Clinical Information Network (CIN)-Using Routine Data to Assess Effectiveness of Recommended Treatments and Identify children for Special Considerations

Sam Akech, MMED(Paediatrics), PhD
KEMRI/Wellcome Trust, Nairobi
Background

• Children aged <5 years still die from common conditions-diarrhoea, pneumonia etc
• Effective interventions available
• Any new intervention will be delivered in a complex health system
• Important to understand how available interventions work within complex system
Efficacious Interventions

Implementation

“Coverage”

“Quality”

↑Outcomes
The Clinical Information Network
14 hospital sites in central and western parts of Kenya

Data Entry on site – REDCap & error checking with R

Synchronised to server & error checking with R

Routine analytics with R – Report generation

Research analysis
3-monthly audit and feedback reports

5 COLOUR KEYS

<table>
<thead>
<tr>
<th>Color</th>
<th>Interpretation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Excellent Performance</td>
<td>&gt;90%</td>
</tr>
<tr>
<td>Good</td>
<td>Good Performance</td>
<td>80 - 90%</td>
</tr>
<tr>
<td>Some</td>
<td>Some Performance</td>
<td>60 - 79%</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor Performance</td>
<td>&lt;60%</td>
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Objectives

• Improve inpatient documentation
• Collaborate to improve uptake of MoH/WHO guidelines
• Use data to inform policy and advocacy
Methods

• Children aged 2-60 months
• Multilevel/hierarchical analysis methods to account for different hospital contexts (patients are nested within hospitals)
Inpatient population

<table>
<thead>
<tr>
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<th>Sep 2013- April 2018</th>
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<tbody>
<tr>
<td>Number of hospitals</td>
<td>14</td>
</tr>
<tr>
<td>Number of paediatric admissions</td>
<td>113,250</td>
</tr>
<tr>
<td>Number of admission with full clinical data*</td>
<td>87,607</td>
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</tbody>
</table>
Diarrhoea and Dehydration

- Number of participants=8,562 [15.6%]
- Overall mortality was 8.9% (759/8,562);
  - Some dehydration (60% of cases)- (case fatality=4.7%),
  - Severe dehydration (28% cases)-(case fatality=12.7%),
  - Shock (5% cases) case fatality=41.5%),
  - non-classified (6% cases)-case fatality=5.6%).
- 83.2% had at least one additional diagnosis (comorbidity), mainly malaria (32.3%), pneumonia (35.8%), anaemia (5.0%), possible meningitis (7.5%) among others.
Which clinical signs are associated with mortality in dehydration?
How does correct fluid prescription affect early in-hospital deaths (≤ 2 days)?

<table>
<thead>
<tr>
<th>Sign Type</th>
<th>Unadjusted Odds Ratios</th>
<th>Adjusted Odds Ratios (Model II)</th>
<th>Adjusted Odds Ratios (Model II-Interactions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway signs</td>
<td></td>
<td></td>
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<tr>
<td>Pallor</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Circulatory signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dehydration signs</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Neurological signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory signs</td>
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</tbody>
</table>

Odds Ratio

Adjusted Odds Ratios (Model II)

Adjusted Odds Ratios (Model II-Interactions)
Use of correct fluid on risk of mortality

<table>
<thead>
<tr>
<th>Condition</th>
<th>Fluid Wrong AND Symptom Present</th>
<th>Fluid right AND Symptom Present</th>
<th>Fluid right AND Symptom Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemia</td>
<td>2.16 (1.66-2.82)</td>
<td>1.07 (0.69-1.67)</td>
<td>0.29 (0.21-0.41)</td>
</tr>
<tr>
<td>Circulatory</td>
<td>1.92 (1.47-2.51)</td>
<td>0.64 (0.40-1.03)</td>
<td>0.35 (0.25-0.50)</td>
</tr>
<tr>
<td>Dehydration signs only</td>
<td>0.96 (0.70-1.33)</td>
<td>0.38 (0.26-0.55)</td>
<td>0.26 (0.15-0.45)</td>
</tr>
<tr>
<td>Neurological</td>
<td>3.57 (2.75-4.64)</td>
<td>1.15 (0.77-1.72)</td>
<td>0.37 (0.25-0.54)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>3.18 (2.35-4.31)</td>
<td>1.17 (0.80-1.73)</td>
<td>0.30 (0.18-0.49)</td>
</tr>
</tbody>
</table>
Should all children with non-severe pneumonia be treated at home as recommended by WHO?

