfunction (including those receiving dialysis), or have fluctuating distribution volumes (A-II).66. Continuous infusion vancomycin schemes are not recommended (A-II). Pediatric considerations 67. The data is limited to the guidance of vancomycin in children. IV vancomycin 15 mg/kg/dose every 6 h is recommended in children with serious or invasive diseases (B-III).68. The efficacy and safety of orientation trough concentrations of 15-20 micrograms/ml in children requires further study, but should be considered in those with serious infections such as bacteremia, infectious endocarditis, osteomyelitis, meningitis,

pneumonia, and severe SSTI (i.e., necrotizing fasciitis) (B-III). Evidence Summary of Vancomycin doses of 15-20 mg/kg/day every 8-12 hours is recommended for adult patients based on actual body weight and adjusted for the patient's estimated creatinine clearance, no more than 2 grams per dose. Weight-based dosing is particularly important in obese patients, who are likely to be underdosed when conventional pre-1g strategies are used. Some experts suggest doses of vancomycin loading for serious suspected or documented MRSA infections (sepsis, meningitis, pneumonia, or endocarditis) to ensure early achievement of targeted trough concentrations, although clinical data are lacking (298, 299). Vancomycin loading a dose of 25 mg/kg was found to be safe in a small study. Due to the lack of explicit benefits about intermittent dosing, and because of the time of the zgt;MICH is not the main predictor of effectiveness (301-303), continuous infusion vancomycin is not recommended. The pharmacodynamic parameter that best predicts the effectiveness of vancomycin is the ratio of the region under the curve (AUC) to the MIC (AUC/MIC) (304-306). Одно исследование с участием пациентов с S. aureus нижних дыхательных путей инфекций сообщили, что AUC / MIC ≥400, по сравнению с AUC / MIC <400, was= associated= with= improved= clinical= response= and= microbiologic= eradication= [307].= in= a= study= involving= patients= with= mrsa= health= care–associated= pneumonia,= mean= trough= vancomycin= levels= of= 9.4= μg/ml= and= 20.4= μg/ml= correlated= with= a= mean= auc= (± standard= deviation)= of= 318= ± 111= μg·h/ml= and= 418= ± 152= μg·h/ml,= respectively,= although= no= association= between= trough= concentrations= and= clinical= response= was= observed= [308].= additional= studies= are= needed= to= verify= the= target= auc/mic= ≥400= but,= on= the= basis= of= currently= available= data,= vancomycin= trough= concentrations= of= 15–20= μg/ml= are= needed= to= achieve= this= target= if= the= mic= of= the= organism= is= ≤1= μg/ml.= the= probability= of= achieving= target= auc/mic= of=>400 составляет 100% для ванкомицина MIC 0,5 мкг / мл и 0% для ВПК значение 2 мкг / мл Even aggressive pre-use strategies are being used. In patients with normal kidney function, up to 3-4 g/day of vancomycin may be required to achieve the AUC/MIC target. Measuring the zlt;400, qgt; концентрации сыворотки, которые являются прогностический AUC / MIC, является наиболее практичным средством мониторинга ванкомицина. Концентрации ванкомицина в корыте 400 для изолятов <10 μg/ml= have= been= associated= with= treatment= failures,= perhaps= attributable= to= variable= penetration= into= tissue= compartments= and= selection= of= vancomycin-heteroresistant= s.= aureus= (hvisa)= [309].= clinical= data= to= support= higher= target= troughs= are= limited.= a= trough= ≥15= μg/ml= has= not= clearly= been= associated= with= improved= outcomes= [310]= [311],= duration= of= bacteremia,= or= mortality= [308,= 312].= however,= to= optimize= vancomycin= pharmacodynamics,= improve= tissue= penetration,= and= minimize= selection= of= resistant= strains,= the= panel= suggests= targeting= higher= trough= concentrations= for= serious= infections= due= to= mrsa.= for= less= serious= infections,= including= most= sstis,= traditional= dosing= in= the= adult= patient= with= normal= renal= function= and= weight= is= likely= to= be= adequate= on= the= basis= of= excellent= clinical= response= rates= without= a= more= aggressive= dosing= strategy= [50 ,= 136,= 138,= 313,= 314].= higher= vancomycin= doses= and= trough= concentrations= may= be= associated= with= increased= nephrotoxicity= [263,= 311,= 315,= 316]= and= high-frequency= hearing= loss= in= older= patients= [317].