MANAGEMENT OF PAEDIATRIC COMMUNITY ACQUIRED PNEUMONIA AT MAMA LUCY KIBAKI HOSPITAL DURING THE MONTH OF NOVEMBER 2013

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INTRODUCTION

Community acquired pneumonia (CAP) is a common diagnosis. There is often variability in choice of antibiotics prescribed and in light of on-going problems of antibiotic resistance, evidence based appropriate choice of antibiotic treatment is important. It is one of the top 5 causes of paediatric mortality at MLKH. The Kenya paediatric association (KPA) published management guidelines on acute management of pneumonia in children in the 2013 Basic Protocols book (see appendix 1). An audit was undertaken in July 2013 by Dr Candler and Dr Musoma. Due to the frequency of admissions due to pneumonia it was important to re-audit our compliance to this guidance. Children with CAP are commonly seen and discharged from our outpatient department and some may be subsequently admitted to the ward. Reassessment of patients not responding to 1st line antibiotics is important to exclude diagnosis like TB, empyema, HIV. Therefore, it is important to rationalise the use of radiological and microbiological investigations.

Aim

To audit the management of community acquired pneumonia for children aged > one month admitted to Mama Lucy Kibaki hospital to ascertain compliance with National Guidance. To compare with the previous audit undertaken to see where we have improved, and what areas we need to focus on.

Objectives

- To assess if children with pneumonia are assessed appropriately on admission
- To see if children with pneumonia are appropriately classified
- To assess the choice of 1st line antibiotic
- To assess the correct use of oxygen with regard oxygen saturation
- To assess management of pneumonia when children do not respond to 1st line treatment or deteriorate

Method

The audit adopted a retrospective case note review methodology using a structured audit data collection sheet (see appendix 2). All case files from November 2013 were reviewed and the cases of pneumonia were identified by examining each set of notes. The inclusion criteria were all infants > 1 month who were admitted with a diagnosis of pneumonia. In total 77 inpatient records were audited. The audit standards were taken from the revised Kenya paediatric guidelines recommendations for the assessment, investigations, management and follow up of community acquired pneumonia.

Clinical Audit Standards
From the current evidence, 13 core clinical audit standards were developed and measured. The audit standards are shown in appendix 3. These were the same standards used in the previous audit in July 2013.

**Results**

I have included all children with pneumonia in the demographic and initial observation section. After that, the results relate only to those age >1 month and <60month, as that is the age group the guideline used in the standards relates to.

**Demographics**

<table>
<thead>
<tr>
<th>Age</th>
<th>LOS</th>
<th>Sex</th>
<th>Alive</th>
<th>Referred</th>
<th>Died</th>
</tr>
</thead>
<tbody>
<tr>
<td>n= 77</td>
<td>1-96 months</td>
<td>1-21 days</td>
<td>50 Male (64.9%)</td>
<td>69 (89.6%)</td>
<td>4 (5.2%)</td>
</tr>
<tr>
<td>Median – 18.6 months</td>
<td>Median – 4.0 days</td>
<td>27 Female (35.1%)</td>
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Length of stay in:
- Very Severe pneumonia: <1day – 21 days. Median 5 days.
- Severe pneumonia: 1-3 days. Median 3 days.
- Non-severe pneumonia: <1day – 10days. Median 1 day.

**Initial observations**

<table>
<thead>
<tr>
<th></th>
<th>Respiratory rate</th>
<th>Heart rate</th>
<th>O2 Saturations</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>n= 77</td>
<td>Yes – 71 (92.2%)</td>
<td>Yes – 73 (94.8%)</td>
<td>Yes – 75 (97.4%)</td>
<td>Yes – 75 (97.4%)</td>
</tr>
<tr>
<td></td>
<td>No – 6 (7.8%)</td>
<td>No – 4 (5.2%)</td>
<td>No – 2 (2.6%)</td>
<td>No – 2 (2.6%)</td>
</tr>
</tbody>
</table>

