

# **Infective Endocarditis Considerations in 2009**

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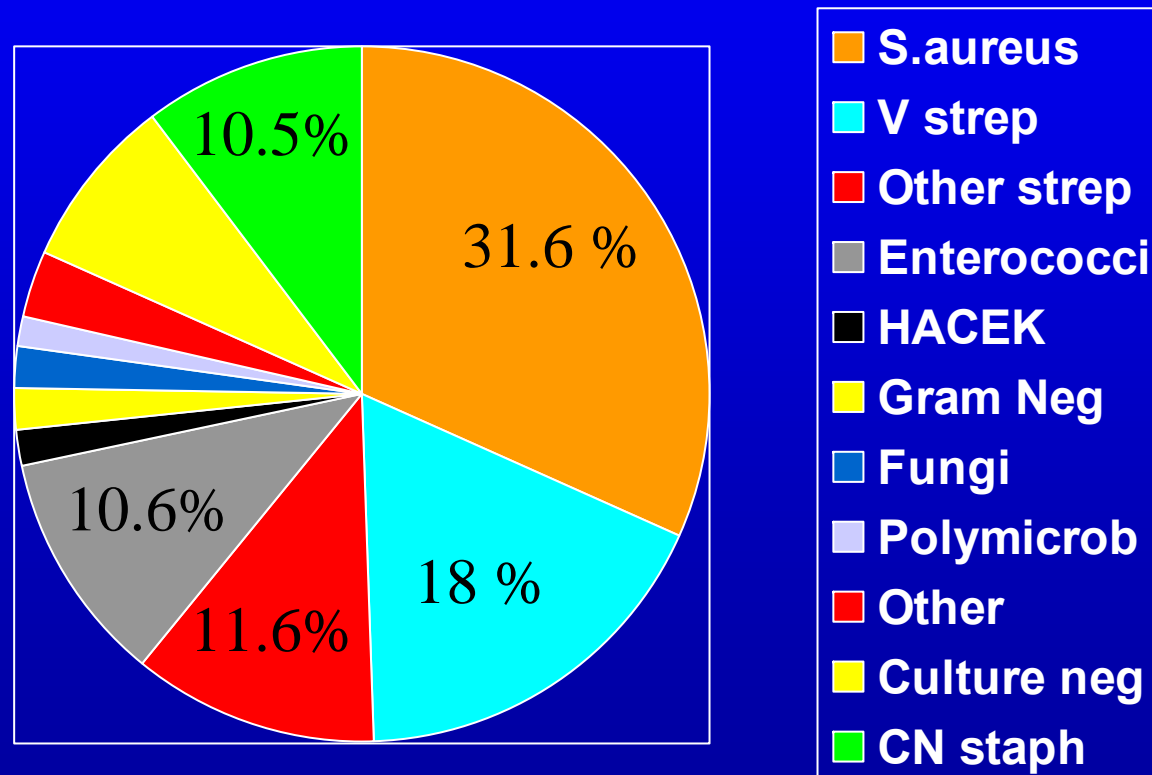
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**Boston, Massachusetts**

# Causes of Endocarditis: International Collaborative on Endocarditis – 1779 Cases, 39 Centers 2000-2003



Fowler et al JAMA 2005;293:3012-21

## Treatment for Native Valve Endocarditis Due to Penicillin-Susceptible Viridans Streptococci and *Streptococcus bovis* (MIC < 0.1 MIC/ml)

Antibiotic	Dosage and Route	Duration (wk)
<hr/>		
• Aqu penicillin G	12-18 million U/24 h IV either continuously or every 4 h in 6 equally divided doses	4
• Ceftriaxone	2 g once daily IV or IM	4
• Aqu penicillin G	12-18 million U/24 h IV either continuously or every 4 h in 6 equally divided doses	2
<i>or</i>		
Ceftriaxone	2 g once daily IV or IM	2
<i>plus</i>		
Gentamicin	1 mg/kg IM or IV every 8 h or 3mg/kg IV qd single dose	2

Baddour et al AHA Scientific Statement. Circ. 2005;111:e394-e433

# **Contraindications to Short Course Treatment of IE Caused by Penicillin-Susceptible Viridans Streptococci/S. bovis**

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- Isolate with MIC Pen  $\geq 0.1\mu\text{g/ml}$ , HLR gent
- NVE with cardiac or CNS complications
- PVE (short course not effective –  $\uparrow$ relapses)
- Intra or extra cardiac abscess/focal infection
- VIII nerve dysfunction
- Reduced renal function (Cr Cl  $< 20\text{ mL/min}$ )
- Visual impairment (severe)
- Non –viridans streptococci, *Gemella*, *Abriotrophia*, *Granulicatella* species

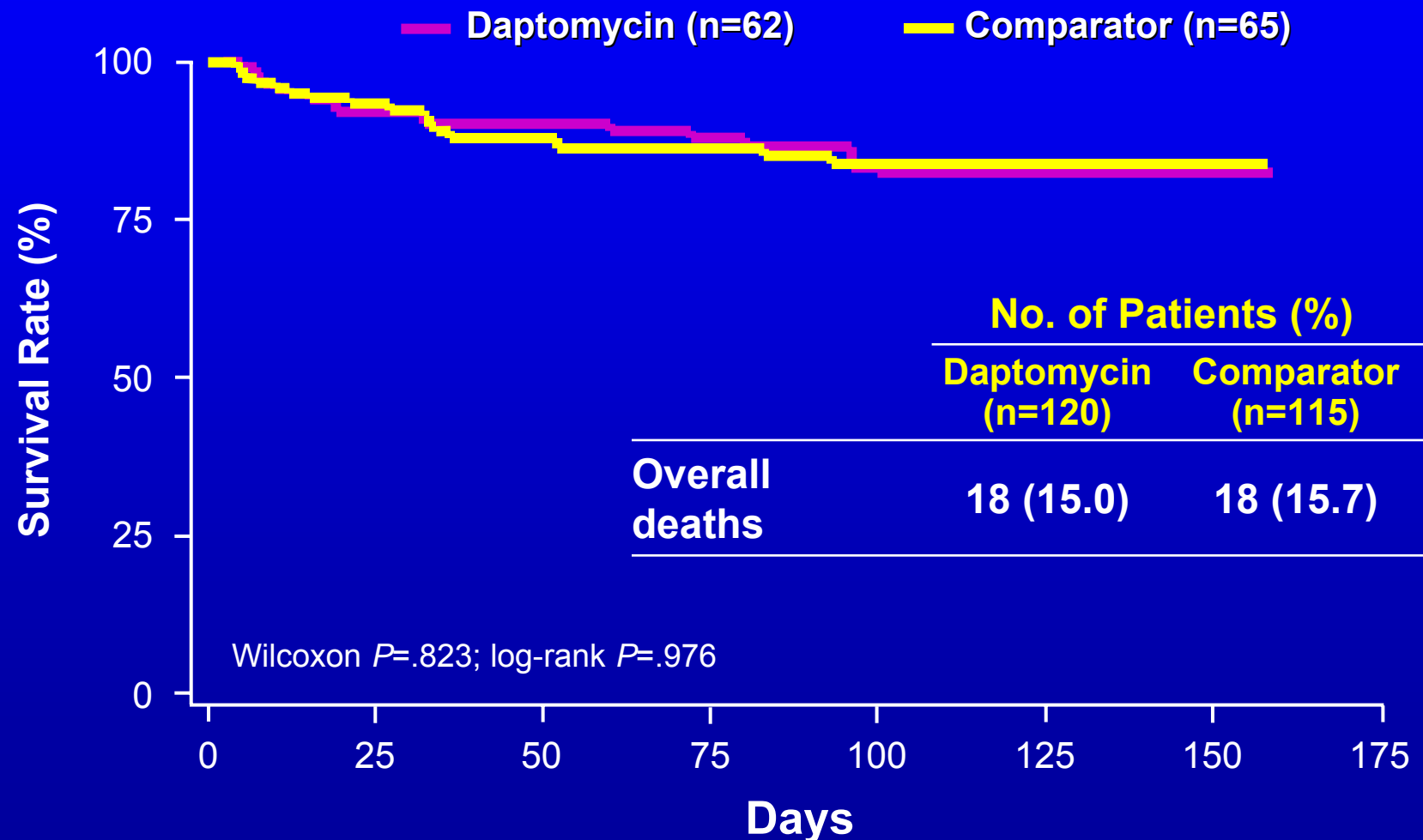
## ***Treatment of Native Valve Endocarditis Due to Streptococci Relatively Resistant to Penicillin G (MIC > 0.1 µg/ml And < 0.5 µg/ml)***

<u><b>Antibiotic</b></u>	<u><b>Dosage and Route</b></u>	<u><b>Duration (wk)</b></u>
➤Aqueous penicillin G	24 million U/24 h IV either continuously or every 4-6 h in divided doses	4
	<b>or</b>	
Ceftriaxone	2g/24 h IV in single dose	4
	<b>plus</b>	
Gentamicin	1mg/kg IM or IV every 8 h	2
	<b>or</b>	
➤Vancomycin	30 mg/kg per 24 h IV in 2 equally divided doses, not to exceed 2g/24 h unless serum levels are monitored	4

Treat **Abiotrophia** and **Granulicatella spp.** and **Gemella** with enterococcal Rx (can use ceftriaxone) although series suggest maybe cult neg by 14 days .

