



UMÝVADLÁ AKO **HOTSPOTY** ŠÍRENIA MULTIREZISTENTNÝCH BAKTÉRIÍ V NEMOCNIČNOM PROSTREDÍ

Jaroslava Sokolová

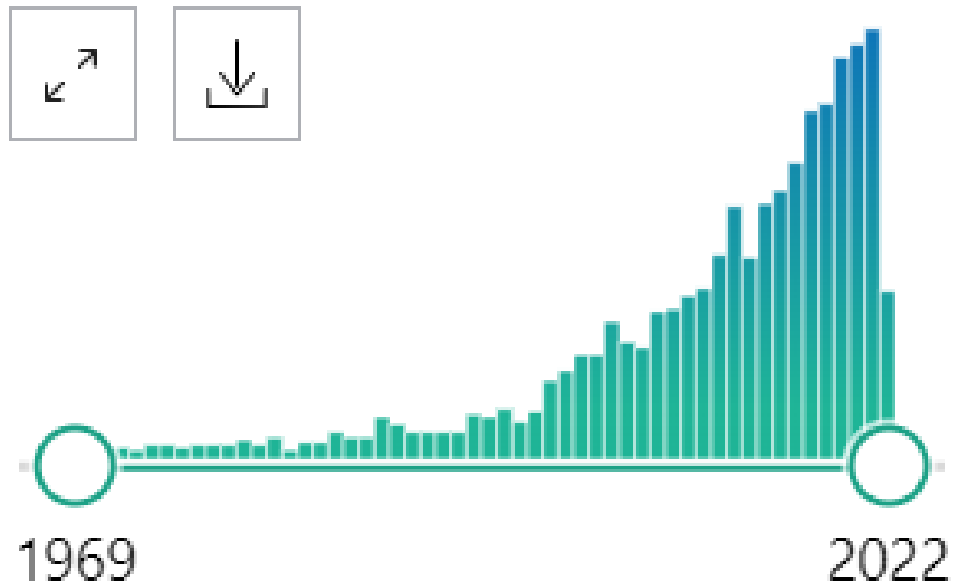
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Centrum mikrobiológie a prevencie infekcií Trnavská univerzita, Trnava*

PubMed

"SINK, MULTIRESTANT BACTERIA"

- 1793 vedeckých článkov

RESULTS BY YEAR



1974 – LANCET – první report PSA v umývadlách

THE LANCET, SEPTEMBER 7, 1974

Hospital Practice

PSEUDOMONAS AERUGINOSA IN HOSPITAL SINKS

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Summary *Pseudomonas aeruginosa* was isolated
from sink waste-traps in 27 of 116



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Contaminated sinks in intensive care units: an underestimated source of extended-spectrum beta-lactamase-producing Enterobacteriaceae in the patient environment

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ARTICLE INFO

Article history:

SUMMARY

Background: Extended-spectrum beta-lactamase-producing Enterobacteriaceae (ESBLE)

Are Sink Drainage Systems a Reservoir for Hospital-Acquired Gammaproteobacteria Colonization and Infection? A Systematic Review

Cheryl Volling,¹ Narges Ahangari,¹ Jessica J. Bartoszko,² Brenda L. Coleman,¹ Felipe Garcia-Jeldes,³ Alainna J. Jamal,¹ Jennie Johnstone,¹ Christopher Kandel,¹ Philipp Kohler,⁴ Helena C. Maltezos,⁵ Lorraine Maze dit Mieusement,⁶ Nneka McKenzie,¹ Dominik Mertz,⁷ Adam Monod,¹ Salman Saeed,⁸ Barbara Shea,¹ Rhonda L. Stuart,⁹ Sera Thomas,¹ Elizabeth Uleryk,¹⁰ and Allison McGeer¹

¹Sinai Health System, Toronto, Ontario, Canada, ²McMaster University, Hamilton, Ontario, Canada, ³Centre Hospitalier de l'Université Laval, Quebec City, Quebec, Canada, ⁴Cantonal Hospital St. Gallen, St. Gallen, Switzerland, ⁵National Public Health Organization, Athens, Greece, ⁶Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada, ⁷Hamilton Health Sciences, Hamilton, Ontario, Canada, ⁸Mercy Hospital, Joplin, Missouri, USA, ⁹Monash Health, Clayton, Victoria, Australia, and ¹⁰E.M. Uleryk Consulting, Mississauga, Ontario, Canada

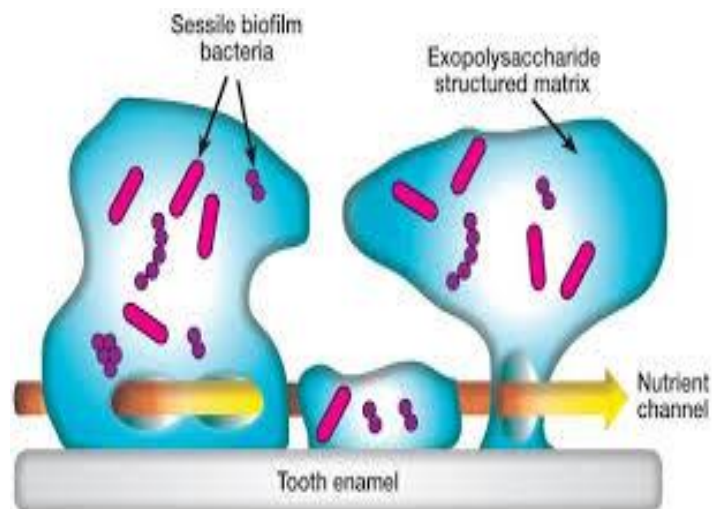
Increasing rates of antimicrobial-resistant organisms have focused attention on sink drainage systems as reservoirs for hospital-acquired Gammaproteobacteria colonization and infection. We aimed to assess the quality of evidence for transmission from this reservoir. We searched 8 databases and identified 52 studies implicating sink drainage systems in acute care hospitals as a reservoir for Gammaproteobacterial colonization/infection. We used a causality tool to summarize the quality of evidence. Included studies provided evidence of co-occurrence of contaminated sink drainage systems and colonization/infection, temporal sequencing compatible with sink drainage reservoirs, some steps in potential causal pathways, and relatedness between bacteria from sink drainage systems and patients. Some studies provided convincing evidence of reduced risk of organism acquisition following interventions. No single study provided convincing evidence across all causality domains, and the attributable fraction of infections related to sink drainage systems remains unknown. These results may help to guide conduct and reporting in future studies.

