Supportive Care

Tamás Masszi

Dept of Haematology and HSCT
St László Hospital, Semmelweis University Budapest
What is Supportive Care?

Treatment given
to prevent, control, or relieve complications and side effects
to improve the patient's comfort and quality of life.
Supportive Care in This Lecture

Nausea & vomiting

Oral mucositis

The Galery of Supportive Care

Nutritional support

CVC related
Nausea and vomiting

XIV century
unknown master
Vomiting is not universal

Man: responds to all known emetics
Monkey: responds to selected emetics
Sheep: vomits rarely
Horse: vomits very rarely
Rabbit: does not vomit
Mouse: does not vomit

(Borison et al, 1981)
The central neural regulation of vomiting is controlled by two separate units in the medulla

**Chemoreceptor trigger zone (CTZ)**
Is in the area postrema on the floor of the IV ventricle, is particularly sensitive to chemical stimuli. The blood-brain barrier is poorly developed in CTZ, hence, it is readily accessible to emetic substances in the general circulation.

**Vomiting center (VC)**
Coordinates the emetic response. Located in the dorsolateral border of the reticular formation of the medulla. Consisting of N. tractus solitarius, parvicellular reticular formation; and the visceral and somatic motor nuclei coordinating the act of vomiting.
Pathways and receptors involved in emesis

Sensory input (pain, smell, sight) → Higher cortical centres → Memory, fear, anticipation

Histamine antagonists
Muscarinic antagonists
Dopamine antagonists
Cannabinoids → Benzodiazepines

Chemoreceptor Trigger Zone (area prosstema, 4th ventricle) → Vomiting Centre (medulla)

Chemotherapy
Sphincter modulators

5HT3 antagonists

Stomach Small intestine

Chemotherapy Radiotherapy

Labyrinths

Vomiting Reflex

Factors which can cause nausea & vomiting
Sites of action of drugs
Antiemetics

5HT₃ antagonists
- DOLASETRON
  Anzemet
- GRANISETRON
  Kytril
- ONDANSETRON
  Zofran
- PALONOSETRON
  Aloxi

H₁ antagonists
- DIMENHYDRINATE
  Dramamine
- DIPHENHYDRAMINE
  Benadryl
- MECLIZINE
  Antivert

Anticholinergics
- SCOPOLAMINE
  Hyocine, TransdermScop

NK₁ antagonist
- APREPITANT / FOSAPREPITANT
  Emend

Dopamin antagonists
- DROPERIDOL
  Inapsine
- METOCLOPRAMIDE
  Reglan
- PROCHLORPERZAINE
  Compazine
- PROMETHAZINE
  Phenergan
- THIETHYLPERAZINE
  Torecan

Cannabinoids
- DRONABINOL
  Marinol
- NABILONE
  Cesamet

Corticosteroids
- DEXAMETHASONE
  Decadron
- METHYLPR EDNISOLONE
  Medrol
The 3 major players of antiemetics

<table>
<thead>
<tr>
<th>Agent</th>
<th>Route</th>
<th>Recommended dose (once daily)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-HT&lt;sub&gt;3&lt;/sub&gt;-receptor antagonist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ondansetron</td>
<td>Oral</td>
<td>24 mg (high), 16 mg (moderate)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>i.v.</td>
<td>8 mg (0.15 mg/kg)</td>
</tr>
<tr>
<td>Granisetron</td>
<td>Oral</td>
<td>2 mg</td>
</tr>
<tr>
<td></td>
<td>i.v.</td>
<td>1 mg (0.01 mg/kg)</td>
</tr>
<tr>
<td>Tropisetron</td>
<td>Oral</td>
<td>5 mg</td>
</tr>
<tr>
<td></td>
<td>i.v.</td>
<td>5 mg</td>
</tr>
<tr>
<td>Dolasetron</td>
<td>Oral</td>
<td>100 mg</td>
</tr>
<tr>
<td></td>
<td>i.v.</td>
<td>100 mg (1.8 mg/kg)</td>
</tr>
<tr>
<td>Palonosetron</td>
<td>i.v.</td>
<td>0.25 mg</td>
</tr>
<tr>
<td>Steroids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>Oral/i.v.</td>
<td>12 mg (highly emetogenic, with aprepitant), 20 mg without aprepitant; 8 mg (moderately emetogenic); 8 mg (high/moderate) days 2 and 3</td>
</tr>
<tr>
<td>NK&lt;sub&gt;1&lt;/sub&gt;-receptor antagonist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aprepitant</td>
<td>Oral</td>
<td>125 mg on day 1, 80 mg on days 2 and 3</td>
</tr>
</tbody>
</table>

