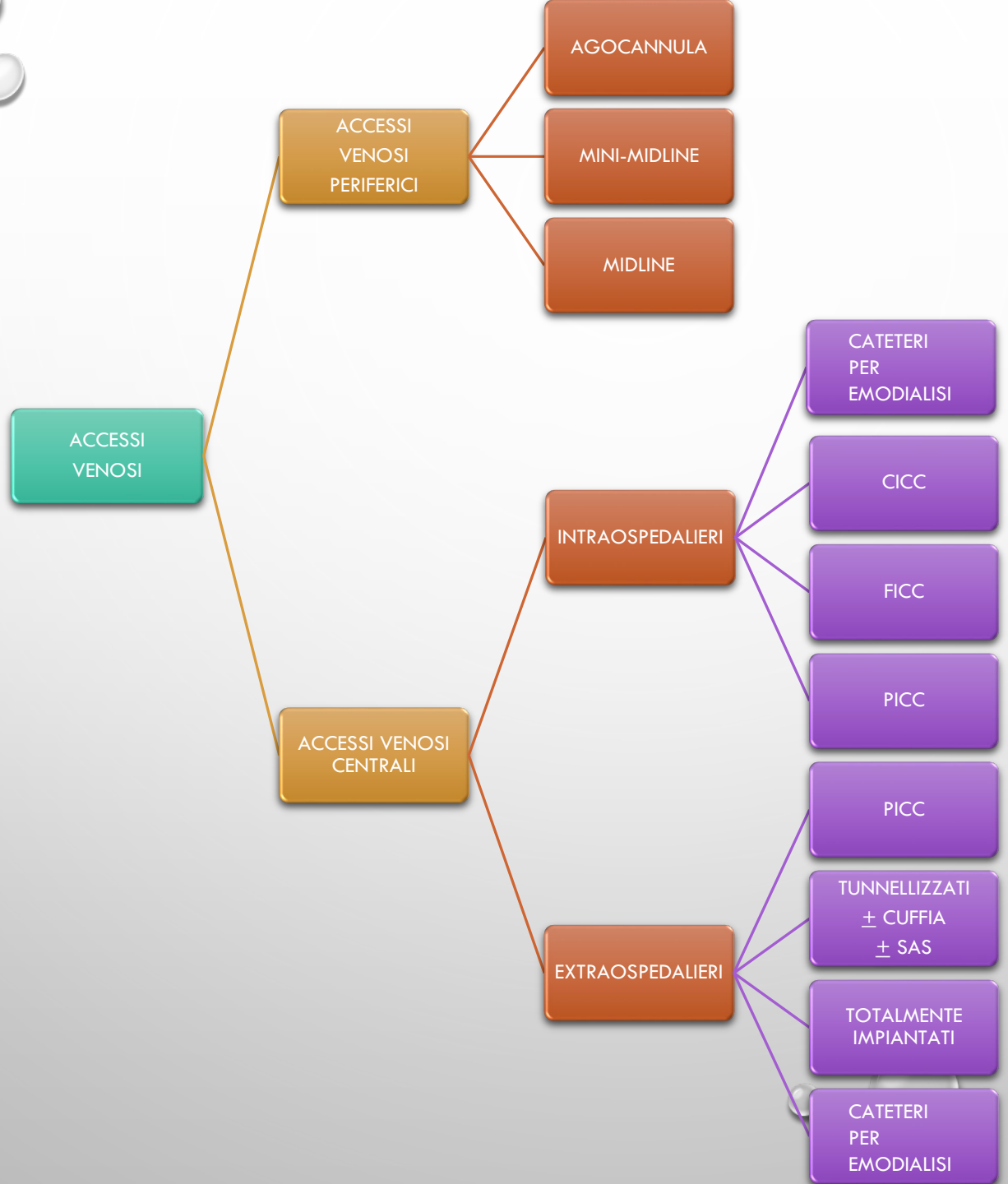
Gemelli
Fondazione Policlinico Universitario A. Gemelli
Università Cattolica del Sacro Cuore

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

LE COMPLICANZE INFETTIVE DEI DISPOSITIVI PER ACCESSO VASCOLARE: DIAGNOSI E TRATTAMENTO

GIANCARLO SCOPPETTUOLO

FONDAZIONE POLICLINICO UNIVERSITARIO "A. GEMELLI"- IRCCS - ROMA


ACCESSI VENOSI
ACCESSI VENOSI PERIFERICI
AGOCANNULA
MINI-MIDLINE
MIDLINE
ACCESSI VENOSI CENTRALI
INTRAOSPEDALIERI
CATETERI PER EMODIALISI
CICC
FICC
PICC
EXTRAOSPEDALIERI
PICC
TUNNELLIZZATI ± CUFFIA ± SAS
TOTALMENTE IMPIANTATI
CATETERI PER EMODIALISI

PRIMA TENTAZIONE DEL MEDICO….

- ATTRIBUIRE IMMEDIATAMENTE LA RESPONSABILITA' DELLA FEBBRE AL CV, ANCORA PRIMA DI AVERE ESEGUITO ALCUNA INDAGINE DIAGNOSTICA
  - SOPRATTUTTO NEL PAZIENTE OSPEDALIZZATO (MA ANCHE NEL PAZIENTE DOMICILIARE) IL CV **È SOLO UNA DELLE POSSIBILI CAUSE DI INFEZIONE**
- RIMUOVERE IL CATETERE VASCOLARE
  - IN LETTERATURA È BEN DESCRITTO CHE CIRCA IL 70% DEI CVC RIMOSSI SOLO CON CRITERIO EMPIRICO NON HANNO RAGIONE DI ESSERE RIMOSSI
  - CRITERI PER LA RIMOZIONE IMMEDIATA DI UN CATETERE VASCOLARE? SI, MA IN CASI SELEZIONATI
- RICHIEDERE SUBITO DOPO LA RIMOZIONE IL POSIZIONAMENTO DI UN NUOVO CATETERE…

Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America

Leonard A. Mermel,[1] Michael Allon,[2] Emilio Bouza,[9] Donald E. Craven,[3] Patricia Flynn,[4] Naomi P. O'Grady,[5] Issam I. Raad,[6] Bart J. A. Rijnders,[10] Robert J. Sherertz,[7] and David K. Warren[8]

[1]Division of Infectious Diseases, Warren Alpert Medical School of Brown University, Providence, Rhode Island; [2]University of Alabama-Birmingham Hospital, Birmingham, Alabama; [3]Tufts University School of Medicine, Lahey Clinic Medical Center, Burlington, Massachusetts; [4]St. Jude Children's Research Hospital, Children's Infection Defense Center, Memphis, Tennessee; [5]National Institutes of Health, Critical Care Medicine Department, Bethesda, Maryland; [6]Section of Infectious Diseases, University of Texas-Cancer Center, Houston; [7]Section of Infectious Diseases, Wake Forest University School of Medicine, Winston-Salem, North Carolina; [8]Division of Infectious Diseases, Washington University School of Medicine, St Louis, Missouri; [9]Servicio de Microbiología Cliínica y E. Infecciosas Hospital General "Gregorio Marañón," Madrid, Spain; and [10]Internal Medicine and Infectious Diseases, Erasmus University Medical Center, Rotterdam, the Netherlands

Med Intensiva. 2018;42(1):5–36

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CONSENSUS STATEMENT

Diagnosis and treatment of catheter-related bloodstream infection: Clinical guidelines of the Spanish Society of Infectious Diseases and Clinical Microbiology and (SEIMC) and the Spanish Society of Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC)☆

F. Chaves[a], J. Garnacho-Montero[b,*], J.L. del Pozo (Coordinators)[c], Authors: E. Bouza[d], J.A. Capdevila[e], M. de Cueto[f], M.Á. Domínguez[g], J. Esteban[h], N. Fernández-Hidalgo[i], M. Fernández Sampedro[j], J. Fortún[k], M. Guembe[l], L. Lorente[m], J.R. Paño[n], P. Ramírez[o], M. Salavert[p], M. Sánchez[q], J. Vallés[r]

CONCISE COMMUNICATION

Unnecessary Removal of Central Venous Catheters in Cancer Patients with Bloodstream Infections

Anne Marie Chaftari, MD;[1] Ray Hachem, MD;[1]
Sammy Raad, MS;[1] Ying Jiang, MS;[1]
Elizabeth Natividad, RN;[2] Patrick Chaftari, MD;[3]
Issam Raad, MD[1]

We evaluated the rate of central venous catheter (CVC) removal in 283 cancer patients with bloodstream infections (BSIs). Removal of CVCs occurred unnecessarily in 57% of patients with non-central-line-associated BSI (non-CLABSI), which was equivalent to the rate of CVC removal in patients with CLABSIs. Physician education and safe interventions to salvage the vascular access are warranted.

Infect Control Hosp Epidemiol 2018;1–4

from our institutional review board and a waiver of informed consent was obtained.

Statistical Analysis

Descriptive statistics were used to summarize patients' demographics and clinical characteristics.

The χ^2 or Fisher exact tests were used to compare categorical variables, as appropriate. Continuous variables were compared using Wilcoxon rank-sum tests because of the data's deviation from normal distribution. All tests were 2-sided, and statistical significance was set at *P*-value of .05. The statistical analyses were performed using R statistical software (version 3.2.1; R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

We identified 283 patients who had a CVC and had simultaneous blood cultures drawn from the CVC and the peripheral

CRITICAL CARE

RESEARCH Open Access

Should central venous catheter be systematically removed in patients with suspected catheter related infection?

Leonardo Lorente[1*], María M Martín[2], Pablo Vidal[3], Sergio Rebollo[4], María I Ostabal[5], Jordi Solé-Violán[6] and Working Group on Catheter Related Infection Suspicion Management of GTEIS/SEMICYUC

Abstract

Introduction: Best clinical practice for patients with suspected catheter-related infection (CRI) remains unclear according to the latest Infectious Diseases Society of America (IDSA) guidelines. Thus, the objective of this study was to analyze clinical practice concerning the central venous catheter (CVC) and its impact on prognosis in patients with suspected CRI.

Methods: We performed a prospective, multicenter, observational study in 18 Spanish Intensive Care Units (ICUs). Inclusion criteria were patients with CVC and suspected CRI. The following exclusion criteria were used: age less than 18 years; pregnancy; lactation; human immunodeficiency virus; neutropenia; solid or haematological tumor; immunosuppressive or radiation therapy; transplanted organ; intravascular foreign body; haemodynamic instability; suppuration or frank erythema/induration at the insertion site of the CVC, and patients with bacteremia or fungemia. The end-point of the study was mortality at 30 days of CRI suspicion.

Results: The study included 384 patients. In 214 (55.8%) patients, CVC was removed at the moment of CRI suspicion, in 114 (29.7%) CVC was removed later and in 56 (14.6%) CVC was not removed. We did not find significant differences between survivors (n =311) and non-survivors (n =73) at 30 days according to CVC decision (P =0.26). The rate of confirmed catheter-related bloodstream infection (CRBSI) was higher in survivors than in non-survivors (14.5% versus 4.1%; P =0.02). Mortality rate was lower in patients with CRBSI than in the group of patients whose clinical symptoms were due to other causes (3/48 (6.25%) versus 70/336 (20.8%); P =0.02). We did not find significant differences in mortality in patients with confirmed CRBSI according to CVC removal at the moment of CRI suspicion (n =38) or later (n =10) (7.9% versus 0; P =0.99).

Conclusion: In patients with suspected CRI, immediate CVC removal may be not necessary in all patients. Other aspects should be taken into account in the decision-making, such as vascular accessibility, the risk of mechanical complications during new cannulation that may be life-threatening, and the possibility that the CVC may not be the origin of the suspected CRI.

DIFFICOLTÀ DIAGNOSTICHE

- CRITERI CLINICI (FEBBRE, BRIVIDI…) ASSOLUTAMENTE POCO SPECIFICI
- CLINICA ESTREMAMENTE POLIMORFA (FEBBRE ISOLATA CON CARATTERISTICHE VARIABILI FINO A SEPSI E SHOCK SETTICO)
- SEGNI LOCALI DI INFEZIONE MOLTO SPECIFICI MA POCO SENSIBILI

DIFFICOLTÀ DIAGNOSTICHE

- DIFFERENTI TESTS DI LABORATORIO, CON DIVERSA SENSIBILITÀ E SPECIFICITÀ

CLABSI/LCBSI E CRBSI

Table 1.

Two definitions of central venous catheter-related bloodstream infections

Bloodstream infection	Definitions
Catheter-related bloodstream infection	Clinical signs of sepsis and positive peripheral blood culture in the absence of an obvious source other than CVC with one of the following:
	Positive semiquantitative (>15 CFU) or quantitative (>103 CFU) culture from a part of the catheter with the same organisms isolated peripherally
	Simultaneous quantitative blood cultures with a ratio of ≥3:1 (CVC vs. peripheral)
	Time difference of ≤2 hours leading to culture positive between CVC and peripheral cultures
Central line-associated bloodstream infection	Primary bloodstream infection in a patient who had a central line within the 48 hours period before development of infection
	Infection must not be related to an alternative cause

CVC, central venous catheter; CFU, colony forming unit.

Adapted from Bell T, et al. Infect Dis Clin North Am 2017;31:551-9, with permission of Elsevier. [3]

NHSN
NATIONAL HEALTHCARE SAFETY NETWORK

January 2024

Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central Line Associated Bloodstream Infection)

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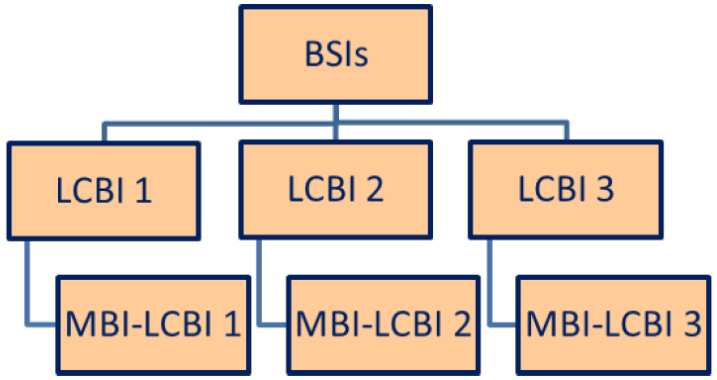
- NHSN CLABSI DEFINITION, JAN 2024

Definitions Specific to Bloodstream Infection (BSI) / Central Line Associated Bloodstream Infection (CLABSI) Surveillance:

Primary bloodstream infection (BSI): A Laboratory Confirmed Bloodstream Infection (LCBI) that is not secondary to an infection at another body site (see Appendix: Secondary BSI Guide and CDC/NHSN Surveillance Definitions for Specific Types of Infection [Ch-17], urinary tract infection (UTI) [Ch-7], pneumonia (PNEU) [Ch-6], and surgical site infection (SSI) [Ch- 9].

