Environmental Sustainability in the Ferrara Hospital: focus on “GREEN CLEANING”

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Panel discussion II: Environmentally friendly facilities: design, procurement & management
<table>
<thead>
<tr>
<th><strong>Ferrara University Hospital: CONTEXT AND ACTIVITIES</strong></th>
<th>2011</th>
<th>2012 (new Hospital CONA – May 8, 2012)</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference population</td>
<td>359,686</td>
<td>359,686</td>
<td>359,686</td>
</tr>
<tr>
<td><strong>Workforce</strong> (+ Resident Physicians and Workers of external Partners)</td>
<td></td>
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<tr>
<td>Workforce</td>
<td>2,571</td>
<td>2,630</td>
<td>2,630</td>
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<tr>
<td>(~ 4,000)</td>
<td>(~ 4,000)</td>
<td>(~ 4,000)</td>
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<tr>
<td><strong>Beds</strong></td>
<td>860</td>
<td>670</td>
<td>670</td>
</tr>
<tr>
<td><strong>Healthcare buildings</strong></td>
<td>~109,000 mc</td>
<td>~250,000 mc</td>
<td>~250,000 mc</td>
</tr>
<tr>
<td>(2 Hospitals)</td>
<td>&gt;700,000 m3</td>
<td>&gt;700,000 m3</td>
<td>(2 Hospitals + 1 Clinic)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(2 Hospitals + 1 Clinic)</td>
</tr>
<tr>
<td><strong>Hospital admissions</strong></td>
<td>36,292</td>
<td>33,023</td>
<td>32,718</td>
</tr>
<tr>
<td><strong>% Surgery admissions</strong></td>
<td>44,8%</td>
<td>43,2%</td>
<td>43,4%</td>
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<tr>
<td><strong>DRG’s average weight</strong></td>
<td>1,27</td>
<td>1,26</td>
<td>1,29</td>
</tr>
<tr>
<td><strong>Outpatient health services</strong></td>
<td>4,144,328</td>
<td>4,615,889</td>
<td>5,764,682</td>
</tr>
<tr>
<td><strong>Operating Theatres</strong> (including 1 Delivery Room)</td>
<td>21 (7 BB.00. + 1 PNBO)</td>
<td>23 (2 BB.00. + 1 PNBO)</td>
<td>23 (2 BB.00. + 1 PNBO)</td>
</tr>
<tr>
<td><strong>Accesses to emergency</strong></td>
<td>79,811</td>
<td>75,127</td>
<td>78,332</td>
</tr>
<tr>
<td><strong>% Hospital admissions</strong></td>
<td>17,5</td>
<td>16,9</td>
<td>16,7</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td>&gt; 283 mil.€</td>
<td>&gt;306mil.€</td>
<td>&gt;306mil.€</td>
</tr>
<tr>
<td><strong>Educational and training related activities</strong></td>
<td></td>
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</table>
Ferrara University Hospital: ENVIRONMENTAL IMPACTS to consider (2013)

<table>
<thead>
<tr>
<th>Natural gas</th>
<th>Electricity purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>25.914.502 KWh</td>
</tr>
<tr>
<td>(tep.2.706)</td>
<td>3.300.000 Kmc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water consumption</th>
<th>148.514 mc</th>
</tr>
</thead>
</table>

- **Urban waste** 746 T
- **% Recycling waste (on total Urban waste)** 40.7%
- **Not hazardous waste** (including drugs, particularly chemicals) 39 T
- **Hazardous waste** (including drugs, particularly chemicals) 76 T
- **Medical waste** 598 T
Ferrara University Hospital: environmental management

Multidimensional values and areas of integration:

Safety and Risk Management

Commitment to environmental management: Hospital Project “A LESSER IMPACT” (2007)

HPH&HS NETWORK

Emilia-Romagna Region Program: "The Regional Sanitary System for sustainable development"

HCWH Europe
Ferrara University Hospital: The Project "A LESSER IMPACT"

AREAS OF INTERVENTION:

- MEDICAL & URBAN WASTE MANAGEMENT
- WATER DISCHARGES
- WATER CONSUMPTION
- SUSTAINABLE MOBILITY
- ENERGY MANAGEMENT
- GREEN PUBLIC PROCUREMENT
- GREEN CLEANING
WASTE MANAGEMENT: GOALS

- compliance with legislation
- reduced use of hazardous substances and decreased production of hazardous medical waste
- safety (for workforce, operators of outsourced services, patients, visitors, Community)
- increased of waste urban recycling
- marketing and social communication (workforce, visitors, patients, Community)
MULTIMODAL STRATEGY: key elements