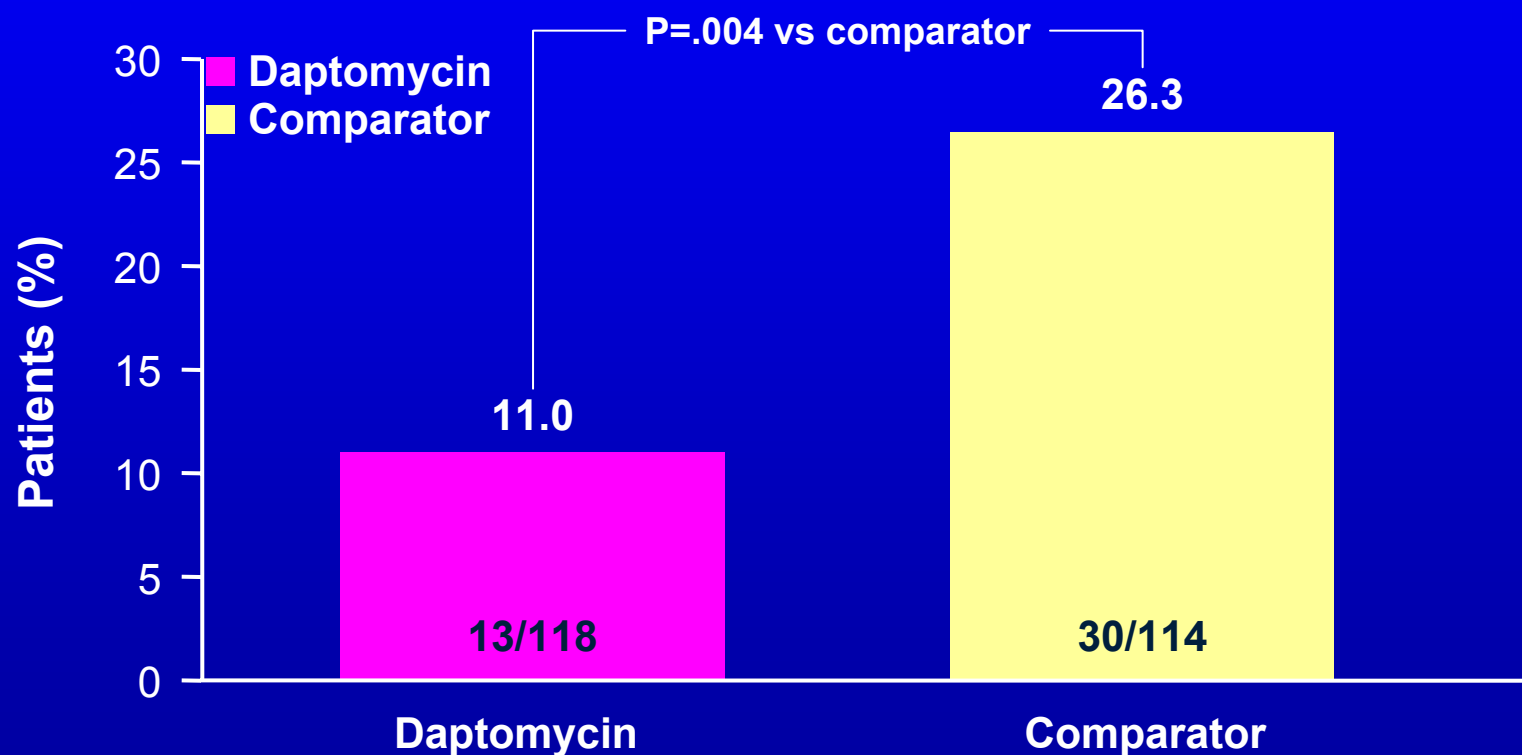
Baddour et al AHA Scientific Statement. Circ. 2005;111:e394-e433

# Daptomycin vs. Comparator Treatment *S. aureus* Bacteremia



# Incidence of Decreased Renal Function\*

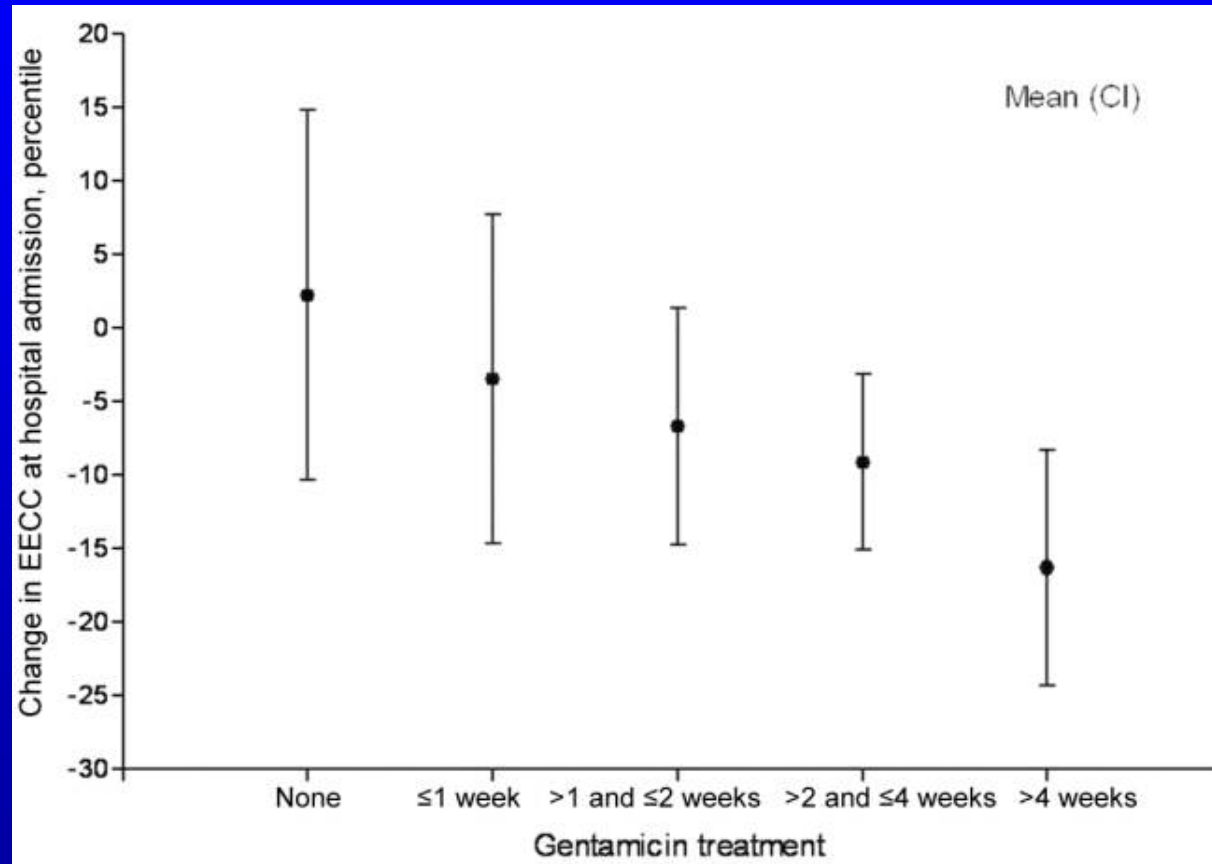
Day 2 to End of Therapy



\*Defined as a creatine clearance <50 mL/min if the baseline clearance was ≥50 mL/min) or with a decrease of ≥10 mL/min if baseline clearance was <50 mL/min.

CUBICIN® (daptomycin for injection) Prescribing Information. May 2006; Fowler VG Jr, Cosgrove S, Doubher H, et al. An international, multi-center, randomized, controlled trial of daptomycin vs. antistaphylococcal penicillin or vancomycin for *S. aureus* infective endocarditis and bacteremia. Presented at: The 45th Interscience Conference on Antimicrobial Agents and Chemotherapy; December 16, 2005; Washington, DC.

# Gentamicin Nephrotoxicity during IE Treatment : Observational Cohort, 373 Patients



Creat Cl mean increased 2.3% in no-genta group, decreased 8.6% in genta group ( $p = .008$ ). No effect on mortality.

**Buchholtz et al, CID 2009; 48:65-71**



# ***Treatment for Endocarditis Due to Methicillin-Susceptible Staphylococci in the Absence of Prosthetic Material***

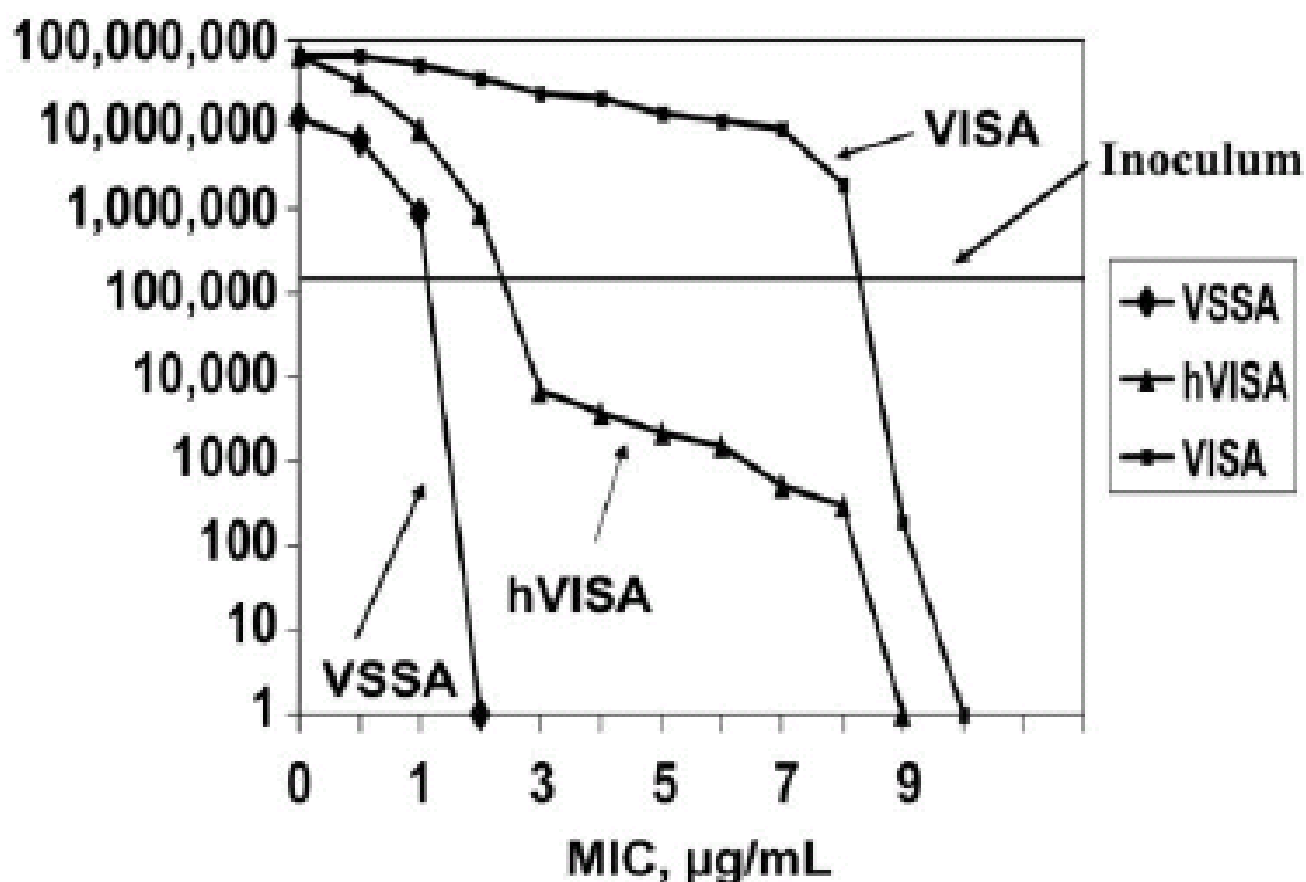
<b>Antibiotic</b>	<b>Dosage and Route</b>	<b>Duration (wk)</b>
<b>Nafcillin or oxacillin</b>	<b>2g IV every 4 h</b>	<b>4-6</b>
<b>With optional addition of gentamicin</b>	<b>1 mg/kg IM or IV every 8 h</b>	<b>3-5 days</b>
<b>Cefazolin (or other first generation cephalosporins in equivalent doses)</b>	<b>2g IV every 8 h</b>	<b>4-6</b>
<b>With optional addition of gentamicin</b>	<b>1 mg/kg IM or IV every 8 h</b>	<b>3-5 days</b>

