

Using the Right Model to Calculate the Financial Implications of *Clostridium difficile* Infection
Dr. Mairead Skally, Beaumont Hospital, Dublin, Ireland
A Webber Training Teleclass

Using the right model to calculate the financial implications of *Clostridium difficile* infection

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Hosted by Paul Webber
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RCSI HOSPITALS
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Beaumont Hospital



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January 18, 2018

BEAUMONT HOSPITAL DUBLIN, IRELAND



Emergency
and Acute
Care

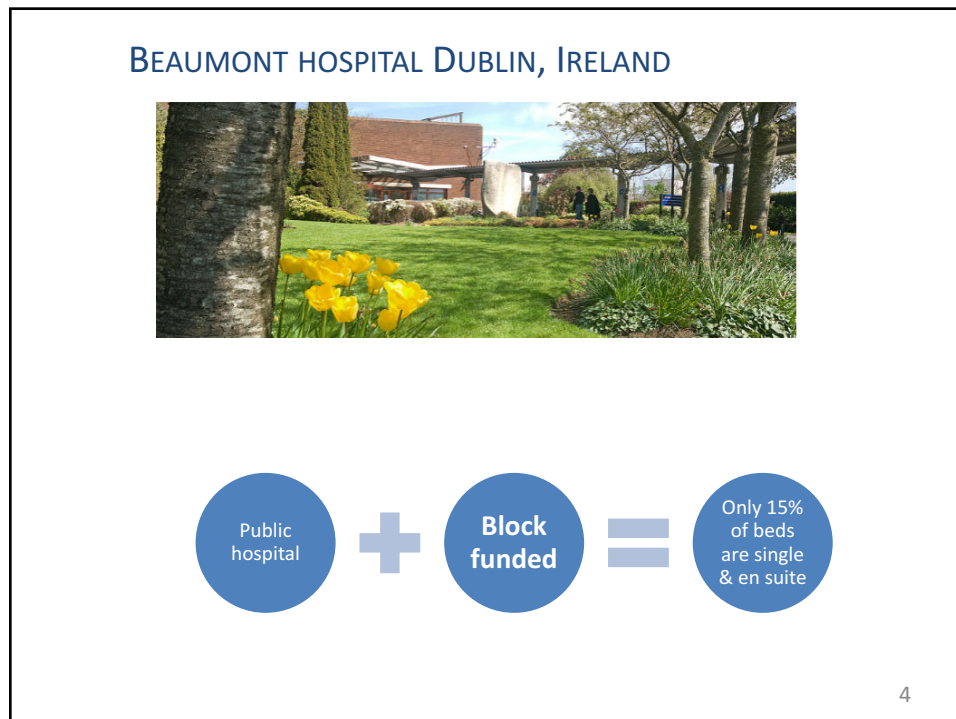
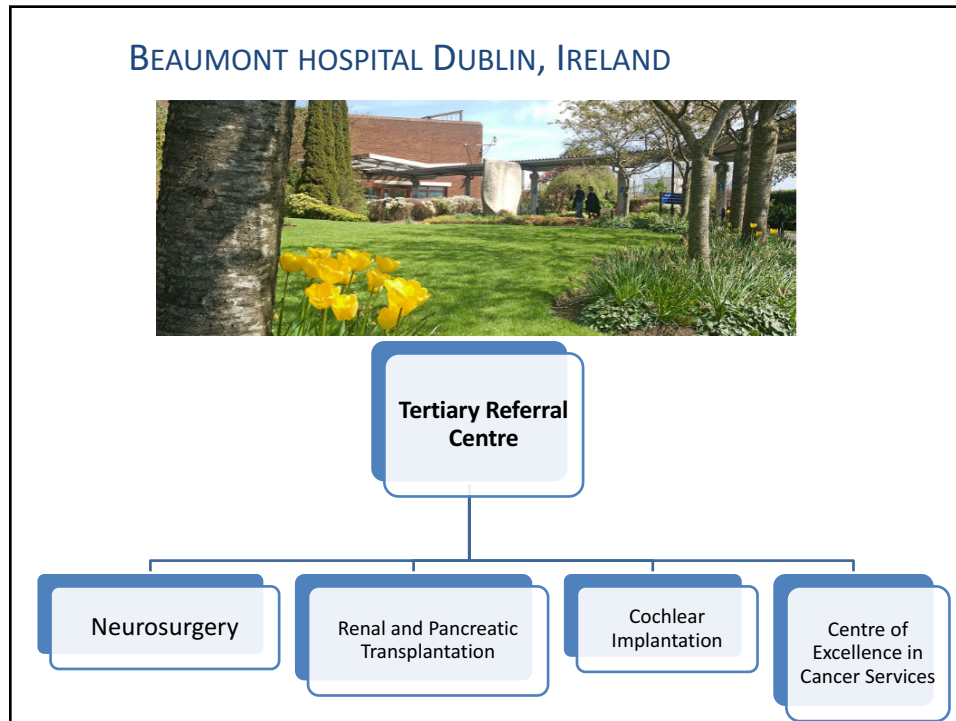
Tertiary
Referral
Centre

