Infection Management in Intensive Therapy Unit (ITU) Patients

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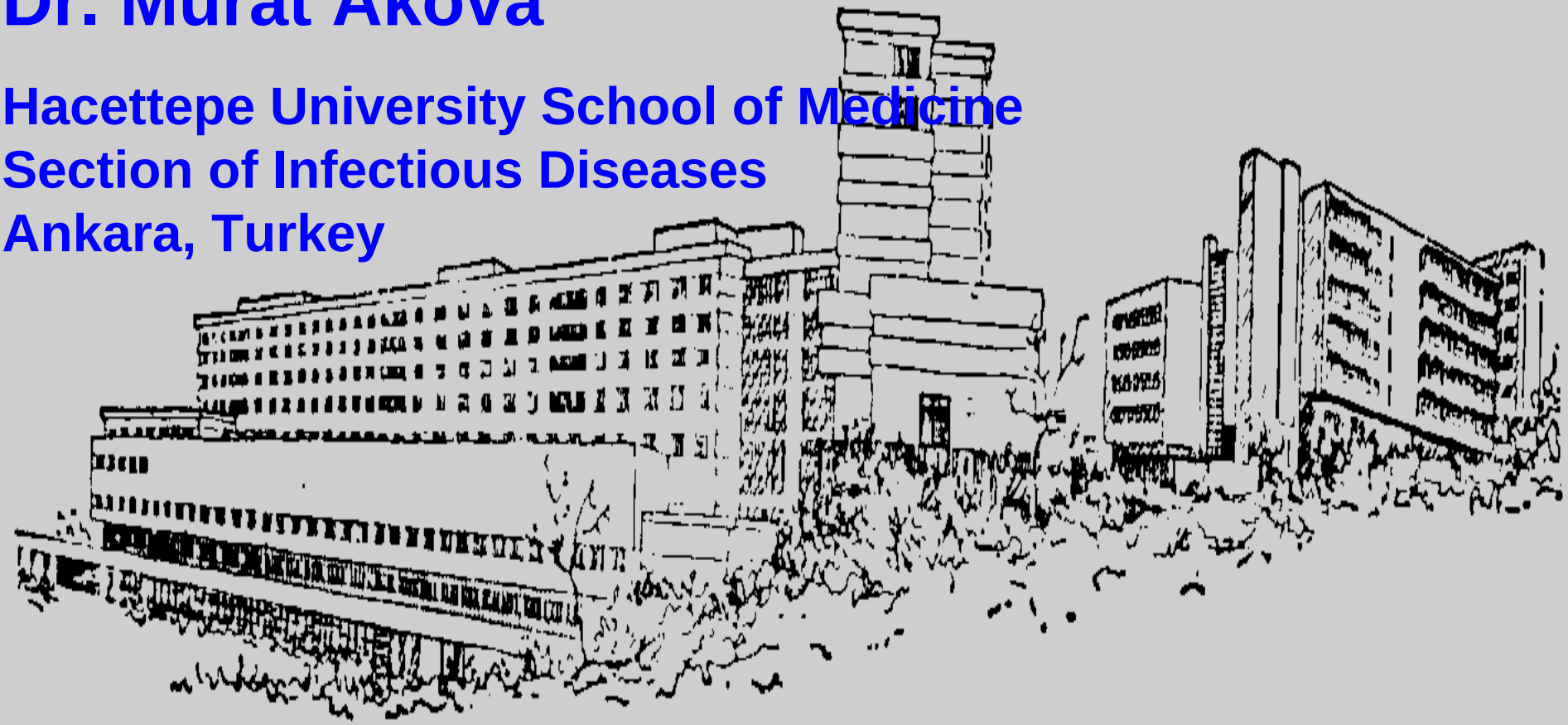
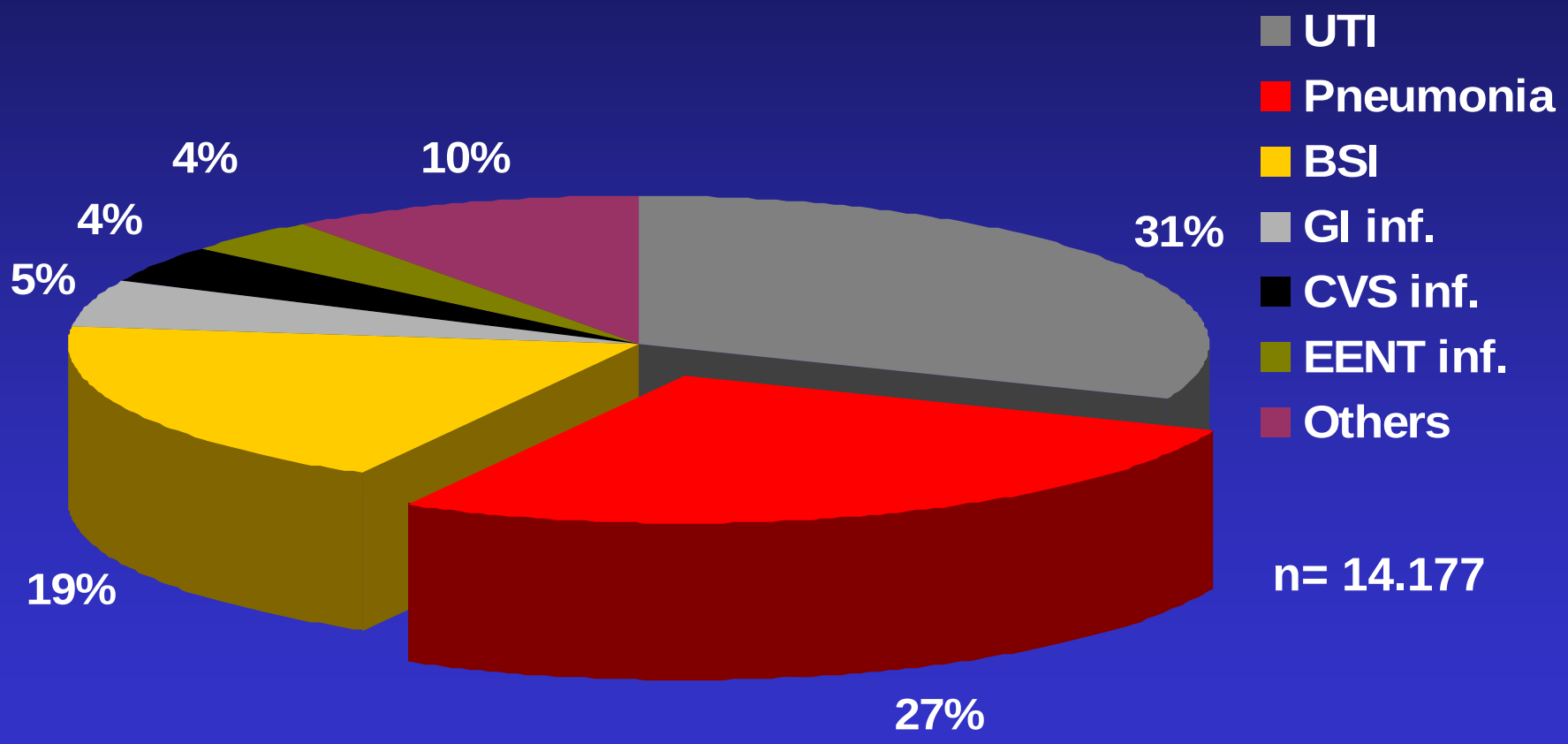


Health-Care Associated Infections
Definition

- An infection that is not present or incubating when the patient is admitted to hospital or other health-care facility
  - In general infections developed after 48-72 h after admittion

