Can the burden of antimicrobial resistance be lowered for immunocompromised cancer patients? A narrative review and call to action

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Heavily immunocompromised cancer patients are at heightened risk from antimicrobial resistance (AMR). A narrative review by the Menarini Group of 214 recent publications has identified the broad burdens of AMR for affected patients and healthcare systems. These include excess mortality, effective treatment of underlying conditions, additional economic costs, and long-term damage to patients' lives. This review also sets out the initiatives needed to reduce these burdens, including more research on the patients' experience, more education for healthcare professionals, rapid diagnostic testing and standardized screening, changes to clinical procedures, a better understanding of AMR cost implications, and more investment in antibiotics.

The complete, original article can be found in https://link.springer.com/journal/40121/volumes-and-issues/14-9

Antimicrobial resistance (AMR) is a growing threat to global health security. In 2021 it was associated with 4.7 million deaths worldwide, with 1.1 million of these deaths due to bacterial-resistant infections. Cancer patients are at particular risk from bacterial infections because of their immunocompromised status, frequent hospitalizations, invasive procedures, and the widespread use of antibiotics in their treatment. In the US population, cancer patients are three-times more likely to die from infection, and in the UK a survey of 100 oncologists found that 46% believed that chemotherapy might become unviable because of AMR.

In August 2025, the Menarini Group conducted an important narrative review, published in *Infectious Diseases and Therapies (1)*, to find out how researchers writing in recent publications (2018–2023) described the burdens faced by immunocompromised cancer patients, and their healthcare systems, from bacterial AMR. Following an initial review of 410,088 publications on AMR, 214 publications were selected following a screening process to compile this review, which was then considered by a virtual steering committee.

The results of this review were particularly focused on how recent publications reported on the current epidemiology and mortality caused by AMR; cancer tumours and AMR; patient perspectives on the impact of AMR; how clinical management practices were changing; and the costs of AMR for patients, healthcare systems, and global society. The review also included transplant patients and those with haematological malignancies.

Epidemiology and mortality

The narrative review found the frequency of AMR in cancer and transplant victims with bacterial infections to be approximately 10% to 30% globally, which is consistent with previous estimates. However, some centres reported a zero susceptibility to ß-lactams and fluroquinolones when used as prophylaxis, revealing a growing threat of AMR. There were also reports of multidrug resistance, where bacteria were resistant to one agent in three or more antibiotics classes, which could range from 1% to 73.8% of the samples taken.

The impact of AMR on mortality also varied, ranging from

3.0% to 64.4% for 30-day mortality and 8.7% to 75% for time-points beyond one year. These wide gaps reflect variations in underlying disease types, treatment intensity, and patient comorbidities, as well as tolerance to specific antimicrobial regimes and access to treatment.

Another key factor contributing to AMR-associated mortality was inappropriate empiric antibiotic therapy (IEAT), where a prescribed antibiotic is known to be ineffective against a pathogen but is still given to the patient. Rates of IEAT range from 16.8% to 68.6%, but are a modifiable risk factor. Poor outcomes were also reported for carbapenem-resistant bacteria because of limited treatment options.

Cancer tumours and AMR

Infection remains a leading cause of death for patients with solid tumours, with worse overall survival rates for AMR versus no AMR. The narrative review found that median overall survival in AMR-compromised patients was just 6.0–17.0 months compared with 23.9–50 months for non-colonized patients with cancer.

The lowest prevalence of AMR in patients with solid cancers was in pre-surgery patients with gynaecological cancer and the highest in patients with cholangiocarcinoma (CCA). One study found that 71.7% of patients undergoing resection of extrahepatic CCA had resistant bacterial infections.

Despite the high levels of AMR, the review found that there is a lack of infectious disease specialists involved with cancer patients. A recent Spanish study of cancer patients with pneumonia reported that only 26% were evaluated by an infectious disease specialist.

The narrative review also highlighted the problems that continue to exist in assessing the impact of infection on cancer mortality, which include under-reporting on death certificates due to comorbidities, and the long-term impact of treatment delays on disease control and survivorship.

Patient perspectives

The narrative review was particularly concerned with understanding the cancer patient's experience of AMR and this was made difficult by differences in patient populations, study designs, local epidemiology, and microbiological practices. The review makes it clear that there needs to be greater consistency and standardization in testing and reporting to accurately identify the patient burdens caused by AMR.

Some significant burdens for cancer patients were highlighted by the review:

- Social isolation due to long periods of care in hospital intensive care units (ICUs) and the enforced lack of contact with relatives and close social connections to control infection;
- Increased anxiety, particularly if there are additional burdens such as mechanical ventilation;
- Invasive AMR management, such as amputations to control infection in leukaemia, even when the underlying cancer was successfully treated;
- Central venous catheter (CVC) infections which require the removal of a catheter can complicate treatments like chemotherapy and lead to delays or incomplete treatments;
- Poor communication about the risks of AMR to patients, which, if improved, could help minimize the frequency of infections.