<sup>a</sup>8 mg twice daily is recommended.
# Classification of chemotherapy induced emesis

<table>
<thead>
<tr>
<th><strong>Acute emesis</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>within 24 hours</td>
<td></td>
</tr>
<tr>
<td>following</td>
<td></td>
</tr>
<tr>
<td>chemotherapy</td>
<td></td>
</tr>
</tbody>
</table>
Classification of chemotherapy induced emesis

<table>
<thead>
<tr>
<th>Acute emesis</th>
<th>Delayed emesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>within 24 hours</td>
<td>later than 24h hours</td>
</tr>
<tr>
<td>following chemotherapy</td>
<td>following chemotherapy</td>
</tr>
</tbody>
</table>
### Classification of chemotherapy induced emesis

<table>
<thead>
<tr>
<th></th>
<th>Acute emesis</th>
<th>Delayed emesis</th>
<th>Anticipatory emesis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>within 24 hours</strong></td>
<td>following chemotherapy</td>
<td>following chemotherapy</td>
<td>learned response conditioned by the severity and duration of previous reactions to chemotherapy.</td>
</tr>
<tr>
<td><strong>later than 24h</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Classification of emetogenic potential of chemotherapy

<table>
<thead>
<tr>
<th>emetogenic potential</th>
<th>probability of vomiting (in the absence of effective antiemetic prophylaxis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>&gt;90%</td>
</tr>
<tr>
<td>moderate</td>
<td>30-90%</td>
</tr>
<tr>
<td>Low</td>
<td>10-29%</td>
</tr>
<tr>
<td>Minimal</td>
<td>&lt;10%</td>
</tr>
</tbody>
</table>
Emetogenic potential of antineoplastic agents

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>AGENT</th>
<th>AGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>High emetic risk (≥ 90% frequency of emesis)</td>
<td>• AC combination defined as either doxorubicin or epirubicin with cyclophosphamide&lt;br&gt;• Alitretamine&lt;br&gt;• Carmustine &gt; 250 mg/m²&lt;br&gt;• Cisplatin ≥ 50 mg/m²</td>
<td>• Cyclophosphamide &gt; 1500 mg/m²&lt;br&gt;• Dacarbazine&lt;br&gt;• Mechlorethamine&lt;br&gt;• Procarbazine (oral)&lt;br&gt;• Streptozocin</td>
</tr>
</tbody>
</table>
| Moderate emetic risk (30%-90% frequency of emesis) | • Aldesleukin > 12-15 million units/m²<br>• Amifostine > 300 mg/m²<br>• Arsenic trioxide<br>• Azacitidine<br>• Bendamustine<br>• Busulfan > 4 mg/d<br>• Carboplatin<br>• Carmustine ≤ 250 mg/m²<br>• Cisplatin < 50 mg/m²<br>• Cyclophosphamide < 1500 mg/m²<br>• Cyclophosphamide (oral)<br>• Cytarabine > 1 g/m²<br>• Daunorubicin<br>• Dactinomycin<br>• Etoposide (oral)<br>• Idarubicin<br>• Ifosfamide<br>• Imatinib (oral)<br>• Irinotecan<br>• Lomustine<br>• Melphalan > 50 mg/m²<br>• Methotrexate 250 to > 1000 mg/m²<br>• Oxaliplatin > 75 mg/m²<br>• Temozolomide (oral)<br>• Vinorelbine (oral) | • Doxorubicin<br>• Epirubicin<br>• Etoposide (oral)<br>• Idarubicin<br>• Ifosfamide<br>• Imatinib (oral)<br>• Irinotecan<br>• Lomustine
Principles of Emesis Control