Garner JS, et al. Am J Infect Control 1988;16: 128

Sites of Infection in ICU
NNIS 1992-97



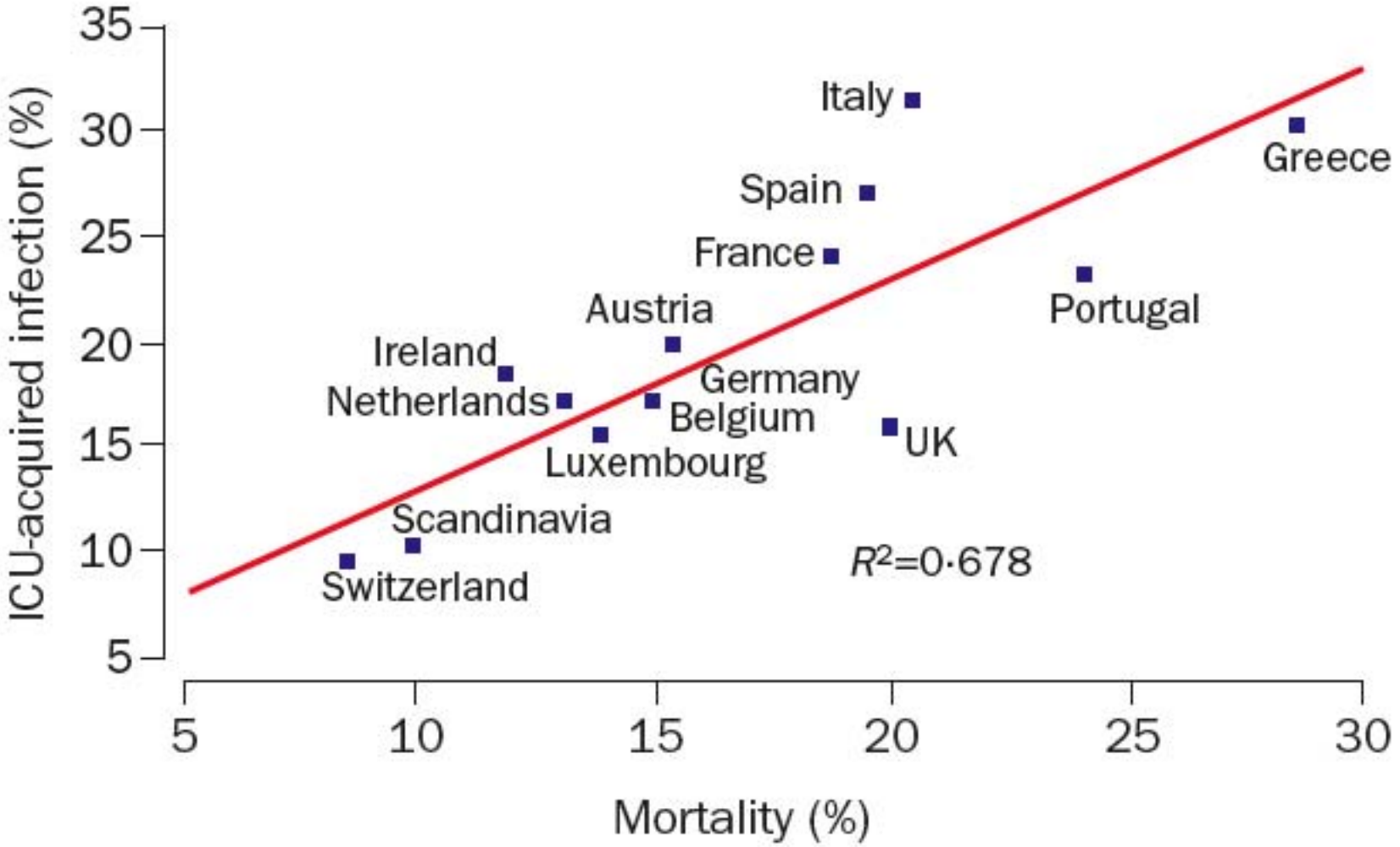
Richards, et al. Crit Care Med. 1999;27:887

Factors that predispose to nosocomial infection

Related to underlying health status
Advanced age
Malnutrition
Alcoholism
Heavy smoking
Chronic lung disease
Diabetes
Related to acute disease process
Surgery
Trauma
Burns
Related to invasive procedures
Endotracheal or nasal intubation
Central venous catheterisation
Extracorporeal renal support
Surgical drains
Nasogastric tube
Tracheostomy
Urinary catheter
Related to treatment
Blood transfusions
Recent antimicrobial therapy
Immunosuppressive treatments—eg, corticosteroids
Stress-ulcer prophylaxis
Recumbent position
Parenteral nutrition

Vincent Jl. Lancet 2003; 361: 2068

Prevalence and Mortality



Vincent JL, et al. *JAMA 1995; 274: 639*

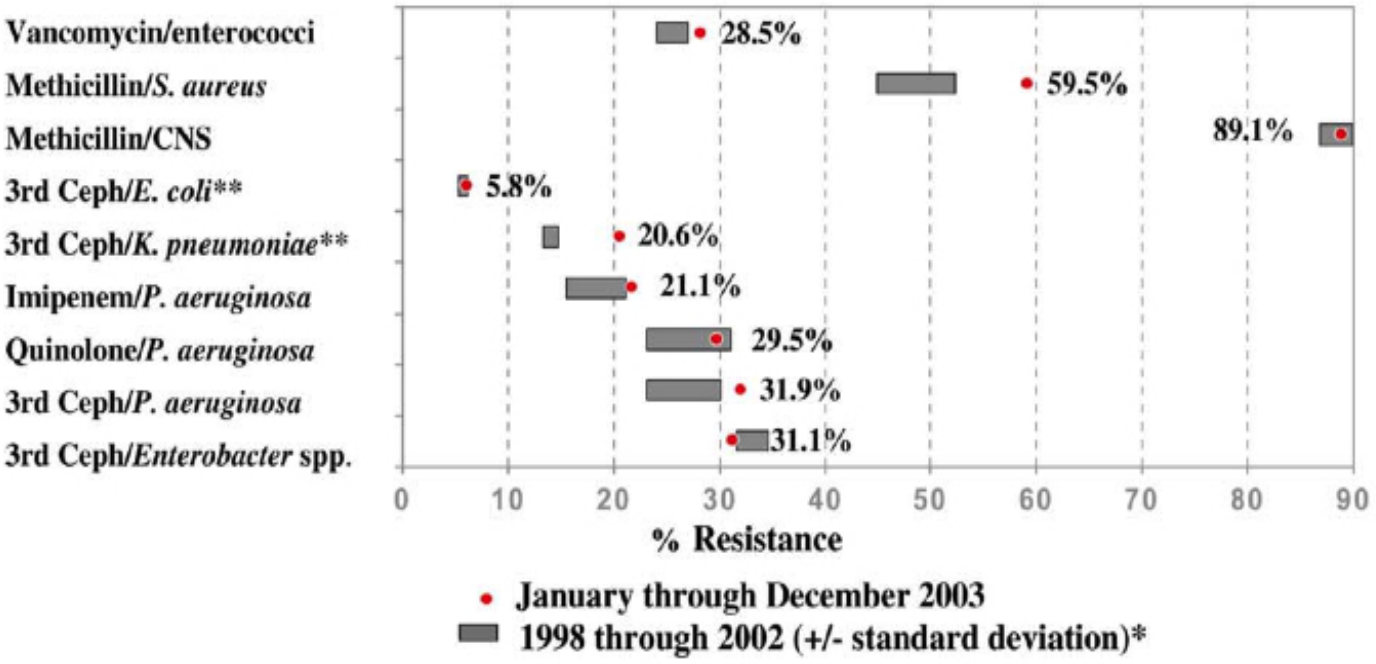
Effect of Nosocomial Infection

- Increased length of stay (LOS)
  - Additional cost of $ 3.5 billion per year w/o antibiotic and other therapy costs
  - In a Spanish study with catheter infection
    - LOS increased 20 days
    - Excess cost € 3000 per episode

