Pre-Hospital and Ambulance Service Management of the Poisoned Patient

Fridtjof Heyerdahl
MD, PhD
Department of Acute Medicine
Oslo University Hospital, Ullevaal
Oslo, Norway
Disposition

- The prehospital setting
  - Differences to the hospital setting, toxicological panorama
- The patient to the hospital or the hospital to the patient?
  - GI decontamination in the pre-hospital setting?
- Prehospital discharge of opioid overdoses against medical advice (AMA)
- Challenges with opioid poisoning reversal
  - Routes of Naloxone administration
  - Reversal, recurrence in long-acting opioids
- Flumazenil – or not?
The out-of-hospital setting

Rural vs urban setting
Skills and levels of the EMS responders
Toxic agents in patients treated at different levels
(highest level of care for each patient)

More than half of the poisoned patients treated in prehospital settings were discharged without transfer to higher levels.

More often caused by illicit drugs and alcohol.

More than two-thirds were males.

Almost half of those discharged from ambulances received an antidote.
Out-of-hospital treatment

The mainstay – simple principles!

ABC
Transportation
The effect of different treatments

Mortality

Treatment of cardiovascular failure

Protect airway, oxygen

Centralization
No stimulation
Forced diuresis
Dialysis, antidotes

T Rygnestad, 2012
The Role of Activated Charcoal and Gastric Emptying in Gastrointestinal Decontamination: A State-of-the-Art Review

Figure 1. Impact of time to syrup of ipecac on efficacy of emesis. 52-54,56,62,64-66,70,76,82

Figure 2. Impact of time to gastric lavage on efficacy of gastric lavage. 52,64-66,78

Reduction in absorption (%) vs. Time from ingestion to gastric lavage (min)

Reduction in absorption (%) vs. Time from ingestion (min)
The Role of Activated Charcoal and Gastric Emptying in Gastrointestinal Decontamination: A State-of-the-Art Review

Figure 3.

Impact of time to activated charcoal on efficacy of activated charcoal. 51,56-58,60-63,66-69,71-74,84-86

Reduction in absorption (%) vs Time from ingestion to activated charcoal (min)
“It should not be performed routinely, if ever”

In addition:
Requires intact or protected airway (intubation skills)
Handling of possible deterioration of the clinical situation
Difficult to perform outside treatment facilities

= not very feasible in the prehospital setting
Position Paper: Ipecac Syrup

American Academy of Clinical Toxicology*
European Association of Poisons Centres and Clinical Toxicologists**

ABSTRACT

Syrup of ipecac should not be administered routinely in the management of poisoned patients. In experimental studies the amount of marker removed by ipecac was highly variable and diminished with time. There is no evidence from clinical studies that ipecac improves the outcome of poisoned patients and its routine administration in the emergency department should be abandoned. There are insufficient data to support or exclude ipecac administration soon after poison ingestion. Ipecac may delay the administration or reduce the effectiveness of activated charcoal, oral antidotes, and whole bowel irrigation. Ipecac should not be administered to a patient who has a decreased level or impending loss of consciousness or who has ingested a corrosive substance or hydrocarbon with high aspiration potential. A review of the literature since the preparation of the 1997 Ipecac Syrup Position Statement revealed no new evidence that would require a revision of the conclusions of that Statement.
GUIDELINE

Guideline on the Use of Ipecac Syrup in the Out-of-Hospital Management of Ingested Poisons*

Anthony S. Manuguerra, Pharm.D., D.A.B.A.T., F.A.A.C.T.,
Daniel J. Cobaugh, Pharm.D., D.A.B.A.T., and the Members of the
Guidelines for the Management of Poisonings Consensus Panel
American Association of Poison Control Centers, Washington, District of Columbia, USA

No routine use, but in rare situations in which:
• no contraindication
• substantial risk of serious toxicity
• no alternative therapy available (e.g., activated charcoal)
• delay of greater than 1 hour before the patient will arrive at an emergency medical facility
• ipecac syrup administration will not adversely affect more definitive treatment that might be provided at a hospital.