Laboratory Confirmed Bloodstream Infection (LCBIs) Hierarchy; Types of LCBIs

(see Table 1 and Table 2):



Secondary BSI: A BSI that is thought to be seeded from a site-specific infection at another body site (see Appendix: Secondary BSI Guide and CDC/NHSN Surveillance Definitions for Specific Types of Infection, UTI, PNEU, and SSI).

Central line (CL): An intravascular catheter that terminates at or close to the heart, **or** in one of the great vessels **AND** is used for infusion, withdrawal of blood, or hemodynamic monitoring. Consider the following great vessels when making determinations about CLABSI events and counting CL device days:

- Aorta
- Pulmonary artery
- Superior vena cava
- Inferior vena cava
- Brachiocephalic veins
- Internal jugular veins
- Subclavian veins
- External iliac veins
- Common iliac veins
- Femoral veins
- In neonates, the umbilical artery/vein.

Notes:

1. Neither the type of device nor the insertion site is used to determine if a device is considered a central line for NHSN reporting purposes.
2. At times, a CL may migrate from its original central location after confirmation of proper placement. NHSN does not require ongoing verification of proper line placement. Therefore, once a line has been designated a CL it remains a CL, regardless of migration, until removed from the body or patient discharge, whichever comes first. CL days are included for any CLABSI surveillance conducted in that location.
3. An introducer is an intravascular catheter, and depending on the location of the tip and its use, may be considered a CL.
4. A non-lumened intravascular catheter that terminates at or close to the heart or in a great vessel that is not used for infusion, withdrawal of blood or hemodynamic monitoring is not considered a CL for NHSN reporting purposes (for example, non-lumened pacemaker wires.)
    - There are some pacemaker wires that do have lumens, which may be considered a central line.

Types of Central Lines for NHSN reporting purposes:

1. Permanent central line: Includes:
    a. Tunneled catheters, including tunneled dialysis catheters
    b. Implanted catheters (including ports)
2. Temporary central line: A non-tunneled, non-implanted catheter
3. Umbilical catheter**:** A vascular catheter inserted through the umbilical artery or vein in a neonate. All umbilical catheters are central lines

Eligible Central Line: A CL that has been in place for **more than two consecutive calendar days** (on or after CL day 3), following the *first access* of the central line, in an inpatient location, during the current admission. Such lines are eligible for CLABSI events and remain eligible for CLABSI events until the day after removal from the body or patient discharge, whichever comes first. (See Table 3 for examples).

Eligible BSI Organism: Any organism that is eligible for use to meet LCBI or MBI-LCBI criteria. In other words, an organism that is not an excluded pathogen for use in meeting LCBI or MBI-LCBI criteria. These organisms may or may not be included on the NHSN Organisms List accessed via the spreadsheet or refer to the new NHSN Terminology Browser. Contact NHSN for guidance regarding organisms that are not included on the NHSN Organisms List.

Table 1: Laboratory-Confirmed Bloodstream Infection Criteria:

Must meet **one** of the following LCBI criteria:

Criterion	*Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Once an LCBI determination is made, proceed to the MBI-LCBI definitions, and determine if the corresponding MBI-LCBI criteria are also met (for example, after meeting LCBI 2, investigate for potential MBI-LCBI 2)
LCBI 1 If LCBI 1 criterion is met, consider MBI-LCBI 1	Patient of any age has a recognized bacterial or fungal pathogen, not included on the NHSN common commensal list: 1. Identified from one or more blood specimens obtained by a culture **OR** 2. Identified to the genus or species level by non-culture based microbiologic testing (NCT)* methods (for example, T2 Magnetic Resonance [T2MR] or next-generation sequencing (NGS). ***Note:*** *If blood is collected for culture within 2 days before, or 1 day after the NCT, disregard the result of the NCT and use only the result of the CULTURE to make an LCBI surveillance determination. If no blood is collected for culture within this time period, use the result of the NCT for LCBI surveillance determination.* **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix: Secondary BSI Guide). *For the purposes of meeting LCBI 1, NCT is defined as a methodology that identifies an organism directly from a blood specimen without inoculation of the blood specimen to any culture media.

LCBI 2 If LCBI 2 criterion is met, consider MBI-LCBI 2	Patient of any age has at least ***one*** of the following signs or symptoms: fever (>38.0°C), chills, or hypotension **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix: Secondary BSI Guide). **AND** The same NHSN common commensal is identified by culture from two or more **blood specimens** collected on separate occasions (see Blood Specimen Collection). For common commensal organisms, see the Common Commensal tab of the NHSN Organism List accessed via the spreadsheet or refer to the new NHSN Terminology Browser. **Notes:** 1. Criterion elements must occur within the 7-day IWP (as defined in Chapter 2) which includes the collection date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after. 2. The two matching common commensal specimens represent a single element for use in meeting LCBI 2 criterion, and the collection date of the first specimen is used to determine the BSI IWP. 3. At least one element (specifically, a sign or symptom of fever, chills, or hypotension) is required to meet LCBI 2 criterion; the LCBI 2 DOE will always be the date the first element occurs for the first time during the BSI IWP, whether that be a sign or symptom or the positive blood specimen.

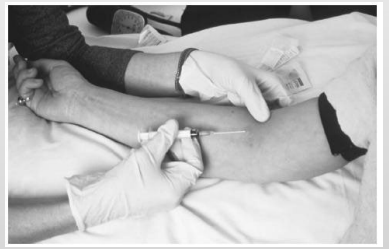
LCBI 3 If LCBI 3 criterion is met, consider MBI-LCBI 3	Patient ≤ 1 year of age has at least one of the following signs or symptoms: fever (>38.0°C), hypothermia (<36.0°C), apnea, or bradycardia **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix: Secondary BSI Guide). **AND** The same NHSN common commensal is identified by a culture from two or more blood specimens collected on separate occasions (see Blood Specimen Collection). For common commensal organisms, see the Common Commensal tab of the NHSN Organism List accessed via the spreadsheet or refer to the new NHSN Terminology Browser. **Notes:** 1. Criterion elements must occur within the 7-day IWP (as defined in Chapter 2) which includes the collection date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after. 2. The two matching common commensal specimens represent a single element for use in meeting LCBI 3 criterion, and the date of the first is used to determine the BSI IWP.

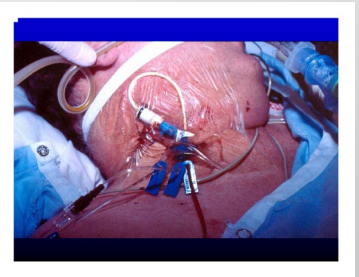
	A	B	C	D
1	**Common Commensals (CC)**			
2	It is possible that your laboratory may identify an organism that cannot be found when referencing the NHSN Organism List. DO NOT interpret the absence of an organism to mean the event is not reportable. If you have an organism which is not found on the NHSN Organism List, please contact us at nhsn@cdc.gov for guidance on appropriate reporting.			
3	**NHSN Code**	**NHSN Display Name**	**SNOMED Preferred Term**	**SNOMED Code**
4	ACTSP	Actinomyces	Actinomyces	40560008
5	ACTBO	Actinomyces bovis	Actinomyces bovis	59806008
6	ACTDENT	Actinomyces dentalis	Actinomyces dentalis	426330001
7	ACTFUNK	Actinomyces funkei	Actinomyces funkei	419012004
8	ACTGR	Actinomyces gerencseriae	Actinomyces gerencseriae	113416002
9	ACTGRAE	Actinomyces graevenitzii	Actinomyces graevenitzii	113417006
10	ACTIS	Actinomyces israelii	Actinomyces israelii	46369004
11	ACTNA	Actinomyces naeslundii	Actinomyces naeslundii	8940004
12	ACTORIC	Actinomyces oricola	Actinomyces oricola	425488009
13	ACTORIS	Actinomyces oris	Actinomyces oris	447175005
14	ACTRADI	Actinomyces radicidentis	Actinomyces radicidentis	427691003
15	ACTUROG	Actinomyces urogenitalis	Actinomyces urogenitalis	409827009
16	ACTVI	Actinomyces viscosus	Actinomyces viscosus	33529006
17	AEGU	Aerococcus	Aerococcus	9008009
18	AECH	Aerococcus christensenii	Aerococcus christensenii	409818008
19	AESGN	Aerococcus sanguinicola	Aerococcus sanguinicola	427222006
20	AEUR	Aerococcus urinae	Aerococcus urinae	243230001
21	AEURQ	Aerococcus urinaeequi	Aerococcus urinaeequi	430979003
22	AEURH	Aerococcus urinaehominis	Aerococcus urinaehominis	409819000
23	AEVI	Aerococcus viridans	Aerococcus viridans	78803006
24	ASNSP	Alpha-hemolytic Streptococcus, not S pneumoniae	Alpha-hemolytic Streptococcus not Streptococcus pneumoniae	713921004
25	ARCSP	Arcanobacterium	Arcanobacterium	51714009
26	ARCHA	Arcanobacterium haemolyticum	Arcanobacterium haemolyticum	44723000
27	ARCPLUR	Arcanobacterium pluranimalium	Arcanobacterium pluranimalium	428939003
28	ARTSP	Arthrobacter	Arthrobacter	56214009
29	ARTAGIL	Arthrobacter agilis	Arthrobacter agilis	113432004
30	ARTASTR	Arthrobacter astrocyaneus	Arthrobacter astrocyaneus	113433009
31	ARTCITR	Arthrobacter citreus	Arthrobacter citreus	44955005
32	ARTCRYS	Arthrobacter crystallopoietes	Arthrobacter crystallopoietes	113435002
33	ARTFLAV	Arthrobacter flavus	Arthrobacter flavus	429762004
34	ARTGAND	Arthrobacter gandavensis	Arthrobacter gandavensis	428332000

DIAGNOSI MICROBIOLOGICA

EMOCOLTURE QUANTITATIVE APPAIATE

- EMOCOLTURE CONVENZIONALI PRELEVATE CONTEMPORANEAMENTE DAL CATETERE E DAL SANGUE PERIFERICO
- POSITIVITÀ: POSITIVITÀ DELLE COLTURE DA ENTRAMBI I SITI, CON UNA CONCENTRAZIONE DI MICRORGANISMI DAL CATETERE 3-5 VOLTE SUPERIORE A QUELLA DEL SANGUE PERIFERICO
- 10 STUDI CONSIDERATI
- SENSIBILITÀ: 87%
- SPECIFICITÀ: 98%
- **TEST PIU' ACCURATO IN ASSOLUTO!**

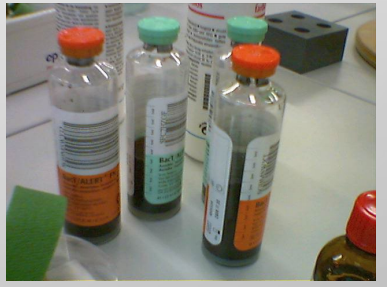




Maki, Ann Inter Med 2005

DIFFERENTIAL TIME TO POSITIVITY

- EMOCOLTURE CONVENZIONALI PRELEVATE CONTEMPORANEAMENTE DAL CATETERE E DAL SANGUE PERIFERICO
- POSITIVITÀ: POSITIVITÀ DELLE COLTURE DA ENTRAMBI I SITI, CON QUELLE CENTRALI POSITIVE 2 E PIÙ ORE PRIMA RISPETTO A QUELLE DAL SANGUE PERIFERICO
- 10 STUDI CONSIDERATI
- SENSIBILITÀ 85%
- SPECIFICITÀ: 81%



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Clinical Infectious Diseases

MAJOR ARTICLE

Utility of Differential Time to Positivity in Diagnosing Central Line–Associated Bloodstream Infections: A Systematic Review and Meta-Analysis

Manreet Dhaliwal[1] **and Nick Daneman**[1,2]

[1]Department of Medicine, University of Toronto, Toronto, Ontario, Canada; and [2]Division of Infectious Diseases, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada

Background. Differential time to positivity (DTP), defined as pathogen growth at least 2 hours earlier from catheter versus paired peripheral blood cultures, is sometimes used to diagnose central line–associated bloodstream infections (CLABSIs). Previous studies assessing DTP, however, have been small, provided conflicting results, and did not assess heterogeneity across important subgroups.

Methods. We systematically reviewed the diagnostic characteristics of DTP for CLABSI using MEDLINE, Embase, WoS, CINAHL, LILACS, AMED, and the Cochrane database. Studies were included if they reported sensitivities, specificities, predictive values, likelihood ratios, or 2×2 tables of DTP for diagnosing CLABSI. Extracted data were analyzed by using forest plots, bivariate model meta-analysis, and QUADAS-2 quality assessment.

Results. We identified 274 records, of which 23 met the criteria for meta-analysis. Among 2526 suspected CLABSIs, DTP demonstrated a summary sensitivity of 81.3% (95% confidence interval [CI]: 72.8%–87.7%), specificity of 91.8% (95% CI: 84.5%–95.8%), positive likelihood ratio of 9.89 (95% CI: 5.14–19.00), and negative likelihood ratio of 0.20 (95% CI: .14–.30). Covariate analysis based on catheter duration, study design, and patient immune status demonstrated no significant differences. However, DTP performed worse for *Staphylococcus aureus* (low sensitivity but high specificity) and *Candida* (high sensitivity but low specificity) compared to other organisms.