- **ALLIANCE**: “Environmental Management Local Board”
- **DOCUMENTARY HERITAGE** (eg. Procedures, Operating Instructions, Posters)
- **REMINDERS IN THE WORKPLACE**
- **PROMOTION CAMPAIGN FOR URBAN WASTE RECYCLING** "If you recycle you alive! Do you know ..."
- **INFORMATION - EDUCATION - TRAINING**: different paths, Master EMAS UNIFE
- **ADVICE and SUPPORT**: dedicated telephone N°, field trips, selling "door to door"
- **ANNUAL CONTROL PLAN**: of structure, process and outcome (internal producers, contractors Companies), observation on the field
- **OBSERVATORY OF PRODUCTION & COSTS**: computerized detection of medical waste for production area (bar-code)
- **INDICATORS**: production and costs
- **OBJECTIVES**: annual and long-term improvement
- **REPORTING** of results (internal and external for stakeholders and shareholders)
Testing and implementing an innovative cleaning system made-up on a **microbial-based product**, which combines efficacy, safety and environmental protection. The product is based on **non-pathogenic bacteria** (spores of genus Bacillus subtilis, Bacillus pumilus, Bacillus megaterium) that colonize environmental surfaces, competing with potentially pathogenic bacteria, responsible for nosocomial infections (Gause's law), with a mechanism of biocontrol.

**GOALS:**
- contribute to create a hygienically-safe hospital environment
- reduce exposure to chemicals
- reduce environmental impact.
GREEN CLEANING: Experimental path

2010

2010 – 2011
Preliminary Tests of the microbial cleaning products (in Laboratory):
- Ghent University (BE)
- AZ Lokeren Hospital (BE)
- Ferrara University (IT)

2011
Hospital Trial setup, comparison between microbial cleaning products and the conventional hygiene protocols (chemicals and disinfectants):
- AZ Lokeren Hospital (BE): 2 geriatrics ward, 500 mc
- Ferrara University Hospital (IT): 836 mc

2011 - 2012
Hospital Trial setup (14 months): Rehabilitation Hospital – Ferrara University H. (Severe Brain and Mielo Damage), all wards (12,300 mc)

1). 20th International Conference on Health Promoting Hospital and Health Services, Oral Presentation, parallel session 03.8 “Creating environment-friendly hospitals as health services, April 11-13, 2012, Taipei, Taiwan
2). XVth National Conference of Health Promoting Hospital and Health Services, Poster, November 8, 2012, Trieste, Italy
3). PLOS one, September 2014, Volume 9, Issue 9, e108598 “Hard Surface Biocontrol in Hospitals Using Microbial-Based Cleaning Products”,
The effect of microbial cleaning was evaluated in these 3 independent hospital sites and about 20,000 microbial surface samples were collected.

The effect of microbial cleaning, as a part of the daily cleaning protocol, resulted in a reduction of potential HAI-related pathogens by 50 to 89% (Staphylococcus aureus, Coliformi and E.coli, Pseudomonas spp, Candida, Acinetobacter b., Clostridium diff.)

**PCHS (Probiotic Hygiene Cleaning System) Protocol:**
- New cleaning products, technologies, procedures, specific TRAINING of cleaners
riduzione espressa in unità formanti colonia (CFU)/m$^2$ in funzione del tempo.

**Stafilococcus spp.**

![Graph showing CFU/m$^2$ over time for Stafilococcus spp.](image-url)
riduzione espressa in unità formanti colonia (CFU)/ m² in funzione del tempo

Coliformi

TEMPO: mese

CFU/m²

T0 nov. 2011  T1  gen-12  dic-11  feb-12  mar-12  apr-12  mag-12  giu-12  lug-12  set-12  nov-12
riduzione espressa in unità formanti colonia (CFU)/m² in funzione del tempo

Candida spp.

Tempo: mese

- DEGENZA UGC Blocco C
- DEGENZA UMR Blocco C
riduzione espressa in unità formanti colonia (CFU)/m² in funzione del tempo

Acinetobacter spp.

