

## **Educational Workshop**

### **EW01: Infection prevention and management in long-term care facilities**

Arranged with the ESCMID Study Group for Antibiotic Policies (ESGAP); the ESCMID Study Group for Infections in the Elderly (ESGIE) and the ESCMID Study Group for Nosocomial Infections (ESGNI)

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                         – no handout available  
                         **Mical Paul (Haifa, Israel)**  
                         **Dilip Nathwani (Dundee, United Kingdom)**  
                         – no handout available



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### Clostridium difficile infection in the elderly

Infection prevention and management in long-term care facilities

Mical Paul  
Rambam Health Care Campus,  
Haifa, Israel

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### Epidemiology of hospitalized CDI

Category	Count	Percentage
Healthcare-associated	775	73%
Community-associated	287	27%

Of HCA cases, 371 (48%) had a long-term care facility admission in the previous month

Jarvis, et al. Am J Infect Control. 2009 May;37(4):263-70. US, national hospital questionnaire survey

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### Epidemiology of hospitalized CDI

Category	Count	Percentage
Hospital-acquired	5792	69%
Community onset	1761	21%
Nursing home onset	447	5%
Indeterminate	447	5%

Visser et al. Euro Surveill. 2011;16(43). Belgium, acute care hospitals, compulsory surveillance data

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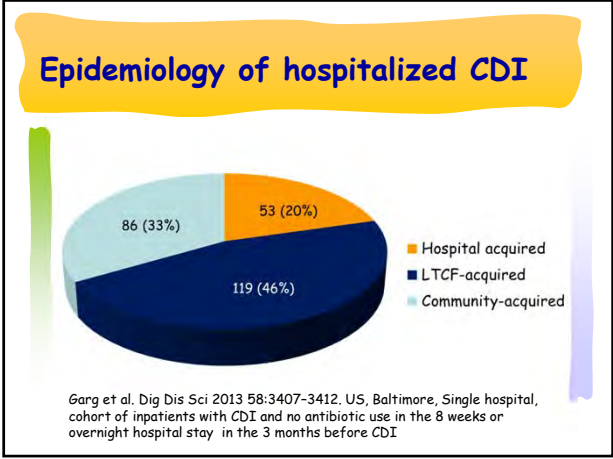
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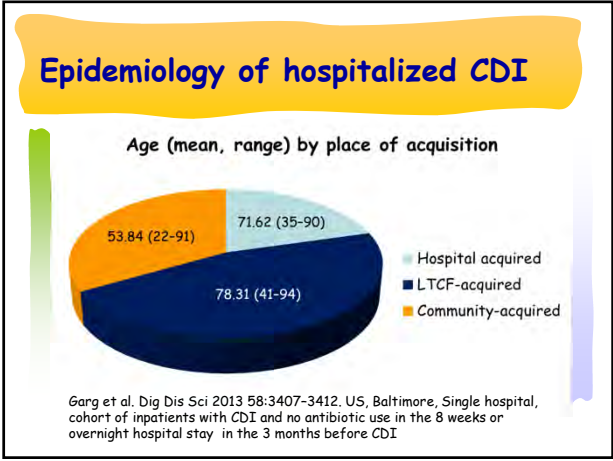
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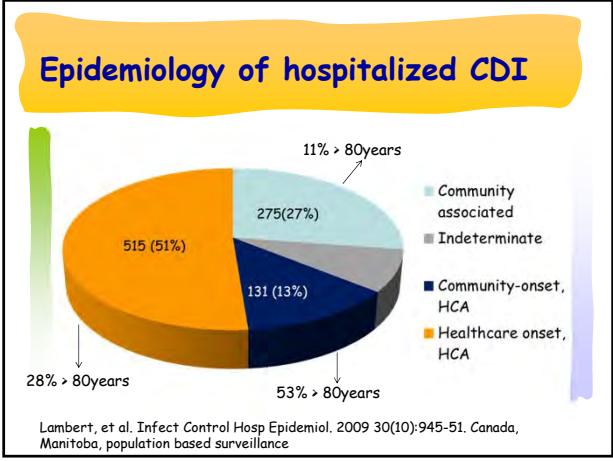
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### Incidence in acute care hospitals vs. LTCFs

Location, design	Cases per 10,000 PD	
	Acute care	LTCF
France, MC survey	2.28	1.15
Monroe County, New York, population based surveillance	9.2 (10,125 cases)	3.3 (estimated 10,300 cases)

Eckert et al. Med Mal Infect. 2013 Feb;43(2):67-74; Pawar 2012. Infect Control Hosp Epidemiol. 2012 33(11):1107-12

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### Time of CDI onset in LTCF

Pawar 2012. Infect Control Hosp Epidemiol. 2012 33(11):1107-12. Monroe County, New York, population-based surveillance.

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### Who are the purely community-acquired cases?

