Infection Control
Current Awareness Bulletin
June 2021

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Title: Epidemiology of Escherichia coli Bacteremia: A Systematic Literature Review.

Citation: Clinical Infectious Diseases; Apr 2021; vol. 72 (no. 7); p. 1211-1219

Author(s): Bonten ; Johnson, James R; Biggelaar, Anita H J van den; Georgalis, Leonidas; Geurtsen, Jeroen; Palacios, Patricia Ibarra de; Gravenstein, Stefan; Verstraeten, Thomas; Hermans, Peter; Poolman, Jan T

Background: Escherichia coli is the most common cause of bacteremia in high-income countries. To enable the development and implementation of effective prevention strategies, a better understanding of the current epidemiology of invasive E. coli infections is needed.

Methods: A systematic review of literature published between 1 January 2007 and 31 March 2018 on the burden and epidemiology of E. coli bacteremia in populations that include adults in high-income countries was conducted. Meta-analysis was performed for descriptive purposes.

Results: During the studied time interval, the estimated incidence rate of E. coli bacteremia was 48 per 100 000 person-years, but this increased considerably with age: rates per 100 000 person-years were >100 in 55-to-75-year-olds and >300 in 75-to-85-year-olds. Overall, E. coli accounted for 27% of documented bacteremia episodes: 18% if hospital acquired, 32% if community-onset healthcare associated, and 33% if community acquired. The estimated case fatality rate was 12%. Approximately 44% of episodes were community acquired, 27% community-onset healthcare associated, and 27% hospital acquired. Urinary tract infection (UTI) was the primary source for 53% of episodes.

Conclusions: This systematic review confirms the substantial burden of E. coli bacteremia in older adults and justifies the implementation of community-level programs to prevent E. coli bacteremia and ideally UTI in this age group.

Title: The impact of the COVID-19 pandemic on healthcare acquired infections with multidrug resistant organisms.

Citation: American Journal of Infection Control; May 2021; vol. 49 (no. 5); p. 653-654

Author(s): Cole ; Barnard, Emily

Abstract: • Increase in hand hygiene compliance. • Decrease in Health care onset multidrug resistant organism infections. • Compliance with personal protective equipment requirements. This retrospective, cross-sectional study was conducted in four community hospitals in Los Angeles County, California. The assumption of this study was, coronavirus disease-19 (COVID-19) contributed to the increase in healthcare workers compliance with infection prevention measures. IP initiatives fostered among HCWs have increased awareness of effective hand washing, cleaning equipment after use and appropriate personal protective equipment use which has subsequently decreased healthcare acquired infections with multidrug-resistant organisms.

Title: Individual, social, and environmental factors for infection risk among home healthcare patients: A multi-method study.

Citation: Health & Social Care in the Community; May 2021; vol. 29 (no. 3); p. 780-788

Author(s): Russell ; Dowding, Dawn; Trifilio, Marygrace; McDonald, Margaret V.; Song, Jiyoun; Adams, Victoria; Ojo, Marietta I.; Perry, Eun K.; Shang, Jingjing
Abstract: There has been limited research into the individual, social, and environmental factors for infection risk among patients in the home healthcare (HHC) setting, where the infection is a leading cause of hospitalisation. The aims of this study were to (1) explore nurse perceptions of individual, social, and environmental factors for infection risk among HHC patients; and (2) identify the frequency of environmental barriers to infection prevention and control in HHC. Data were collected in 2017–2018 and included qualitative interviews with HHC nurses (n = 50) and structured observations of nurse visits to patients’ homes (n = 400). Thematic analyses of interviews with nurses suggested they perceived infection risk among patients as being influenced by knowledge of and attitudes towards infection prevention and engagement in hygiene practices, receipt of support from informal caregivers and nurse interventions aimed at cultivating infection control knowledge and practices, and the home environment. Statistical analyses of observation checklists revealed nurses encountered an average of 1.7 environmental barriers upon each home visit. Frequent environmental barriers observed during visits to HHC patients included clutter (39.5%), poor lighting (38.8%), dirtiness (28.5%), and pets (17.2%). Additional research is needed to clarify inter-relationships among these factors and identify strategies for addressing each as part of a comprehensive infection control program in HHC.