Vincent Jl. Lancet 2003; 361: 2068

Antimicrobial Resistance in ICU

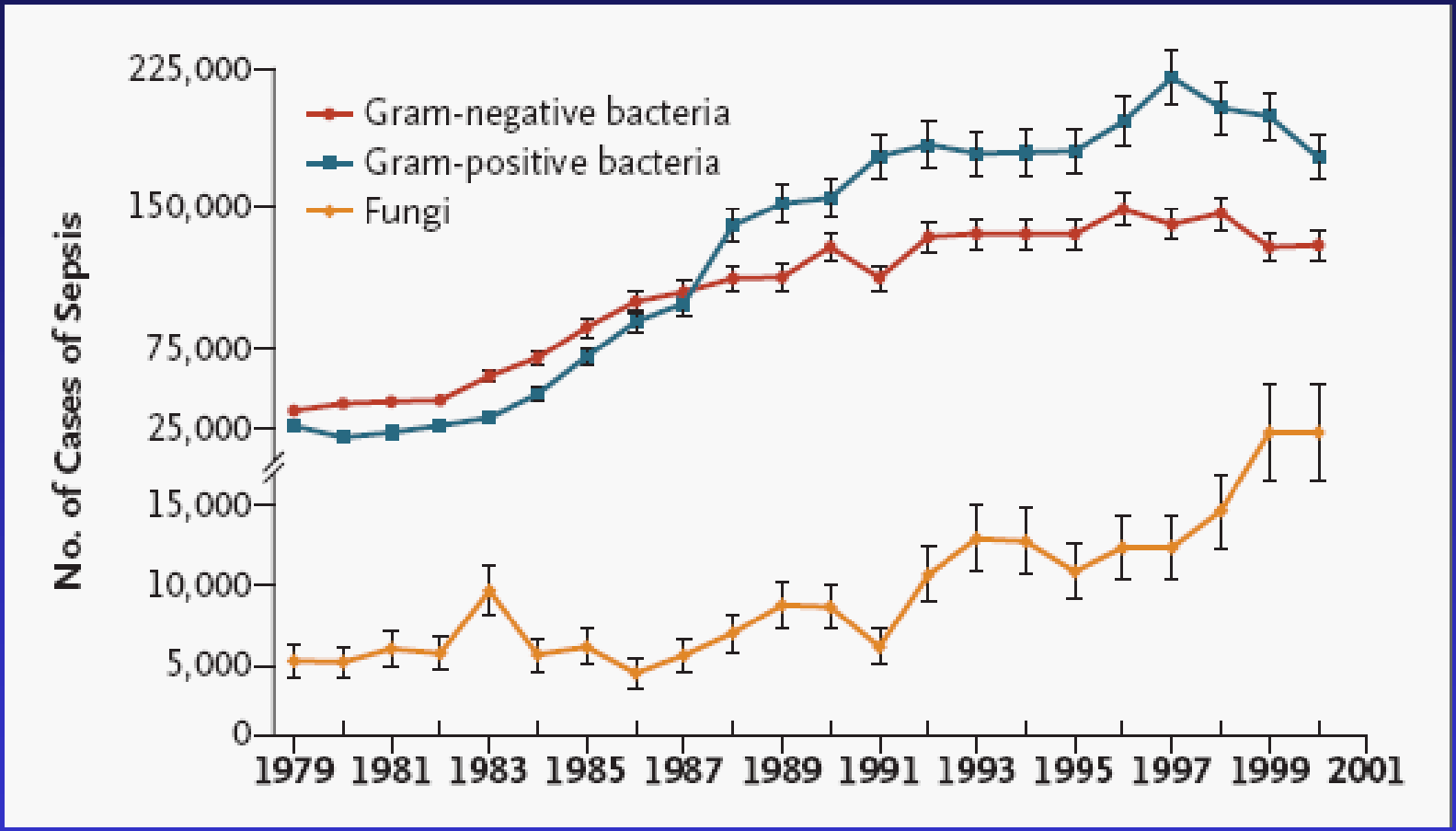
NNIS 2003 vs 1998-2002



Jan–Dec 2003 No. of Isolates	% increase in resistance (2003 vs 98-02*)
2048	12%
4100	11%
3336	1%
1355	0%
1068	47%
1392	15%
1825	9%
2119	20%
1411	–6%

NNIS System. Am J Infect Control 2004;32:470

Epidemiology of Sepsis in the US 1979-2000



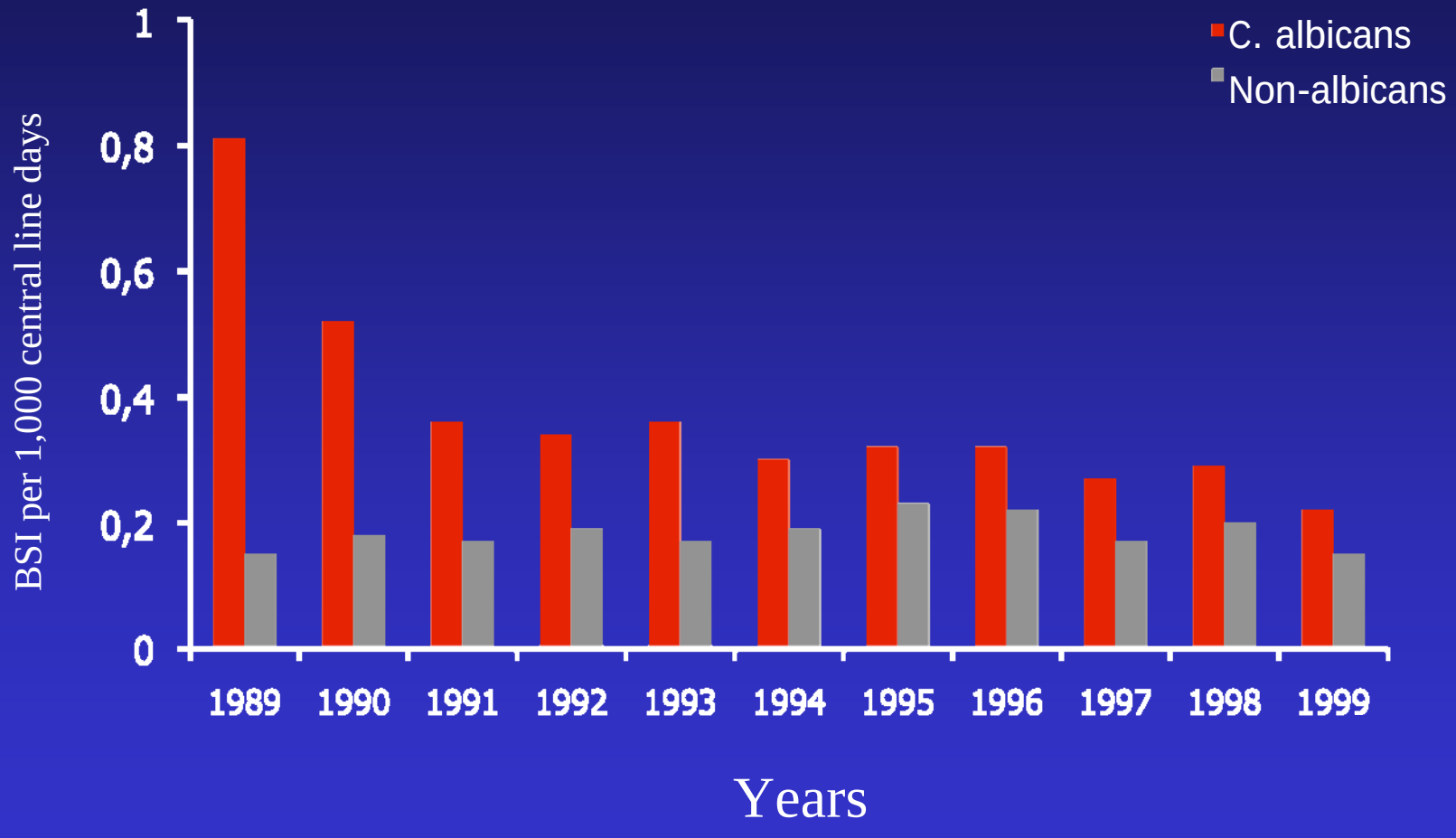
Martin GS, et al. N Engl J Med 2003;348:1546