OPEN

Novel use of culturomics to identify the microbiota in hospital sink drains with and without persistent VIM-positive *Pseudomonas aeruginosa*

Jannette Pirzadian¹, Susan P. Hartevelde^{1,2}, Shanice N. Ramdutt^{1,2}, Willem J. B. van Wamel¹, Corné H. W. Klaassen¹, Margreet C. Vos¹ & Juliëtte A. Severin¹✉

In hospitals, Verona Integron-encoded Metallo-beta-lactamase (VIM)-positive *Pseudomonas aeruginosa* may colonize sink drains, and from there, be transmitted to patients. These hidden reservoirs are difficult to eradicate since *P. aeruginosa* forms biofilms that resist disinfection. However, little is known on the composition of these biofilms. Therefore, culturomics was used for the first time to investigate the viable microbiota in four hospital sink drain samples with longstanding VIM-positive *P. aeruginosa* drain reservoirs (inhabited by high-risk clone, sequence type ST111), and four

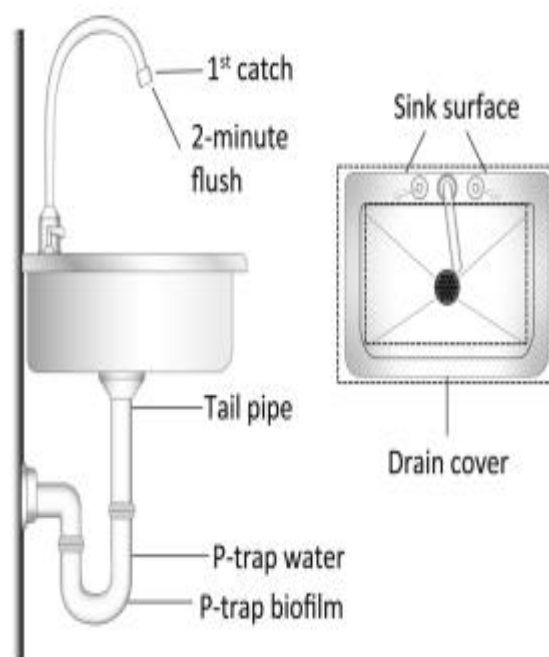


OPEN

A microbiological survey of handwashing sinks in the hospital built environment reveals differences in patient room and healthcare personnel sinks

Lauren C. Franco^{1,3}, Windy Tanner², Christine Ganim¹, Terri Davy¹, Jonathan Edwards¹ & Rodney Donlan¹✉

Handwashing sinks and their associated premise plumbing are an ideal environment for pathogen-harboring biofilms to grow and spread throughout facilities due to the connected system of wastewater plumbing. This study was designed to understand the distribution of pathogens and antibiotic resistant organisms (ARO) within and among handwashing sinks in healthcare settings, using culture-dependent methods to quantify *Pseudomonas aeruginosa*, opportunistic pathogens capable of growth on a cefotaxime-containing medium (OPP-C), and carbapenem-resistant Enterobacteriaceae (CRE). Isolates from each medium identified as *P. aeruginosa* or Enterobacteriaceae were tested for susceptibility to aztreonam, ceftazidime, and meropenem; Enterobacteriaceae were also tested against ertapenem and cefotaxime. Isolates exhibiting resistance or intermediate resistance were designated ARO. Pathogens were quantified at different locations within handwashing sinks and compared in quantity and distribution between healthcare personnel (HCP) and patient room (PR) sinks. ARO were compared between samples within a sink (biofilm vs planktonic samples) and between sink types (HCP vs. PR). The drain cover was identified as a reservoir within multiple sinks that was often colonized by pathogens despite daily sink cleaning. *P. aeruginosa* and OPP-C mean log₁₀ CFU/cm² counts were higher in p-trap and tail pipe biofilm samples from HCP compared to PR sinks (2.77 ± 2.39 vs. 1.23 ± 1.62 and 5.27 ± 1.10 vs. 4.74 ± 1.06) for *P. aeruginosa* and OPP-C, respectively. *P. aeruginosa* and OPP-C mean log₁₀ CFU/ml counts were also higher (p < 0.05) in HCP compared to PR sinks p-trap water (2.21 ± 1.52 vs. 0.89 ± 1.44 and 3.87 ± 0.78 vs. 3.21 ± 1.11) for *P. aeruginosa* and OPP-C, respectively. However, a greater percentage of ARO were recovered from PR sinks compared to HCP sinks (p < 0.05) for Enterobacteriaceae (76.4 vs. 32.9%) and *P. aeruginosa* (25.6 vs. 0.3%). This study supports previous work citing that handwashing sinks are reservoirs for pathogens and ARO and identifies differences in pathogen and ARO quantities between HCP and PR sinks, despite the interconnected premise plumbing.



The handwash station: friend or fiend?

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REVIEW | VOLUME 100, ISSUE 2, P159-164, OCTOBER 01, 2018



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The handwash station: friend or fiend?

M.J. Weinbren

Published: March 26, 2018 • DOI: <https://doi.org/10.1016/j.jhin.2018.03.023> • Check for updates

Summary

Keywords

References

Article Info

Related

Summary

Handwashing is a key barrier to cross-infection (pseudomonas drainage systems). Widespread and often uncritical use of handwashing stations (HWS) has led to the recognition of the associated hazards went unheeded. An outbreak of pseudomonas in Belfast in 2012 forced testing of water from the outlet of a HWS for the r



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Short report

Handwashing sinks as the source of transmission of ST16 carbapenem-resistant *Klebsiella pneumoniae*, an international high-risk clone, in an intensive care unit

Y. Feng ^{a, b, c, #}, L. Wei ^{d, #}, S. Zhu ^{d, #}, F. Qiao ^d, X. Zhang ^{a, b, c}, Y. Kang ^e, L. Cai ^e, M. Kang ^f, A. McNally ^g, Z. Zong ^{a, b, c, d}

WHO Guideline (2019): umývadlá & ADR

Implementation manual to prevent and control the spread of carbapenem-resistant organisms at the national and health care facility level: interim practical manual supporting implementation of the Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities

- Umývadlá sú známym rezervoárom MDR G-baktérií
- Žiadne umývadlá ale ADR v patientskej zóne
- Redukcia umývadiel
- Racionálne umiestnenie umývadiel
- Správne typy umývadiel
- WASTE MANAGEMENT



NAŠE SKÚŠENOSTI Z FN TRNAVA

O NEMOCNICI —

Fakultná nemocnica Trnava

Fakultná nemocnica Trnava je najväčším poskytovateľom zdravotnej starostlivosti v Trnavskom kraji. Na 641 lôžkach odliečime viac ako 20-tisíc pacientov ročne. Náš kvalifikovaný personál realizuje liečebno-preventívny a ošetrovateľský proces s cieľom zaistiť maximálnu spokojnosť našich pacientov. Nemocnica má 9 kliník a 17 oddelení, na ktorých pracujú špičkoví lekári.