# Treatment of Endocarditis Caused by MRSA with Reduced Vancomycin Susceptibility

Age/ Valve	Days Failed Vanco	Antibiotic Therapy	Surgery	Outcome (mos F/U)
80/TV	29	Linezolid	No	Cure (10)
66/TV-PM	19	Linezolid / Rif + Fus	Yes	Cure (3)
73/M	8	Linezolid	No	Cure (3)
73/TV	8	Linezolid / Rif + Fus	No	Died-cult neg
66/M	13	Linezolid / Rif + Fus	Yes	Died-cult neg
72/AVR	7	Rif / Fusidic acid	No	Died-stroke
77/A	20	Rif / Linezolid	No	Died-sepsis
67AVR	32	Linezolid	Yes	Died-relapse

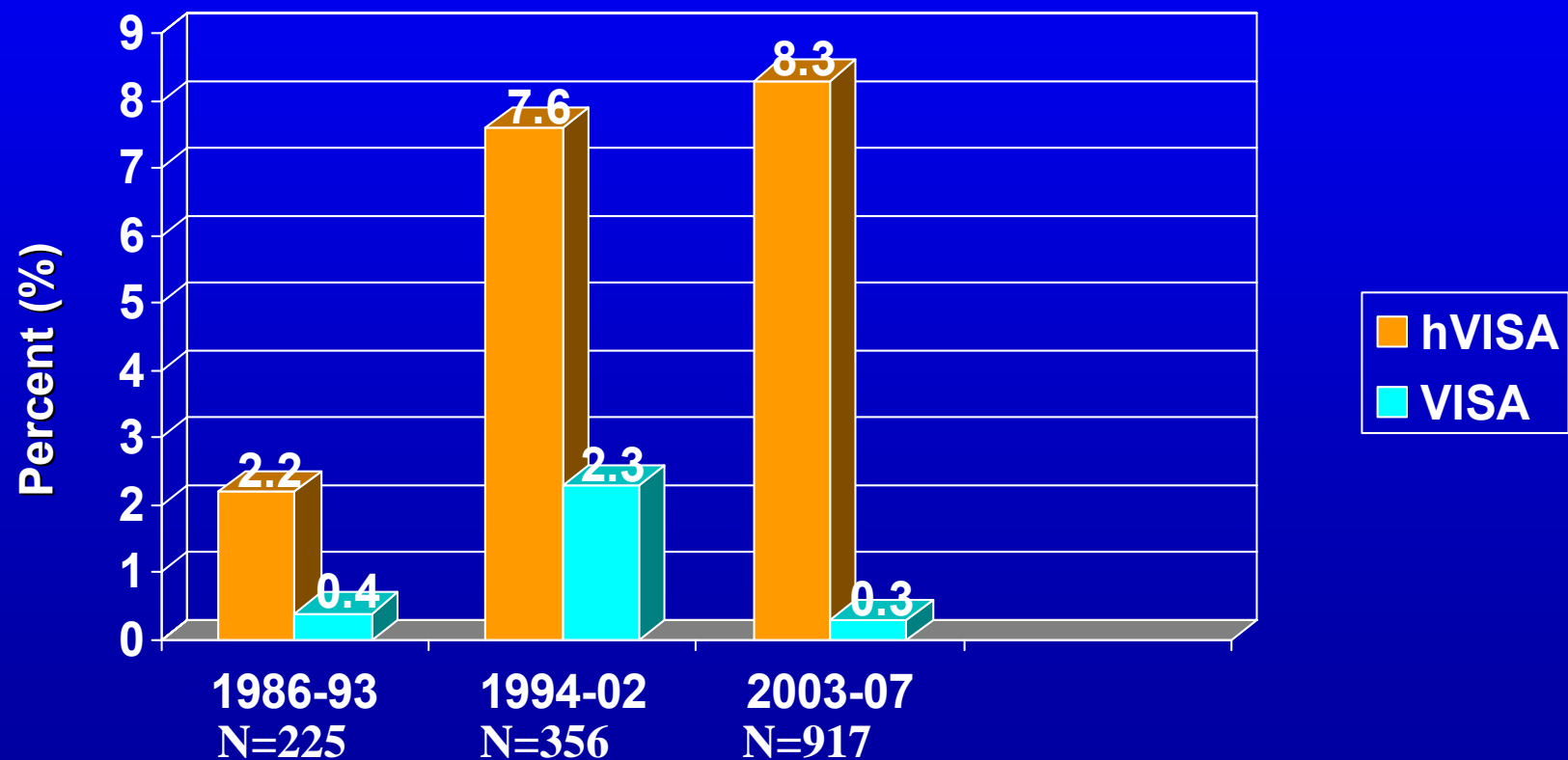
Howden, et al., 2004; CID 2004; 38:521-528.

# Population Analysis of MRSA Susceptibility to Vancomycin



Tenover and Moellering CID 2007;44:1208

# Percentages of *S. aureus* Isolates Tested in Detroit Area Over 22 Years That Were Either hVISA or VISA



Rybak, et al., J Clin Micro 2008; 45:2950-54.

# Bactericidal Activity of Vanco and Dapto Against MRSA Variably Vanco Susceptible

Phenotype (N)	Agent	MBC <sub>50</sub>	MBC <sub>90</sub>	(N)	2 x MIC*		4 x MIC*	
					↓CFU	% Cidal	↓CFU	% Cidal
GSSA (95)	V	4	16	(10)	1.5		2.3	10
	D	0.5	1		3.8	70	4.9	90
hGISA (55)	V	16	32	(10)	2.2	20	3.4	80
	D	1	2		4.3	100	5.7	100
GISA	V	16	32					
	D	2	2					

\*At 24 hrs, cidal = decrease  $\geq 3 \times \log$  CFU

Wootton, M., et al., AAC 2006; 50:4195-4197.

# Considerations for Treating IE Caused by hVISA (hGISA)

**Determine MIC vancomycin, daptomycin, gentamicin, linezolid**

- Vancomycin (tr  $\geq 15$ ), rifampin (Moore, et al., AAC 2003)
- Daptomycin (10 mg/kg/d), gentamicin (3-5 mg/kg/d)
- Linezolid, vancomycin, gentamicin (Julian AAC 2007)

**Problem: Dapto decreased susceptibility post vanco**

**Sterilize the blood → Valve replacement surgery**

- Dapto (10 mg/kg) gentamicin, rifampin
- Linezolid, rifampin, ? gentamicin
- ? Role of TMP/SMZ

**ALL REGIMENS ARE OFF LABEL**

# Standard Therapy of Endocarditis Due to Enterococci\*

Antibiotic	Dosage and Route	Duration(wks)
➤ Aqueous penicillin G	18-30 million U/24 h IV either continuously or every 4 h in 6 equally divided doses	4-6
plus Gentamicin	1 mg/kg IM or IV every 8 h	4-6
➤ Ampicillin	12 g/24 HIV given continuously or every 4 h in 6 equally divided doses	4-6
plus Gentamicin	1 mg/kg IM or IV every 8 h	
➤ Vancomycin**	30 mg/kg per 24 h IV in 2 equally divided doses, not to exceed 2g/24 h unless serum levels are monitored	4-6
plus Gentamicin	1mg/kg IM or IV every 8 h	4-6

\* Test for antimicrobial susceptibility in order to select optimal therapy.

