

Where is Differential-Time-to-Positivity most relevant for catheter-related infection – if at all?

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ESCMID Course „Improving the Diagnosis of Bloodstream Infections“

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Conflict of interest

No conflict within past 3 years.

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Catheter-related infection

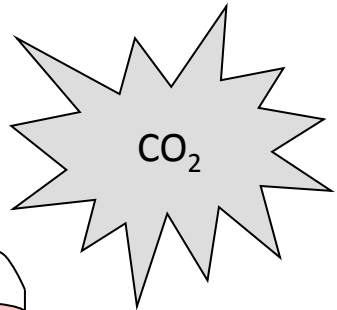
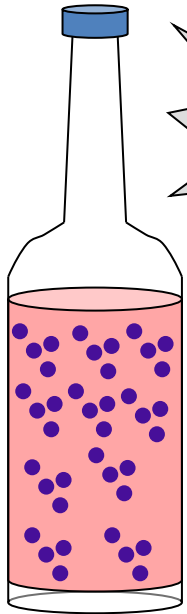
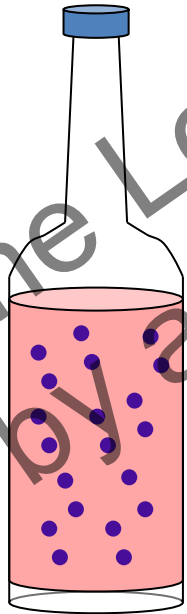
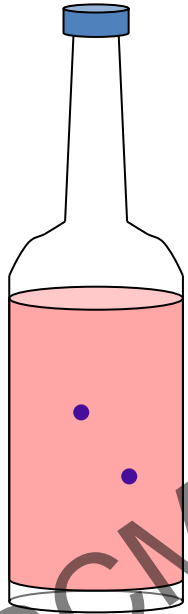
Symptoms

- Redness, swelling, pus at insertion site
- Thrombophlebitis / septic thrombosis
- SSTI