1. Antiemetic therapy should be adjusted to the drug with the **highest emetic risk**

2. The risk for emesis after high emetogen chemother. **lasts cca 4 days**

3. Patients must be protected throughout the **full period** of risk

4. **Oral** and i.v. formulations have equivalent efficacy
Remember

Nausea and vomiting are far easier to prevent than to treat
Personal factors

- **History** and efficacy of previous antiemetic therapy
- **Gender**
  - women are more susceptible
- **Age**
  - younger pts are more prone
- **Alcoholism**
  - decreases the incidence of emesis
Antiemetic prevention based on emesis risk category (MASCC, ASCO, NCCN)

<table>
<thead>
<tr>
<th>Group</th>
<th>Acute CINV</th>
<th>Delayed CINV</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASCC</td>
<td>$5\text{-HT}_3\text{RA} + dexamethasone +$</td>
<td>$\text{Dexamethasone +}$</td>
</tr>
<tr>
<td></td>
<td>aprepitant</td>
<td>aprepitant</td>
</tr>
<tr>
<td>ASCO</td>
<td>$5\text{-HT}_3\text{RA} + dexamethasone +$</td>
<td>$\text{Dexamethasone +}$</td>
</tr>
<tr>
<td></td>
<td>aprepitant</td>
<td>aprepitant</td>
</tr>
<tr>
<td>NCCN</td>
<td>$5\text{-HT}_3\text{RA} + dexamethasone +$</td>
<td>$\text{Dexamethasone +}$</td>
</tr>
<tr>
<td></td>
<td>aprepitant ± lorazepam</td>
<td>aprepitant ± lorazepam</td>
</tr>
</tbody>
</table>

Chemotherapy Induced Nausea and Vomiting

Multinational Association in Supportive Care in Cancer

American Society of Clinical Oncology

National Comprehensive Cancer Network

Prevention and treatment of conditioning induced nausea/vomiting

Start before conditioning

Aprepitant 125mg PO on day 1 & 80mg on days 2-3

Dexamethason 12mg PO or iv on days 1- until end of conditioning +2days

5HT3 antagonist P.o. or i.v.

+ Proton pump inhibitor
+/- Lorazepam or Clonazepam (0.5-2mg)
Treatment of breakthrough emesis

General principle: give an additional agent from a different drug class

– Metoclopramide 10-40mg po or iv every 4-6 h
– Lorazepam or Clonazepam 0.5-2mg every 4-6 h
– Promethazin 12.5-25mg po or iv every 4h
– Haloperidol 1-2mg po every 4-6h
– Change 5H3 antagonist

Exclude other causes: GVHD, Candida/herpes esophagitis, other drugs (Imipenem), bowel obstruction, uremia, etc…
Causes of vomiting

**Physiologic:**
- Constipation
- Gastric Stasis/Outlet Obstruction
- Brain Metastases
- Increased Intracranial Pressure
- Bowel/Inestinal Obstruction
- Hepatomegaly
- Oral Thrush
- Cough

**Metabolic:**
- Uremia
- Endocrine Imbalance
- Electrolyte Imbalance:
  - Hypercalcemia
  - Hyponatremia

**Treatment Related:**
- Chemotherapy
- Radiation Therapy
  (especially to brain or GI tract)
- Medications:
  - Initial Opioid Therapy
  - Antibiotics
  - Aspirin/NSAIDS
  - Carbamazepine
  - Steroids
  - Expectorants

**Emotional/Spiritual/Psychological:**
- Anticipatory N&V (prior to chemotherapy)
- Meaning of Illness
- Loss of Personhood
- Role Change
- Suffering
- Anxiety/Fear
- Fatigue

**Vomiting Center of the Brain:**
Lower Medulla
Treatment of anticipatory vomiting

- Aggressive antiemetic therapy during early courses of cancer chemotherapy is the key to prevent this condition.

- Behavioral therapy
  - Relaxation
  - Hypnosis
  - Music therapy

- Alprazolam /Lorazepam 0.5-2mg po the night before
Oral mucositis

Edvard Munch
The Scream
Clinical appearance of oral mucositis
Overview of the five-stage model of mucositis

1. Initiation
   - Generation of ROS within cells
   - Direct damage to cells, tissues, and blood vessels
   - Initiation of downstream events

2. Upregulation
   - Activation of transcription factors (NF-KB)
   - Pro-inflammatory cytokines (IL6, TNF-alpha)
   - Apoptosis and tissue injury
   - Positive feedback loops amplify primary damage
   - Damaging events focus on basal membrane and submucosal tissue