# Cephalosporins are not alternatives to penicillin/ampicillin in pen-allergic pts.

# Screening for Resistance in Enterococci

## **SCREENING TEST**

## **IMPLICATION**

Growth in Streptomycin at  $\geq 2000$  mcg/ml

No synergy, strep

Growth in Gentamicin at  $\geq 500$ -1000 mcg/ml

No synergy with any aminoglycosides except possibly streptomycin

Nitrocefin chromogenic cephalosporin (Beta lactamase production)

Lose penicillin/ampicillin synergy effect

MIC penicillin/ampicillin  $> 32$  mcg/ml (PBP change)

Lose penicillin/ampicillin synergy

MIC vancomycin  $\geq 32$  mcg/ml

Lose vancomycin synergy



# Therapy of Endocarditis Due to Resistant Enterococcus

- **No simple formula**
- **Synergistic therapy is ideal**
  - Cell wall active agent -- achievable concentration
  - Aminoglycoside -- no high level resistance
- **Options for therapy when synergy not achievable**
  - Penicillin/ampicillin
  - Vancomycin
  - Ampicillin-sulbactam
  - Linezolid ?
  - Quinupristin/dalfopristin ( *E. faecium* only)?
  - Daptomycin??
  - Double beta-lactam: imipenem-ampicillin, ceftriaxone -ampicillin
- **Surgery**

# Treatment of Enterococcal Endocarditis: Shorter Courses of Aminoglycosides

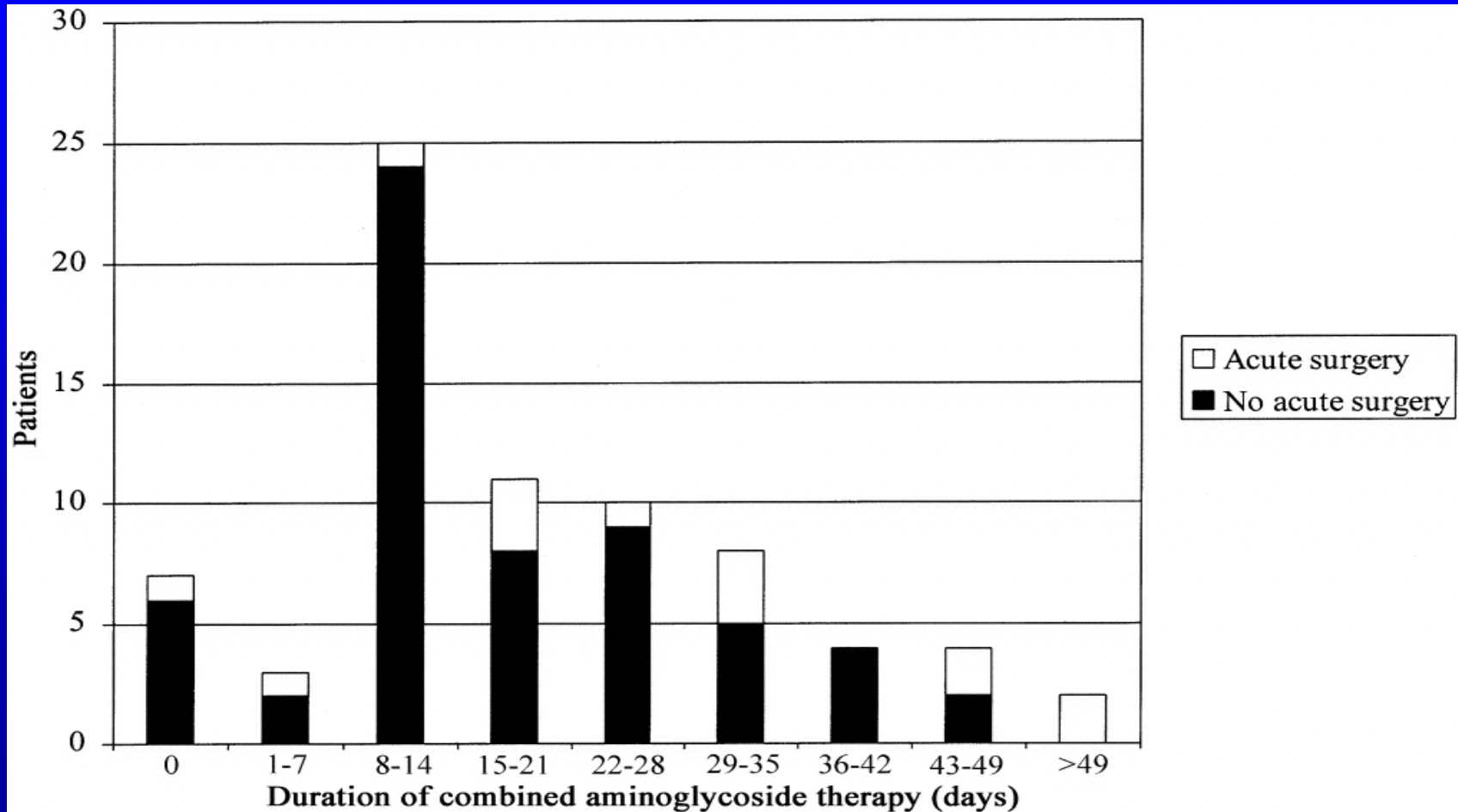
	Cases	Cure	Died	Relapse	Antibiotic Days* Cell Wall/Ag
All	93	75 (81%)	15 (16%)	3 (3%)	42/15
NVE	66	54 (82%)	10 (15%)	2 (3%)	42/16
PVE	27	21 (78%)	5 (19%)	1 (4%)	42/15

**\*Median**

**FU 41 patients > 1 month (mean 90D)**

**Olaison, et al., CID 2002; 34:159-166.**

# Duration of Combined Aminoglycoside Therapy in 75 Cured Enterococcal IE



Oliason, L., et al: CID 2002; 34:159-166.

# Ampicillin-Ceftriaxone Treatment of *E. faecalis* IE\*

	Number Cases (%)		
	HLAR N=40	Non-HLAR N=78	All N=118
Failed	13 (33)	14 (18)	27 (23)
Died on Rx	11	9	20 (17)
Died after Rx	1	3**	4 (3)
Relapse	0	2**	2 (2)
AE	1	10	12 (10)
Cured @ 3 mos	27 (67)	64 (82)	91 (77)

\*PVE = 47, NVE = 71, Pacers = 3

\*\*1 pt relapsed and died

HLAR = High Level Aminoglycoside Resistant

Gavaldà, et al., Ann Int Med  
2007; 146:574.

Gavaldà, et al., ICAAC 2008

# Cardiac Surgical Intervention in Endocarditis

## ***PATIENTS FOR CONSIDERATION***

- **Congestive heart failure due to valve dysfunction**
- **Myocardial invasion -- abscess**
- **Resistant pathogens**
  - Fungi**
  - Gram-negative bacilli**
  - Multi-resistant enterococci**
- **Relapse of PVE**
- ***S. aureus* endocarditis -- left-sided**
- ***S. aureus* PVE**
- **High risk for embolic complications**
- **Culture-negative endocarditis unresponsive to antimicrobial therapy**

# Timing Surgery for Endocarditis

- Hemodynamic status is primary consideration
- Mortality is proportional to hemodynamic disability
- Mortality is increased by continuing antibiotics in the face of worsening hemodynamics
  - **Delaying surgery in the face of deteriorating hemodynamics increases mortality from 6-11% to 17-33%**
- Delayed surgery is acceptable when the operation is “elective”

# **Surgery in Patients with Active Endocarditis: Risk of Recurrent IE**

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- **NVE:**

- 200 patients (44 culture-positive within 48 hours of surgery)
- 5/161 survivors (3%) recurred

- **PVE:**

- Recurrence of PVE occurs in 6-15% (reoperation rate 18 to 26%)

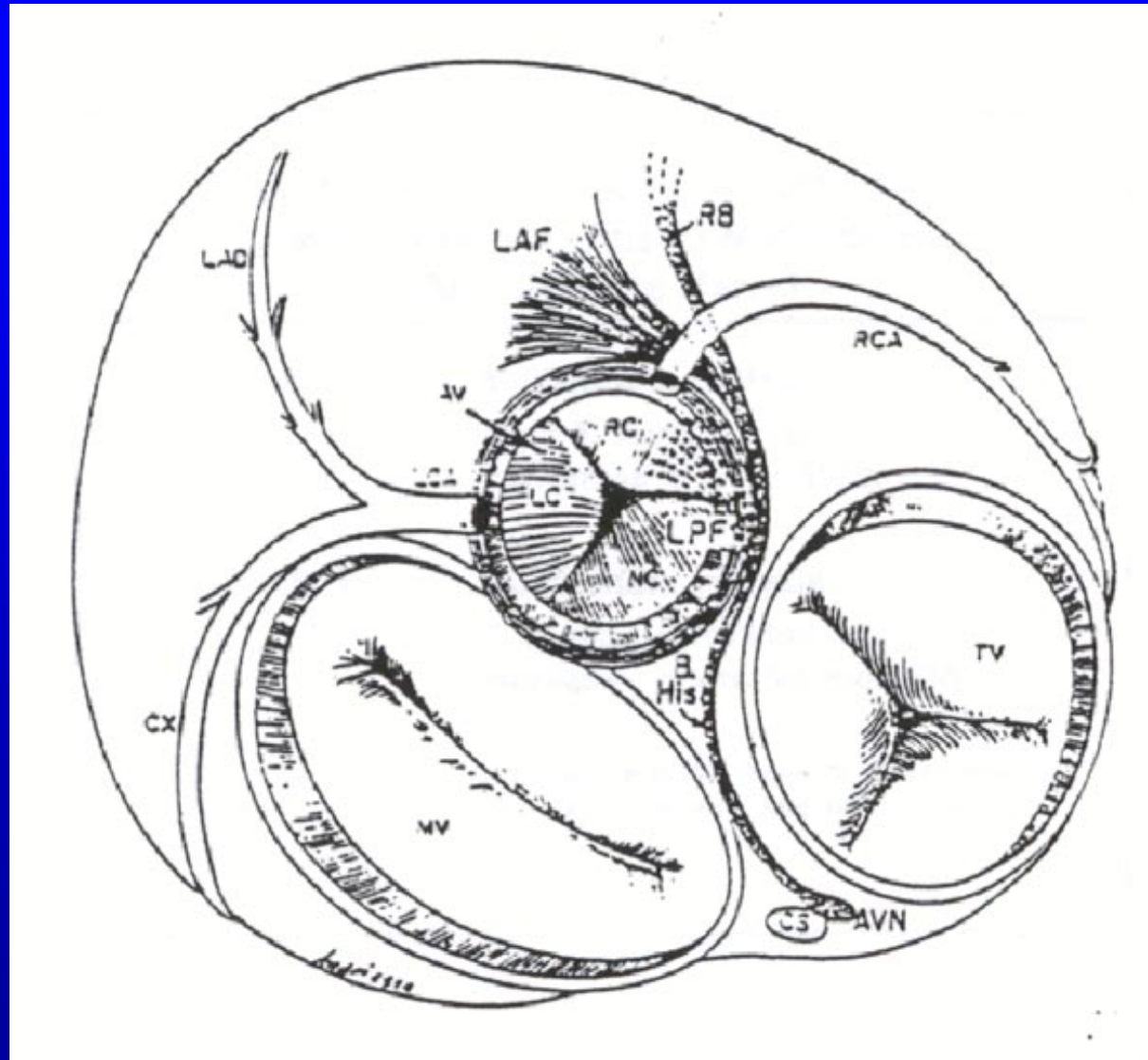
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# Anatomy of Myocardial Invasion



