

Oral Health Division

Ministry of Health Malaysia

**MOH/P/PAK/260.....GU)**

**ANTIBIOTIC PROPHYLAXIS**

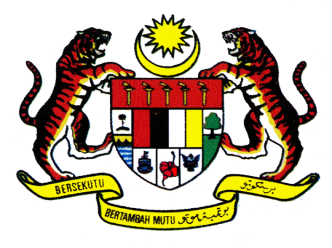
**IN ORAL SURGERY**

**FOR PREVENTION OF**

**SURGICAL SITE INFECTION**

2nd Edition

……… 2015

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**Oral Health Division**

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**STATEMENT OF INTENT**

These guidelines update the original guidelines developed in 2003 and are based on the best available contemporary evidence. This CPG is intended to serve as a guide to best practice on the use of prophylactic antibiotics in oral surgery. It must be noted however, that adherence to these guidelines may not lead to the best outcome in every situation. Dental practitioners are responsible for the management of their own patients. They may choose to deviate from these guidelines but if they do so their decision must be evidence based.

This guidelines issued in ….2015, will be reviewed in 2019 or earlier if important new evidence becomes available.

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**LEVELS OF EVIDENCE**

|  |  |
| --- | --- |
| **LEVEL** | **STUDY DESIGN** |
| **l** | Evidence obtained from at least one properly designed randomised controlled trial |
| **ll-1** | Evidence obtained from well-designed controlled trials without randomization |
| **ll-2** | Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group |
| **ll-3** | Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence |
| **lll** | Opinions or respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees |

Source: Adapted from U.S./Canadian Preventive Services Task Force

**GRADES OF RECOMMENDATION**

|  |  |
| --- | --- |
| **GRADE** | **STUDY DESIGN** |
| **A** | At least one meta-analysis, systematic review or RCT or evidence rated as good or directly applicable to the target population |
| **B** | Evidence from well conducted clinical trials, directly applicable to the target population and demonstrating overall consistency of results; or evidence extrapolated from meta-analysis, systematic reviews or RCT |
| **C** | Evidence from expert committee reports, or opinions and or clinical experiences of respected authorities; indicates absence of directly applicable clinical studies of good quality |

urce: Modified Source: Adapted from the Scottish Intercollegiate Guidelines Network (SIGN)

**GUIDELINE DEVELOPMENT AND OBJECTIVES**

These Clinical Practice Guidelines (CPG) were developed by a committee comprising six Oral Surgeons, one Periodontist, one Clinical Microbiologist, two Dental Public Health Specialists and one Pharmacist.

After development, the guidelines were scrutinized by an internal review committee who gave feedback primarily on the comprehensiveness of the guidelines and accuracy of the interpretation of evidences supporting the recommendations in the guidelines.

Two respected members of the profession were invited as external reviewers to provide feedback on the guidelines.

The previous edition of the CPG on Antibiotic Prophylaxis against Wound Infection for Oral Surgical Procedures (August 2003) was used as a reference.

Several changes have been made in these updated guidelines. Sections on periodontal surgery, cancer surgery and surgery in previously irradiated bone have been included. The section on trauma has been simplified. There are also some changes in the choice and regime of antibiotics. In addition to the new and updated information, key messages are given where the available evidence is too weak to make a recommendation.

Clinical audit indicators have been identified for the purpose of monitoring and evaluating outcomes and are recommended for use in individual centres.

In reviewing these guidelines, publications from the year 2003 onwards were retrieved and scrutinized. A literature search was carried out using the following electronic databases: PubMed/MEDLINE; Cochrane Database of Systemic Reviews (CDSR); ISI Web of Knowledge and full text journal articles via the OVID search engine. In addition, the reference lists of all relevant articles retrieved were searched to identify further studies. Free text terms or MeSH terms were used either singly or in combination to retrieve the articles **(Appendix 1).** Only literature in English was retrieved. Each article retrieved was appraised by at least two members. The selected articles were assigned their evidence level according to the U.S./Canadian Preventive Services Task Force guide and the key information in each article was presented in an evidence table. These were then discussed during group meetings. Recommendations made were graded according to the Scottish Intercollegiate Guidelines Network (SIGN) guide. All statements and recommendations formulated were agreed upon by both the development group and review committee.