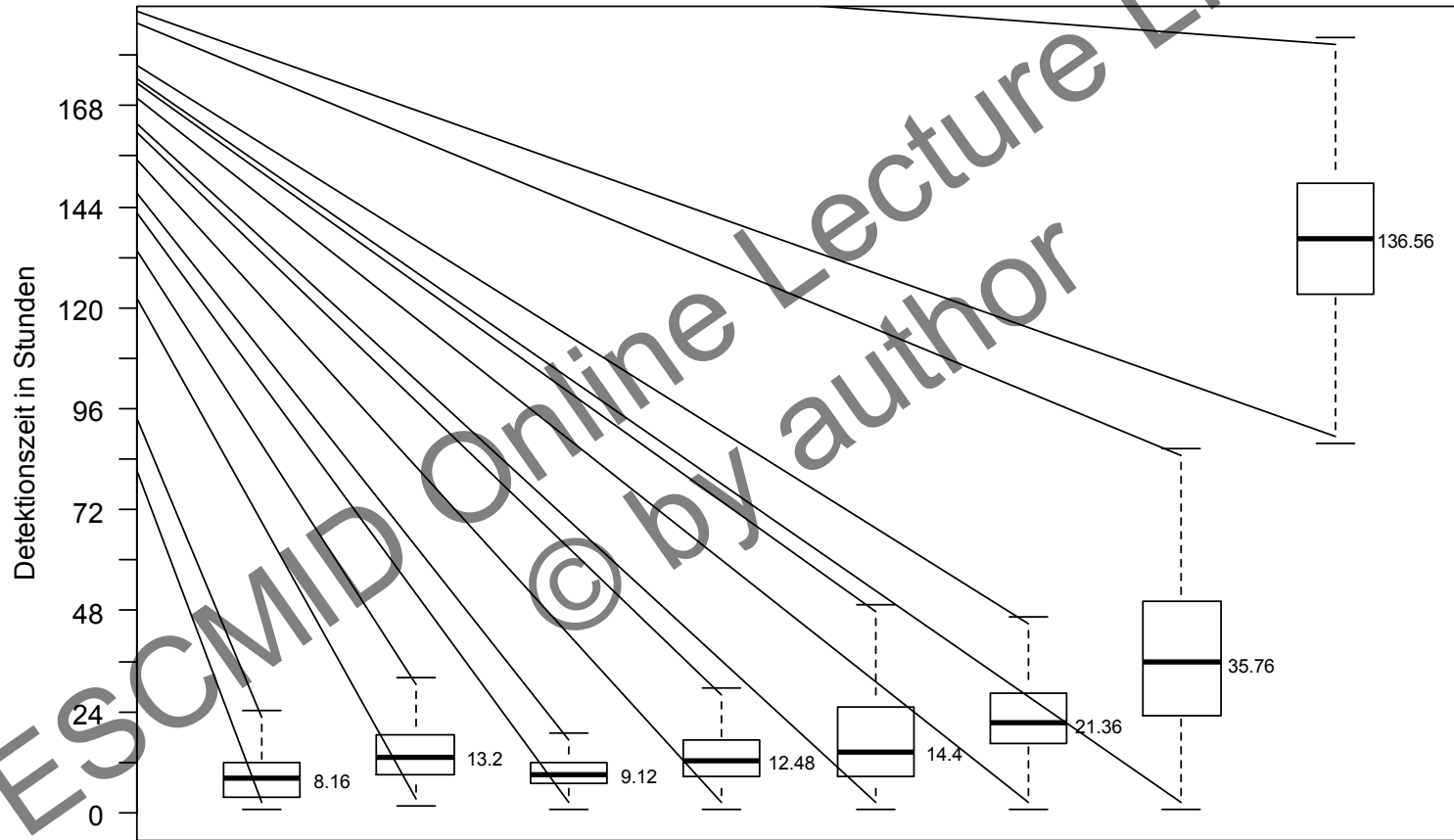
Methods

- Quantitative blood culture
- Catheter culture
- Differential-time-to-positivity (DTP)