Title: Improving hand hygiene practice recommendations for acute-care hospitals.

Citation: Infection control and hospital epidemiology; May 2021 ; p. 1-2
Author(s): Nix, Chad D; Bisht, Anjali; Ogden, Lauren A; Townes, John M


Citation: HERD; May 2021 ; p. 19375867211009273
Author(s): Verderber, Stephen; Gray, Seth; Suresh-Kumar, Shivathmikha; Kercz, Damian; Parshuram, Christopher

Background: The intensive care environment in hospitals has been the subject of significant empirical and qualitative research in the 2005-2020 period. Particular attention has been devoted to the role of infection control, family engagement, staff performance, and the built environment ramifications of the recent COVID-19 global pandemic. A comprehensive review of this literature is reported summarizing recent advancements in this rapidly expanding body of knowledge.

Purpose and aim: This comprehensive review conceptually structures the recent medical intensive care literature to provide conceptual clarity and identify current priorities and future evidence-based research and design priorities.

Method and result: Each source reviewed was classified as one of the five types-opinion pieces/essays, cross-sectional empirical investigations, nonrandomized comparative investigations, randomized studies, and policy review essays-and into nine content categories: nature engagement and outdoor views; family accommodations; intensive care unit (ICU), neonatal ICU, and pediatric ICU spatial configuration and amenity; noise considerations; artificial and natural lighting; patient safety and infection control; portable critical care field hospitals and disaster mitigation facilities including COVID-19; ecological sustainability; and recent planning and design trends and prognostications.

Conclusions: Among the findings embodied in the 135 literature sources reviewed, single-bed ICU rooms have increasingly become the norm; family engagement in the ICU experience has increased; acknowledgment of the therapeutic role of staff amenities;
Title: Development of a high-level light-activated disinfectant for hard surfaces and medical devices.

Citation: International journal of antimicrobial agents; May 2021 ; p. 106360

Author(s): Wylie, Matthew P; Craig, Rebecca A; Gorman, Sean P; McCoy, Colin P

Background: Bacterial spores are an important consideration in healthcare decontamination, with cross-contamination highlighted as a major route of transmission due to their persistent nature. Their containment is extremely difficult due to the toxicity and cost of first-line sporicides.

Methods: Susceptibility of Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa and Escherichia coli to phenothiazinium photosensitisers and cationic surfactants under white- or red-light irradiation was assessed by determination of MICs, MBCs and time-kill assays. B. subtilis spore eradication was assessed via time-kill assays, with and without nutrient and non-nutrient germiant suplementation of photosensitiser, surfactant and photosensitiser-surfactant solutions in the presence and absence of light.

Results: Under red light irradiation, >5-log10 cfu/mL reduction of vegetative bacteria was achieved within 10 minutes with Toluidine Blue O (TBO) and methylene blue (MB). Cationic surfactant addition did not significantly enhance spore eradication by photosensitisers (p>0.05). However, addition of a nutrient germiant mixture to TBO achieved 6-log10 reductions after 20 minutes irradiation, while providing 1-2 log10 improvements in spore eradication for MB and Pyronin Y.

Conclusions: Light-activated photosensitiser solutions in the presence of surfactants and germination-promoting agents provide a highly effective method to eradicate dormant and vegetative bacteria. These solutions could provide a useful alternative to traditional chemical agents used for high-level decontamination and infection control within healthcare.

Title: COVID-19 outbreak and healthcare worker behavioural change toward hand hygiene practices.

