Long-term Acute Care Hospitals

Infection Control Issues

SHEA 2007

Carolyn V. Gould, MD, MSc
Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention
Atlanta, GA

Disclosure: Nothing to disclose

Long-term Acute Care Hospitals

- Defined by CMS as hospitals with average length of stay ≥ 25 days

- LTACH patients:
  - Have multiple complicated medical conditions
  - Require skilled, complex medical care
  - Cannot be managed under lesser level of care

Long-term Acute Care: An oxymoron?

- Patients in LTACHs differ from those in other long-term settings:
  - Require continuous intensive acute care services
  - Higher severity of illness
  - Multisystem complications (e.g. ventilator dependence)
  - Goal is medical recovery and return home

Long-term Acute Care Hospitals

- Examples of conditions appropriate for LTACH:
  - Prolonged ventilator weaning
  - Intensive respiratory care
  - Chronic renal failure requiring dialysis complicating other medical conditions
  - Complex medical regimen (e.g. multiple IV meds, TPN, frequent transfusions)
  - Complex wound care

Common Diagnoses

- CV disease
- Ventilator-dependence
- Tracheotomies with complications
- Peripheral vascular disease
- Pressure wounds
- Surgical recuperation
- Burns
- Trauma
- Complicated fractures
- Head/spinal cord injuries
- Stroke

LTACHs: An Expanding Healthcare Setting

- Aging population
- New technology
- Economic forces
  - Prospective payment system for acute care hospitals