Fakultná nemocnica Trnava



1285

ZAMESTNANCOV



31

PRACOVÍSK



20000

PACIENTOV ROČNE



641

LOŽOK

Program prevencie a kontroly infekcií vo FN Trnava

- **Oddelenie nemocničnej hygieny a epidemiológie**

- 4 pracovníci úväzok 3,0 / 641 lôžok
- Podľa *Guidelines on core components of IPC programmes*
720 - 90% - pokročilá úroveň
- Komisia RALAP

- **Izolačné kapacity**

- na každom oddelení/klinike – 1 až 2 lôžka

- **Surveillance HCAI**

- aktívna - 4 – 6%
- od 2022 softvér HAIDi

- **Oddelenie centrálnej sterilizácie**

- **Klinika infektológie** - ATB konzília + klinický farmakológ

Hygienické audity

Vlastné upratovanie

Terminálna dezinfekcia – Aerospet (Ecolab)

UVflorescencia – EnCompass (Ecolab)

ATP monitoring (3M)

Mikrobiologický monitoring – externý + laboratóriá CEMIP

Program hygieny rúk

spotreba – 30,2 l/1000LD pred COVID-19

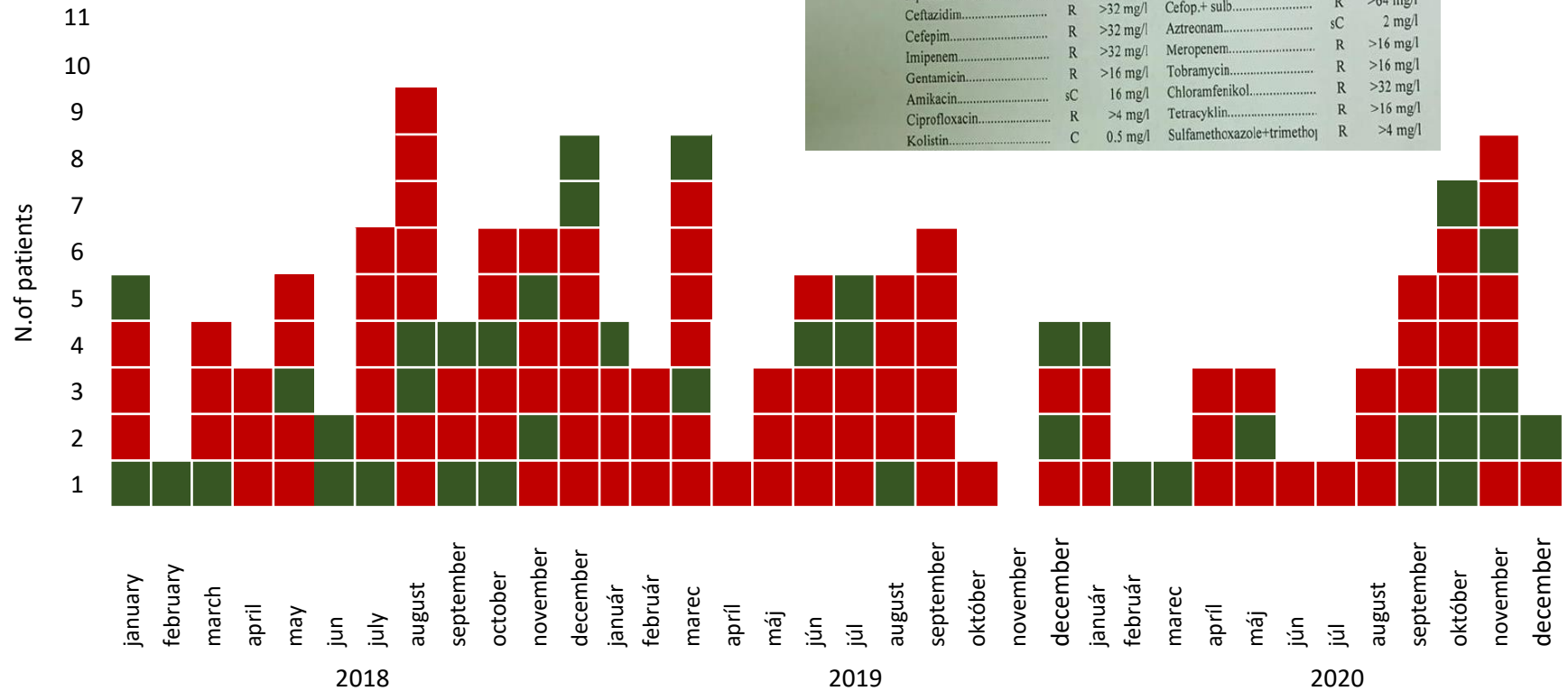
48,1/1000LD COVID-19

compliance – 40- 60% - systém OBSERVE (Hartmann)



