Avdeling for smittevern

Smittevernaspekter ved dialyse utenfor dialyseavdelingen

Egil Lingaas

14. november 2024

Dialyse og risiko for smitte

- Pasientenes immunstatus
- Hyppig og langvarig kontakt med blod
- Nærhet til andre pasienter (i samme rom)
- Hyppig kontakt med helsepersonell som beveger seg mellom pasienter og maskiner
- Hyppige hudpunksjoner
- Hyppige sykehusopphold og kirurgiske inngrep
- Risiko for brudd på smittevernrutiner
- Kontakt med vann

Infeksjonsrisiko ved dialyse

- Infeksjoner er den nest hyppigste årsak til død hos dialysepasienter (1)
- Sepsis er rapportert hos 0,63 – 1,7 % per måned
- Infeksjon knyttet til vaskulær tilgang (m/u bakteriemi): 1,3 – 2,7 % per måned

Fransk studie (2)

- 28 % knyttet til vaskulær tilgang
- 25 % lungeinfeksjon
- 23 % urinveisinfeksjon
- 9 % hud og bløtvev
- 15 % ukjent lokalisasjon

MMWR 2001;50: RR-5
Kessler M et al. Nephron 1993;64:95

Infeksjonsrisiko ved dialyse

National Healthcare Safety Network (NHSN) Dialysis Event Surveillance Report for 2014

Duc B. Nguyen, Alicia Shugart, Christi Lines, Ami B. Shah, Jonathan Edwards, Daniel Pollock, Dawn Sievert, and Priti R. Patel

Abstract

Background and objectives Persons receiving outpatient hemodialysis are at risk for bloodstream and vascular access infections. The Centers for Disease Control and Prevention conducts surveillance for these infections through the National Healthcare Safety Network. We summarize 2014 data submitted to National Healthcare Safety Network Dialysis Event Surveillance.

Design, setting, participants, & measurements Dialysis facilities report three types of dialysis events (bloodstream infections; intravenous antimicrobial starts; and pus, redness, or increased swelling at the hemodialysis vascular access site). Denominator data consist of the number of hemodialysis outpatients treated at the facility during the first 2 working days of each month. We calculated dialysis event rates stratified by vascular access type (*e.g.*, arteriovenous fistula, arteriovenous graft, or central venous catheter) and standardized infection ratios (comparing individual facility observed with predicted numbers of infections) for bloodstream infections. We described pathogens identified among bloodstream infections.

Results A total of 6005 outpatient hemodialysis facilities reported dialysis event data for 2014 to the National Healthcare Safety Network. These facilities reported 160,971 dialysis events, including 29,516 bloodstream infections, 149,722 intravenous antimicrobial starts, and 38,310 pus, redness, or increased swelling at the hemodialysis vascular access site events; 22,576 (76.5%) bloodstream infections were considered vascular access related. Most bloodstream infections (63.0%) and access-related bloodstream infections (69.8%) occurred in patients with a central venous catheter. The rate of bloodstream infections per 100 patient-months was 0.64 (0.26 for arteriovenous fistula, 0.39 for arteriovenous graft, and 2.16 for central venous catheter). Other dialysis event rates were also highest among patients with a central venous catheter. Facility bloodstream infection standardized infection ratio distribution was positively skewed with a median of 0.84. *Staphylococcus aureus* was the most commonly isolated bloodstream infection pathogen (30.6%), and 39.5% of *S. aureus* isolates tested were resistant to methicillin.

Conclusions The 2014 National Healthcare Safety Network Dialysis Event data represent nearly all United States outpatient dialysis facilities. Rates of infection and other dialysis events were highest among patients with a central venous catheter compared with other vascular access types. Surveillance data can help define the epidemiology of important infections in this patient population.

Clin J Am Soc Nephrol 12: 1139–1146, 2017. doi: https://doi.org/10.2215/CJN.11411116

Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia

Correspondence:
Dr. Duc B. Nguyen, Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road NE, MS A-35 Atlanta, GA 30329-4018. Email: vif8@cdc.gov

Nguyen DB et al. Clin J Am Soc Nephrol 2017;12:1139

National Healthcare Safety Network (NHSN) Dialysis Event Surveillance Report for 2014

Duc B. Nguyen, Alicia Shugart, Christi Lines, Ami B. Shah, Jonathan Edwards, Daniel Pollock, Dawn Sievert, and Priti R. Patel

Nguyen DB et al. Clin J Am Soc Nephrol 2017;12:1139

Infeksjoner ved dialyse (2014)

- 6005 dialyseenheter
- 160.971 hendelser knyttet til dialyse
- 29.516 blodbaneinfeksjoner,
  - hvorav 22.576 (76,5 %) relatert til vaskulær tilgang
- 149.722 antibiotikabehandlinger
- 31.310 hendelser med lokalinfeksjon på innstikksted

Nguyen DB et al. Clin J Am Soc Nephrol 2017;12:1139

Infeksjoner ved dialyse, forts

- De fleste blodbaneinfeksjonene (63,0%) og de fleste som var forbundet med innstikk (69,8 %) ble registrert hos pasienter med dialysekateter
- Raten blodbaneinfeksjon per 100 pasientmåneder var:
  - 0,64 samlet
  - 0,26 hos pasienter med AV-fistel
  - 0,36 hos pasienter med AV-graft
  - 2,16 hos pasienter med dialysekateter
- Andre uønskede hendelser var også hyppigst hos pasienter med dialysekateter