3. Signal amplification
   - Loss of barrier function
   - Inflammation
   - Pain
   - Risk of bacteremia and/or sepsis
   - Production of cytokines, chemokines and growth factors
   - Migration, proliferation, and differentiation of epithelial cells to rebuild tissue

4. Ulceration
5. Healing

### WHO scale for assessment of oral mucositis (OM)

<table>
<thead>
<tr>
<th>Grade Scale</th>
<th>WHO oral toxicity scale¹</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Soreness and erythema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulcers +/- erythema</td>
<td>can swallow solid diet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulcers, extensive erythema</td>
<td>can not swallow solid diet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mucositis to extent that alimentation not possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

¹ Cut-off for ulcerative oral mucositis
² Cut-off for severe oral mucositis
Mucositis is dose dependent

Blijlevens N et al. JCO 2008;26:1519-1525
Incidence depends on conditioning

Blijlevens N et al. JCO 2008;26:1519-1525
# Agents for prevention or treatment of mucositis

<table>
<thead>
<tr>
<th>Anti-Inflammatory Agents</th>
<th>Antiseptics</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indomethacin</td>
<td>Hydrogen Peroxide</td>
<td>Chamomile</td>
</tr>
<tr>
<td>Polaprezinc</td>
<td>Chlorhexidine</td>
<td>Immunoglobulin</td>
</tr>
<tr>
<td>Azelastine</td>
<td>Providone Iodine</td>
<td>Iseganan</td>
</tr>
<tr>
<td>Prostaglandins</td>
<td></td>
<td>Low Level Laser Therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Antioxidants</th>
<th>Coating Agents</th>
<th>Steroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta Carotine</td>
<td>Kaolin-Pectin</td>
<td>Betamethasone</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Sucralphate</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citric Acid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Oral Care</th>
<th>Cryotherapy</th>
<th>Wound Healing Promoters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9% Saline</td>
<td>Ice Chips</td>
<td>Tetrachlorodecaoxid</td>
</tr>
<tr>
<td>Sodium Bicarbonate</td>
<td></td>
<td>Traumeel S</td>
</tr>
<tr>
<td>Ca phosphate</td>
<td></td>
<td></td>
</tr>
</tbody>
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</tr>
<tr>
<td>Traumeel S</td>
</tr>
</tbody>
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Agents for prevention or treatment of mucositis

<table>
<thead>
<tr>
<th>Analgesics and Narcotics</th>
<th>Mucosal Coating Agents</th>
<th>Cytoprotective Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzdamine</td>
<td>Gelclair</td>
<td>Amifostine</td>
</tr>
<tr>
<td>Benzococaine Gel</td>
<td>Sucralphate</td>
<td>Leucovorin</td>
</tr>
<tr>
<td>Cocaine</td>
<td></td>
<td>Lysopylline</td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td></td>
<td>Pentoxifylline</td>
</tr>
<tr>
<td>Doxepin Rinse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lidocaine Jelly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anti-cholinergic Agents</th>
<th>Growth Factors</th>
<th>Non-Absorbable Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>G-CSF</td>
<td>tobramycin</td>
</tr>
<tr>
<td>Pilocarpine</td>
<td>GM-CSF</td>
<td>polymysin</td>
</tr>
<tr>
<td></td>
<td>IL-11</td>
<td>amphotericin</td>
</tr>
<tr>
<td></td>
<td>KGF</td>
<td>clarithromycin</td>
</tr>
<tr>
<td></td>
<td>TGF-Beta3</td>
<td></td>
</tr>
</tbody>
</table>
Palifermin mimics the actions of endogenous KGF binding specifically to a tyrosine kinase receptor.
Summary of postulated mechanisms by which palifermin may ameliorate chemotherapy- and radiotherapy-induced mucositis (adapted from Sonis et al. 2004) [55].

Blijlevens N, Sonis S Ann Oncol 2006;18:817-826
Effect of Palifermin on the Incidence and Severity of Oral Mucositis

Palifermin for Oral Mucositis after Intensive Therapy for Hematologic Cancers
Nutritional support

Tintoretto Last Supper
Caloric and metabolic alterations

- Sepsis
- GVHD

Underlying disease

CATABOLIC EFFECTS ON SKELETAL MUSCLE

conditioning

Nausea vomiting, diarrhoea

Decreased nutrient / amino acid absorption + Altered transmembrane transport

INTESTINAL LOSSES OF AMINO ACIDS

NEGATIVE NITROGEN BALANCE
Why parenteral nutrition?