Hutter and Moellering. JAMA 1976;235:1603

# **Candida Infective Endocarditis 2000-05**

## **ICE – Prospective Cohort Study**

- **33 Cases**
- **C. albicans 16 (48%), C. parapsilosis 7 (21%), C. glabrata 5 (15%), C. tropicalis 3 (9%), unspciated 2**
- **Mortality at discharge:**
  - **Surgical Rx 33%, Medical Rx 27%**
- **Caspofungin (with/without flu/ampho)**
  - **Mortality: Surgery 1/3, med 1/6**
- **Indications for surgery: persistent fungemia, emboli, abscess**
- **Indefinite post-acute Rx oral suppressive Rx**

**Baddley, et al., E J Clin Micro Infect Dis 2008; 27:519-529.**

# Potential Role of Surgical Treatment in *S. aureus* Endocarditis in Non-addicts (Mitral/Aortic Valve)

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## ACTIVE IE:\*

Multivariate analysis  
Only *S. aureus* infection  
correlates with mortality

## ACTIVE IE: #

Multivariate analysis  
*S. aureus* correlates with  
increased operative mortality

\*D'Agostino et al. Ann Thorac. Surg. 1985; 40:429.

#Mullaney et al. World J. Surg. 1989; 13:132.

# Outcome for 49 Patients With IE Due to *S. aureus*

Outcome	Visualized by TTE (n = 19)	Vegetations Visualized only by TEE (n = 30)	P Value
Death due to <i>S. aureus</i> infection	6 (31.6%)	2 (6.7%)	.04
Any major embolic event	11 (57.9%)	3 (10.0%)	< .01
Cerebrovascular	5 (26.3%)	1 (3.3%)	.03
Pulmonary	5 (26.3%)	2 (6.7%)	NS
Other	4 (21.1%)	2 (6.7%)	NS
Major embolic event or death due to <i>S.aureus</i> infection	13 (68.4%)	5 (16.7%)	< .01

Fowler et. al. CID. 1999; 28:106.

# Impact of Cardiac Surgery on Outcome of *S. aureus* IE

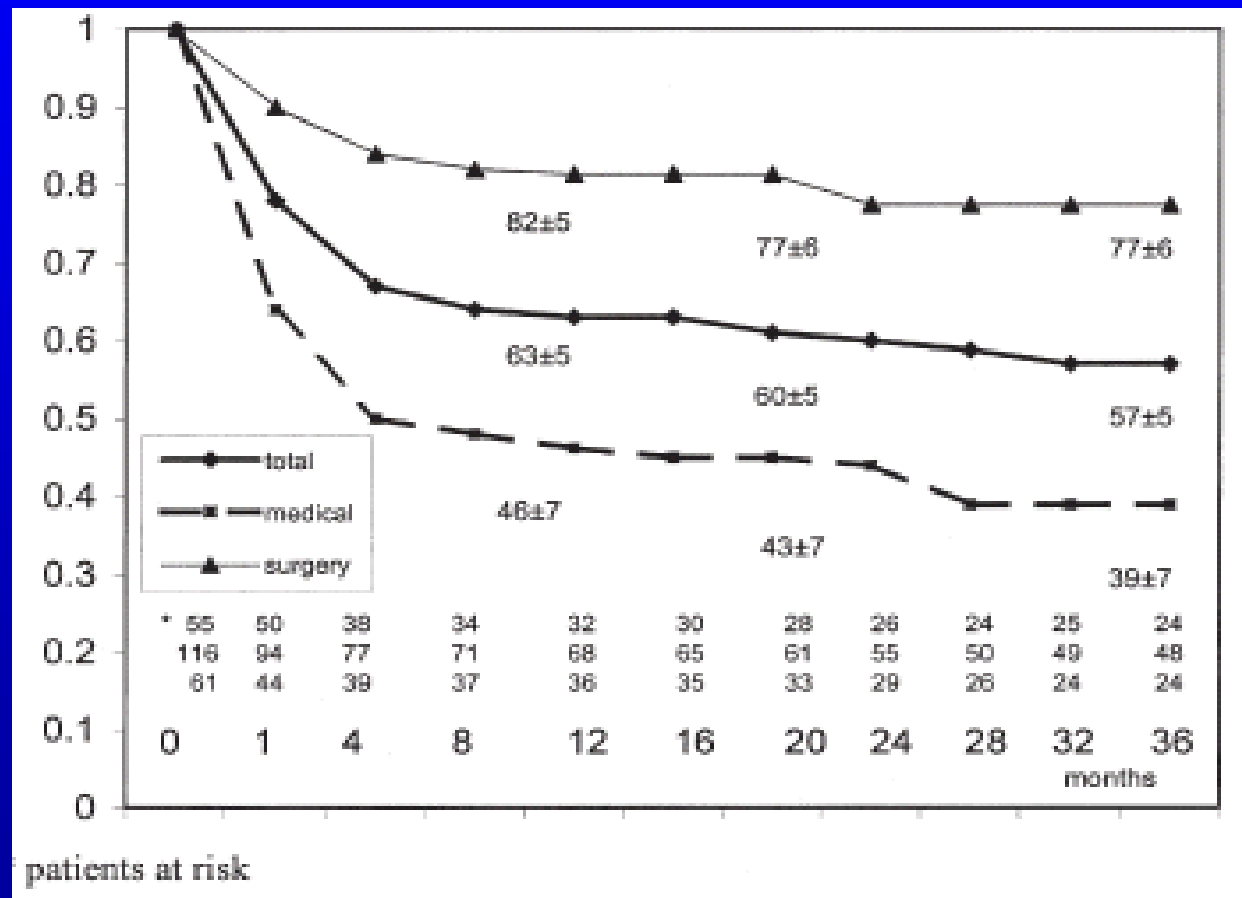
116 definite cases (17 PVE, 30 right sided); 55 early surgery (47%),  
Hospital deaths: surgery 9/55 (16%) vs. medical 21/61 (34%) [p0.03]

Risk Factor for Death	In Hospital		Overall 36 Mos	
	OR (CI)	P	OR (CI)	P
Comorbidity	4.5 (1.2-18.5)	0.03	2 (1-3.9)	0.04
Severe sepsis	23 (6-93)	0.0001	3.7 (2-7.1)	0.0001
CHF	3.7 (1-13.8)	0.049		
CNS event	9.2 (1.7-48)	0.008		
PVE	9.1 (2-40)	0.003	2 (1-4.3)	0.055
Surgery	0.3 (0.1-1.2)	0.1	0.5 (0.2-1)	0.047*

\*Exclude right IE: OR 0.41 (0.37-0.8) p 0.02

Remadi, et al., Ann Thorac Surg 2007; 83:1295-1302.

# Impact of Cardiac Surgery on Outcome of S aureus IE



Surgical pts\*

All pts

Medical pts\*

\*p=.001

Kaplan Meier curves of Overall Survival

Remadi et al Ann Thor Surg 2007;83:1295

# Outcome of *S. aureus* PVE

<u>Treatment</u>	<u>Died/Treated (%)</u>
Medical	59/81 (73)
Medical-surgical	12/48 (25)

Wolf et al., John et al., Kuyvenhoven et al., Tormos et al., Yu et al.,  
Roder et al., Sett et al.

# Survival After *S. aureus* PVE (14/33 {42%} Dead at 3 Months)

Risk Factor	Univariate Odds Ratio (95% CI)	Multivariate Odds (95% CI)	P value
Cardiac complications	5.4 (0.9 - 31)	13.7 (1.4 - 131)	.02
CNS complications	3.8 (0.8 - 17.2)		
Any systemic complication	1.0 (0.2 - 5.5)		
Valve surgery during antibiotic Rx	0.1 (0.02 - 0.6)	0.05 (0.005 - 0.42)	.004

John et al. CID. 1998; 26:1302.

