Anaphylaxis – epidemiology and guideline adherence in a city center emergency department

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Anaphylaxis is an acute, potentially life-threatening reaction usually affecting several organ systems.

**Warning symptoms**

The skin is involved in 90% of cases.

**Life-threatening symptoms**
Etiology of fatal anaphylaxis

Mostly cardiac arrest

Wasp bites and medication

Mostly respiratory arrest → most patients are known with uncontrolled asthma

Food

50% of fatal cases had previously mild episodes for which an adrenaline auto-injector was not prescribed.
Concomitant diseases increase the risk for severe/fatal anaphylaxis

- Severe or uncontrolled asthma
- Cardiovascular disease
- Medication: Beta-Blockers
- Atopic diseases (only for anaphylaxis to food, latex)
- Mastocytosis, monoclonal mast cell disorders
<table>
<thead>
<tr>
<th>Grade</th>
<th>Skin</th>
<th>GI Tract</th>
<th>Respiratory Tract</th>
<th>Cardiovascular</th>
<th>Neurological</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Localized pruritus, flushing, urticaria, angioedema</td>
<td>Oral pruritus, oral “tingling,” mild lip swelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Generalized pruritus, flushing, urticaria, angioedema</td>
<td>Any of the above, nausea and/or emesis x’s 1</td>
<td>Nasal congestion and/or sneezing</td>
<td></td>
<td>Change in activity level</td>
</tr>
<tr>
<td>3</td>
<td>Any of the above</td>
<td>Any of the above plus repetitive vomiting</td>
<td>Rhinorrhea, marked congestion, sensation of throat pruritus or tightness</td>
<td>Tachycardia (increase &gt;15 beats/min)</td>
<td>Change in activity level plus anxiety</td>
</tr>
<tr>
<td>4</td>
<td>Any of the above</td>
<td>Any of the above plus diarrhea</td>
<td>Any of the above, hoarseness, “barky” cough, difficulty swallowing, dyspnea, wheezing, cyanosis</td>
<td>Any of the above, dysrhythmia and/or mild hypotension</td>
<td>“Light headedness,” feeling of “pending doom”</td>
</tr>
<tr>
<td>5</td>
<td>Any of the above</td>
<td>Any of the above, loss of bowel control</td>
<td>Any of the above, respiratory arrest</td>
<td>Severe bradycardia and/or hypotension or cardiac arrest</td>
<td>Loss of consciousness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Skin</th>
<th>Abdomen</th>
<th>Respiratory tractus</th>
<th>Cardiovascular</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>itch, flushing, urticaria, angioedema</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>same as above</td>
<td>nausea cramping</td>
<td>rhinorrhea hoarseness</td>
<td>Tachycardia (rise &gt; 20 bpm) Hypotension (fall &gt; 20 mmHg systolic pressure) Arrhythmia</td>
</tr>
<tr>
<td>3</td>
<td>same as above</td>
<td>vomiting defecation diarrhea</td>
<td>laryngeal edema bronchospasm cyanosis</td>
<td>shock</td>
</tr>
<tr>
<td>4</td>
<td>same as above</td>
<td>Same as above</td>
<td>respiratory arrest</td>
<td>cardiac arrest</td>
</tr>
</tbody>
</table>
Wheals as symptom: the chronology determines the right diagnosis

- Acute urticaria
  - 6 weeks

- Chronic urticaria
  - 6 weeks

- Anaphylaxis Grade I: intermittent acute episodes van urticaria
  - 1.3.2013
  - 5.4.2013
  - 17.2.2014
### Table: Medications, Supplies, and Equipment for Anaphylaxis Treatment