The recommendations in this CPG were made taking into consideration both current scientific evidence as well as local circumstances. Where there was lack of or weak evidence, recommendations were made based on consensus of the group members.

The draft guidelines were also posted on the Ministry of Health website for comments and feedback.

The final draft of the CPG was presented to the Technical Advisory Committee for CPGs, the Health Technology Assessment (HTA) division and the CPG Council of the Ministry of Health, Malaysia for approval.

**OBJECTIVE**

The main aim of these guidelines is to assist dental practitioners make informed decisions on prophylactic antibiotic use in the prevention of oral surgical site infections.

**SPECIFIC OBJECTIVES**

1. To identify the procedures in oral surgery that would benefit from surgical antibiotic prophylaxis.

2. To assist in deciding which antibiotics to use and what regime to follow if prophylactic

antibiotics are indicated.

**CLINICAL QUESTIONS**

The clinical questions addressed by the guidelines are:

1. When are antibiotics indicated for the prevention of surgical site infections in oral

surgery?

1. What antibiotics are appropriate in surgical prophylaxis?
2. Could the inappropriate use of antibiotics in surgical prophylaxis be reduced or

eliminated?

**TARGET POPULATION**

These guidelines are applicable to patients undergoing oro-maxillofacial (OMF) surgical procedures.

**TARGET GROUP/USER**

These guidelines will be useful for oral and maxillofacial surgeons as well as dental practitioners involved in the surgical management of patients.

**HEALTHCARE SETTINGS**

Primary and specialist care (public and private sectors).

**PROPOSED CLINICAL AUDIT INDICATOR FOR QUALITY MANAGEMENT**

1. **Lower third molar surgery**

Indicator: Percentage of patients undergoing lower third molar surgery requiring antibiotic prophylaxis <10%

No. of antibiotic prescriptions given for impacted lower third molar surgery x 100%

No. of impacted lower third molar surgery done

1. **Trauma**

Indicator: Percentage of patients undergoing open reduction and internal fixation (ORIF) of simple mandibular fractures given post-op antibiotics <2%

No. of antibiotic prescriptions given post-ORIF x100%

No. of ORIF done

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**IMPLEMENTING THE GUIDELINES**

The first edition of these CPG on antibiotic prophylaxis against wound infection for oral surgical procedures was developed and published in 2003. An audit carried out in 2010 however found that more than half of the respondents did not use the CPG1. It was also noted that the most important source of information that clinicians used were their own clinical experience and the opinions of their colleagues.

A study done in 2012 by the IHSR 2 found a wide variation in the use of antibiotics by doctors for patients undergoing dento-alveolar surgery. At the start of the study it was discovered that doctors either did not prescribe any antibiotics, prescribed only a single dose of antibiotic pre-operatively or prescribed 5 days of antibiotics post-operatively. For doctors who prescribed antibiotics post-operatively, most prescribed one antibiotic while some prescribed two. There was also a wide range of the types of antibiotics prescribed which included amoxicillin, bacampicillin, co-amoxiclav, metronidazole, cloxacillin and cefuroxime. Appropriate use of antibiotics can reduce the financial cost in the management of patients. 2

This guideline is important as it would be able to standardise the use of prophylactic antibiotics in oral surgery at all healthcare levels in Malaysia and aims to prevent long-term morbidity and mortality by using an evidence-based CPG.

**Facilitating and Limiting Factors**

The following factors would be able to facilitate the application of recommendations in the CPG. These include:-

* + - 1. dissemination of the CPG to healthcare providers
      2. regular update for healthcare providers

**Existing barriers for application of recommendations of the CPG are:-**

* + - 1. variation in use of prophylactic antibiotics in oral surgery treatment practice and

preferences.

**Potential Resource Implications**

There should be a strong commitment to:-

* + - 1. ensure widespread distribution of the CPG to healthcare providers
      2. initiate training (with adequate funding) of healthcare providers ensuring information is up-to-date

Implementation strategies will be developed following the approval of the CPG by MoH. These are the Quick Reference and Training Module.

**1. INTRODUCTION**

A landmark animal study by Burke (1961)3, level III and subsequent clinical studies by Polk (1969)4, level III and Stone (1979)5, level III initially defined the scientific basis for the prophylactic use of antimicrobial agents to prevent surgical site infection. From these studies several important principles were established which remain valid to this day.