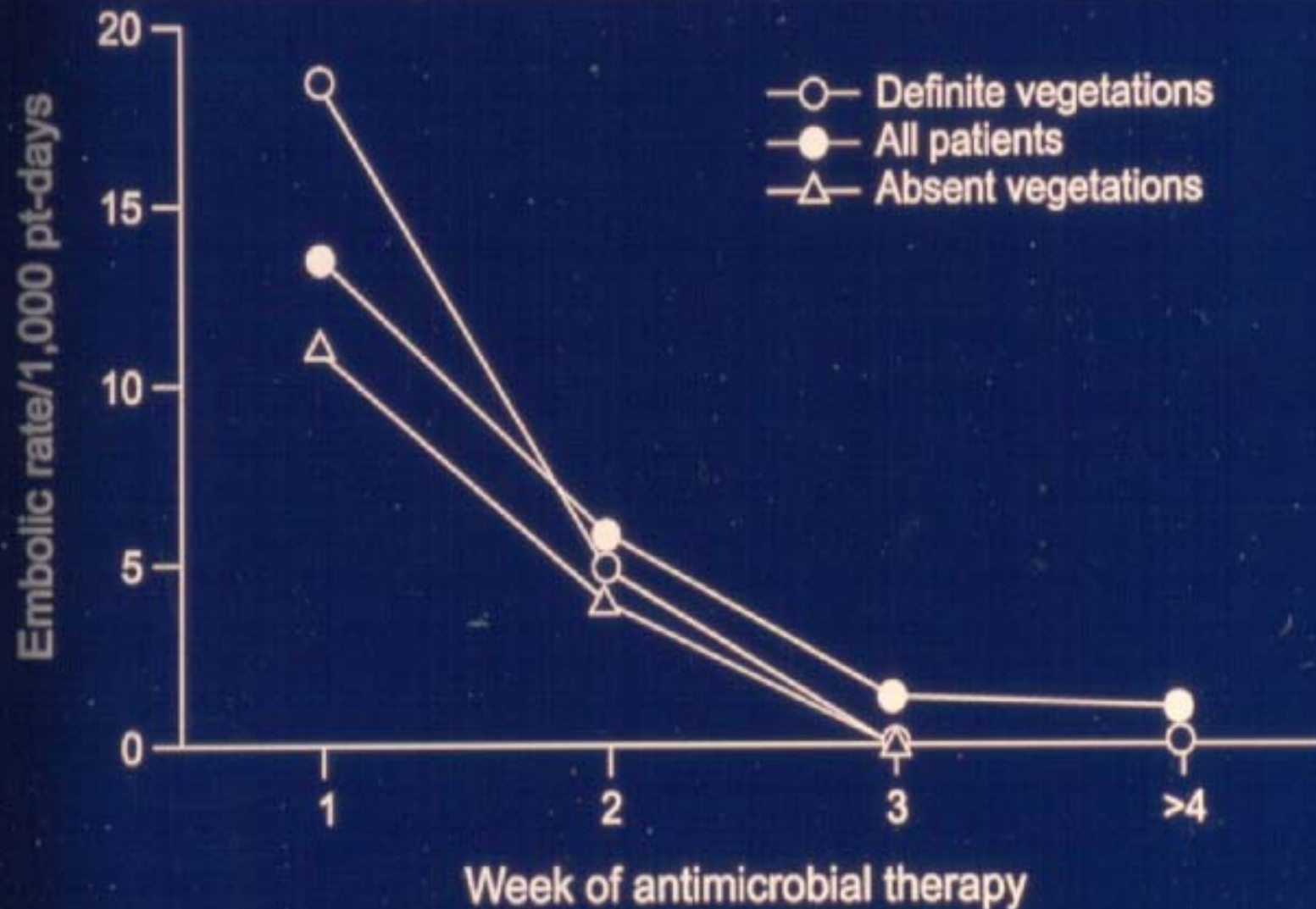


# Vegetation Size and Complications of Endocarditis

		% with Event			
Status	# Cases	Death	CHF	Emboli	Surgery
Vegetations present	343	20	62	36	50
No vegetations	363	9	24	12	12
Vegetations					
> 10	92			33	
0-10	128			19	

Aragam & Weyman. Principles and Practice of Echocardiography, 1994.

# Incidence of Embolic Events in Patients with Infective Endocarditis

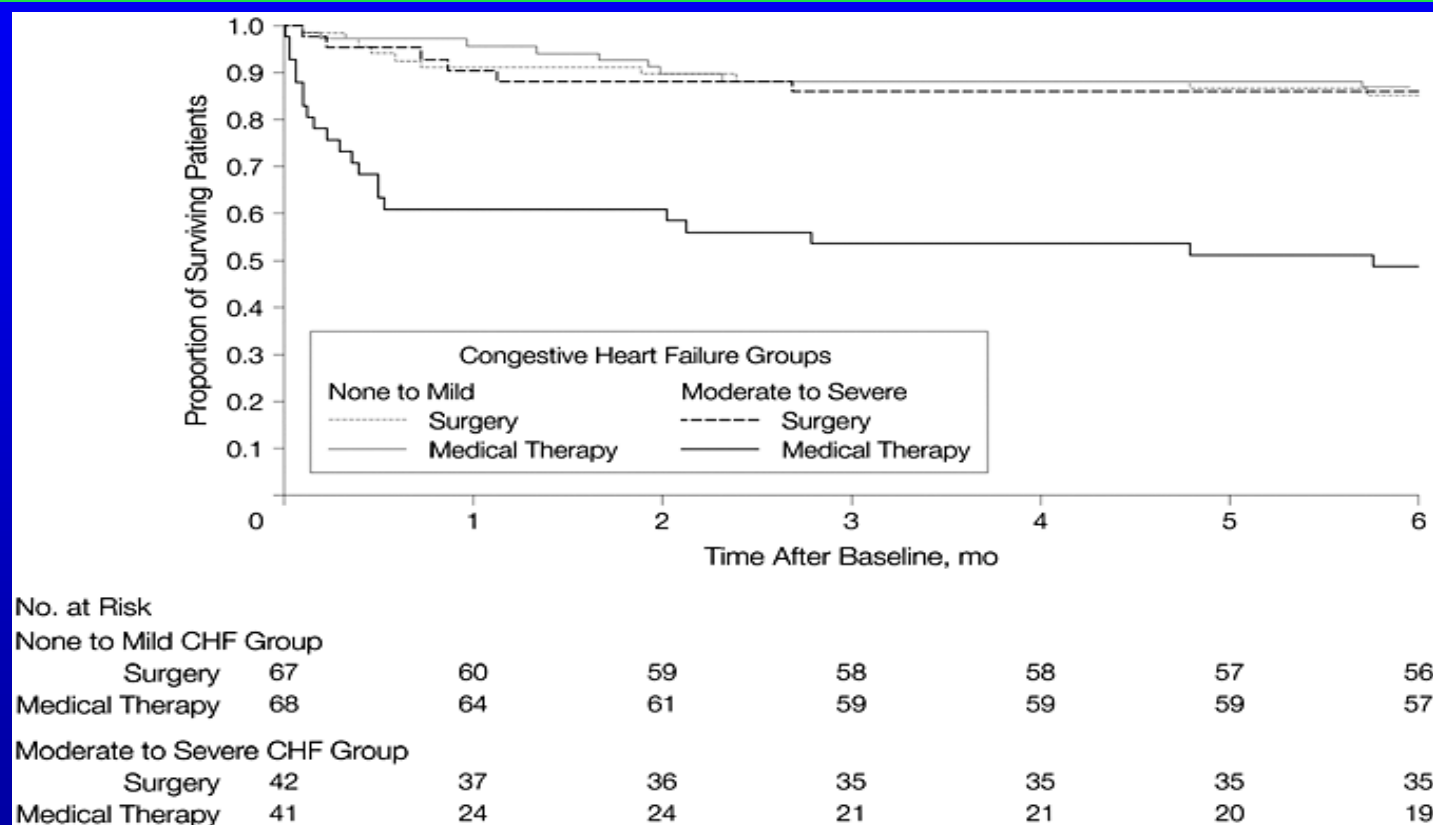


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- High risk for embolic complications
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# Impact of Valve Surgery on 6 month Mortality - Propensity Analysis 109 Matched Surgically and Medically Treated Patients



Surgical therapy is associated with reduced mortality when adjusted for baseline mortality risk and confounders (surgical propensity) HR 0.40 (0.18-0.91) [p=.03] with impact related to mod/severe CHF

Vikram,et al, JAMA 2003;290:3207

# Early Surgery in 333 Patients With Left-Sided IE

- **Med/Surg Rx: 78/333 ( 23%) early surgery**
  - Increased: Males, new aortic vegetations/regurgitation, intracardiac abscess, Class IV CHF
  - Decreased: Hemodialysis, diabetes, cancer, chronic immunosuppression, *S. aureus* infection
- **5 Year Mortality:**
  - 162/333 (48.6%)
  - Older age, hemodialysis, diabetes, HIV, cancer, evident IE at admission, persistent positive blood culture, *S. aureus*

Aksoy, et al., CID 2007; 44: 364-372.