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Time to Positivity



Enterobakterien

P. aeruginosa

Streptokokken

Enterokokken

S. aureus

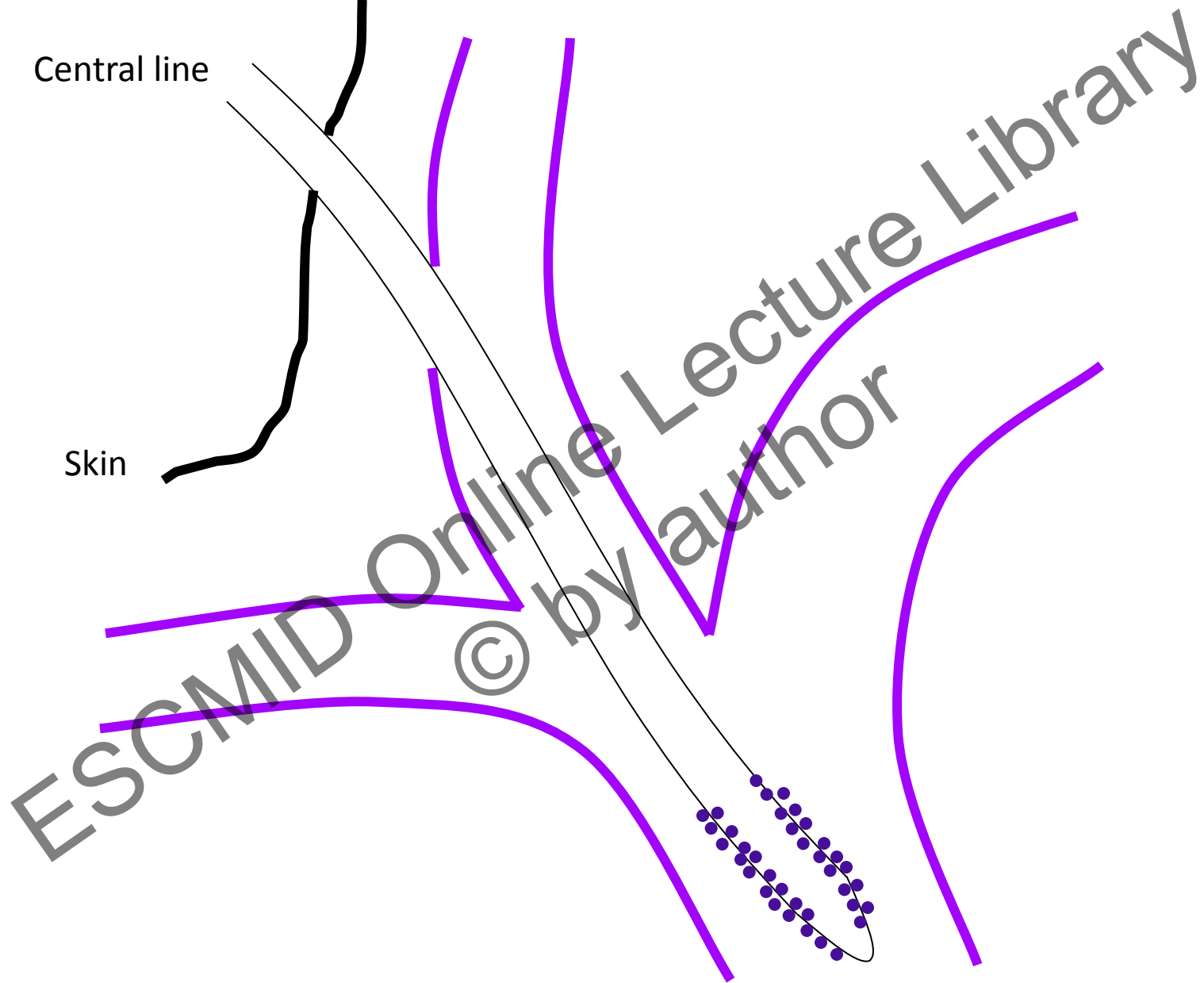
CNS

Candida spp.

