An audit of transfers into the PICU at the Red Cross War Memorial Children’s Hospital: ten years later

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Background

- Post centralisation of paediatric intensive care services – international move towards specialised paediatric retrieval services

- South Africa has not adopted a specialised paediatric retrieval service and relies on transfers performed by general paramedic services

- Previous study in the Western Cape revealed high rate of adverse events
Literature Search

- Outcomes prior to SRT’s
- Outcomes of SRT’s
- Use of Pre-transfer Communication
- Requirements of Specialised Retrieval Units
- Perceptions Surrounding SRT’s
- Concerns Regarding SRT’s
- PIM scoring and the retrieval process
- Previous Study on Paediatric Transfers in the Western Cape Province
Outcomes Prior to SRT’s

- Rate of Adverse Events 20 – 75%
  - No Difference in Physiologic Deterioration
  - Significant Difference in Intensive Care related events


- Increase in Adverse Events with increased distance and level of required therapy

  Barry PW, Ralston C. Adverse events occurring during interhospital transfer of the critically ill. *Archives of Disease in Childhood* 1994;71:8–11.

- Significant Correlation between lack of experience and increase in Adverse Events

Outcomes of SRT’s

- Increase in interventions performed during the retrieval process.
- Improvement in the severity of illness as assessed by PRISM scoring.
- Fewer Adverse Events in transfers by SRT’s as compared to non-SRT’s.
- Fewer Adverse Events in transfers by SRT’s compared to transfers accompanied by the referring specialist.
- Reduced risk of mortality with SRT’s.


Use of Pre-transfer Communication

- Pre-transfer communication can prevent problems that occur during different phases of the transfer process.

- Pre-transfer communication leads to earlier interventions and appropriate stabilisation of patients.

- The use of communication checklists allows for improved clarity, shorter communication times and better planning for the transfer process.


Requirements of Specialised Retrieval Units

- Various team members (Doctor, Nurse, Paramedic)
- Teams evolve depending on requirements and level of function


- Equipment must be standardized and must meet the requirement for mobile intensive care.
- Continuous monitoring should be utilized
- Minimum levels and standards of equipment are changing


Perceptions surrounding SRT’s

- Referring physicians and receiving specialists found the use of SRT’s favorable.
  

- Nurses were in favor of the development of nurse practitioners in critical care transport and felt that they were adequately trained.
  

- Parents accompanying SRT’s found the process to be safe and beneficial. Staff noted they were able to perform their duties without hinderance.

Concerns regarding SRT’s

- Concern regarding loss of skills in referring institutions.

- 2 studies investigated this concern and both concluded that there was no loss in skills as noted by the increase in airway management procedures and central line placement prior to the retrieval process.


Use of PIM in transfers

- PIM preferred over PRISM due to the ease in collecting required variables
- Point of care collection of data in PIM not affected by the retrieval process.
- Over estimation of predicted mortality.

Previous Study on Paediatric Transfers in the Western Cape Province

- Study by Hatherill et al
- Prospective study over one year period
- Technical Adverse Event in 36%
- Clinical Adverse Event 27%
- Critical Adverse Event in 9%

Objective of the Study

- To perform an audit on transfers in to the paediatric intensive care unit at Red Cross War Memorial Children’s Hospital and to describe adverse events as well as their effect on outcomes.
Specific Aims

◆ Primary Objective
  ◆ To describe the adverse events that occurred during the interfacility transfer process.
    ◆ Technical Adverse Events
    ◆ Clinical Adverse Events
    ◆ Critical Adverse Events

◆ Secondary Objective
  ◆ To describe the mortality of patients transferred in to the PICU from other institutions

◆ Tertiary Objective
  ◆ To describe the effect of staff, mode of transport, duration of transfer as well as the level of referring institution on adverse events and outcomes.
Study Design

☒ To reliably indicate any changes from the 2003 study – the study design was unchanged

☒ Prospective Observational Study

☒ Population

+ Children admitted to the PICU at RCWMCH

☒ Sample Size and Selection

+ All children transferred directly in to the PICU from other institutions (1 December 2013 – 30 November 2014)

+ Exclusions

  + Children Transferred from within the hospital
  + Children with a PIM Risk of Mortality of <1%
Study Method

- Patients identified at time of arrival or through the admission register

- Data is extracted from the patient file, paramedic transfer log and in discussion with the admitting doctor within 24 hours of the admission

- Data Analysis Strategy
  - Nonparametric descriptive and $\chi^2$ tests
  - $P < 0.05$ significant
  - Statistica (version 11)
Ethics

- HREC approval 702/13
- Ethics approved the study with waived consent
  - Observational study
  - Risk of breach of confidentiality minimized by de-identifying data.
- This study conforms to the principles stated in the Declaration of Helsinki (2008)
## Interim Results