Citation: The Journal of hospital infection; May 2021; vol. 111 ; p. 27-34

Author(s): Huang, F; Armando, M; Dufau, S; Florea, O; Brouqui, P; Boudjema, S

Background: The coronavirus disease (COVID-19) pandemic has affected healthcare workers (HCWs) in their clinical practice. HCWs were challenged with new guidelines and practices to protect themselves from occupational risks.

Aim: To determine whether hand hygiene behaviour by real-time measurement was related to the dynamic of the epidemic, and the type of patient being cared for in France.

Methods: This study used an automated hand hygiene recording system to measure HCW hand hygiene on entry to and exit from patient rooms throughout the COVID-19 pandemic. The correlation between hand hygiene compliance and COVID-19 epidemiological data was
analysed. Analysis of variance was performed to compare compliance rate during the different periods of the epidemic.

Findings: HCW hand hygiene rate on room entry decreased over time; on room exit, it increased by 13.73% during the first wave of COVID-19, decreased by 9.87% during the post-lockdown period, then rebounded by 2.82% during the second wave of the epidemic. Hand hygiene during patient care and hand hygiene on room exit had a positive relationship with the local COVID-19 epidemic; conversely, hand hygiene on room entry did not depend on the trend of the epidemic, nor on nursing of COVID-19 patients, and it decreased over time.

Conclusion: HCWs modified their behaviours to face the risk propensity of the pandemic. However, to improve the poor compliance at room entry, reducing confusion between the hand hygiene recommendation and glove recommendation may be necessary; disinfection of gloving hands might solve this issue.

Title: Patient, staff empowerment and hand hygiene bundle improved and sustained hand hygiene in hospital wards.

Citation: Journal of paediatrics and child health; Apr 2021
Author(s): Chong, Chia Yin; Catahan, Marionette A; Lim, Siok Hong; Jais, Thuraiya; Kaur, Gian; Yin, Shanqing; de Korne, Dirk; Thoon, Koh Cheng; Ng, Kee Chong

Aim: We piloted a hand hygiene (HH) project in a ward, focusing on World Health Organization moments 1 and 4. Our aim was to design highly reliable interventions to achieve >90% compliance.

Methods: Baseline HH compliance was 57 and 67% for moments 1, 4, respectively, in 2015. After the pilot ward showed sustained improvement, we launched the 'HH bundle' throughout the hospital. This included: (i) appointment of HH champions; (ii) verbal/visual bedside reminders; (iii) patient empowerment; (iv) hand moisturisers; (v) tagging near-empty handrub (HR) bottles. Other hospital-wide initiatives included: (vi) Smartphone application for auditing; (vii) 'Speak up for Patient Safety' Campaign in 2017 for staff empowerment; (viii) making HH a key performance indicator.

Results: Overall HH compliance increased from a baseline median of 79.6-92.6% in end-2019. Moments 1 and 4 improved from 71 to 92.7% and from 77.6 to 93.2%, respectively. Combined HR and hand wash consumption increased from a baseline median of 82.6 ml/patient day (PD) to 109.2 mL/PD. Health-care-associated rotavirus infections decreased from a baseline median of 4.5 per 10,000 PDs to 1.5 per 10 000 PDs over time.

Conclusions: The 'HH Bundle' of appointing HH champions, active reminders and feedback, patient education and empowerment, availability of hand moisturisers, tagging near-empty hand rub bottles together with hospital-wide initiatives including financial incentives and the 'Speak Up for Patient Safety' campaign successfully improved the overall HH compliance to >90%. These interventions were highly reliable, sustained over 4 years and also reduced health-care-associated rotavirus infection rates.

Title: A survey of commercially available electronic hand hygiene monitoring systems and their impact on reducing healthcare-associated infections.