DEGENZA UGC Blocco C
DEGENZA UMR Blocco C

Tempo: mese
### December 1, 2012: the new Hospital strategy for environmental hygiene

<table>
<thead>
<tr>
<th><strong>PCHS PROTOCOL FOR MANUAL CLEANING</strong></th>
<th><strong>STRENGTHS</strong> (with evidence)</th>
<th><strong>WEAKNESSES</strong> (with evidence)</th>
</tr>
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<tbody>
<tr>
<td><strong>- Based on probiotics</strong></td>
<td><strong>-</strong> Based on probiotics</td>
<td><strong>Not usable in all care units</strong> (areas where we want low microbial load: eg. operating theatres, interventive rooms, &quot;clean rooms&quot; like Antiblastic or Radiopharmaceutical Units).</td>
</tr>
<tr>
<td><strong>- Specific training of cleaners</strong></td>
<td><strong>- Specific training of cleaners</strong></td>
<td><strong>- Not usable in presence of patients / operators</strong></td>
</tr>
<tr>
<td><strong>- Effective environmental hygiene</strong></td>
<td><strong>- Effective environmental hygiene</strong></td>
<td><strong>- Need time for the decontamination to occure</strong></td>
</tr>
<tr>
<td><strong>- Exposure reduction</strong> to chemicals of patients, caregiver and staff**</td>
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<td><strong>- Need time for the decontamination to occure</strong></td>
</tr>
<tr>
<td><strong>- Environmental protection</strong></td>
<td><strong>- Environmental protection</strong></td>
<td><strong>- Need time for the decontamination to occure</strong></td>
</tr>
<tr>
<td><strong>It’s our basic cleaning method.</strong></td>
<td><strong>It’s our basic cleaning method.</strong></td>
<td><strong>- Need time for the decontamination to occure</strong></td>
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</tbody>
</table>

#### MANUAL CLEANING WITH CHEMICALS + DECONT.

With AUTOMATIC EQUIPMENT (GLOSAIR™)

- Sodium hypochlorite
  - Generates a dry mist of fine hydrogen-peroxide + silver cations, non-toxic, non-corrosive and more than 99% biodegradable, maximizing the contact on all surfaces, with no residues & odor
  - Final disinfection
  - Periodic treatment

- Not usable in presence of patients / operators
  - Need time for the decontamination to occure
**PCHS ENVIRONMENTAL PERFORMANCES.**
Comparison data between the PCHS Protocol and the previous traditional system based on chemicals *(104.191 mq)* - 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>Reduction</th>
<th>Amounts</th>
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<tbody>
<tr>
<td><strong>Energy consumption</strong></td>
<td>- 20,9% Kwh/week</td>
<td>- 489 Kwh/week</td>
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<tr>
<td></td>
<td>(1.185 Kwh/week vs. 1.674 Kwh/week)</td>
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<tr>
<td><strong>Water consumption</strong></td>
<td>- 26,8% liters/week</td>
<td>- 20.319 liter/week</td>
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<tr>
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<td>(55.525 liters/week vs. 75.844 liters/week)</td>
<td></td>
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<tr>
<td><strong>Cleaning products</strong></td>
<td>- 8,4% Kg/week</td>
<td>- 20,9 kg/week</td>
</tr>
<tr>
<td>consumption</td>
<td></td>
<td>(229.7 Kg/week vs. 250.6 Kg/week)</td>
</tr>
<tr>
<td><strong>Chemicals consumption</strong></td>
<td>- 52,8% Kg/week</td>
<td>- 132,2 Kg/week</td>
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<tr>
<td></td>
<td></td>
<td>(118.4 kg/week vs. 250.6 kg/week)</td>
</tr>
<tr>
<td><strong>Disposable gauze</strong></td>
<td>- 84,4% Kg/week</td>
<td>-66,5 kg/week</td>
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<tr>
<td>consumption</td>
<td></td>
<td>(12,3 kg/week vs. 78,8 Kg/week)</td>
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<tr>
<td></td>
<td></td>
<td>(n° 3.515 disp.gauze/week vs. n° 11.236 disp.gauze/week)</td>
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</tbody>
</table>
Conclusions

For environmental management, the hospital ethical commitment can be realized also with the introduction of an innovative cleaning system able to pull down the pathogenic microorganisms and to reduce the hospital's environmental impact.

The Project it’s part of Hospital Policy, integrated with Regional Program for environment; it promotes safety and risk management; it’s a fundamental commitment for HPH Hospital Network on social marketing and promotion of virtuous behavior.
Cleaning
This is a typical condition of all places and of all people. **In healthcare facilities such condition acquires a value absolutely peculiar**, because it marries the concept of **cleaning that hygiene.** That combines an **aspect of pleasantness, and comfort one aspect of health guarantee and safety**, of which no hospital can do without. Indeed, whereas often in recent years the lack of hygiene was the cause of serious events in terms of the health consequences, the cleaning element is one that combines all the comforts closely with the health outcome of hospitalization.
MULTIDIMENSIONAL STRATEGY (Policy AOUFE):

3 MACRO-AREAS OF INTERVENTIONS:

1. HAND HYGIENE

2. HEALTH CARE ENVIRONMENT

3. GOOD PRACTICES

Systematic implementation of Microbial Cleaning PCHS Protocols (December 2012)