HSCT

Malnutrition

Feeding is needed

ENTERAL

Nasogastric tube
- Nausea
- vomiting
- mucositis

PARENTERAL

Central venous catheter
- Already in situ
- easy modulation of fluids, electrolyte while administration of nutrients
The routine use of TPN is based on a prospective clinical trial

**Figure 2.** Life-table curves (Kaplan-Meier plot) for overall survival in the TPN prophylaxis versus control groups, \( P = .011 \). Tick marks indicate length of survival at the time of analysis.
TPN and enteral feeding program in BMT patients

Fig. 3. Kaplan-Meier survival plot. Probability of survival for the 27 TPN and 33 EFP patients. (The patient who violated the study protocol was not included in this analysis.) Indicated are the censored data points.
Energy requirements

exceed 130-150% BEE

BEE = basal energy expenditure

BEE (kcal) is calculated according to the Harris - Benedict equation:

for males:
$$66 + (13.7 \times \text{kg bw}) + (5 \times \text{cm height}) - (6.8 \times \text{year age})$$

for females:
$$665 + (9.5 \times \text{kg bw}) + (1.7 \times \text{cm height}) - (4.7 \times \text{year age})$$

BEE(kcal) = ideal bodyweight kg x 30
Composition of energy requirements

- 10-15% from protein
- 50-60% from carbohydrate
- 30-40% from fat
Composition of TPN

1. Energy
2. Essential amino acids
3. Essential fatty acids
4. Vitamins
5. Trace elements
Composition of TPN

- **Amino acids** 1.5-2g/kg/day
- **Fat** 30% of caloric intake; mixture of:
  - MCT (6-12 C)
    - more water soluble,
    - more rapidly cleared form plasma
    - do not accumulate in the liver
  - LCT (20-24 C)
- **Glucose** (for completing energy requirement)
- **Micronutrients** (according to RDA)
Evaluation of nutritional status

• Clinical assessment

• Anthropometric measurements
  – Weight, body mass index (BMI), mid upper arm circumference (MAC)

• Biochemical parameters
  – Albumin, prealbumin, transferrin

• Immunologic parameters

• Nitrogen balance
Nitrogen balance

**Input (g/24h)**
Amino acids in TPN

**Output (g/24h)**
Corrected urinary urea excretion

(Urinary urea (mmol/L) \* urine volume (L/24h) \* 0.0336)
# Monitoring of TPN in the hospital

<table>
<thead>
<tr>
<th>Daily</th>
<th>Two times a week</th>
<th>Once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight (fluid balance)</td>
<td>liver function tests</td>
<td>nitrogen balance</td>
</tr>
<tr>
<td>blood glucose</td>
<td>serum calcium</td>
<td>serum transferrin</td>
</tr>
<tr>
<td>serum electrolytes</td>
<td>serum magnesium</td>
<td>serum albumin</td>
</tr>
<tr>
<td>BUN</td>
<td>serum phosphorus</td>
<td>serum triglyceride</td>
</tr>
<tr>
<td>serum creatinine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>calorie and protein intake</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Metabolic Complications of TPN

1. Hyperglycaemia
2. Azotaemia
3. Elevated liver enzymes
Common causes of elevated liver enzymes in the post SCT period

1. Drugs (Methotrexate, Cyclosporin-A)

2. Infections (bacterial, fungal, viral)

3. VOD

4. Graft versus host disease

5. Relapse of malignancy

6. Parenteral nutrition
Treatment of elevated liver enzymes during TPN

1. Search for other possible causes

2. Shorten TPN cycle to 12-20 from 24 hours/day

3. Reduce the no protein caloric intake by 10-15% of the total daily calorie

4. Initiate some oral intake if possible

5. Treat with ursodeoxycholic acid

6. Give oral metronidazol to decrease enteral endotoxin formation
Timing of nutritional support

• From conditioning to day +28

• From day +1 for 2-3 weeks according to mucositis

• When severe mucositis develops
Central venous catheter (CVC) related complications

Parmigianino Madonna of the long neck
Catheter Anatomy

- Exit site
- Tunnel
- Tip
- Hub
- Heart
Central venous catheter (CVC) related complications

