Innovation and Implementation Strategic Approaches to Reduce Catheter-Related Bacteraemia

Dr. Walter Zingg, University of Geneva Hospitals
A World Health Organization Teleclass

Outline

BACKGROUND
THE GENEVA “REDCO-CVC project”
PROHIBIT
PROHIBIT – The catheter project
PROHIBIT – In Depth
SUMMARY

Background – SENIC

Relative change of nosocomial infections over 5 years (1970-1975)

Without infection control

LRTI 9%
SSI 14%
UTI 19%
BSI 26%
Total 18%

With infection control

Without infection control

LRTI 27%
SSI 35%
UTI 31%
BSI 35%
Total 32%

50%

Haley Am J Epidemiol 1985

Background – ECDC

ECDC – ICU-data

<table>
<thead>
<tr>
<th>Type of ICU</th>
<th>ICU's, n</th>
<th>Patients, n</th>
<th>Pooled mean CLABSI rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>42</td>
<td>30,823</td>
<td>14.7</td>
</tr>
<tr>
<td>Medical cardiac</td>
<td>27</td>
<td>26,704</td>
<td>6.2</td>
</tr>
<tr>
<td>Medical/surgical</td>
<td>138</td>
<td>102,227</td>
<td>6.8</td>
</tr>
<tr>
<td>Neurologic</td>
<td>4</td>
<td>3,369</td>
<td>12.9</td>
</tr>
<tr>
<td>Neurosurgical</td>
<td>25</td>
<td>8,100</td>
<td>4.6</td>
</tr>
<tr>
<td>Pediatric</td>
<td>45</td>
<td>20,900</td>
<td>10.7</td>
</tr>
<tr>
<td>Respiratory</td>
<td>18</td>
<td>2,710</td>
<td>4.9</td>
</tr>
<tr>
<td>Surgical</td>
<td>50</td>
<td>63,270</td>
<td>5.0</td>
</tr>
<tr>
<td>Surgical cardiothoracic</td>
<td>28</td>
<td>25,130</td>
<td>1.5</td>
</tr>
<tr>
<td>Trauma</td>
<td>9</td>
<td>4,507</td>
<td>2.5</td>
</tr>
<tr>
<td>Overall</td>
<td>386</td>
<td>295,264</td>
<td>6.8*1000 catheter-days</td>
</tr>
</tbody>
</table>

*422 ICUs from 36 countries in Latin America, Asia, Africa, and Europe
Impact of a prevention strategy targeted at vascular-access care on incidence of infections acquired in intensive care

*Eggimann. Lancet 2000;355:1864

### Multimodal intervention:
- Education/Training
- Standardized processes
- Maximal sterile barrier precautions
- Chlorhexidine
- Hand hygiene
- Catheter care
- etc.

Eggimann. Lancet 2000;355:1864

### Background – Eggimann

<table>
<thead>
<tr>
<th>Initiative period</th>
<th>Incidence density</th>
<th>Bloodstream infections*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Microbiologically documented (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Catheter-related (%)</td>
</tr>
<tr>
<td>Incubation period</td>
<td>Incubation period</td>
<td>Incubation period</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>11-3</td>
<td>3-1</td>
</tr>
<tr>
<td></td>
<td>9-2</td>
<td>5-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9-2</td>
</tr>
</tbody>
</table>

### Written Protocols

- **Initiative from the ICU**
  - **Contact infection control**
  - **Detailed protocol based on literature**
  - **Teaching on the ward**
  - **Bedside teaching**
  - **CVC-insertion**
  - **Surveillance**

### Key personnel

- **Eggimann. Lancet 2000;355:1864**

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Background – Pronovost

Explaining Michigan: Developing an Ex Post Theory of a Quality Improvement Program

1. Generating isomorphic pressures for ICUs to join the programme and conform to its requirements
2. Creating a densely networked community with strong horizontal links that exerted normative pressures on members
3. Reframing CVC-BSIs as a social problem and addressing it through a professional movement combining “grassroots” features with a vertically integrating program structure
4. Using several interventions that functioned in different ways to shape a culture of commitment to doing better in practice
5. Harnessing data on infection rates as a disciplinary force
6. Using “hard edges

Dixon-Woods. Milbank Quarterly 2011;89:167

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SUMMARY

REDCO – CVC

“Réduction des complications des Cathéters Veineux Centraux”
The aim of the study was to test the effectiveness of a hospital-wide training program on the reduction of central venous catheter-related bloodstream infections (CRBSI) by standardization of practice upon insertion and care.
**Key factors for success**

- Administrative support
- Multidisciplinary task force
- Improved equipment (carts, insertion kits)
- Engagement of front-line staff
- Professional groups were addressed separately
- Practical workshops

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**Aims**

The aim of PROHIBIT is to provide the vision for policy makers, managers and healthcare workers to prevent transmission of HAI by improving understanding of European guidelines and hospital policies and practices for HAI prevention, by overcoming common barriers for implementing evidence-based best practices, and by testing the effectiveness of 2 interventions to prevent catheter related bloodstream infection

**EC Framework 7 – Project**

**Project**
The Catheter Project

The objective of the catheter project was to test the effectiveness of bundle strategies and hand hygiene in the prevention of central line-associated bloodstream infections.

The setting was a stepped-wedge cluster-randomization in intensive care units among 15 European hospitals.