FAKULTNÁ NEMOCNICA
TRNAVA

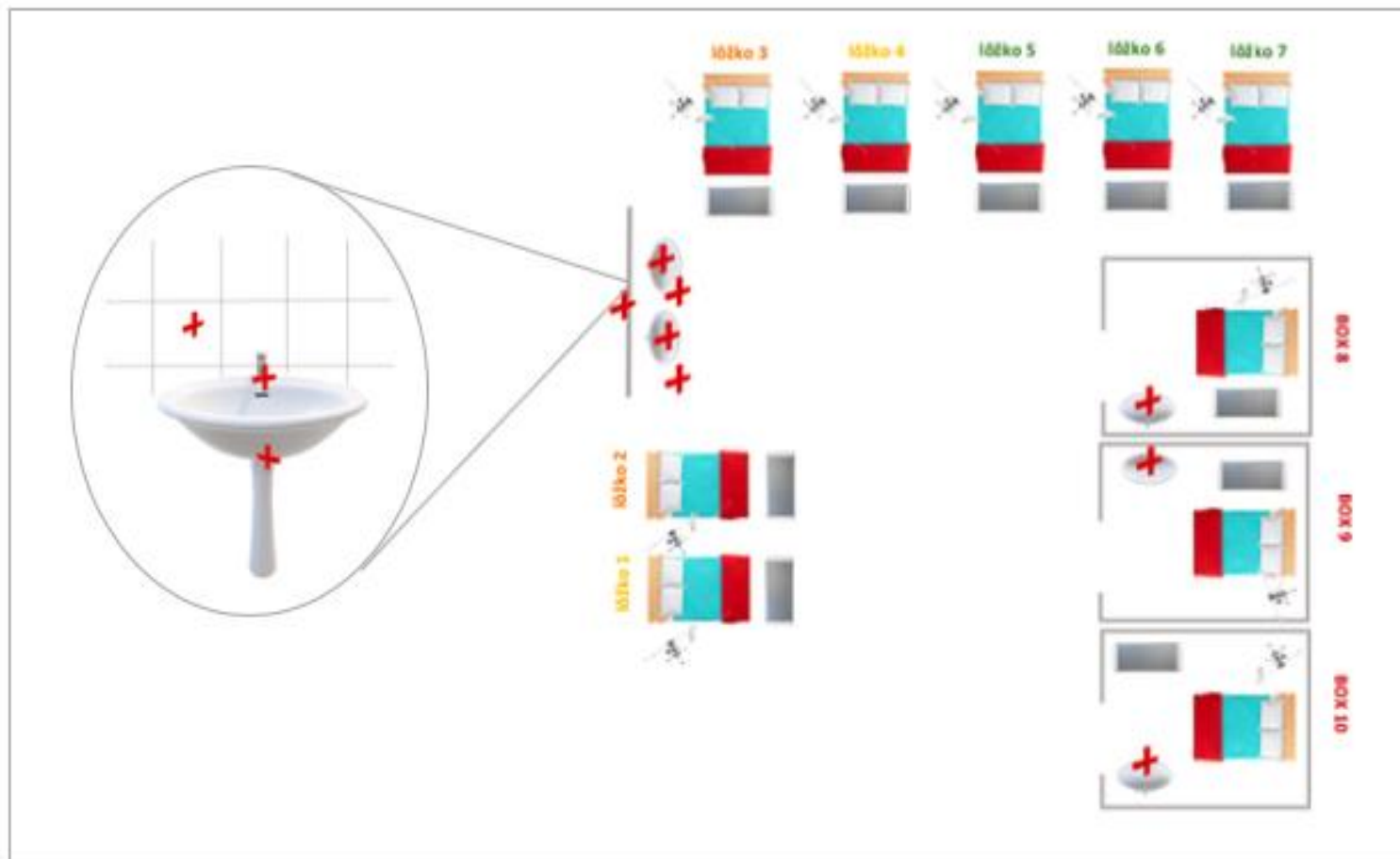
Prolongovaný outbreak PSA NN



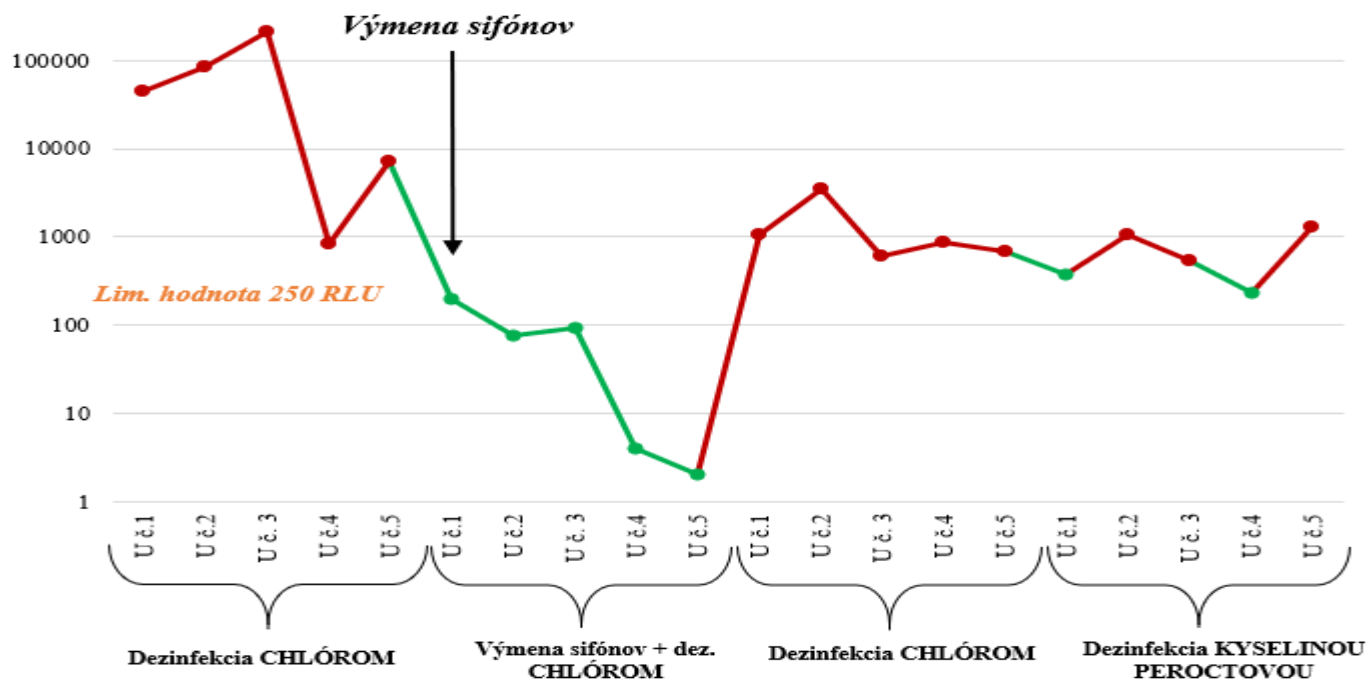
Materiál: hemokultúra aeróbna			
Výšetrenie: Kultivačné vyšetrenie			
Mikroskopické vyšetrenie materiálu: gramnegatívne paličky			
Výšetrenie: Kultivačné vyšetrenie			
Nález: <u>Pseudomonas aeruginosa</u>			
Ampicilin + Sulbaktam.....	R	>32 mg/l	Piperacilin..... R >64 mg/l
Pipracilin+Tazobactam.....	R	>64 mg/l	Cefotaxim..... R >32 mg/l
Ceftazidim.....	R	>32 mg/l	Cefop.+ sub..... R >64 mg/l
Cefepim.....	R	>32 mg/l	Aztreonam..... sC 2 mg/l
Imipenem.....	R	>32 mg/l	Meropenem..... R >16 mg/l
Gentamicin.....	R	>16 mg/l	Tobramycin..... R >16 mg/l
Amikacin.....	sC	16 mg/l	Chloramfenikol..... R >32 mg/l
Ciprofloxacín.....	R	>4 mg/l	Tetracyklin..... R >16 mg/l
Kolistin.....	C	0.5 mg/l	Sulfamethoxazole+trimethop..... R >4 mg/l