Clin J Am Soc Nephrol 2017;12:1139

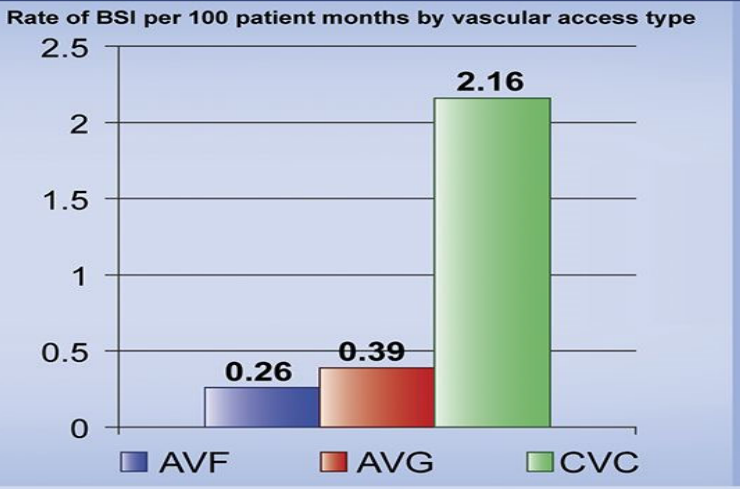
National Healthcare Safety Network (NHSN) Dialysis Event Surveillance Report for 2014

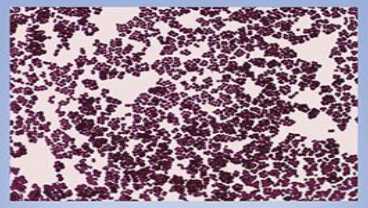
6,005 Outpatient Hemodialysis Facilities

DIALYSIS EVENTS 160,971

BSIs	ABX	PRS
29,516	149,722	38,310

BSIs: Bloodstream infections
ABX: Intravenous antimicrobial starts
PRS: Pus, redness or swelling at the HD access site





Staphylococcus aureus was the most commonly isolated pathogen (31 %); and 40 % of ***S. aureus*** isolates were resistant to methicillin

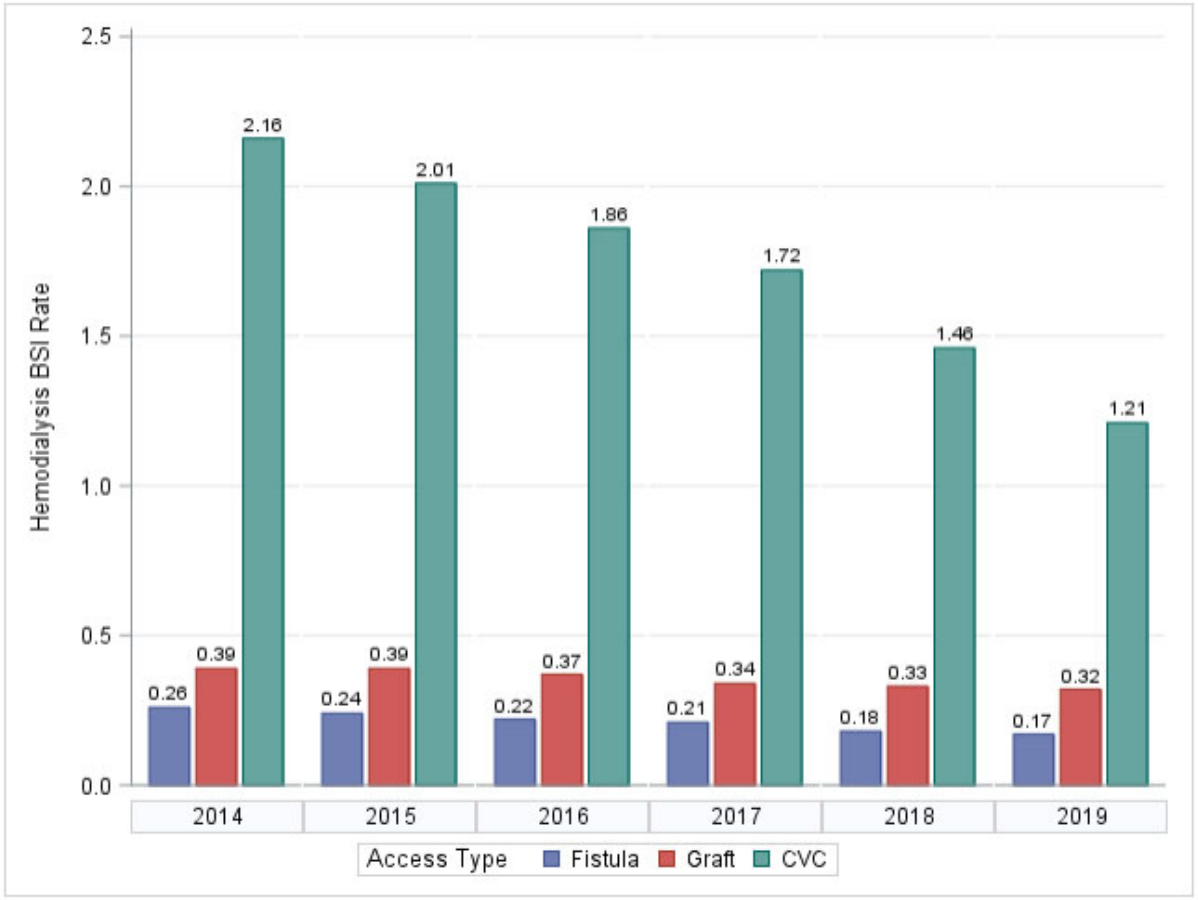
Rates of infection and other dialysis events were highest among patients with CVC compared to other vascular access types. Surveillance data can help define the epidemiology of important infections in this patient population.