Candida as a Nosocomial Pathogen

Rank	Pathogen	BSI per 10,000 admissions	% BSI			% Crude Mortality		
			Total (n=20,978)	ICU (n=10,515)	Non-ICU (n=10,515)	Total	ICU	Non-ICU
1.	CoNS	15.8	31.3	35.9	26.6	20.7	25.7	13.8
2.	S aureus	10.3	20.2	16.8	23.7	25.4	34.4	18.9
3.	Enterococcus spp	4.8	9.4	9.8	9.0	33.9	43.0	24.0
4.	Candida spp	4.6	9.0	10.1	7.9	39.2	47.1	29.0
5.	E coli	2.8	5.6	3.7	7.6	22.4	33.9	16.9
6.	Klebsiella spp	2.4	4.8	4.0	5.5	27.6	37.4	20.3
7.	P aeruginosa	2.1	4.3	4.7	3.8	38.7	47.9	27.6
8.	Enterobacter spp	1.9	3.9	4.7	3.1	26.7	32.5	18.0
9.	Serratia spp	0.9	1.7	2.1	1.3	27.4	33.9	17.1
10.	A baumannii	0.6	1.3	1.6	0.9	34.0	43.4	16.3

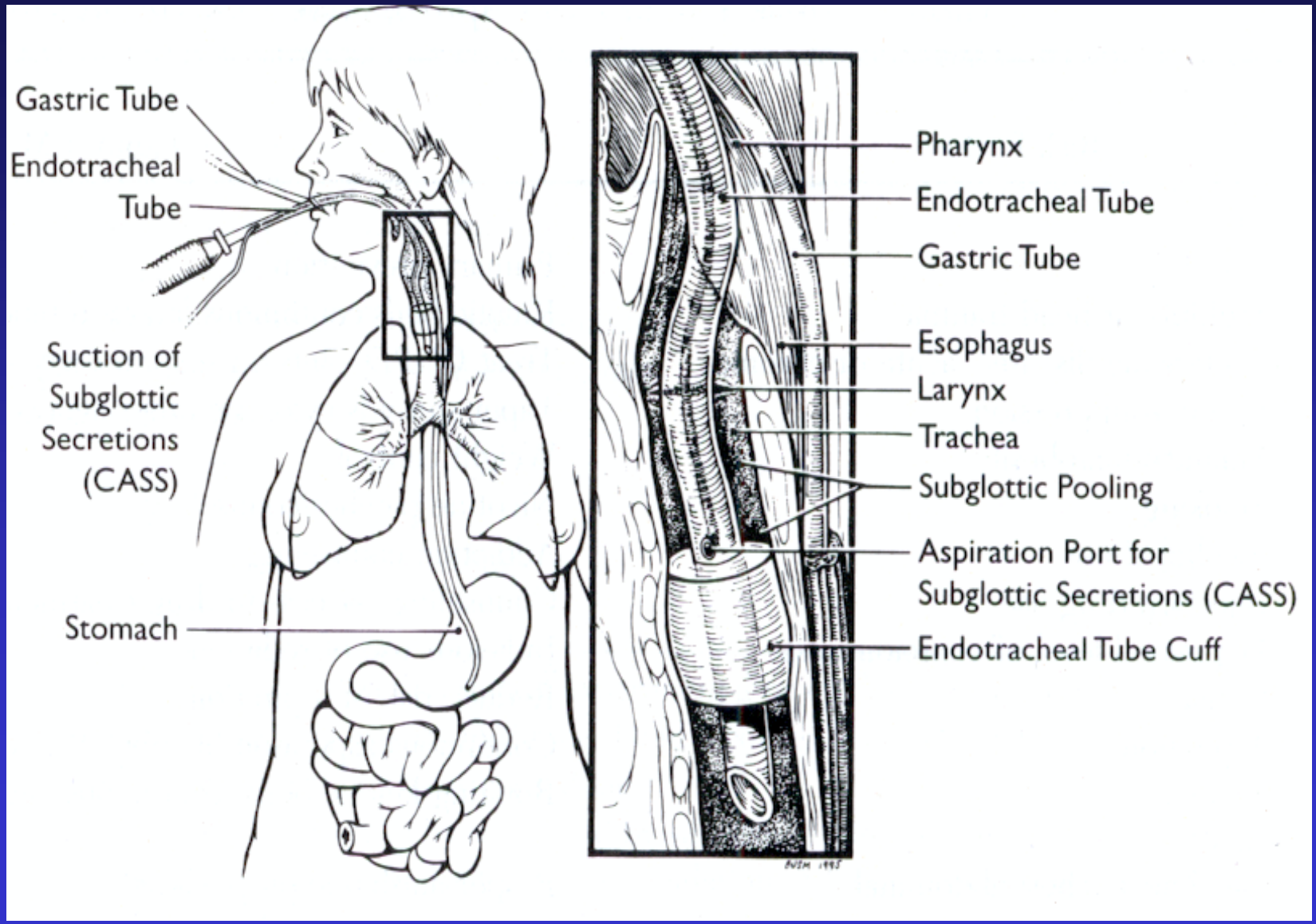
Wisplinghoff H, et al. *Clin Infect Dis.* 2004;39:309

Incidence of Nosocomial Candidemia in ICU (NNIS)



Trick WE, et al. Clin Infect Dis 2002;35:627

Pathogenesis of VAP



Craven, et al. Chest 1995;108:s1

Management of VAP
"The Tarragona Strategy"

- What microbes should be covered?
- Role of microbiological tests
- When to start antibiotics?
- Dose and duration
- Which initial agents should be chosen?

