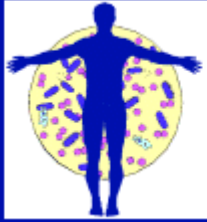




SBIMC  
BVIKM



Société belge d'infectiologie et de microbiologie clinique

Belgische vereniging voor infectiologie en klinische microbiologie

## **Catheter-related infections: practical aspects in 2003**

A joint meeting of the *Société Belge d'Infectiologie et de Microbiologie Clinique / Belgische Vereniging voor Infectiologie en Klinische Microbiologie* (21st meeting) and the *Groupement pour le Dépistage, l'Etude et la Prévention des Infections Hospitalières / Group ter Opsporing, Studie en Preventie van Infecties in de Ziekenhuizen*

**Thursday 20th November 2003**

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# Treatment of Catheter-related infections: General management.

Bart Rijnders  
Erasmus Medical Center  
The Netherlands



## Introduction:

Management of CRI most often is the management of a patient with *suspected* CRI.

# Introduction:

<b>Catheters Removed</b>	<b>Confirmed CRBSI</b>	<b>%</b>	<b>Reference</b>
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# Introduction:

## FEMORAL AND SUBCLAVIAN CATHETER-RELATED COMPLICATIONS

1.81-11.23;  $P = .001$ ); and catheter insertion during the night (OR, 2.06; 95% CI, 1.04-4.08;  $P = .03$ ).

**Infectious Complications.** Infectious complications were analyzed in 270 (93.4%) of the 289 patients randomized (TABLE 3). Among the 19 patients with no catheter tip culture, 7

catheters could not be inserted, 4 were grossly contaminated during removal, and 8 were removed without notification of the investigator. Catheters were removed because of suspicion of catheter-related sepsis in 31 patients in the femoral group and 37 patients in the subclavian group ( $P = .44$ ). Catheter-

related infectious complications were recorded in 27 (19.8%) of the femoral catheters and 6 (4.5%) of the subclavian catheters ( $P < .001$  by log-rank test). The incidence densities of infectious complications were 20 per 1000 femoral catheter-days and 3.7 per 1000 subclavian catheter-days. There were 6

**Table 3. Catheter-Related Infectious Complications**

Code <sup>a</sup>	Classification	Femoral Group, No. (n = 134)	Subclavian Group, No. (n = 136)	P Value <sup>†</sup>
NA	Sterile	100	127	NA
1	Contamination (<1000 colony-forming units/mL and no clinical sepsis)	7	3	NA
2	Colonization (≥1000 colony-forming units/mL and no clinical sepsis)	19	3	] .07 ] <.001
3	Clinical sepsis without bloodstream infection	4	1	
4	Clinical sepsis with bloodstream infection	2	1	
5	Unable to discriminate between codes 2 and 3	2	1	

<sup>a</sup>Codes 2, 3, 4, and 5 were collectively considered catheter-related infectious complications. Codes 3 and 4 were considered major catheter-related infectious complications. NA indicates not applicable.

<sup>†</sup>Calculated using the log-rank test, comparing codes 3+4 in femoral vs subclavian groups and comparing codes 2-5 in femoral vs subclavian groups.

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# Introduction:

**Table 2.** Clinical findings and reasons for catheter removal

Data	New Hub Model Segur-Lock <i>n</i> = 116	Control Group Luer- Lock Connector <i>n</i> = 114	<i>p</i> Value
Insertion site			NS
Normal	93 (80.2)	81 (71.0)	
Swelling/tenderness	19 (16.4)	29 (25.2)	
Suppuration	4 (3.4)	4 (3.5)	
Systemic symptoms			.028
Persistent fever, $\geq 38^{\circ}\text{C}$	24 (20.7)	28 (24.6)	
Shaking chills	18 (15.5)	20 (17.5)	
Septic shock	2 (1.7)	11 (9.6)	
No symptoms	72 (62.1)	55 (48.2)	
Reasons for removal			
No longer needed	58 (50)	39 (34.2)	.018
Suspicion of CRBI	35 (30.2)	50 (43.8)	.035
Local infection	3 (2.6)	7 (6.1)	NS
Clotted catheter/thrombosis	5 (4.3)	4 (3.5)	NS
Death	15 (12.9)	14 (12.3)	NS

CRBI, catheter-related bloodstream infection. Data given as absolute number (%).