Academic
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Hospital

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CDI Definitions



New Case

- 2+ years
- Positive laboratory result for toxin producing *C. difficile* organism detected in stool

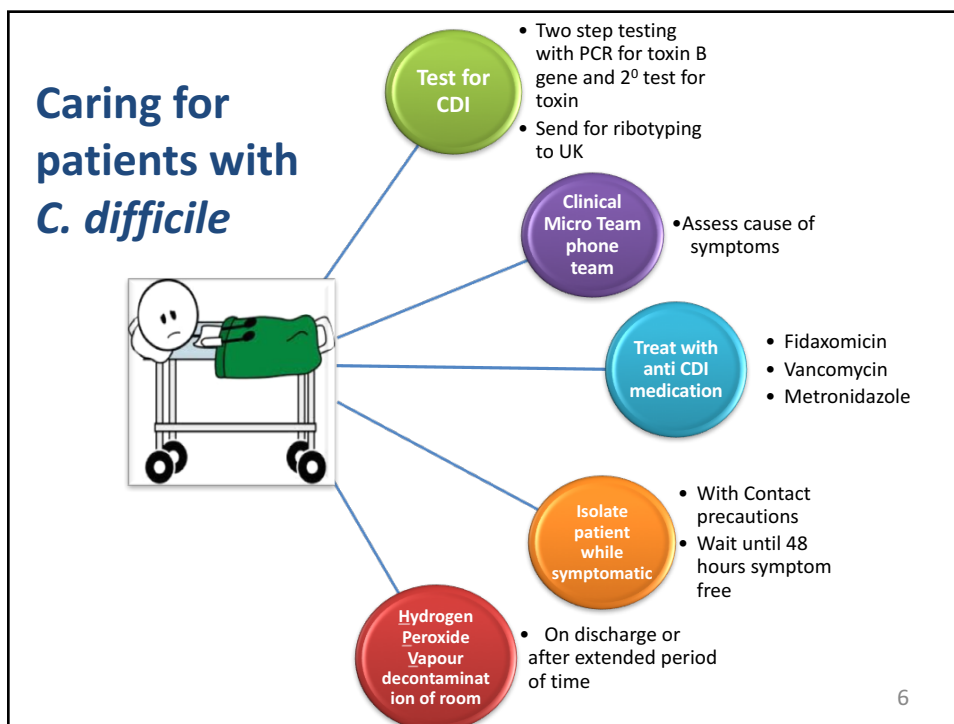
and / or

- Colonic histopathology characteristic of *C. difficile* infection (with or without diarrhoea) on a specimen obtained *during endoscopy, colectomy or autopsy.*