Citation: The Journal of hospital infection; May 2021; vol. 111 ; p. 40-46
Author(s): Cawthorne, K-R; Cooke, R P D
Background: Although the benefits of electronic hand hygiene monitoring systems (EHHMSs) are well described, uptake has been poor since they were first introduced over 10 years ago. There is considerable published evidence on the association between the introduction of EHHMSs and improved hand hygiene (HH) compliance rates. However, their impact on healthcare-associated infection (HCAI) reduction is much less clear-cut.

Methods: Commercial EHHMS identification was undertaken using a Google internet search and all relevant websites and marketing materials were reviewed. A structured literature search was undertaken to identify evidence of HCAI reduction through EHHMS implementation. Structured interviews were undertaken with a number of Directors of Infection Prevention and Control (DIPCs) from acute NHS Trusts in the North West of England to seek opinions on HH improvement strategies and the use of EHHMSs.

Results: Twenty-nine commercial EHHMSs were identified, 20 of which are currently market active. Six EHHMSs had supporting evidence, across nine published studies, demonstrating their ability to reduce HCAIs. However, most evaluation designs were quasi-experimental with only one study using a high-quality stepped-wedge cluster randomized controlled trial design. In this study the EHHMS was part of a wider HH multi-modal improvement strategy. Structured interviews were undertaken with five DIPCs who consistently expressed a reluctance to support financial investment into this type of technology until EHHMS cost-effectiveness was better established.

Conclusions: The evidence base for the ability of EHHMSs to reduce HCAIs needs to improve before NHS trusts will consider procuring them.

Title: Loopholes in Current Infection Control and Prevention Practices Against COVID-19 in Radiology Department and Improvement Suggestions.

Citation: Canadian Association of Radiologists journal = Journal l'Association canadienne des radiologistes; May 2021; vol. 72 (no. 2); p. 215-221

Author(s): Yu, Juan; Ding, Ning; Chen, Huan; Liu, Xia-Jing; Pu, Zu-Hui; Xu, Hua-Jian; Lei, Yi; Zhang, Han-Wen

Objectives: To improve the infection control and prevention practices against coronavirus disease 2019 (COVID-19) in radiology department through loophole identification and providing rectifying measurements.

Methods: Retrospective analysis of 2 cases of health-care-associated COVID-19 transmission in 2 radiology departments and comparing the infection control and prevention practices against COVID-19 with the practices of our department, where no COVID-19 transmission has occurred.

Results: Several loopholes have been identified in the infection control and prevention practices against COVID-19 of the 2 radiology departments. Loopholes were in large part due to our limited understanding of the highly contagious coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is characterized by features not observed in other SARS viruses. We recommend to set up an isolation zone for handling patients who do not meet the diagnostic criteria of COVID-19 but are not completely cleared of the possibility of infection.

Conclusions: Loopholes in the infection control and prevention practices against COVID-19 of the 2 radiology departments are due to poor understanding of the emerging disease which can be fixed by establishing an isolation zone for patients not completely cleared of SARS-CoV-2 infection.
Title: Attributable Length of Stay, Mortality Risk, and Costs of Bacterial Health Care–Associated Infections in Australia: A Retrospective Case-cohort Study.

Citation: Clinical Infectious Diseases; May 2021; vol. 72 (no. 10)

Author(s): Lee; Stewardson, A J; Worth, L J; Graves, N; Wozniak, T M

Background: Unbiased estimates of the health and economic impacts of health care–associated infections (HAIs) are scarce and focus largely on patients with bloodstream infections (BSIs). We sought to estimate the hospital length of stay (LOS), mortality rate, and costs of HAIs and the differential effects on patients with an antimicrobial-resistant infection.

Methods: We conducted a multisite, retrospective case-cohort of all acute-care hospital admissions with a positive culture of 1 of the 5 organisms of interest (Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus, or Enterococcus faecium) from 1 January 2012 through 30 December 2016. Data linkage was used to generate a data set of statewide hospital admissions and pathology data. Patients with bloodstream, urinary, or respiratory tract infections were included in the analysis and matched to a sample of uninfected patients. We used multistate survival models to generate LOS, and logistic regression to derive mortality estimates.