= such= investigations= are= limited= by= small= sample= sizes,= retrospective= design,= and= co-administration= of= other= nephrotoxic= agents.= clearly,= additional= prospective= studies= are= needed,= particularly= because= higher= dosing= strategies= are= implemented.there= are= limited= data= to= guide= vancomycin= dosing= in= children= with= mrsa.= pharmacodynamic= data= suggest= that= higher= dosages= (60= mg/kg/day)= are= required= to= achieve= auc/mic=>с ванкомицином MIC ≤1 мкг/мл, но необходимы дополнительные исследования. При нагрузке доза 20-25 мг/кг может быть рассмотрена у тяжелобольных детей. Эффективность и безопасность ориентации концентрации корыта 15-20 мкг/мл для инвазивных инфекций у детей не изучены, но должны быть рассмотрены в серьезных инфекций, таких как бактериемия, эндокардит, остеомиелит, менингит, пневмония, и тяжелых SSTI (т.е., некротизирующий фасциит). Нефротоксичность ванкомицина чаще встречается при сопутствующей аминокислотной пользе (319). IX. Как следует использовать результаты тестирования на восприимчивость к ванкомицину для руководства терапией? 69. Для изолятов с ванкомицином MIC ≤2 (например, восприимчивы в соответствии с точками разрыва CLSI), клинический ответ пациента должен определить дальнейшее использование ванкомицина, независимо от MIC (A-III).i. Если пациент имел клиническую и микробиологическую реакцию на ванкомицин, то он может быть продолжен с близкими последующей деятельности. Если пациент не имел клинической или the response to vancomycin, despite adequate scattering and removal of other pockets of infection, is recommended an alternative to vancomycin regardless of MIC.70. For MIC vancomycin isolates (e.g. VISA or VRSA), the alternative is lt/10 qgt; (A-III). Evidence Summary Appearance of hVISA, VISA and VRSA presents an additional challenge for the use of this drug. Although these strains are relatively rare, they are associated with failures in the treatment of vancomycin and poor outcomes (235, 309, 320, 321). As a result, in 2006, clSI reduced the MIC break point from ≤4 microgram/ml to ≤2 microgram/ml for susceptible strains, with MIC 4-8 microgram/ml and ≥16 microgram/ml now pointing to intermediate and resistant strains, respectively. The detection of these strains, in particular hVISA, which contains a small, stable cell subpopulation, remains a limitation of susceptibility testing methods (322-324). Currently, the gold standard for hVISA detection is the population analysis profile (PAP) divided by AUC; however, this method is time-consuming and impractical for a clinical laboratory (325, 326). Several less labor-intensive tests, including Etest macro-hydration, etest glycopephidic resistance detection, and Muller-Hinton agar with 5 mg/L teikoplanin, are more sensitive and specific to hVISA detection than other methods (322, 327-329), although optimal analysis of the most predictive outcomes is not. Given the current limitations, hVISA testing is usually not recommended. For patients with MIC 2 microgram/ml vancomycin isolate, especially in patients with limited or no clinical response to vancomycin therapy, an alternative method such as Etest should be performed to improve VISA detection. In recent years, several centers have observed MIC creep among MRSA isolates characterized as susceptible by the criteria of CLSI (331, 332), with a fundamental concern is the gradual loss of vancomicin activity, because clinical failures appear to be more common among those with MIC values of 2 micrograms/ml than among those with MIC values of 1 mcg/ml, as defined by the link of the qlt;2 zg/ml' (95, 310, 311, 333, 333, q 334. regimens' have' been clearly shown to' result' in a better clinical outcomes' in those ' patients' with' isolates' with the vancomycin' mics' of q 2 qg/ml.' in addition, data about the presence of the presence or absence of mic creep The frequency of mrsa' isolates with an mic-gt;microdiacuation broth ranged from 1.6% to 3.7% and was primarily associated with the clonal spread of the USA100 strain with reduced susceptibility to vanicicin. The interpretation of these data is further complicated by the limitations in current susceptibility testing methods and the significant variability of MIC results, depending on the method used. One problem is that acceptable variability in methods is ± 1 doubling dilution (339), making it difficult to distinguish between MIC 1 vs. 2 micrograms/ml. Etest, MicroScan