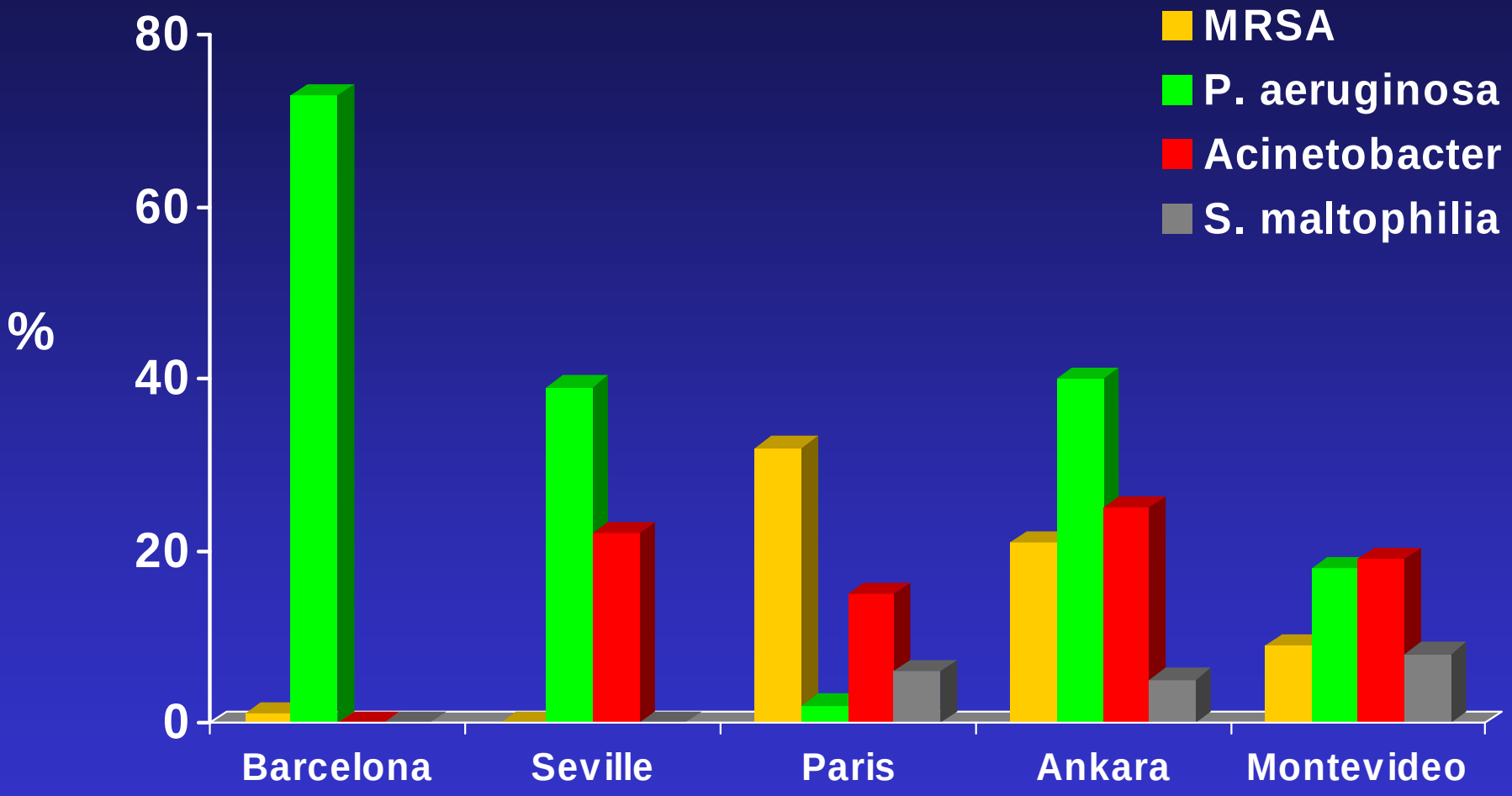
Intensive Care Med 2003;29:876

Etiological Agents of Nosocomial Pneumonia

- Commonly caused by aerobic gram-negative bacilli
  - *P. aeruginosa*
  - *K. pneumoniae*
  - *Acinetobacter spp.*
- MRSA is the most common gram-positive
- MDR pathogens are common
- Anaerobes are uncommon

ATS. Am J Respir Crit Care Med 2005;171:388

Regional Variations in Pathogens



Rello, et al. Am J Respir Crit Care Med 1999;160:608

Hacettepe University MICU, 2000

Risk Factors for MDR Pathogens HAP / VAP / HCAP

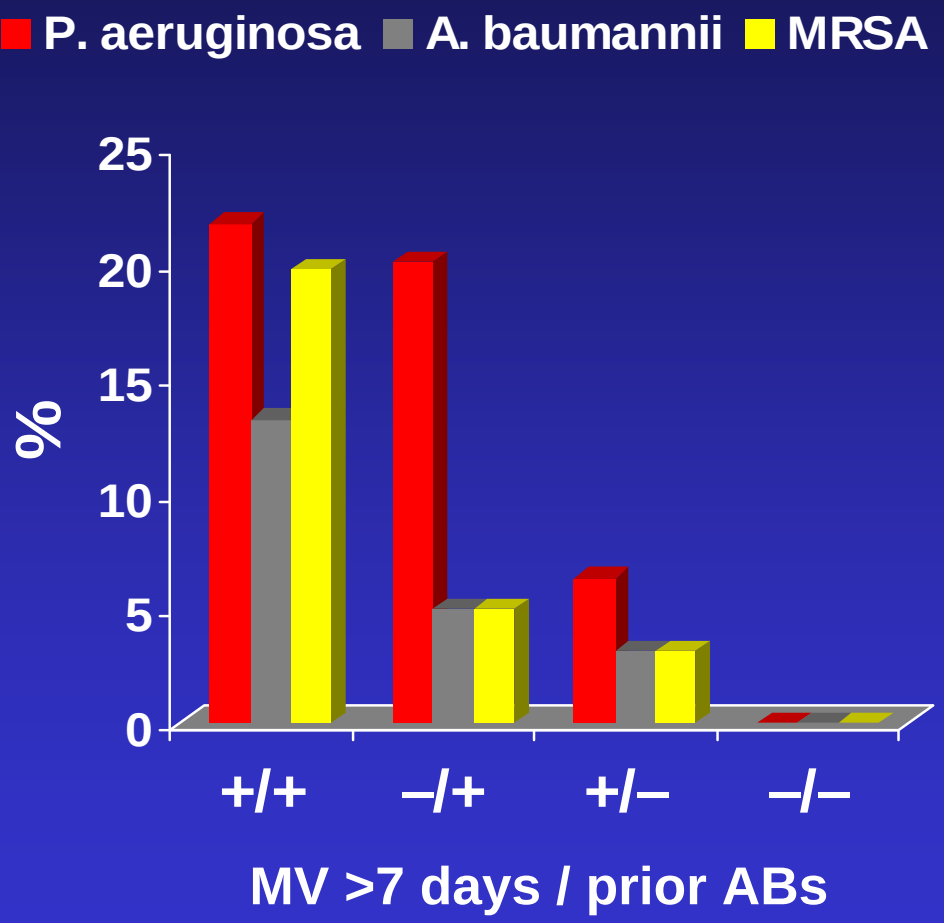
- Antimicrobial therapy in preceding 90 days
- Current hospitalization of 5 d or more
- High frequency of antibiotic resistance in the community or in the spesific hospital
- Presence of risk factors for HCAP
  - Hospitalization for 2 d or more in the preceding 90 d
  - Residence in a nursing home or extended care facility
  - Home infusion therapy
  - Chronic dialysis within 30 d
  - Home wound care
  - Family member with MDR pathogen
- Immunosuppressive disease and/or therapy

ATS. Am J Respir Care Med 2005;171:388

Risk Factors for Resistant Pathogens in Patients with VAP

- 135 episodes in ICU

Variable	OR	*P*
Prior MV		
>7 days	6.0	.009
Prior Abs	13.5	<.001
Broad ABs	4.1	.025