Results: We matched 20,390 cases to 75,635 uninfected control patients. The overall incidence of infections due to the 5 studied organisms was 116.9 cases per 100,000 patient days, with E. coli urinary tract infections (UTIs) contributing the largest proportion (51 cases per 100,000 patient days). The impact of a UTI on LOS was moderate across the 5 studied pathogens. Resistance significantly increased LOS for patients with third-generation cephalosporin-resistant K. pneumoniae BSIs (extra 4.6 days) and methicillin-resistant S. aureus BSIs (extra 2.9 days). Consequently, the health-care costs of these infections were higher, compared to corresponding drug-sensitive strains.

Conclusions: The health burden remains highest for BSIs; however, UTIs and respiratory tract infections contributed most to the health-care system expenditure.

Title: Impact of the Surgical Safety Checklist on Surgical Site Infections, Antimicrobial Resistance, Antimicrobial Consumption, Costs and Mortality.

Citation: The Journal of hospital infection; May 2021

Author(s): de Almeida, Silvana Maria; de Menezes, Fernando Gatti; Martino, Marinês Dalla Valle; Tachira, Carolina Roberta; do Rosário Toniolo, Alexandra; Fukumoto, Helena Lumi; Edmond, Michael B; Marra, Alexandre R

Background: In 2010, following the recommendations of the World Health Organization (WHO), our hospital implemented the Surgical Safety Program centred around a surgical safety checklist.

Aim: The aim of the study was to compare indicators of surgical site infection, antimicrobial consumption, antimicrobial resistance, costs and in-hospital mortality before (January 2006 to July 2010) and after (August 2010 to December 2014) implementation of the program.

Methods: A case-control study was carried out matching patients with surgical site infection (SSI) to surgical patients without infection to examine the impact of the intervention.

Finding: Use of the surgical checklist was associated with a significant reduction in SSI. When comparing the two time periods, we also identified a reduction in infections due to microorganisms in the ESKAPE group (from 90.7% to 73.9%, p<0.001), a reduction of SSI in patients with contaminated, infected and potentially contaminated wounds, and for those in
whom perioperative antimicrobial prophylaxis was discontinued in less than 48 hours. Overall, there was a reduction in antimicrobial resistance, though there was increased resistance to carbapenems for Klebsiella pneumoniae, to glycopeptides for Enterococcus faecium, and to clindamycin for Staphylococcus aureus. We also detected increased antimicrobial consumption of 2nd and 3rd generation cephalosporins and clindamycin. We observed a reduction in hospital deaths from 6.4% to 3.2% (p=0.001), but we did not observe any reduction in costs.

**Conclusions:** Implementation of a surgical checklist was an independent predictor of SSI reduction, and was also associated with a decrease in antimicrobial resistance and reduced in-hospital mortality.

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**Title:** Antibiotic resistance among major pathogens compared to hospital treatment guidelines and antibiotic use in Nordic hospitals 2010-2018.

**Citation:** Infectious diseases (London, England); May 2021; p. 1-12

**Author(s):** Möller, Vidar; Östholm-Balkhed, Åse; Berild, Dag; Fredriksson, Mats; Gottfredsson, Magnus; Holmbom, Martin; Järvinen, Asko; Kristjansson, Mar; Rydell, Ulf; Sönksen, Ute Wolff; Kolmos, Hans Joern; Hanberger, Håkan

**Background:** The Nordic countries have comparable nationwide antibiotic resistance surveillance systems and individual antibiotic stewardship programmes. The aim of this study was to assess antibiotic resistance among major pathogens in relation to practice guidelines for hospital antibiotic treatment and antibiotic use in Nordic countries 2010-2018.

**Methods:** Antibiotic resistance among invasive isolates from 2010-2018 and aggregated antibiotic use were obtained from the European Centre for Disease Prevention and Control. Hospital practice guidelines were obtained from national or regional guidelines.