# Factors Impacting Survival\* of 102 IE Patients within a Matched Cohort

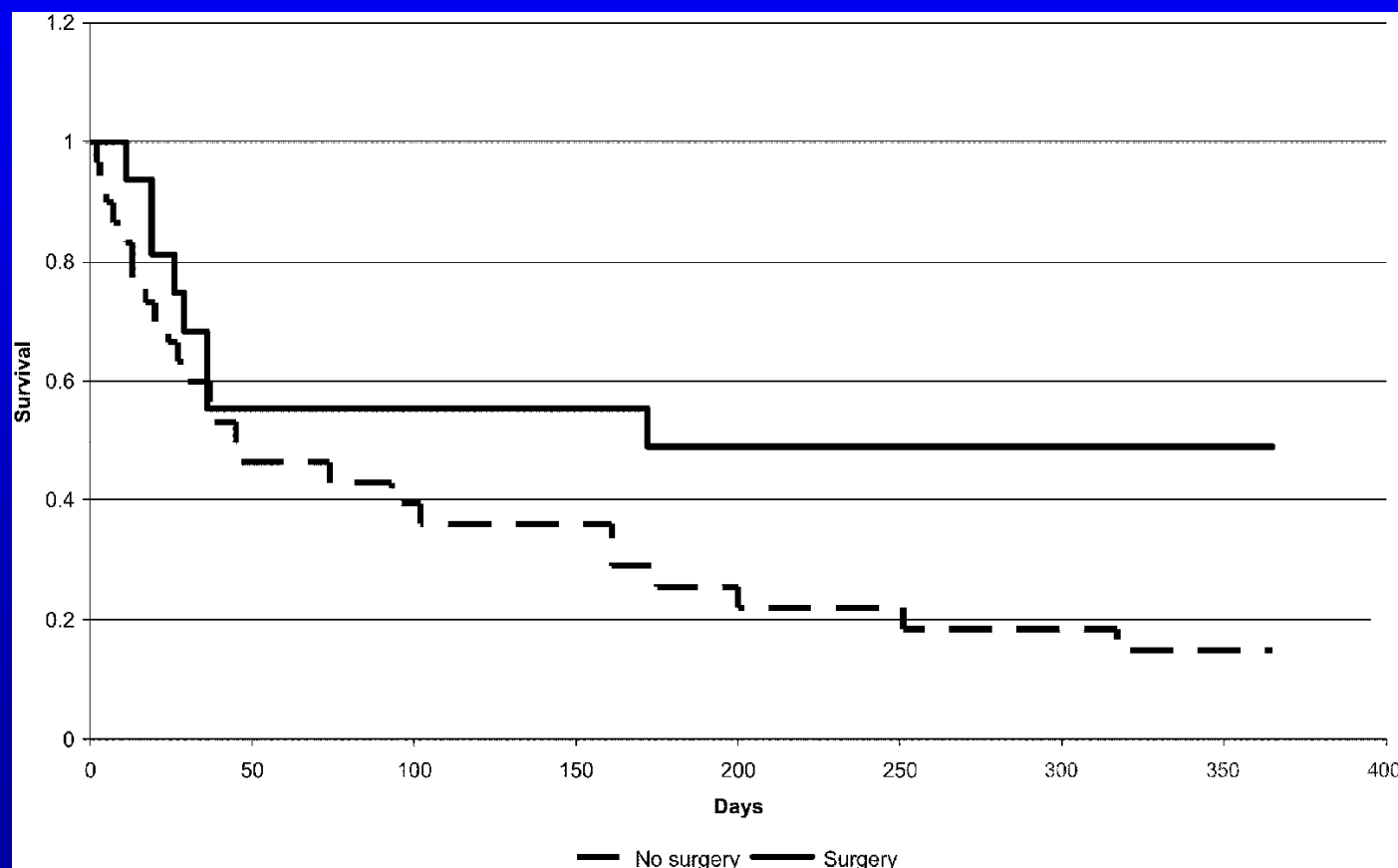
Characteristic	$\chi^2$ test score	Hazard ratio (95% CI)
Surgery	13.01	0.27 (0.13–0.55)
Diabetes mellitus	19.80	4.81 (2.41–9.62)
Chronic indwelling central catheter	7.43	2.65 (1.31–5.33)
Paravalvular complications	4.43	2.16 (1.06–4.44)

\*Cox proportional hazard regression analysis

Aksoy, et al., CID 2007; 44: 364-372

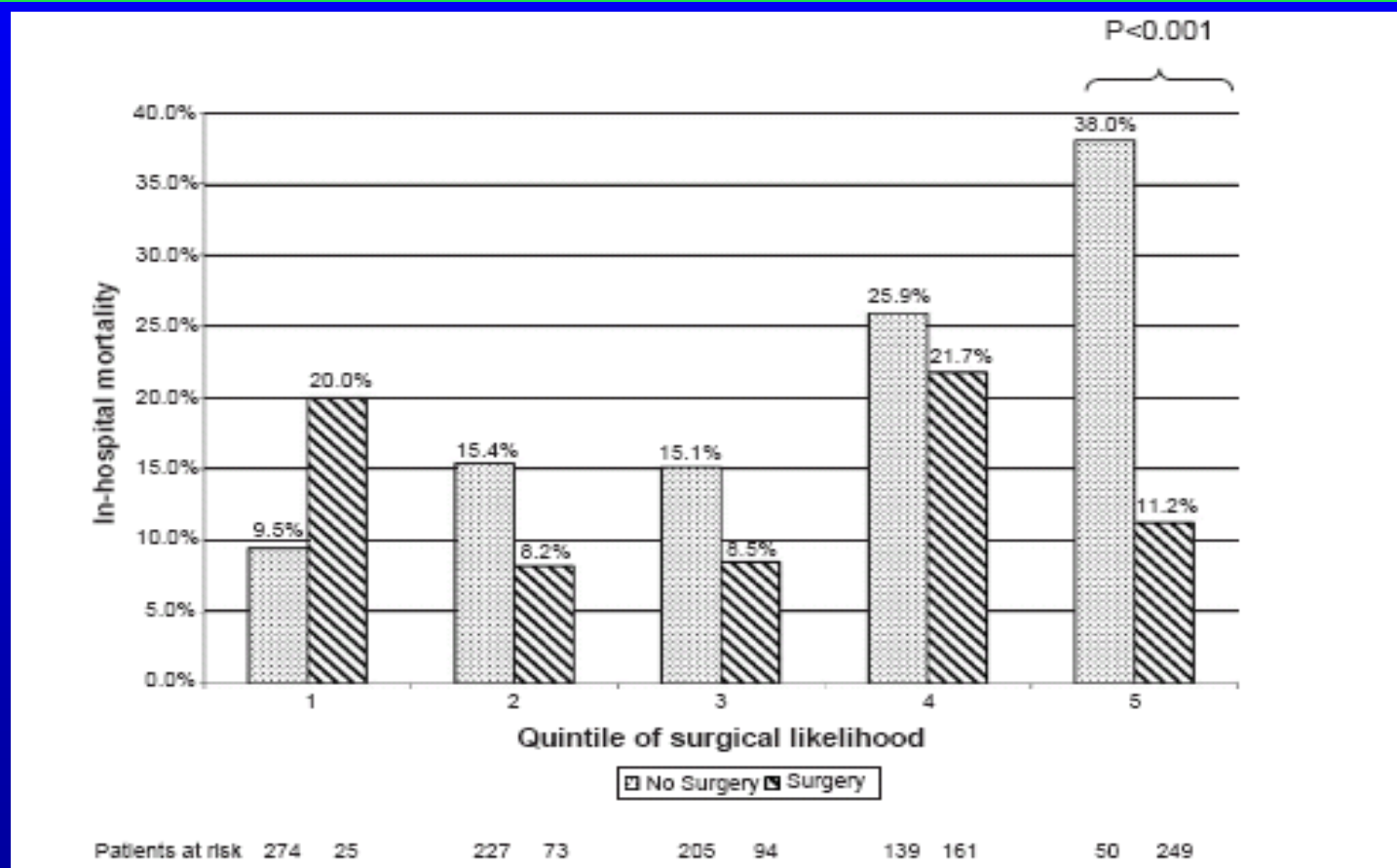
# Medical vs. Medical-Surgical Therapy of Propensity Matched IE Patients

## Adjusted Kaplan Meier Survival Curves



Aksoy, et al., CID 2007; 44: 364-372

# In-Hospital Mortality of Native Valve IE Treated with Medical vs. Medical-Surgical Therapy by Propensity Groups



Cabell et al Am Heart J 2005;150:1092-8



# Clinical Characteristics of Patients in Propensity Groups

	Propensity group				
	1 (n = 299)	2 (n = 300)	3 (n = 299)	4 (n = 300)	5 (n = 299)
Female	47.5	33.7	35.5	25.0	20.1
<i>S aureus</i>	31.4	20.0	27.1	24.3	16.1
Coagulase-negative staphylococci	2.7	5.0	5.0	9.0	12.4
Viridans group streptococci	39.1	34.3	23.1	21.0	23.4
AV vegetation	10.0	20.0	26.8	31.7	52.2
MV vegetation	32.4	33.0	38.5	37.0	26.8
TV vegetation	10.4	5.0	5.7	4.3	1.7
CHF	0.7	12.0	36.5	68.0	73.6
Abscess	0.0	0.0	0.0	6.0	43.1
Embolization, systemic	31.8	31.3	37.5	36.3	30.1

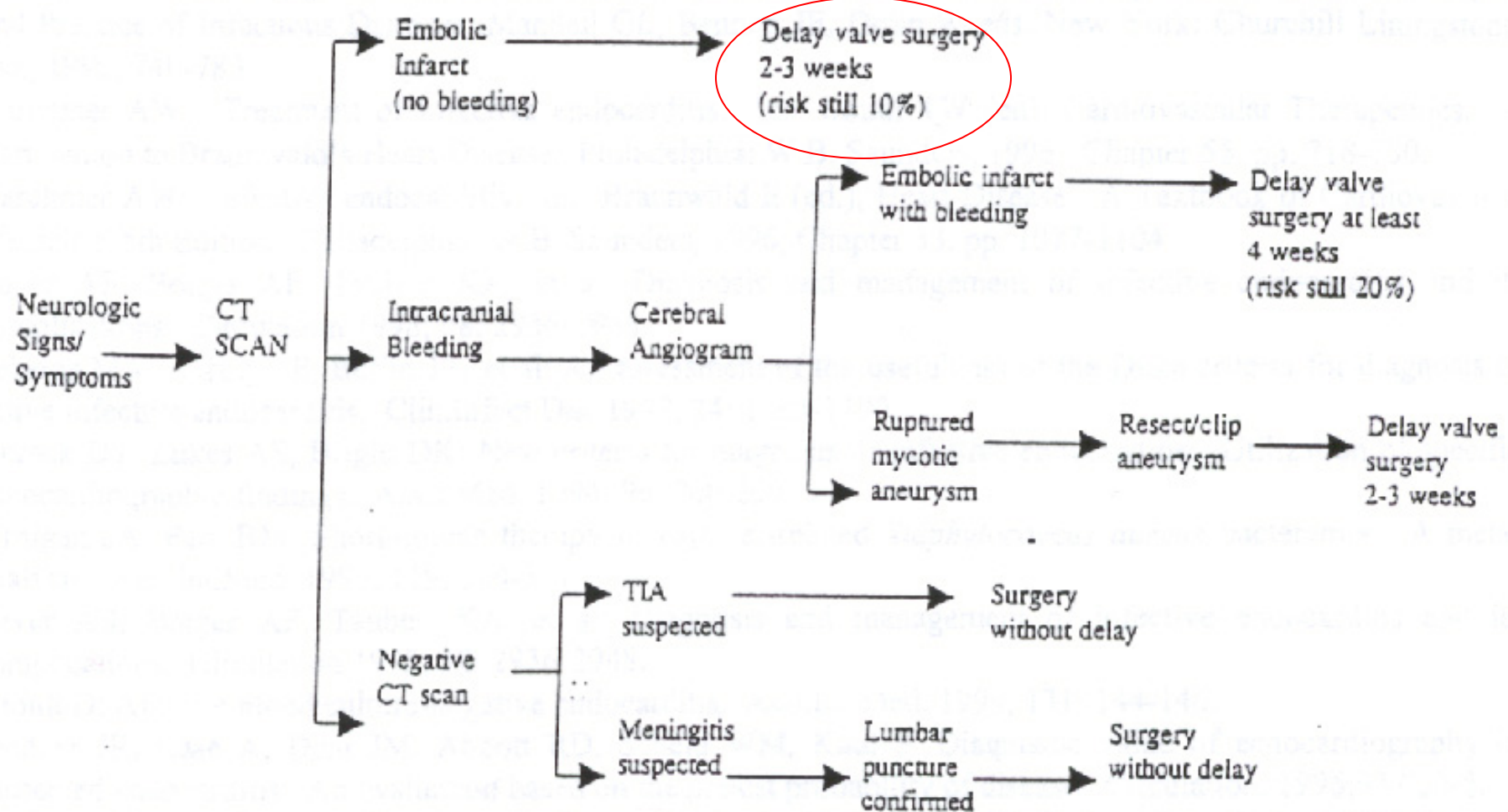
Values are presented as percentages. AV, Aortic valve; MV, mitral valve; TV, tricuspid valve; CNS, central nervous system.