Propionibakterien

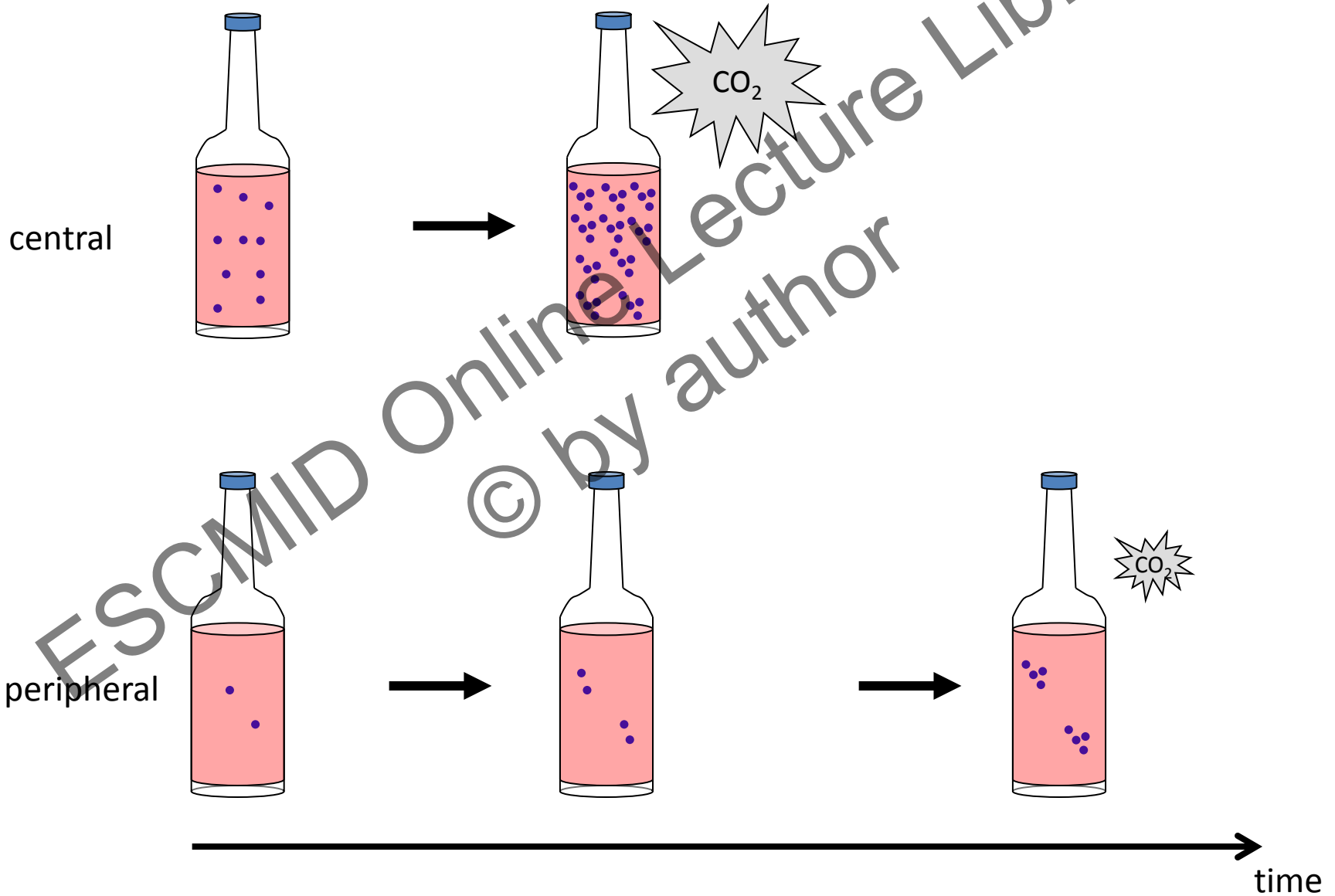
Central line

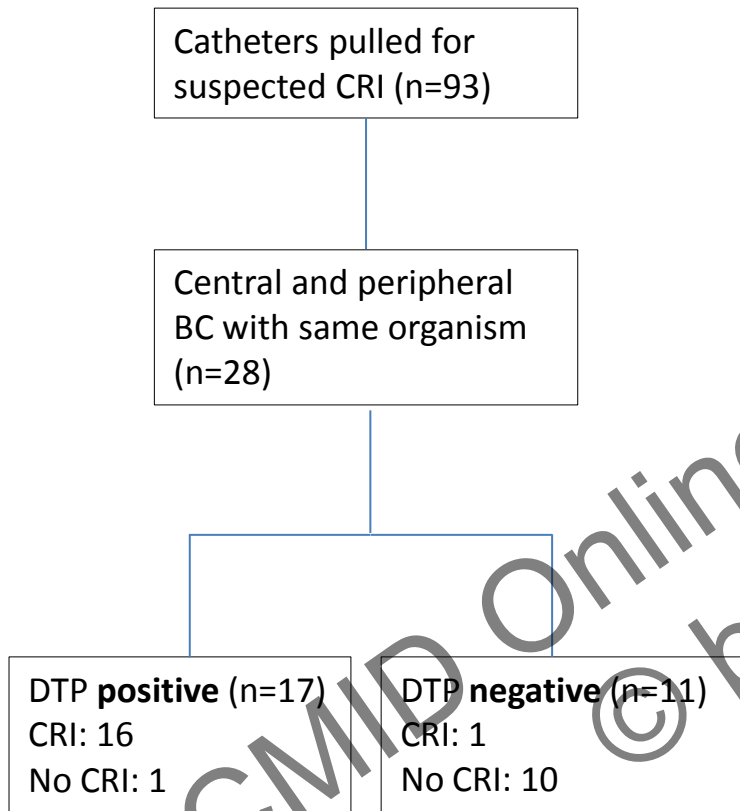
Skin