# Introduction:

**Table 3.** Catheter-related bloodstream infection rates

Catheter-Related Sepsis	New Hub Model Segur-Lock <i>n</i> = 116	Control Group Luer- Lock Connector <i>n</i> = 114	<i>p</i> Value
Total	6 (5.1)	13 (11.4)	NS
Infusate-related sepsis	1 (0.8)	1 (0.9)	NS
Skin-related sepsis	3 (2.5)	4 (3.5)	NS
Hub-related sepsis	2 (1.7)	8 (7.0)	.049
Hub- and skin-related sepsis	1 (0.8)	2 (1.7)	NS
Infections/1000 catheter days			
Total	4.8	10.2	NS
Hub-related sepsis	1.6	6.3	.06
Positive tip culture	1.6	9.4	.008
Positive hub culture	11.2	21.9	.03

Data as absolute numbers (%).

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<hr/>			
N=275	n=71	26%	

# Introduction:

## Why ?

- Quantitative blood cultures = rarely available
- Peripheral BC = “not done” in pediatric patients
- Brush and AOLC = costly single centre experience
- DTTP
  - ✓ Well validated for long term CVCs  
LANCET 1999. Blot et al. Clin Inf Dis 2003 Gaur et al.
  - ✓ Disappointing when used in ICU setting  
Crit Care Med 2001. Rijnders et al

# Suspected CRI

= Patient with unexplained new symptoms and signs (clinical, haematological, biochemical) compatible with infection and CRI is one of the possible infections.

In ICU patients this is by far the most frequent situation and not a new bacteremia from an unknown source.



# Suspected CRI

We ask ourselves questions like

1. Is catheter needed / will replacement be hazardous ?
2. Is the patient HD stable ?
3. Is this patient at particular risk when a CRBSI is subsequently confirmed ?
4. Other possible explanations for symptoms ?

# Suspected CRI

In a setting of uncertainty we have to decide in which subpopulation we will remove the catheter and in which we can watchfully wait.

IDSA guidelines for the diagnosis and treatment of CRI suggest that;