Conclusions. DTP performs well in ruling CLABSIs in or out. Obtaining paired catheter and peripheral blood cultures for DTP when the infectious source is unclear may prevent unnecessary line removal and diagnostic tests. However, this must be balanced against higher contamination rates from catheter cultures.

Keywords. DTP; CLABSI; sensitivity; specificity; meta-analysis.

Table 2 Summary of main diagnostic methods for catheter-related bloodstream infections.

	Criteria for positivity	Interpretation	Comments	Recommendation
Diagnosis without catheter withdrawal				
Paired quantitative blood cultures	Ratio ≥3:1	Both sets are positive for the same microorganism and the set obtained through the catheter has ≥3:1 fold-higher colony count than the peripheral culture	Sensitivity ≈79% Specificity ≈99% Labor intensive and expensive	A-II
Paired blood cultures for differential time to positivity (DTP)	≥120 min	Both sets are positive for the same microorganism and the set obtained through the catheter becomes positive ≥120 min earlier	Sensitivity: 72% to 96% Specificity: 90% to 95% Less specificity for long-term catheters The interpretation of DTP should take into account adherence to the technical procedure and the type of microorganism	A-II
Endoluminal brushing	>100 CFU	Indicative of CRBSI	Sensitivity: 95% to 100% Specificity: 84% to 89% It may underestimate CRBSI in short-term catheters Risk of pathogen dissemination and thrombotic complications	C-III

DIFFICOLTÀ DIAGNOSTICHE

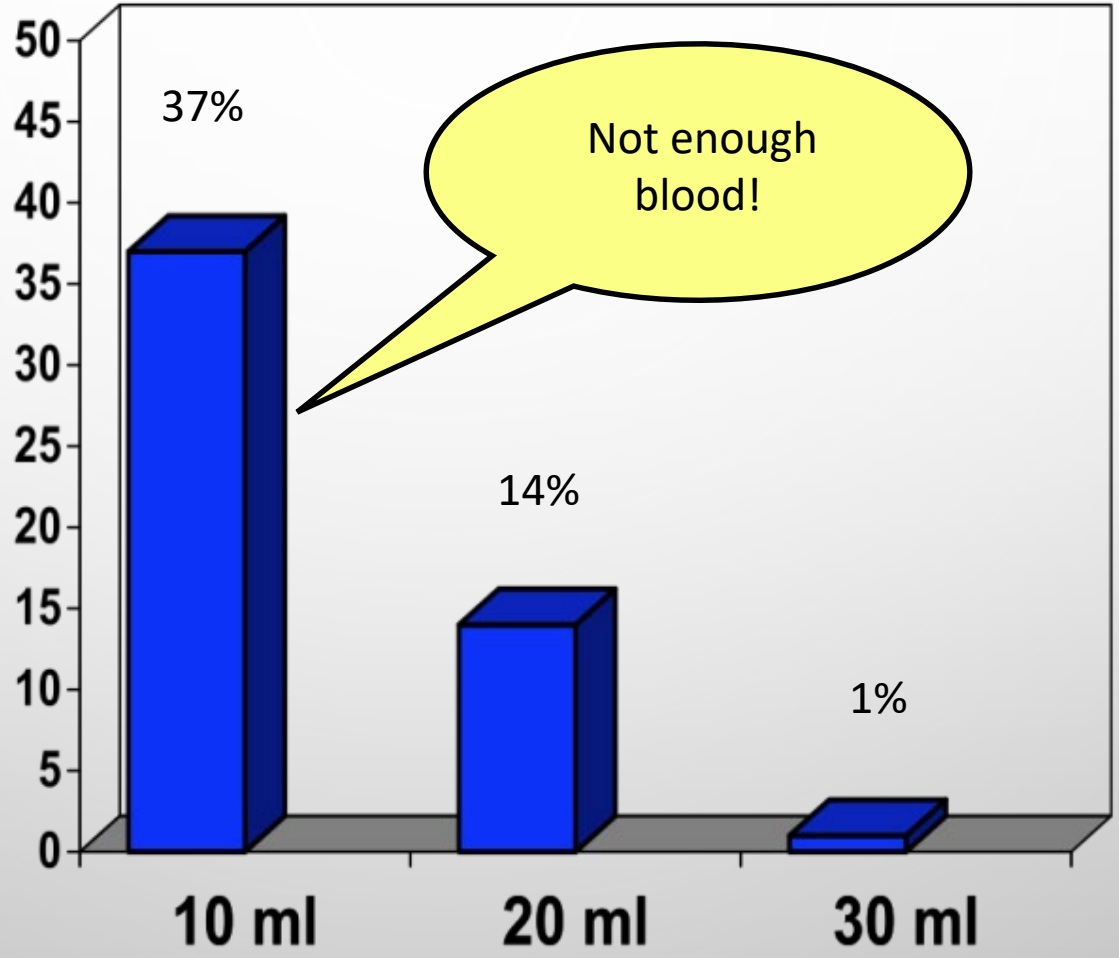
- MANCANZA DI PROTOCOLLI OMOGENEI PER L'ESECUZIONE DELLE EMOCOLTURE (NUMERO DI PRELIEVI DA EFFETTUARE, SITO DEL PRELIEVO, DISINFEZIONE DELLA CUTE, TIMING DI PRELIEVI SERIATI, VOLUME DI SANGUE DA PRELEVARE, CONTAMINAZIONI…)
- DIFFICOLTA' NELLA INTERPRETAZIONE DEI RISULTATI DELLE EMOCOLTURE

EMOCOLTURE

- QUANTE?
- QUANDO?
- QUANTO SANGUE?
- QUALE ANTISETTICO?
- “DISCARD VOLUME”?

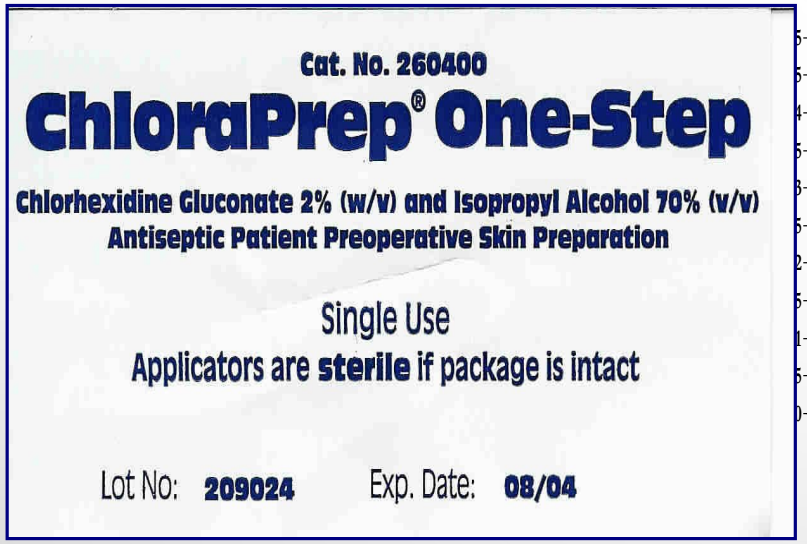
% False Negative vs. Volume of Blood

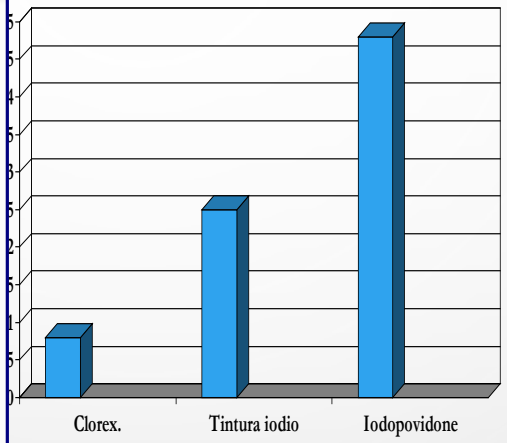
% False Negative (blood culture is negative but patient is really septicemic)

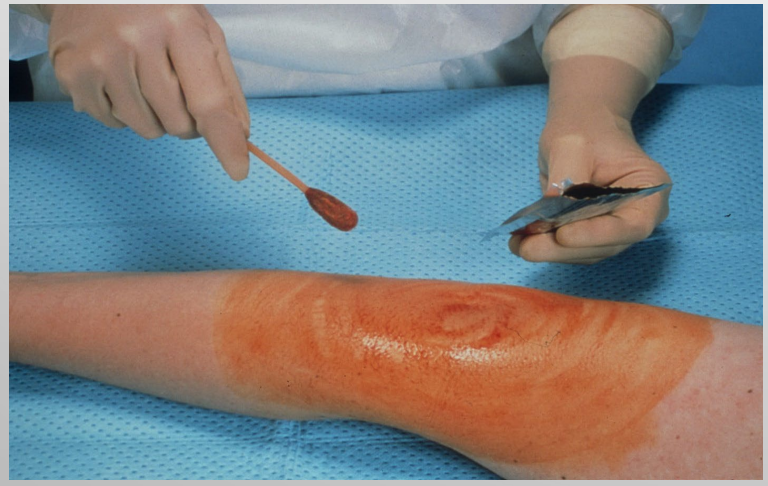


Courtesy of E.J Baron, PhD, Dir of Microbiology Lab, Stanford Hosp

CONTAMINAZIONE DELLE EMOCOLTURE RISPETTO ALL'ANTISETTICO IMPIEGATO

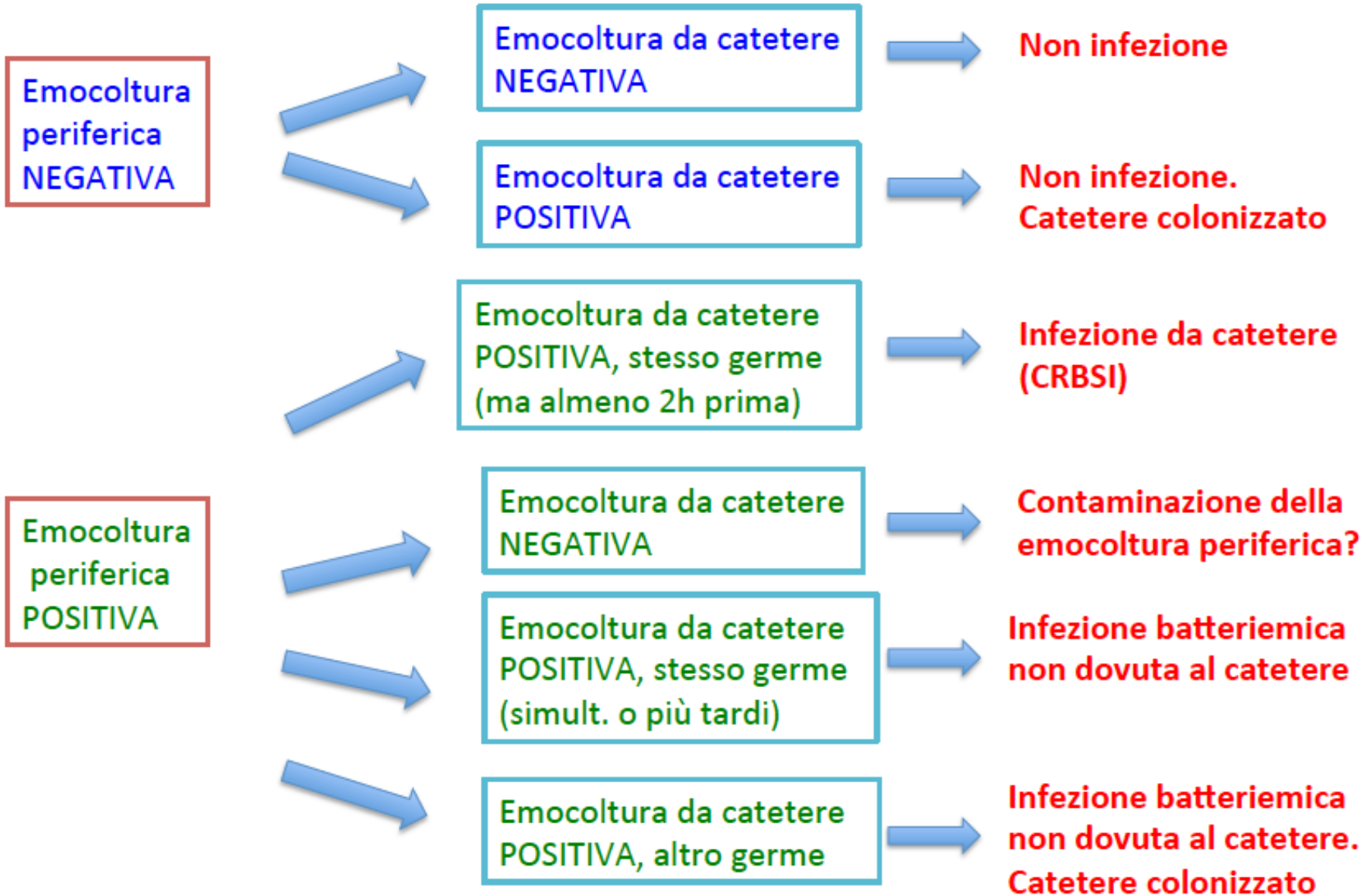






Baylor, 2006

Interpretazione della DTP



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Med Intensiva. 2018;42(1):5–36