<table>
<thead>
<tr>
<th></th>
<th>Hatherill 2003 n=202</th>
<th>Dimitriades Interim 2014 n=104</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (mts)</strong></td>
<td>2.8 (1.1 – 14)</td>
<td>1.67 (0.25 – 10.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td>3.5 (2.5 – 8.1)</td>
<td>3.4 (2.2 – 8.6)</td>
<td></td>
</tr>
<tr>
<td><strong>PIM2 (ROM)</strong></td>
<td>0.15 (0.13-0.18)</td>
<td>0.08 (0.03 – 0.15)</td>
<td></td>
</tr>
<tr>
<td><strong>Type of illness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>99 (49%)</td>
<td>38 (36,5%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Cardiac</td>
<td>22 (10,9%)</td>
<td>19 (18,2%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Neonatal surgical</td>
<td>52 (25,7%)</td>
<td>30 (28,8%)</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Hospital</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>71 (35,1%)</td>
<td>52 (50%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Metropolitan</td>
<td>70 (34,7%)</td>
<td>19 (18,3%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Rural</td>
<td>61 (30,2%)</td>
<td>32 (30,8%)</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Personnel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PICU staff</td>
<td>20 (9,9%)</td>
<td>13 (12,5%)</td>
<td>0.5</td>
</tr>
<tr>
<td>Non-PICU staff</td>
<td>182 (90,1%)</td>
<td>91 (87.5%)</td>
<td>0.49</td>
</tr>
<tr>
<td>Refer. physician</td>
<td>17 (8,4%)</td>
<td>1 (1%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Paramedics</td>
<td>165 (81,7%)</td>
<td>90 (86.5%)</td>
<td>0.28</td>
</tr>
</tbody>
</table>
## Interim results

<table>
<thead>
<tr>
<th>Transport</th>
<th>Hatherill 2003 n=202</th>
<th>Dimitriades Interim 2014 n=104</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>153 (75.7%)</td>
<td>79 (76%)</td>
<td>0.97</td>
</tr>
<tr>
<td>Helicopter</td>
<td>20 (9.9%)</td>
<td>0 (0%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Fixed wing aircraft</td>
<td>29 (14.4%)</td>
<td>25 (24%)</td>
<td>0.035</td>
</tr>
<tr>
<td>Duration of transport (hours)</td>
<td>3.5 (2 – 6)</td>
<td>3.67 (2.1 – 8.73)</td>
<td></td>
</tr>
<tr>
<td>Technical adverse events</td>
<td>72 (35.6%)</td>
<td>47 (45.2%)</td>
<td>0.1</td>
</tr>
</tbody>
</table>
## Interim results

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>No functional venous access (total)</td>
<td>38 (18.8%)</td>
<td>1 (1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Venous access placed</td>
<td>190 (94.1%)</td>
<td>103 (99%)</td>
<td></td>
</tr>
<tr>
<td>1 peripheral</td>
<td>159 (83.7%)</td>
<td>31 (30.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>2 peripheral</td>
<td>19 (10%)</td>
<td>56 (54.4%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Central venous</td>
<td>6 (3.2%)</td>
<td>15 (14.6%)</td>
<td>0.0007</td>
</tr>
<tr>
<td>Insufficient monitoring (total)</td>
<td>26 (12.9%)</td>
<td>56 (53.8%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Intubated for transfer</td>
<td>118 (58.4%)</td>
<td>73 (70.2%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Oral</td>
<td>74 (62.7%)</td>
<td>22 (30.1%)</td>
<td>0.006</td>
</tr>
<tr>
<td>Nasal</td>
<td>44 (37.3%)</td>
<td>47 (64.4%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ETT malpositioned</td>
<td>30 (25.4%)</td>
<td>12 (16.4%)</td>
<td>0.4</td>
</tr>
</tbody>
</table>
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<tbody>
<tr>
<td><strong>Clinical adverse events</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>En route</td>
<td></td>
<td>54 (26.7%)</td>
<td>28 (26.9%)</td>
</tr>
<tr>
<td>En route</td>
<td></td>
<td>28 (13.9%)</td>
<td>7 (6.7%)</td>
</tr>
<tr>
<td>Hypoxia</td>
<td></td>
<td>27 (13.4%)</td>
<td>5 (4.8%)</td>
</tr>
<tr>
<td>Hypoglycaemia</td>
<td></td>
<td>12 (5.9%)</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td><strong>Critical adverse events</strong></td>
<td></td>
<td>18 (8.9%)</td>
<td>5 (4.8%)</td>
</tr>
<tr>
<td>Immediate intubation</td>
<td>11 (5.4%)</td>
<td>0</td>
<td>3 (2.9%)</td>
</tr>
<tr>
<td>Cardiac and/or respiratory arrest</td>
<td>13 (6.4%)</td>
<td>0</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td><strong>Mortality all cause</strong></td>
<td>34 (16.8%)</td>
<td>9 (8.6%)</td>
<td></td>
</tr>
<tr>
<td>LOS ICU</td>
<td>5.1 (2.0 – 9.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Strengths and Weaknesses

- **Strengths**
  - Prospective study
  - Similar methodology to prior study

- **Weaknesses**
  - Poor consensus prior to the commencement of the study on quality metrics
Conclusion

- Rate of transfers unchanged
- Staffing structure of transfers unchanged
- Comparatively high rate of adverse events still noted
- Further research is required to improve the retrieval process in to PICU
  - Novel approaches required
    - Strengthening of education and training
    - Clinical Decision Facilitators