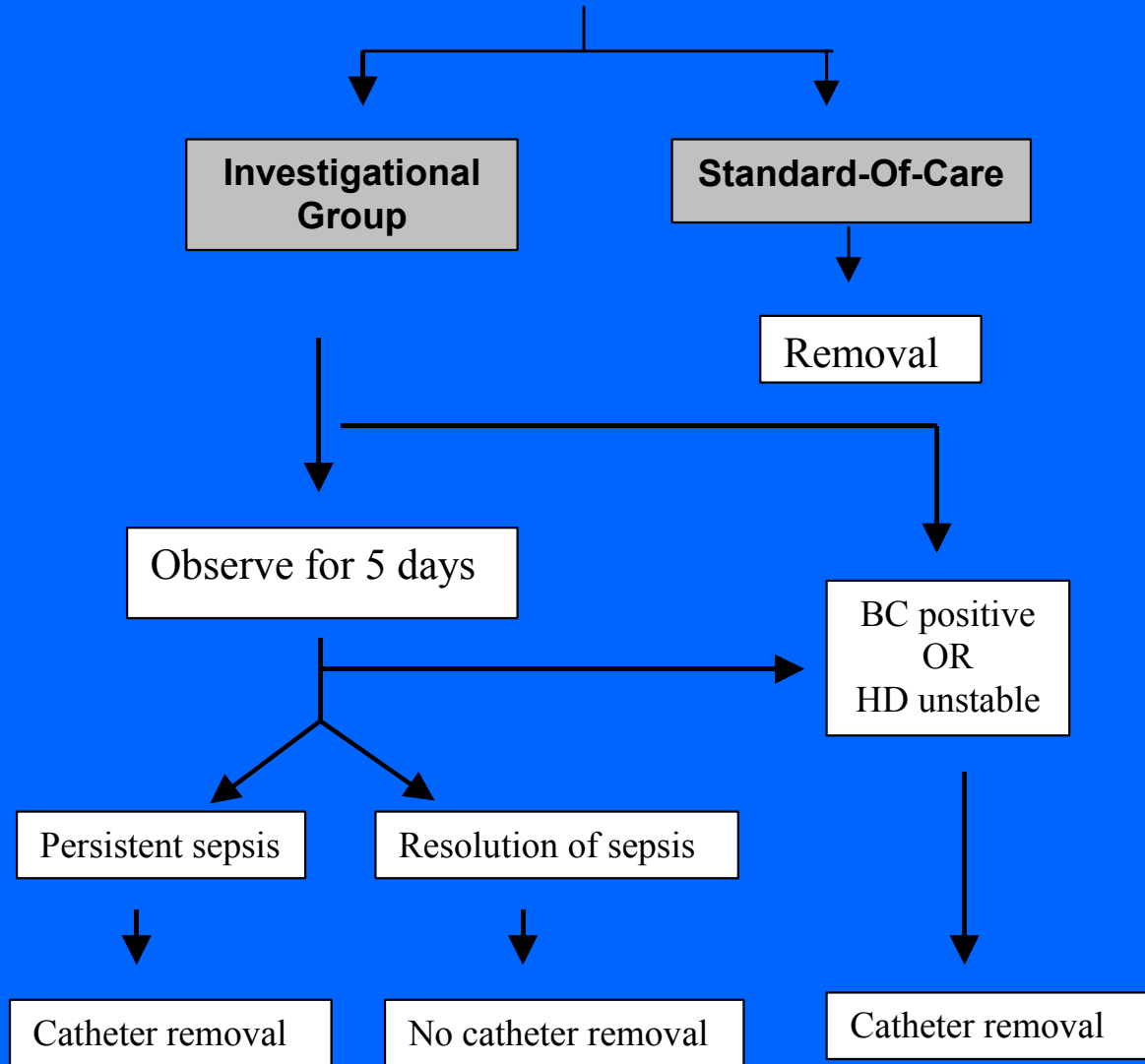
*“non-tunneled central venous catheters should not be routinely removed in patients with unexplained fever and mild to moderate disease”*

# Suspected CRI

*Included:* All consecutive ICU pts in which CVC change for suspected CR-infection was planned by the treating physician.

*Excluded:*

1. Haemodynamically unstable patient
2. Confirmed bacteraemia
3. Suppuration or frank erythema/induration at insertion site
4.  $<500/\text{mm}^3$  neutrophils, intravascular FB, recent transplantation
5. Previously included, DNR