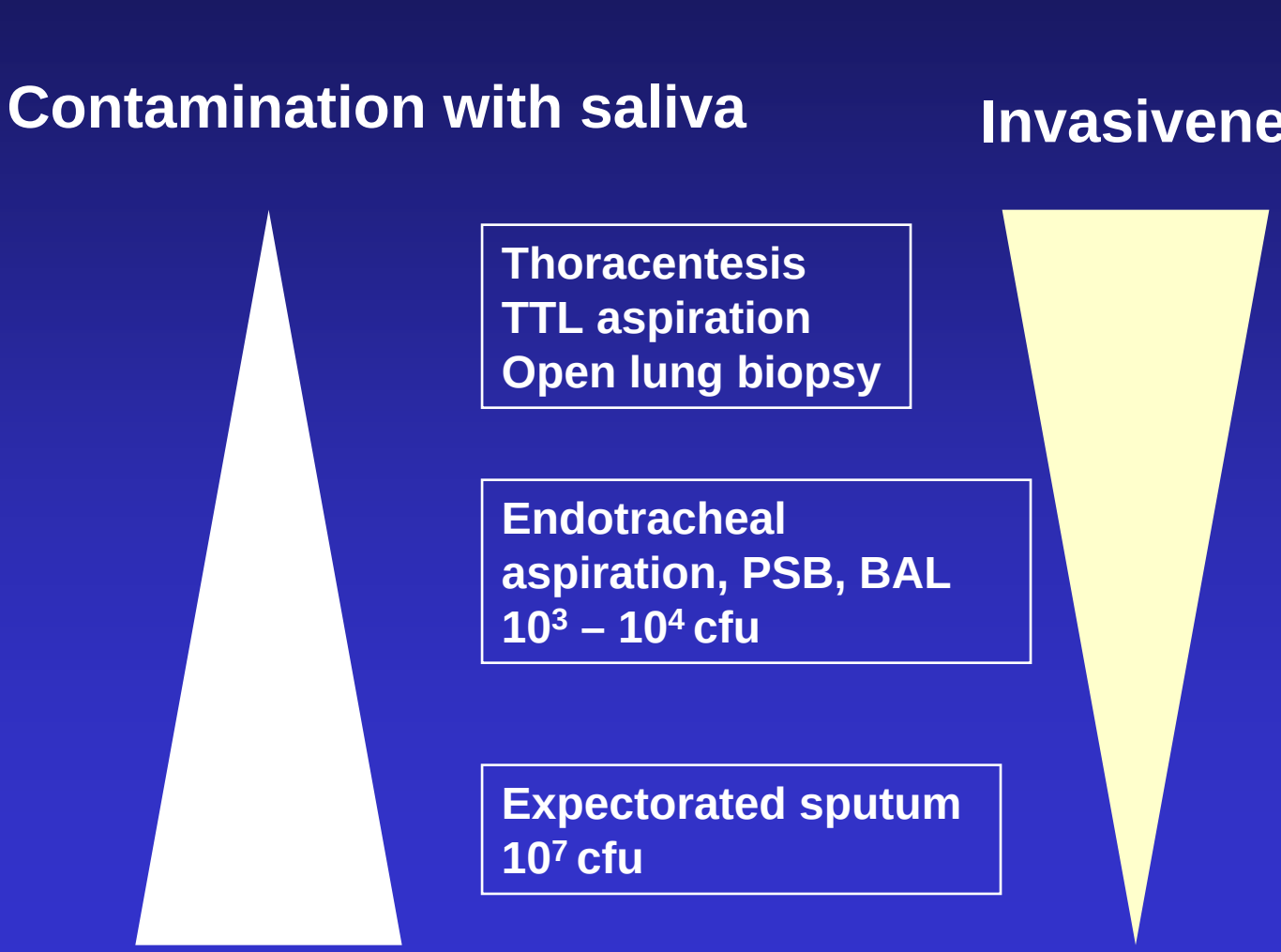


Trouillet, et al. *Am J Respir Crit Care Med.* 1998;157:531

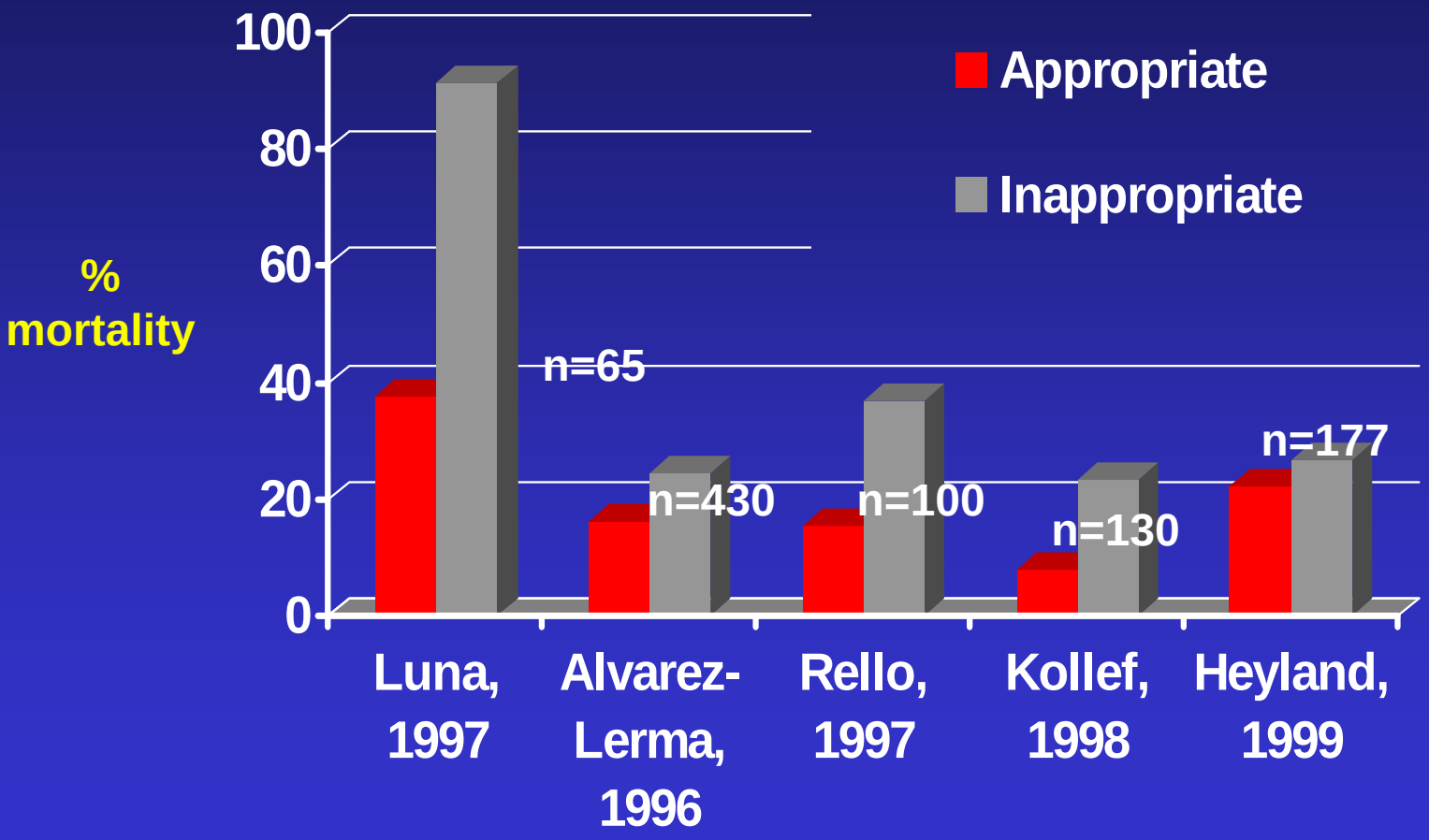
Risk Factors for Mortality due to Nosocomial Pneumonia

- Inappropriate antibiotic therapy
- Prior antibiotic therapy
- Duration of prior hospitalization
- Infection with high-risk pathogens
  - *Pseudomonas aeruginosa*
  - *Acinetobacter spp.*
- Bilateral pulmonary infiltrates
- Severity of underlying disease
- Advanced age