<table>
<thead>
<tr>
<th>Medications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First line (priority medication)</strong></td>
<td></td>
</tr>
<tr>
<td>Epinephrine (adrenaline) 1:1,000 (1 mg/mL) for intramuscular injection 0.01 mg/kg, to a maximum of 0.5 mg (adult), 0.3 mg (child)</td>
<td></td>
</tr>
<tr>
<td><strong>Second line medications</strong></td>
<td></td>
</tr>
<tr>
<td>$H_1$-antihistamine for intravenous infusion eg. chlorpheniramine 10 mg (adult), 2.5-5 mg (child) or diphenhydramine 25-50 mg (adult) (1 mg/kg, maximum 50 mg [child])</td>
<td></td>
</tr>
<tr>
<td>$\beta_2$-adrenergic agonist, eg. salbutamol (albuterol) solution, 2.5 mg/3 mL or 5 mg/3 mL (adult), (2.5 mg/3 mL [child]) given by nebulizer and face mask glucocorticoid for intravenous infusion, eg. hydrocortisone 200 mg (adult), maximum 100 mg (child); or methylprednisolone 50-100 mg (adult); 1 mg/kg, maximum 50 mg (child)</td>
<td></td>
</tr>
<tr>
<td>$H_2$-antihistamine for intravenous infusion, for example, ranitidine 50 mg (adult) or 1 mg/kg, maximum 50 mg (child)</td>
<td></td>
</tr>
</tbody>
</table>

Aim of our study

- Examine epidemiology and etiology of anaphylactic reactions
- Analyze how fast an emergency specialist was encountered
- Investigate the adherence of acute treatment to actual guidelines:
  - the use of adrenaline in treatment of anaphylaxis
  - the use of adrenaline in prevention of anaphylaxis

in the Sint-Pieter hospital in central Brussels
Methods

Questionnaire filled in by MDs for adult patients with anaphylaxis presenting in the emergency department (ED)

Enquête de Pratique
« Prise en charge de l'anaphylaxie sévère dans les services d'urgence »
Société Française de Médecine d'Urgence (SFMU) (Pr A BELLOU)
Société Française d'Anesthésie Réanimation (SFAR) (Pr PM MERTÈS)
Société Française d'Allergologie et d'Immunologie Clinique (SFAIC) (Pr DA MONFERT-VAUTERN)

Objectifs :
(1) Décrire les modalités de prise en charge actuelle de l'anaphylaxie sévère dans les services d'urgence (SU)
(2) Consulter l'épidémiologie actuelle de l'anaphylaxie sévère en France à partir des SU

Critère d'inclusion : Admission au SU pour prise en charge d'une suspicion de réaction anaphylactique sévère survenu chez un enfant ou un adulte.

Définition de l'anaphylaxie sévère : au moins 1 des 3 critères est présent (Sampson HA : J All 2006 ; 117 :391-397).

Critères 1 : Signes cutanés, muqueux ou les 2 plus au moins 1 signe : respiratoire ou baisse de la PAS < 90mmHg (ou une chute de plus de 30% par rapport à la PAS de base chez l'adulte) ou dysfonction d'organe (hypotension, syncpe, incontinence)

Critère 2 : 2 ou plusieurs signes après exposition à un probable allergène, atteinte cutanée, respiratoire, baisse de la PA < 90mmHg ou une chute de plus de 30% par rapport à la PAS de base chez l'adulte ou signes associés, troubles gastrointestinaux persistants

Critère 3 : Baisse de la PAS < 90mmHg ou une chute de plus de 30% par rapport à la PAS de base chez l'adulte après exposition à un allergène connu

Chez l'enfant une chute de la PAS est définie si :
• PAS < 70 mmHg de 1 mois à 1 an,
• moins de (70 mmHg + 2 x âge) de 1 an à 10 ans
• < 90mmHg de 11 ans à 17 ans

Numéro de Centre

Fiche de Recueil de données

Date :