and BD-Phoenix report MIC values of zlt;/2/gt; higher than those reported by the link of broth microdeadation, overcalling susceptible strains as intermediates in some cases, while Sensititre and Vitek 2 systems tend to have insufficient resistance. In one study, up to 98% of IS were reported as 1.5 or 2 micrograms/ml etest, but when the CLSI broth dilution method was used, only 3% of isolates were found to be vancomycin MIC 2 micrograms/ml. Since Etest and other methods tend to report MIC results that are higher than those reported in the reference broth micro-breeding, it is not known whether MIC creep is a true phenomenon, whether this is a technical artifact that depends on the testing method used, or whether it is applied to several institutions as a result of clonal distribution. The existence or degree of MIC creep for pediatric MRSA isolates is not well characterized. In one children's hospital, an increase in MIC vancomycin for S. aureus isolates was observed with Etest, but not with broth microdilation testing (341). Since modern susceptibility testing methods are not able to distinguish the MIC in the amount of 1 microgram/ml from the MIC at a rate of 2 micrograms/ml, the Panel recommends an assessment of the patient's clinical and microbiological response, along with the results of MIC in treatment decisions. X. What is the management of persistent MRSA bacteria and the failure of vancomycin treatment in adult patients? It is recommended that other outbreaks, drainage or surgical debrication (A-III) be searched and removed. High-dose daptomycin (10 mg/kg/day) if isolate is susceptible, combined with another agent (e.g. gentamicin 1 mg/kg IV every 8 hours, rifampin 600 mg PO/IV daily or 300-450 mg PO/IV twice a day, linezoid 600 mg PO/IV BID, TMP-SMX 5 mg/kg IV twice a day, or beta-lactam antibiotic) should be considered (B-III).73. When reducing susceptibility to vancomycin and daptomycin, the following options are present: hinupristin-dalfopristin 7.5 mg/kg/dose IV every 8 hours, TMP-SMX 5 mg/kg/dose IV twice a day, linozolid 600 mg PO/IV twice a day, or telavancin 10 mg/kg/dose IV once a day (III). These options can be given as a single agent or in combination with other antibiotics. Evidence summary of clinical or microbiological failures occur in a large part of the invasive MRSA infection treated with vancomycin. Persistent bacteria and relapses are common among patients with infectious endocarditis (171) and account for 17% of vancomycin failures in a randomized trial. Persistent bacteremia is associated with the worst clinical outcomes (171, 342). Failures in the treatment of vancomycin are explained by the slow bactericide activity of the drug, the appearance of strains with reduced susceptibility to vancomycin, possible increased virulence of CA-MRSA, as well as inadequate or preserved prosthetics. However, at present, there is no alternative agent or or has proven to be higher than vancomycin in achieving clinical treatment or sterilization of blood cultures, which creates problems for the management of such infections. The point at which the patient should be treated as an experienced failure of treatment and alternative therapy sought is a complex issue. Since the average time to clean MRSA bacteriology is 7-9 days (49,172), most experts agree that persistent bacteria on or around the 7th day of therapy should prompt an estimate to determine whether a change in therapy is indicated. Several factors should be taken into account, including: (1) the patient's overall clinical response; (2) concentrations of vancomycin in serum; (3) Susceptibility test results; and (4) the presence and ability to remove other pockets of infection. The decision to change the therapy and the time frame in which this occurs may vary depending on the clinical scenario. Although modification therapy should usually be considered if the patient is permanently bacterial after 1 week of vancomycin therapy, the threshold for treatment changes may be earlier if the patient's clinical condition worsens despite adequate spraying and removal of other pockets of infection or if MIC vancomycin is 2 micrograms/ml, especially in septic or critically ill patients. On the other hand, no immediate changes in therapy can be indicated if the patient clinically reacts and the MIC vancomycin is 1 microgram/ml) and in vitro exposure to vancomycin can