Duc B. Nguyen, Alicia Shugart, Christi Lines, Ami B. Shah, Jonathan Edwards, Daniel Pollock, Dawn Sievert, and Priti R. Patel: National Healthcare Safety Network (NHSN) Dialysis Event Surveillance Report for 2014. CJASN CJN.11411116, doi:10.2215/CJN.11411116.

CJASN
Clinical Journal of American Society of Nephrology

Nguyen DB et al. Clin J Am Soc Nephrol 2017;12:1139

Blodbaneinfeksjoner per 100 pasientmåneder ved hemodialyse, USA National Healthcare Safety Network 2014–2019



2019:
500.000 pasienter
7.000 dialysesentre

Table 3. Most frequently reported micro-organisms isolated from blood cultures (Dialysis Event Surveillance, National Healthcare Safety Network, 2014)

Pathogen	Frequency, *N* (%)	
	All BSI, *n*=32,016	ARBSI, *n*=24,574
Ten most common pathogens		
Staphylococcus aureus	9788 (30.6)	7817 (31.8)
Staphylococcus epidermidis	4690 (14.6)	3837 (15.6)
Staphylococcus coagulase negative	3212 (10.0)	2389 (9.7)
Enterococcus faecalis	1535 (4.8)	1194 (4.9)
Escherichia coli	1193 (3.7)	720 (2.9)
Enterobacter cloacae	891 (2.8)	782 (3.2)
Klebsiella pneumoniae	880 (2.7)	640 (2.6)
Gram-positive cocci unspecified	689 (2.2)	509 (2.1)
Pseudomonas aeruginosa	638 (2.0)	486 (2.0)
Serratia marcescens	421 (1.3)	351 (1.4)
Other pathogens		
Proteus mirabilis	354 (1.1)	244 (1.0)
Acinetobacter baumannii	289 (0.9)	244 (1.0)
Stenotrophomonas maltophilia	288 (0.9)	257 (1.0)
Enterococcus faecium	219 (0.7)	159 (0.6)
Candida parapsilosis	58 (0.2)	52 (0.2)
Bukholderia cepacia	54 (0.2)	40 (0.2)
Ralstonia picketti	12 (<0.1)	11 (<0.1)

BSI, bloodstream infection; ARBSI, access-related bloodstream infection.

Clin J Am Soc Nephrol 2017;12:1139

Vannbårne mikororganismerog dialyse

- Achromobacter xylosoxidans
- Acinetobacter calcoaceticus
- Burkholderia cepacia
- Candida tropicalis
- Citrobacter freundii
- Elizabethkingia spp
- Elizabethkingia meningoseptica
- Enterobacter cloacae
- Herbaspirillium huttiense
- Klebsiella oxytoca
- Klebsiella pneumoniae
- Mycobacterium chelonae
- Mycobacterium mucogenicum
- Pseudomonas aeruginosa
- Ralstonia spp
- Stenotrophomonas maltophilia
- Serratia marcescens

Smittevernproblematikk ved dialyse utenfor dialyseavdeling

- Intensivavdelinger
- Isolater
- Intermitterende dialyse
- Kontinuerlig dialyse
- Tilførselsvann
- Avløp
- Dialyseutstyr som vehikkel for smittespredning
- Hjemmedialyse

Intensivavdelinger

Achromobacter xylosoxoidans

JOURNAL OF CLINICAL MICROBIOLOGY, Feb. 1984, p. 140–143 Vol. 19, No. 2
0095-1137/84/020140-04$02.00/0

Nosocomial Colonization and Infection by *Achromobacter xylosoxidans*

MARIE E. REVERDY, JEAN FRENEY, JEAN FLEURETTE,* MICHÈLE COULET, MARYSE SURGOT, DANIÈLE MARMET, AND CHRISTINE PLOTON

Laboratoire de Bactériologie, Faculté de Médecine A. Carrel, 69372 Lyon Cédex 8, France

- Fransk intensivavdeling
- 39 pasienter over 18 måneder
- 2 dødsfall
- Kilden var deionisert vann til hemodialyse

Mycobacterium chelonei

THE JOURNAL OF INFECTIOUS DISEASES • VOL. 152, NO. 5 • NOVEMBER 1985
 0022-1899/85/5205-0020$01.00

Infections with *Mycobacterium chelonei* in Patients Receiving Dialysis and Using Processed Hemodialyzers

Gail Bolan, Arthur L. Reingold, Loretta A. Carson, Vella A. Silcox, Charles L. Woodley, Peggy S. Hayes, Allen W. Hightower, Louise McFarland, Joseph W. Brown III, Norman J. Petersen, Martin S. Favero, Robert C. Good, and Claire V. Broome

