Neonatal inter-hospital transfer in a resource-limited setting:

Clinical information sharing and condition of neonates referred to tertiary hospitals in Kigali, Rwanda

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Background

• UN, SDG in 2015: goal of reducing neonatal mortality from 19 to 12 per 1,000 live births by 2030

• Multifactorial:
  ✓ Advances in neonatal care (steroids, surfactant, caffeine etc.): thus improving survival
  ✓ Centralization of specialist care
    • Then, increase in the number of neonatal transfers between low-level units and more specialized hospitals
    • However, neonatal inter-hospital transfers: clinical deterioration, doubling the mortality
  ✓ Developed countries have organized neonatal transport/transfer services (NRFs,...) 

1. General Assembly W. Transforming our world: the 2030 Agenda for Sustainable Development. 2015
Background...

• Rwanda 2015: NMR 20 per 1,000 live births
  • Capacity building (doctors and nurses)
  • Improving infrastructures
  • Regionalization of pediatric care: to improve access to maternal & neonatal care
  • Sick neonates still require transfer to more specialized centers (e.g.: Intensive care, neurosurgery, ped surgery)

5. Ministry of Health; Republic of Rwanda. Health Sector Policy [Internet]. 2015.
Transferring a sick neonate

Question 2:
What is the quality of information shared in Rwanda?

Referring hospital  ➔  Receiving hospital
Transferring a sick neonate

Question 3: How many survive?
Objectives

1. Determine the consensus regarding the core clinical information that should shared while transferring a sick neonate in resource limited setting

2. Determine the quality of the existing neonatal clinical information sharing practice in Rwanda

3. Determine the baseline mortality and morbidity of neonates transferred to tertiary centers in Rwanda
Modified Delphi technique:

Round-1: Internet and literature search to find NRFs globally
- Use these to identify “items” and create draft CCI list

Round-2: Present draft list to participants and ask for new additions
- Create second draft CCI

Round-3: Participants to score importance of each item
- Create final CCI list
Objectives

1. Determine the consensus regarding the core clinical information that should be shared while transferring a sick neonate in a resource-limited setting.

2. Determine the quality of the existing neonatal clinical information sharing practice in Rwanda.

3. Determine the baseline mortality and morbidity of neonates transferred to tertiary centers in Rwanda.
Methods

• **Design**: cross-sectional, longitudinal study

• **Setting**: Pediatric dept of Kigali public referral hospitals (CHUK & RMH)

• **Participants**:
  ✓ Neonates, aged 0-28 days,
  ✓ transferred and
  ✓ whose caregivers aged > 18yrs,
  ✓ consented for participation
Methods

Main independent factor: Quality of information sharing:
  ✓ Low CCI documentation (< 33.3% of CCI documented)
  ✓ High CCI documentation (≥ 33.3 % of CCI documented)

Outcomes:

1. **Mortality** within 7 days of admission:
2. **Morbidities at admission:** hypothermia, hypoxia, seizures and requiring resuscitation
Fig 1: Recruitment strategy

Eligible for inclusion (n=160)

Declined to participate (n=0)
Caregivers aged < 18yrs (n=0)

RMH (n=15)  CHUK (n=145)

Duplicated cases (n=2) excluded

Analysis (n=158)
Fig 2: Overall quality of referral letters
Table 1: Prevalence of mortality and morbidities