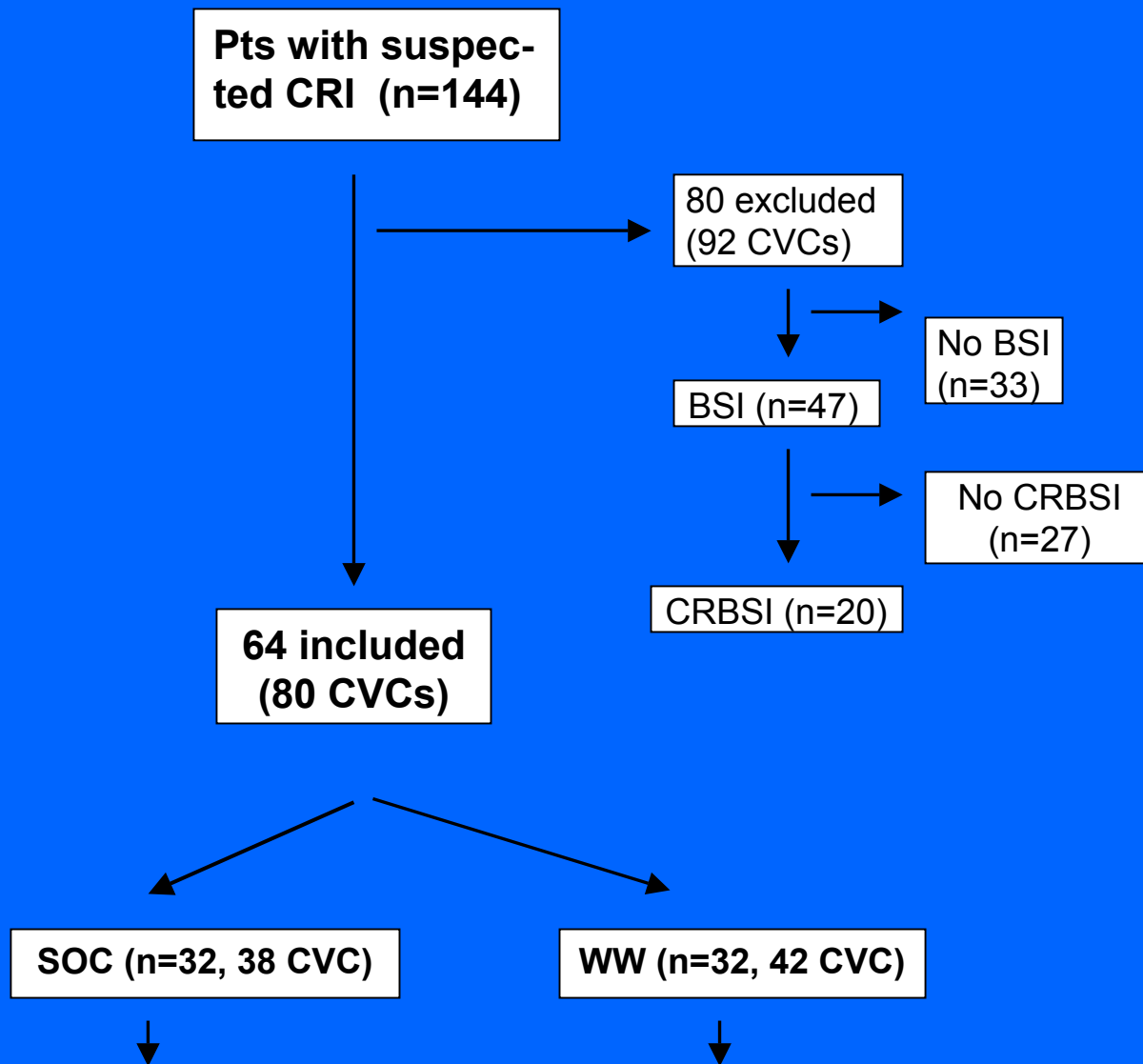
# Suspected CRI

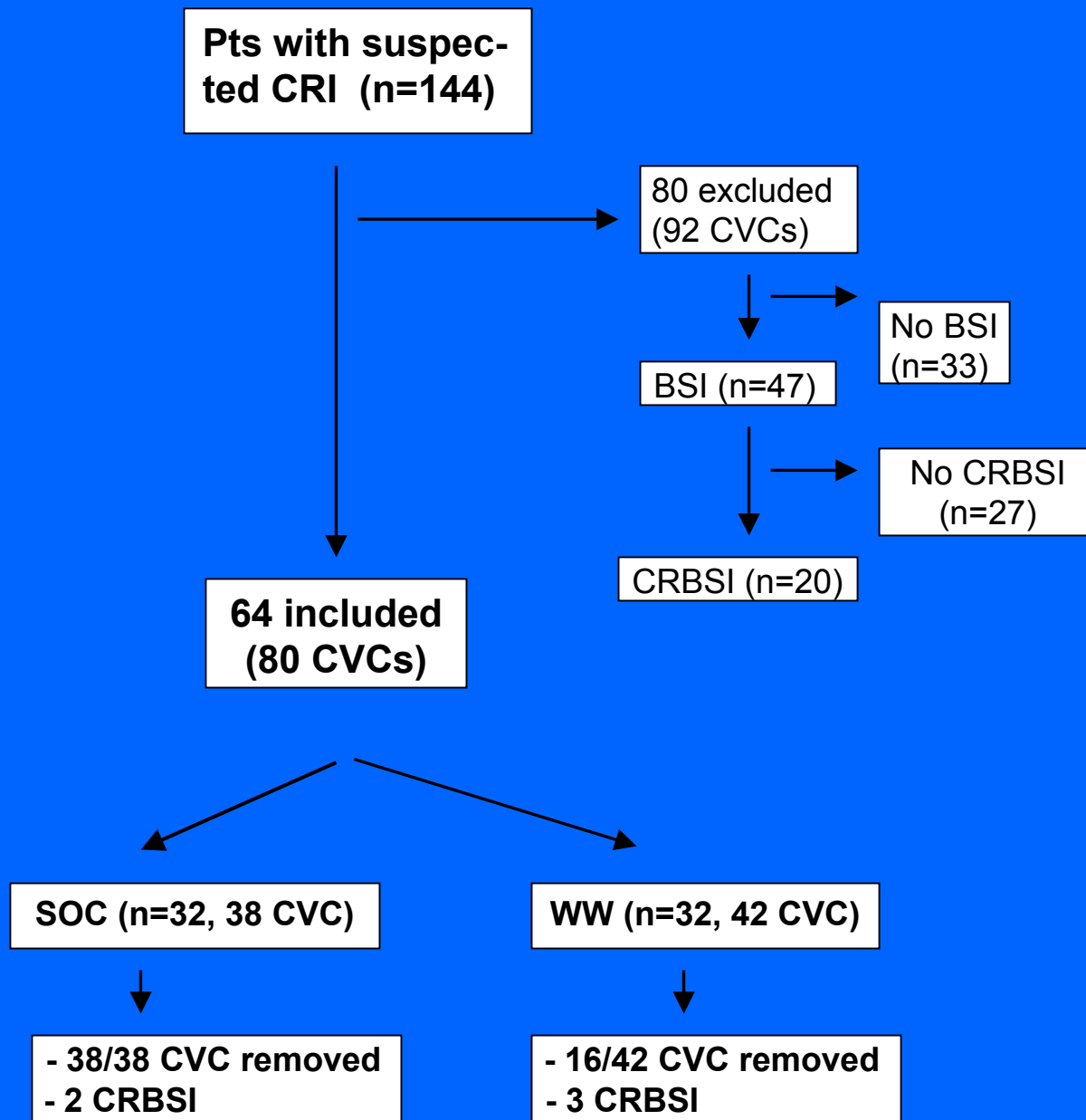
144 patients evaluated

64 of 144 pts (44.5%) could be included.

Reasons for excluding 80 of 144 evaluated patients:

	(n=)
<b>Bloodstream infection</b>	36
<b>HD unstable</b>	31
<b>Inflamed/purulent ins. site</b>	18
<b>High risk patient</b>	12
<b>Other</b>	4





# Suspected CRI

- 38/38 CVC changes in SOC  $\Leftrightarrow$  16/42 in WW or a 62 % reduction (p<0.01)
- 4 of the 16 removals in the WW group for a diagnosis of bacteremia (3 with CRBSI or 9%).



		<b>SOC</b>	<b>WW</b>	
<b>CVC changes</b>		38/38	16/42	p<0.01
<b>CRBSI</b>		2	3	p>0.2
<b>Duration of Hosp.</b>		42	34	p>0.2
<b>ICU Mortality</b>		10/32	8/32	p>0.2
<b>T (°C)</b>	d 1	37.9	38.4	p=0.02
	d 5	37.6	37.6	p>0.2
	d 10	37.5	37.4	p>0.2
<b>CRP (mg/l)</b>	d 1	128	155	p>0.2
	d 5	100	134	p>0.2
	d 10	85	104	p=0.15
<b>SOFA score</b>	d 1	6.1	6.9	p>0.2
	d 5	5.4	6.2	p>0.2
	d 10	5.3	5.8	p>0.2

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# Suspected CRI

*Did exclusion criteria select for patients with CRBSI ?*

CRBSI in 5/64 included pts  $\Leftrightarrow$  20/80 excluded pts (p=0.01)

*Was antibiotic use increased in the WW group ?*

New antimicrobial added during follow-up:

13/32 in the WW  $\Leftrightarrow$  22/32 in SOC (p=0.04)

# Suspected CRI

- Data suggest that in a subset of ICU patients, CVC change can be safely avoided.
- The extent of this subset will largely depend on the habits/routine of the individual ICU / physician.