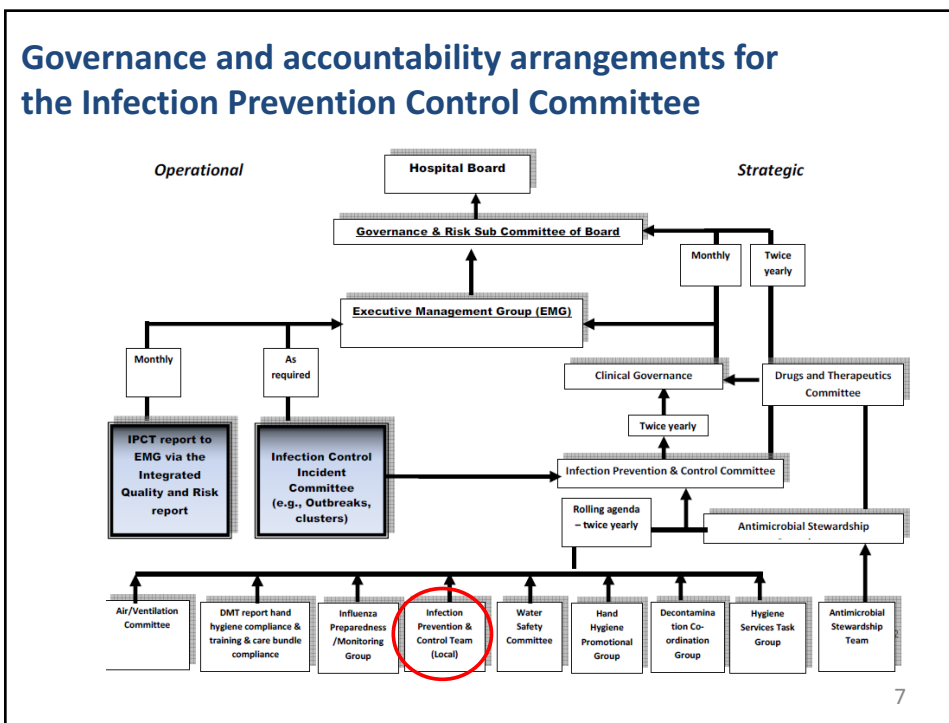
Recurrent case

- Symptoms < eight weeks since first infectious episodes

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.....COSTING *C. DIFFICILE* INFECTION

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How much does a case cost?

UK

€4,655 to € 12,751
(£4,000 to £10,956)

Europe

€5,798 to €11,202

USA

\$ 2,992 to \$29,000
(€2,485 to €24,092)*

20 new hospital acquired
cases CDI
@ €4,655 = €93,100
@ €24,092 = € 481,840

* Conversion figures correct as of 02nd January 2018
courtesy of www.xe.com

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Health Economic Analysis

Article
 November 24, 1989
Clinical Economics
 A Guide to the Economic Analysis of Clinical Practices
 John M. Eisenberg, MD, MBA
> Author Affiliations
 JAMA. 1989;262(20):2879-2886. doi:10.1001/jama.1989.03430200123038

Bombardier and Eisenberg, 1984

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ECONOMICS

- **COST UTILITY ANALYSIS (CUA) - OUTCOMES EXPRESSED IN UNITS OF UTILITY (E.G., QALYS)**
- **COST EFFECTIVE ANALYSIS (CEA) - ESTIMATES COSTS AND OUTCOMES OF INTERVENTION**
- **COST BENEFIT ANALYSIS (CBA) - ESTIMATE COSTS AND BENEFITS IN THE SAME UNITS**
- **COST IDENTIFICATION - MICRO COSTING ANALYSIS**

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ECONOMICS

- COST UTILITY ANALYSIS (CUA) COSTS EXPRESSED IN UTILITIES (ANALYSIS)
- COST-BENEFIT ANALYSIS (CBA) COSTS AND BENEFITS EXPRESSED IN MONETARY TERMS
- COST-EFFECTIVENESS ANALYSIS (CEA) COSTS AND EFFECTIVENESS
- MICRO COSTING

REALITY

Limited knowledge due to:
 Limited manpower
 &
 Limited funding

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Article
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Health Economic Analysis

Bombardier and Eisenberg, 1984

"Be 'creative'? I'm an accountant, not a novelist."