Heure d'arrivée : ... J L
Heure de prise en charge : ... J L

Données démographiques :
Sexe : □ Homme □ Femme Âge : ........ ans

Régulation par le Centre 15 :
□ Oui □ Non
□ SMUR □ SOS médecin □ Généraliste :
Traitement pré-hospitalier :
□ Réanimation cardio respiratoire □ CEE □ Intubation et VA □ Adénaline Dose : ....
□ S/C □ IV □ Remplissage vasculaire □ Corticostéroïde □ Antihistaminique □ E2-Stimulant
□ Glucagon □ Vasopressine

Arrivée au SU :
□ Médicalisé (SMUR) □ Saupeurs-Pompiers □ Ambulance □ Progrès moyens

Données Cliniques :
Arrêt cardio-respiratoire :
□ Oui □ Non
Sensation de mort imminente :
□ Oui □ Non
Baisse de la PA > 30 mmHg par rapport à la PA habituelle : □ Oui □ Non
PA la plus basse mesurée : PAS...mmHg PAD...mmHg FC :...min

Détresse respiratoire :
□ Oui □ Non
Précisez :...% SO2...% ou C2...min

Troubles du rythme cardiaque :
□ Bradycardie □ Tachycardie □ Hemorragie coronarienne

Génération pharyngée-laryngée :
□ Oui □ Non
Bronchoptasie :
□ Oui □ Non
Angio-œdème :
□ Oui □ Non
Urticaire :
□ Oui □ Non
Signes digestifs :
□ Oui □ Non
□ Douleur abdominale □ Vomissements □ Diarrhée

Prurit palpe-plantaire :
□ Oui □ Non
COMU : □ 1 □ 2 □ 3 □ 4 □ 5
Antécédents :
□ Allergie alimentaire □ Antiline □ Allergie médicamenteuse □ Allergie hémolytique
Facteurs de risque :
□ Cardiothoraxie Prise de : □ β-bloquants □ IEC □ ARAL. (Sortir...)

Ci-dessus, les informations sur les patients sont soumises à la loi informatique et libertés du 6 janvier 1978, modifiée par la loi en date du 30 décembre 2004, relative à l'informatique, aux fichiers et aux libertés.
Methods

- Questionnaire filled in by ED specialists for adult patients with anaphylaxis presenting in the emergency department (ED)
- Data collection from April 2009 to April 2013
- Inclusion criteria based on the Sampson criteria of definition and grading of anaphylaxis
- Data recovery by emergency records and the completed questionnaire
- All data were processed and analyzed using a Microsoft Excel database. Relationships between (encoded) categorical variables were determined using the Pearson’s Chi-square test or Fisher exact test.

100/230,878 pts visiting the ED were diagnosed with A (0.04%)
Age distribution and symptoms classified by organ affected

<table>
<thead>
<tr>
<th>SEX</th>
<th>AGE GROUP</th>
<th>Count of dyspnea</th>
<th>Count of pharynx and/or larynx edema</th>
<th>Count of bronchospasm</th>
<th>Count of facial edema</th>
<th>Count of urticaria</th>
<th>Count of digestive symptoms</th>
<th>Count of palmo plantar prurigo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>16-30 (n=11)</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>(n=45)</td>
<td>31-40 (n=14)</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>12</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>41-50 (n=12)</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>51-60 (n=7)</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>61-70 (n=1)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Men total</td>
<td></td>
<td>31</td>
<td>26</td>
<td>16</td>
<td>15</td>
<td>40</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>Women (n=55)</td>
<td>&lt;16 (n=2)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>16-30 (n=16)</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>15</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>31-40 (n=12)</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>41-50 (n=12)</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>51-60 (n=9)</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>61-70 (n=2)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Women total (n=2)</td>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>71-80 (n=2)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Women total</td>
<td></td>
<td>30</td>
<td>22</td>
<td>14</td>
<td>23</td>
<td>42</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Grand total (n=100)</td>
<td></td>
<td>61</td>
<td>48</td>
<td>30</td>
<td>38</td>
<td>82</td>
<td>58</td>
<td>46</td>
</tr>
</tbody>
</table>

