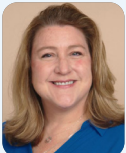


The overlooked intersection: AMR's consequences for cancer patients

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Antimicrobial resistance (AMR) poses a critical threat to cancer patients, who are especially vulnerable due to immunosuppression and frequent infections. Recent large-scale studies reveal significantly higher AMR rates in both inpatient and outpatient cancer populations, leading to increased morbidity, mortality, and healthcare costs. This article highlights the urgent need for targeted infection prevention, diagnostic stewardship, and global collaboration to mitigate AMR's impact on oncology care and safeguard treatment outcomes.

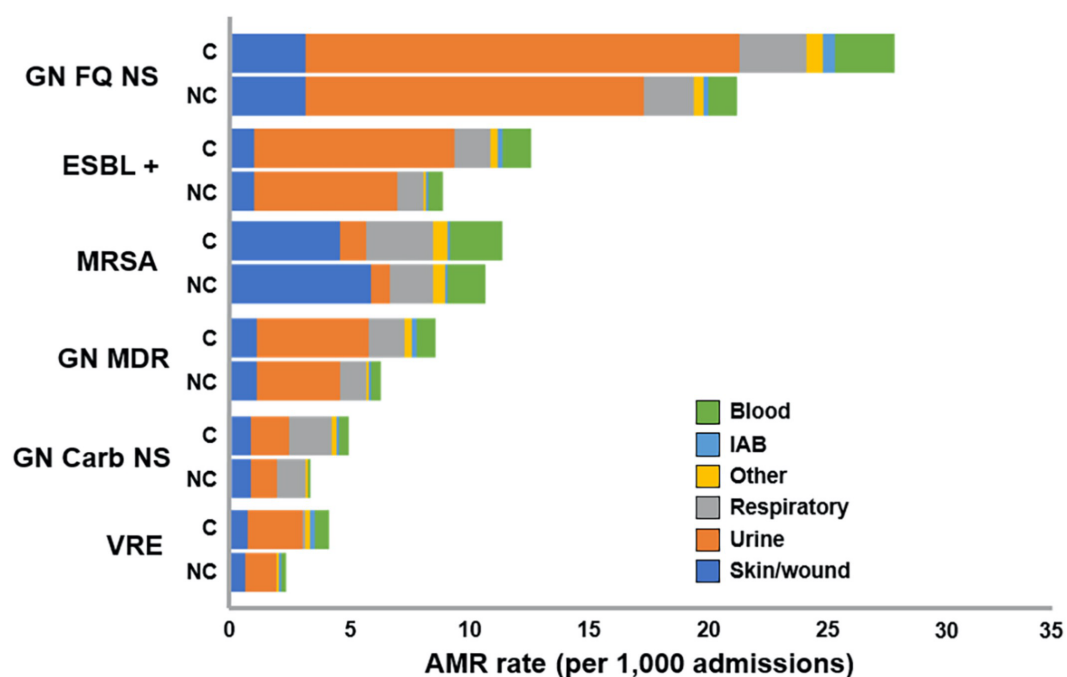
Patients with noncommunicable diseases (NCDs) are vulnerable to other health threats, including infectious diseases. COVID-19 brought this into stark reality, but viral pandemics, while devastating and disruptive, are not the only concern. Antimicrobial resistance (AMR) is a real and current threat, already associated with approximately five million deaths a year and trillions of dollars in healthcare costs. As a result of AMR, antibiotics, antifungals, and other medicines become ineffective and infections become difficult or impossible to treat (1,2).

Most alarmingly, its burden is felt in vulnerable populations, including people living with NCDs. In patients with cancer, the

estimated risk of an infection-related death is >2.9 times that in the non-cancer population (3), and the hospital mortality rate for cancer patients with sepsis in intensive care is 62% (4).

Infections remain a leading cause of morbidity and mortality among cancer patients, many of whom are immunocompromised due to chemotherapy and other medical interventions. It is estimated that one in five cancer patients undergoing treatment are hospitalized due to infection, and antibiotics are the main line of defence. The global rise in AMR complicates infection management by reducing the effectiveness of standard therapies. This situation leads to prolonged hospital stays, increased healthcare costs, and higher mortality rates.

Figure 1: Burden of antimicrobial resistance in adult hospitalized patients with cancer: A multicenter analysis



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Figure 2: Visual abstract of outpatient data, produced by *The Lancet Oncology*

showed a higher incidence of AMR rates in cancer, except for *Acinetobacter* sp. The analysis included Gram-negative pathogens analyzed for multidrug resistance, ESBL production, and resistance to fluoroquinolones and carbapenems. For Gram-positive pathogens, methicillin resistance for *S. aureus* and vancomycin resistance for *Enterococci* sp. were analyzed (Figure 1).