First, our body’s defence against bacteria depends primarily on its own natural resistance. Second, the risk of infection can be decreased and sometimes prevented by supplementing the body’s antibacterial resistance with antibiotics. Third, antibiotics must be delivered before bacterial contamination of the tissue occurs. Fourth, antibiotics serve no purpose if it is administered after the end of the period of active bacterial contamination.

There are however significant risks associated with antibiotic use. When an antibiotic is administered, strains of bacteria sensitive to the antibiotic are killed allowing the proliferation of resistant strains. Repeated ‘selection’ of resistant strains of bacteria would eventually render the antibiotic ineffective for prophylaxis or treatment of infections associated with these bacteria.

Also, an antibiotic administered to a patient can act as an antigenic stimulus and hence produce an allergic reaction. Allergic reactions manifest either locally or systemically at varying degrees of severity ranging from minor skin lesions to anaphylactic shock and death.

Antibiotics in general should be used only when the benefits outweigh the risks to the patient and are therefore only indicated when the consequence of infection is severe or when the incidence of infection is high.

**2 INDICATIONS FOR PROPHYLACTIC ANTIBIOTICS**

The United States Centers for Disease Control’s (CDC) National Nosocomial Infection Surveillance (NNIS) classification system for the risk of Surgical Site Infection (SSI) which is based on a large multicentre study (Study on the Efficacy of Nosocomial Infection Control - SENIC) lists multiple factors that increase the risk of SSI.6, level II-2 These factors include:

* Patients with underlying medical problems (ASA score)
* Wound class
* Duration of surgery

Other factors such as previous exposure of the site of the surgery to radiotherapy may also increase the risk of SSI.

**2.1 Patients with underlying medical problems**

A Swedish Systematic Review of the Literature did not find any clinical trials on antibiotic prophylaxis in medically compromised patients other than patients with heart disease. The authors noted that despite the lack of evidence, recommendations in Sweden include many different medical conditions for which antibiotic prophylaxis should be used.7, level 1

A Cochrane Review 8, level 1 stated that though there is some evidence that prophylactic antibiotics can reduce infection and dry sockets following third molar extraction, it was unclear whether the evidence in the review is generalizable to those with concomitant illnesses or immunodeﬁciency. They however concluded that such patients are more likely to beneﬁt from prophylactic antibiotics, because infections in them are likely to be more frequently associated with complications and be more difﬁcult to treat.

The French Health Products Safety Agency Recommendations (2003) 9, level III states that patients with certain medical conditions have an increased susceptibility to infection which would include oncological patients, patients with congenital or immunological immunodepression, patients with immunodepression due to medication, patients with infectious immunodepression (AIDS), patients with metabolic disorders (diabetes), and patients with renal and hepatic insufficiency. Such patients would require antibiotic prophylaxis.

The large multicentre trial of CDC’s SENIC Project showed that patients with ASA (Appendix1) scores of 1 and 2 had lower infection rates than patients with ASA scores of 3 or more. 6, level II-2

**RECOMMENDATON 1**

Antibiotic prophylaxis is indicated for all surgical procedures carried out on medically compromised patients especially those with ASA score of 3 or more. **(Grade B)**

**2.2 Clean surgery**

This category of surgery refers to surgical procedures in the maxillofacial region in which the incision and exposure does not extend into the oral cavity and includes submandibular and parotid gland surgery and TMJ surgery.

Johnson10, level III reported a very low infection rate of 0.6% for clean surgery in the head and neck region (parotidectomy, thyroidectomy, or submandibular gland excision) without the use of prophylactic antibiotics

The CDC’s SENIC Project showed a low infection rate of 1% for clean general surgery cases with no other risk factors. 6, level II-2

Knight et al11, level III showed a very low infection rate of 0.2 % for clean general surgery cases in which antibiotic prophylaxis were not given. It is important to note that this infection rate was similar to that of clean general surgery cases in which antibiotic prophylaxis was given (0.94%).

In an attempt to reduce the inappropriate use of antibiotics Liu et al (2008) showed that with continuing medical education 100% of the surgeons at their hospital stopped using prophylactic antibiotics for clean surgery. 12, level II-3

Chattopadhyayl13, level III and Knight11, level III showed that clean surgery of long duration (> 75th percentile for similar procedures / > 2 hours) is not associated with higher infection rates.