### Suspected elicitors of anaphylaxis

<table>
<thead>
<tr>
<th>Suspected etiology</th>
<th>Food</th>
<th>Drugs</th>
<th>Hymenoptera venom</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men (n=38)</td>
<td>21 (55.3%)</td>
<td>15 (39.5%)</td>
<td>2 (5.3%)</td>
<td>2 (5.3%)</td>
</tr>
<tr>
<td>Women (n=51)</td>
<td>25 (49.0%)</td>
<td>26 (51.0%)</td>
<td>1 (2.0%)</td>
<td>2 (3.9%)</td>
</tr>
<tr>
<td>Grand total (n=89)</td>
<td>46 (51.7%)</td>
<td>41 (46.1%)</td>
<td>3 (3.4%)</td>
<td>4 (4.5%)</td>
</tr>
</tbody>
</table>

History of allergy

<table>
<thead>
<tr>
<th>Sex</th>
<th>History of allergy</th>
<th>Food (%)</th>
<th>Drugs (%)</th>
<th>Hymenoptera venom (%)</th>
<th>Respiratory allergens (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (n=24)</td>
<td></td>
<td>13 (54.2%)</td>
<td>5 (20.8%)</td>
<td>2 (8.3%)</td>
<td>2 (8.3%)</td>
</tr>
<tr>
<td>Women (n=37)</td>
<td></td>
<td>21 (56.8%)</td>
<td>10 (27.0%)</td>
<td>3 (8.1%)</td>
<td>7 (18.9%)</td>
</tr>
<tr>
<td>Grand total (n=61)</td>
<td></td>
<td>34 (55.7%)</td>
<td>15 (24.6%)</td>
<td>5 (8.2%)</td>
<td>9 (14.8%)</td>
</tr>
</tbody>
</table>

- women indicated more allergy in their history compared to men
- with increasing age, the number of reported previous allergies increased (data not shown)
- 19% reported asthma in the past, without specifying which type of asthma (data not shown)
- 76.5% of patients who reported a history of food allergy, had a suspected (recurrent) food elicitor when presenting at the Sint-Pieters Hospital. For patients with a history of drug allergy, 88.2% had a suspected recurrence of a drug elicitor for the presenting anaphylaxis (data not shown).
## Time interval between symptom onset and first medical contact

<table>
<thead>
<tr>
<th>Timeframe (Min.)</th>
<th>0 - 30</th>
<th>31 – 90</th>
<th>91 – 180</th>
<th>181 –360</th>
<th>&gt;360</th>
<th>unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (n=45)</td>
<td>13 (28.9%)</td>
<td>5 (11.2%)</td>
<td>7 (15.6%)</td>
<td>6 (13.3%)</td>
<td>3 (6.7%)</td>
<td>11 (24.4%)</td>
</tr>
<tr>
<td>Female (n=55)</td>
<td>15 (27.3%)</td>
<td>15 (27.3%)</td>
<td>4 (7.3%)</td>
<td>7 (12.7%)</td>
<td>3 (5.5%)</td>
<td>11 (20%)</td>
</tr>
<tr>
<td>Total number of pts (n=100)</td>
<td>28</td>
<td>20</td>
<td>11</td>
<td>13</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

Only 36% received medical help within 30 minutes of symptom onset.
## Treatment of anaphylaxis at the ED