In the second study, published in *The Lancet Oncology*, research looking at the outpatient setting found that AMR rates among key pathogens were one to three times higher, and up to five times greater with some specific pathogen-source combinations in outpatient cancer patients (6). The study, which included 1,655,594 unique bacterial isolates collected from outpatients attending 198 facilities, is, to our knowledge, the first time a large multicentre study quantifying AMR in outpatients with cancer in the United States has been published. A significantly higher prevalence (% NS) of AMR and rate of AMR (per 1,000 pathogen isolates) among US patients with cancer compared to those without cancer in most evaluated pathogens, regardless of the culture site, was seen (Figure 2). Particularly alarming were the findings in blood and urine cultures. In blood, fluoroquinolone-resistant and ESBL+ pathogens, as well as vancomycin-resistant *Enterococcus* (VRE), were markedly more prevalent in cancer outpatients. In urine

Recent publications highlight the impact

In people with cancer, infections have a primary or secondary role in over half of deaths. However, there have not been large studies or meta-analysis completed to understand the impact of AMR in the cancer population.

In a recent study in *Cancer Medicine*, research indicates that people with cancer had a heightened risk of drug-resistant infection. The study showed that cancer patients receiving care in the inpatient setting have 1.5–2x risk of having an AMR pathogen than non-cancer patients (5). The study analyzed data from more than 4.6 million admissions across 168 US hospitals. Most pathogen-AMR combinations

samples, cancer outpatients exhibited elevated resistance to carbapenems, fluoroquinolones, ESBL-producing organisms, methicillin-resistant *Staphylococcus aureus* (MRSA), and VRE.

Taken together, the two studies, which are believed to be the first large multicentre studies to quantify AMR among cancer patients in the United States, offer some of the strongest evidence to date that superbugs or drug-resistant pathogens pose a substantial risk to cancer patients across a variety of settings.

The increased rates of AMR in patients with cancer in both the inpatient and outpatient settings highlights the need for enhanced infection prevention programmes and focused

antibiotic and diagnostic stewardship efforts to improve timely AMR identification and antibiotic prescribing among patients with cancer. This includes:

- ➔ increasing the use of rapid diagnostic tools in the outpatient setting prior to antibiotic prescription;
- ➔ adjusting hospital-level guidelines on empiric antibiotic choice based on real-time antibiograms, as well as prompt de-escalation, escalation, or switch in antibiotics based on susceptibility testing even in the outpatient setting; and
- ➔ implementing antimicrobial stewardship protocols as they are critical for the management of patients with cancer.

A scoping review in *The Lancet Oncology* found the prevalence of AMR bacterial infections from seven World Health Organization (WHO) priority pathogens in patients with haematological malignancies was 35%, with 65% of the studies in the meta-analysis showing higher mortality rates associated with AMR infections (7). Bloodstream infections were the most common, particularly involving resistant strains such as third-generation cephalosporin-resistant Enterobacterales, MRSA, and VRE. The findings underscore the urgent need for improved surveillance, standardized reporting, and targeted interventions, especially in underrepresented low- and middle-income regions.

The commentary by Shropshire et al in *The Lancet Oncology* highlights the growing threat of AMR across the cancer care continuum, particularly in outpatient settings (8). Historically confined to hospitals, AMR has expanded into the community, posing significant risks to cancer patients, who are especially vulnerable to infections. The commentary published alongside the publications referenced above noted that the findings underscore the need for improved infection control measures in outpatient oncology care, which currently lack the rigour of inpatient protocols. The commentary also emphasizes the importance of integrating microbiome-based strategies and environmental surveillance to prevent AMR transmission. Ultimately, the authors call for targeted research and sustainable interventions to mitigate AMR's impact on cancer treatment outcomes.

Together, these studies demonstrate the need for action

While significant advancements have been made in the treatment of patients with cancer, additional attention to AMR research and prevention is necessary to maintain this progress and reduce the adverse impact of AMR on this highly vulnerable population.

Learnings from an AMR Insights roundtable

A roundtable, hosted by AMR Insights, brought together

international experts from academia, clinical practice, and microbiological research, each providing a unique lens on the complex intersection between AMR and oncology (9). Below are the key takeaways published in a white paper summarizing the roundtable discussion.