	2018	2019	2020
Number of patients with PSA HCAI	N=59	N=45	N=39
Number of MDR PSA infections 	40 (67.8%)	35 (55.5%)	25 (64.1%)
Number of sensitive PSA infections 	19 (32.2%)	10 (44.5%)	14 (35.9%)
Number of MDR PSA detected from blood culture	6 (10.2%)	6 (13.3%)	7 (18.0%)

Miesta detekcie PSA VIM - JIS



Sledovanie kolonizácie sifónov po výmene



	perióda 1	perióda 2	perióda 3	perióda 4
priemerné hodnoty RLU	69378,4	75,4	1331,8	692,8
	$p=0,0001$		$p=0,0798$	$p=0,2699$
	$p=0,0001$			

Mikrobiologický monitoring sifónov

odberové miesta	lokalizácia	prvý odber	kontrolný odber po výmene sifónov
Používaná dezinfekcia		Chlór 1x denne	Chlór 1x denne
umývadlo sifón	BOX 10	<i>Pseudomonas aeruginosa</i> , <i>Staphylococcus warneri</i> , <i>Enterobacter</i> spp., <i>Klebsiella</i> spp.	<i>Acinetobacter junii</i> , <i>Pseudomonas oleovorans</i> , <i>E.coli</i>
umývadlo sifón	BOX 9	<i>Stenotrophomonas maltophilia</i>	<i>Pseudomonas aeruginosa</i> , <i>Pseudomonas oleovorans</i> , <i>Enterobacter cloacae</i>
umývadlo sifón	BOX 8	<i>Pseudomonas montei</i>	<i>Acinetobacter junii</i> , <i>Stenotrophomonas maltophilia</i>
umývadlo sifón (P)	spoločná izba	<i>Klebsiella</i> spp., <i>Citrobacter freundii</i> , <i>Stenotrophomonas maltophilia</i> , <i>Serratia marcescens</i> , <i>Klebsiella</i> spp.	<i>Acinetobacter pittii</i> , <i>Pseudomonas mosselii</i> , <i>Pseudomonas aeruginosa</i> , <i>Acinetobacter johnsonii</i> , kvasinkové mikroorganizmi, <i>Klebsiella</i> spp.
umývadlo sifón (L)	spoločná izba	<i>Pseudomonas aeruginosa</i> , <i>Pseudomonas</i> spp., <i>Citrobacter braakii</i> , <i>Stenotrophomonas maltophilia</i> , <i>Chryseobacterium joostei</i> , <i>Klebsiella</i> spp.	<i>Pseudomonas mosselii</i> , <i>Pseudomonas aeruginosa</i> , <i>Acinetobacter pittii</i> , <i>Stenotrophomonas maltophilia</i> , <i>Klebsiella</i> sp.

Mikrobiologický monitoring sifónov

Odberové miesta	Miesto	Mikroorganizmus	Rast na chromID	OXI	NG Carba 5	GeneXpert Carba R	Rast na Mac Conkey
umývadlo sifón (P)	spoločná izba	<i>Pseudomonas aeruginosa</i> ,	áno	pozit.	VIM	negat.	áno
umývadlo sifón	BOX 10	<i>Pseudomonas aeruginosa</i> ,	áno	pozit.	negat.	negat.	áno
umývadlo sifón (L)	spoločná izba	<i>Pseudomonas aeruginosa</i> ,	áno	pozit.	VIM	VIM	áno
kachličky okolo umývadla (L)	spoločná izba	<i>Pseudomonas aeruginosa</i>	áno	pozit.	negat.	negat.	áno
Kontrolné stery po výmene sifónov – dezinfekcia chlóróm 1x denne							
kohútik	BOX 9	<i>Pseudomonas aeruginosa</i>	áno	pozit.	VIM	VIM	áno
umývadlo sifón (P)	spoločná izba	<i>Pseudomonas aeruginosa</i> ,	áno	pozit.	VIM	VIM	áno
kohútik UP	spoločná izba	<i>Pseudomonas aeruginosa</i>	áno	pozit.	negat.	negat.	áno
umývadlo sifón (L)	spoločná izba	<i>Pseudomonas aeruginosa</i>	áno	pozit.	VIM	VIM	áno
kohútik UL	spoločná izba	<i>Pseudomonas aeruginosa</i>	áno	pozit.	VIM	VIM	áno

Bodový skrining kontaminácie sifónov a perlátorov MDR baktériami

- Marec 2022
- Cílený skrining - VRE, CPE, PSA
- 67 vzoriek – JIS pracoviská
- **Chromogénne mediá** (PAID, CARB, VRE) bioMérieux)
- **Imunochromtaografický test** - NG-Test Carba 5 (NG Biotech, FR)
 - KPC, OXA, IMP, NDM a VIM

Typ MO	Počet pozitívnych	%
PSA	27	40,3
VRE	25	37,3
CARBA	12	17,9
Producent karbapenemáz PSA (VIM, IMP, NDM)	10	14,9
Producent karbapenemáz CPE (KPC, NDM)	10	14,9



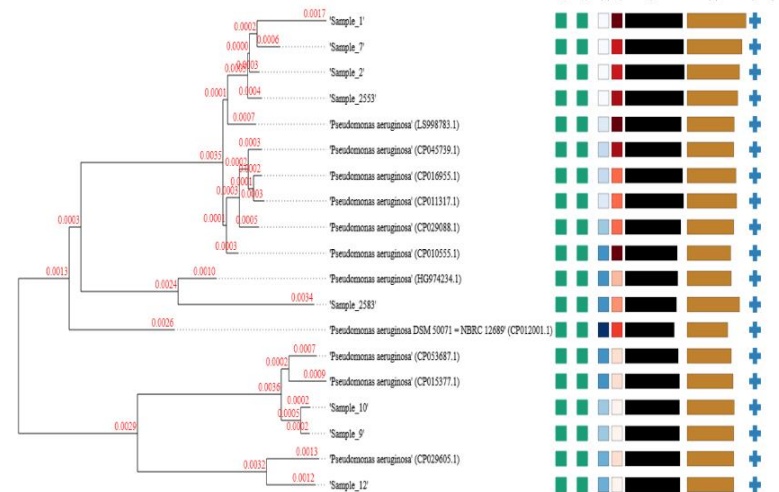
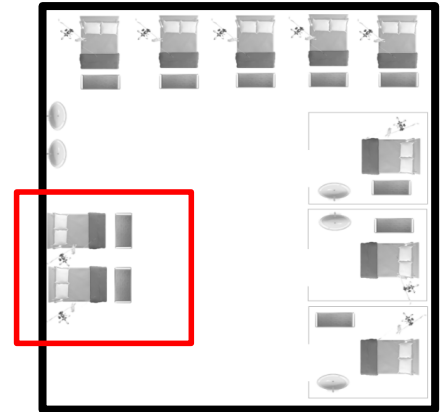
Bodový skrining kontaminácie sifónov a perlátorov MDR baktériami