**Results:** Antibiotic resistance levels among Escherichia coli and Klebsiella pneumoniae were similar in all Nordic countries in 2018 and low compared to the European mean. Guidelines for acute pyelonephritis varied; 2nd generation cephalosporin (Finland), 3rd generation cephalosporins (Sweden, Norway), ampicillin with an aminoglycoside or aminoglycoside monotherapy (Denmark, Iceland and Norway). Corresponding guidelines for sepsis of unknown origin were 2nd (Finland) or 3rd (Sweden, Norway, Iceland) generation cephalosporins, carbapenems, (Sweden) combinations of penicillin with an aminoglycoside (Norway, Denmark), or piperacillin-tazobactam (all Nordic countries). Methicillin-resistant Staphylococcus aureus rates were 0-2% and empirical treatment with anti-MRSA antibiotics was not recommended in any country. Rates of penicillin non-susceptibility among Streptococcus pneumoniae were low (<10%) except in Finland and Iceland (<15%), but benzylpenicillin was recommended for community-acquired pneumonia in all countries.

**Conclusion:** Despite similar resistance rates among Enterobacteriaceae there were differences in practice guidelines for pyelonephritis and sepsis. National surveillance of antibiotic resistance can be used for comparison and optimization of guidelines and stewardship interventions to preserve the low levels of antibiotic resistance in Nordic countries.

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**Title:** Prevalence and Outcomes of Multi-Drug Resistant Blood Stream Infections Among Nursing Home Residents Admitted to an Acute Care Hospital.

**Citation:** Journal of intensive care medicine; May 2021; p. 8850666211014450
Objective: The prevalence of multi-drug resistant organism (MDRO) colonization in nursing home residents has been well documented, but little is known about the impact of MDRO bloodstream infections (BSIs). The aim of this study was to assess the prevalence, cost, and outcomes of MDRO-BSI vs. non-MDRO-BSI among nursing home residents.

Design: Retrospective cohort study.

Setting: 960 bed tertiary academic medical center.

Patients: Persons ≥18 years old admitted to an acute care tertiary hospital from Skilled Nursing Facilities with a diagnosis of sepsis between 2015 and 2018.

Interventions: Retrospective analysis of prevalence and outcomes.

Measurements and main results: Among patients admitted to the study hospital with a diagnosis of sepsis during the study period, 7% were from nursing homes. The prevalence of MDRO-BSI was 47%. We identified 54 (50%) gram positive BSIs, 48 (45%) gram negative BSI and 5 (5%) fungal BSI. Thirty-one (57%) of the gram-positive infections and 14 (30%) of the gram-negative infections were with MDROs. The prevalence of BSI organisms were Staphylococcus aureus in 24%, Escherichia coli in 14%, Proteus mirabilis in 13%, Staphylococcus epidermidis in 8%, Enterococcus faecalis in 7%, and Klebsiella pneumoniae in 6%. We found that intensive care unit length of stay (7 days vs 5 days, P = .009), direct cost ($13,639 vs $9,922, P = .027), and total cost ($23,752 vs $17,900 P = .032) were significantly higher in patients with MDRO-BSI vs. non-MDRO-BSI. Patients with MDRO-BSI were twice as likely to receive inappropriate empiric antiinfective therapy (31% vs 16%, P = .006) and were more likely to die (49.1% vs 29.6%, P = .049).

Conclusion: Nursing home residents have a high prevalence of MDRO-BSI, which is associated with higher risk of receiving inappropriate initial anti-infective therapy, higher cost, higher ICU LOS, and higher mortality. Our research adds new information about the prevalence of fungemia in this population.

Title: Pseudomonas aeruginosa infection in augmented care: the molecular ecology and transmission dynamics in four large UK hospitals.