Units 14

Our objective

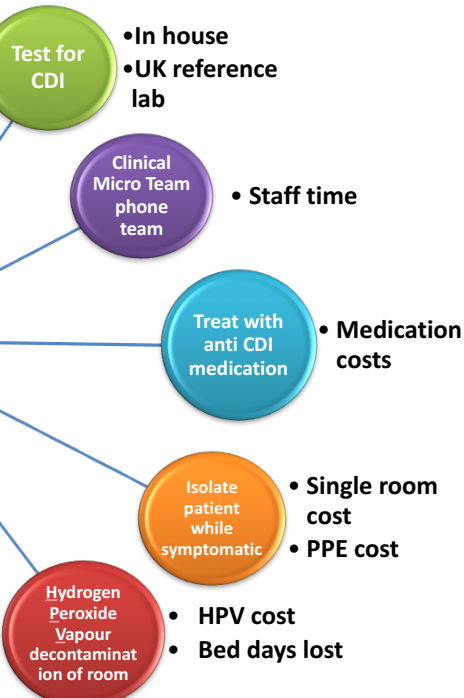
Analyse cost of *C. difficile* infection in Beaumont Hospital in August 2015

- 'Routine' cost
- Additional costs associated with an outbreak on one ward

Perspective: Hospital decision-makers

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Caring for patients with *C. difficile*



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Methods - 1

- **Resource use collection**
 - Chart review
 - Patient transfer history – length of stay, time in isolation
 - Prescribing & cleaning records
- **Unit costs**
 - Beaumont Hospital Patient-Level Costing project
 - Health Services Executive (HSE)

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Methods - 2

- **Outbreak analysis**
 - Additional personnel time (outbreak meetings)
 - Additional cleaning
 - Bed closures = bed-days lost
- **Return on investment**
 - Break even analysis using

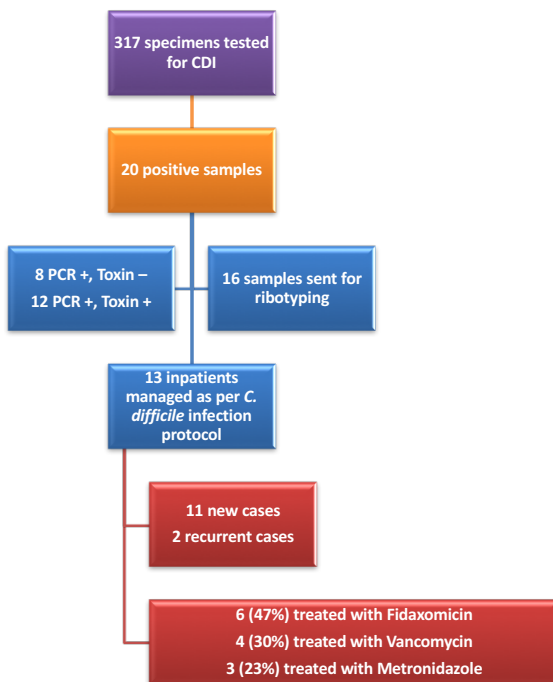
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Methods -3

- Calculating additional length of stay (LOS)
 - Disregard > 10 days in isolation
 - Compared to *C. difficile* LOS to cohort with same DRG / ICD codes = incremental LOS due to CDI
 - Cost of additional LOS derived from national DRG estimates (sensitivity analysis)
- Conducting a sensitivity analysis varying key parameters of the study

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Results



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Cost of routine *C. difficile* patient

	Aggregate cost / variable cost (€)	Mean per patient cost / variable cost (€)
		€1,026 / 17% variable
Total	75,680 / 13,338	5,820 / 1,026
Personnel	3,199 / 0	246 / 0
Radiology and endoscopy	2,002 / 0	154 / 0
Surgery	0	0
Anti-CDI medication	10,057 / 10,057	773 / 773
Cleaning/decontamination	2,011 / 2,011	155 / 155
Laboratory diagnosis and ribotyping	6,437 / 1,274	495 / 98
Length of stay	32,713 / 0	2,516 / 0
Isolation room	19,261 / 0	1,481 / 0