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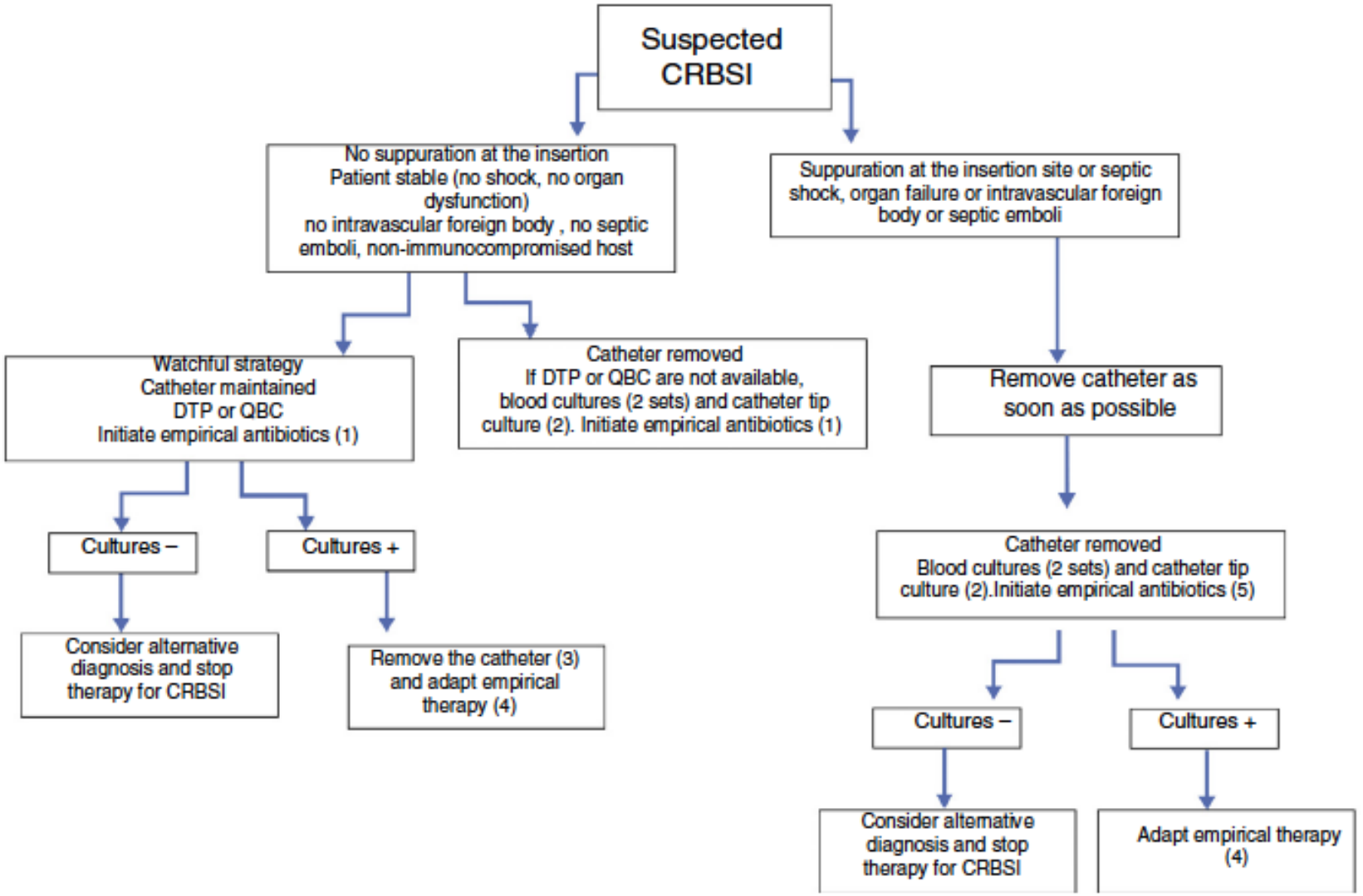
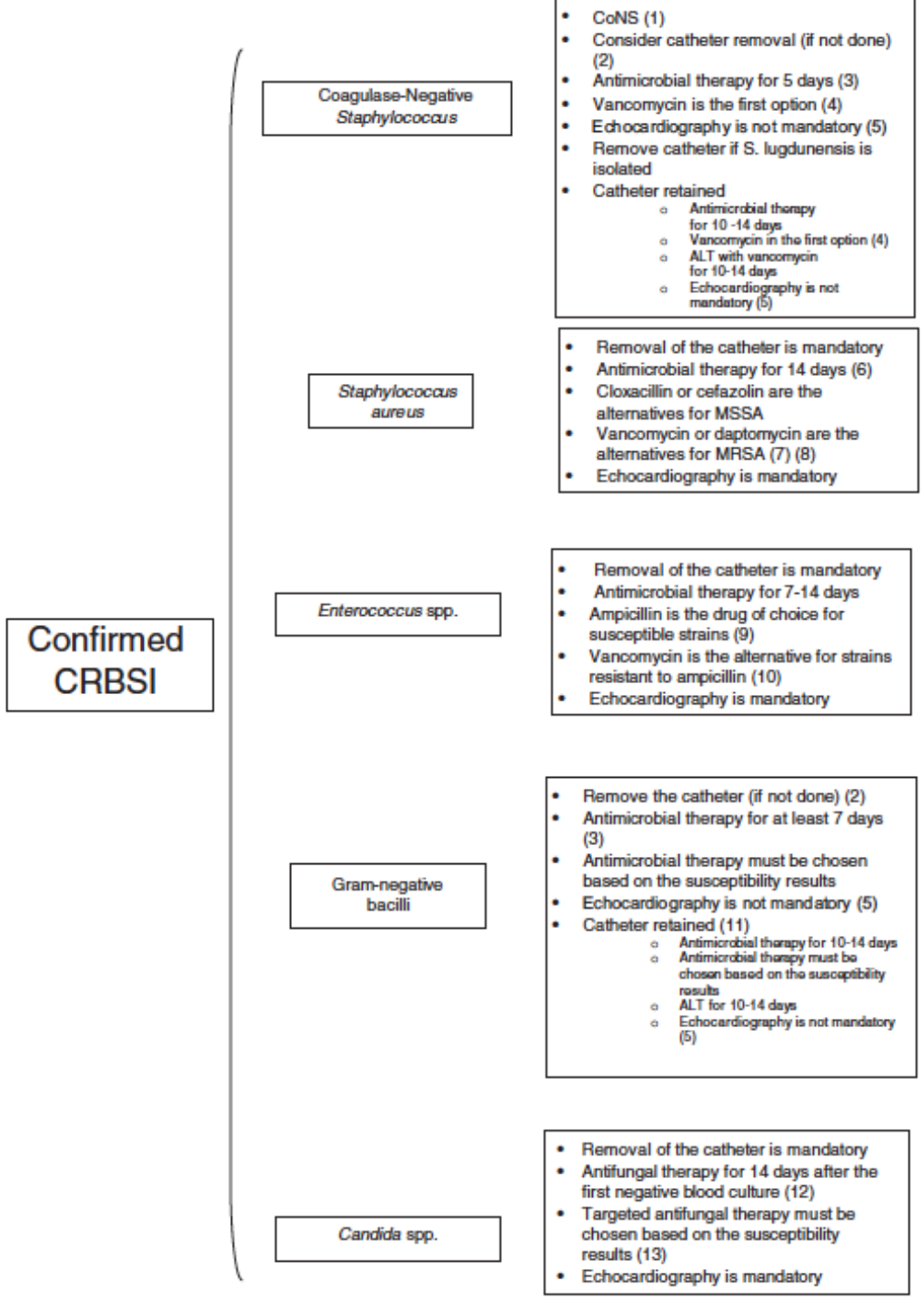
CONSENSUS STATEMENT

Diagnosis and treatment of catheter-related bloodstream infection: Clinical guidelines of the Spanish Society of Infectious Diseases and Clinical Microbiology and (SEIMC) and the Spanish Society of Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC)☆


Suspected CRBSI
No suppuration at the insertion
Patient stable (no shock, no organ dysfunction)
no intravascular foreign body , no septic emboli, non-immunocompromised host
Suppuration at the insertion site or septic shock, organ failure or intravascular foreign body or septic emboli
Watchful strategy
Catheter maintained
DTP or QBC
Initiate empirical antibiotics (1)
Catheter removed
If DTP or QBC are not available,
blood cultures (2 sets) and catheter tip culture (2). Initiate empirical antibiotics (1)
Remove catheter as soon as possible
Cultures –
Cultures +
Consider alternative diagnosis and stop therapy for CRBSI
Remove the catheter (3) and adapt empirical therapy (4)
Catheter removed
Blood cultures (2 sets) and catheter tip culture (2).Initiate empirical antibiotics (5)
Cultures –
Cultures +
Consider alternative diagnosis and stop therapy for CRBSI
Adapt empirical therapy (4)


Confirmed CRBSI
Coagulase-Negative Staphylococcus
CoNS (1)
Consider catheter removal (if not done) (2)
Antimicrobial therapy for 5 days (3)
Vancomycin is the first option (4)
Echocardiography is not mandatory (5)
Remove catheter if S. lugdunensis is isolated
Catheter retained
Antimicrobial therapy for 10 -14 days
Vancomycin in the first option (4)
ALT with vancomycin for 10-14 days
Echocardiography is not mandatory (5)
Staphylococcus aureus
Removal of the catheter is mandatory
Antimicrobial therapy for 14 days (6)
Cloxacillin or cefazolin are the alternatives for MSSA
Vancomycin or daptomycin are the alternatives for MRSA (7) (8)
Echocardiography is mandatory
Enterococcus spp.
Removal of the catheter is mandatory
Antimicrobial therapy for 7-14 days
Ampicillin is the drug of choice for susceptible strains (9)
Vancomycin is the alternative for strains resistant to ampicillin (10)
Echocardiography is mandatory
Gram-negative bacilli
Remove the catheter (if not done) (2)
Antimicrobial therapy for at least 7 days (3)
Antimicrobial therapy must be chosen based on the susceptibility results
Echocardiography is not mandatory (5)
Catheter retained (11)
Antimicrobial therapy for 10-14 days
Antimicrobial therapy must be chosen based on the susceptibility results
ALT for 10-14 days
Echocardiography is not mandatory (5)
Candida spp.
Removal of the catheter is mandatory
Antifungal therapy for 14 days after the first negative blood culture (12)
Targeted antifungal therapy must be chosen based on the susceptibility results (13)
Echocardiography is mandatory

Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America

Leonard A. Mermel,[1] Michael Allon,[2] Emilio Bouza,[9] Donald E. Craven,[3] Patricia Flynn,[4] Naomi P. O'Grady,[5] Issam I. Raad,[6] Bart J. A. Rijnders,[10] Robert J. Sherertz,[7] and David K. Warren[8]

[1]Division of Infectious Diseases, Warren Alpert Medical School of Brown University, Providence, Rhode Island; [2]University of Alabama-Birmingham Hospital, Birmingham, Alabama; [3]Tufts University School of Medicine, Lahey Clinic Medical Center, Burlington, Massachusetts; [4]St. Jude Children's Research Hospital, Children's Infection Defense Center, Memphis, Tennessee; [5]National Institutes of Health, Critical Care Medicine Department, Bethesda, Maryland; [6]Section of Infectious Diseases, University of Texas-Cancer Center, Houston; [7]Section of Infectious Diseases, Wake Forest University School of Medicine, Winston-Salem, North Carolina; [8]Division of Infectious Diseases, Washington University School of Medicine, St Louis, Missouri; [9]Servicio de Microbiología Cliínica y E. Infecciosas Hospital General "Gregorio Marañón," Madrid, Spain; and [10]Internal Medicine and Infectious Diseases, Erasmus University Medical Center, Rotterdam, the Netherlands

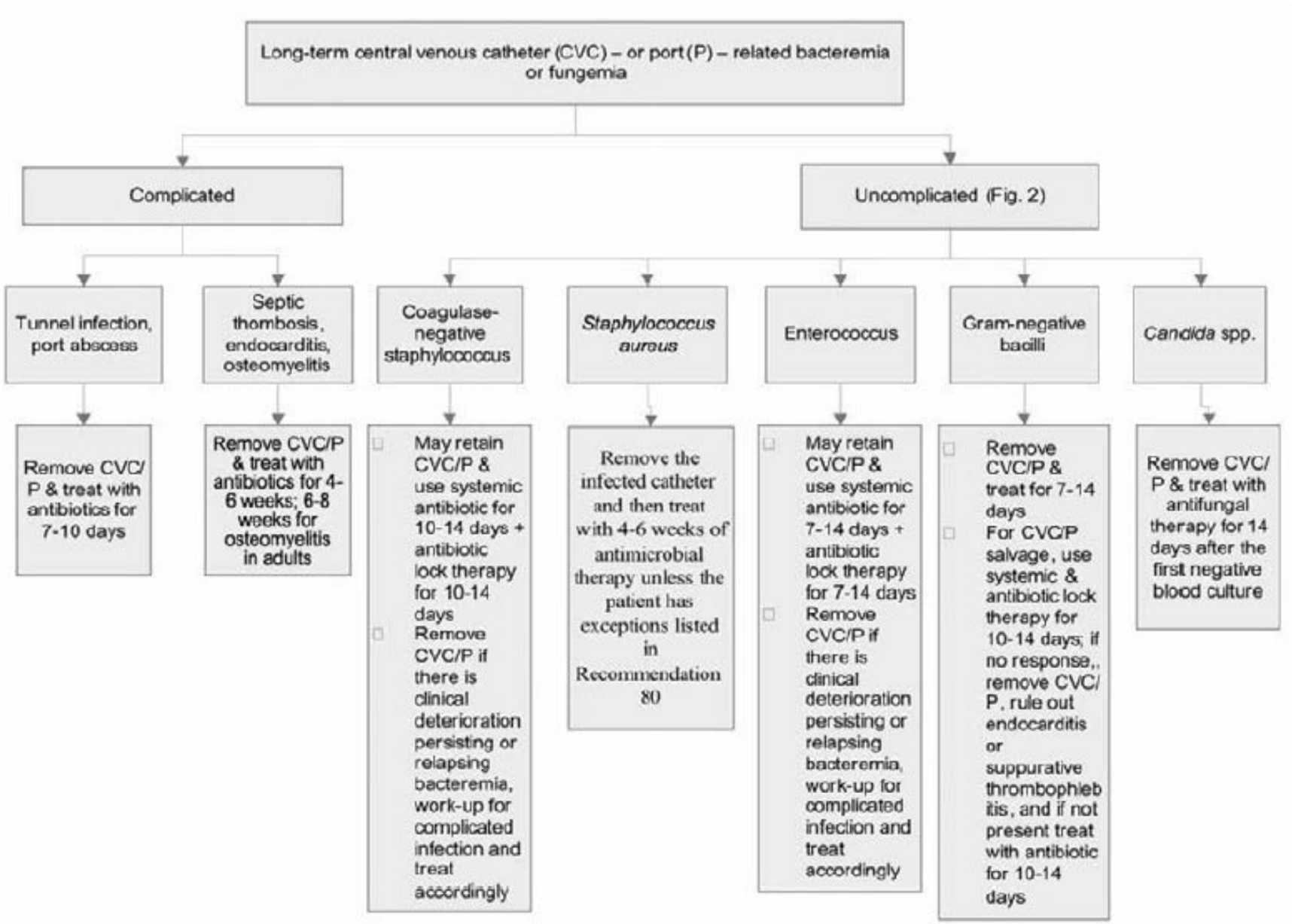


Figure 3. Approach to the treatment of a patient with a long-term central venous catheter (CVC) or a port (P)-related bloodstream infection.