Are there any such situations?
The documentation is still scarce
In the pre-hospital setting: transportation of a vomiting patient...
Conclusion - Induced emesis in a pre-hospital setting:

• New position paper – old conclusion
• NOT routinely use
• Rare situations IF ANY:
  – Alert patient, severe poisoning suspected, short time from ingestion, time delay to other treatment.
  – iron poisoning, toxic mushroom ingestion?
• In Norway – Still in the recommendations - not completely abandoned, but rarely used
  – Children: less effective gastric lavage because of small tube size?
  – cooperation with AC administration?
Not routinely administered
Severe poisoning

Within one hour
“the potential for benefit after one hour cannot be excluded”
Out-of-Hospital Administration of Activated Charcoal by Emergency Medical Services

Ari O. Alaspää, MD
Markku J. Kuisma, MD, PhD
Kalle Hoppu, MD, PhD
Pertti J. Neuvonen, MD, PhD

From the Helsinki Emergency Medical Services, Poison Information Centre, and Department of Clinical Pharmacology, Helsinki University Central Hospital, Helsinki, Finland.

Volume 45, No. 2 : February 2005

Annals of Emergency Medicine 207
Table 3. The subgroups of the study by administration route of activated charcoal.

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Orally (n=490)</th>
<th>Nasogastric Tube (n=65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only BLS, No. (%) *</td>
<td>307 (63)</td>
<td>0</td>
</tr>
<tr>
<td>ALS unit at the scene, No. (%) *</td>
<td>159 (32)</td>
<td>20 (31)</td>
</tr>
<tr>
<td>MICU at the scene, No. (%) *</td>
<td>27 (6)</td>
<td>57 (88)</td>
</tr>
</tbody>
</table>

Adverse events reported, No.

- Cardiopulmonary resuscitation (n=2)
  - Before AC (died) 0
  - After AC (survived) 0
- Vomiting (n=47)
  - Before AC 19
  - After AC 17
- Convulsions (n=9)
  - Before AC 1
  - After AC 1
- Deterioration of consciousness† 7
- Deterioration of pulse oximeter values† 1
Feasibility of prehospital treatment with activated charcoal: Who could we treat, who should we treat?

G K Isbister, A H Dawson, I M Whyte

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drugs regarded as highly toxic (where supportive care alone may be ineffective) or where there is no antidote available, and where early decontamination with charcoal is potentially life-saving. This group included any cases where one of these drugs was ingested: A: cause significant early sedation B: less likely to cause sedation</td>
<td>A Tricyclic antidepressants Carbamazepine Hydroxychloroquine Quinine Thioridazine B Theophylline Calcium channel blockers Colchicine Arsenic, boric acid Antiarrhythmics (flecainide) β blockers</td>
</tr>
<tr>
<td>2</td>
<td>Drugs that may cause early sedation, are treated effectively with supportive care and activated charcoal is unlikely to affect major outcomes. This group included only single ingestions of these drugs or where only combinations of these drugs were taken.</td>
<td>Benzodiazepines Ethanol Antihistamines (excluding pheniramine and diphenhydramine) Opioids Other hypnotics (zolpidem, zopiclone)</td>
</tr>
<tr>
<td>3</td>
<td>Paracetamol containing analgesics where only this analgesic or analgesic combination was ingested.</td>
<td>Paracetamol Paracetamol/codeine Paracetamol/codeine/antihistamine</td>
</tr>
<tr>
<td>4</td>
<td>All other single or multiple drug ingestions not fitting criteria for groups 1–3</td>
<td>Available from authors</td>
</tr>
</tbody>
</table>
Only a small group of patients will possibly benefit from the use of prehospital activated charcoal.

- a much larger group of patients must be exposed to the risk of charcoal aspiration
- or protocols would need to be developed for ambulance services so that only this group receives charcoal.

Table 2: Subgroup analysis of patients presenting to ambulance and hospital within one and two hours. The subgroups are defined in table 1 and the number of each is entered in this table. Numbers in parentheses for groups 1A and 1B are if patients with a GCS <14 are excluded so less patients are decontaminated by ambulance, reducing the number of extra cases.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Hospital within one hour</th>
<th>Extra cases AC</th>
<th>Hospital within two hours</th>
<th>Extra cases AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>334</td>
<td>129 (39)</td>
<td>106</td>
<td>38</td>
<td>19 (18)</td>
</tr>
<tr>
<td>1A</td>
<td>279</td>
<td>105 (83)</td>
<td>87 (65)</td>
<td>44</td>
<td>36 (65)</td>
</tr>
<tr>
<td>1B</td>
<td>55</td>
<td>24 (23)</td>
<td>5</td>
<td>32</td>
<td>128</td>
</tr>
<tr>
<td>2</td>
<td>439</td>
<td>160 (36)</td>
<td>13</td>
<td>13</td>
<td>43</td>
</tr>
<tr>
<td>3</td>
<td>134</td>
<td>56 (42)</td>
<td>13</td>
<td>10</td>
<td>79</td>
</tr>
<tr>
<td>4</td>
<td>1134</td>
<td>429 (38)</td>
<td>93</td>
<td>8</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>2041</td>
<td>774 (38)</td>
<td>161</td>
<td>8</td>
<td>1247</td>
</tr>
</tbody>
</table>

activated charcoal administration could be appropriate for patients who might have ingested large doses of acetaminophen and who are located several hours from an emergency department.
Conclusion: AC in a pre-hospital setting