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Cost of *C. difficile* decontamination

Expenditure category	Routine cost (€)	Outbreak cost (€)	Total cost (€)
Total cost	2,011	9,654	11,665
'Deep' cleaning on CDI discharge	95	1,243	1,338
HPV decontamination	1,815	3,712	5,527
Curtain exchange	101	824	925
Bed linen	-	124	124
Fire blankets	-	62	62
Shower curtains	-	22	22
Hypochlorite tablets	-	2,048	2,048
Mattress replacement	-	1,033	1,033
Commodes	-	517	517

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Cost of our *C. difficile* outbreak

- 58 bed days lost due to bed closures ≈ €34,585
- Outbreak control team meetings:
 - 5 x meetings, mean personnel cost: €546
 - Aggregate cost: €2,728
- Outbreak-related cleaning: Total = €9,654

Total = €88,049 (€6,773 per patient)

€1,768 / 26%
variable

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Return on investment / Break even analysis

- Antimicrobial pharmacist = €87,712 per year
 - Using **variable costs** only, preventing **47 CDI** cases annually would offset this cost
 - If **mean cost** was used for this calculation preventing only **12 CDI** cases would be required to break even
- The pharmacist would also potentially contribute to other HAI reductions

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International comparisons

	Our hospital	Europe
Cost	€5,820	€5,000 to €11,000
Additional Length of stay	4.2 days	7 days
20 new cases	€116,400	
Of which is variable	€19,788	

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Sensitivity analysis

Parameter varied	Sensitivity analysis
<ul style="list-style-type: none"> Incremental length of stay due to <i>C. difficile</i> infection 1.75 days to 22.55 days (average = 4.2) 	<ul style="list-style-type: none"> Increasing length of stay from 4.2 to 7.0 days: = Cost increase from €2,516 to €4,147
<ul style="list-style-type: none"> Preventing 5%, 10% and 20% of our <i>C. difficile</i> cases 	<ul style="list-style-type: none"> Reduce attributable cost by €4,403, €8,806 and €17,612

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To conclude

- Preventing CDI = some cash savings
- Other “cost savings” are notional i.e. resources directed elsewhere
- It is possible to count the cost of CDI in your hospital but you should focus on variable costs
- Investing in CDI prevention can offer net financial benefit

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Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin



Evaluation of fixed and variable hospital costs due to *Clostridium difficile* infection: institutional incentives and directions for future research[☆]

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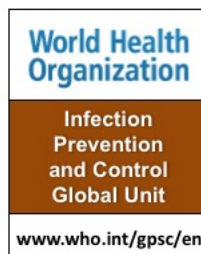
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	<p><i>(FREE ... WHO Teleclass - Europe)</i> GLOBAL INFECTION PREVENTION AND CONTROL PRIORITIES 2018-2022: A CALL FOR ACTION</p>
January 24, 2018	<p>Speaker: Prof. Benedetta Allegranzi, World Health Organization, Geneva</p> <p><i>Sponsored by the World Health Organization, Infection Prevention and Control Global Unit</i></p>
January 25, 2018	<p>PRACTICAL APPROACHES FOR MONITORING CLEANING IN HEALTHCARE FACILITIES</p> <p>Speaker: Prof. Curtis Donskey, Case Western Reserve University, Cleveland</p>
February 8, 2018	<p><i>(FREE Teleclass)</i> PATIENTS ARE YOUR PARTNERS - WHY AND HOW THIS PARTNERSHIP WORKS</p> <p>Speaker: Ioana Popescu, Canadian Patient Safety Institute, Judy Birdsell and Kim Neudorf, Patients for Patient Safety Coalition</p>
February 15, 2018	<p>REFUGEE HEALTH: A NEW PERSPECTIVE FOR INFECTION PREVENTION AND CONTROL</p> <p>Speaker: Prof. Ruth Carrico, University of Louisville</p>
	<p><i>(South Pacific Teleclass)</i> IMPROVING THE KNOWLEDGE AND RECEPTIVENESS OF MEDICAL</p>

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