Randomization for staggered intervention start

15 hospitals (EARSS network)

15 Hospitals in the European Union – participating in the randomized controlled trial to reduce catheter-associated bloodstream infections

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The Catheter Project

A stepped wedge randomised controlled trial has sequentially rolled out defined intervention packages over a period of 36 months

<table>
<thead>
<tr>
<th>Project</th>
<th>Total</th>
<th>Intervention 2021</th>
<th>Intervention 2022</th>
<th>Intervention 2023</th>
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<tbody>
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</tbody>
</table>

Centralised training of hospital delegates
- Simulator-based training
- "Carepractice.net"
- WHO hand hygiene strategy
- Implementation strategy

University of Groningen

Outcomes and process indicators

Catheter-related bloodstream infections in all CVCs in ≥ 1 ICU
Patient characteristics
CVC characteristics

Hand hygiene compliance
- Measured according to the WHO "5 Moments for Hand Hygiene"
- On average 5 observations per week

CVC bundle compliance
- On average 3 observations per week

Data from 25,377 patients with 35,894 central venous catheters: 263,093 catheter-days and 384 catheter-related bloodstream infections

Overall HH compliance

CRBSI incidence

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The Catheter Project

CRBSI incidence in HH hospitals

CRBSI incidence in CVC hospitals

The Catheter Project

CRBSI incidence in hospitals with Both interventions

The Catheter Project

CRBSI incidence in hospitals with Baseline incidence > 1.5 only

The Catheter Project

Rel. improvement CRBSI

Rel. improvement in CVC bundle compliance

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The objective of InDepth was to determine key factors for success or failure in the implementation of good practices in the prevention of healthcare-associated infections among a representative sample of hospitals participating in the catheter project.

"Why are some hospitals more successful in implementing best infection control practices than others?"

"What are the barriers and facilitators in implementing best infection control practice?"


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Outer setting
Process
Inner setting
Core components
Adaptable periphery
Individuals involved


 Purposeful sampling
Case finding
Who???

Case finding
Adapted ‘Intervention’

Unchallenged
Challenged
Sampling of extremes

Unchallenged
Challenged
Sampling of extremes

Case finding

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Institutional context

Implementation fitness

PROHIBIT implementation success

12 two-day site visits
132 recorded interviews (±1 hour)
6'336 pages of transcripts
48 hours of ethnographic observations
500 photographs
>200 artefacts (guidelines, posters, etc.)

Major implementation codes

Perceived value of intervention
Intervention adaptation
Perceived implementation success
Hospital management priorities
Innovation(s)

Major codes at 1st site visit

Material & Environment
Training
Influential individuals
Network & Communication
Staffing
Monitoring & Feedback
Safety culture
Innovation

‘Individuals make a difference’
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Street-Credit
An individual who earns respect through their “on the ground” presence and (clinical) experience

Innovator (a.k.a. Ideator)
An individual who brings new ideas to an organization and promotes innovation

Other themes...
- Communication
- Champions
- Generations of healthcare workers
- “Brain drain”
- Work attitude
- Safety culture (teaching, critical incidents)

Solution Finder
An individual who presents solutions and makes things happen

Relationship-oriented leader
An individual that channels interpersonal interactions to build effective working relationships

In-depth
Casillas A. 23R ECCMID, Berlin 2013

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Summary

Adoption
Implementation
Evaluation

Summary

Adoption
Implementation
Evaluation

Summary

Adoption
Implementation
Evaluation
Barrier Identification

Summary

Adoption
Implementation
Evaluation
(Re-) Implementation
Barrier Identification

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INNOVATION AND IMPLEMENTATION STRATEGIC APPROACHES TO REDUCE CATHETER-RELATED BACTERAEMIA: THE RESULTS OF A EUROPEAN MULTICENTRE STUDY (PROHIBIT)

Summary

Adoption
(Re-) Implementation
(Re-) Evaluation
Barrier Identification
Sustainability
→ iterative process

Summary

- High vs. low baseline CLABSI-rates
- Multidisciplinarity – ICU professionals as teachers
- Multimodality
- Leadership – Role model
- Safety culture – Learning from errors
- Communication – Speaking up
- Generations – Younger healthcare workers more flexible, but also less knowledgeable
- Staffing issues – Brain drain
- Culture of excellence
- External pressure

INNOVATION AND IMPLEMENTATION STRATEGIC APPROACHES TO REDUCE CATHETER-RELATED BACTERAEMIA: THE RESULTS OF A EUROPEAN MULTICENTRE STUDY (PROHIBIT)

2014

WHO Teleclass Schedule

January 29
Innovation and implementation strategic approaches to reduce catheter-related bacteraemia: The results of a European multicentre study (PROHIBIT)
Dr. Walter Zingg, Switzerland

March 7
How to prevent the spread of multiresistant bacteria
Dr. Stephan Haibarth, Switzerland

April 9
Highlights on SSI prevention: The new CDC guidelines and more
Dr. Joseph Solomkin, USA

May 5
Special lecture for International Hand Hygiene Day
Prof. Didier Pittet, Switzerland

September 3
New WHO global campaign to eliminate unsafe therapeutic injections
Dr. Benedetta Allegranzi, Switzerland

October 8
Public reporting and disclosure of HAI rates: Positive impact or confusion?
Dr. Maryanne McGuckin, USA

November 5
Global application of behaviour change models and infection control strategies
Dr. Michael Borg, Malta

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