Abstract Highlights

The following highlights showcase selected abstracts presented at this year's European Society of Clinical Microbiology and Infectious Diseases (ESCMID) Global Congress, held in Barcelona, Spain. The chosen pieces shed light on current and exciting areas of the field, from the alarming extent of antibiotic loss in intensive care infusion practices, to the influence of antibiotic types on the risk of chronic urinary tract infections.

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Unveiling the Tales of Transplant Infection

OVER the last 30 years, there has been a significant rise in both the number of solid organ transplant recipients, and the success rates of transplants. However, infections continue to pose a challenge to long-term outcomes, particularly those occurring more than 1 year after transplantation, which have not been well understood. The goal of this study, which was presented at the 2024 ESCMID Global Congress, was to provide a detailed overview of the occurrence and impact of late-onset infections in the Swiss Transplant Cohort Study.

Since 2008, the Swiss Transplant Cohort Study has been systematically enrolling over 95% of all solid organ transplant recipients in Switzerland. This involves gathering pre-determined data, including information on infections, at specific intervals. The study includes adult recipients of heart, liver, lung, kidney, and kidney-pancreas transplants conducted between 1st May 2008–December 2020, who have been followed up for at least 12 months. All types of clinically significant infections, such as proven bacterial, fungal, parasitic, and viral infections; as well as probable fungal, parasitic, viral, and mycobacterial infections; along with viral syndromes, were analysed.

The study included 4,378 patients who underwent various organ transplants, with a median follow-up duration of 6.3 years. Among them, 64.9% experienced at least one clinically relevant infection, with an incidence rate of 0.69 infections per 1,000 transplantation days.

> **"Infections persisted at high rates throughout the observation period."**

Notably, lung, kidney-pancreas, and kidney transplant recipients had the highest incidence rates. Bacterial infections were the most common (57.8%), followed by viral (39.8%), fungal (4.4%), and parasitic (0.9%) infections. Enterobacterales and respiratory viruses were the primary pathogens identified. Viruses were the main cause of infections in heart and lung recipients, while bacteria prevailed in kidney, liver, and kidney-pancreas transplant recipients. These infections persisted at high rates throughout the observation period.

In conclusion, this study highlights a continued significant burden of late-onset infections following transplantation.

Minimising Antibiotic Loss in Intensive Care Infusion Practices

EFFECTIVE antibiotic administration is critical in intensive care settings, where precise dosing can have an effect on recovery and resistance. Research increasingly suggests that achieving optimal pharmacokinetic/pharmacodynamic targets in the intensive care unit (ICU) may be compromised by physical losses of the drug before it even reaches the patient. A recent study, presented at the 34th ESCMID Global Congress, showed significant loss of antibiotic doses due to remnants in vials and intravenous lines after reconstitution.

The researchers performed an observational prospective study in the ICUs at the University Hospitals Leuven, Belgium, in November 2023, where they evaluated the residual volume and antibiotic loss in infusion sets from ICU patients. The study assessed 40 intermittent antibiotic infusions to determine the residual volume and antibiotic loss in the infusion sets used at the hospital. The team focused on common antibiotics such as amoxicillin-clavulanate, piperacillin-tazobactam, and vancomycin, using the 110.1569 Dialex Biomedica (Dialex Biomedica, Bilzen, Belgium) infusion sets.

Results showed that the majority of infusion sets were re-used to administer the same antibiotic (55%), and another 25% were used for different drugs. Most notably, antibiotic loss occurred in 85% of administrations, with a median loss of 24%, while considering factors such as flushing, antibiotic stability, and time interval until subsequent administration through the same infusion set.

> **"To mitigate these losses, it is recommended to flush infusion lines post-administration."**

The results implicate that the combined loss of antibiotic doses through residuals in vials and infusion sets may have significant influence on pharmacokinetic/pharmacodynamic target attainment and clinical outcomes in the ICU. Additionally, data showed that substantial amounts of prescribed antibiotic doses do not reach the patients with intermittent antibiotic infusions. This issue is particularly acute with antibiotics that have limited stability, such as meropenem or amoxicillin-clavulanate. To mitigate these losses, it is recommended to flush infusion lines post-administration, and to consider switching intermittent infusion to bolus injection to minimise residual volumes.