Current evidence therefore shows that clean surgery is associated with low infection rates with or without antibiotics.

**RECOMMENDATION 2**

Antibiotic prophylaxis is not indicated for clean surgery in healthy patients. **(Grade B)**

**2.3 Minor clean-contaminated surgery**

This category of surgery refers to surgical procedures in the oral and maxillofacial region limited to the oral cavity or which extends into the oral cavity.

In this category fall a wide range of procedures. They range from minor soft tissue and dentoalveolar surgery to surgery to place dental implants and major maxillofacial surgery.

**2.3.1 Lower third molar surgery**

Various randomised controlled trials,14-18, level 1 found that prophylactic antibiotics did not have a statistically significant effect on post-operative infections in third molar surgery and concluded that antibiotics should not be routinely administered when third molars are removed in the healthy individuals.

A local retrospective study by Royan19, level III also showed no difference in infection rates between patients who were given prophylactic antibiotics and those who were not.

A large multicentre prospective Malaysian study2, level II-2 showed that the infection rate in healthy patients given a single dose of antibiotics (0.6%) was lower than that in patients not given antibiotics (2%) or in patients given 5 days of antibiotics post-operatively (2%). All the infections were also noted to be mild and easily treated. The study concluded that the low infection rate and mild infections in patients not given antibiotics did not justify the use of prophylactic antibiotics. The authors commented that it was not justifiable to give antibiotics to 100 patients to prevent mild infections in 2 of them.

A Cochrane Review 8, level I stated that there is some evidence that prophylactic antibiotics can reduce infection and dry sockets following third molar extraction. The authors however concluded that due to the increasing prevalence of bacteria which are resistant to treatment by currently available antibiotics, clinicians should consider the fact that because the infection rate is low, giving antibiotics is likely to do more harm than good.

**RECOMMENDATION 3**

Antibiotic prophylaxis is not indicated for lower third molar surgery.**(Grade A)**

**2.3.2 Periodontal Surgery**

The incidence of infection after periodontal surgery is low (0.55-2.09%).20-21, level III

A retrospective study by Callis et al20, level III showed that patients who received antibiotics as part of the surgical protocol (pre- and/ or post-surgery) had an infection rate of 2.85% compared to an infection rate of 1.81% when no antibiotics were used. This result was not statistically significant.21, level III Here again because of the low infection rate, giving antibiotics is likely to do more harm than good.

**RECOMMENDATION 4**

Antibiotic prophylaxis is not recommended for routine periodontal surgery **(Grade B)**

**2.3.3 Minor clean-contaminated surgery with high degree of difficulty / long duration**

Clean contaminated surgery of long duration (> 75th percentile for similar procedures) is associated with higher infection rates. 6, level II-2; 13, level III

This higher infection rate is to be expected as the deeper tissues of the surgical site is exposed to the oral cavity for a longer period of time. Also, surgery with a higher degree of difficulty causes more injury to the tissues resulting in compromised healing and immune responses.

**RECOMMENDATION 5**

Antibiotic prophylaxis may be indicated for minor surgery with a high degree of difficulty in which the duration of the surgery is predicted to be long. **(Grade B)**

* + 1. **Surgery to place dental implants**

Despite the high success rates published in the literature, implant failures do occur. Some of the early dental implant losses could be due to bacterial contamination during implant insertion which may lead to infections around implant. Such infections when they do occur are very difficult to manage. The financial loss of implant failure is also great. In order to minimize early infection after dental implant placement, systemic antibiotic prophylaxis regimes have been advocated.

A recent Cochrane systematic review in 2010 22-23, level 1 concluded that there is some evidence suggesting 2g of amoxicillin given orally 1 hour preoperatively significantly reduces failures of dental implants placed in ordinary conditions.

**RECOMMENDATION 6**

Antibiotic prophylaxis is indicated for surgery to place dental implants. **(Grade A)**

* + 1. **Surgery associated with the use of bone grafts**

There is a paucity of evidence on whether antibiotic prophylaxis is indicated when bone grafts are inserted intra-orally. The reason for this lack of evidence is probably due to the fact that surgeons consider the financial cost and morbidity too great if a bone graft is lost through infection and therefore prescribe antibiotics.

