

Calculation Skills: Otitis Media

The National Institute for Health and Care Excellence (NICE) define Otitis Media as

'The presence of inflammation in the middle ear associated with an effusion, and accompanied by the rapid onset of symptoms and signs of an ear infection'

Otitis media is a fairly common childhood condition. It is an infection of the middle ear and anyone can develop this. The most common age for middle ear infections is between 6 months and 2 years. More than 75% of cases occur in the under 10 age group (NICE 2015).

The infection causes inflammation in the middle ear, leading to pain, redness, swelling, a build-up of fluid behind the eardrum (the drum can be seen as 'bulging' on examination) and is sometimes accompanied by discharge of pus or fluid from the affected ear.

The main symptoms a child will present with are:

- Earache
- Fever
- Fatigue
- Hearing loss

Younger children who cannot communicate their symptoms may be seen to be

- Tugging at the affected ear
- Irritability and restlessness
- Poor feeding compared to normal
- Signs of a cold or flu like illness
- Loss of balance

Most ear infections will resolve spontaneously in about three to five days. If required, simple analgesia such as, paracetamol or ibuprofen can be given to the child for the symptoms of pain and fever.

Antibiotics are not always needed as many cases of otitis media are viral in origin, however if antibiotic therapy is necessary a five day course is usually sufficient. There is evidence, from randomised control trials, to show that in children with bacterial otitis media, antibiotic treatment is associated with a better resolution of the condition at 2-3 months post intervention (Venekamp et al 2016).

Answer the questions below based on 2 children presenting with acute otitis media symptoms which after examination appear to be bacterial in origin and the children require antibiotic therapy as per NICE guidelines (2015).

Question 1

Joshua is 2 years old and has otitis media with purulent discharge from his right ear. He has had these symptoms now for 4 days with no sign of resolution. He is systemically unwell. You want to prescribe paracetamol and amoxicillin in liquid forms.

Part 1- Joshua can have amoxicillin 250mg three times per day. You have a choice of strengths of solution

- 25mg per ml
- 50mg per ml

Calculate the amount in ml for each and decide which strength you would prescribe for Joshua?

Part 2- Joshua can have paracetamol 180mg four times per day. You have a choice of strengths of solution

- 24mg per ml
- 50mg per ml
- 100mg per ml

Calculate the amount in ml for each and decide which strength you would prescribe for Joshua?

Question 2

Part 1- Amelie is 10 months old and has otitis media and is allergic to penicillin. She weighs 10kg. She requires an antibiotic and you have chosen clarithromycin. She also is having pain which is not responding to paracetamol according to her mother, she would like you to prescribe ibuprofen.

Amelie can have 62.5mg of clarithromycin twice daily. You have a choice of strengths of solution

- 25mg per ml
- 50mg per ml

Calculate the amount in ml for each and decide which strength you would prescribe for Amelie?

Part 2- Amelie can have 30mg per kg per day in 3 divided doses. You have 20mg per ml solution.

Calculate:

- The total daily dose in mg for Amelie
- The amount in mg per divided dose for Amelie
- How many ml per dose for Amelie

Answers

Using the basic formula method of

$$D/H \times Q = X$$

Where;

D= Dose required

H= Strength available

Q = Quantity or unit of measure (for solid dose Q= 1, for liquids Q can vary)

X= what is to be administered

Question 1

Part 1

- $250/25 \times 1 = 10\text{ml per dose}$
- $250/50 \times 1 = 5\text{ml per dose}$

The 5ml dose is preferable for a child of this age

Part 2

- $180/24 \times 1 = 7.5\text{ml}$
- $180/50 \times 1 = 3.6\text{ml}$
- $180/100 \times 1 = 1.8\text{ml}$

The 7.5ml dose is preferable for accuracy and reproducibility

Question 2

Part 1

- $62.5/25 \times 1 = 2.5\text{ml}$
- $62.5/50 \times 1 = 1.25\text{ml}$

The 2.5ml dose is preferable for accuracy and reproducibility

Part 2

- $30 \times 10 = 300\text{mg for the daily dose}$
- $300/3 = 100\text{mg per divided dose}$
- $100/20 \times 1 = 5\text{ml for the divided dose}$

References

National Institute for Health and Care Excellence (2015) Clinical Knowledge Summaries
<http://cks.nice.org.uk/otitis-media-acute#!topicsummary>

Venekamp RP, Burton MJ, van Dongen TMA, van der Heijden GJ, van Zon A, Schilder AGM.
Antibiotics for otitis media with effusion in children. Cochrane Database of Systematic Reviews 2016,
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