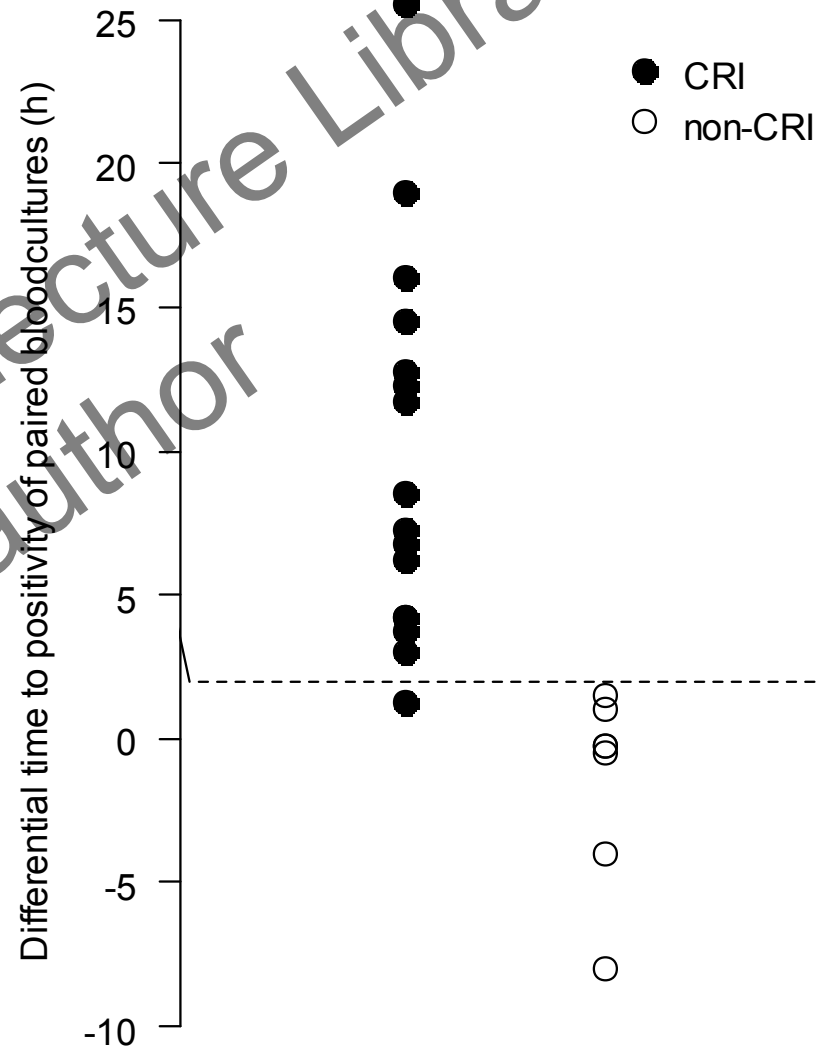
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Differential time to positivity