choose for more than qlt;2 zg/ml;in many cases, the bloodstream will be clear with the continued vancomycin therapy.in general, when constructing The panel recommends a' change in therapy' rather than the addition of other agents (eg, rifampin) and gentamicin. vancomycin.' Comycin's needs of special consideration.' isolates' with the vancomycin' mics ≥2' zg/ml' may have q daptomycin' mics' in the nonsusceptible range , 48, 179, 345-347). Persistent bacteremia and clinical failures with daptomycin have been associated with daptomycin zgt;1 microgram/ml (49, 348). A dose of 10 mg/kg, which appears to be safe, recommended on the basis of limited in vitro evidence, which suggests that higher doses may inhibit the appearance of resistance (179-181) and some clinical evidence indicating the potential efficacy of daptomycin in 10 mg/kg/day in the purification of complex MRSA bacteriology due to strains with MIC 2 mcg/ml. necessary, some experts suggest the use of daptomycin in combination with another agent, such as gentamicin injected into the zlt;/2 qgt; 1 mg/kg every 8 hours, rifampin, or both drugs if the strain is susceptible to both 96, 181, 350, 351. Synergy has been described in test tube and in animal models between daptomycin and gentamicin (96, 181, 350-352), daptomycin and rifampin (351, 353), and among all 3 drugs, although one study suggests that a combination of daptomycin and rifampin may be antagonistic. Once a day, gentamicin at 5 mg/kg may be an alternative to traditional dosing and has a lower risk of nephrotoxicity. There is even less data to guide the management of patients with isolates who are not noticeable for vancomycin and daptomycin and who are experiencing failed therapy. Kwinupristin-Dalfopristin was successfully used as a life-saving therapy in patients with failed vancomycin treatment, although response rates were lower in patients with endocarditis and bacteria of an unknown source. TMP-SMX is a microbicide in vitro, but gives way to vancomycin to treat S. aureus infections, although all failures in treatment have occurred among patients with MSSA infection, while all patients with MRSA infection have been cured. The release of thymine from damaged host cells and bacteria may limit the effectiveness of folic acid antagonists, so caution should be exercised when using TMP-SMX to treat serious S. aureus infections. Some experts suggest adding gentamicin or rifampin if TMP-SMX is used in life-saving therapy. The combination of daptomycin and trimethoprim-sulfamethoxazole had rapid bactericide activity compared to daptomycin only for daptomycin, an unsusceptible strain in the in vitro study. Linezolid has been used with some success in several series either alone or in combination with other agents (e.g. rifampin, fusydin acid, gentamicin, amikacin and carbapenem), but the results for patients with left-sided endocarditis were poor (235, 357-360). It should be noted that rifampin can reduce the level of linzolide when combined using an obscure mechanism (361-363). There is one case of reports of persistent MRSA bacteremia in a patient with tricuspid endocarditis valve, which has been successfully treated with telavancin. The combination of vancomycin plus β-lactam has been shown to be synergistic in vitro and in vivo for VISA and VRSA (365, 366), although more clinical trials are needed. More recently, similar observations have been seen with daptomycin in combination with β-lactam to treat infection due to daptomycin unenceptible strains. Let's hope that new compounds that are under development to treat MRSA infections will provide more effective alternatives in the future. The data are not sufficient to guide the treatment of persistent MRSA bacteria in children, and the decision to use alternative or combination therapy should be XI. What is MRSA infections in newborns? Neonatal pustule 74. In mild cases with localized disease, local treatment with mupirocin may be adequate in newborns and young children (A-III).75 For localized diseases in premature or very low birth weight or more extensive disease involving multiple sites in newborns for a full term, IV vancomycin or clindamycin is recommended, at least initially, until the bacterium is ruled out (A-II). Neonatal sepsis MRSA 76. IV vancomycin is recommended, dosing, as stated in the Red Book (A-II).77. Clindamycin and linezolid are an alternative to non-vascular