From the Respiratory and Special Pathogens Epidemiology Branch, the Respiratory and Special Pathogens Laboratory Branch, Division of Bacterial Diseases, and the Hospital Infections Program, Center for Infectious Diseases, Centers for Disease Control, Atlanta, Georgia; and the Louisiana State Department of Health and Human Resources, and the Department of Medicine, Louisiana State University, New Orleans, Louisiana

Between April and November 1982, 27 of 140 patients in a hemodialysis center in Louisiana were infected with rapidly growing mycobacteria; 14 had bacteremia alone, 3 had soft-tissue infections, 1 had an access-graft infection, and 9 had widely disseminated disease. Of 26 identified isolates, 25 were *Mycobacterium chelonei* ssp. *abscessus*, and one was an *M. chelonei*–like organism. One factor common to all patients was exposure to processed hemodialyzers (artificial kidneys). Environmental sampling of the water-treatment system showed widespread contamination with nontuberculous mycobacteria, which were also recovered from the patient's side (blood compartment) of five of 31 hemodialyzers that had been processed and were ready for use. The formaldehyde concentration

Burkholderia cepacea

Journal of Hospital Infection (2003) 54, 120-123

Available online at www.sciencedirect.com
SCIENCE DIRECT®

www.elsevierhealth.com/journals/jhin

Polyclonal outbreak of *Burkholderia cepacia* complex bacteraemia in haemodialysis patients

M. Magalhães[a], C. Doherty[b], J.R.W. Govan[b], P. Vandamme[c,*]

[a]*Federal University of Pernambuco, Brazil*
[b]*Department of Medical Microbiology, University of Edinburgh Medical School, Edinburgh, UK*
[c]*Laboratory of Microbiology, Universiteit Gent, Ghent, Belgium*

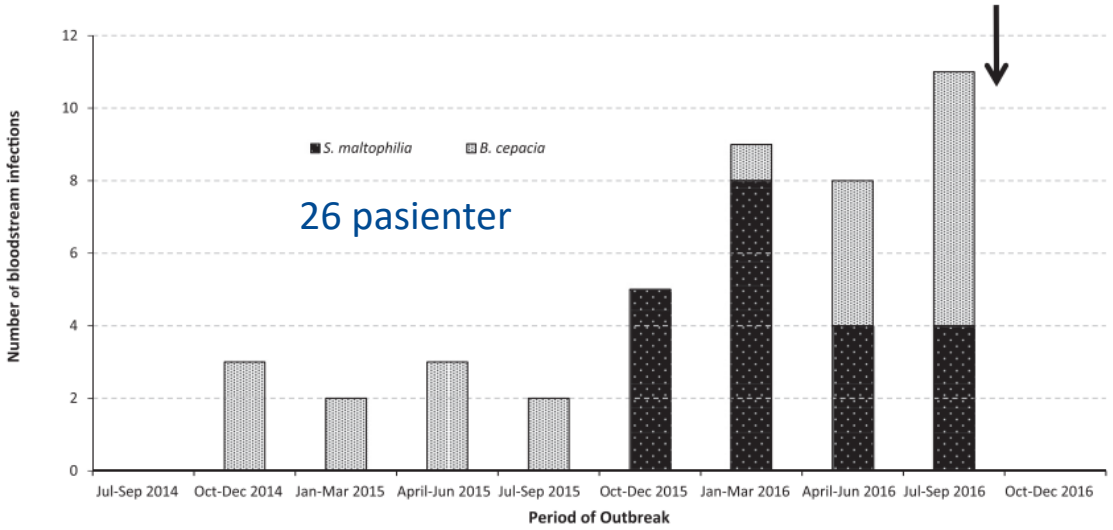
- 24 pasienter i dialyseavdeling i Brasil med
- B. cepacia isolert fra flere deler av vannsystemet

Am. J. Trop. Med. Hyg., 104(3), 2021, pp. 848–853
doi:10.4269/ajtmh.20-1035

Outbreak of *Stenotrophomonas maltophilia* and *Burkholderia cepacia* Bloodstream Infections at a Hemodialysis Center

Verônica França Diniz Rocha,[1,2] Thiago Pereira Cavalcanti,[2] Jailton Azevedo,[1] Helena Ferreira Leal,[1] Giulyana Evelyn Oliveira Silva,[3] Allan Roberto Xavier Malheiros,[2] Ledilce Almeida Ataide,[2] José Admirço Lima Filho,[2] Antonio Raimundo Pinto Almeida,[4] Nadia de Andrade Khouri,[2] Mitermayer Galvão Reis,[1,4,5] and Joice Neves Reis[1,3*]

[1]*Laboratory of Pathology and Molecular Biology (LPBM), Gonçalo Moniz Research Institute, Oswaldo Cruz Foundation, Salvador, Brazil;* [2]*Secretaria Estadual de Saúde do Estado da Bahia, Centro Administrativo da Bahia, Salvador, Brazil;* [3]*Faculdade de Farmácia, Universidade Federal da Bahia, Salvador, Brazil;* [4]*Faculdade de Medicina da Universidade Federal da Bahia, Salvador, Brazil;* [5]*Yale School of Public Health, Yale University, New Haven, Connecticut*



Mer enn 10^4 CFU/mL i vann-systemet og dialysemaskiner:

- S. maltophilia
- Cupriavidus pauculus
- Burkholderia cepacia
- Ralstonia pickettii