Percentage of observations taken on admission
Regular observations and monitoring

<table>
<thead>
<tr>
<th></th>
<th>4 hourly</th>
<th>6 hourly</th>
<th>12 hourly</th>
<th>24 hourly</th>
<th>&gt;24 hourly</th>
<th>Not done</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>1 (1.6%)</td>
<td>19 (31.1%)</td>
<td>14 (23.0%)</td>
<td>18 (29.5%)</td>
<td>8 (13.1%)</td>
<td>1 (1.6%)</td>
</tr>
<tr>
<td>HR</td>
<td>2 (3.3%)</td>
<td>46 (75.4%)</td>
<td>10 (16.4%)</td>
<td>2 (3.3%)</td>
<td>1 (1.6%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>O2 sats</td>
<td>2 (3.3%)</td>
<td>46 (75.4%)</td>
<td>9 (14.8%)</td>
<td>2 (3.3%)</td>
<td>2 (3.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Temp</td>
<td>2 (3.3%)</td>
<td>57 (93.4%)</td>
<td>2 (3.3%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

* There were 14 sets of notes with missing observation charts, therefore this information is not available.

The above excludes 2 patients who stayed less than 24 hours. The % are calculated from n = 61 (excluding the missing notes and the 2 patients less than 24h)
Classification

52% of classifications were made correctly.

Of those which were incorrectly classified as very severe, all 3 should have been classified as severe.

Of those incorrectly classified as severe, 13 should have been classified as very severe; 2 had insufficient data to assess if there was non-severe pneumonia or URTI; and 6 should have been classified as URTI.

Of those incorrectly classified as non-severe pneumonia, 6 should have been classified as URTI.

2 were not classified at all.

Initial treatment

2A - Children classified as Very Severe Pneumonia should have Benzylpenicillin and Gentamicin IV prescribed.

10 out of 13 children with very severe pneumonia were prescribed Benzylpenicillin and Gentamicin (77%)

2B - Children classified as Severe Pneumonia should have Benzylpenicillin IV prescribed

34 of 41 children with severe pneumonia were prescribed Benzylpenicillin (76%)

Antibiotics prescribed to those with Severe Pneumonia

- Benzylpenicillin (34)
- Benzylpenicillin + Gentamicin (6)
- Ceftriaxone (1)
2C - *Children classified as Non-severe Pneumonia should have Amoxicillin or Cotrimoxazole Oral prescribed*

2 of 13 children with non-severe pneumonia were prescribed amoxicillin or cotrimoxazole. (15%)

Management – Oxygen

3A - *Children with very severe pneumonia should receive Oxygen*

9 of 13 children with very severe pneumonia received oxygen (69%)

3B - *Children with Oxygen saturations <92% should receive Oxygen*

76% of children with Oxygen saturations <92% were documented to have received Oxygen.

Pneumonia treatment failure at 48 hours

4A - *Children with Very severe pneumonia who are deteriorating or remain febrile at 48 hours should have a Chest x-ray*

2 of 8 children with very severe pneumonia who were deteriorating or remained febrile at 48 hours had a chest x-ray. (25%)

4B - *Children with Very severe pneumonia who are deteriorating or remain febrile at 48 hours should have their antibiotics changed to Ceftriaxone IV*

4 of 8 children with very severe pneumonia who were deteriorating or remained febrile at 48 hours had their antibiotics changed (50%). 3 were changed to Ceftriaxone, and 1 who was already on Ceftriaxone had Amikacin added.
4C - *Children with Severe pneumonia who are deteriorating or remain febrile at 48 hours should have Gentamicin IV added*

4 of 9 children with severe pneumonia who were deteriorating or remained febrile at 48 hours had antibiotics changed (44%). 2 had Gentamicin added (22%), and 2 were changed to Ceftriaxone.