- Community-associated CDI, excluding overnight stay in long-term care facility or acute care hospital stay in the 12 weeks before infection
- Median patient's age was 51 (1-97) years

Chitnis, et al. JAMA Intern Med. 2013;173(14):1359-1367. US multicenter

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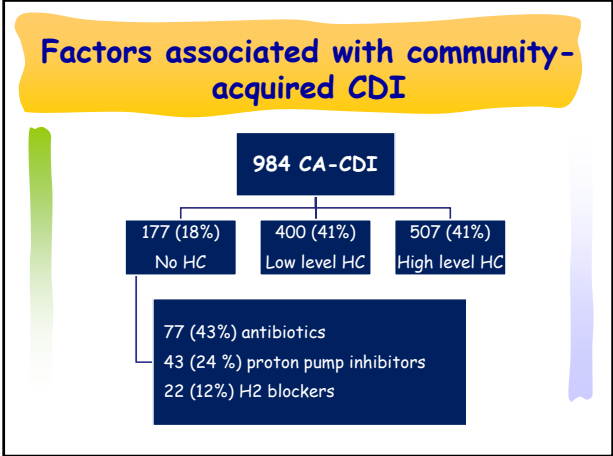
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### Age and community-associated CDI

Age by healthcare exposure

	No HC	Low level HC	High level HC
Median age	53 (1-93)	48 (1-97)	53 (1-94)

Independent factors associated with CDI (in a cohort of only CDI patients)

	No HC exposure	Low level HC exposure
Infant <1yr at home	1.8 (0.7-4.6)	2.1 (1.1-4.5)
Household member with CDI	6.8 (0.7-65.9)	6.9 (0.9-56.7)

- ### Common knowledge
- Age associated with
    - Higher CDI incidence
    - More complications
    - Higher mortality
    - More frequent relapses
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### Is age a risk factor for CDI? Case control studies: No

	N patients	Matching criteria	CDI age	Non-CDI age
Hensgens 2012	564	Time, ward, diarrhea	61.8 ± 21.1	58.1 ± 21.4
Pakyz 2014	14,134	LOS, service	adjusted OR for age 0.98 (0.97-0.98)	
Modena 2005	250	AB Tx	57.5 ± 18.1	60.2 ± 16.9
Muto 2005	406	LOS, service, date	64 (17-95)	59 (16-93)
Saes 2013 (community)	714	Suspected Cdif	50 (2-94)	50 (2-90)
Leonard 2012	137	Suspected Cdif	60 ± 17	61 ± 20

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### Is age a risk factor for CDI? Cohort studies: Yes

Study	N patients	Adjusted age association
Beaulieu 2007	827 MICU	Age ≥65 yrs. 2.33 (1.23-4.40) vs <65 yrs.
Carignan 2008	7,657 surgical	65-74 yrs. OR 2.4 (1.0 - 4.9); ≥75 yrs. OR 3.1 (1.4 - 6.8) vs. <65 yrs.
Dalton 2008	14,719 +antibiotics	OR per year 1.03 (1.01 - 1.04)
Garey 2009 *	41 224 +antibiotics	50-80 yrs. OR 1.5 (1.1 - 2.1); >80 yrs. OR 2.5 (1.7 - 3.7) vs. <50 yrs.
Dubberke 2011 *	35,350	OR per year 2.5 (1.9 - 3.3)
Chandra 2012 *	21,541	Age >65 yrs. received 3 points in a 16-point predictive score for CDI
Doernberg 2012	2,305 +antibiotics	HR per year 1.01 (0.99 - 1.03)
Ahyow 2013	93,190	65-84 yrs. OR 1.85 (1.11 - 3.09); >85 yrs. OR 2.14 (1.27 - 3.59) vs. <25 yrs.
Rodriguez 2014	12,026 >55 yrs.	OR per year 1.02 (1.01-1.03)

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### Microbiota of elderly vs. younger adults

- ELDERMET consortium, Ireland
- Comparison of the microbiota composition in elderly Irish people ≥65 yrs. and adults aged 28-46 yrs.
- People recruited in-hospital, some treated with antibiotics
- Composition of the fecal microbiota in each of the enrolled subjects was determined by sequencing over 40,000 16S rRNA gene V4 region amplicons
- Validated by comparison with a phylogenetic profiling microarray.