# **Influence of Interval Between Cerebral Event and Cardiac Surgery on Postoperative Exacerbation of CNS Injury (Including Related Death)**

<b>Interval Event to Surgery (Days)</b>	<b>Patients Worsened Preoperative Event/Number Operated (%)</b>	
	<b>Infarction N = 111</b>	<b>Hemorrhage N = 34</b>
<b>≤ 1</b>	<b>5/11 (45)</b>	<b>1/1 (100)</b>
<b>2-7</b>	<b>7/16 (44)</b>	<b>0/1 (0)</b>
<b>8-14</b>	<b>2/12 (17)</b>	
<b>15-21</b>	<b>1/10 (10)</b>	<b>1/5 (20)</b>
<b>22-28</b>	<b>2/19 (10)</b>	<b>0/6 (0)</b>
<b>29+</b>	<b>1/43 (2)</b>	<b>4/21 (19)</b>

**Eishi et al. J Thorac Cardiovasc Surg. 1995; 110: 1745.**

Cardiac Surgery in Patients with Active Endocarditis and Neurologic Complications  
Reducing Risks of Worsening CNS Injury



Modified from Gillinov, et al., Ann Thorac Surg 1996; 61:1125.

# **Outcome of 214 IE Patients treated Surgically with/without Preop Embolic Stroke**

- **65 patients CNS emboli (55 prior to admission)**
  - Event to surgery – median 4 days (0-38 d)
  - 6 preop intracerebral bleed (4 died postop- 1 rebleed)
- **30 day mortality**
  - CNS event 11/65 (17%) (complicated stroke 39% mort)
  - No CNS event 19/149 (13%)
- **Survival similar 1 yr (81% with CNS vs. 86% with out CNS event)**
- **Recovery stroke – full in 70% of patients (middle cerebral artery stroke – 50%)**
- **Early surgery after CNS event acceptable**

**Ruttmann, et al., Stroke 2006; 37:2094.**

# ***Microbiology of Surgically Excised Infected Valves***

<b>Percent Standard Therapy at Surgery (N)</b>	<b>Number Positive/Number Examined (%)</b>			
	<b>Gram Stain Micro</b>	<b>Culture</b>	<b>Gram Stain Pathology</b>	<b>Inflammatory Cells</b>
<b>≤ 25 (106)</b>	<b>88/100 (88)</b>	<b>76/106 (72)</b>	<b>51/63 (81)</b>	<b>4/63 (14)</b>
<b>25-50 (113)</b>	<b>85/101 (84)</b>	<b>40/108 (37)</b>	<b>50/70 (71)</b>	<b>17/70 (24)</b>
<b>51-75 (57)</b>	<b>37/50 (74)</b>	<b>7/54 (13)</b>	<b>21/39 (54)</b>	<b>12/39 (31)</b>
<b>76-&gt;100 (102)</b>	<b>49/77 (64)</b>	<b>7/91 (8)</b>	<b>47/89 (53)</b>	<b>22/89 (25)</b>
<b>≤ 1 mo off (22)</b>	<b>7/15 (47)</b>	<b>0/19 (0)</b>	<b>9/20 (45)</b>	<b>4/20 (20)</b>
<b>&gt; 1 mo off (33)</b>	<b>4/18 (22)</b>	<b>1/22 (5)</b>	<b>6/25 (24)</b>	<b>9/25 (36)</b>

**Morris, et al., CID 2003; 36:697-704.**

## Recurrent IE After Surgery in 358 IE Cases\* (1 in 221 NVE, 2 in 65 Mechanical PVE)

Variable (N)	Relapse/Total Cases	
	Yes	No
Antibiotic > 3 wks (358)	2/236	1/122
Perivalve invasion (358)	1/131	2/227
Positive valve culture (341)	1/116	1/225**
Positive gram stain (322)	1/244	1/78
Bacteria in histopath (225)	0/157	1/98

\*49% had < 50% Rx course; 38% staph, 34% strep, 28% other

\*\*Relapses 0/54 Rx  $\leq$  14 d, 1/170 Rx 14 - >43 d

Morris, et al., CID 2005; 41:187.

# Antibiotic Duration After Surgery for IE

Valve Culture, Perivalve Extension	No. Cases	1963-93 Days Rx*	No. Cases	1994-99 Days Rx*
<b>Positive</b>				
Extension	31	36 (28-42)	22	28 (21-28)
No extension	39	29 (28-41)	25 <sup>#</sup>	28 (21-30)
<b>Negative</b>				
Extension	63	28 (25-42)	13	14 (14-28)
No extension	112 <sup>**</sup>	27 (17-28)	36	14 (9-20)

\* Median (interquartile range)

\*\*Relapse NVE viridans strep

# Relapse PVE *S. epidermidis*

Morris, et al., CID 2005; 41:187.

# Rationale for Changes in AHA IE Prophylaxis Guidelines

- Bacteremia: Tooth brushing 154,000 times greater/yr than single extraction, daily activity possibly  $5.6 \times 10^6$  greater/yr
- Antibiotics do not eliminate bacteremia, not clear reduces IE
- No prospective studies of prophylaxis efficacy
- Case controlled study dental event not increased in IE
- If 100% effective, antibiotics prevent rare cases of IE

Wilson, et al., AHA Committee. Circulation Online 4/19/07



# Rationale for Changes in AHA IE Prophylaxis Guidelines

- Estimates of IE risk with dental procedure
  - MVP 1:1.1 million      PV  $1:114 \times 10^3$
  - CHD  $1:475 \times 10^3$       Prior IE  $1:95 \times 10^3$
  - RHD  $1:142 \times 10^3$
- Adverse reactions, cost, malpractice
- Lifetime IE risk wrong target
- Data less convincing for GU/GI procedures, thus no prophylaxis advised

Wilson, et al., AHA Committee. Circulation Online 4/19/07

# **Cardiac Conditions Associated with High Risk for Adverse Outcome Prophylaxis Advised with Dental Work**

- **Prosthetic cardiac valve**
- **Prior IE**
- **Congenital heart disease (CHD)**
  - **Unrepaired cyanotic CHD includes shunts/conduit**
  - **Repaired CHD with prosthetic material (within 6 mos)**
  - **Repaired CHD with residual defect**
- **Cardiac transplant with valvulopathy**

**Wilson, et al., AHA Committee. Circulation Online 4/19/07**

# Risk of Endocarditis After Correction of Congenital Heart Disease

Lesion (Cases)	Pt Years Follow-Up	Cases	Cumulative % (yrs)	Cases/1000 % (yrs)
Aortic valve stenosis (178)	1814	13*	20.6	7.2
Prosthetic valve		3	26.0 (10)	
No prosthesis		10	15.0 (25)	
Pulmonary atresia/VSD (50)	262	3 <sup>#</sup>	6.4 (10)	11.5
Pulmonary atresia (32)	157	1*	5.3 (10)	6.4
Coarctation (563)	6675	3*	3.5 (30)	1.2
Tetrology of Fallot (430)		5*	1.3 (30)	0.7
VSD (557)	6310	4*	4.1 (30)	0.6
Dextrotransposition great arteries (208)	1390	1	4.0 (20)	0.7
Primum ASD/cleft mitral (114)	1117	2	2.8 (20)	1.8
Complete A-VSD (165)	996	1	1.1 (15)	1.0

\*Residual surgical or congenital abnormalities

<sup>#</sup>Conduit placed

Morris et al. JAMA. 1998; 279:599-603.

# Prophylaxis with Dental Procedures Involving Gingival or Periapical Manipulation

Agent	Single Dose*
Amoxicillin	2 gm PO
Ampicillin	2 gm IM/IV
Cefazolin/Ceftriaxone*	1 gm IM/IV
Cephalexin*	2 gm PO
Clindamycin	600 mg PO/IM/IV
Azithro/Clarithro	500 mg PO

**\*Not used if pen/ampi causes anaphylaxis, urticaria, angioedema**

**Wilson, et al., AHA Committee. Circulation Online 4/19/07**

# Prevention of Endocarditis in High Risk Patients

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- Treat GU infection before manipulation, cover enterococci
- Prophylaxis for respiratory tract (mucosal) surgery (tonsillectomy, bronchoscopic surgery)
- Treat infected (*S. aureus*, streptococci) skin or skin structures before or with procedure

# New Major References

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- **Infective Endocarditis**

**Diagnosis, Antimicrobial Therapy, and  
Management of Complications.**

**Statement of the AHA**

**Baddour, LM et al. Circ 2005;111: e394-e433.**

- **Prevention of Infective Endocarditis. A  
Guideline from the AHA. Wilson,W et al.  
Circulation online 4/19/2007.  
<http://circ.ahajournals.org>**