Prevention and Control of nosocomial CDAD

Ten helpful approaches to prevent, manage and control CDAD

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Problem to be discussed:

Increase in frequency and severity (lethal outcome) of CDAD, the most common cause of nosocomial diarrhea

Spread of certain epidemic strains (e.g. BI/NAP1/027 with resistance to fluorochinolones)
International and national sources of information

- ECDC: Emergence of C. difficile-associated diseases in Canada, the United States of America and Europe (Background document Kuijper et al. 2007)
- NRZ für die Surveillance nosokomialer Infektionen: www.nrz-hygiene.de
- Schneider et al. D. Ärzteblatt 22:B 1403 (2007); AWMF-Guideline
Population at risk for CDAD

Risk Factors

- age
- antimicrobial therapy within the last 3-6 months
- hospitalisation (> 3 d)
- abdominal surgery
- bowel disease
- tube feeding
- chemotherapy
Public health impact:
The population at risk is increasing in number!
Economical impact

Safdar, N. et al. (2005) CritCareMed
Wilcox, MH et al. (1996) JHospInf.
McFarland, LV et al. (2006) AJIC

Extension of hospital stay: 4-14d
The ten cornerstones of prevention and control of severe nosocomial infections with epidemic potential

Common (VRE, ESBL-producing E.coli/Klebsiella; MRSA) and C. difficile-specific preventive measure
Prevention (of C. difficile) infection relies on preventing as far as possible patient’s exposure to the organism, and ensuring that they do not become susceptible through disruption of their normal gut flora.
Common preventive measures

• 1) High quality of standard hygienic measures including careful cleaning of the patient’s environment

• 2) Rational/Restrictive use of antibiotics; antibiotic stewardship; Prescriber education

• 3) Availability of isolation capacity/ Clear isolation strategies/Outbreak management/Availability of practice guidelines
Disruption of the normal colonic flora.

Cave: Broad spectrum antibiotics including anaerobes; bile excretion !!
e.g. fluorochinolones

Probiotics may be protective
(D’Souza, AL et al. (2002) BMJ 324.1361-1364)
Characteristics of patients carrying C. difficile

(Riggs et al. 2007 CID)

Table 2. Univariate logistic regression analysis of characteristics associated with carriage of *Clostridium difficile* in stool for 68 long-term care patients with no symptoms of *C. difficile*-associated disease (CDAD).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Carriage of <em>C. difficile</em> in stool</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal incontinence</td>
<td>1.73 (0.63–4.67)</td>
<td>.285</td>
</tr>
<tr>
<td>Any antibiotic use in the previous 3 months</td>
<td>3.39 (1.24–9.23)</td>
<td>.017</td>
</tr>
<tr>
<td>Antianaerobic agents</td>
<td>2.35 (0.76–7.24)</td>
<td>.138</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>3.00 (0.99–9.13)</td>
<td>.053</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>1.33 (0.41–4.36)</td>
<td>.634</td>
</tr>
<tr>
<td>Proton pump inhibitor use</td>
<td>0.61 (0.23–1.61)</td>
<td>.321</td>
</tr>
<tr>
<td>Previous CDAD*</td>
<td>20.71 (2.41–8)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

* The OR was not calculable by logistic regression, because previous CDAD predicts current carriage perfectly; the OR was estimated by 2 × 2 analysis after adding 0.5 to each cell; the lower bound of 95% CI was estimated by Cornfield approximation.
Specific preventive measures

• 4) **Clinical Awareness**
  Early recognition of (inflammatory) diarrhoea or toxic megacolon

• 5) Availability of standardized diagnostic strategies and indications for microbiological tests (e.g. 3 unformed stools/d, age > 65, fever or leukocytosis)
  Use of immunoassays, detecting both toxin A and B (DD: C. perfringens; S. aureus; Norovirus)
Therapy and isolation strategies

- 6) **Prompt treatment** (Metronidazol; Vancomycin; Zar et al. 2007; CID 45:302-7) and **isolation**

Role of the environment?
Problem: *C. difficile* is an aero-tolerant sporeforming bacillus
Some facts I

• Patients shed vegetative cells and spores
• Rates of colonisation increase with age (> 65!) and length of hospitalisation and are higher during outbreaks
• Mean densities of C. difficile in stool:
  • Patients with CDAD: 5.6 +/- 1.4 log_{10}/g stool
  • Asymptomatic carriers: 3.6 +/- 1.3 log_{10}/g stool
    (Riggs et al. 2007 CID)
  • Asymptomatic infants (1 month): 3 - 7 log_{10}/g stool (Kim, K-H et al. (1981) JID143:42-50)
Some facts II

• The patient’s environment is contaminated with C. difficile (for months (depending on the inoculum); symptomatic > asymptomatic)

• Cross contamination (same room as well as room-to-room is well established)
Percentage of *C. difficile*-positive samples from the environment: symptomatic patients > asymptomatic carriers