Non-severe pneumonia

- **2.7%**
  - Low mortality
  - Home care

Severe pneumonia

- **14.2%**
  - High mortality
  - Admit

* Case fatality rate in Asia for non-severe pneumonia=0.3%

* 322/11930 (95% CI 2.4 to 3.0%)

** 488/3434 (95% CI 13.1 to 15.4%)
Risk factors among children with non-severe pneumonia

Severe pneumonia

- High mortality
- Admit

Non severe pneumonia

- Low mortality
- Home care

Pallor
WAZ <-3SD
Increased Risk of Mortality with Missed Blood Transfusion

Blood Transfusion Delay and Outcome in County Hospitals in Kenya

Julius Thomas,1* Philip Ayieko,1 Morris Ogero,1 Susan Gachau,1 Boniface Makone,1 Wycliffe Nyachiyo,1 George Mbevi,1 Mercy Chepkirui,1 Lucas Malla,1,2 Jacqui Oliwa,1 Grace Irimu,1,3 and Mike English1,2 for the Clinical Information Network

1KEMRI-Wellcome Trust Research Programme, Nairobi, Kenya; 2Nuffield Department of Medicine, University of Oxford, Oxford, United Kingdom; 3Department of Paediatrics and Child Health, University of Nairobi, Nairobi, Kenya

Abstract. Severe anemia is a leading indication for blood transfusion and a major cause of hospital admission and mortality in African children. Failure to initiate blood transfusion rapidly enough contributes to anemia deaths in sub-Saharan Africa. This article examines delays in accessing blood and outcomes in transfused children in Kenyan hospitals. Children admitted with nonsurgical conditions in 10 Kenyan county hospitals participating in the Clinical Information Network who had blood transfusion ordered from September 2013 to March 2016 were studied. The delay in blood transfusion was calculated from the date when blood transfusion was prescribed to date of actual transfusion. Five percent (2,875/53,174) of admissions had blood transfusion ordered. Approximately half (45%, 1,295/2,875) of children who had blood transfusion ordered at admission had a documented hemoglobin < 5 g/dl and 36% (2,232/6,198) of all children admitted with a diagnosis of anemia were reported to have hemoglobin < 5 g/dL. Of all the ordered transfusions, 82% were administered and documented in clinical records, and three-quarters of these (75%, 1,760/2,352) were given on the same day as ordered but these proportions varied from 71% to 100% across the 10 hospitals. Children who had a transfusion ordered but did not receive the prescribed transfusion had a mortality of 20%, compared with 12% among those transfused. Malaria-associated anemia remains the leading indication for blood transfusion in acute childhood illness admissions. Delays in transfusion are common and associated with poor outcomes. Variance in delay across hospitals may be a useful indicator of health system performance.

Children who had a transfusion ordered but did not receive the prescribed transfusion had a mortality of 20%, compared with 12% among those transfused.
Zinc-Discharge probability

Overall: Group 1 and 2

Length of stay (Days)

Probability (Discharged alive)

- Zinc : age >= 6 months
- Zinc : age < 6 months
- No Zinc : age >= 6 months
- No Zinc : age < 6 months

n = 13191  n = 5711  n = 1473  n = 474
### Zinc-Time to Discharge (Nourishment status)

<table>
<thead>
<tr>
<th></th>
<th>1 – 5 months</th>
<th>6 – 59 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc-malnourished</td>
<td>0.82 [0.67, 1.01]</td>
<td>0.85 [0.79, 0.91]</td>
</tr>
<tr>
<td>No Zinc-wellnourished</td>
<td>0.88 [0.74, 1.04]</td>
<td>0.90 [0.84, 0.98]</td>
</tr>
<tr>
<td>No Zinc-malnourished</td>
<td>0.63 [0.49, 0.82]</td>
<td>0.64 [0.58, 0.70]</td>
</tr>
<tr>
<td>Zinc-wellnourished (reference group)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Conclusions

• Correct fluid prescription beneficial for management of dehydration reduces risk of mortality

• Zinc effective in shortening the time to discharge for all children under 5 years admitted with diarrhea in both well-nourished and malnourished children.

• Current WHO criteria defining pneumonia leave out some important factors associated with poor outcome.
Clinical Information Network partners include: Vihiga County Hospital, Kakamega County Hospital, Mbagathi County Hospital, Mama Lucy Kibaki County Hospital, Machakos County Hospital, Nyeri County Hospital, Kisumu East County Hospital, Embu County Hospital, Karatina County Hospital, Kerugoya County Hospital, Kitale County Hospital, Busia County Hospital, Kiambu County Hospital, Mbale RHTC, Pumwani Maternity Hospital