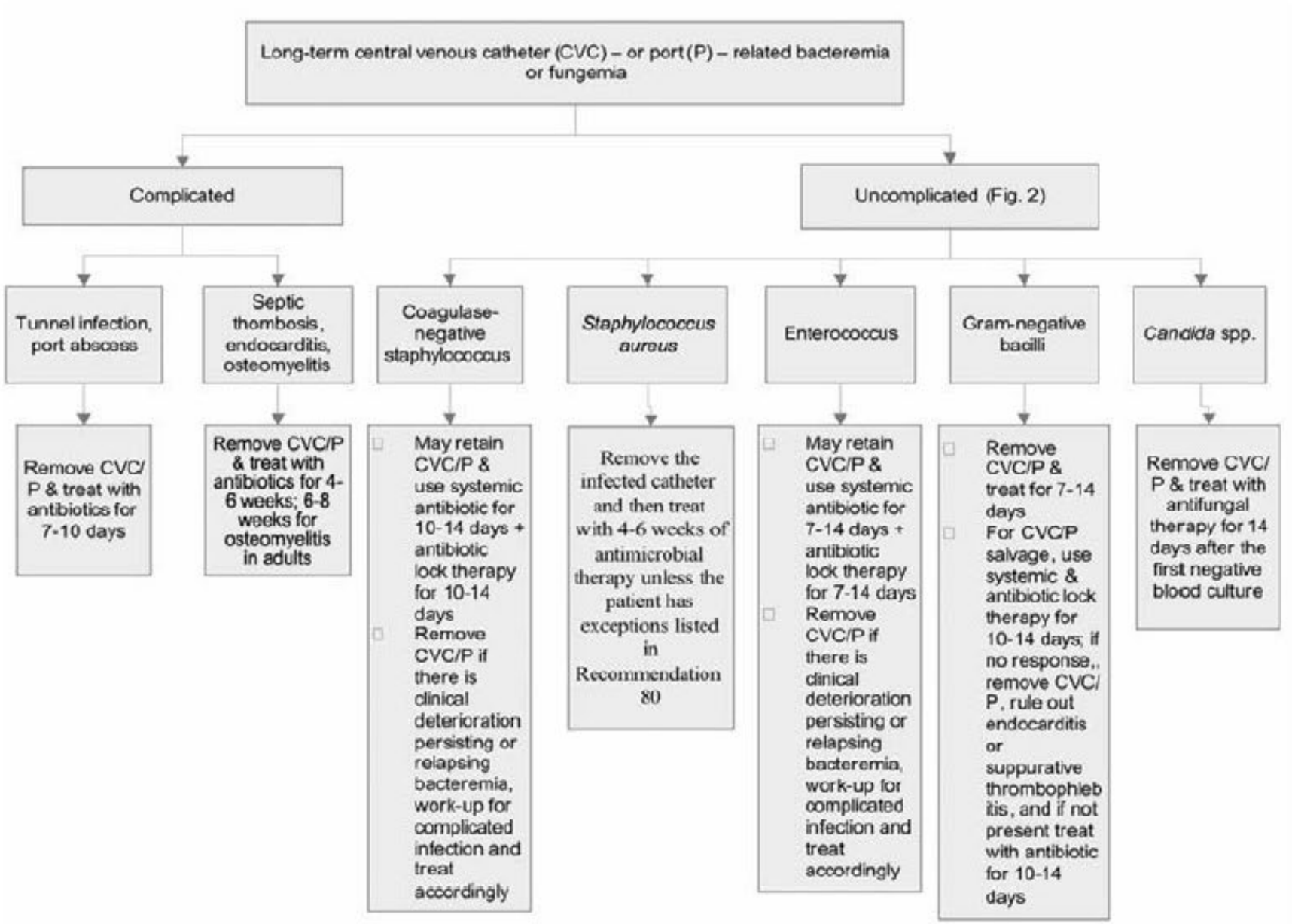


Figure 3. Approach to the treatment of a patient with a long-term central venous catheter (CVC) or a port (P)-related bloodstream infection.

EXPERT REVIEWS

Antibiotic-lock therapy: a clinical viewpoint

Expert Rev. Anti Infect. Ther. 12(1), 117–129 (2014)

Nuria Fernández-Hidalgo* and Benito Almirante

Infectious Diseases Department, Hospital Universitari Vall d'Hebron Passeig Vall d'Hebron 119-129, 08035 Barcelona, Spain
**Author for correspondence:*
Tel.: +34 932 746 090
Fax: +34 934 894 091
nufernan@gmail.com

Antibiotic lock therapy (ALT) – instillation of high concentrations of anti-microbial agent with or without anti-coagulant into the lumen of central venous catheters – is considered a valid conservative treatment for catheter-related bloodstream infection (CRBSI) in patients highly dependent on maintaining the catheter. Results from randomized controlled studies have indicated that the effectiveness of ALT is moderate, but recent findings from experimental studies and observational case series point to considerable efficacy and safety of this therapy, which is usually associated with concomitant systemic treatment. In this article, the current knowledge about ALT for patients with CRBSI is reviewed and discussed, with emphasis on existing controversies and the results obtained according to the various uses of the catheters and the etiologies of infection.

KEYWORDS: antibiotic lock therapy • catheter-related sepsis • conservative management • permanent central venous catheter

Antimicrobial lock prophylaxis

Over the past years, several randomized trials have been performed to address this issue, with encouraging results. However, concerns on the emergence of antimicrobial resistant bacteria; non infectious complications and the failure of some studies to prove the benefits of antimicrobial lock prophylaxis over care bundles are the major obstacles to recommend antimicrobial lock prophylaxis as routinely technique to prevent catheter related infections .

Actually, guidelines do not recommend antimicrobial lock solutions to prevent CRBSI, except for some special circumstances (e.g., in patients with long term, cuffed catheters Ports, or patients with a history of multiple CRBSI, despite adherence to aseptic technique).

ANTIMICROBIAL LOCK PROPHYLAXIS

SHEA/IDSA 2022 GUIDELINES, FOR THE POTENTIAL EMERGENCE OF ANTIMICROBIAL RESISTANCE, SUGGEST TO USE ANTIBIOTIC LOCK SOLUTIONS AS A PREVENTIVE STRATEGY ONLY FOR THE FOLLOWING: A) **PATIENTS WITH LONG-TERM HEMODIALYSIS CATHETERS; B) PATIENTS WITH LIMITED VENOUS ACCESS AND A HISTORY OF RECURRENT CLABSI; C) PATIENTS WHO ARE AT HEIGHTENED RISK OF SEVERE SEQUELAE FROM A CLABSI (EG, PATIENT WITH RECENTLY IMPLANTED INTRAVASCULAR DEVICES, SUCH AS PROSTHETIC HEART VALVE OR AORTIC GRAFT).**

INS 2024: **USE ANTIMICROBIAL LOCKING SOLUTIONS FOR THERAPEUTIC AND PROPHYLACTIC PURPOSES IN PATIENTS WITH LONG-TERM CVADS IN THE FOLLOWING CIRCUMSTANCES: A) PATIENTS WITH A HISTORY OF MULTIPLE CLABSIS; B) HIGH-RISK PATIENT POPULATIONS; C) IN FACILITIES WITH UNACCEPTABLY HIGH RATES OF CLABSI, DESPITE IMPLEMENTATION OF OTHER METHODS OF INFECTION PREVENTION.**

Med Intensiva. 2018;42(1):5–36

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CONSENSUS STATEMENT

Diagnosis and treatment of catheter-related bloodstream infection: Clinical guidelines of the Spanish Society of Infectious Diseases and Clinical Microbiology and (SEIMC) and the Spanish Society of Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC)☆

F. Chaves[a], J. Garnacho-Montero[b,*], J.L. del Pozo (Coordinators)[c], Authors: E. Bouza[d], J.A. Capdevila[e], M. de Cueto[f], M.Á. Domínguez[g], J. Esteban[h], N. Fernández-Hidalgo[i], M. Fernández Sampedro[j], J. Fortún[k], M. Guembe[l], L. Lorente[m], J.R. Paño[n], P. Ramírez[o], M. Salavert[p], M. Sánchez[q], J. Vallés[r]

The ideal lock solution should possess a number of characteristics. Many, but perhaps not all, of these factors are applicable for both treatment and prophylactic modalities.

1. Spectrum of activity should include common or targeted pathogens. Although the majority of CRBSI are secondary to gram-positive organisms, protracted use of CVCs in high-risk patients increases the likelihood of gram-negative and fungal pathogens.
2. Ability to penetrate or disrupt a biofilm. Especially important in treatment, the ability to penetrate a biofilm and demonstrate activity against biofilm cells at concentrations 100–1,000 times standard concentrations is essential. Several lock solution additives, including ion chelators such as citrate and EDTA, can also disrupt intact biofilms.

3. Compatibility with anticoagulants. Not all CVC will require the addition of an anticoagulant (eg, heparin) to maintain patency; however, to decrease the risk of occlusion, the ability to include a low-dose heparin (eg, <1,000 units/mL) or an alternative ion chelator such as citrate will enhance the ability to broadly utilize a lock solution.
4. Prolonged stability. The ability to prepare lock solutions in bulk and apply extended expiration will enhance the continuation of ALT at points of transitions of care. This will be important for a pharmacy to maximize cost-effective use of lock therapy. Storage at room temperature as opposed to refrigeration is an additional advantage.

5. Low risk of toxicity and adverse events. The small volumes used in the intraluminal space do not lend themselves to high risk of toxicity. However, higher concentrations of specific agents (eg, aminoglycosides and citrate) have been associated with significant toxicity and should be avoided when using ALT.[18,19] There is additional concern if these solutions are flushed as opposed to aspirated, which could expose the patient to higher concentrations of anticoagulants (eg, heparin). Ethanol at higher concentrations may be associated with minor adverse events, especially in low-weight neonates.[14] Catheter occlusion is another possible adverse event with ALT, especially in the absence of a low-dose anticoagulant in solution.

6. Low potential for resistance. Although there is likely minimal systemic exposure of the antibiotic lock solution if aspirated with each exchange, use of agents with a low risk for development of resistance is important. In a treatment modality, if the systemic antibiotic is also used concurrently as a component of the lock solution, concern for resistance is diminished.

7. Cost-effectiveness. Use of certain agents (eg, linezolid, daptomycin) may be cost-prohibitive, especially when used on a larger population in a prophylactic modality. Careful consideration on maximizing compounding efficiency and stability should be done prior to initiating lock therapy with such high-cost agents.

LOCK THERAPY O PROPHYLAXIS

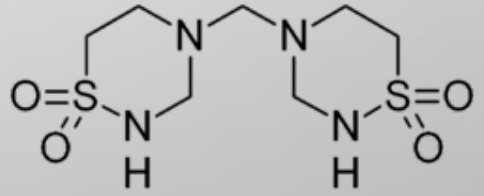
ANTIBIOTICI OPPURE NO?

SOSTANZE NON ANTIBIOTICHE UTILIZZATE COME LOCK THERAPY O PROPHYLAXIS

- ETHANOL
- CITRATE
- EDTA
- TAUROLIDINE

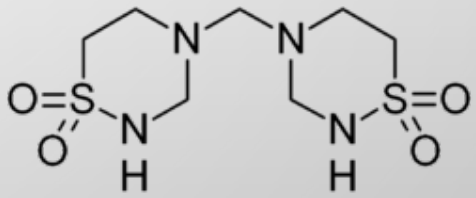
TAUROLIDINE

- TAUROLIDINE IS A TAURINE AMINO ACID DERIVATIVE; IT IS AN ANTIMICROBIAL AGENT WITH BROAD SPECTRUM OF ANTIBACTERIAL AND ANTIFUNGAL ACTION
- THE METHYL DERIVATIVES OF TAUROLIDINE INTERACT WITH THE BACTERIAL WALL (PARTICULARLY FLAGELLA AND FIMBRIAE), CAUSING IRREVERSIBLE DAMAGE TO THE BACTERIAL WALL, WHICH CONSISTS OF AN INABILITY TO ADHERE (THUS AN INABILITY TO FORM BIOFILM!)
- UNLIKE ANTIBIOTICS, TAUROLIDINE ACTS BY A CHEMICAL REACTION AT THE LEVEL OF THE BACTERIAL WALL.
- THE OTHER MECHANISM OF ACTION IS THE INACTIVATION OF BACTERIAL EXO- AND ENDOTOXINS. THIS MAKES THE INDUCTION OF BACTERIAL RESISTANCE HIGHLY UNLIKELY.
- TAUROLIDINE HAS A BACTERICIDAL EFFECT ON GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA, INCLUDING MDR, AND FUNGI.
- THERE ARE CURRENTLY NO REPORTED RESISTANCES TO TAUROLIDINE.