A search of the literature found only one small randomized controlled double blind study. The results of this study showed there was a statistically significant increased risk of having an infection after an intra-oral bone grafting procedure when antibiotic prophylaxis was not used. 24, level 1

**RECOMMENDATION 7**

Antibiotic prophylaxis is indicated for minor oral surgical procedures in which a bone graft is inserted. **(Grade A)**

**2.4 Major clean-contaminated surgery**

Orthognathic surgery is the archetype of major clean contaminated maxillofacial surgery. This category of surgery also includes surgery for large benign tumours and cysts.

In major maxillofacial surgery, the duration of the surgery is expected to be long with the wound open into the mouth for the duration of the surgery. As discussed above in Section 2.3.3, clean-contaminated surgery of longer duration is associated with an increased incidence of SSI. 6, level II-2; 13, level III

Using proper surgical techniques and prophylactic antibiotics, Peterson(1990) 25, level III stated that it was possible to reduce infection rates to as low as 1%.

Tan et al26, level 1 and Oomens et al27, level 1 in their systematic reviews and meta-analysis of clinical trials recommended that prophylactic antibiotics are indicated for orthognathic surgery.

**RECOMMENDATION 8**

Antibiotic prophylaxis is indicated for major clean contaminated maxillofacial surgery. (**Grade A)**

**2.5 Cancer surgery**

Patients with head and neck cancer, in addition to the presence of malignancy, are usually older and are often medically compromised.

Simo 28,level III advocated the use of prophylactic antibiotics for clean surgery associated with malignancy as it has a significantly higher infection rate when compared to surgery for benign disease. A prospective controlled study on antibiotic prophylaxis in clean neck dissections done by Seven et al29, level II-1 showed a significantly higher incidence of infections in patients who were not given antibiotics.

In clean-contaminated cancer surgery of the head and neck involving major resections and flap reconstruction, Hirakawa et al30, level II-3 showed an infection rate 32% and Skitarelić et al 200731, level ii-3 found an infection rate of 22% even with prophylactic antibiotics.

**RECOMMENDATION 9**

Antibiotic prophylaxis is indicated in all forms of head and neck cancer surgery. **(Grade A)**

**2.6 Oral and maxillofacial trauma**

There is little strong evidence relating to the use of prophylactic antibiotics in trauma surgery. A few points from the literature should however, be highlighted:

* Prophylactic antibiotic therapy reduces the risk of infection in the treatment of mandibular fractures. 32, level II-3
* There is no good evidence for the use of post-operative antibiotics after open reduction and internal fixation of fractured mandibles.33, level III; 34, level II-2; 35, level II-3
* The incidence of SSI following surgery for fractures of the zygoma is low whether antibiotics are given or not. 32, level II-3
* Infection rates for maxillary fracture treatment are very low. 33, level II-3

It is also logical to consider that trauma to tissue renders it less resistant to infection.

In view of the lack of strong evidence, the indication for antibiotic prophylaxis in open reduction and internal fixation of facial bone fractures is considered as for clean, contaminated surgery and placement of implants.

**RECOMMENDATION 10**

Antibiotic prophylaxis is indicated for open reduction and internal fixation of facial bone fractures. **(Grade B)**

Antibiotics should not be continued postoperatively. **(Grade B)**

**2.7 Site of surgery involving bone previously exposed to radiotherapy**

Patients who have had radiation for the treatment of head and neck malignancy are at risk of osteoradionecrosis following oral surgical intervention to the jaws. While osteoradionecrosis itself is not considered an infection, surgical site infection involving the bone can cause osteoradionecrosis by means of inflammatory and infectious insult to the compromised bone. As a result of the morbidity associated with osteoradionecrosis, antibiotics have been widely used peri-operatively in association with surgery involving bone to try and prevent the occurrence of osteoradionecrosis.

No randomized controlled trial has been conducted to determine if prophylactic antibiotics are effective in preventing the onset of osteoradionecrosis.

In one systematic review 36, level II-3 the incidence of osteoradionecrosis following tooth extraction was slightly lower when prophylactic antibiotic was used as compared to when no antibiotics was used (6% vs 7%). The conclusions of this systematic review were, however, derived from weak evidence consisting mainly of retrospective and non-randomised prospective studies.