- Probably a role in prehospital treatment
  - Remote areas – long distances
  - Suspected severe poisonings (with adsorbable substances)
  - Intact or protected airways
  - Requires EMS protocols, training etc.
Antidotes in the pre-hospital setting
Naloxone

• “Ideal reversal”
  – gradual titration to reverse respiration depression
• Higher dose may be needed to prevent recurrence
  – IM / IV or both?
  – Dosing typically 0,4-2 mg IV, 0,4-2 mg IM
• What about signing out against medical advice?
Pre-hospital discharge after opioid poisoning – safe or not?

**Heyerdahl** et al, BMC Emerg Med, 2008, 8:15
- 1402 patients discharged from a pre-hospital setting after acute poisoning
  - 630 with suspected opioid poisonings
  - Naloxon: Standard protocol: 0.4 mg I.M. plus 0.4 mg iv
- National Death Register- one week after the overdose:
  - One dead because of new overdose
  - No other deaths

**Wampler** et al, Prehosp Emerg Care 2011;15:320
- 552 patients with opioid overdose and signing out AMA
- Naloxone: 2 mg I.M (plus optional 2 mg I.V.)
- Medical examiner: 48 hours after treatment: No deaths

**Vilke** et al, Academ Emerg Med 2003;10,8:893
- 998 patients with opioid overdose and signing out AMA
- Naloxon: 2 mg I.V. or I.M., repeated if necessary
- Medical Examiner: 12 hours after treatment: No deaths
Kaplan-Meier plot
One-year estimated repetition rate

Repetition of acute poisoning during one year

Kaplan-Meier estimation

Adverse events after naloxone treatment of episodes of suspected acute opioid overdose

Ingebjørg Buajordet\textsuperscript{a}, Anne-Cathrine Næss\textsuperscript{b}, Dag Jacobsen\textsuperscript{c} and Odd Brørs\textsuperscript{a}

N=1192, Adverse events in 538 (45%)

Table 3. Events reported after naloxone treatment.

<table>
<thead>
<tr>
<th>Events</th>
<th>No. of events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n=726 )</td>
</tr>
<tr>
<td>Confusion\textsuperscript{a}</td>
<td>235 (32)</td>
</tr>
<tr>
<td>Headache\textsuperscript{a}</td>
<td>157 (22)</td>
</tr>
<tr>
<td>Nausea/vomiting\textsuperscript{a}</td>
<td>66 (9)</td>
</tr>
<tr>
<td>Aggressiveness\textsuperscript{a}</td>
<td>62 (8)</td>
</tr>
<tr>
<td>Tachycardia\textsuperscript{a}</td>
<td>47 (6)</td>
</tr>
<tr>
<td>Shivering</td>
<td>33 (5)</td>
</tr>
<tr>
<td>Seizures\textsuperscript{a}</td>
<td>27 (4)</td>
</tr>
<tr>
<td>Sweating</td>
<td>24 (3)</td>
</tr>
<tr>
<td>Tremor</td>
<td>9 (1)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>66 (9)</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Predefined events noted in the reporting charts used by the paramedics.
# Intranasal Naloxone

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Naloxon</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robertson 2009 (Fresno, USA)</td>
<td>N=154 suspected opioid overdose Retrospective</td>
<td>2 mg I.N. Vs 1 mg I.V.</td>
<td>Equal time interval from contact to response. More rescue naloxone in I.N. group (34 vs 18%)</td>
</tr>
<tr>
<td>Kelly 2005 (Melbourne, Australia)</td>
<td>N=155 unconscious, suspected opioid overdose</td>
<td>2 mg I.N. Vs 2 mg I.M.</td>
<td>Faster response time in I.M. vs I.N. group (6 vs 8 min) More agitation in the I.M. group (13 vs 2%)</td>
</tr>
<tr>
<td>Kerr 2009 (Melbourne, Australia)</td>
<td>N=172 unconscious, suspected opioid overdose</td>
<td>2 mg I.N. (2mg/ml) Vs 2 mg I.M.</td>
<td>Equal response time in both groups More rescue naloxone in I.N. group (18 vs 5%)</td>
</tr>
<tr>
<td>Merlin 2010 (New Jersey, USA)</td>
<td>N=93 suspected opioid overdose Retrospective</td>
<td>2 mg I.N. Vs 0.4-2 mg I.V.</td>
<td>Equal response time in both groups More rescue naloxone in I.N. group (42 vs 20%)</td>
</tr>
</tbody>
</table>