n=67	Pozitívny ster N = 32	%	Negatívny ster N = 35	%	P-value
Miesto					
sifón	20	62,5	22	62,9	0,976
perlátor	12	37,5	13	37,1	
Typ miestnosti					
čistiaca miestnosť	2	6,3	8	22,9	0,118
denná miestnosť/kuchynka	4	12,5	1	2,9	0,301
obslužné miestnosti	3	9,4	4	11,4	0,785
kúpeľňa	6	18,8	6	17,1	0,864
umývadlo pri lôžku	17	53,1	16	45,7	0,717
Vzdialenosť od lôžka					
priemer ± SD	1 ±1		3 ±1		<0,001
Meranie ATP					
priemer ± SD	64164 ± 150257		32098 ± 147412		0,434
median (IQR)	1628 (774 - 4859)		680 (227 - 3035)		

Sekvenovanie 8 izolátov PSA počas outbreaku NN

PSA u pacientov s COVID-19 na JIS

- 2 klinické kmene MDR PSA (VIM) z hemokultúry od pacientov s COVID-19 (muž 64, muž 67)
- 6 enviromentálnych kmeňov MDR PSA (VIM) izolovaných zo sifónov JIS
- Kmene izolové z hemokultúr a zo sifónu umývadla medzi pacientami boli homológne na viac ako 99%.
potvredný kmeň **ST111**
- Všetky kmene niesli gém ***qac EΔ1***



Analýza výskytu *qac* EΔ1 u izolátov rodu *Pseudomonas* získaných z nemocničného prostredia v SR počas štúdie HER v rokoch 2015 – 2019 (n=274)

- Na *qac* EΔ1 bolo **pozitívnych 27,4 % izolátov pseudomnád** (n=75)
- **85,9 % *qac* EΔ1 pozitívnych pseudomonád** tvorili nástroje a pomôcky s vlhkým prostredím
- **92,3 % (n=72) silní producenti biofilmu**
 - *štatisticky signifikantne viac boli medzi nimi zastúpené MDR formy pseudomonád s rezistenciou na chinolónové a karbapenémové antibiotiká (P<0,001)*



Perzistencia MDR pseudomonád v prostredí lôžkových ZZ v podobe biofilmu predstavuje významný rezervoár nozokomiálnych multirezistentných patogénov

Abstract Submission

Topic area: 8. Disinfection/sterilization

Topic: 8a. Environmental control

Abstract N°: ICPC21-1501

A FIRST REPORT OF *QACΔE1* DETECTION IN *PSEUDOMONAS* SPECIES FROM HOSPITAL ENVIRONMENT IN SLOVAKIA

Martina Havriško¹, Jaroslava Brmova¹, Lenka Reizigová¹, Lukas Pazderka¹, Janka Prnová¹, Anna Lisková², Zuzana Sirotná³, Anna Strehárová⁴, Vladimír Krčmery⁵

¹Centre for Microbiology and Infection Prevention, School of Health Sciences and Social Work, Trnava University, Trnava, ²Department of Clinical Microbiology, University Hospital Nitra, Nitra, ³National Reference Centre of Environmental Microbiology, Public Health Authority, Bratislava, ⁴Department of Infectious Diseases, Trnava University Hospital, Trnava, ⁵Tropicteam, St. Elisabeth University, Bratislava, Slovakia

Preferred presentation method: Poster communication only

I want to submit my abstract for the ICPC Clip award: No

Introduction: Quaternary ammonium compounds (QAC) are often employed as disinfectants in hospitals. The resistance mechanism to disinfectants is usually determined by genes *qacΔE1* that are found in Gram-negative bacteria, mainly in the Enterobacteriaceae family and with *Pseudomonas* species

Objectives: The aim of this study was to analyse the frequency of biocide resistant gene *qacΔE1* in *Pseudomonas* species isolated from hospital environment during HOSPITAL-ENVIRO-REZ study in 2015 - 2019 in Slovakia.

Methods: In this study 274 environmental isolates of *Pseudomonas* species from 93 Slovakia hospitals were screened for the presence of biocide resistant genes *qacΔE1* (by the PCR and visualised by ELFO) and resistance to antibiotics genes *bla_{TEM}*, *bla_{NDM}*, *bla_{KPC}*, *bla_{IMP}*, *bla_{OXA-48}* and *bla_{MBL}* (GeneXpert, Cepheid) and immunochromatographic rapid tests (NG-Test CARBA 5, NG Biotech).

Results: Out of the 274 isolates of *Pseudomonas* species from hospital environment 78 isolates (28.5%) were positive for *qacΔE1* gene. Overall 62 (79.5%) were from hospital sanitary facilities (sinks, sink drains, faucets, showers, washing basins and soaps). Within all *qacΔE1* *Pseudomonas* spp. isolates were 57 (73%) multidrug resistant. Carbapenem resistance was detected in 32 (41%) isolates, of which two were *bla_{KPC}* and six *bla_{NDM}* positive.

Conclusion: This study shows that the multidrug resistant *Pseudomonas* species with *qacΔE1* gene which harboured resistance to quaternary ammonium compound biocides are widespread in hospital sanitary facilities in Slovakia.

This study was supported by a research grant from the MŠV VaŠ SR and grant from Trnava University.

I want to apply for a fellowship: No

*A first report of *qacΔE1* detection in pseudomonas species from hospital environment in Slovakia / Martina Havriško, Jaroslava Sokolová, Lenka Reizigová, Lukáš Pazderka, Janka Prnová, A. Lisková, Zuzana Sirotná, Anna Strehárová, Vladimír Krčmery.*
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RIEŠENIE ?