The findings emphasise the need for new strategies and methods to ensure complete and effective delivery of prescribed doses to patients, particularly in ICU settings.

Varying Effects of β-Lactams on the Gut Microbiota

NEW RESEARCH presented at the ESCMID Global Congress 2024, which took place from 27th–30th April, compared the effects of ceftriaxone (CRO), piperacillin-tazobactam (TZP), and ceftazidime-avibactam (CZA) on the gut microbiota. Previous research has confirmed that antibiotics affect the composition of the microbiota, but the strength of the effect of each antibiotic remains unclear. The research team, based in Paris, France, compared these three β-lactams in order to begin to understand their effect.

"Previous research has confirmed that antibiotics affect the composition of the microbiota."

Healthy volunteers were exposed to 1 g/day CRO, 4 g/0.5 g three times/day TZP, 2 g/0.5 g three times/day CZA, or no antibiotic (control group) for 7 days. Their faeces were collected before, at the end, and 30 days after treatment, and the metagenomes were then sequenced (minimum 20 M paired-end reads per sample). After cleaning, reads were assembled using MEGAHIT, and metagenome-assembled genomes were obtained using Metabat2. Richness was calculated at the species level. β-lactamase-encoding genes were identified using pair-wise comparative modelling with a final expertise validation.

Ultimately, 130 metagenomes out of 144 could be sequenced. From baseline, CRO, TZP, and CZA induced a significant richness drop at the end of treatment (-18, -22 and -37; $P<0.01$, respectively, for each). Thirty days after treatment, only subjects exposed to CZA had a lower richness compared to baseline (-17; $P<0.001$). A total of 149 β-lactamase-encoding genes were predicted on the whole dataset, including 21 and 37 whose relative abundance increased from baseline to the end of treatment, and 30 days after treatment, respectively.

The team found that subjects exposed to CZA had a greater loss of richness after 7 days of exposure compared to subjects exposed to CRO and TZP. Moreover, they still had a richness loss 30 days after exposure. Though the study continues as the team carry on with synthesising and characterising the β-lactamase-encoding genes, this research highlights the impact of various β-lactams on the gut microbiota. ●

Prevalence of Multi-drug Resistant Bacteria in Elderly Care Centres

THE World Health Organization (WHO) has identified multi-drug-resistant (MDR) extended-spectrum β-lactamase producing Enterobacterales (ESBL-PE), carbapenemase-producing Enterobacterales (CPE), vancomycin-resistant enterococci (VRE), and toxigenic *Clostridioides difficile* (tCD) as significant threats to human health. Moreover, the prevalence of carriage of MDR micro-organisms in elderly care centres (ECC) is not well-established. Therefore, researchers conducted a worldwide systematic review examining MDR carriage prevalence and risk factors in ECCs. Data from this study were presented at the 2024 ESCMID Global Congress.

The study employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology to search PubMed, Web of Science, and Cochrane databases for all studies until 2022, evaluating the prevalence of specific MDR bacterial species. Essential information, including prevalence, risk factors, sample size, sampling period, and study design, was extracted from articles included in the study. Through electronic database searches, the researchers identified 2,015 articles, of which a total of 25 articles involving 12,790 participants across 14 countries were selected for the systematic review.

Of the 25 articles reviewed, the global prevalence of MDR species, including ESBL-PE, CPE, VRE, or tCD in ECCs, was estimated at 13.1%, 1.1%, 3.3%, and 16.5%, respectively. Moreover, the most significant risk factors for MDR carriage identified consistently across studies included incontinence, the presence of an invasive medical device, and a history of antibiotic use.