<table>
<thead>
<tr>
<th></th>
<th>CHUK (n=143)</th>
<th>RMH (n=15)</th>
<th>Total (n=158)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Death within day 1</strong></td>
<td>6 (4.2 %)</td>
<td>0</td>
<td>6 (3.8%)</td>
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<tr>
<td><strong>Death within days 2 to 7</strong></td>
<td>22 (15.4%)</td>
<td>2 (13.3%)</td>
<td>24 (15.2%)</td>
</tr>
<tr>
<td><strong>Total deaths</strong></td>
<td>28 (19.6%)</td>
<td>2 (13.3%)</td>
<td>30 (19%)</td>
</tr>
<tr>
<td><strong>Hypothermia</strong></td>
<td>53 (37.1%)</td>
<td>10 (66.7%)</td>
<td>63 (39.9%)</td>
</tr>
<tr>
<td><strong>Resuscitation</strong></td>
<td>35 (24.5%)</td>
<td>8 (53.3%)</td>
<td>43 (27.2%)</td>
</tr>
<tr>
<td><strong>Hypoxia</strong></td>
<td>17 (11.9%)</td>
<td>5 (33.3%)</td>
<td>22 (13.9%)</td>
</tr>
<tr>
<td><strong>Seizures</strong></td>
<td>7 (4.9 %)</td>
<td>2 (13.3%)</td>
<td>9 (5.7 %)</td>
</tr>
<tr>
<td>Mortality (study period)</td>
<td>Mortality rate</td>
<td>Unadjusted odds ratio, (df = 1)</td>
<td></td>
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<tr>
<td>----------------------------------------------</td>
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<tr>
<td>Amount of CCI data</td>
<td></td>
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<tr>
<td>Low (&lt; 33.3%)</td>
<td>17/75 (22.7%)</td>
<td>OR=1.58 (CI:0.71 to 3.52), p=0.262</td>
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<tr>
<td>High (≥ 33.3%)</td>
<td>13/83 (15.7%)</td>
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</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17/100 (17%)</td>
<td>OR=1.41 (CI: 0.63 to 3.17), p=0.40</td>
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</tr>
<tr>
<td>Female</td>
<td>13/58 (22.4%)</td>
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<td></td>
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<tr>
<td>Prematurity</td>
<td></td>
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<tr>
<td>&lt;37 weeks</td>
<td>7/33 (21.2%)</td>
<td>OR=1.27 (CI:0.48 to 3.31), p=0.632</td>
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<tr>
<td>&gt;37 weeks</td>
<td>20/114 (17.5%)</td>
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<tr>
<td>Birth weight</td>
<td></td>
<td></td>
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<tr>
<td>&lt;2.5 Kg</td>
<td>15/53 (28.3%)</td>
<td>OR=2.37 (CI:1.05 to 5.32), p=0.034</td>
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<tr>
<td>≥2.5 Kg</td>
<td>15/105 (14.3%)</td>
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<tr>
<td>Primary diagnosis</td>
<td></td>
<td></td>
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<tr>
<td>Surgical</td>
<td>19/106 (17.9%)</td>
<td>OR=1.23 (CI: 0.54 to 2.82), p=0.627</td>
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<tr>
<td>Medical</td>
<td>11/52 (21.2%)</td>
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<tr>
<td>Hypothermia</td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>15/63 (23.8%)</td>
<td>OR=1.67 (CI: 0.75 to 3.71), p=0.21</td>
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</tr>
<tr>
<td>No</td>
<td>15/95 (15.8%)</td>
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<tr>
<td>Seizures</td>
<td></td>
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<tr>
<td>Yes</td>
<td>3/9 (33.3%)</td>
<td>OR=2.26 (CI: 0.53 to 9.61), p=0.258</td>
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</tr>
<tr>
<td>No</td>
<td>27/149 (18.1%)</td>
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<tr>
<td>Hypoxia</td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>8/22 (36.4%)</td>
<td>OR=2.96 (CI:1.11 to 7.9), p=0.025</td>
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<tr>
<td>No</td>
<td>22/136 (16.2%)</td>
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<tr>
<td>Resuscitation</td>
<td></td>
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<tr>
<td>Yes</td>
<td>11/43 (25.6%)</td>
<td>OR=1.74 (CI: 0.75 to 4.04), p=0.196</td>
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<tr>
<td>No</td>
<td>19/115 (16.5%)</td>
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Discussion - CCI

• First study, globally, targeting clinical information sharing in neonatal care

• Consensus from international experts
  ➢ 57 items which should be shared between clinicians when transferring a sick neonate in a resource limited setting, Rwanda.

• Mainly participants from resource limited countries (hence generalizable results to similar setting)
Discussion

• Similar to a Nigerian study, pediatric referral letters of poor quality in terms of completeness.²

• **Almost one fifth** (19%) of study population died before the 7th day of admission,
  - Studies from Brazil, India and Argentina showed the overall mortality (until discharge or death) of transported neonates was 18%, 20% and 18% respectively.⁷,⁸,⁹
  - CHUK/Neonatal unit mortality: 16% ¹⁰

• **Hypoxia and low birth weight** were found strongly associated with mortality, (p<0.05)
  - Need of improving quality of neonatal transfer services (e.g. transport modalities, communication)

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¹ Rathod et al. Transport of sick neonates to a tertiary care hospital, South India: condition at arrival and outcome. 2015:
² Goldsmid et al. Transport of sick neonates to a tertiary care hospital, South India: condition at arrival and outcome. 2012:
³ Araújo et al. Effect of place of birth and transport on morbidity and mortality of preterm newborns 2011
⁴ Jaeseok et al. Establishing a neonatal database in a tertiary hospital in Rwanda. 2019
Conclusion & Recommendations

• Transfer of neonates in resource limited settings
  • poses an additional risk to mortality and morbidities;
  ➢ Need of organized transport systems with focus to neonates

• To close the gap in communication,
  ➢ Needs a harmonized neonatal referral form and improved documentation (clinicians)

• Points of future work:
  ➢ Designing and validation of a national NRF from the CCI list items
  ➢ Transport modalities
Next steps

Limitations:
- Only clinicians involved
  - No nurses or parents
- Two of 4 referral hospitals, public
- Clinical outcomes prior/during transportation,
- Transport modalities (monitoring in ambulance, etc)

Next steps:
- Any country like Rwanda, create national NRF from this CCI list?
- Further research on whether a standardized NRF affects the outcomes of neonates transferred between health facilities in Rwanda
Where are we?
Two page raNRF drafted from 57 items under piloting process...
Acknowledgments

Co-authors

- Dr Christian UMUHOZA
- Dr Peter CARTLEDGE
- Dr Mark H. CORDEN

Others

- Rwanda Neonatal Working Group
- RPA (transport chapter team)
- Study participants
Thank you