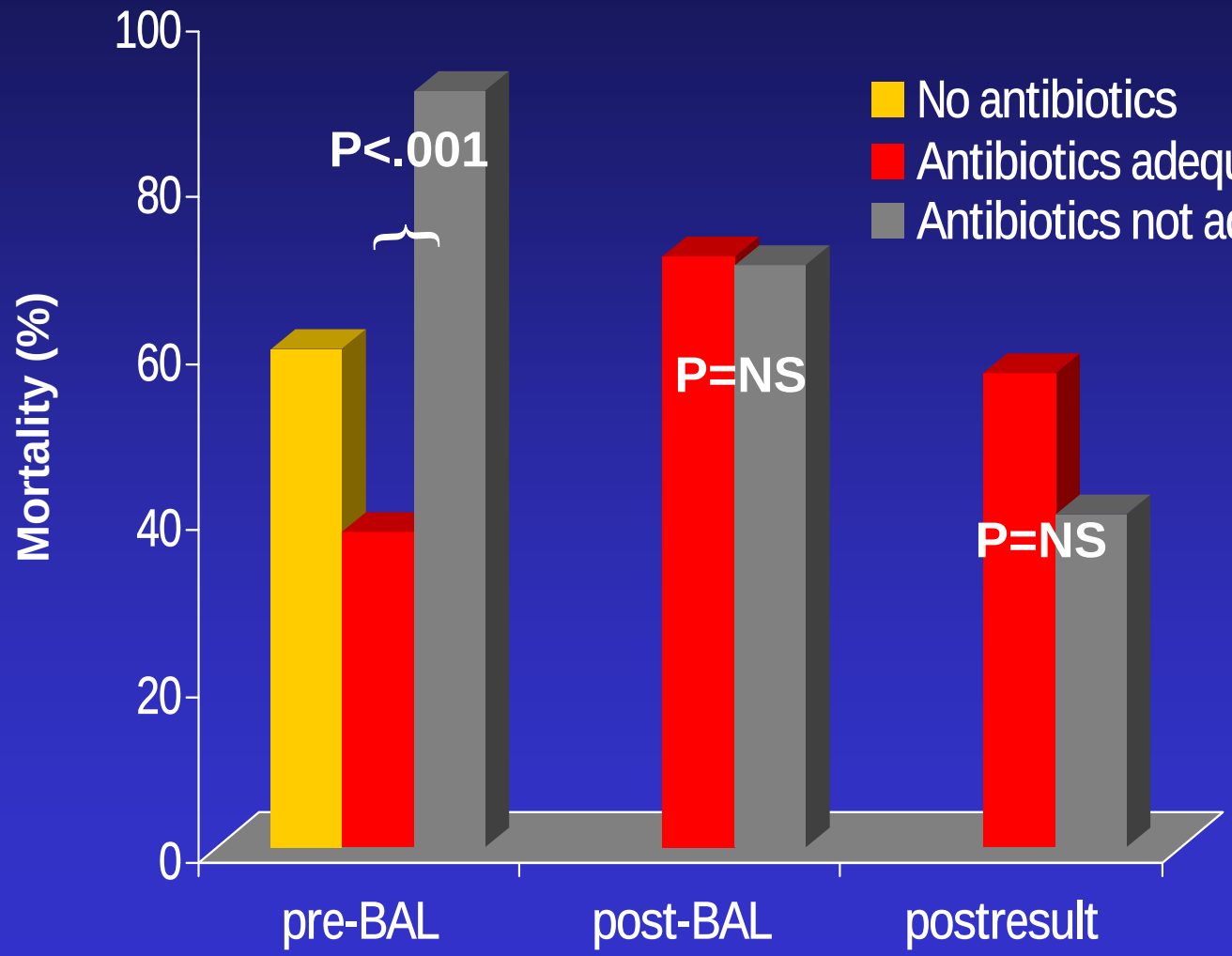
Diagnostic Methods in Nosocomial Pneumoniae



Effect of Appropriate Antibiotics on Mortality in Nosocomial Pneumonia



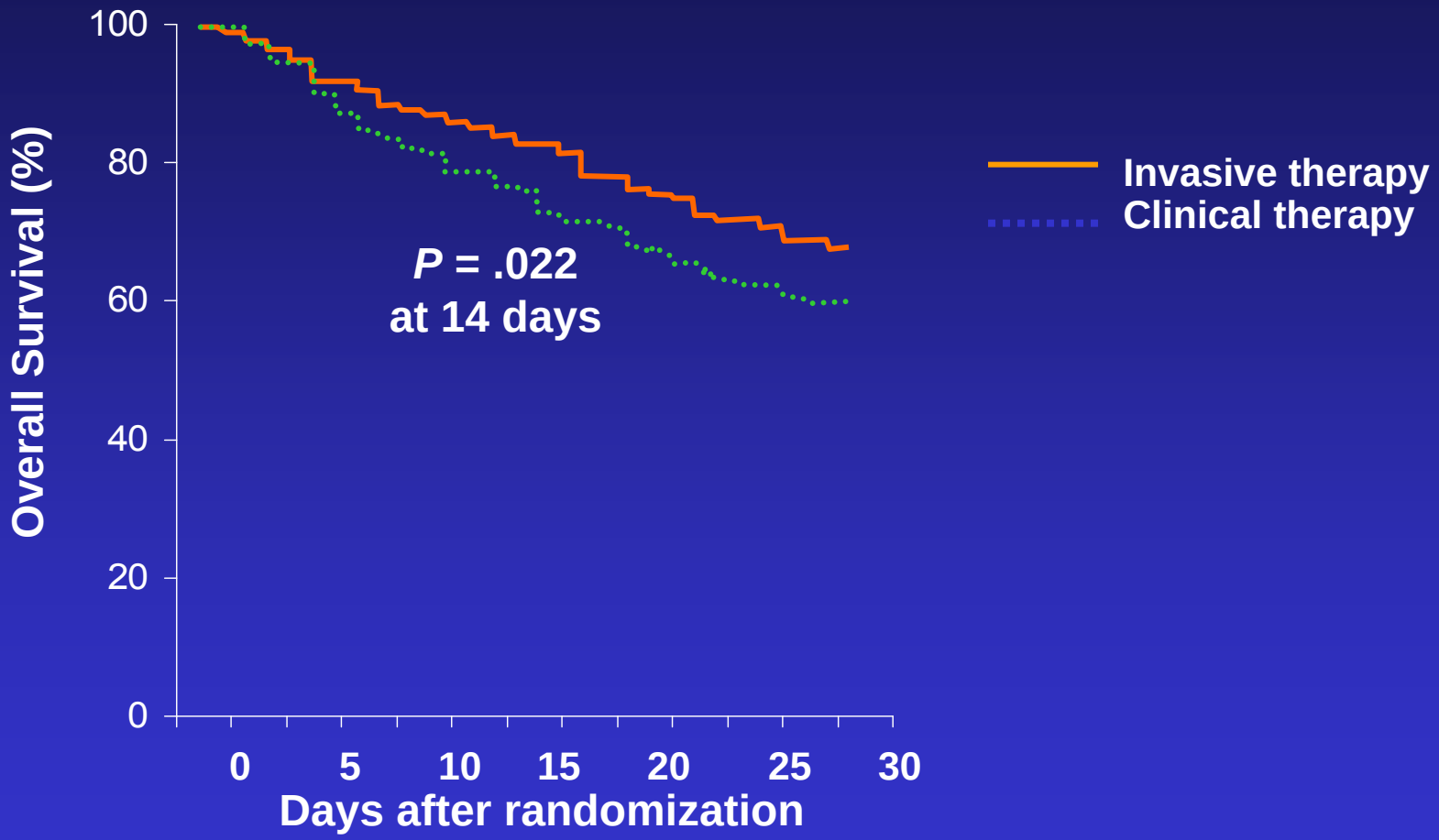
Mortality in Patients with BAL-positive Nosocomial Pneumonia