**Pneumonia treatment failure at 5 days**

5A - *Children who have 3 of fever, RR >60, cyanosis, chest indrawing, worsening CXR at 5 days must have an HIV test*

4 of 10 Children who met the above criteria had a HIV test done (40%).

**Pneumonia treatment failure at 7 days**

6A - *Children with persistent fever or respiratory distress at 7 days must be investigated for TB*

1 of 4 children who had persistent respiratory distress or fever at 7 days was investigated for TB (25%)

**Discussion**

There are a number of positive points from this audit. The first is that we are capturing observations in nearly all children at admission. This is an essential part of assessment though, and it would be desirable to aim for 100% in this.

The monitoring of observations is also being done reasonably well. The most regularly monitored parameter is the temperature. We need to improve on the monitoring of the respiratory rate, as this is an important indicator of the clinical condition of the child, and their response to treatment.

Only 52% of classification of the severity of pneumonia were correct based on the clinical findings documented. This is disappointing and an area we should be able to improve on. All MO-interns and CO-interns have a copy of the KPA 2013 paediatric protocol book, where the classifications can be easily identified. 13 were incorrectly classified as severe, when they should have been classified, meaning their antibiotic therapy may have been sub-optimal.

We are treating 76-77% of children with Very Severe pneumonia and Severe pneumonia correctly. The treatment for Non-severe pneumonia was only correct in 15% of cases. There was a lot of over treatment with IV therapy in the non-severe group.

Oxygen was given to 76% of children with saturations $<$90%. This must be improved, although it is likely that more of these children received Oxygen, and that the error is in the lack of documentation.
In terms of children, where there is deterioration or persistent fever, in very severe pneumonia at 48 hours, only 25% were documented to have had a chest x-ray. Again it may be that this is not an accurate figure and that the issue lies with the documentation.

Only 40% of children who were febrile or not improving on day 5 had a HIV test done. Although currently there is an issue with the supply of testing kits, this was not the case in November. Once the kits are available, all children being admitted to the ward should have HIV testing offered, but this is even more important in this group of children with non-resolving pneumonia.

We also need to remember to consider TB in children who remain febrile or are not clinically improving after 7 days. This was only done in 1 of 4 children.

Key points for improvement

- Correct classification is essential to ensure appropriate treatment is given. The KPA 2013 paediatric protocol book should be used to support clinicians in this.
- Antibiotic treatment should be based on the KPA 2013 Paediatric protocol book. There will be a small number of patients where deviation from this protocol is necessary.
- Children with non-severe pneumonia should be treated with oral antibiotics, and may not require admission.
- Those with O2 saturations <92% should be placed on Oxygen therapy.
- All children with persisting fever, or deterioration at 48 hours should have antibiotic therapy changed
- HIV status and TB need to be considered in those with persisting symptoms

Strategy for improvement

- Ensure all staff familiar with KPA 2013 Paediatric protocol book
- Correct diagnosis will help ensure correct treatment
- Aim for correct treatment to minimise hospital stay and improve outcomes
- Ensure OPD staff are aware of the guidelines, initiate correct treatment, and do not admit uncomplicated non-severe pneumonia.
- Re-audit
APPENDIX 1

**Pneumonia**

for children aged 2 - 59 months

For HIV exposed / infected children see page 36

- History of cough or difficulty breathing, age > 60 days
  - Yes
    - Oxygen sat\(^n\) < 90%
    - Cyanosis
    - Inability to drink / breast feed
    - AVPU = 'V', 'P' or 'U', or
    - Grunting
    - VERY SEVERE PNEUMONIA
      - Oxygen
      - Ampicillin or Penicillin
      - Gentamycin
    - No
  - Lower chest wall indrawing
    - AVPU = 'A'
    - Yes
      - SEVERE PNEUMONIA
        - Benzyl Penicillin ONLY
    - No
      - Age 2 - 11 months:
        - Respiratory rate: ≥ 50
        - Age ≥ 12 months:
        - Respiratory rate: ≥ 40
      - No:
        - No pneumonia, probably URTI
      - Yes:
        - PNEUMONIA
          - Cotrimoxazole or if previously had cotrimoxazole for this illness, give high ‘pneumonia’ dose Amoxicillin

If there is a wheeze,
- consider POSSIBLE ASTHMA, and
- treat according to separate protocol on page 34, and
- revise pneumonia classification after initial treatment with bronchodilators.
APPENDIX 2

Pneumonia Audit Proforma

DEMOGRAPHICS

Hospital number: ………………..