In ECC environments, colonisation of residents with ESBL-PE or tCD is common, affecting one resident in six, while CPE and VRE colonisation rates are significantly lower. The identified risk factors of MDR carriage in ECCs are aligned with the risk factors in the literature. An improved understanding of the prevalence and risk factors for MDR colonisation in ECCs could lead to improvements in prevention. Nevertheless, complete adherence to infection control measures and appropriate antibiotic stewardship remains necessary to protect populations from MDR microorganisms. ●

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Understanding Antimicrobial Resistance at the Healthcare Facility Level

INCIDENCE of hospital-acquired or resistant gram-negative bacilli bloodstream infections (GNB-BSI) was measured in a recent study benchmarking hospitals in a large public healthcare consortium in the Parisian areas of France. Data were presented at the 2024 ESCMID Global Congress in Barcelona, Spain. Benchmarking can be employed to identify priorities for hospitals, and in this study, it was used to produce indicators for understanding differences in antimicrobial resistance (AMR) and healthcare-associated infections (HAI) between hospitals. The increasing frequency of AMR in bacteria, driving the rise in HAIs worldwide, poses a serious threat to healthcare systems, increasing the cost, length of hospitalisation, and mortality and morbidity of patients. Therefore, monitoring the incidence of GNB-BSIs as a marker of HAI and AMR burden is essential to survey and control the spread of these phenomena.

The study was composed of a cohort of 28 hospitals from a network of 38 hospitals belonging to the largest hospital group in France, Assistance Publique-Hôpitaux de Paris. All data analysed in this study were from 2019 due to the impact of COVID-19 on organisation of hospitals and downstream effect on AMR. The use of the same laboratory information system in the bacteriology laboratories across the hospitals in the study meant that all data extraction and analysis were standardised. Spearman's rank correlation coefficient was used to determine correlation between incidence density rates for resistance patterns of concern. Principal component analysis of different micro-organisms isolated from BSIs was performed to identify correlations between incidence rates of GNB-BSIs due to micro-organism species, patterns of resistance, and scores for subsequent analysis. Finally, multivariate linear regression analysis was conducted to examine associations between AMR and HAI scores and various explanatory factors.

Results revealed that within each hospital there is a strong positive correlation between the incidence of GNB-BSI and resistant GNB-BSI, and hospital-acquired GNB-BSI. Two scores for AMR and HAI rates were created by combining different GNB-BSI, and multivariate analysis demonstrated significant associations between the proportion of surgical beds, use of carbapenems, staff absenteeism, and alcohol-based hand rub consumption. The researchers acknowledged that carbapenem association with AMR may be a result of carbapenems being the preferred antibiotic drug for resistant infections.

The researchers concluded that the identification of factors associated with HAIs and AMR, particularly staff absenteeism and consumption of alcohol-based hand rub, are amenable to targeted intervention at the healthcare facility level. ●

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Comparative Outcomes of Respiratory Syncytial Virus and Influenza A in Adults

ANNUAL incidence rates and hospital admissions of respiratory syncytial virus (RSV) are higher than those for influenza A. RSV infection in older patients is associated with poorer outcomes compared to influenza A.