Brief Communication

Elizabethkingia meningoseptica: Emerging nosocomial pathogen in bedside hemodialysis patients

M. S. Ratnamani, Ratna Rao

- 8 pasienter med sepsis i intensivavdeling
- Alle var på hemodialyse
- Utbredte funn av bakterien i vannet

Ind J Crit Care Med 2013 Vol 17 Issue 5

Candida tropicals, mobilt dialyseapparat

American Journal of Infection Control 49 (2021) 1008–1013

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

A multi-center outbreak of *Candida tropicalis* bloodstream infections associated with contaminated hemodialysis machine prime buckets

John M. Boyce MD [a,*], Diane G. Dumigan RN, BSN, CIC [a], Nancy L. Havill MT, MHA, CIC [a], Richard J. Hollis MS [b], Michael A. Pfaller MD [b], Brent A. Moore PhD [c]

[a] Department of Medicine, Hospital of Saint Raphael, New Haven, CT
[b] Department of Pathology, University of Iowa College of Medicine, Iowa City, IA
[c] Department of Psychiatry, Yale University School of Medicine, New Haven, CT

Intermitterende dialyse

Intermitterende dialyse – tilkobling for vann og avløp

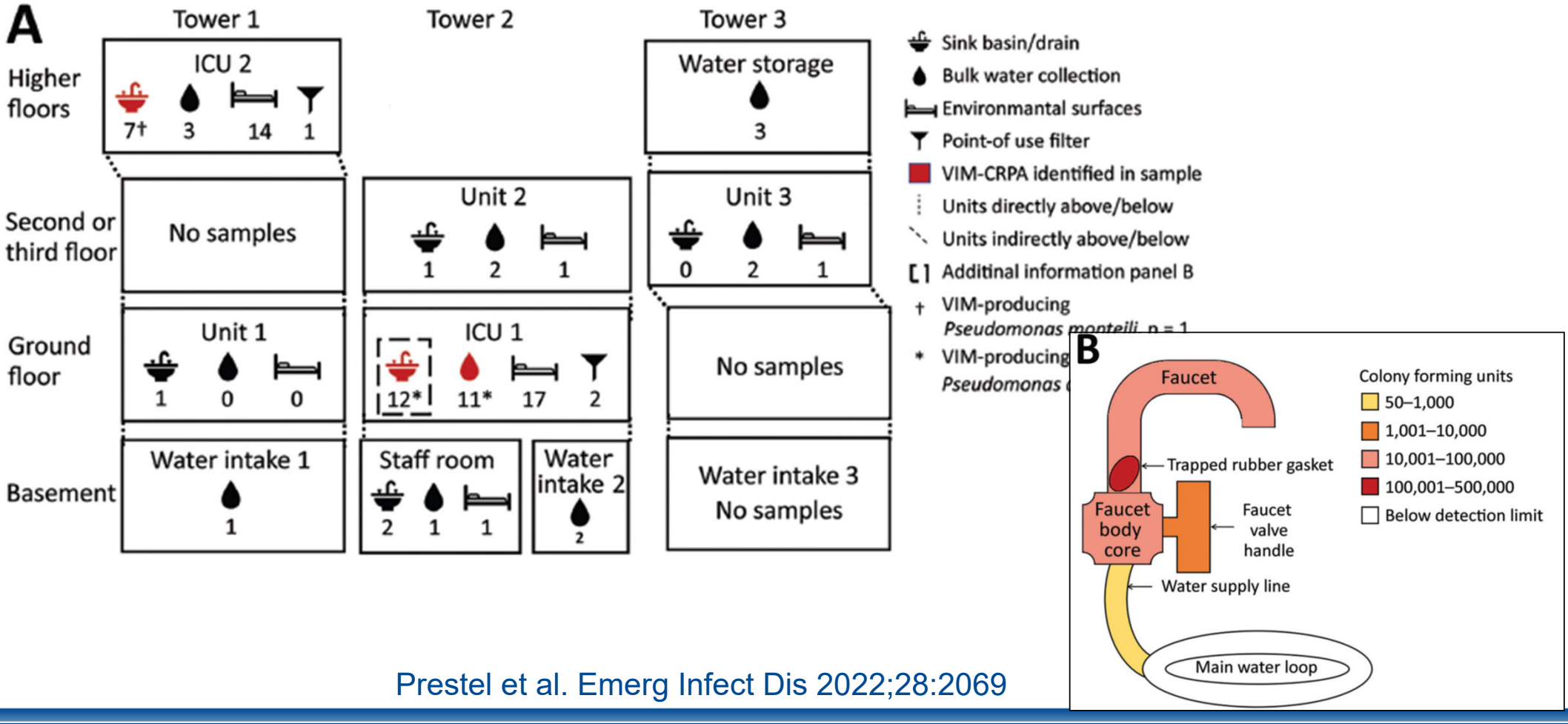
Dialysis Water Supply Faucet as Reservoir for Carbapenemase-Producing *Pseudomonas aeruginosa*

Christopher Prestel, Heather Moulton-Meissner, Paige Gable, Richard A. Stanton, Janet Glowicz, Lauren Franco, Mary McConnell, Tiffany Torres, Dijo John, Gillian Blackwell, Renae Yates, Chavela Brown, Kristina Reyes, Gillian A. McAllister, Jasen Kunz, Erin E. Conners, Katharine M. Benedict, Amy Kirby, Mia Mattioli, Kerui Xu, Nicole Gualandi, Stephanie Booth, Shannon Novosad, Matthew Arduino, Alison Laufer Halpin, Katherine Wells, Maroya Spalding Walters