# Suspected CRI

This algorithm has not been validated in Non-ICU patients but considerations / exclusion criteria will be identical

However

- *Watchful* waiting out of the ICU possible ?
- A priori probability of CRI sometimes higher ?

# Suspected CR-bloodstream infection

Bacteremia without an obvious other source and short-term catheter; *Catheter removal whenever possible*

Tunneled and totally implanted catheters;

Failure or relapse rate varies substantially

172 CRBSI : 15 immediately removed  
149 short-term salvage (87%)  
131 (76%) at 12m

JCO 2003. Flynn et al.

50 CRBSI : 10 immediately removed  
32 (64%) short term salvage  
23 (46%) 6m salvage

UZ Leuven data

# CR-bloodstream infection

**Factors that influence the risk of relapse probably are**

1. (leaving the catheter in place)
2. The type of catheter
3. The duration of the antibiotic treatment given
4. Use of AB / antiseptic Lock or not ?
5. Catheter-tip situated in a intravascular thrombus
6. Immune status of the patient ?

# CR-bloodstream infection

## 2. The type of catheter

Relapse in 8/18 or 44% of “early salvaged” CRBSI in ports

Relapse in 10/131 or 8% of CRBSI in tunneled catheters

J of Clin Oncol 2003. Flynn et al.



# CR-bloodstream infection

## 3. The duration of AB therapy

Quite reasonable but not a single RCT. Indirect evidence;

71% of CRBSI without recurrence >10d of treatment

50% of CRBSI with recurrence > 10d (p=0.05)

J of Clin Oncol 2003. Flynn et al.

# CR-bloodstream infection

## 4. The use of an antibiotic lock

Quite reasonable but not a single RCT. Indirect evidence;

11 AB lock studies for tunneled CRBSI ; catheter salvage in  
138 (82.6%) of 167

***versus***

Parenteral AB therapy in 14 open trials ; catheter salvage in  
342 (66.5%) of 514 ( $p < 0.001$ )

# CR-bloodstream infection

5. Catheter-tip situated in a intravascular thrombus
6. Immune status of the patient ?

# CR-bloodstream infection

What about the causative microorganism as a predictor of

- *Overall risk of morbidity/mortality ?*
- *Morbidity/mortality (MM) when catheter is not removed ?*
- *Successful short-term salvage ?*
- *Risk of relapse after initial salvage ?*

*Candida* CRBSI ; ↑ *MM* when CVC not removed.

Arch Intern Med 1995. Nguyen M et al.  
Clin Inf Dis 2002. Nucci M et al.

*S. Aureus* CRBSI ; Probably ↑ *M* when CVC not removed.

Clin Infect Dis 1998. Fowler V et al.  
Am J Med 1990. Dugdale D et al.

# CR-bloodstream infection

*S. epidermidis* ; predictor of relapse after initial cure.

J of Clin Oncol 2003. Flynn et al.

*Enterococci* ; Treatment successful in 5 of 13 if CVC not removed.

JAC 2002. Sandoe J et al.

- In cases of
- Corynebacterium
  - Bacillus
  - Stenotrophomonas
  - Acinetobacter
  - Non-aeruginosa pseudomonas
  - Agrobacterium
  - Mycobacterium

Catheter removal is probably preferred

## CR-bloodstream infection

*What to do when bacteremia / fungemia persists after catheter removal ?*

Continuing bacteremia (especially for *S. aureus*) or fungemia is not unusual during the first 24 (to 48h) after catheter removal.

# CR-bloodstream infection

## S. aureus

>72hrs bacteremia = predictor of complicated infection with 40% risk of complicated infection ! Arch Intern Med 2003. Fowler V et al.

- ⊕ Clinical signs of disseminated infection or venous thrombosis
- ⊕ Perform TEE : Endocarditis in 16/69 pts ⇔ 4/69 with TTE  
J Am Coll Cardiol 1997. Fowler V et al.
- ⊕ Cardiac device : Of 33 pts, 45% (!) had a device infection.  
Circulation 2001. Chamis A et al.



[b.rijnders@erasmusmc.nl](mailto:b.rijnders@erasmusmc.nl)