infections (B-II). Evidence Summary For newborns with localized pustulosis, clinical experience shows that topical mupyrouscin can only be effective, although parenteral antibiotic therapy is recommended for more extensive diseases. Lambara puncture is not necessary in a full-term infant for 30 days with localized pustulosis with no signs or symptoms of sepsis. Vancomycin is the main treatment for serious MRSA infections during the neonatal period. There is limited evidence of the potential benefits of combination therapy with rifampin, gentamicin or daptomycin for neonatal staph sepsis (184, 369); the decision to use combination therapy should be individualized. The experience of chindamycin and linesolide for serious neonatal MRSA infections is limited, but these drugs may be considered to treat patients with susceptible isolates who have nonendovascular infections (29, 370). TMP-SMX is not recommended during the immediate neonatal period due to the increased risk of kernicterus. RESEARCH GAPS The first step in developing a sound clinical research agenda is to identify gaps in information. The process of developing guidelines, as practiced by IDSA, is a natural means by which such gaps are created. In this way, the guidelines identify important clinical issues and determine the quality of the evidence to support these recommendations. The clinical issues identified by the authors of the guidelines and members of the IDSA Research Committee, which could report on the MRSA research agenda, are below. Bacteremia and endocarditis What is the role of echocardiography, and does it improve the result? Should it be carried out regularly in all patients with S. aureus bacteri containry or only in certain subsms? Should the preferred condition be TEE or transthoracic examination sufficient in certain cases? How extensive should the work be to identify the occult hotbeds of metastatic infection? Is the symptoms and signs based on the approach sufficient, or is there a minimum research to be carried out? What is the optimal initial therapy? Should vancomycin be the first drug of choice for empirical therapy? If the patient also receives β-lactam antibiotic to cover methicillin-susceptible strains while waiting for a test for susceptibility What is the optimal therapy after the results of susceptibility tests are available? What is the optimal therapy for patients with metastatic pockets of infection? Is there a role in combination therapy? What schemes should be used to treat persistent or recurrent infections? What duration of the remaining bacteria signals the need for a change in antibiotic therapy? What alternative antibiotic regimens should be used? What is the role of combination therapy? Which susceptibility and break point testing methods are best to predict the failure of treatment, especially for vancomycin? Should MIC 2 microgram/ml strains be considered unfeasible, and if so, what test should be used to determine MIC? Does the infection predict the so-called hVISA strains of treatment failure, and if so, what are the optimal tests for detecting these strains? What is the optimal duration of therapy? Is rapid examination of bacteriology an indication that a reduced course of antibiotic therapy is sufficient? Are there subsms of patients for whom shorter therapy courses (i.e. less than the generally accepted minimum of 14 days) would be effective? What is the role of biological markers (e.g. C-reactive protein or procalcione) in determining the duration of therapy? What is the optimal duration of therapy for patients with metastatic pockets of infection? Osteomyelitis What is optimal therapy? What is the significance of bactericidal therapy and the penetration of antimicrobial bones into the management of osteomaylititis? What is the effectiveness of oral and parenteral therapy? Is oral turn-based therapy an alternative to long-term parenteral therapy? Are there any benefits of targeting above vancomycin gutters in osteomyelate? What are the alternatives to vancomycin to treat osteomyelitis caused by MRSA strains with elevated vancamines? What is the role of rifampic combination therapy? Does early surgery improve the result? What is the optimal management of hardware infections? What is the optimal duration of therapy? What is the best way to use laboratory markers of inflammation (ESR and CRP levels) to guide therapy? SSTI What