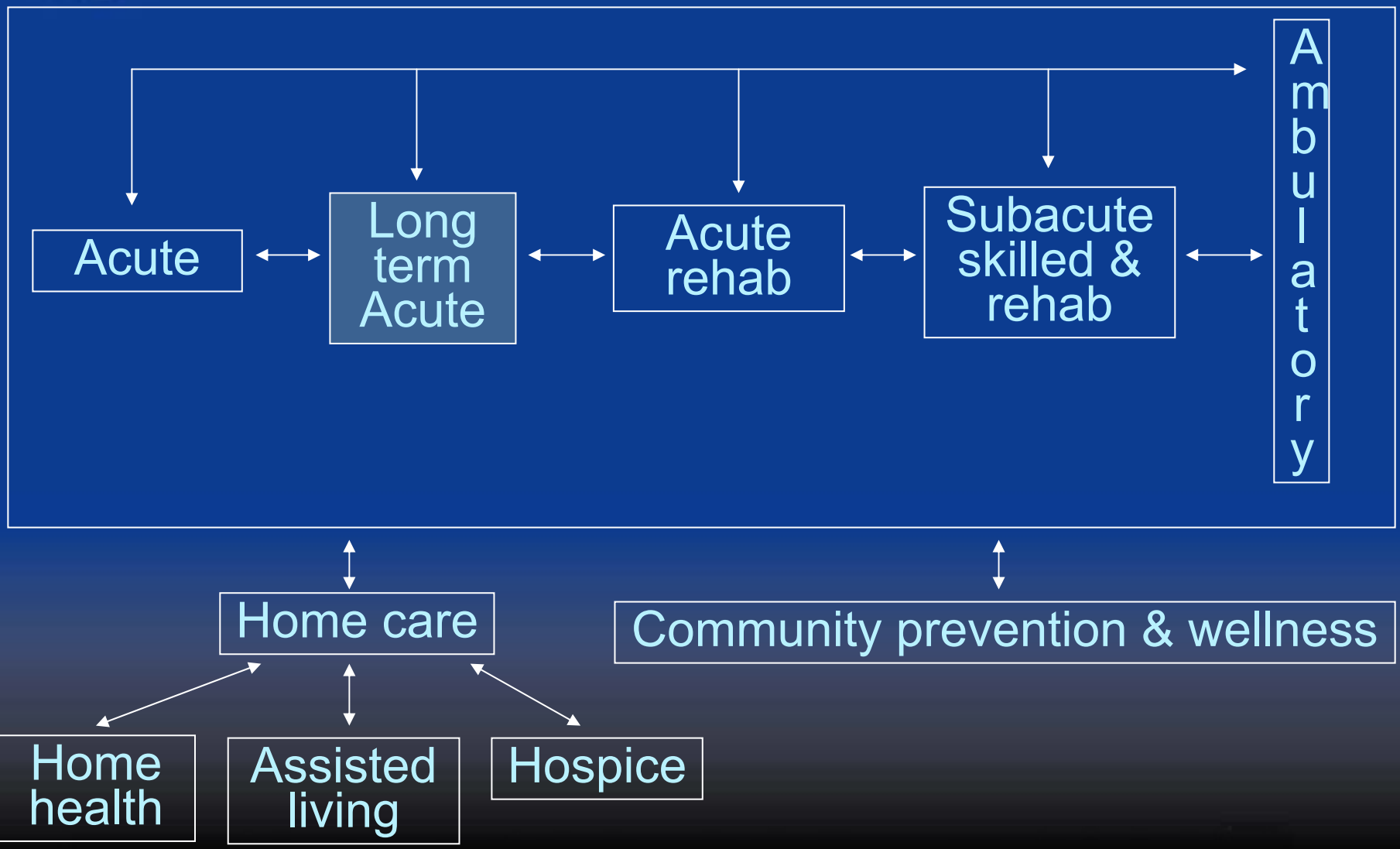
Long-term Acute Care Hospitals: History

- 1984: Medicare implemented acute care hospital prospective payment system
  - Long-term care exemption
- 1988-1996: Average annual growth rate 31%
- 1993: 58 LTACHs in 20 states
- 2003: 280 LTACHs in 40 states

Long-term Acute Care Hospitals

- Freestanding or “hospitals within hospitals”
  - “host” hospital leases unused space to LTACH
- Separate governing body, administration, and medical staff
- Must meet same health and safety standards as acute care hospitals

LTACH Role in Continuum of Care



Adapted from Matarelli. Case Manager 2001;12:79

Infection Control Issues in LTACHS

- Unique population and environment
- What do we know?
- How do we apply current infection control recommendations?