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CPR</th>
<th>MV</th>
<th>Adr</th>
<th>Adr (IM)</th>
<th>Adr (IV)</th>
<th>Adr (SC)</th>
<th>Fluids (IV)</th>
<th>MP (IV)</th>
<th>Other CS</th>
<th>H1-AH</th>
<th>H2-AH</th>
<th>BM aerosols</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=45)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
<td>4</td>
<td>32</td>
<td>30</td>
<td>1</td>
<td>1</td>
<td>35</td>
<td>40</td>
<td>3</td>
<td>39</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>(2%)</td>
<td>(9%)</td>
<td>(71%)</td>
<td>(67%)</td>
<td>(2%)</td>
<td>(2%)</td>
<td>(78%)</td>
<td>(89%)</td>
<td>(7%)</td>
<td>(87%)</td>
<td>(18%)</td>
<td>(27%)</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>3</td>
<td>35</td>
<td>34</td>
<td>1</td>
<td>0</td>
<td>41</td>
<td>49</td>
<td>4</td>
<td>46</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>(n=55)</td>
<td>(2%)</td>
<td>(5%)</td>
<td>(64%)</td>
<td>(62%)</td>
<td>(2%)</td>
<td>(0%)</td>
<td>(75%)</td>
<td>(89%)</td>
<td>(7%)</td>
<td>(84%)</td>
<td>(16%)</td>
<td>(29%)</td>
</tr>
<tr>
<td>Total pt count <strong>(n=100)</strong></td>
<td>2</td>
<td>7</td>
<td>67</td>
<td>64</td>
<td>2</td>
<td>1</td>
<td>76</td>
<td>89</td>
<td>7</td>
<td>85</td>
<td>17</td>
<td>28</td>
</tr>
</tbody>
</table>

Treatment of anaphylaxis according to severity grade

Figure legend:
Data are given as total patient count per grade and concern all different treatments given on the ED. Abbreviations in figure: CPR = Cardio-Pulmonary Resuscitation; MV = Mechanic Ventilation; A = Adrenaline; MP = Methylprednisolone; CS = Corticosteroids; H2-AH = H2-antihistaminics (Ranitidine®); H1-AH = H1-antihistaminics (Xyzall®); BM = Betamimetic

Biphasic response

- 94% of all cases showed no sign of a biphasic or protracted reaction within the observation time at the ED.

- 6% (=6 pts.) had a reported recurrence of symptoms after initial amelioration:
  - 4/6 pts (66.7%): 2 to 3 hours after first onset of symptoms
  - 1/6 pts (16.7%): >3 hours after onset of first episode
  - 5/6 pts (83.3%) had a presumed anaphylaxis towards food
  - 1/6 pts (16.7%) had a presumed anaphylaxis on drugs

- More men had a biphasic response (66.7%)
Limitations

- No difference between protracted and biphasic reactions was defined on the questionnaire
- No standardized observation in time
- Small group size of pts who had a biphasic reaction: limited data which preclude statistical analysis
Patient observation and recommendations at discharge

- 54% of pts: admitted as in-patients for further observation
  → 22.2% of these patients were hospitalized in the ICU

- 46% of pts: discharged from the ED after clinical improvement
  → 87% of those patients received further recommendations for treatment or follow-up:

  - 82.6% antihistamines
  - 73.9% were instructed to consult an allergist
  - 67.4% corticosteroids
  - 8.7% Adrenaline IM (Epipen®)

Discussion

- First prospective study of management of anaphylaxis in adults in a large inner city Belgian ED

- Time frame analysis: 64% received medical help later than 30 minutes after onset of first symptoms \(\rightarrow\) need for rescue self-medication

- 6% had a potential biphasic response
  \(\rightarrow\) majority of pts. received methylprednisolone in addition to adrenaline, preventing a biphasic response

- Majority of pts (74%) were advised to consult an allergist
Discussion

67% of all pts. were given adrenaline at the ED

- Grabenhenrich et al. (2012, Germany): 12% treated with Adrenaline
- Worm et al. (2014, Austria, Switzerland): epinephrine for grade 3 & 4 to 14.5% and 43.9% of pts. in their anaphylaxis registry
- Russell et al. (2013, US): 42% of patients with anaphylaxis received epinephrine

*Treatment guidelines were most strictly followed in Sint-Pieters hospital*

8.7% of pts. received prescription for Adrenaline auto-injector (Epipen®) at discharge

- Grabenhenrich et al. (2012, Germany): 21% of pts with A received an auto-injector prescription
- Russell et al. (2013, US): <50% of all ED specialists provided pts with auto-injector prescription
- Asero et al. (2010 Italy): for 13% of pts with anaphylaxis an auto-injector was prescribed

*Recommendations at discharge were poorly followed in all of these countries but the worst in Sint-Pieters hospital*
Conclusion

- ED specialists in St. Pieter hospital treat majority of pts with anaphylaxis according to WAO-guidelines.