Claesson et al. PNAS 2011; 108 suppl. 1: 4587

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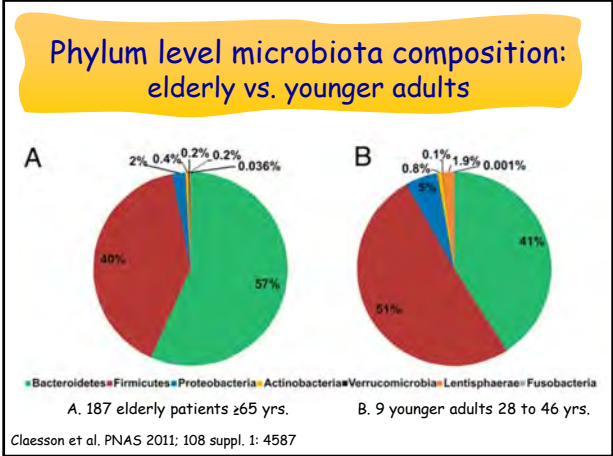
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### Microbiota-related risk factors for CDI

- Nested case-control study
- Stool samples taken from all cohort patients within 72 h after admission
- Cases (N=25) developed CDI
- Controls (N=50) without CDI matched for age, sex, date and LOS
- Fecal specimens evaluated by 16S ribosomal RNA microarray

Source: Manges et al. J Infect Dis 2010; 202(12):1877-1884

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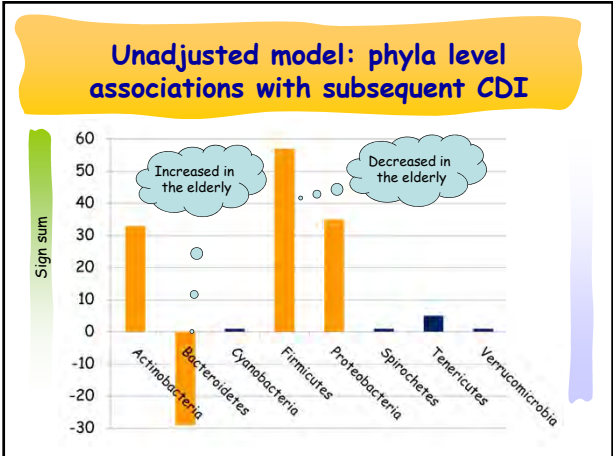
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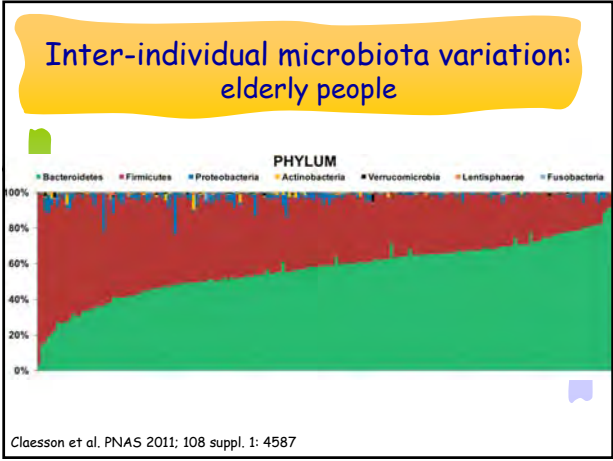
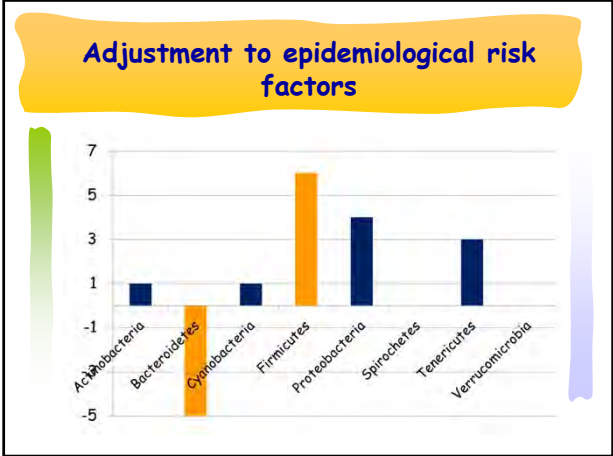
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### Universal?

- Cross sectional study of adults (20-50 yrs.) and elderly (>60 yrs.) in France, Germany, Italy, and Sweden
- Genus level analysis by 16S rRNA-targeted oligonucleotide probes
- Country-age interactions inverse for the predominant bacterial groups
- Bifidobacteria affected by country, not by age
- Enterobacteria more common in the elderly across countries

Mueller et al. Appl Environ Microbiol. 2006; 72(2): 1027-3

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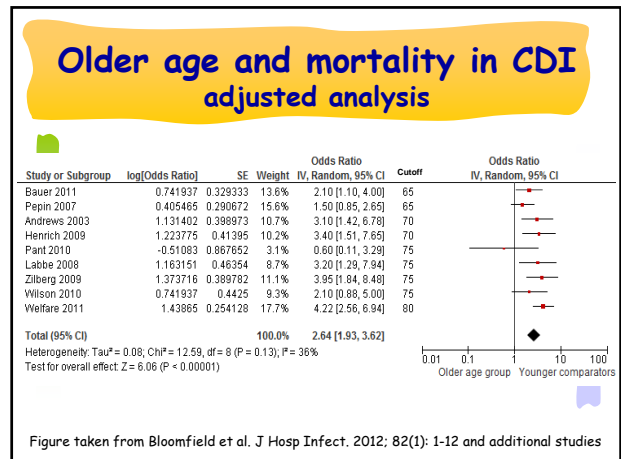