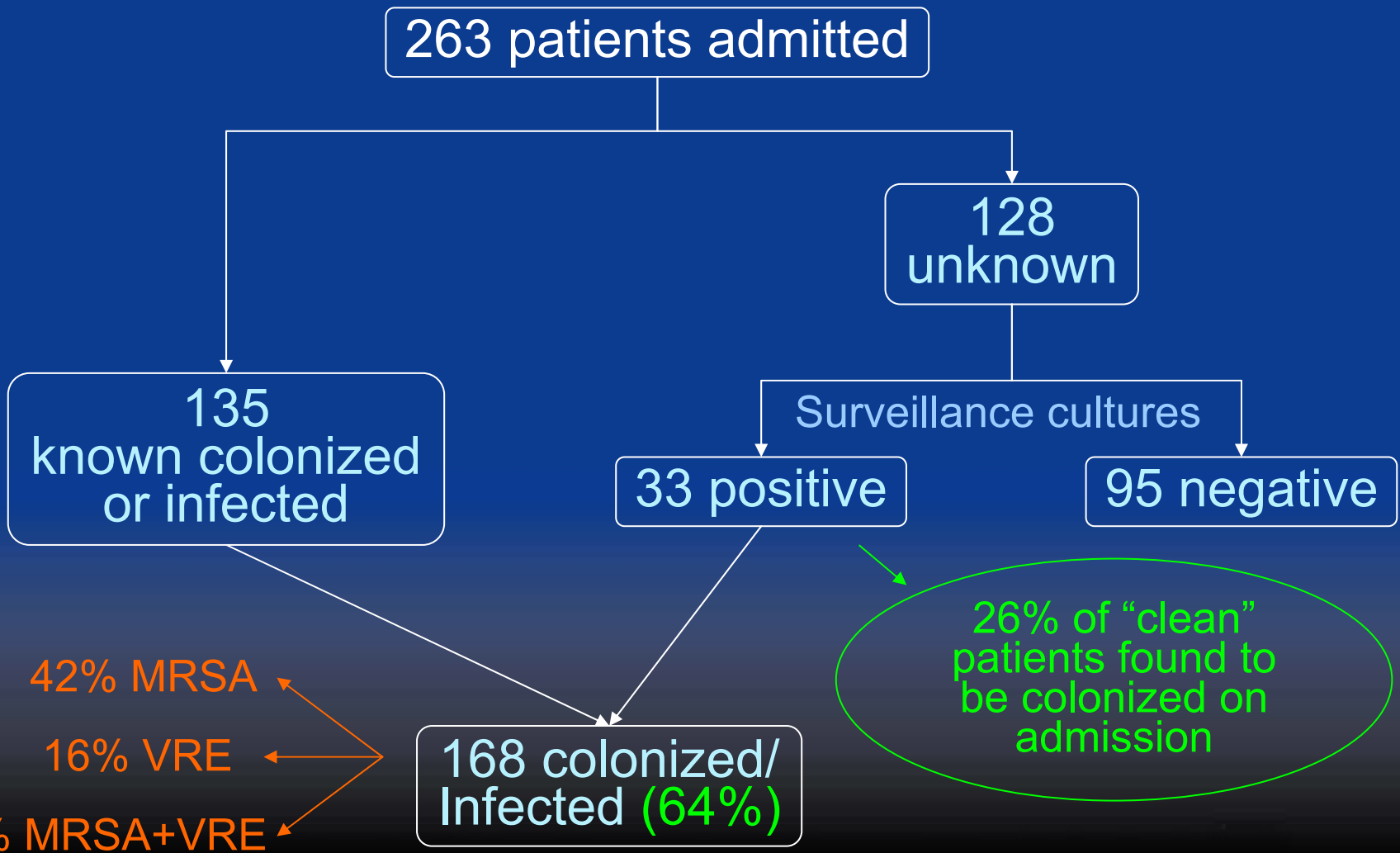
Infection Control Challenges in LTACHs

- High risk patient population
- High prevalence of MDROs
- Availability of private rooms for isolation
- Logistics of isolating and cohorting patients
- Adequate infection control resources
- Active surveillance capabilities
- Antibiotic pressure

Antibiotic resistance and antibiotic use patterns in 45 LTACHs (2002-2003)

- Data obtained from corporation that manages LTACHs in U.S.
  - Geographically diverse
  - Most were hospitals within hospitals

Colonization on admission: Active surveillance at one LTACH, 2003



Gould, Rothenberg, Steinberg. ICHE 2006;27:923-5

Colonization pressure

"…compliance for hand washing significantly in excess of reported levels, or the cohorting of nursing staff, are needed to prevent nosocomial transmission of VRE in endemic settings."

Austin DJ et al. Proc Natl Acad Sci USA 1999;96:6908-13

VRE acquisition in relation to colonization pressure and antibiotic pressure

Colonization pressure	Antibiotic pressure	Time to acquisition
75%	75%	5 days
75%	25%	6 days
25%	75%	16 days
25%	25%	19 days

Antibiotic pressure = % of days with cephalosporin use

Bonten MJM et al. Arch Intern Med 1998;158:1127-32

Device Utilization

- 45 LTACHs:
  - Central line utilization rate†: 56%
  - Ventilator utilization rate‡: 18%
- 2 LTACHs, 93 ventilator-dependent patients:
  - Central line utilization rate: 75%

† Central line days/patient days

‡ Ventilator days/patient days

Gould et al. ICHE 2006;27:923-5
Wolfenden et al. ICHE 2007;28:105-6

Device Use rates in LTACHs compared to NNIS Medical ICUs (2002-2003)

Medical ICUs 45 LTACHS

	10%	25%	50%	75%	90%	Pooled mean
Central Line Utilization	0.3	0.37	0.52 ▲	0.64	0.75	0.56
Ventilator Utilization ▲	0.24	0.35	0.47	0.59	0.67	0.18

NNIS data are from Jan 1995 to June 2003

Am J Infect Control 2003;31:481-98
Gould et al. ICHE 2006;27:923-5

Data on Nosocomial Infections in LTACHs

- Cohort of 93 patients with respiratory failure in 2 LTACHs Nov 04 - Jul 05

	LTACH patients	90th percentile in NNIS medical ICUs (2002-04)
Central Line use rate	75%	75%
CR-BSI rate	**16.4**	8.8

Central line use rate = Central line days/total patient-days

CR-BSI rate = BSI Cases per 1000 central line days

Wolfenden LL et al. ICHE 2007;28:105-6
Am J Infect Control 2004;32:470-85

Pathogens isolated from 33 LTACH Patients with CR-BSI

Organism	No (%) of isolates (n=40)
Enterococcus species	13 (32)
Coagulase-negative staphylococci	12 (29)
Staphylococcus aureus	5 (12)
Candida species	5 (12)
Klebsiella oxytoca	3 (8)
Acinetobacter baumannii	1 (3)
Alcaligenes xylosoxidans	1 (3)