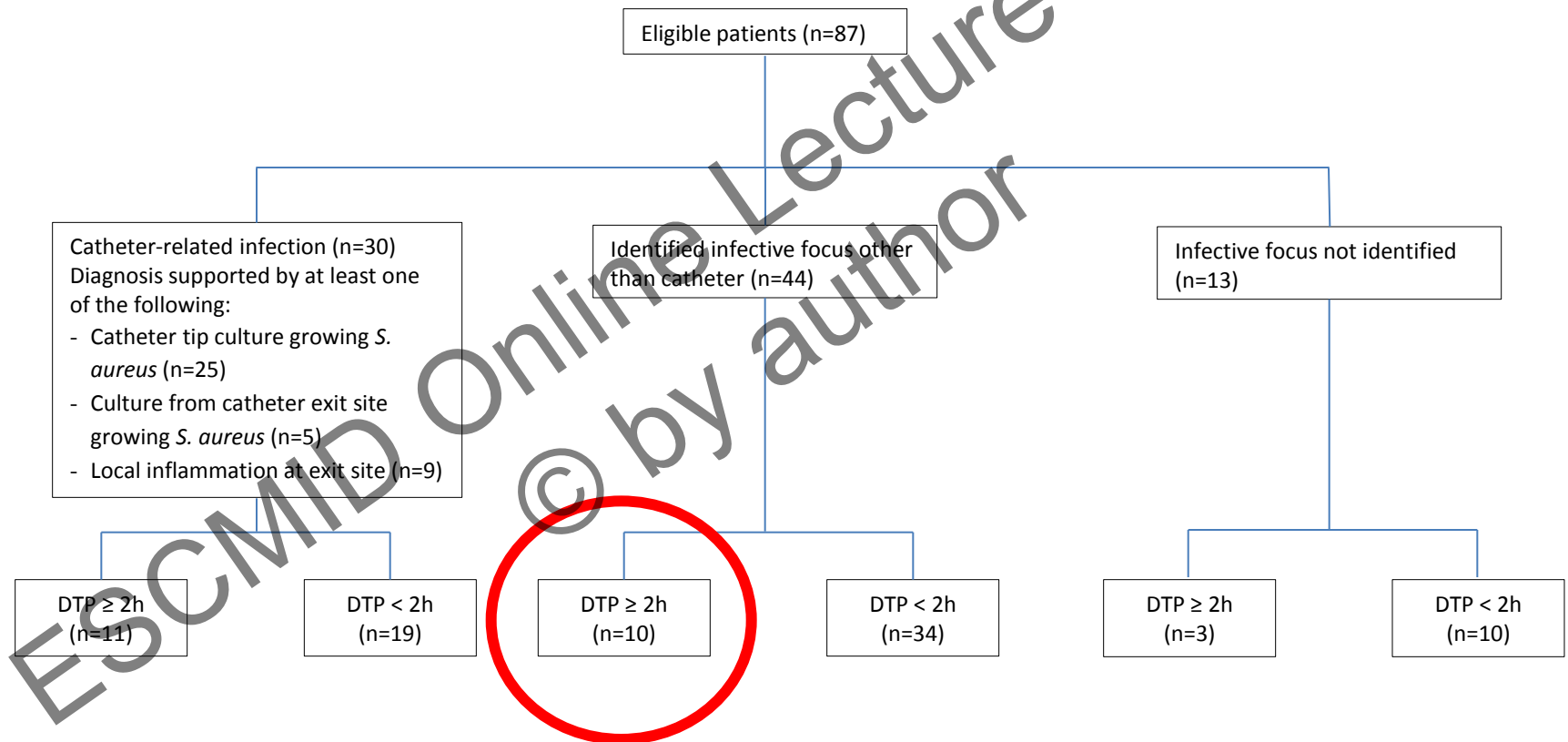




Sensitivity: 94%
 Specificity: 91%
 Positive predictive value: 94%
 Negative predictive value: 91%



DTP in Routine culture



PPV: 0.42 [0.24 – 0.61]

NPV: 0.46 [0.34 – 0.58]

