Quality Assurance Of Pre-hospital Endotracheal Intubation Performed By Advanced Care Paramedics (ACPs) In Ottawa, Canada

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Background

- ETI as “gold standard” of airway care in unconscious patients
- Provide secured airway during transport
- Optimize oxygenation and ventilation
- Pulmonary toileting
- Route of drugs administration
# Success & outcome

<table>
<thead>
<tr>
<th>Study</th>
<th>Success Rate</th>
<th>Arrest/coma</th>
<th>NT/OT</th>
<th>Comp</th>
<th>Pediatrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stewart</td>
<td>90.9</td>
<td>Yes</td>
<td>OT</td>
<td>9.5</td>
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<tr>
<td>O’Brian</td>
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<td>Jacobs</td>
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<td>Mainly</td>
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<td>All</td>
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<tr>
<td>Delec</td>
<td>90.6</td>
<td>NA</td>
<td>OT</td>
<td>5.1</td>
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<tr>
<td>Pointer</td>
<td>93.5</td>
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<td>OT</td>
<td>31.3</td>
<td>No</td>
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<tr>
<td>Aijan</td>
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<td>Yes</td>
<td>OT</td>
<td>7.0</td>
<td>All</td>
</tr>
<tr>
<td>Krisanda</td>
<td>75.0</td>
<td>N</td>
<td>NT/OT</td>
<td>7.0</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Current Controversy

- Modify patient outcome
  - Beneficial vs harmful
- Mode of training
- Skill retention
- Drug-assisted intubation
- Alternative airways
Objectives

- **Primary Objective:**
  - Ottawa’s pre-hospital ETI success rate

- **Secondary Objective:**
  - To identify potential barriers and complications
Methods

- Retrospective review of Ambulance Call Reports (ACRs) involving invasive airway management by ACPs
- Study period: July 1st 2003 - July 31st 2005
Definitions

- **Age:**
  - Adults: $\geq 8$ yrs old
  - Children: $< 8$ yrs old

  - AHA ACLS 2000
Definitions

- ETI attempt
  - ETT beyond oropharynx

- ETI success
  - ETT position confirmed clinically and be able to ventilate through it
Study target

- Advanced Care Paramedics (ACPs)
  - 150 ACPs in Ottawa region
  - Scope of practice
    - ACLS
    - Symptoms relief intervention
  - Perform pre-hospital endotracheal intubation (ETI) as clinically indicated
  - Non DAI
Data source

- Ambulance Call Reports
  - Mandatory reports (>95%)
Inclusion criteria

- All patients attended during the study period by Ottawa ACPs
Exclusion criteria

- ETI not performed by ACPs
- Inter-provincial transfer
- Inter-facilities transfer
- Physicians on scene
Method (Data collection)

- 3 independent chart extractors
- Reviewed all eligible ACRs, and transcribed onto a predetermined data entry form
- Conflicting of interpretation was resolved by agreement between the two principle investigators
Statistical analysis

- Descriptive statistical analysis
- Univariate analysis on demographics data
- Logistic regression to determine environmental barriers and complications
## Patient demographics

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Non-transported</th>
<th>Transported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ACRs</td>
<td>1029</td>
<td>514</td>
<td>515</td>
</tr>
<tr>
<td>Sex (M)</td>
<td>640</td>
<td>343</td>
<td>297</td>
</tr>
<tr>
<td>Adults</td>
<td>1013</td>
<td>510</td>
<td>503</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>
Patient demographics

- **Age:**
  - Median 69, range (0-97)
Nature of EMS calls

- Medical Pts
- Trauma Pts
- Others

Studied ACRs

- 100.0%
- 90.0%
- 80.0%
- 70.0%
- 60.0%
- 50.0%
- 40.0%
- 30.0%
- 20.0%
- 10.0%
- 0.0%
## Overall successful attempts

<table>
<thead>
<tr>
<th></th>
<th>Overall success rate</th>
<th>Success rate in non-transported</th>
<th>Success rate in Transported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall ACRs</td>
<td>82.1%</td>
<td>86.4%</td>
<td>77.6%</td>
</tr>
<tr>
<td>VSA</td>
<td>86.3%</td>
<td>86.7%</td>
<td>85.7%</td>
</tr>
<tr>
<td>Medical Pts</td>
<td>82.4%</td>
<td>86.7%</td>
<td>78.4%</td>
</tr>
<tr>
<td>Trauma Pts</td>
<td>69.8%</td>
<td>75.0%</td>
<td>69.1%</td>
</tr>
<tr>
<td>Adults</td>
<td>82.1%</td>
<td>86.3%</td>
<td>77.7%</td>
</tr>
<tr>
<td>Children</td>
<td>77.8%</td>
<td>NA</td>
<td>77.8%</td>
</tr>
</tbody>
</table>
Success in first attempts