Wolfenden LL et al. ICHE 2007;28:105-6

Composite Antibiogram from 45 LTACHs (2002-2003)

Organism	Antibiotic	Median % resistant	Range %
S. aureus	Oxacillin	**86***	57-100
Enterococcus	Vancomycin	32	2-69
Pseudomonas	Piperacillin	23	2-52
	Fluoroquinolones	**60***	28-89
	Imipenem	31	0-69
Klebsiella	Ceftazidime	**12***	0-81
E. coli	Fluoroquinolones	**45***	8-86

* >90th percentile of resistance rates in NNIS ICUs (Jan 1998-June 2003)

Gould et al. ICHE 2006;27:923-5
Am J Infect Control 2003;31:481-98

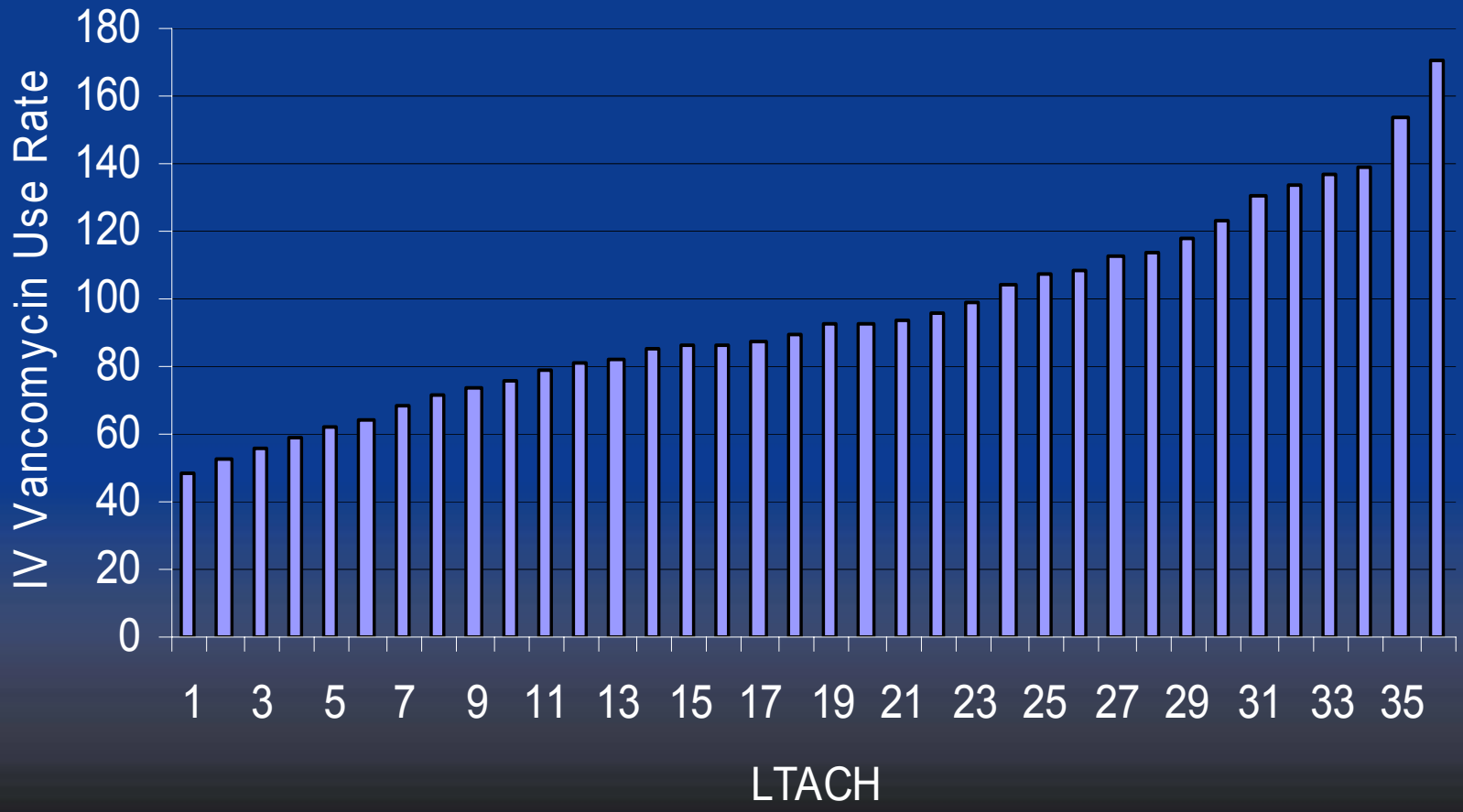
Antibiotic use rates in LTACHs compared to Medical ICUs