TAUROLIDINA: FORMULAZIONI DISPONIBILI

- TAUROLIDINA (1.35% OR 2%)
- TAUROLIDINA + CITRATO 4%
- TAUROLIDINA + CITRATO 4% + EPARINA
- TAUROLIDINA + CITRATO 4% + UROKINASI



TAUROLIDINA: MECCANISMO DI AZIONE

TAUROLIDINA: ELIMINAZIONE DEL BIOFILM SULLA PARETE INTERNA DI UN CATETERE

J Leukoc Biol. 1995 Sep;58(3):299-306.

Taurolidine, an antilipopolysaccharide agent, has immunoregulatory properties that are mediated by the amino acid taurine.

Watson RW[1], Redmond HP, Mc Carthy J, Bouchier-Hayes D.

Author information

Abstract

Taurolidine has bactericidal and antilipopolysaccharide properties. It is broken down into the amino acid taurine, which has been shown to modulate intracellular calcium activity, a critical component in the priming and activation of macrophages and polymorphonuclear leukocytes. We hypothesized that taurolidine may function to enhance immune activity in these cells. The aim of this study was to investigate the immunological effects of taurolidine and correlate findings with survival after a septic challenge in a murine model. Study 1: CD-1 mice underwent cecal ligation and puncture, were randomized to receive taurolidine (200 mg/kg body weight/i.p.) or saline control, and studied for end point survival. Study 2: CD-1 mice were randomized to receive taurolidine (200 mg/kg body weight/i.p.) or saline control. Peritoneal macrophages (PM luminal diameters) were assessed for O2-, NO, tumor necrosis factor-alpha (TNF-alpha), CD11b, phagocytosis, and PMN influx. O2-, TNF-alpha, CD11b expression, and phagocytosis were significantly increased in the taurolidine group. Study 3: PM luminal diameters were cultured in vitro +/- 0.5 mg/ml taurolidine and PM luminal diameter antimicrobial function assessed (O2-, NO, TNF-alpha, and phagocytosis). O2-, TNF-alpha, and phagocytosis were significantly increased, whereas NO was reduced. Study 4: PM luminal diameters were also cultured with taurine (0.5 mg/ml). Similar increase in O2-, TNF-alpha, and phagocytosis were identified. Intracellular PM luminal diameter [Ca2+] was also assessed and increases in free, unbound intracellular [Ca2+] occurred after taurine culture. Thus, in addition to its bactericidal and antilipopolysaccharide activity, taurolidine primes PM luminal diameters for enhanced antimicrobial activity and these effects appear mediated by the amino acid taurine.

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International Journal of Antimicrobial Agents 24 (2004) 491–495

INTERNATIONAL JOURNAL OF Antimicrobial Agents

www.ischemo.org

Taurolidine is effective in the treatment of central venous catheter-related bloodstream infections in cancer patients

M. Koldehoff[a,*], J.L. Zakrzewski.[b]

[a] *Department of Bone Marrow Transplantation, University Hospital Essen, Hufelandstreet 55, 45122 Essen, Germany*
[b] *Memorial Sloan Kettering Cancer Center, New York City, USA*

Received 29 March 2004; accepted 9 June 2004

Abstract

Taurolidine is an antimicrobial agent that was originally used in the local treatment of peritonitis and was shown to be effective in the prevention of catheter-related bloodstream infections (CR-BSI). In this pilot study, we used taurolidine solution as an intravenous (i.v.) lock into the totally implantable intravascular devices of 11 consecutive oncological patients with catheter-related bloodstream infections not responding to systemic antimicrobial chemotherapy. All patients recovered completely from the infection. No adverse drug effects were seen. Three patients were successfully retreated for a recurrent infection. Our data suggest a beneficial role of taurolidine i.v. lock for the therapy of catheter-related bloodstream infections in oncological patients. Taurolidine i.v. lock application is feasible and could especially be useful in infections resistant to antibiotic chemotherapy.

Keywords: Totally implantable intravascular devices; Taurolidine; Antimicrobial lock solution; Bloodstream infections; Treatment

11 oncologic pts
Failure with antimicrobials ev alone
Eradication rate: 100%

Original Communication

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American Society for Parenteral and Enteral Nutrition

Journal of Parenteral and Enteral Nutrition
Volume 42 Number 6
August 2018 1017–1025

DOI: 10.1002/jpen.1043
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Strategies to Reduce Catheter-Related Bloodstream Infections in Pediatric Patients Receiving Home Parenteral Nutrition: The Efficacy of Taurolidine-Citrate Prophylactic-Locking

Cecile Lambe, MD[1]; Catherine Poisson[1]; Cecile Talbotec, MD[1]; and Olivier Goulet, MD, PhD[1,2]

Abstract

Background: Catheter-related bloodstream infections (CRBSIs) remain a major issue in patients who are receiving home parenteral nutrition (HPN). The aim of this interventional study was to assess the impact of a new strategy using taurolidine-citrate (T-C) prophylactic locks on the CRBSI rate in children with intestinal failure who are receiving HPN. *Methods:* The rate of CRBSIs was monitored every calendar year in a prospective cohort of 195 children with intestinal failure. T-C locks were initiated from October 2011 in children with recurring CRBSIs (≥2 episodes per year). *Results:* In the whole cohort, the median annual CRBSI rate per 1000 catheter days decreased significantly from 2.07 in 2008 to 2010 to 1.23 in 2012 to 2014 ($P < .05$). T-C locks were used in 40 patients. No adverse events were reported. In taurolidine-treated patients, the CRBSI rate per 1000 catheter days decreased from 4.16 to 0.25 ($P < .0001$). The cumulative percentage of patients free of CRBSI at 18 months was 92% (95% confidence interval [CI]: 71–98) on T-C lock vs 61% (95% CI: 49–72) in controls ($P = .01$). In multivariate analysis, factors associated with CRBSI were immune deficiency (adjusted hazard ratio 3.49; 95% CI: 1.01–12.17) and the young age of the parents (adjusted hazard ratio 4.79, 95% CI: 2.16–10.62), whereas T-C locks were protective (adjusted hazard ratio 0.22, 95% CI: 0.06–0.74). *Conclusion:* This study confirms the efficacy of T-C catheter locks in decreasing the incidence of CRBSIs in children with intestinal failure who are receiving HPN. (*JPEN J Parenter Enteral Nutr.* 2018;42:1017–1025)

Received: 26 March 2018 | First decision: 27 April 2018 | Accepted: 18 June 2018
DOI: 10.1111/apt.14904

WILEY AP&T Alimentary Pharmacology & Therapeutics

Randomised clinical trial: 2% taurolidine versus 0.9% saline locking in patients on home parenteral nutrition

Y. Wouters[1] | M. Theilla[2] | P. Singer[2] | S. Tribler[3] | P. B. Jeppesen[3] | L. Pironi[4] | L. Vinter-Jensen[5] | H. H. Rasmussen[5] | F. Rahman[6] | G. J. A. Wanten[1]

[1]Intestinal Failure Unit, Department of Gastroenterology and Hepatology, Radboud University Medical Centre, Nijmegen, The Netherlands

[2]General Intensive Care Department, Rabin Medical Centre, Beilinson Hospital and Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

[3]Department of Medical Gastroenterology, Copenhagen University Hospital Rigshospitalet, Copenhagen, Denmark

[4]Centre for Chronic Intestinal Failure, Department of Medical and Surgical Science, University of Bologna, Bologna, Italy

[5]Department of Gastroenterology, Centre for Nutrition and Bowel Disease, Aalborg University Hospital, Aalborg, Denmark

[6]Department of Gastroenterology, University College London Hospital, London, UK

Correspondence
Dr. Y Wouters, Intestinal Failure Unit, Department of Gastroenterology and Hepatology, Radboud University Medical Centre, Nijmegen, The Netherlands.
Email: Yannick.Wouters@radboudumc.nl

Funding information
Geistlich Pharma AG (Wolhusen, Switzerland) funded the study and provided 2% taurolidine and 0.9% saline solution. The funder had no involvement in the study design, collection, analysis and interpretation of data, writing of the report and the decision to submit the article for publication.

Summary

Background: The catheter lock solutions 2% taurolidine and 0.9% saline are both used to prevent catheter-related bloodstream infections (CRBSIs) in home parenteral nutrition patients.

Aims: To compare the effectiveness and safety of taurolidine and saline.

Methods: This multicentre double-blinded trial randomly assigned home parenteral nutrition patients to use either 2% taurolidine or 0.9% saline for 1 year. Patients were stratified in a new catheter group and a pre-existing catheter group. Primary outcome was the rate of CRBSIs/1000 catheter days in the new catheter group and pre-existing catheter group, separately.

Results: We randomised 105 patients, of which 102 were analysed as modified intention-to-treat population. In the new catheter group, rates of CRBSIs/1000 catheter days were 0.29 and 1.49 in the taurolidine and saline arm respectively (relative risk, 0.20; 95% CI, 0.04-0.71; $P = 0.009$). In the pre-existing catheter group, rates of CRBSIs/1000 catheter days were 0.39 and 1.32 in the taurolidine and saline arm respectively (relative risk, 0.30; 95% CI, 0.03-1.82; $P = 0.25$). Excluding one outlier patient in the taurolidine arm, mean costs per patient were $1865 for taurolidine and $4454 for saline ($P = 0.03$). Drug-related adverse events were rare and generally mild.

Conclusions: In the new catheter group, taurolidine showed a clear decrease in CRBSI rate. In the pre-existing catheter group, no superiority of taurolidine could be demonstrated, most likely due to underpowering. Overall, taurolidine reduced the risk for CRBSIs by more than four times. Given its favourable safety and cost profile, taurolidine locking should be considered as an additional strategy to prevent CRBSIs.

Trial registration: Clinicaltrials.gov, identifier: NCT01826526.

The Handling Editor for this article was Professor Peter Gibson, and it was accepted for publication after full peer-review.

Review

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American Society for Parenteral and Enteral Nutrition

Journal of Parenteral and Enteral Nutrition
Volume 44 Number 7
September 2020 1198–1209

DOI: 10.1002/jpen.1761
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CE Use of Catheter Lock Solutions in Patients Receiving Home Parenteral Nutrition: A Systematic Review and Individual-Patient Data Meta-Analysis

Yannick Wouters, MD[1]; Erna Causevic, BSc[1]; Stanislaw Klek, MD, PhD[2]; Hans Groenewoud, PhD[3]; and Geert J. A. Wanten, MD, PhD[1]

Abstract

Background: Use of catheter lock solutions (CLSs) as a strategy to prevent catheter-related bloodstream infections (CRBSIs) has been evaluated in recent clinical trials. Our aim was to identify the most effective CLS formulation in patients receiving home parenteral nutrition (HPN). *Methods:* We conducted a systematic review and individual-patient data meta-analysis (IPDMA). Prospective randomized clinical trials in adult HPN patients using CLS were identified from PubMed, EMBASE, Web of Science, CINAHL, Cochrane library, and ClinicalTrials.gov. Primary outcome was the number of CRBSIs per 1000 catheter days for each CLS. Other outcomes included time to CRBSI and identification of patients with a higher risk for CRBSIs. *Results:* In total, 1107 studies were screened for eligibility, of which three studies comprising 162 HPN patients and 45,695 catheter days were included in the IPDMA. CRBSI rates were significantly decreased in patients using taurolidine (rate 0.13; 95% confidence interval [CI], 0.05–0.32) when compared with saline (rate 0.74; 95% CI, 0.31–1.74; $P = .002$) or heparin (rate 2.01; 95% CI, 1.03–3.91; $P < .001$). The cumulative proportion of CRBSI-free patients using taurolidine, saline, and heparin after 1 year was 88%, 56%, and 14%, respectively. Three risk factors for CRBSIs were identified: type of CLS, intestinal dysmotility as underlying condition, and use of central venous catheters. *Conclusions:* Taurolidine was the most effective CLS formulation in HPN patients for the prevention of CRBSIs. We suggest discussing with patients the benefits and risks when starting taurolidine, especially in patients who are considered to have a higher risk for CRBSIs. (*JPEN J Parenter Enteral Nutr.* 2020;44:1198–1209)

Keywords

catheter lock solution; catheter-related bloodstream infection; central venous access device; ethanol; heparin; home parenteral nutrition; intestinal failure; saline; systematic review; taurolidine

DOI: 10.1002/jpen.2589

ORIGINAL RESEARCH

Cost-effectiveness of taurolidine-citrate in a cohort of patients with intestinal failure receiving home parenteral nutrition

Thomas J. Williams MBBS[1,2] | Naomi Moy PhD[1] | Patricia Kaazan MD[1,2] | Gavin Callaghan BPharm[1] | Gerald Holtmann PhD[1,2] | Neal Martin MBBS[1,2]

[1]Department of Gastroenterology and Hepatology, Princess Alexandra Hospital, Woolloongabba, Brisbane, Queensland, Australia

[2]School of Medicine, University of Queensland, Herston, Queensland, Australia

Correspondence
Thomas J. Williams, MBBS, Department of Gastroenterology and Hepatology, Princess Alexandra Hospital, 199 Ipswich Rd, Woolloongabba 4102, Brisbane, QLD, Australia.
Email: thomaswilliamsresearch@gmail.com

Abstract

Background: Catheter-related bloodstream infections (CRBSIs) in patients receiving home parenteral nutrition (HPN) for chronic intestinal failure (CIF) are associated with significant morbidity and financial costs. Taurolidine is associated with a reduction in bloodstream infections, with limited information on the cost-effectiveness as the primary prevention. This study aimed to determine the cost-effectiveness of using taurolidine-citrate for the primary prevention of CRBSIs within a quaternary hospital.

Methods: All patients with CIF receiving HPN were identified between January 2015 and November 2022. Data were retrospectively collected regarding patient demographics, HPN use, CRBSI diagnosis, and use of taurolidine-citrate. The direct costs associated with CRBSI-associated admissions and taurolidine-citrate use were obtained from the coding department using a bottom-up approach. An incremental cost-effective analysis was performed, with a time horizon of 4 years, to compare the costs associated with primary and secondary prevention against the outcome of cost per infection avoided.