- 36 pasienter i løpet av 30 måneder i en by med 250.000 innbyggere
- 21 (58 %) hadde vært innlagt i sykehus A siste 6 mnd før påvisning av bakterien
- Ikke overlappende opphold eller felles prosedyrer

Emerg Infect Dis 2022;28:2069

Mikrobiologiske prøver



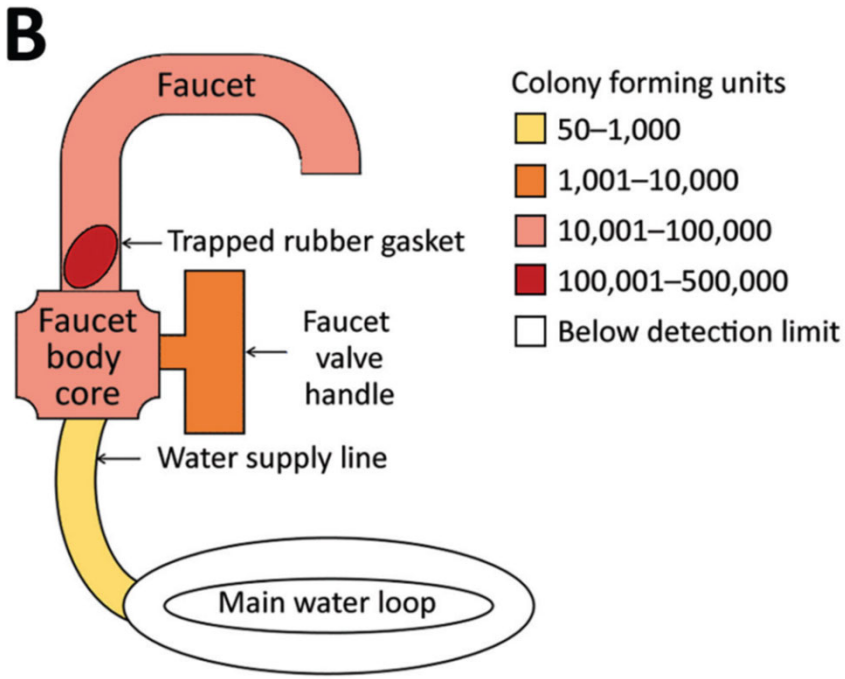
Prestel et al. Emerg Infect Dis 2022;28:2069

“Given the stay in room A of a patient with VIM-CRPA before the faucet was installed,

we hypothesize that the sink drain became contaminated first,

followed by retrograde contamination from the sink drain to the faucet, either during installation or through patient care activities.”

Prestel et al. Emerg Infect Dis 2022;28:2069


B
Faucet
Trapped rubber gasket
Faucet body core
Faucet valve handle
Water supply line
Main water loop
Colony forming units
50–1,000
1,001–10,000
10,001–100,000
100,001–500,000
Below detection limit

Perlator (aereator)

Punktfiltrering

Kontinuerlig dialyse

Dialyse – avløp

Kontinuerlig dialyse – tilkobling for avløp

Avløp

Infection (2019) 47:233–238
https://doi.org/10.1007/s15010-018-1239-9

ORIGINAL PAPER

Dialysis drains as a possible source for carbapenem-resistant pathogens causing an ICU outbreak

Birgit Ross[1] · Marco Krull[1] · Peter Rath[2] · Andreas Kribben[3] · Dana Dopadlik[1] · Irmgard Erlemann[1] · Ina Wiegard-Szramek[3] · Bartosz Tyczynski[3] · Jan Buer[2] · Frank Herbstreit[4]

- 5 pasienter, alle isolert, 4 pga influensa
- 4 fikk ECMO
- Alle fikk kontinuerlig dialyse
- Ultrafiltatet ble tømt i avløpet 5 ganger daglig