Antimicrobial Class	Percentile of distribution of use rates in NNIS medical ICUs					
	< 10th	10th	25th	50th	75th	90th
Antipseudomonal Penicillins			31.9			
Third-generation Cephalosporins	77.6					
Carbapenems				31.8		
Fluoroquinolones					241	
Vancomycin IV				90.2		

LTACH pooled mean use rates in DDD/1000 pt-days; n = 45, 2002-03

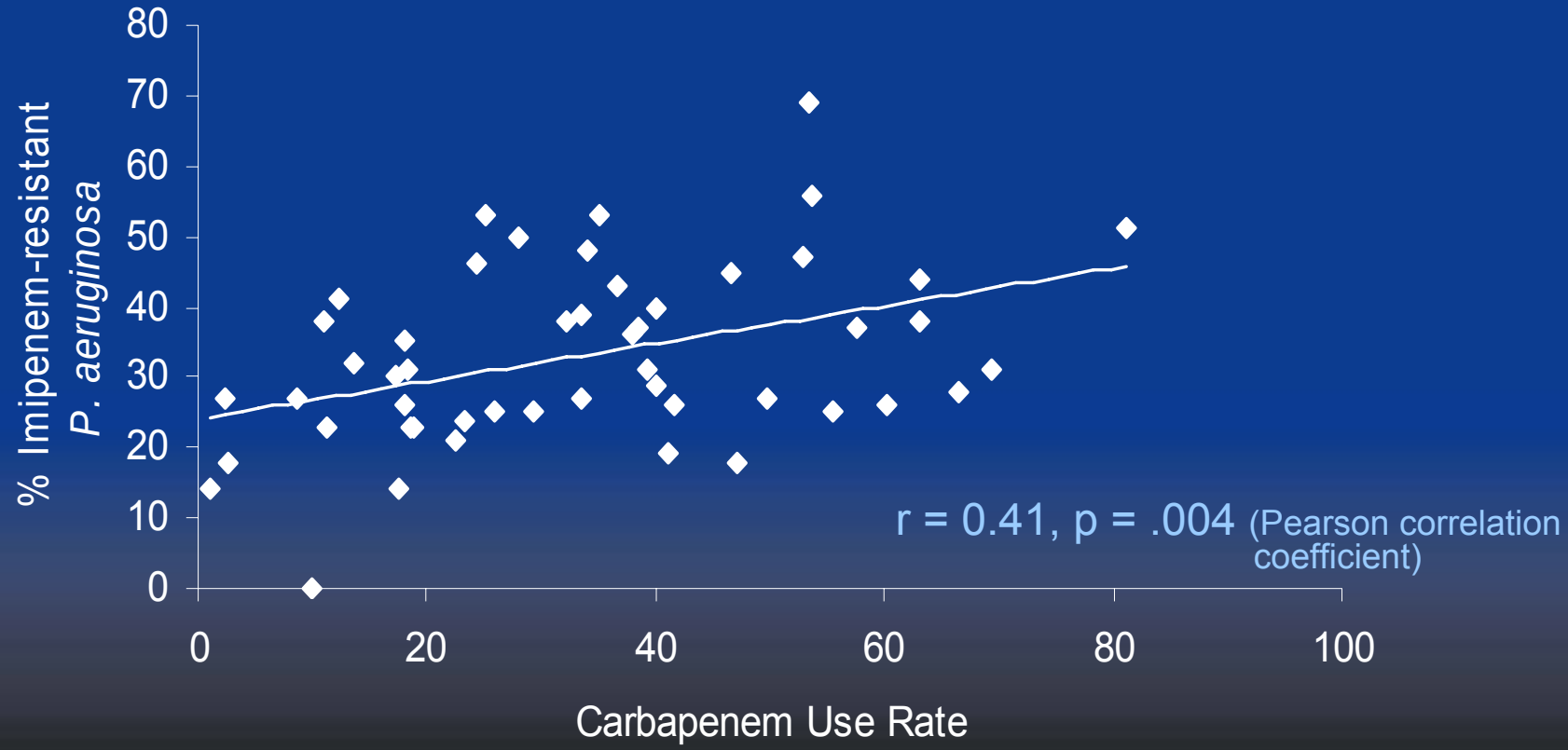
Gould et al. ICHE 2006;27:923-5
Am J Infect Control 2003;31:481-98