is optimal management of non-purple cellulite? What is the microbiology of unpurposed cellulite (e.g. cellulite without purulent drainage or exudate and without associated abscess) in the ERA of CA-MRSA? Is there an initial MRSA empirical cover? What is the optimal management of abscesses? Are there any additional benefits of antibiotics, especially with regard to the effects of recurrent infections and transmission in households? What is optimal management for periodic SSTIs? What is the pathogenesis of recurrent SSTIs? What is the nature of interaction between the pathogen, host and the environment? Is decolonization effective in preventing recurrent SSTI? If so, what are the schemes? What are the specific specifics should hygiene measures be taken to prevent recurrent transmission of STIs and domestic infections? PERFORMANCE METRICS 1. Management of all MRSA infections should include the detection, elimination and/or deridization of primary source and other infections where possible (e.g. abscess drainage, removal of central venous catheters and removal of osteomyelitis).2 In patients with MRSA bacteria, subsequent blood cultures 2-4 days after the initial positive culture and, as needed afterwards, it is recommended to document the resolution of the bacterium.3. To optimize the concentrations of trough in serum in adult patients, vancomycin should be dosed according to the actual weight (15-20 mg/kg/dose every 8-12 hours), not exceeding 2 grams per dose. Trough monitoring is recommended to reach target concentrations of 15-20 micrograms/ml in patients with serious MRSA infections and to provide targeted concentrations in those who are morbidly obese, have kidney dysfunction, or have fluctuating distribution volumes. The effectiveness and safety of targeting higher trough concentrations in children requires further study, but should be considered in those with severe sepsis or persistent bacteriology.4 When the use of vancomycin is considered, in vitro susceptibility must be confirmed and documented in medical records5. For MSSA infections, β-lactam is the antibiotic drug of choice in the absence of allergies. The Panel of Experts would like to thank Dr. Gordon Archer, Frank Lowy and Brad Spelberg for their thoughtful review of previous draft guides. The panel also recognizes their important contribution to identifying critical gaps where research funding is needed to advance clinical treatment and care: William Boorman, David M. Margolis and Louis B. Rice (IDSA Research Committee), Stanley K. Deresinski (IDSA SPGC) and Padma Natarajan (IDSA). The conclusions and conclusions of this report are the authors' conclusions and do not necessarily reflect the official position of the Centers for Disease Control and Prevention. Idsa. Potential conflicts of interest. H.F.C. received honorary certificates and research grants and worked as a consultant at Cubist, Ortho-McNeil, Pfizer, Theravance and Targanta. S. E. C. received a fee from Forest and RibX, worked as a consultant for Merck, and received research support from Astellas, Cubist and AdvanDx. R.D. received research funding from Pfizer, Clorox, Sanofi Pasteur, Sage and GeneOhm. S.L.K. received grant funding from Pfizer, served as MRSA Leadership Advisor at Pfizer, and participated in the study of pediatric daptomycin. A.W.K. received royalties and grants from Cubist Pharmaceuticals, Merck, Wyeth and Pfizer and worked as a consultant at Cubist Pharmaceuticals, Theravance, Merck, and Ortho-McNeil both own shares of Cubist Pharmaceutical, Pfizer, and Johnson and Johnson. The D.P.L. received research support from Cubist, Johnson and Theravance and served as a speaker for the Cubists. B.E.M. has worked as a consultant and has received research support from Johnson and Johnson, Astellas, Pfizer, Cubist, Theravance, Targanta, Sanofi-Aventis, Vicuron Pharmaceuticals and Wyeth-Ayerst. M.R. has received grants and or served as a consultant speaker for Pfizer, Cubist, Theravance/Astellas, Targanta and Johnson and Johnson. D.A.T. has served on the advisory board at Pfizer, Ortho-McNeil, Astellas, Schering-Plough and Replidyne. All the other authors: no conflicts. Links 1. , et al. Strategies to prevent the transmission of methicillin-resistant Staphylococcus aureus in emergency hospitals, Infect Control Hosp Epidemiol, , vol. (pg. -) 3. , et al. 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