Ross B et al. Infection 2019; 47:233-238

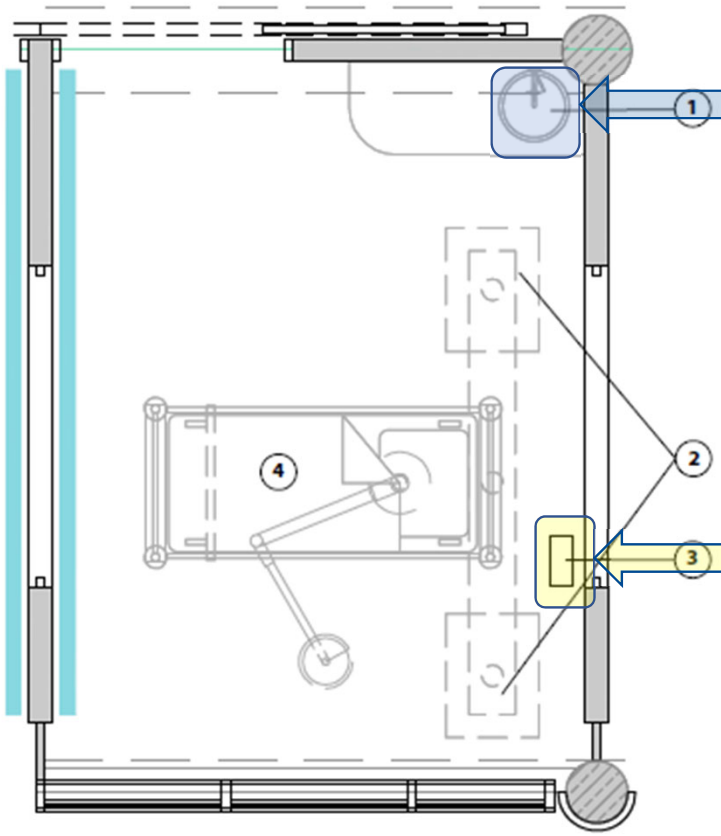


Fig. 1 Patient's room (ICU). (1) sink, (2) syringe pumps, infusion pumps, (3) dialysis unit, (4) patient's bed

Room number	Dialysis drains	Sink drains	Patient with proven colonization with KPC
2	Skin flora	Skin flora	–
3	Skin flora	Skin flora	–
4	Skin flora	Skin flora	–
7	Skin flora	Skin flora	–
11	***K. oxytoca* KPC**	***K. oxytoca* KPC**	+ ***Citrobacter freundii* KPC**
12	*S. maltophilia* Skin flora	Skin flora	–
13	***C. freundii* KPC**	*P. fluorescens* Skin flora	–
14	*S. maltophilia* Skin flora	Skin flora	–
15	***K. oxytoca* KPC**	Skin flora	+ ***Klebsiella pneumoniae* KPC**
16	*P. putida* Skin flora	*K. oxytoca* (susceptible) Skin flora	–
17	*P. putida, P. fluorescens* Skin flora	*P. putida* Skin flora	–
18	*Ps. putida, P. fluorescens* Skin flora	***K. oxytoca, C.freundii* KPC**	+ ***Citrobacter freundii* KPPC**
19	***K.oxytoca, C.freundii* KPC**	Skin flora	–
20	Skin flora	*P. aeruginosa* (susceptible)	–
21	*S. maltophilia* Skin flora	Skin flora	–
22	***E. cloacae, KPC***	Skin flora	–

Bold indicates KPC-producing *Enterobacteriaceae*

Ross B et al. Infection 2019; 47:233-238

Hjemmedialyse

Mycobacterium mucogenicum

Hemodialysis International 2017; **21**:E79–E81

Case Report

Case of *Mycobacterium mucogenicum* in a home hemodialysis patient

Miten J. DHRUVE,[1] Paul E. BUNCE,[2] Celine D'GAMA,[1] Christopher T CHAN[1]

[1]Division of Nephrology, University Health Network, Toronto, Ontario, Canada; [2]Department of Medicine, University of Toronto; Division of Infectious Diseases, University Health Network, Toronto, Ontario, Canada

- Ingen vekst fra dialysemaskinen eller RO-vannet.
- Høyt antall M. mucogenicum i springvannet.

Peritoneal hjemmedialyse

Annals of Clinical & Laboratory Science, vol. 51, no. 2, 2021

A Case of *Roseomonas gilardii* Peritonitis Associated with a Flooded Peritoneal Dialysis Treatment Space

Matthew S. Burgstahler[1], Scott D. Bieber[2], and David C. Pfeiffer[3]

[1]WWAMI Medical Education Program, University of Washington School of Medicine, Moscow, [2]Kootenai Clinic Nephrology - Kidney and Hypertension Services, Coeur d'Alene, and [3]WWAMI Medical Education Program and Department of Biological Sciences, University of Idaho, Moscow, ID, USA

Abstract. Bacterial peritonitis is a key complication of Peritoneal Dialysis (PD) and a preventable cause of withdrawal from PD treatment. Infection generally arises from contamination with skin commensals during handling of the dialysis delivery system or from translocation of gastrointestinal organisms and more rarely from an environmental organism. Herein, we report the case of a 73-year-old admitted for PD-related peritonitis due to *Roseomonas gilardii* with an associated environmental exposure from a domestic plumbing issue. We describe the presentation, case, and antibiotic regimen progression from empiric therapy of ceftazidime and vancomycin IP to ciprofloxacin. We acknowledge the importance of performing laboratory sensitivities given the high antibiotic resistance of the *Roseomonas* genus. We offer that nephrologists should consider *Roseomonas* as a potential causative organism of peritonitis, especially when initial or further history reveals exposure to potentially contaminated water.

Vannsikkerhet

VANNSIKKERHETSPLAN

HOLD VARMTVANNET VARMT

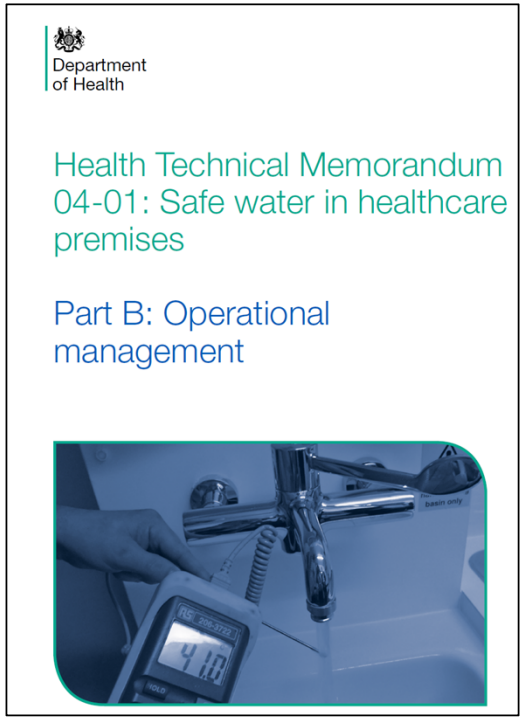
HOLD KALDTVANNET KALDT

HOLD SYSTEMET I BEVEGELSE

HOLD SYSTEM RENT

Bør vi teste vannet rutinemessig for bakterier?