Distribution of Vancomycin usage among LTACHs, 2003



Gould et al. ICHE 2006;27:923-5

Annual prevalence of imipenem resistance in *P. aeruginosa* vs. carbapenem use rate



45 LTACHs, 2002-03 (59 LTACH years)

Gould et al. ICHE 2006;27:923-5

Multivariable logistic regression analysis

Outcome: Imipenem resistance prevalence in *P. aeruginosa* isolates (45 LTACHs)

Covariates*	Odds ratio (95% CI)	p-value
Carbapenem use rate	11.88 (1.42-99.13)	.02
Median length of stay	26.19 (2.46-279.1)	.007
Fluoroquinolone-R in *P. aeruginosa*	17.02 (1.74-167.0)	.02
Piperacillin-R in *P. aeruginosa*	9.36 (1.12-77.89)	.04

* Variables that remained in model after backwards stepwise logistic regression

Gould et al. ICHE 2006;27:923-5

Conclusions of study

- Antibiotic resistance in LTACHs is high
  - High MDRO prevalence on admission
  - Transmission within LTACH likely significant
  - Antibiotic pressure is high
    - Antibiotic use comparable to ICUs
    - Limited correlation with resistance prevalence

Limitations of study

Limited Data

- Antibiograms
  - No standardized protocols
  - Data often combined with host hospital
- Device-related infection rates
  - Unknown criteria/definitions
- Prevalence of MDRO colonization
  - Active surveillance not done at most facilities
- Infection control practices
- Staffing ratios

Antibiotic Resistance in LTACHs the "Perfect Storm"

- Very high rate of MDRO colonization at time of admission
- Compromised patients
- Multiple sources of infection, invasive devices
- High rate of antibiotic use
- Prolonged hospitalizations

Questions proposed

- What infection control strategies should be used in LTACHs to prevent transmission?
- How much antibiotic usage is inappropriate?
  - Treatment of colonization?
  - Variation in prescribing practices
- What are the infection risks of colonization?
  - Infection rates compared to ICUs
  - Compared to an LTACH benchmark

Infection Control Strategies in LTACHs

Overview of CDC/HICPAC Recommendations to Prevent Transmission of MDROs

- Administrative measures
- Education and training of healthcare personnel
- Judicious use of antimicrobial agents
- Surveillance
- Infection control precautions
- Environmental measures

CDC/HICPAC, 2006

Infection Control Strategies in LTACHs

1. Administrative Measures
   - Make MDRO prevention an organizational patient safety priority
   - Provide fiscal and human resources
     - Dedicated, trained IC professionals
   - Provide communication and feedback system

Infection Control Strategies in LTACHs

2. Education and training of healthcare personnel
   - Periodic training on prevention strategies
   - Include organization-specific experience with MDROs

Infection Control Strategies in LTACHs

3. Judicious use of antimicrobial agents
   - Review and provide feedback on hospital-specific antimicrobial utilization and susceptibility patterns (antibiograms)
   - Implement antimicrobial management systems
   - Provide appropriate review of prescribed antimicrobials (e.g. “report cards”) and suggestions for improving use

Infection Control Strategies in LTACHs

4. Surveillance
   - Ensure standardized laboratory methods for antimicrobial susceptibility testing
   - Provide *facility-specific* antibiograms at least annually using CLSI standards

Infection Control Strategies in LTACHs

4. Surveillance, continued
   - Develop protocols for active surveillance for targeted MDROs
     - At time of admission
     - Weekly point prevalence surveys
   - Exchange information about MDROs with referring hospitals

Infection Control Strategies in LTACHs

5. Infection control precautions
   - Follow standard precautions for all patient encounters
   - Contact precautions for patients with MDROs
   - Implement contact precautions until results of surveillance cultures reported negative
   - All LTACH rooms should be private