There is no difference in the incidence of osteoradionecrosis following tooth extraction whether antibiotics are administered or not.

**3.0 ADMINISTRATION OF PROPHYLACTIC ANTIBIOTICS**

Once it has been decided that prophylactic antibiotics are indicated, Peterson 25, level III has suggested that several principles be followed:

* The correct antibiotic must be used.
* The plasma antibiotic level must be high.
* The timing of administration must be correct.
* The shortest antibiotic exposure must be used.

**3.1 Choice of antibiotic**

Surgery confined to the oral cavity

One of the principles followed in choosing antibiotics is their effectiveness against the likely organisms causing the infection. Following this principle alone, the choice of antibiotics for odontogenic infections becomes complicated due to the polymicrobial nature of these infections.

The bacteria involved in odontogenic infections include the facultative anaerobic Gram-positive cocci (*Streptococcus viridans),* the strict anaerobic Gram-negative rods (*Porphyromona, Prevotella* and *Fusobacterium* spp.) and the strict anaerobic Gram-positive cocci (*Peptostreptococcus* spp.)37, level III; 38, level II-1

There is agreement that facultative and strict anaerobes act synergistically and not in isolation in causing infection.37, level III; 38, level II-1; 39, level II-3 Gaetti-Jardim et al went on to suggest that it may be sufficient just to break the established synergism between different bacteria, rather than to try and target every single potential organism that may be involved in the infection. 39, level II-3

Yuvaraj et al38, level II-1 showed that in interdependent, synergistic mixed infections, one bacterial species sensitive to penicillin may render the entire pathogenic complex non-pathogenic.

Penicillin and amoxicillin are effective against the organisms causing odontogenic infections and penicillin is still regarded by many authorities as the drug of choice. 38, level II-1; 40, level II-3; 41, level II-3; 42, level 1

There is emerging resistance to penicillin by the *Streptococcus viridans* group due to modifications of the penicillin binding proteins(PBP). This resistance however can be overcome by increasing the dose of the antibiotic. The resistance of the anaerobic gram negative rods to penicillin is however due to the production of beta lactamase. As a result of this, the use of the amoxicillin-clavulanic acid combination is becoming increasingly popular. 37, level III

The amoxicillin-clavulanic acid combination is a broad spectrum antibiotic. It should be avoided when other more narrow-spectrum antibiotics could be used. It increases the risk of Clostridium difficile, MRSA and other resistant infections. 43, Level I This antibiotic should therefore be prescribed only for appropriate indications so that it remains an effective antibiotic when needed.

Clindamycin has been shown to be effective against the facultative and strict anaerobes involved in odontogenic infections and is therefore often the drug of choice in patients allergic to penicillin. 39, level II-3

The choice of antibiotic however must be justified by the antibiotic susceptibility patterns in the population. Table 2 represents the antibiotic resistance patterns of oral organisms isolated in Hospital Sungai Buloh for 2014. The results show that *Streptococcus viridans* is still very sensitive to penicillin G and clindamycin but resistant to ampicillin. It also appears that the anaerobic organisms are showing some resistance to penicillin G and clindamycin.

Microorganisms intervene in the odontogenic infection in a chronological manner. It is therefore logical to assume that effective antibiotic prophylaxis against the initiating bacteria, which are usually the facultative bacteria (mainly *Streptococcus viridans*), could prevent the infection. 37, level III

In the light of these findings, penicillin G and clindamycin would be obvious choices as prophylactic antibiotics.

Surgery involving the oral cavity extending onto the skin

The pathogenic organisms involved in surgical site infections for surgery extending onto the skin may also include methicillin sensitive *Staphylococcus aureus* in addition to the oral organisms. The penicillinase resistant antibiotics cloxacillin and cefazolin (1st generation cephalosporin) would be the drugs of choice. Cloxacillin needs to be prescribed together with penicillin as it is effective only against S*taphylococcus aureus* and not the oral organisms. Cefazolin however can be prescribed alone as it is effective against both. Clindamycin is the antibiotic of choice for patients allergic to penicillin and is effective against all the organisms involved. 44,Level III

**RECOMMENDATION 11**

Amoxicillin, Penicillin G and Clindamycin are appropriate choices of antibiotics for oral surgical prophylaxis **(Grade B)**

Cloxacillin, cefazolin or clindamycin should be considered in the surgery extends onto the skin **(Grade C)**

**Table 2**.

Recommended initial dose strengths of commonly used antibiotics for oral surgical prophylaxis.