Citation: The Journal of hospital infection; May 2021; vol. 111 ; p. 162-168

Author(s): Halstead, F D; Quick, J; Niebel, M; Garvey, M; Cumley, N; Smith, R; Neal, T; Roberts, P; Hardy, K; Shabir, S; Walker, J T; Hawkey, P; Loman, N J

Background: Pseudomonas aeruginosa is a common opportunistic pathogen and molecular typing in outbreaks has linked patient acquisition to contaminated hospital water systems. AIMTo elucidate the role of P. aeruginosa transmission rates in non-outbreak augmented care settings in the UK.

Methods: Over a 16-week period, all water outlets in augmented care units of four hospitals were sampled for P. aeruginosa and clinical isolates were collected. Outlet and clinical P. aeruginosa isolates underwent whole-genome sequencing (WGS), which with epidemiological data identified acquisition from water as definite (level 1), probable (level 2), possible (level 3), and no evidence (level 4).

Findings: Outlets were positive in each hospital on all three occasions: W (16%), X (2.5%), Y (0.9%) and Z (2%); and there were 51 persistently positive outlets in total. WGS identified likely transmission (at levels 1, 2 and 3) from outlets to patients in three hospitals for P. aeruginosa positive patients: W (63%), X (54.5%) and Z (26%). According to the criteria
(intimate epidemiological link and no phylogenetic distance), approximately 5% of patients in the study ‘definitely’ acquired their P. aeruginosa from their water outlets in the intensive care unit. This study found extensive evidence of transmission from the outlet to the patients particularly in the newest hospital (W), which had the highest rate of positive outlets.

**Conclusions:** The overall findings suggest that water outlets are the most likely source of P. aeruginosa nosocomial infections in some settings, and that widespread introduction of control measures would have a substantial impact on infections.

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**Title:** Pervasive transmission of a carbapenem resistance plasmid in the gut microbiota of hospitalized patients.

**Citation:** Nature microbiology; May 2021; vol. 6 (no. 5); p. 606-616

**Author(s):** León-Sampedro, Ricardo; DelaFuente, Javier; Díaz-Agero, Cristina; Crellen, Thomas; Musicha, Patrick; Rodríguez-Beltrán, Jerónimo; de la Vega, Carmen; Hernández-García, Marta; R-GNOSIS WP5 Study Group; López-Fresneña, Nieves; Ruiz-Garbajosa, Patricia; Cantón, Rafael; Cooper, Ben S; San Millán, Álvaro

**Abstract:** Infections caused by carbapenemase-producing enterobacteria (CPE) are a major concern in clinical settings worldwide. Two fundamentally different processes shape the epidemiology of CPE in hospitals: the dissemination of CPE clones from patient to patient (between-patient transfer), and the transfer of carbapenemase-encoding plasmids between enterobacteria in the gut microbiota of individual patients (within-patient transfer). The relative contribution of each process to the overall dissemination of carbapenem resistance in hospitals remains poorly understood. Here, we used mechanistic models combining epidemiological data from more than 9,000 patients with whole genome sequence information from 250 enterobacteria clones to characterize the dissemination routes of a pOXA-48-like carbapenemase-encoding plasmid in a hospital setting over a 2-yr period. Our results revealed frequent between-patient transmission of high-risk pOXA-48-carrying clones, mostly of Klebsiella pneumoniae and sporadically Escherichia coli. The results also identified pOXA-48 dissemination hotspots within the hospital, such as specific wards and individual rooms within wards. Using high-resolution plasmid sequence analysis, we uncovered the pervasive within-patient transfer of pOXA-48, suggesting that horizontal plasmid transfer occurs in the gut of virtually every colonized patient. The complex and multifaceted epidemiological scenario exposed by this study provides insights for the development of intervention strategies to control the in-hospital spread of CPE.

**Sources Used:**
The following databases are searched on a regular basis in the development of this bulletin:

- British Nursing Index
- Cinahl
- Medline

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