M □  F □

Age at admission: ……. years …….. months

Length of stay: ……. days

Outcome: Alive at discharged □  Referred □  Died □

SYMPTOMS, SIGNS AND INITIAL ASSESSMENT

The following observations were taken on admission:

RR  Y/N  HR  Y/N  Saturations  Y/N  Temperature  Y/N

Observations were subsequently taken:

RR: 4 hourly □  6 hourly □  12 hourly □  24 hourly □  <24 hourly □

HR: 4 hourly □  6 hourly □  12 hourly □  24 hourly □  <24 hourly □

Saturations: 4 hourly □  6 hourly □  12 hourly □  24 hourly □  <24 hourly □

Temperature: 4 hourly □  6 hourly □  12 hourly □  24 hourly □  <24 hourly □

Classified pneumonia: Very severe □  Severe □  Non-severe □  Not classified □

Classified severity of pneumonia correctly: Y/ N

FIRST LINE ABX PRESCRIBED:

Benzylpenicillin □  Ampicillin □  Gentamicin □  Chloramphenicol □
Ceftriaxone □  Cotrimoazole □  Flucloxacillin □  Septrin □
Other: please state………………………………

**OXYGEN GIVEN:** Y / N  Saturations <92%: Y / N

**CXR:** Y / N ?

Any: Cavitation □  Effusion □  Empyema □  TB □  PCP □  Consolidation □

**AFTER 48 HOURS:**

Clinical condition worsening or still febrile? Y / N

If yes: Were antibiotics changed? Y/ N CXR: Y / N

If so, what to?

Benzylpenicillin □  Ampicillin □  Gentamicin □  Chloramphenicol □
Ceftriaxone □  Cotrimoazole □  Flucloxacillin □  Septrin □
Other: please state………………………………

>5 DAYS:

Clinical condition worsening or still febrile Y / N

If yes: HIV test Y / N  Result of HIV test: +ve / -ve

If yes: Were antibiotics changed? Y/ N

If so, what to?

Benzylpenicillin □  Ampicillin □  Gentamicin □  Chloramphenicol □
Ceftriaxone □  Cotrimoazole □  Flucloxacillin □  Septrin □
Other: please state………………………………

>7 DAYS:

Clinical condition worsening or still febrile Y / N

If yes: Investigated for TB Y / N
## APPENDIX 3

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Standard</th>
<th>Exemptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Symptoms, signs and initial management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1A</strong> Children and young people with pneumonia should have the following recorded at admission:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Physiological observations of heart rate</td>
<td>Heart rate 94%</td>
<td>&lt;2 months</td>
</tr>
<tr>
<td>• Respiratory rate</td>
<td>Resp rate 91%</td>
<td></td>
</tr>
<tr>
<td>• Oxygen saturation</td>
<td>O2 sats 97%</td>
<td></td>
</tr>
<tr>
<td>• Temperature</td>
<td>Temp 97%</td>
<td></td>
</tr>
<tr>
<td><strong>1B</strong> Children and young people with pneumonia should have the following monitored and recorded every 6 hours:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Physiological observations of heart rate</td>
<td>Heart rate 63%</td>
<td>&lt;2 months</td>
</tr>
<tr>
<td>• Respiratory rate</td>
<td>Resp rate 28%</td>
<td>Discharged before 6 hours</td>
</tr>
<tr>
<td>• Oxygen saturation</td>
<td>O2 sats 63%</td>
<td></td>
</tr>
<tr>
<td>• Temperature</td>
<td>Temp 79%</td>
<td></td>
</tr>
<tr>
<td><strong>1C</strong> Children with pneumonia should be classified as Very severe, Severe or Non-severe according to the following criteria:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very severe: Cyanosis, inability to drink/breastfeed, AVPU less than A, O2 saturations &lt; 90%</td>
<td>97%</td>
<td>Asthma</td>
</tr>
<tr>
<td>Severe: Lower chest wall indrawing, AVPU at A</td>
<td></td>
<td>URTI</td>
</tr>
<tr>
<td>Non-severe: RR &gt;50 (2-11months) and &gt;40 (12-59months) and none of the above</td>
<td></td>
<td>&lt;2 months or &gt;59 months</td>
</tr>
<tr>
<td><strong>2 Management – 1st line antibiotics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2A</strong> Children classified as Very Severe Pneumonia should have Benzylpenicillin and Gentamicin IV prescribed</td>
<td>77%</td>
<td>Allergy, concern regarding <em>Staph Aureus</em> or aspiration pneumonia or previous treatment with these</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td><strong>2B</strong></td>
<td>Children classified as Severe Pneumonia should have Benzylpenicillin IV prescribed</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allergy, concern regarding <em>Staph Aureus</em> or aspiration pneumonia or previous treatment with these antibiotics and not responding &gt;59 months or &lt;2 months</td>
</tr>
<tr>
<td><strong>2C</strong></td>
<td>Children classified as Non-severe Pneumonia should have Amoxicillin or Co-trimoxazole Oral prescribed</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allergy, concern regarding <em>Staph Aureus</em> or aspiration pneumonia or previous treatment with these antibiotics and not responding &gt;59 months or &lt;2 months</td>
</tr>
<tr>
<td><strong>2D</strong></td>
<td>Children with cavitation on chest X-ray should receive Flucloxacillin and Gentamicin IV</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allergy, or previous treatment with these antibiotics and not responding &gt;59 months or &lt;2 months</td>
</tr>
</tbody>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>3</strong></td>
<td>Management – Oxygen</td>
<td></td>
</tr>
<tr>
<td><strong>3A</strong></td>
<td>Children with very severe pneumonia should receive Oxygen</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;59 months or &lt;2 months</td>
</tr>
<tr>
<td><strong>3B</strong></td>
<td>Children with Oxygen saturations &lt;92% should receive Oxygen</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;59 months or &lt;2 months</td>
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<tbody>
<tr>
<td><strong>4</strong></td>
<td>Pneumonia Treatment failure at 48 hours</td>
<td></td>
</tr>
<tr>
<td><strong>4A</strong></td>
<td>Children with Very severe pneumonia who are deteriorating or remain febrile at</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;59 months or &lt;2 months</td>
</tr>
<tr>
<td></td>
<td>48 hours should have a Chest x-ray</td>
<td></td>
</tr>
<tr>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>4B</td>
<td>Children with Very severe pneumonia who are deteriorating or remain febrile at 48 hours should have their antibiotics changed to Ceftriaxone IV</td>
<td>50%</td>
</tr>
<tr>
<td>4C</td>
<td>Children with Severe pneumonia who are deteriorating or remain febrile at 48 hours should have Gentamicin IV added</td>
<td>22%</td>
</tr>
<tr>
<td>5</td>
<td><strong>Pneumonia Treatment failure at 5 days</strong></td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td>Children who have 3 of fever, RR &gt;60, cyanosis, chest indrawing, worsening CXR at 5 days must have an HIV test</td>
<td>40%</td>
</tr>
<tr>
<td>6</td>
<td><strong>Pneumonia Treatment failure at 7 days</strong></td>
<td></td>
</tr>
<tr>
<td>6A</td>
<td>Children with persistent fever or respiratory distress at 7 days must be investigated for TB</td>
<td>25%</td>
</tr>
</tbody>
</table>