Lobmaier et al. Nor J Epidemiol 2011;21(1):107-111
INTRanasal NaloxOne Is a ViABLE Alternative to IntravenouS NaloxOne for Prehospital Narcotic Overdose

Tania Mieke Robertson, MD, Gregory W. Hendey, MD, Geoff Stroh, MD, Marc Shalit, MD

PREHOSPITAL EMERGENCY CARE 2009;13:512–515
Intanasal naloxone

Pro

• Needleless
• Less adverse events?
• Adm by laypersons
  – Earlier treatment

• Prescription naloxone
  – Overdose prevention

Con

• More rescue naloxone
• False sense of security?
• Lay rescue may lead to overuse, and potentially unnecessary adverse events?
Buprenorphine overdose:
• opioid syndrome not differing significantly from heroin and methadone in mental status or arterial blood gases.
• Mental status depression was not reversed in buprenorphine overdoses with naloxone (0.4–0.8 mg).
Naloxone Reversal of Buprenorphine-induced Respiratory Depression

Eveline van Dorp, M.D.,* Ashraf Yassen, M.Sc.,† Elise Sarton, M.D., Ph.D.,‡ Raymonda Romberg, M.D., Ph.D.,§
Erik Olofsen, M.Sc.,|| Luc Teppema, Ph.D.,# Meindert Danhof, Ph.D.,** Albert Dahan, M.D., Ph.D.††

Fig. 1. (A) Effect of placebo on 0.2 mg buprenorphine–induced respiratory depression. Values are the mean values ± SEM (n = 8) of the 1-min averages of individual subjects. (B) Influence of 2 mg naloxone given over 30 min on 0.2 mg buprenorphine–induced respiratory depression (open circles) in one subject. Gray field in the background is the result of the placebo group. (C) Influence of 6 mg naloxone given over 30 min on 0.2 mg buprenorphine–induced respiratory depression (open circles) in one subject. Gray field in the background is the result of the placebo group. Light gray dots = buprenorphine infusion; dark gray dots = naloxone infusion.
Reversal of Buprenorphine-induces respiratory depression

Anesthesiology 2006; 105:51-7
Fig. 3. Influence of a continuous infusion of naloxone and placebo on 0.2 mg intravenous buprenorphine (a) and 0.4 mg intravenous buprenorphine (b). The buprenorphine dose was given over 60 min from t = 2 to t = 62 min (light gray dots). Naloxone or placebo was given for 2 h, from t = 32 to t = 152 min (dark gray dots). Black circles = naloxone (n = 8 per treatment); open circles = placebo (n = 8 per treatment). The gray area represents the 95% confidence interval of predrug baseline ventilation. Mean ventilation data are relative to baseline.

Anesthesiology 2006; 105:51-7
Buprenorphine overdoses

• Difficult to distinguish from other opioid poisonings
• Reversal with naloxone may be difficult, with a complex dose-response pattern
• Significant recurrence
Flumazenil – or not

- Paramedic or emergency physicians?
- Overuse if available?
  - Hospitals in Oslo:
    - Flumazenil given to 23% of all acute poisonings
    - 49% of patients receiving Flumazenil were not comatose!
      (Heyerdahl et al, Clinical Toxicology (2008) 46, 42–49)
- Adverse events: Seizures, withdrawal
- Is it really necessary?
- Oslo: Not with paramedics, only emergency physicians
Conclusion

• Prehospital toxicological panorama different from hospital
• Mainstay is ABC and symptomatic treatment
• In a long-distance prehospital setting and need for GI decontamination – administration of AC (oral or with nasogastric tube) is a feasible choice.
• Naloxone dosing – avoiding recurrence vs side effects and signing out AMA
• Route of administration – IN vs IV or IM ?
• Long acting opioid, Buprenorphine – bell shaped dose-response
• Flumazenil – needed in a regular paramedic ambulance?
Thank you