***Table 2. Antibiotic resistance patterns of oral organisms- Hospital Sg. Buloh, 2014***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** |  |  | **% resistance** | | | | | | | | | | | | |
| **2014** | **Organism** | Total isolate | Ampicilin | Clindamycin | Ceftriaxone | Cefotaxime | Erythromycin | Gentamicin | Imipenem | Metronidazole | Penicillin G | Piperacilin Tazobactam | Trimethoprim/Sulbactam | Tetracycline | Vancomycin |
|  | *Streptococcus intermedius* | 6 |  | 0 |  |  |  |  | 0 | 0 | 0 | 0 |  |  | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Streptococcus viridans* | 11 | 100 | 0 |  |  |  |  | 0 | 0 |  | 0 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Peptostreptococcus sp.* | 4 |  | 0 |  |  |  |  | 0 | 0 | 50 | 0 |  |  | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Prevotella intermedia* | 1 |  | 100 |  |  |  |  | 0 | 0 |  | 0 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Prevotella bivia* | 1 | 0 | 0 |  |  |  |  | 0 | 0 |  | 0 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Prevotella oralis* | 5 | 100 | 20 |  |  |  |  | 0 | 0 |  | 20 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Fusobacterium varium* | 3 |  | 33 |  |  |  |  | 0 | 0 |  | 33 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Fusobacterium mortiferum* | 5 | 40 | 0 |  |  |  |  | 0 | 0 |  | 0 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

**3.2 Dose of antibiotic**

The dose of the antibiotic should be based on its pharmacokinetic and pharmacodynamic properties and on patient factors. The clinical guidelines by Bratzler45, level II-2 and Mangram46, level II-3 have recommended that full therapeutic doses for antibiotics be used for prophylaxis. In obese patients, it is suggested that the dosage be increased although relevant studies are lacking.

**RECOMMENDATION 12**

The dose of antibiotic that should be administered for surgical prophylaxis should be at the full therapeutic dose of the antibiotic **(Grade B)**

The recommendations for initial dose strengths of various antibiotics are as in **Table 3.**

**Table 3. Initial dose strengths of various antibiotics**

Oral Route

|  |  |
| --- | --- |
| **Antibiotic** | **Initial dose strength** |
| Amoxicillin | 1.0 g |
| Clindamycin | 600mg |
| Amoxicillin/clavulanic acid | 1.0 g of the amoxicillin component |
| Cefuroxime | 500mg |

Parenteral Route

|  |  |
| --- | --- |
| **Antibiotic** | **Initial dose strength** |
| Benzyl Penicillin | 2 mega units |
| Clindamycin | 600 mg |
| Amoxicillin/clavulanic acid | 1.2g |
| Cloxacillin | 1.0g |
| Cefazolin | 2.0g |
| Cefuroxime | 1.5g |

**3.3 Timing of first dose of antibiotic**

Peterson suggested that for prophylaxis against wound infection to be effective, the tissue antibiotic levels must be high at the time of surgery which would necessitate the administration of the antibiotic preoperatively.

The first dose of the antibiotic should be administered within 60 minutes prior to the surgical incision.40,46, level II-3

A number of studies have demonstrated that there is an increased rate of SSI when antibiotics are given earlier than 60 minutes before incision.45, level II-2; 46, level II-3; 47, level II-2 A Dutch study of 1922 patients showed that the highest risk of SSI was found in patients who were given prophylaxis after incision. 48, level II-2

**RECOMMENDATION 13**

The first dose of antibiotic should be administered within 60 minutes prior to the surgical incision (**Grade B)**

**3.4 Additional doses (duration) and dose intervals of the antibiotic**

Mangram et al suggests that additional doses of the antibiotic be given if the length of the surgery exceeds two half-lives of the drug or if there is excessive bleeding (more than 1500 ml). 46, level II-3

Another suggestion by Sancho-Puchades37, level II-1 is that if the surgical intervention extends in time or if the tissue damage is considerable, another antibiotic dose can be administered at the equator (half) of its therapeutic interval.  This is to ensure adequate serum and tissue concentrations of the drug until the wound is closed. The interval between doses is measured from the time of the first preoperative dose.