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**CLOSTRIDIUM DIFFICILE COLITIS—FEKETY ET AL.**

### TABLE 1 Results of Environmental Cultures

<table>
<thead>
<tr>
<th>Sites Cultured</th>
<th>Areas With Cases</th>
<th>Areas With No Known Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floors</td>
<td>43/305 (14)*</td>
<td>5/145 (3)*</td>
</tr>
<tr>
<td>Bathroom</td>
<td>9/55 (16)</td>
<td>0/10 (0)</td>
</tr>
<tr>
<td>Patient’s room</td>
<td>21/140 (15)</td>
<td>2/70 (3)</td>
</tr>
<tr>
<td>Soiled utility room</td>
<td>12/80 (15)</td>
<td>3/45 (7)</td>
</tr>
<tr>
<td>Clean storage room</td>
<td>2/30 (7)</td>
<td>0/20 (0)</td>
</tr>
<tr>
<td>Furniture surfaces</td>
<td>3/106 (3)</td>
<td>1/48 (2)</td>
</tr>
<tr>
<td>Toilets</td>
<td>17/55 (31)</td>
<td>1/5 (20)</td>
</tr>
<tr>
<td>Bedpans, hoppers</td>
<td>16/111 (14)</td>
<td>2/60 (3)</td>
</tr>
<tr>
<td>Bedding (in use)</td>
<td>9/75 (12)</td>
<td>3/45 (7)</td>
</tr>
<tr>
<td>Bedding (clean)</td>
<td>0/20 (0)</td>
<td>0/8 (0)</td>
</tr>
<tr>
<td>Uniforms, gowns</td>
<td>1/51 (2)</td>
<td>0/30 (0)</td>
</tr>
<tr>
<td>Scales</td>
<td>8/40 (20)</td>
<td>1/30 (3)</td>
</tr>
<tr>
<td>Tubs, sinks, washbasins</td>
<td>7/110 (6)</td>
<td>1/64 (2)</td>
</tr>
<tr>
<td>Dust mops, pans</td>
<td>2/6 (33)</td>
<td>0/4 (0)</td>
</tr>
<tr>
<td>Shoes</td>
<td>1/4 (25)</td>
<td>1/4 (25)</td>
</tr>
<tr>
<td>Stethoscopes, flashlights, sphygmomanometers</td>
<td>2/95 (2)</td>
<td>0/67 (0)</td>
</tr>
<tr>
<td>Walls</td>
<td>0/40 (0)</td>
<td>0/20 (0)</td>
</tr>
<tr>
<td>Windows</td>
<td>0/28 (0)</td>
<td>0/23 (0)</td>
</tr>
<tr>
<td>Plants</td>
<td>0/5 (0)</td>
<td>0/0 (0)</td>
</tr>
<tr>
<td>Food, dishes</td>
<td>0/14 (0)</td>
<td>0/24 (0)</td>
</tr>
<tr>
<td>Air conditioner filters</td>
<td>0/5 (0)</td>
<td>0/5 (0)</td>
</tr>
<tr>
<td>Air (30 cu ft/sample)</td>
<td>0/16 (0)</td>
<td>0/7 (0)</td>
</tr>
<tr>
<td>All sites</td>
<td>110/1,086 (10)</td>
<td>15/589 (3)</td>
</tr>
</tbody>
</table>

*Number positive/number of cultures (percent positive).*

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Consequently: Contact (enteric) Isolation

- Gowns
- Surface Disinfection
- Daily change of linen
- Waste Disposal
- Medical Devices (e.g. thermometers)

Photos: Prof. Trautmann sowie RKI
Spores and Disinfection

- Surface disinfection: horizontal and hand contact surfaces, bathroom!

- Peracetic acid-based disinfectants (e.g. at least 0.1% acidic or 0.4% alkaline PAA) or
  Sodium hypochlorite (e.g. 1000-3000-5000 ppm depending on clean or dirty conditions as well as unbuffered or buffered preparations; freshly prepared)

- Wash hands (in addition to routine alcoholic hand disinfection) before preparation of food
Assure Epidemiologic Competency

• 7) Establish standardized surveillance and feedback strategies (e.g. CDAD-KISS)

• 8) Algorithm for early cluster/outbreak recognition
   (e.g. 3 or more cases/month in one department > bacterial culture for epidemiological typing and antimicrobial susceptibility testing > reporting; EpiBull September 36/2006)

• 9) Availability of Expert/Reference Laboratories for strain typing and determination of resistency
Standardised reporting system

Krankenhaus-Infektions-
Surveillance-System (KISS)

CDAD-KISS:
Surveillance-Protokoll
Clostridium difficile assoziierte
Diarrhö in Krankenhäusern

Www.nrz-hygiene.de
National Experts
Reference/Advisory Laboratories

Prof. Kist (Freiburg)
Prof. von Eichel-Streiber (Mainz)
Prof. Witte (Wernigerode)
• 10) **Information** (education and training) of patients (hand hygiene), healthcare providers (including nursing homes), antimicrobial drug prescribers
Information
www.rki.de
Thanks for your interest