- ➔ **Dr Debbie Goff**, an infectious disease pharmacist and global stewardship expert, highlighted the transformative implications of the recent data. She emphasized the underestimated burden of AMR in outpatient settings, pointing out that the trend of shifting cancer care from inpatient to outpatient environments has not reduced infection risks as previously assumed. Dr Goff advocated for developing cancer-unit-specific antibiograms to detect AMR patterns more precisely. She also stressed the importance of diagnostic stewardship, urging healthcare systems to implement rapid diagnostic testing in ambulatory care settings, where empiric prescribing is most vulnerable to failure.
- ➔ **Dr Margaret Lubwama**, a clinical microbiologist at Makerere University College of Health Sciences, presented findings from Uganda that align with the global data. She underscored that AMR rates among cancer patients in sub-Saharan Africa are significantly high, with over 80% of ESBL-producing *E. coli* showing resistance to fluoroquinolones and other frontline antibiotics. Dr Lubwama's research extended to environmental swabbing in oncology wards, revealing the presence of multidrug-resistant organisms on surfaces such as toilet bowls, which suggests potential transmission via environmental reservoirs. Her proposed next steps include whole genome sequencing to identify cross-transmission routes, co-designing infection prevention protocols with hospital staff, and integrating community stakeholders in policy formulation.
- ➔ **Dr Afreenish Amir**, a medical microbiologist, speaking from her experience in Pakistan's national AMR surveillance initiatives, stressed the importance of comprehensive metadata in AMR analysis for cancer patients. She emphasized that understanding the context – hospitalization history, antibiotic usage, immune status, and facility type – is critical for policy relevance. Dr Amir proposed a framework linking microbiological data with antimicrobial usage and outcome indicators to inform empirical treatment guidelines, essential medicines lists, and national stewardship strategies. She also called for alignment with global AMR initiatives such as Global Antimicrobial Resistance and Use Surveillance System (GLASS) and the WHO Research Agenda on Human Health.
- ➔ **Dr Vikas Gupta**, Senior Director of Clinical Affairs (Q-linea), emphasized the strategic decision to publish in

oncology journals. He noted that traditional infectious disease channels fail to reach the oncology community, where AMR awareness is often limited. By engaging oncologists directly through their literature and professional networks, Dr Gupta and colleagues aim to foster recognition of AMR as an oncologic risk factor. He encouraged replication of these studies in other countries, particularly low- and middle-income countries, to broaden the evidence base. He also called for coordinated international efforts to monitor AMR trends in oncology and adapt stewardship practices accordingly.

The roundtable served not only to disseminate new data but also to galvanize a global call to action for safeguarding cancer care against the rising tide of AMR.

Action is needed today

AMR is a core threat to vulnerable patients. Through political declarations, partnerships, and programmes, we must recognize the devastating impact of AMR on health systems and acknowledge that AMR undermines cornerstone medical procedures such as surgery, cancer treatment, and organ transplants. Working together we can improve access to the tools needed to slow AMR, improve cancer outcomes, and support people's overall wellbeing.

Learn more about the AMR and the impact to vulnerable populations at the [AMR: Combat Antimicrobial Resistance and Cancer And AMR Consortium | AMR](#). ■

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References

1. Murray C, et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *The Lancet*. 2022 Feb;399(10325):629-655.
2. <https://www.who.int/docs/default-source/antimicrobial-resistance/amr-factsheet.pdf>; Accessed 2 March 2025.
3. Zheng Y, Chen Y, Yu K, et al. Fatal Infections Among Cancer Patients: A Population-Based Study in the United States. *Infect Dis Ther*. Jun 2021;10(2):871-895. doi:10.1007/s40121-021-00433-7
4. Nazer L, et al. All-cause mortality in cancer patients treated for sepsis in intensive care units: a systematic review and meta-analysis. *Support Care Cancer*. Dec 2022;30(12):10099-10109. doi:10.1007/s00520-022-07392-w
5. Gupta V, et al. Burden of Antimicrobial Resistance in Adult Hospitalized Patients With Cancer: A Multicenter Analysis. *Cancer Med*. 2024 Dec;13(24):e70495. <https://doi.org/10.1002/cam4.70495>
6. Gupta V, et al. Incidence and prevalence of antimicrobial resistance in outpatients with cancer: a multicentre, retrospective, cohort study. *Lancet Oncol*. 2025 May;26(5):620-628. doi: 10.1016/S1470-2045(25)00128-7
7. Sallah YH, et al. Antimicrobial resistance in patients with haematological malignancies: a scoping review. *Lancet Oncol*. 2025 May;26(5):e242-e252. doi: 10.1016/S1470-2045(25)00079-8
8. Shropshire WC, et al. Antimicrobial resistance: a problem across the cancer care continuum. *Lancet Oncol*. 2025 May;26(5):537-538. doi: 10.1016/S1470-2045(25)00155-X.
9. AMR Insights Webinar: How AMR Threatens Cancer Care. AMR Insights, 25 June 2025. <https://www.amr-insights.eu/roundtable-how-amr-threatens-cancer-care/>