- 23 patients had died when BAL results were known

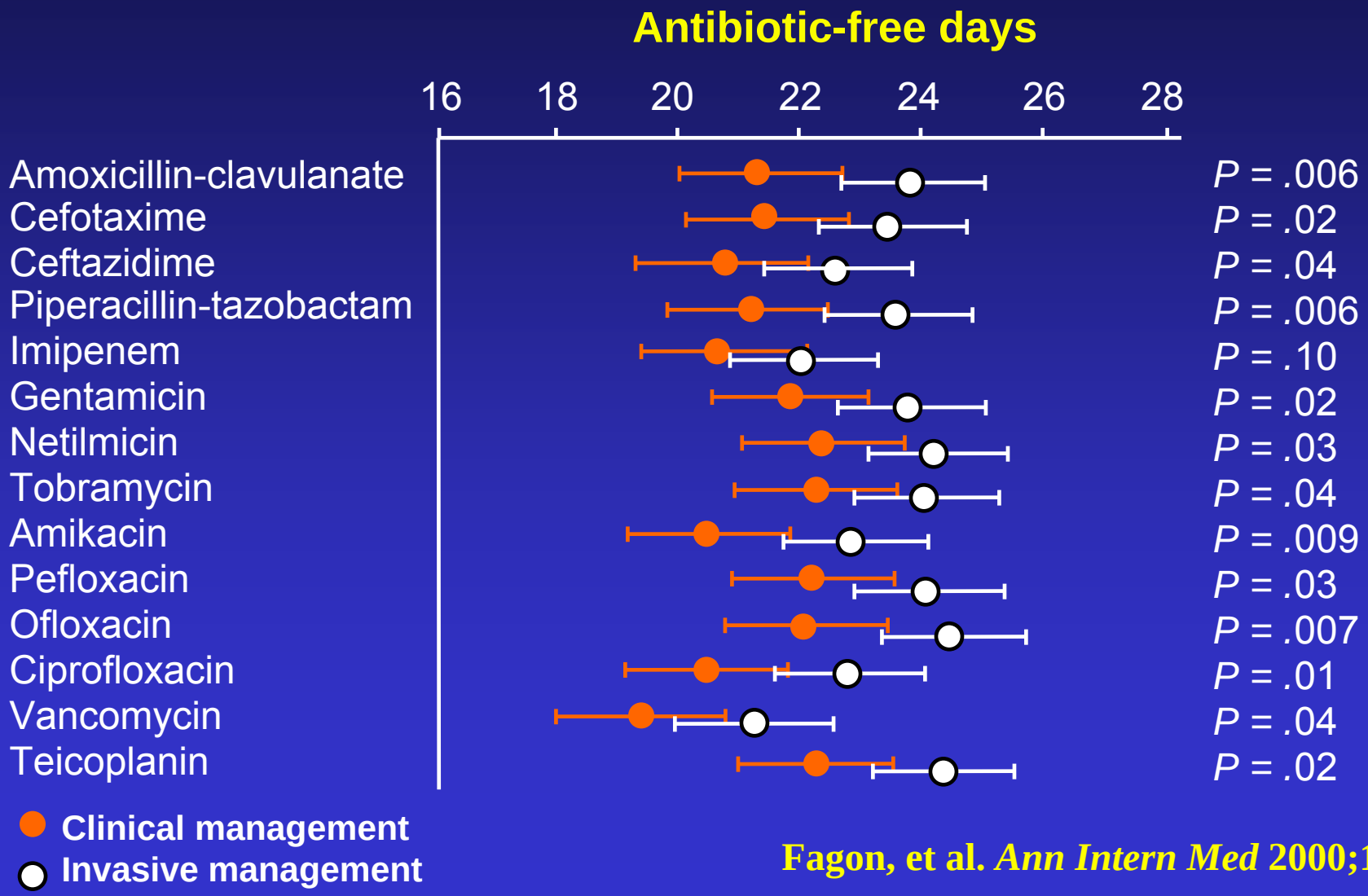
Luna, et al. *Chest.* 1997;111:676

28-day Survival in Patients with Different Management Strategies



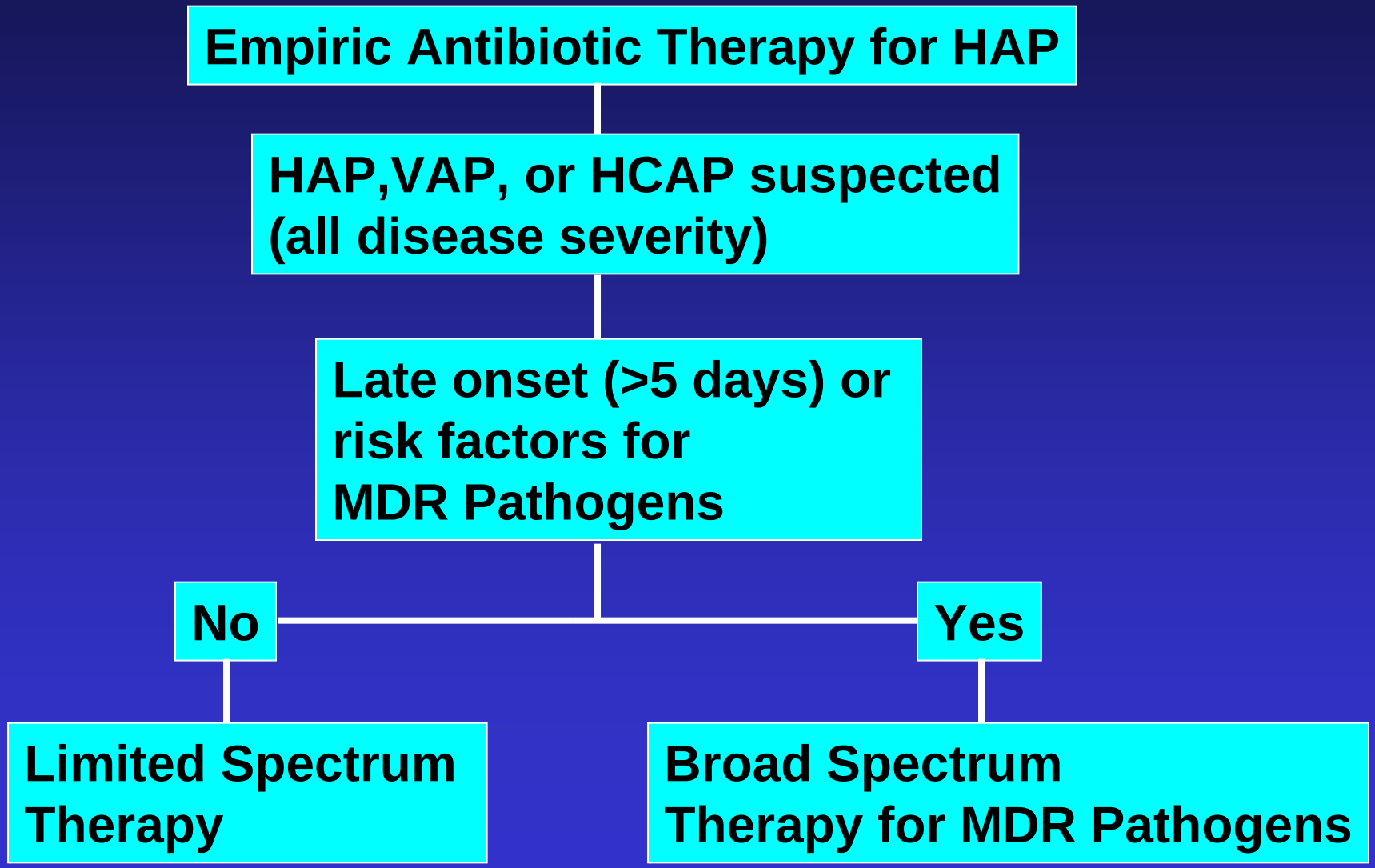
Fagon, et al. *Ann Intern Med* 2000;132:621

Survival without Antibiotics



Fagon, et al. *Ann Intern Med* 2000;132:621

Algorithm for Initiating Empiric Antibiotic Therapy



ATS. Am J Respir Crit Care Med 2005;171:388

Control of Cephalosporin Resistance

	1995	1996	% change
All cephalosporins (grams)	5558	1106	- 80†
Imipenem (grams)	197	474	+ 141††
– Ceftazidime-resistant *K. pneumoniae* (incidence)	150	84	- 44†
Per 1,000 patient days	0.75	0.48	- 36
– Multidrug-resistant *K. pneumoniae* (incidence)	8	0	
– Imipenem-resistant *P. aeruginosa* (incidence)	67	113	+ 69††

Rahal JJ, et al. JAMA 1998;280:1233

†*P* < 0.001
††*P* < 0.05

Management of Sepsis in ITU

- Obtain appropriate cultures
  - Two blood cultures
  - From vascular access inserted >48 h
  - Other relevant cultures
- Begin iv, broad sectrum antibiotics ASAP, always within the 1st hour of diagnosis
  - Reassess spectrum daily
  - Duration 7-10 days, longer if undrainable foci are present
- Implement source control measures

Dellinger PR, et al. Crit Care Med 2008;36:296

Startegies to Prevent Emergence of Resistance in ITU

- Antibiotic cycling has limited value
- Successful interventions
  - Antibiotic heterogeneity
  - Shorter courses of treatment
  - De-escalation therapy depending on the culture results

Kollef MH. Clin Infect Dis 2006;43:S82

Conclusions

- Management of infection in the ITU is a multitask approach
- Local surveillance data are necessary
- Invasive vs non-invasive diagnostics should be decided on patient basis
- Initial empirical antimicrobial regimen should be initiated ASAP and should be appropriate
  - "Hit hard" then "focus & de-escalate"
  - Cover resistant pathogens