If additional doses of the antibiotic are to be administered, the dose given should be the same as the initial prophylactic dose of the antibiotic.45, level II-2

The additional dosing suggested for the recommended antibiotics are as in Table 4.

Post-operative antibiotic administration is not necessary for most surgical procedures as it does not proffer any added advantage in preventing surgical site infections.46, Level II-3; 29, level 1

**RECOMMENDATION 14**

Additional doses of prophylactic antibiotics should be administered if the length of surgery exceeds either two half-lives or half the therapeutic interval of the drug.**(Grade B)**

The additional dose strength should be the same as the initial prophylactic dose of the antibiotic.(**Grade C)**

Post-operative antibiotics should not be prescribed for surgical prophylaxis.**(Grade B)**

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**Table 3**.

Recommended additional dose strengths and dose intervals of commonly used parenteral antibiotics for oral surgical prophylaxis

**Table 4. Additional dosing recommendations for long operations**

|  |  |  |
| --- | --- | --- |
| **Antibiotic** | **Additional dose strength** | **Dose Interval** |
| Benzyl Penicillin | 2 mega units | 2 hours |
| Clindamycin | 600 mg | 6 hours |
| Amoxicillin/clavulanic acid | 1.2g | 3 hours |
| Cloxacillin | 1.0g | 4 hours |
| Cefazolin | 2.0g | 4 hours |
| Cefuroxime | 1.5g | 4 hours |

**4.0 CONCLUSION**

These guidelines are the current recommendations of the committee towards good practice with respect to the appropriate use of antibiotics in surgical prophylaxis. Dental practitioners may have individual preferences but all decisions made must be in the light of available evidence, resources and the circumstances presented by their patients.

It is important to emphasize that the appropriate use of antibiotics in patient care is of paramount importance and that antibiotic prophylaxis in surgery is an adjunct to and not a substitute for good surgical technique. Antibiotic prophylaxis should be regarded as one component of an effective policy for control of surgical site infection.

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**Appendix 1**

**ASA PHYSICAL STATUS CLASSIFICATION SYSTEM**Last approved by the ASA House of Delegates on October 15, 2014   
  
Current definitions (NO CHANGE) and Examples (NEW)

|  |  |  |
| --- | --- | --- |
| **ASA PS Classification** | **Definition** | **Examples, including, but not limited to:** |
| **ASA I** | A normal healthy patient | Healthy, non-smoking, no or minimal alcohol use |
| **ASA II** | A patient with mild systemic disease | Mild diseases only without substantive functional limitations.  Examples include (but not limited to):  Current smoker, social alcohol drinker, pregnancy, obesity (30 < BM < 40), well controlled DM/HTN, mild lung disease |
| **ASA III** | A patient with severe systemic disease | Substantive functional limitations; One or more moderate to severe diseases.  Examples include (but not limited to):  Poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents. |
| **ASA IV** | A patient with severe systemic disease that is a constant threat to life | Examples include (but not limited to):  recent ( < 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis |
| **ASA V** | A moribund patient who is not expected to survive without the operation | Examples include (but not limited to):  Ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction |

**Appendix 2**

**LIST OF MESH TERMS**

The following MESH terms or free text terms were used either singly or in combination, search was limit to English, human and 2003 to current:

|  |  |
| --- | --- |
| **Microbiology**   * oral bacteria * oral microorganisms * microflora * Antibiotic sensitivity * Antibiotic resistance * Odontogenic infections * Surgical site infections   **Treatment**   * Oral surgery * Dental surgery * Maxillofacial surgery * Clean surgery * Clean-contaminated surgery * Minor oral surgery * Wisdom teeth surgery * Periodontal surgery * Traumatic injuries to face and jaws * Cancer surgery * Orthognathic surgery * Osseointegrated implants * Osteoradionecrosis * Bone grafts * Skin incisions | **Antibiotics**   * Therapy * Prophylaxis * Penicillin * Amoxicillin * Clindamycin * Co-amoxiclav * Antibiotic regime * Dosage * Duration * Re-dosing protocol * Pre-operative antibiotics * Post-operative antibiotics |

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