Reference	Design	CRI/eval episodes (episodes)	PPV	NPV	Comments
Blot JCM 1998	Prosp. Suspected CRI	28/42 (64)	100%	93%	22 pts with indeterminate diagnosis of CRI
Blot Lancet 1999	Prosp. Suspected CRI in ICU	17/28 (93)	96%	91%	Specificity 91%, 94% sensitivity, 50% long-term catheters,
Rijnder CCM 2001	Prosp. Suspected CRI	4/10 (100)	33%	75%	25 indeterminable (only 1 BC pos [hub or peripheral]) Mixed ICU
Malgrange JCM 2001	Prosp. Suspected CRI	21/30 (213)	100%	69%	Cutoff 3h; 107 episodes not classifiable; data not clear
Seifert JCM 2003	Prosp. Suspected CRI neutropenic pts.	22/51 (181)	82%	78%	Neutropenic patients
2004 AIM Raad	Prosp.	96/191 (216)	87%	85%	Pts from Cancer center with same organism in simuleatous BCs
2005 BMT Abdelkefi	Prosp. Suspected CRI	22/38 (38)	90%	58%	Bone marrow tranplant pts, shortterm CVC
2005 CCM Catton	Prosp. Suspected CRI	26/123 (123)	87%	89%	ICU and surgical ward; comparison with quantitative culture and endoluminal brushing
2005 PBC Germanakis	?	5/19 (54)	100%	86%	Quantitative culture vs DTP; pediatric cancer pts
2007 CID Bouza	Prosp. Suspected CRI	28 (204)	61%	99%	Details missing in manuscript; ICU pts with neutropenia or blood disorders
2007 NIC Guerti	Retro. BSI	16/23 (181)	87%	38%	Neonatal ICU; cutoff of 1h was more sensitive

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2007 NIC Guerti	Retro. BSI	16/23 (181)	87%	38%	Neonatal ICU; cutoff of 1h was more sensitive
2008 PIDJ Acuna	Prosp. Suspected CRI	24/199 (344)	61%	90%	Comparison to quantitative BC, pediatrics
2009 JoI Chen	Post hoc	70/142 (271)	100%	81%	129 episodes discarded because of „other focus than catheter“; cancer patients mostly long-term CVC; comparison with catheter culture
2012 Med Garcia	Prosp. Suspected CRI	15/219 (226)	92%	99%	Medical and surgical ICU
2013 CMI Bouza	Post hoc	19/24 (108)	86%	67%	Only Candidemia patients; some data not presented
2014 JoI Kaasch	Prosp. Suspected CRI in ICU	30/87 (87)	46%	70%	Patients with S. aureus bacteremia, hospital-wide
2014 JCM Park	Prosp.	9/99 (105)	88%	78%	Only Candidemia patients
2016 B Evans	Prosp. Suspected CRI	2/20 (20)	50%	94%	Burn patients only

Overall: Sensitivity: 80%
 Specificity: 92%
 PPV: 87%
 NPV: 88%

Question

- How would you explain a false result for the „time to positivity“?

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What to consider in DTPP?

- clear labeling
- take samples in parallel
- use first portion from central line
- culture same volume
- short transport time
- influence of antimicrobials via catheter
- only interpret monomicrobial infection

Special cases

- Candidemia
- Only „hub culture“ positive
- Multi-lumen catheters
- Number of peripheral cultures required for DTP

Conclusion

- Many consider DTP as an acceptable method
- All studies are comparatively small and have flaws
- DTP can be helpful, if carefully interpreted and conducted

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Thank you

Further literature using TTP

Reference	Design	CRI/eval episodes (episodes)	PPV	NPV	Comments
2004 JCM Krause	Prosp.	16/51 (51)	-	-	Comparison with Acridine Orange leukocyte cytospin test
2005 ICM Tanguy	Prosp.	7/135 (135)	-	-	Evaluation of positive CVC BC; DTP not evaluated; ICU
2006 ICM Yebenes	-	-	-	-	DTP not measured; DTP cutoff for <i>C. albicans</i> should be 3.5h
2007 JCM Schwetz	-	-	-	-	24h storage of BC bottles at RT leads to false negative DTP
2009 JCM Kassis	Retro.	-	-	-	Time to positivity >20h is associated with less CRBSI in CoNS
2012 EJMID Guembe	-	-	-	-	1 peripheral vein BC is sufficient (
2015 PBC Handrup	-	-	-	-	Children admitted with fever; cBC only overestimates true rate of CRI
2016 PLOSone Zboromyrska	Prosp. Suspected CRI	-	-	-	GenXpert SA MRSA assay for detection of CRI in 92 patients: Sensitivity 88%, Specificity 92%