Figure taken from Bloomfield et al. J Hosp Infect. 2012; 82(1): 1-12 and additional studies

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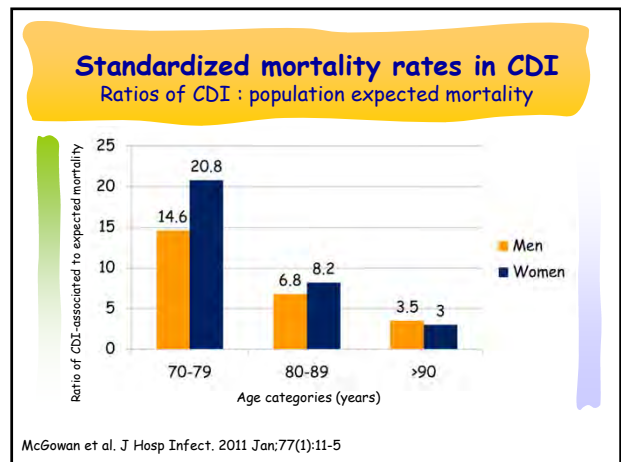
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### Age association with complicated CDI

Study	N patients	Association with complicated CDI	
		Yes	No
Lungulescu 2011	255	No	No significant different in mean age
Shivashanker 2013	1446	Yes	Adjusted OR 1.1 (95% CI 1.0-1.1), p=0.0029 for every 10-year increment
Hensgens 2014	395	Yes	Adjusted OR 5.15 (95% CI 1.66-16.0) for age >85 yrs. compared to <49 yrs. reference

Complicated CDI: ICU admission, colectomy, death due to CDI, prolonged hospital stay related to CDI, hypotension, shock, sepsis, ileus, megacolon, colon perforation.

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### Age association with CDI relapse

Study	N patients	Association with relapse	
Cadena 2010	128	No	Mean age with and without relapse 66.62 ±14.23 vs. 68.76± 13.86, NS, univariate
Freedberg 2013	894	Yes	Adjusted HR 1.02 (95% CI 1.01 - 1.03) per each additional year
D'Agostino 2014	922	Yes	Adjusted OR for age ≥75 yrs. 1.21, p=0.05 (vs. <75 yrs.). Age ≥75 yrs. assigned 1 point in a 4-point risk score
Zilberberg 2014	425	Yes	Adjusted OR 1.08 (95% CI 1.02-1.14) per 10 year increment

- ### Summary
- Elderly patients probably do not have an inherent higher risk for CDI than other people
    - However, CDI is more common in the elderly due to healthcare and antibiotic exposure
  - Complicated disease, relapse and mortality are more frequent in the elderly
    - Probably related to same exposures
    - Frailty, immune dysfunction, nutritional status

- ### Opportunities for risk reduction
- Do not treat asymptomatic bacteremia
    - Avoid redundant catheterization
  - Infected decubitus ulcers respond to local treatment
    - Avoid decubitus ulcers
  - Diarrhea usually does not necessitate antibiotic treatment
  - Stop antibiotics, other than Cdif treatment, when treating CDI whenever possible
  - Home > LTCF > Hospitalization

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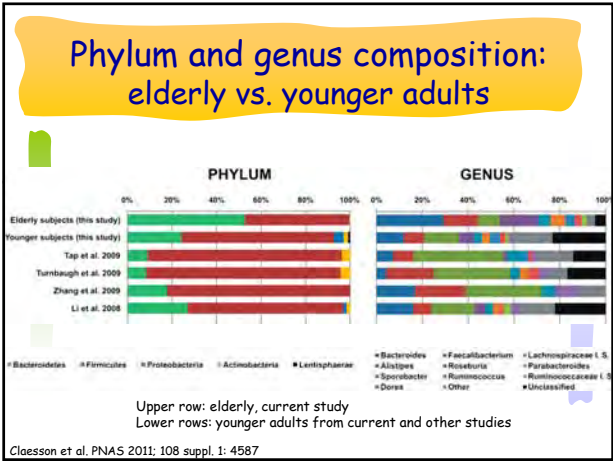
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**Genus level analysis**

- Community dwelling adults (19-35 yrs., N=12) and elderly (>60 yrs., N=6)
- Not receiving antibiotics and generally healthy
- Culture-based methods for bacterial isolation; FAME identification
- Comparison between young and elderly

Woodmansey et al. Appl Environ Microbiol. 2004; 70(10): 6113-22

Paul - Clostridium difficile infection in the elderly

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