Results: Forty-four patients received HPN within this period. The CRBSI rates were 3.25 infections per 1000 catheter days before the use of taurolidine-citrate and 0.35 infections per 1000 catheter days after taurolidine-citrate use. The incremental cost-effectiveness ratio indicates primary prevention is the weakly dominant intervention, with the base case value of $27.04 per CRBSI avoided. This held with one-way sensitivity analysis.

Conclusion: Taurolidine-citrate in the primary prevention of CRBSIs in patients with CIF receiving HPN is associated with reduced hospital costs and infection rates.

Journal of Hospital Infection 123 (2022) 143–155

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Review

The efficacy of taurolidine containing lock solutions for the prevention of central-venous-catheter-related bloodstream infections: a systematic review and meta-analysis

C.H. van den Bosch [a,*], B. Jeremiasse [a], J.T. van der Bruggen [b], F.N.J. Frakking [b], Y.G.T. Loeffen [c], C.P. van de Ven [a], A.F.W. van der Steeg [a], M.F. Fiocco [a,d,e], M.D. van de Wetering [a], M.H.W.A. Wijnen [a]

[a] *Princess Máxima Center for Pediatric Oncology, Utrecht, the Netherlands*
[b] *Department of Medical Microbiology, University Medical Center Utrecht, Utrecht, the Netherlands*
[c] *Department of Pediatric Infectious Diseases and Immunology, Wilhelmina Children's Hospital, Utrecht, the Netherlands*
[d] *Mathematical Institute, Leiden, the Netherlands*
[e] *Leiden University Medical Center, Leiden, the Netherlands*

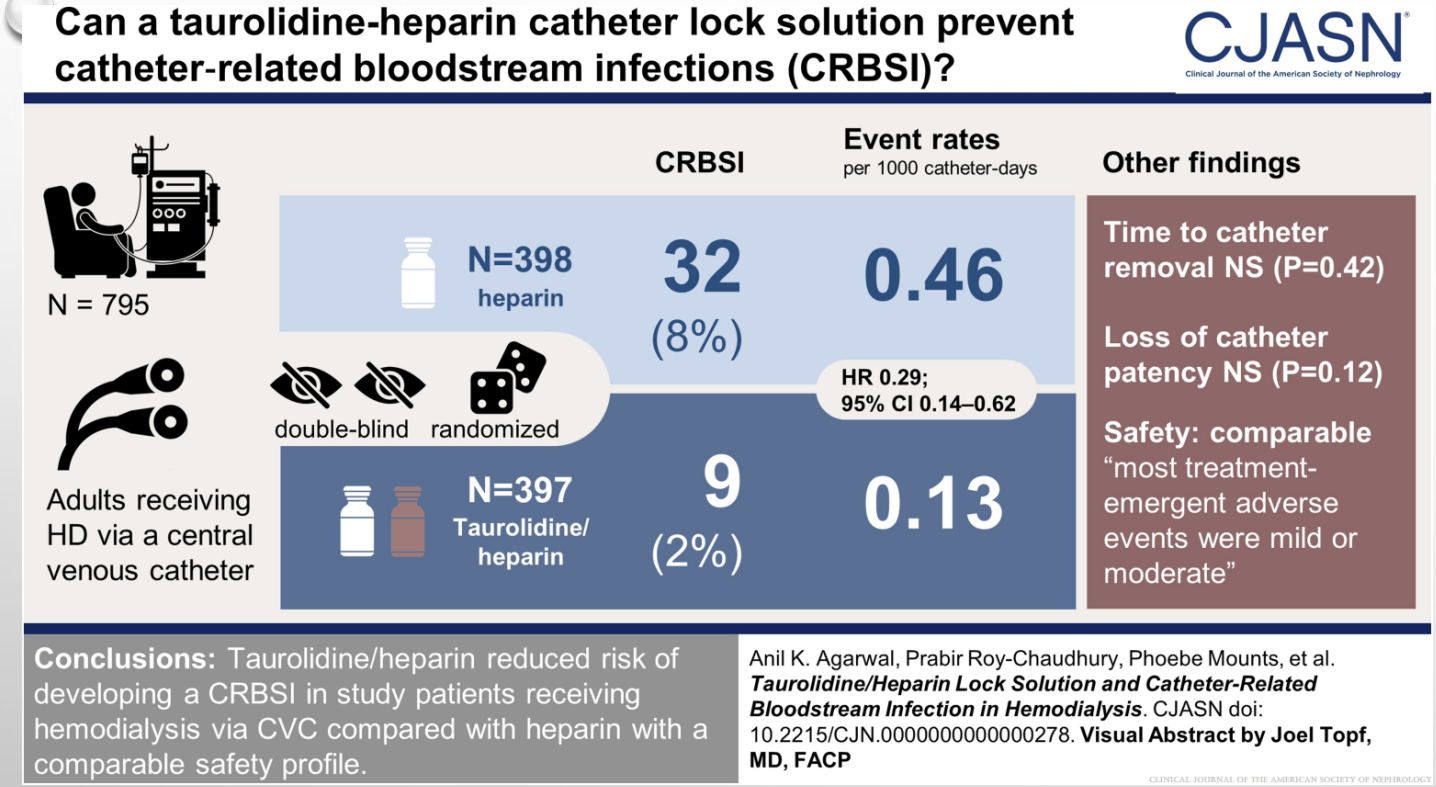
ARTICLE INFO

Article history:
Received 5 August 2021
Accepted 30 October 2021
Available online 9 November 2021

Keywords:
Central venous catheter
Bloodstream infections
Taurolidine
Lock

SUMMARY

The incidence of central venous catheter (CVC)-related bloodstream infections is high in patients requiring a long-term CVC. Therefore, infection prevention is of the utmost importance. The aim of this study was to provide an updated overview of randomized controlled trials (RCTs) comparing the efficacy of taurolidine containing lock solutions (TL) to other lock solutions for the prevention of CVC-related bloodstream infections in all patient populations. On 15th February 2021, PubMed, Embase and The Cochrane Library were searched for RCTs comparing the efficacy of TLs for the prevention of CVC-related bloodstream infections with other lock solutions. Exclusion criteria were non-RCTs, studies describing <10 patients and studies using TLs as treatment. Risk of bias was evaluated using the Cochrane Risk of Bias 2 tool. A random effects model was used to pool individual study incidence rate ratios (IRRs). Subgroup analyses were performed based on the following factors: CVC indication, comparator lock and bacterial isolates cultured. A total of 14 articles were included in the qualitative synthesis describing 1219 haemodialysis, total parenteral nutrition and oncology patients. The pooled IRR estimated for all patient groups together (nine studies; 918 patients) was 0.30 (95% confidence interval 0.19–0.46), favouring the TLs. Adverse events (10 studies; 867 patients) were mild and scarce. The quality of the evidence was limited due to a high risk of bias and indirectness of evidence. The use of TLs might be promising for the prevention of CVC-related bloodstream infections. Large-scale RCTs are needed to draw firm conclusions on the efficacy of TLs.



TAUROLIDINE/HEPARIN LOCK SOLUTION AND CATHETER-RELATED BLOODSTREAM INFECTION IN HEMODIALYSIS: A RANDOMIZED, DOUBLE-BLIND, ACTIVE-CONTROL, PHASE 3 STUDY.

AGARWAL, ANIL K.; ROY-CHAUDHURY, PRABIR; MOUNTS, PHOEBE; HURLBURT, ELIZABETH; PFAFFLE, ANTONY; POGGIO, EUGENE C.

CLINICAL JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY18(11):1446-1455, NOVEMBER 2023.

DOI: 10.2215/CJN.0000000000000278

The Journal of Vascular Access
Volume 24, Issue 1, January 2023, Pages 87-91

https://doi.org/10.1177/11297298211026453

Original research articles

Taurolidine lock in the treatment of colonization and infection of totally implanted venous access devices in cancer patients

Fabrizio Brescia [1], Mauro Pittiruti [2], Giancarlo Scoppettuolo[3], Chiara Zanier[1], Elisa Nadalini[1], Paola Bottos[1], Chiara Moreal[1], Valentina Da Ros[4], and Fabio Fabiani[1]

Background: Taurolidine lock is known to be effective in preventing catheter-related infections in a variety of venous access devices, including long term venous access devices for chemotherapy. Though, literature about the use of taurolidine for treating catheter colonization or catheter-related blood stream infection is scarce.

Method: We have retrospectively reviewed the safety and efficacy of 2% taurolidine lock for treatment of catheter-colonization and of catheter-related bloodstream infection in cancer patients with totally implanted venous access devices. Diagnosis of colonization or catheter-related infection was based on paired peripheral and central blood cultures, according to the method of Delayed Time to Positivity.

Results: We recorded 24 cases of catheter-related infection and two cases of colonization. Taurolidine lock—associated with systemic antibiotic therapy—was successful in treating all cases of catheter-related infection, with disappearance of clinical symptoms, normalization of laboratory values, and eventually negative blood cultures. Taurolidine lock was also safe and effective in treating device colonization. No adverse effect was reported.

Conclusion: In our retrospective analysis, 2% taurolidine lock was completely safe and highly effective in the treatment of both catheter-colonization and catheter-related bloodstream infection in cancer patients with totally implanted venous access devices.

Keywords

Oncology access, techniques and procedures, catheter-related bloodstream infection, catheter-colonization, taurolidine lock

JPEN J Parenter Enteral Nutr. 2024 Apr 11. doi: 10.1002/jpen.2630. Online ahead of print.

Catheter salvage or removal in catheter-related bloodstream infections with Staphylococcus aureus in children with chronic intestinal failure receiving home parenteral nutrition and the use of prophylactic taurolidine catheter lock solution: A descriptive cohort study

Aysenur Demirok [1], David H C Illy [1], Sietse Q Nagelkerke [2], Michiel F Lagerweij [3], Marc A Benninga [1], Merit M Tabbers [1]

Affiliations + expand

PMID: 38605559 DOI: 10.1002/jpen.2630

Abstract

Background: Children with chronic IF require long-term home parenteral nutrition (HPN), administered through a central venous catheter. Catheter-related bloodstream infection (CRBSI) with Staphylococcus aureus is known to be a serious infection with a high mortality rate and risk of complications. A standardized protocol on the management of S aureus CRBSIs in children receiving HPN is lacking. The aim of this study is to evaluate the effectiveness and safety of the current management in an HPN expertise center in the Netherlands.

Methods: We performed a retrospective descriptive cohort study between 2013 and 2022 on children 0-18 years of age with chronic IF requiring long-term HPN. Our primary outcomes were the incidence of S aureus CRBSI per 1000 catheter days, catheter salvage attempt rate, and successful catheter salvage rate. Our secondary outcomes included complications and mortality.

Results: A total of 74 patients (39 male; 53%) were included, covering 327.8 catheter years. Twenty-eight patients (38%) had a total of 52 S aureus CRBSIs, with an incidence rate of 0.4 per 1000 catheter days. The catheter salvage attempt rate was 44% (23/52). The successful catheter salvage rate was 100%. No relapse occurred, and no removal was needed after catheter salvage. All complications that occurred were already present at admission before the decision to remove the catheter or not. No patients died because of an S aureus CRBSI.

Conclusion: Catheter salvage in S aureus CRBSIs in children receiving HPN can be attempted after careful consideration by a multidisciplinary team in an HPN expertise center.

Keywords: Staphylococcus aureus; catheter-related bloodstream infection; intestinal failure; pediatric.

Journal of Hospital Infection 143 (2024) 76–81

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Use of 2% taurolidine lock solution for treatment and prevention of catheter-related bloodstream infections in neonates: a feasibility study

I. Savarese [a], S. Yazami [b], D.U. De Rose [a], K. Carkeek [b], F. Campi [a], C. Auriti [a], O. Danhaive [b], F. Piersigilli [b,*]

[a] Neonatal Intensive Care Unit, "Bambino Gesù" Children's Hospital IRCCS, Rome, Italy
[b] Neonatal Intensive Care Unit, Cliniques Universitaires Saint Luc, Université Catholique de Louvain, Bruxelles, Belgium

ARTICLE INFO

Article history:
Received 18 August 2023
Accepted 2 November 2023
Available online 14 November 2023

Keywords:
Central venous catheter
CRBSI
CLABSI
Taurolidine
Lock therapy
Neonate

SUMMARY

Background: Taurolidine lock, a technique used to prevent or treat catheter-related bloodstream infection (CRBSI), is effective in adult and paediatric patients but has been described rarely in neonates. The aim of this descriptive retrospective study, was to determine the feasibility and direct outcomes of prophylactic and therapeutic taurolidine locks in term and preterm neonates.

Methods: We implemented the use of therapeutic taurolidine lock in addition to antibiotic treatment with the aim of catheter salvage in critical neonates with difficult vascular access (group 1). In addition, we introduced taurolidine lock as a preventive measure in neonates with a central venous catheter (CVC) at high risk of developing CRBSI (group 2). Every 24 h (in the treatment group) a 2% taurolidine solution was injected and the catheter locked for at least 120 min, until infection clearance (group 1). In the preventive group, the catheter was locked for 30 min every 48 h until CVC removal (group 2).

Findings: Thirty-seven neonates who received taurolidine were included in this study. We did not observe any major adverse events. In group 1 (21 cases), clinical symptom disappearance and bacteraemia clearance were achieved without catheter removal in 18 cases (85.7%); in the other three neonates the catheter was removed shortly after the start of the locks as it was possible to replace the CVC. In group 2 (16 neonates), no CRBSI was observed during the duration of the catheter placement.

Conclusions: In this retrospective study, taurolidine was successfully used in neonates both for prevention and treatment of CRBSI, without major undesired effects. A larger cohort and a randomized clinical trial is warranted in order to establish its efficacy and safety in neonates.