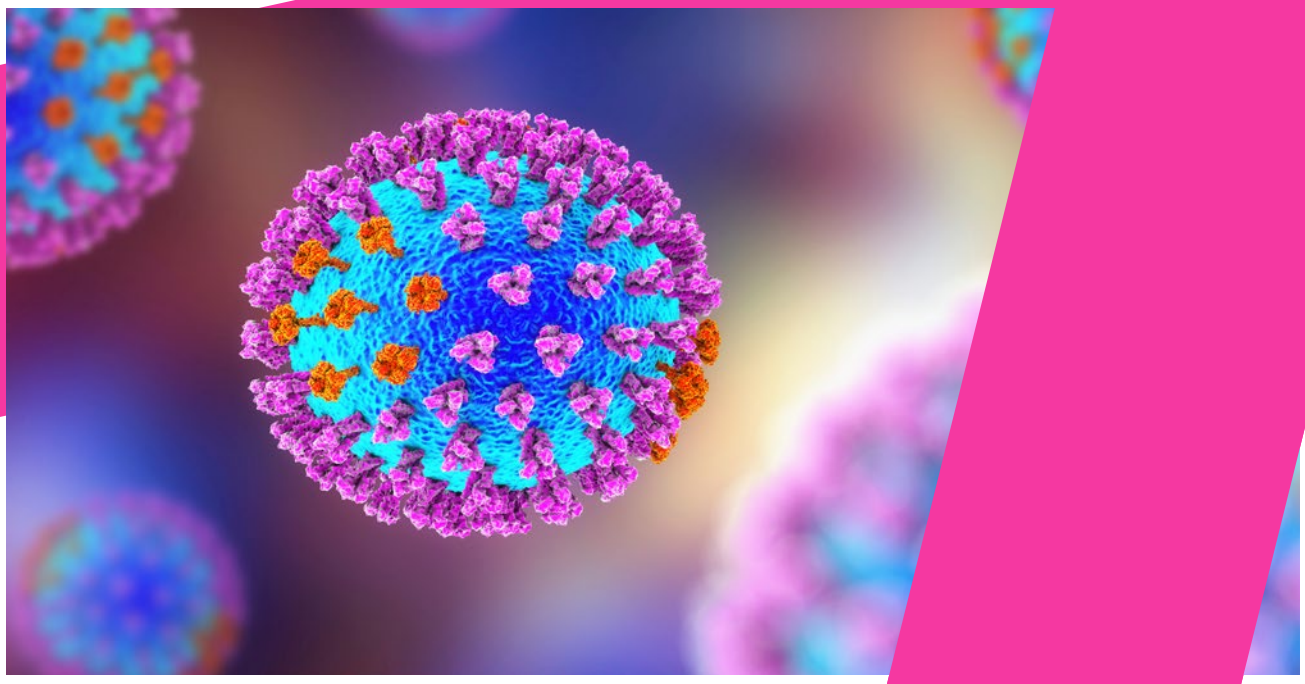
RSV is associated with major causes of influenza-like morbidity worldwide, especially in infants and the elderly. Research presented at the 34th ESCMID Global Congress emphasises the importance of investigating the incidence rates, risk factors, clinical characteristics, and outcomes of hospitalised patients with RSV versus influenza A.

The study, performed at the Tel Aviv Sourasky Medical Center, Israel, comprised two parts. Firstly, the researchers collected incidence data of hospitalised adults with RSV and influenza A, between January 2018–April 2023. Secondly, they conducted a case-control study of hospitalised adults with RSV versus influenza A between October 2021–April 2023 throughout the winter seasons. They gathered information on several clinical characteristics like age, pre-existing medical conditions, the Charlson Comorbidity Score (CCS), and 30-day mortality.

Results showed that incidence rates and hospitalisations were higher in patients with RSV than influenza A. Additionally, multivariate analysis showed older patients with RSV had higher CCS and 16% 30-day mortality rate, nearly double that of patients with influenza A.

> **"RSV infection in older patients is associated with poorer outcomes compared to influenza A."**

This study highlights key differences between RSV and influenza A infections, and indicates that RSV infection leads to increased hospitalisation and mortality rates compared to influenza A, especially in elderly patients. This underscores the significant burden that RSV places on adult populations. Future research should aim to replicate these findings across multiple medical centres, and explore the efficacy of RSV vaccines and antivirals, particularly in populations with high comorbidity scores.



Urinary Tract Infections Recurrence: Play of Treatment Choice

URINARY tract infections (UTI) are the leading reason for doctors in general practice to prescribe antibiotics in Denmark. For general practitioners (GP), the recommended initial treatment for UTIs includes pivmecillinam as the first choice, with nitrofurantoin or trimethoprim recommended as alternative options for those allergic to the first-line treatment. However, despite receiving appropriate treatment, over 30% of females with UTIs experience another infection within a year. This study aimed to evaluate the selection of initial UTI treatments by GPs across various age groups, and determine their effectiveness in preventing recurrent UTIs (rUTI).