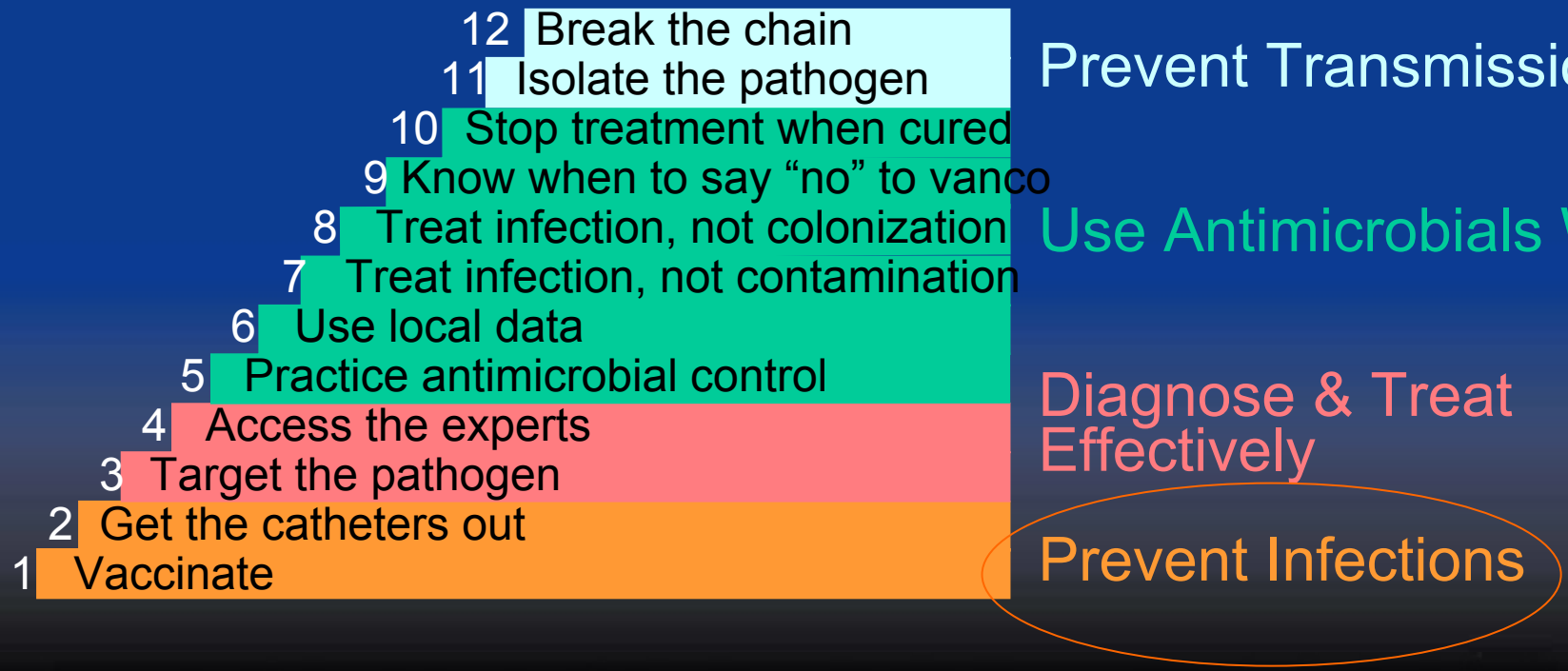
Infection Control Strategies in LTACHs

5. Infection control precautions, continued
   - Cohort patients with same MDRO in designated areas with assigned staff
   - Need for future study: universal gloves and gowns as an alternative to active surveillance

Infection Control Strategies in LTACHs

6. Environmental measures
   - Implement patient-dedicated or single-use equipment
   - Monitor adherence and reinforce training of environmental staff
   - Monitor cleaning performance of high-touch surfaces

12 Steps to Prevent Antimicrobial Resistance: Hospitalized Adults



Future Directions

- Incorporation of LTACHs into National Healthcare Safety Network (NHSN)
  - Standardized protocols for measuring device-associated infection rates, device utilization
  - Surveys specific for LTACHs
  - Risk adjustment of infection rates
  - Feedback of data for performance improvement
  - Access to prevention tools, best practices

The findings and conclusions are those of the author(s) and do not necessarily represent the view of the Centers for Disease Control and Prevention.