<table>
<thead>
<tr>
<th></th>
<th>Overall ACRs success Rate</th>
<th>Non-transported success rate</th>
<th>Transported success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>63.6%</td>
<td>66.5%</td>
<td>62.7%</td>
</tr>
<tr>
<td>VSA</td>
<td>67.0%</td>
<td>66.5%</td>
<td>67.8%</td>
</tr>
<tr>
<td>Medical Pts</td>
<td>65.3%</td>
<td>67.3%</td>
<td>63.4%</td>
</tr>
<tr>
<td>Trauma Pts</td>
<td>53.5%</td>
<td>0%</td>
<td>54.8%</td>
</tr>
<tr>
<td>Adults</td>
<td>65.0%</td>
<td>66.3%</td>
<td>63.6%</td>
</tr>
<tr>
<td>Children</td>
<td>22.2%</td>
<td>NA</td>
<td>22.2%</td>
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</table>
VSA patients on 1st ETI attempts

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Non-transported</th>
<th>Transported</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>75.6%</td>
<td>99.4%</td>
<td>51.8%</td>
</tr>
</tbody>
</table>
Route of ETI on 1st attempts

- Overall
- Non-transported
- Transported

Nasal: Yellow
Oral: Red
Success: oral vs nasal route on 1st attempts

<table>
<thead>
<tr>
<th>Route</th>
<th>Overall</th>
<th>Non-transported</th>
<th>Transported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nasal route</strong></td>
<td>54.7%</td>
<td>NA</td>
<td>54.97%</td>
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<tr>
<td><strong>Oral route</strong></td>
<td>66.1%</td>
<td>66.54%</td>
<td>65.84%</td>
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</tbody>
</table>
Success rates in sequential attempts and cumulative attempts
Complications reported during ETI

Number of incidence reported
(Total n = 1029)

- Equip failure
- Vomiting
- Displaced ETT during transport
- Missing equip
- Laryngospasm
- Others

End tidal CO₂ monitor
Environmental barriers reported during ETI

- Trapped in vehicle
- Poor lighting
- Hostile bystander
- Snow/rain/fire
- Lack of room
- Problem with access

No. of environmental barriers reported
(Total n = 1029)
Reported patient barriers during ETI

- Foreign body / fluid in airway: 290
- Unable to visualize cords: 120
- Clenched jaw trismus: 80
- C spine collar: 60
- Intact gag reflex: 60
- Oral / facial trauma: 40
- Combative pt: 30
- Short neck: 20
- Ant cords: 10
- Inadeq relax: 5
- Others: 5

No. of pt barriers reported
(Total n = 1029)
Success in 1st attempts

<table>
<thead>
<tr>
<th>Descriptive data</th>
<th>p values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.055</td>
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<tr>
<td>Gender</td>
<td>0.0280</td>
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<tr>
<td>Nature EMS calls</td>
<td>0.182</td>
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<tr>
<td>Pre-intubated GCS (3 vs &gt;3)</td>
<td>0.080</td>
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</table>
## Factors influencing overall success

<table>
<thead>
<tr>
<th>Descriptive data</th>
<th>p values</th>
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<tr>
<td>Pre-intubation GCS (3 vs &gt;3)</td>
<td>0.003</td>
</tr>
<tr>
<td>VSA</td>
<td>&lt;0.001</td>
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</table>
Regression analysis of barriers and complications on ETI success

- T-vomit
- T-hostile bystander
- T-short/fat neck
- T-Intact gag
- T-FB
- T-ant cord
- NT-unable visualize cords
- T-unable visualize cords
- T-clenched jaw

Odds ratio (95% CI)
Discussion

- Our ETI success rate of 82.1% is consistent with rates reported in the literature.
- There is no significant improvement in success rates after the 2nd attempt.
Discussion

- Positive predicting variables of success
  - VSA
  - Pre-intubation GSC=3
Discussion

- Negative predicting variables of success
  - Combative, alert patients
  - Unable to visualize vocal cords
Discussion

- Complication rate was 3.2%, excluding equipment issues
- Equipment failure and vomiting were common complications
Conclusion

- Ongoing QA of pre-hospital ETI is critical to ensure successful airway management
- Patient and environmental barriers to ETI success can be identified
- Protocols and training for pre-hospital ETI must consider a risk stratification approach
Limitations

- Retrospective chart review on ACRs; quality of the chart documentation varied
- Lack of independent field validation on ETI confirmation
- No hospital data on transported patients
- Outcome measurement limited to documented intubation success
Future

- National standardized ETI data collection
- Multi-centers collaboration on children
References


Acknowledgements

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- Ottawa Base Hospital Program
Study partners