Dezinfekcia

- **DEZINFEKCIA NEFUNGUJE BEZ MECHANICKEJ OČISTY**
- výmena sifónov je len dočasným riešením
- pravidelná údržba sifónov
- vytvorenie harmonogramu údržby, dezinfekcie a zodpovedných osôb
- zvýšená frekvencia kontrol umývadiel a vody
- preferovanou dezinfekciou zlúčeniny na báze aktívneho kyslíka

Samodezinfekčné sifóny



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Short report

The sink as a correctable source of extended-spectrum β -lactamase contamination for patients in the intensive care unit

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Extended-spectrum

β -lactamase-positive bacteria

Hospital reservoir

Intensive care unit

SUMMARY

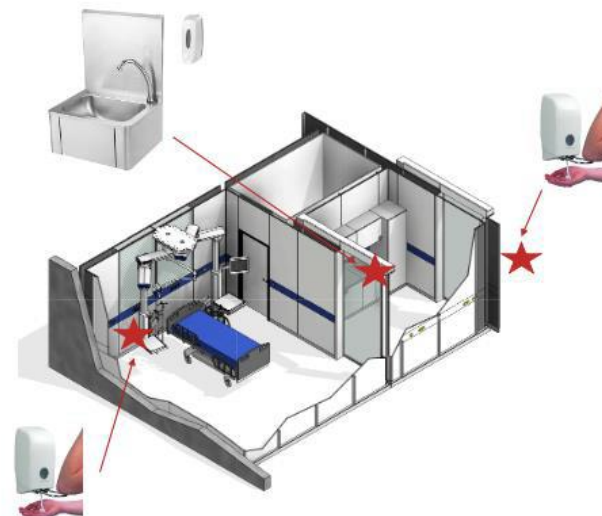
Between December 2010 and April 2012, intensive care unit (ICU) patients in our hospital were infrequently colonized with extended-spectrum β -lactamase-positive bacteria (ESBLs). We hypothesized that these ESBLs originated from patients' room sinks, and this was prospectively investigated by weekly culturing of patients and sinks during a 20-week period. ESBLs were isolated from all 13 sinks. Four patients became colonized with ESBLs that were genetically identical to ESBLs that had previously been isolated from the sink. One of these patients died of pneumonia caused by the ESBL. **Transmission from sinks to patients was stopped by integrating self-disinfecting siphons to all sinks on the ICU.**

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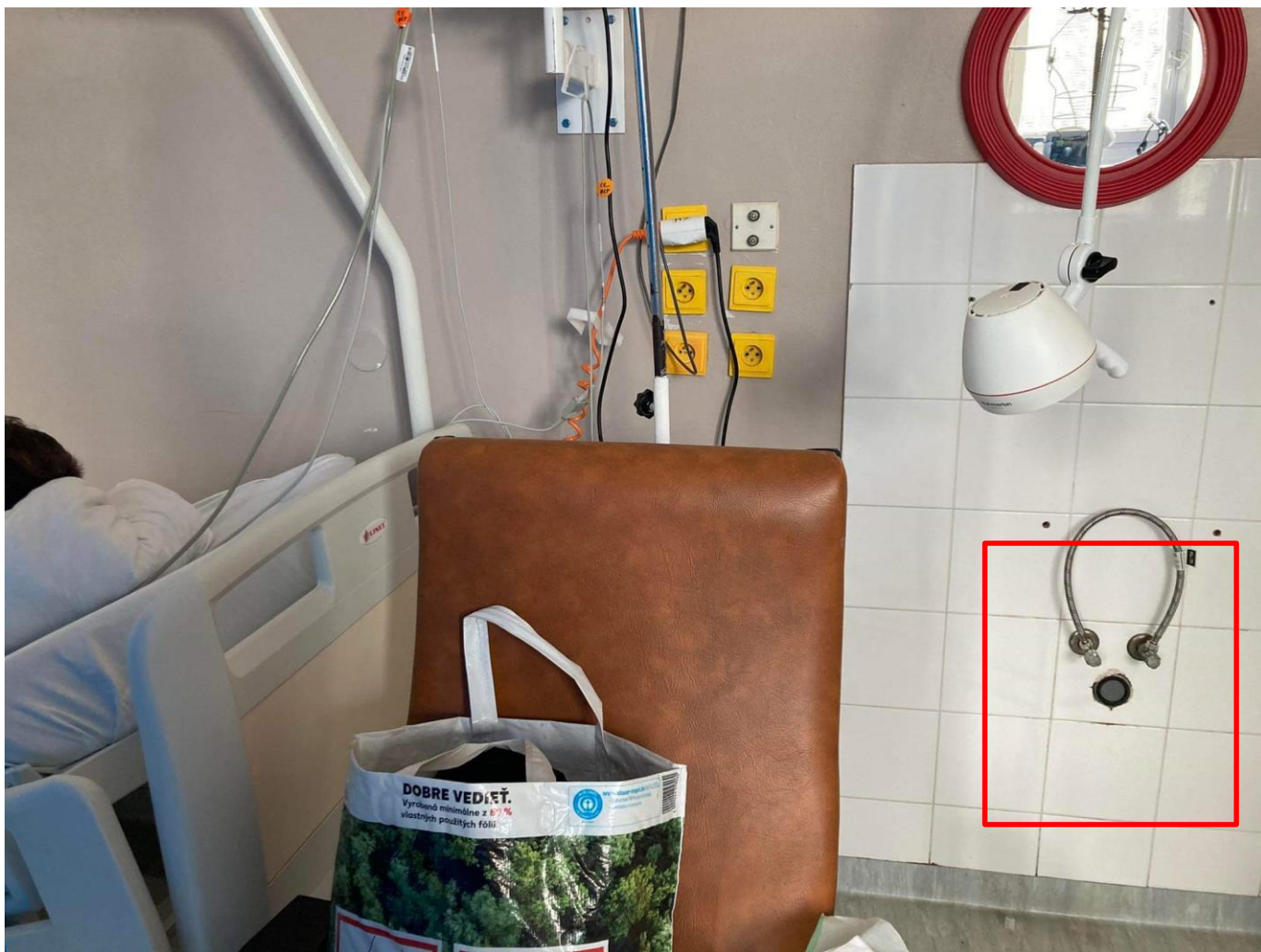


Umiestnenie umývadla v zdravotníckom zariadení

- umývadlo by nemalo byť umiestnené v zóne pacienta (2 metre od lôžka pacienta)
- **v izolačných boxoch by umývadlá nemali byť umiestnené vôbec a mali by byť extrahované**
- umývacia emulzia, jednorazové utierky a kôš by mali byť k dispozícii ku každému umývadlu
- alkoholová dezinfekcia by nemala byť prítomná pri umývadle ale v mieste poskytovania zdravotnej starostlivosti
- prípravné stolíky nesmú byť v blízkosti umývadiel
- **prísny zákaz vlievania biologického odpadu do odtokov**