1. Complications of insertion
2. Dislodgement
3. Leakage
4. Obstruction
5. Thromboembolism
6. Infections

Parmigianino Madonna of the long neck
Central Venous Catheter Infections Statistics (USA)

- Infections: ~ 80,000 / year
- Infection rate: 5 / 1000 patient day
- Mortality: 3 – 25 %
- Costs: 3,700 – 29,000 USD / case
Infective Complications

- Colonisation
- Exit-site infection
- Phlebitis, IE
- Tunnel infection
- Bloodstream infection
Exite site infection
Tunnel infection
Infective Endocarditis
## Common Pathogenes

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>1986-89 (%)</th>
<th>1992-99 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staph.coag.neg</td>
<td>27</td>
<td>37</td>
</tr>
<tr>
<td>Staph.aureus</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Gram-negative bact.</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Candida spp.</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Diagnosis of Catheter-Related Blood Stream Infection

- No specific clinical signs
- Fever: sensitive but aspecific
- Exit site reactions: specific but not sensitive
- Positive blood culture is suspicious in the absence of other foci
- Defeverescence following removal: probable but no sure
Diagnosis of Catheter-Related Blood Stream Infection

• Full proof: Culture results of removed catheter
  – Roll plate (semiquantitative, > 15 CFU)
  – Flush or ultrasound (quantitative, > $10^2$ CFU)
Diagnosis of Catheter Related Blood Stream Infection

- Blood cultures from sample pairs (peripheral vein + line, or one lumen + other lumen).

**Diagnosis of CRBSI if**

1. Same isolate from peripheral vein and from catheter blood (quantitative, CFU 3 x difference)

2. Same isolate from both lumens (quantitative, CFU 3 x difference)

3. Same isolate from blood and catheter tip removed
DTTP = Differential Time To Positivity

2 hours
123. Following identification of a source, there should be ongoing surveillance to confirm eradication of the source of infection
Management of Catheter Related Blood Stream Infection (CRBSI)
Short-term central venous catheter (CVC) or arterial catheter (AC) infection – related bloodstream infection

Complicated

- Suppurative thrombophlebitis, endocarditis or osteomyelitis, etc
  - Remove catheter & treat with systemic antibiotic for 4-6 weeks; 6-8 weeks for ostomyelitis in adults

- Coagulase-negative staphylococci
  - Remove catheter & treat with systemic antibiotic for 5-7 days
  - If catheter is retained, treat with systemic antibiotic + antibiotic lock therapy for 10-14 days

- Staphylococcus aureus
  - Remove catheter & treat with systemic antibiotic for ≥14 days

- Enterococcus
  - Remove catheter & treat with systemic antibiotic for 7-14 days

- Gram-negative bacilli
  - Remove catheter & treat with systemic antibiotic for 7-14 days

Uncomplicated (bloodstream infection and fever resolves within 72 hours in a patient who has no intravascular hardware and no evidence of endocarditis or suppurative thrombophlebitis and for S. aureus is also without active malignancy or immunosuppression

- Candida spp.
  - Remove catheter & treat with antifungal therapy for 14 days after the first negative blood culture
Prevention of cvc related blood stream infections

1. Indication
2. Site of cvc
3. Material of cvc
4. Maximal sterile barrier at insertion
5. Skin antisepsis
6. CVC site dressing regimens

- Cvc really needed?
- Subclavian > others
- Teflon, polyurethane
- Gloves, mask, cap, gown, sterile isolation
- 2 % chlorhexidine > iodine
- Weakly if transparent, every 2 days if gauze dressing
Prevention of cvc related blood stream infections

• Impregnated catheters
  ➢ Better, but expensive: chlorhexidine/Ag sulfadiazine, minocycline/rifampin

• Antibiotic prophylaxis
  – Systemic
    ➢ NOT RECOMMENDED
  – locale
    ➢ NOT RECOMMENDED
Personal factors

- Education
- Periodic assessment of adherence
- Catheter team
- Infection control
- Appropriate nursing staff levels
Effect of prevention programme

What is true Supportive Care?

• Treatment given to improve comfort and quality of life.
Thanks for your attention!

The Galery of Supportive Care

- Nausea & vomiting
- Oral mucositis
- Nutritional support
- CVC related