Clinical Nutrition 41 (2022) 2178–2184

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Taurolidine-related adverse events in patients on home parenteral nutrition frequently indicate catheter-related problems

J.W. Korzilius*, V.E.L.M. Gillis, Y. Wouters, G.J.A. Wanten

Department of Gastroenterology and Hepatology, Radboud University Medical Centre, Nijmegen, the Netherlands

ARTICLE INFO

Article history:
Received 30 May 2022
Accepted 9 July 2022

Keywords:
Taurolidine
Intestinal failure
Home parenteral nutrition
Adverse event
Algorithm
Thrombosis

SUMMARY

Background & aims: A catheter-related bloodstream infection (CRBSI) is a serious complication of home parenteral nutrition (HPN) treatment. Despite taurolidine's frequent use as catheter lock solution (CLS) to prevent CRBSIs and its presumed favourable safety profile, data on taurolidine-related adverse events (AEs) and the clinical implications thereof remain merely anecdotal. Aim of this study was to explore taurolidine-related AEs in our large cohort of HPN patients and to develop an algorithm on how to deal with these AEs in clinical practice.

Methods: This retrospective cohort study comprised all adult HPN patients who used taurolidine as a CLS between 2006 and 2021 at our national HPN referral centre. Primary outcome was to identify taurolidine-related AEs. Secondary outcomes were median time to a taurolidine-related AEs and development of a clinical algorithm. A taurolidine-related AE was defined as an event that occurred directly after instillation of taurolidine in the CVAD or at start of fluid/PN infusion.

Results: In total, 470 patients used taurolidine during 700.232 catheter days. In 89 (19%) patients, 103 mild- to severe AEs related to taurolidine were observed. Six patients developed an allergic reaction. Reported AEs compromised vascular access device-related problems (group A) or taurolidine-related problems (group B) in 53 (51%) and 50 (49%), patients, respectively. In groups A and B, 51 (85%) and 21 (18%) patients presented with taurolidine infusion-related pain. Upon rechallenge, 45 (85%) and 16 (32%) patients, respectively, successfully resumed taurolidine locking without residual symptoms.

Conclusion: In this study, use of taurolidine as CLS was generally safe. Most reported AEs were vascular access device-related, and the majority of symptoms concerned pain. Upon rechallenge, a substantial number of patients, especially those in whom pain was the main symptom, could resume CLS locking after addressing the underlying catheter-related problem. Based on these results, we present a clinical algorithm for patients with possible taurolidine-related symptoms.

Infection Prevention in Practice 6 (2024) 100352

Available online at www.sciencedirect.com

Infection Prevention in Practice

journal homepage: www.elsevier.com/locate/ipip

The effect of taurolidine on the time-to-positivity of blood cultures

C.H. van den Bosch [a, *, 1], J.E.P. Moree [a, b, 1], S. Peeters [b], M. Lankheet [b], A.F.W. van der Steeg [a], M.H.W.A. Wijnen [a], M.D. van de Wetering [a], J.T. van der Bruggen [b]

[a] *Princess Máxima Centre for Paediatric Oncology, Heidelberglaan 25, 3584 CS, Utrecht, The Netherlands*
[b] *Department of Medical Microbiology, University Medical Centre Utrecht, Heidelberglaan 100, 3584 CX, Utrecht, The Netherlands*

ARTICLE INFO

Article history:
Received 3 November 2023
Accepted 7 February 2024
Available online 29 February 2024

Keywords:
Central line-associated bloodstream infection
Taurolidine
Taurolock
Paediatric oncology
Central venous access
Blood culture

SUMMARY

Background: Taurolidine containing lock solutions (TL) are a promising method for the prevention of central line associated bloodstream infections. Per accident, the TL may not always be aspirated from the central venous catheter (CVC) before blood cultures are obtained. The TL could, unintentionally, end up in a blood culture vial, possibly altering the results. The aim of this study was to investigate the effect of the TLs on the detection of microbial growth in blood culture vials.

Methods: Different lock solutions (taurolidine-citrate-heparin (TCHL), taurolidine, heparin, citrate or NaCl) were added to BD BACTEC™ blood culture vials (Plus Aerobic/F, Lytic/10 Anaerobic/F or Peds Plus/F) before spiking with *Staphylococcus aureus* (ATCC 29213 or a clinical strain) or *Escherichia coli* (ATCC 25922 or a clinical strain) in the presence and absence of blood. Subsequently, blood culture vials were incubated in the BD BACTEC FX instrument with Time-to-positivity (TTP) as primary outcome. In addition, the effect of the TCHL on a variety of other micro-organisms was tested.

Discussion: In the presence of taurolidine, the TTP was considerably delayed or vials even remained negative as compared to vials containing heparin, citrate or NaCl. This effect was dose-dependent. The delayed TTP was much less pronounced in the presence of blood, but still notable.

Conclusion: This study stresses the clinical importance of discarding TLs from the CVC before obtaining a blood culture.

JVA
ISSN 1129-7298

J Vasc Access 2016; 17 (6): 453-464
DOI: 10.5301/jva.5000576

REVIEW

Evidence-based criteria for the choice and the clinical use of the most appropriate lock solutions for central venous catheters (excluding dialysis catheters): a GAVeCeLT consensus

Mauro Pittiruti[1], Sergio Bertoglio[2], Giancarlo Scoppettuolo[1], Roberto Biffi[3], Massimo Lamperti[4], Alberto Dal Molin[5], Nicola Panocchia[1], Nicola Petrosillo[6], Mario Venditti[7], Carla Rigo[8], Enrico DeLutio[9]

[1] Fondazione Policlinico Universitario "A. Gemelli", Rome - Italy
[2] Department of Surgical Sciences, Università degli Studi, Genova - Italy
[3] Istituto Europeo di Oncologia, Milan - Italy
[4] Cleveland Clinic Hospital, Abu Dhabi - United Arab Emirates
[5] Università del Piemonte Orientale, Biella - Italy
[6] Istituto Nazionale Malattie Infettive "L. Spallanzani", Rome - Italy
[7] Università "La Sapienza", Rome - Italy
[8] Azienda Ospedaliera Universitaria "Maggiore della Carità", Novara - Italy
[9] Vascular Access Specialist, Rome - Italy

TABLE I - Panel recommendations

The role of lock in preventing occlusion of NDCVA
The role of anticoagulant lock is only marginally important in the management of NDCVA, in terms of prevention of lumen occlusion.
Future assessment of the role of citrate lock in NDCVA is desirable and considered of increasing importance. The benefit of citrate might be more focused on its action against biofilm and against bacteria rather than on its anticoagulant effect.
Heparin lock and citrate lock both guarantee an effective anticoagulant action, which is proven to be useful in DCVA rather than in NDCVA.
Trombolytic/fibrinolytic drugs, as currently available, are neither safe nor cost-effective for prevention of occlusion of NDCVA, while they have a definite role in the treatment of lumen occlusion due to blood clots.
Saline lock is as appropriate as anticoagulant lock in prevention of occlusion of NDCVA.
A pulsatile positive "push and pause" ("start and stop") technique is the most appropriate methodology of flushing.
The role of lock in preventing infection of NDCVA
While antibacterial lock (specifically with antibiotics) has a clear role in clinical practice as a treatment of some selected catheter-related blood stream infection, the use of antibacterial lock for the purpose of prevention of catheter colonization and/or infection is a new field which demands further research, as it may prove to have an important clinical role in some selected populations of high risk patients where the standard bundles of infection prevention appear to be ineffective or insufficient.
Non-antibiotic antibacterial lock will have a major future role for prevention of catheter colonization and infection. While ethanol lock is highly effective, due to concerns about its safety, the drugs most likely to be used as antibacterial lock are taurolidine and citrate, which have optimal characteristics in terms of safety, efficacy and cost-effectiveness.
The association that is most promising as antibacterial/anticoagulant lock, in NDCVA as in DCVA, is taurolidine/citrate. Further studies should clarify which populations of patients might benefit of this association, and which concentrations of taurolidine and of citrate might be associated with the best outcome in terms of safety and efficacy.

ISSN (electrónico): 1699-5198 - ISSN (papel): 0212-1611 - CODEN NUHOEQ S.V.R. 318

Nutrición Hospitalaria

Revisión

Evidence-based recommendations of the Andalusian Group for Nutrition Reflection and Investigation (GARIN) for the management of adult patients with short bowel syndrome

Recomendaciones basadas en la evidencia del Grupo Andaluz para la Reflexión e Investigación en Nutrición (GARIN) para el manejo del paciente con síndrome de intestino corto

Francisco J. Vílchez-López[1,2], Laura Larrán-Escandón[1,2], José M. García-Almeida[3,4], Carmen Arraiza-Irigoyen[5], José A. Irles Rocamora[6], María J. Molina-Puerta[7,8], Juan B. Molina Soria[9], José L. Pereira-Cunill[10,11], Juana M. Rabat-Restrepo[12], María I. Rebollo-Pérez[13], María P. Serrano-Aguayo[10,11], Carmen Tenorio-Jiménez[14], Gabriel Olveira[4,15,16], and Pedro P. García-Luna[10,11,17]

[1]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario Puerta del Mar. Cádiz, Spain. [2]Instituto de Investigación Biomédica de Cádiz (INIBICA). Cádiz, Spain. [3]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario Virgen de la Victoria. Málaga, Spain. [4]Instituto de Investigación Biomédica de Málaga (IBIMA). Málaga, Spain. [5]Department of Endocrinology and Nutrition. Complejo Hospitalario de Jaén. Jaén, Spain. [6]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario de Valme. Seville, Spain. [7]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario Reina Sofía. Córdoba, Spain. [8]Instituto Maimónides de Investigación Biomédica de Córdoba (IMIBIC). Córdoba, Spain. [9]Nutrition and Dietetics Unit. Hospital General de Linares. Linares, Jaén. Spain. [10]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario Virgen del Rocío. Seville, Spain. [11]Endocrine Diseases Research Group. Instituto de Biomedicina de Sevilla (IBIS). Seville, Spain. [12]Department of Endocrinology and Nutrition. Hospital Universitario Virgen Macarena. Seville, Spain. [13]Department of Endocrinology and Nutrition. Hospital Juan Ramón Jiménez. Huelva, Spain. [14]Endocrinology and Nutrition Clinical Management Unit. Hospital Universitario Virgen de las Nieves. Granada, Spain. [15]Endocrinology and Nutrition Clinical Management Unit. Hospital Regional Universitario de Málaga. Universidad de Málaga. Málaga, Spain. [16]CIBERDEM (CB07/08/0019). Instituto de Salud Carlos III. Madrid, Spain. [17]GARIN Group. Seville, Spain

Abstract

In order to develop evidence-based recommendations and expert consensus for the nutritional management of patients with short bowel syndrome (SBS), we conducted a systematic literature search using the PRISMA methodology plus a critical appraisal following the GRADE scale procedures. Pharmacological treatment with antisecretory drugs, antidiarrheal drugs, and somatostatin contributes to reducing intestinal losses. Nutritional support is based on parenteral nutrition; however, oral intake and/or enteral nutrition should be introduced as soon as possible. In the chronic phase, the diet should have as few restrictions as possible, and be adapted to the SBS type. Home parenteral nutrition (HPN) should be individualized. Single-lumen catheters are recommended and taurolidine should be used for locking the catheter. The HPN's lipid content must be greater than 1 g/kg per week but not exceed 1 g/kg per day, and omega-6 fatty acids (ω6 FAs) should be reduced. Trace element vials with low doses of manganese should be used. Patients with chronic SBS who require long-term HPN/fluid therapy despite optimized treatment should be considered for teduglutide treatment. All patients require a multidisciplinary approach and specialized follow-up. These recommendations and suggestions regarding nutritional management in SBS patients have direct clinical applicability.

Keywords:

Short bowel syndrome. Home parenteral nutrition. Teduglutide.

Received: 19/05/2021 • Accepted: 22/06/2021

Home parenteral nutrition	
What is the catheter of choice for HPN in patients with SBS?	
As a consensus of experts our proposal is to individualise the choice of access based on the patient's characteristics and the site's experience	95.38 %
We recommend using single-lumen catheters or using a lumen exclusively for PN when using multiple-lumen catheters	100 %
What is the ideal catheter lock?	
We recommend locking the catheter with taurolidine in all cases	98.46 %
What method of administration should we use?	
We suggest administering the HPN cyclically	98.46 %

INS 2024

O. Use antimicrobial locking solutions for therapeutic and prophylactic purposes in patients with long-term CVADs in the following circumstances: patients with a history of multiple CABSIs, high-risk patient populations, and in facilities with unacceptably high rates of CLABSI, despite implementation of other methods of infection prevention (see Standard 61, *Parenteral Nutrition*).[15,39,46-53] (II)

b. Antiseptic locking solutions include solutions used alone or in numerous combinations, including, but not limited to, ethanol, sodium bicarbonate, taurolidine, citrate, concentrated sodium chloride, and ethylenediaminetetraacetic acid (EDTA).[15,49-51,53-56] (II)

CONCLUSIONI

- LA DECISIONE DI RIMUOVERE O MENO UN CATETERE VASCOLARE IN CORSO DI EPISODIO FEBBRILE DEVE ESSERE ASSOLUTAMENTE INDIVIDUALIZZATA
- TALE DECISIONE E' STRETTAMENTE DIPENDENTE DALL'ACCURATEZZA DELLA DIAGNOSI DI CRBSI
- E' NECESSARIO AVERE UNA DISTINZIONE CHIARA TRA DEFINIZIONE DI CRBSI (UTILE A FINI CLINICI) E DI CLABSI (UTILE A FINE DI MONITORAGGIO EPIDEMIOLOGICO)
- IN CASI SELEZIONATI, IN PAZIENTI ESTREMAMENTE DIPENDENTI DAL CATETERE VASCOLARE E CON RICONOSCIUTA DIFFICOLTA' DI RIPOSIZIONAMENTO, E' POSSIBILE TENTARE UN SALVATAGGIO DEL CATETERE, COMBINANDO TERAPIA ANTIBIOTICA SISTEMICA E LOCK THERAPY, PREFERIBILMENTE RAPPRESENTATA DA SOSTANZE NON ANTIBIOTICHE CON EFFETTO ANTIMICROBICO

GRAZIE PER L'ATTENZIONE!

giancarlo.scoppettuolo@policlinicogemelli.it