"This study aimed to evaluate the selection of initial UTI treatments by GPs across various age groups."

In this retrospective cohort study, researchers analysed data from 95,722 adult females with findings of uropathogenic organisms in urine cultures conducted by GPs. From this pool, 12,058 females were selected and categorised into three age groups: 18–22, 41–45, and 61–65 years. Data were collected from the Department of Clinical Microbiology laboratory information system and The Danish National Health and Prescription Registers. UTI episodes were identified based on significant uropathogenic laboratory findings and subsequent antibiotic prescriptions. rUTI was defined as experiencing ≥2 UTIs within 6 months, or ≥3 within 12 months. The appropriateness of empirical UTI (EUT) treatment was assessed based on antibiotic resistance. Informed treatment referred to the use of antibiotics after receiving test results. Logistic regression was employed to calculate odds ratios for rUTI onset, adjusting for factors such as timing of treatment, type of antibiotic, death, age, and uropathogen.

The study's results revealed that EUT treatment was linked to a higher rate of rUTI debuts, particularly in the 61–65 age group. There was no significant disparity in rUTI odds between appropriate EUT and informed treatment, but inappropriate EUT was associated with increased odds of rUTI. The likelihood of rUTI was notably higher in older age groups, particularly in the 61–65 cohort. Among the antibiotics recommended for UTI treatment, only ciprofloxacin demonstrated a reduction in rUTI odds, while oral ampicillin, which has limited efficacy for oral treatment, was associated with increased odds of rUTI. Comparatively, *Staphylococcus saprophyticus* lowered the odds of rUTI, whereas *Klebsiella pneumoniae* increased the odds. The study's strengths were its large cohort size, diverse species variety, and high quality of data from the Danish registers. However, limitations included reliance on samples analysed by the Department of Clinical Microbiology and assumptions regarding patient compliance.

This study concludes that the choice of treatment for UTIs plays a significant role in affecting the risk of recurrent UTIs, with age and certain bacterial species being particularly influential factors.

Closing Knowledge Gaps: Online Education in Female HIV Care

ONLINE medical education tools substantially enhance physicians' knowledge of the biological considerations and comorbidities in females living with HIV, according to new research presented at the ESCMID 2024 Global Congress. Fifty-three percent of people living with HIV in 2022 were females, who face unique challenges throughout various life stages, including pregnancy, menopause, and ageing. Moreover, virological, immunological, and socio-behavioural disparities exist among females living with HIV, compared to their male counterparts and HIV-negative females.

This study by Julia Duffey, Medscape Education Global, London, UK, and team, aimed to evaluate the effectiveness of online independent medical education in enhancing the knowledge and confidence of HIV and infectious disease (ID) physicians concerning female-specific aspects of living with HIV, and associated comorbidities. The researchers conducted two online, independent medical education activities comprised of an expert-led 30-minute lecture on biological and immunological aspects of HIV infection that are unique to females, and a 30-minute discussion in which three experts exchange viewpoints about increasing awareness and supporting best practice in the management for this group. Each participant completed both pre- and post-education questions to determine if their knowledge was improved, reinforced, or if they need further education.

For the first activity, which included 632 HIV/ID specialists, there was an overall improvement of correct answers from 30 to 63% ($P<0.001$). In addition, 48% (n=45) of participants reported improved confidence in managing non-HIV-related comorbidities specific to females. A similar trend could be seen after the second activity, which included 87 specialists, where correct answers improved from 28 to 56% ($P<0.001$). However, there was a high proportion of specialists (49%) who still required education regarding human papillomavirus vaccination and testing in females living with HIV.

This study has demonstrated that online education can substantially improve specialists' knowledge and confidence concerning health issues disproportionately affecting females with HIV. The baseline knowledge regarding comorbidity risk and prevalence in this population was low, indicating an unmet need for education in prevention and management. This shows the need for education on this topic to be a priority for HIV and ID specialists to meet the unique challenges faced by this demographic.

"48% of participants reported improved confidence in managing non-HIV-related comorbidities specific to females."