Dizajn umývadla

- umývadlo by nemalo obsahovať žiadne plastové komponenty
- kohútik umývadla by mal smerovať čo najnižšie k umývadlu a jeho **koniec musí smerovať mimo odtok**
- alternatívou pákových umývadiel sú **senzorové umývadlá**, ktoré si však tiež vyžadujú údržbu komponentov
- **umývadlo by malo byť čo najhlbšie**, aby sa zabránilo tvorbe aerosólu pri prúde vody
- prúd vody by nemal byť silný, aby sa zabránilo tvorbe aerosólu



Waterless /free/safe patient care

Švajčiarsko

Francúzsko

Holandsko

Catho et al. Crit Care (2021) 25:301
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Critical Care



Control of endemic multidrug-resistant Gram-negative bacteria after removal of sinks and implementing a new water-safe policy in an intensive care unit

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SUMMARY

Background: Contaminated handwashing sinks have been identified as reservoirs that can facilitate colonization/infection of patients with multidrug-resistant (MDR) Gram-negative bacteria (GNB) in intensive care units (ICUs).
Aim: To assess the impact of removing patients' sinks and implementing other water-safe strategies on the annual rates of ICU-acquired MDR-GNB.
Methods: This six-year quasi-experimental study was conducted from January 2011 to December 2016. The intervention was carried out in August 2014 in two adult ICU wards with 12 rooms each. To assess the changes in annual MDR-GNB rates before and after the intervention, we used segmented regression analysis of an interrupted time-series. Crude relative risk (RR) rates were also calculated.
Findings: The incidence rates of MDR-GNB were 9.15 and 2.20 per 1000 patient-days in the pre- and post-intervention periods, respectively. This yielded a crude RR of acquiring MDR-GNB of 0.24 (95% confidence interval: 0.17–0.34). A significant change in level was observed between the MDR-GNB rate at the first point of the post-intervention period and the rate predicted by the pre-intervention time trend.
Conclusion: The implementation of a new water-safe policy, which included the removal of sinks from all patient rooms, successfully improved the control of MDR-GNB spread in an ICU with endemic infection. Our results support the contribution of sink use with the incidence of MDR-GNB in endemic environments.
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Outbreak of *Pseudomonas aeruginosa* producing VIM carbapenemase in an intensive care unit and its termination by implementation of waterless patient care

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Abstract

Background: Long-term outbreaks of multidrug-resistant Gram-negative bacilli related to hospital-building water systems have been described. However, successful mitigation strategies have rarely been reported. In particular, environmental disinfection or replacement of contaminated equipment usually failed to eradicate environmental sources of *Pseudomonas aeruginosa*.

Methods: We report the investigation and termination of an outbreak of *P. aeruginosa* producing VIM carbapenemase (PA-VIM) in the adult intensive care unit (ICU) of a Swiss tertiary care hospital with active case finding, environmental sampling and whole genome sequencing (WGS) of patient and environmental strains. We also describe the implemented control strategies and their effectiveness on eradication of the environmental reservoir.

Results: Between April 2018 and September 2020, 21 patients became either infected or colonized with a PA-VIM strain. For 16 of them, an acquisition in the ICU was suspected. Among 131 environmental samples collected in the ICU, 13 grew PA-VIM in sink traps and drains. WGS confirmed the epidemiological link between clinical and environmental strains and the monoclonal pattern of the outbreak. After removing sinks from patient rooms and implementation of waterless patient care, no new acquisition was detected in the ICU within 8 months after the intervention.

Discussion: Implementation of waterless patient care with removal of the sinks in patient rooms was successful for termination of a PA-VIM ICU outbreak linked to multiple environmental water sources. WGS provides highly discriminatory accuracy to investigate environment-related outbreaks.

Keywords: *Pseudomonas aeruginosa*, VIM, Carbapenemase, Sink, Waterless, Outbreak, Aquatic reservoir, cgMLST

RESEARCH

Open Access

Reduced rate of intensive care unit acquired gram-negative bacilli after removal of sinks and introduction of 'water-free' patient care

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Abstract

Background: Sinks in patient rooms are associated with hospital-acquired infections. The aim of this study was to evaluate the effect of removal of sinks from the Intensive Care Unit (ICU) patient rooms and the introduction of 'water-free' patient care on gram-negative bacilli colonization rates.

Methods: We conducted a 2-year pre/post quasi-experimental study that compared monthly gram-negative bacilli colonization rates pre- and post-intervention using segmented regression analysis of interrupted time series data. Five ICUs of a tertiary care medical center were included. Participants were all patients of 18 years and older admitted to our ICUs for at least 48 h who also received selective digestive tract decontamination during the twelve month pre-intervention or the twelve month post-intervention period. The effect of sink removal and the introduction of 'water-free' patient care on colonization rates with gram-negative bacilli was evaluated. The main outcome of this study was the monthly colonization rate with gram-negative bacilli (GNB). Yeast colonization rates were used as a 'negative control'. In addition, colonization rates were calculated for first positive culture results from cultures taken 23, 25, ≥ 7, 210 and ≥ 214 days after ICU-admission, rate ratios (RR) were calculated and differences tested with chi-squared tests.

Results: In the pre-intervention period, 1496 patients (9153 admission days) and in the post-intervention period 1444 patients (9044 admission days) were included. Segmented regression analysis showed that the intervention was followed by a statistically significant immediate reduction in GNB colonization in absence of a pre or post intervention trend in GNB colonization. The overall GNB colonization rate dropped from 26.3 to 21.6 GNB/1000 ICU admission days (colonization rate ratio 0.82; 95%CI 0.67–0.99; $P = 0.02$). The reduction in GNB colonization rate became more pronounced in patients with a longer ICU-Length of Stay (LOS): from a 1.22-fold reduction (22 days), to a 1.6-fold (25 days; $P = 0.002$), 2.54-fold (for ≥ 210 days; $P < 0.001$) to a 3.6-fold (≥ 214 days; $P < 0.001$) reduction.

Conclusions: Removal of sinks from patient rooms and introduction of a method of 'water-free' patient care is associated with a significant reduction of patient colonization with GNB, especially in patients with a longer ICU length of stay.

Keywords: Intensive care unit, Sinks, Gram-negative bacilli, Multidrug resistance, 'Water-free' patient care, Length of stay, Colonization



Pozvánka

10. – 11. novembra 2022



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