Storbritannia: Ja



Augmented care units:

- Immunsupprimerte pasienter
- Organstøtte (intensiv, dialyse, cystisk fibrose)
- Omfattende brudd på hudbarriere med kontakt med vann (brannskade o.l.)

Norge: ?

Journal of Hospital Infection 97 (2017) 192–195

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Short report

Where to do water testing for *Pseudomonas aeruginosa* in a healthcare setting

M.I. Garvey [a,*], C.W. Bradley [a], E. Holden [a], M. Weibren [b]

[a] University Hospitals Birmingham NHS Foundation Trust, Queen Elizabeth Hospital Birmingham, Edgbaston, Birmingham, UK
[b] Chesterfield Royal Hospital NHS Foundation, Calow, Chesterfield, UK

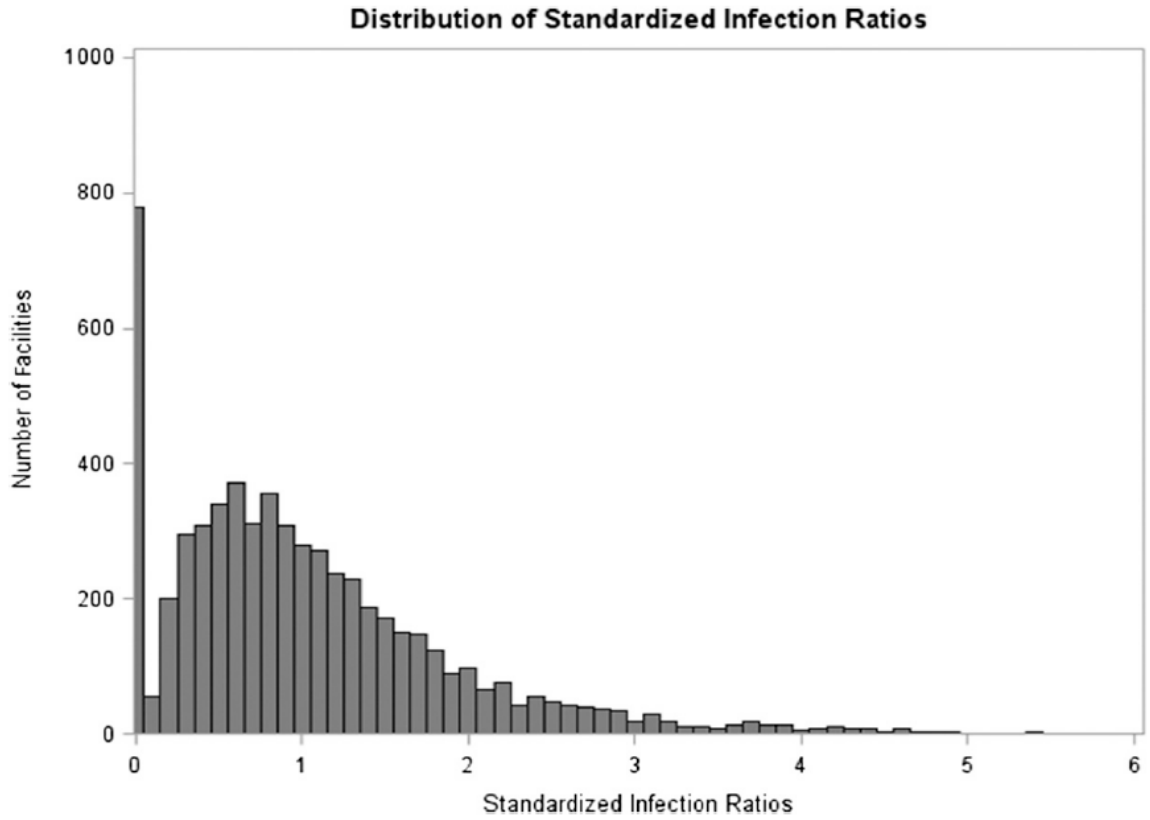
Andel tappepunkter positive for P. aeruginosa per år

Area	No. of outlets	Positive outlets			
		2013	2014	2015	2016
Critical care	231	20%	26%	24%	31%
Burns unit	69	29%	18%	13%	12%
Haematology unit	87	6%	8%	12%	16%
Haemodialysis unit	149	17%	15%	24%	19%

Antall pasienter med P. aeruginosa per år

Area	*P. aeruginosa* infections			
	2013	2014	2015	2016
Critical care	93	102	104	57
Burns unit	19	22	20	18
Haematology unit	15	16	12	11
Haemodialysis unit	3	4	4	2
Total	130	144	140	88

Infeksjonsrisiko ved dialyse var ujevnt fordelt mellom enheter



Nguyen DB et al. Clin J Am Soc Nephrol 2017;12:1139