- They often fail to prescribe adrenaline auto-injector for self-medication at discharge.

- This study emphasizes the need of an adrenaline auto-injector.

- ED specialists need education in prevention of anaphylaxis and the use of self-medication.
A special thanks to the emergency department of the St-Pieters hospital for their collaboration, support and excellent data management involving anaphylaxis patients.
Sampson criteria of definition of anaphylaxis state that anaphylaxis is probable if one of the following criteria are present:

1) skin and/or mucosal tissue symptoms together with respiratory involvement or severe hypotension (systolic pressure below 90mmHg) and/or organic dysfunction

2) the involvement of at least 2 organ systems after recent exposure to a likely allergen, or

3) severe hypotension after exposure to a known allergen.
Tryptase values

- Tryptase was measured in 81% of all patients diagnosed with anaphylaxis.
- 43.2% of patients (35/81) had elevated tryptase levels (cut-off 11.4 µg/L).
- A (non significant) trend of higher median tryptase levels was observed in cases of higher severity of anaphylaxis ($p = 0.101504$).
- Although men seemed to have higher median tryptase levels than women in case of severe anaphylaxis, this gender difference was not significant ($p = 0.745203$).
- The highest average value of tryptase levels was detected in patients with suspected drug-related anaphylaxis (19.45 µg/L).
- An average tryptase level of 12.97 µg/L was calculated for suspected food-related anaphylaxis.
Adrenaline acts rapidly on all relevant symptoms of anaphylaxis

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Antihistamines</th>
<th>Steroids</th>
<th>Adrenaline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasodilatation</td>
<td>++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Permeability of blood vessels</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Bronchospasm</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Hypersecretion</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Cardiotoxicity</td>
<td>-</td>
<td>(-)</td>
<td>(+)</td>
</tr>
</tbody>
</table>
Risk factors for severe anaphylaxis and cofactors that amplify anaphylaxis

<table>
<thead>
<tr>
<th>Risk/co-factor</th>
<th>Cardio-logic history</th>
<th>Beta-blocking agent</th>
<th>ACE inhibitor</th>
<th>Asthma</th>
<th>NSAID</th>
<th>Alcohol consumption</th>
<th>Pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men (n=45)</td>
<td>5 (11.1%)</td>
<td>2 (4.4%)</td>
<td>1 (2.2%)</td>
<td>10 (22.2%)</td>
<td>7 (15.6%)</td>
<td>9 (20%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Women (n=55)</td>
<td>4 (7.3%)</td>
<td>3 (5.5%)</td>
<td>3 (5.5%)</td>
<td>9 (16.4%)</td>
<td>7 (12.7%)</td>
<td>1 (1.8%)</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>9 (%)</td>
<td>5 (%)</td>
<td>4 (%)</td>
<td>19 (%)</td>
<td>14 (%)</td>
<td>10 (%)</td>
<td>1 (%)</td>
</tr>
<tr>
<td>(n=100)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Histamine is the most important mediator in anaphylaxis.

Mast cell

Allergen

Mediator release (e.g. histamine, tryptase, PAF)
Use of adrenaline auto-injector

1. Form FIST around EpiPen® and PULL OFF BLUE SAFETY RELEASE

2. Place orange end HARD into outer thigh so it ‘CLICKS’ and HOLD for 10 seconds.
Epinephrine is the first line therapy in anaphylaxis