Comment

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Our narrative review clearly shows the additional burden that AMR places on cancer patients, who are already facing considerable difficulties from the treatment of their underlying condition. The major problem is the fact that AMR leads to delays in oncological treatment, which can have serious consequences. But AMR is also associated with other problems that deeply impact the patients' quality of life. These can include social isolation from being in an ICU or being kept away from friends and relatives for long periods, new invasive treatments unrelated to the cancer and associated side effects, and increased anxiety and distress.

It is fundamental that all oncologists are very aware of AMR and its related complications. We must increase our understanding and awareness of AMR in order to be able to adequately care for cancer patients. AMR education and awareness must become part of our training, as well as part of our communication with cancer patients, particularly those who are immunosuppressed.

As oncologists, we are often focused on the consequences and outcomes of treating the cancer itself and may consider the risks of AMR as secondary. However, as described above, the consequences of AMR may be equally severe and are intertwined with the oncological care. It is therefore crucial that we integrate prevention and management of AMR with cancer care, to improve patient outcomes.

Coordination of care between hospital departments is also fundamental. Often, antibiotics prescription is performed by different specialists, without a central coordination. This increases the risk of AMR. Each medical area draws upon their separate procedures and traditions, when a cross-functional approach might lead to better stewardship practices and a deeper knowledge of how antibiotics are being used within a complex institution.

Awareness, education and collaboration between specialists, with involvement of the hospital infection control commission, can be difference between life and death for cancer patients.

Clinical management practices

The studies reviewed suggest that many prophylactic regimens were inadequate in oncology settings and that it was important for antibiotic treatment to be tailored to local epidemiology. Some studies also point to the use of targeted therapy in countries with a prevalence for carbapenem resistance, such as Greece, Italy, Spain, Poland, Portugal, and Turkey. However, the best course of management is not always clear because of a lack of high-quality evidence, which again points to the need for standardization in screening and reporting. The emergence of rapid diagnostic tests is starting to help by giving clinicians rapid access to microbiological results, as well as being a key step in improving AMR screening.

A key clinical management practice is antibiotic stewardship, as prolonged use of antibiotics exacerbates AMR trends. Some studies showed that the use of broad-spectrum antibiotics for short durations has been shown to reduce the pressures that drive AMR, and this is a relatively simple modification.

Direct and indirect costs of AMR

If a cancer patient develops an AMR infection, the review showed that this can increase the cost of treatment in several ways:

- The duration of stay in the hospital can be extended and time in ICUs or on ventilators will drive up costs. An AMR infection can extend the stay to up to 30 days and increase the costs by $US 50,000;
- Surgical revisions and central line-associated blood stream infections have caused an additional direct cost of EUR 8,810 per patient;
- Targeted antibiotics regimes can also increase direct costs substantially. The cost of using targeted antibiotics against vancomycin-resistant enterococci was estimated at US$ 1,604 to US$ 27,000, and US$ 8,542 to US$ 31,811 for targeted therapy against P. aeruginosa. These figures are similar to the US$ 31,338 cost of treating bloodstream infections (BSI) due to methicillin-resistant *Staphylococcus aureus* (MRSA) in US hospitals.

Infection control must also be seen in the context of managing a patient's underlying condition. For example, in the United States, cancer treatment has a cumulative cost of US$ 77,339 to US$ 225,270 for treating colorectal, lung, and female breast cancer over 23 months. Depending on the cancer treatment, direct costs can rise to over US$ 1 million per patient. The high cost of these underlying treatments suggests that investing more in infection control and management will lead to a cost saving for the healthcare system as additional costs of fighting the infection will not be encured.

Microbial stewardship programmes have also been shown to generate cost savings of US$ 732 per patient.

Limited study data from the review means that indirect costs are less well understood. Indirect costs can, however, come from several areas:

- The inability to work. The World Bank has estimated that indirect costs could rise in line with the growing presence of AMR and so cost the global economy more than US$ 6.1 trillion (3.8% of GDP) due to lost economic output;
- AMR infections can delay treatments, making outcomes worse, including higher mortality rates;
- Hospitals become less efficient, as witnessed during the COVID-19 pandemic, and precious resources are depleted or diverted.

There is an unmet need for a more comprehensive cost-effectiveness analysis of the impact of AMR on vulnerable patients and society. This would be useful in guiding policymakers towards a complete picture of the AMR situation. It may well also support the case for incentives to increase the development of new antibiotics.

Conclusion

The spread of AMR is a growing and complex societal problem, which places healthcare systems under stress and burdens the patient population with treatment delays, invasive management, social isolation, poorer outcomes, and reductions in quality of life.

This narrative review has shown that to address these challenges, everyone needs to be involved. There should be greater education for clinicians and healthcare professionals, including nurses and pharmacists, to promote the use of appropriate antibiotics and effective stewardship, to make use of rapid diagnostic tools for faster analysis, and to implement more consistent and standardized screening.

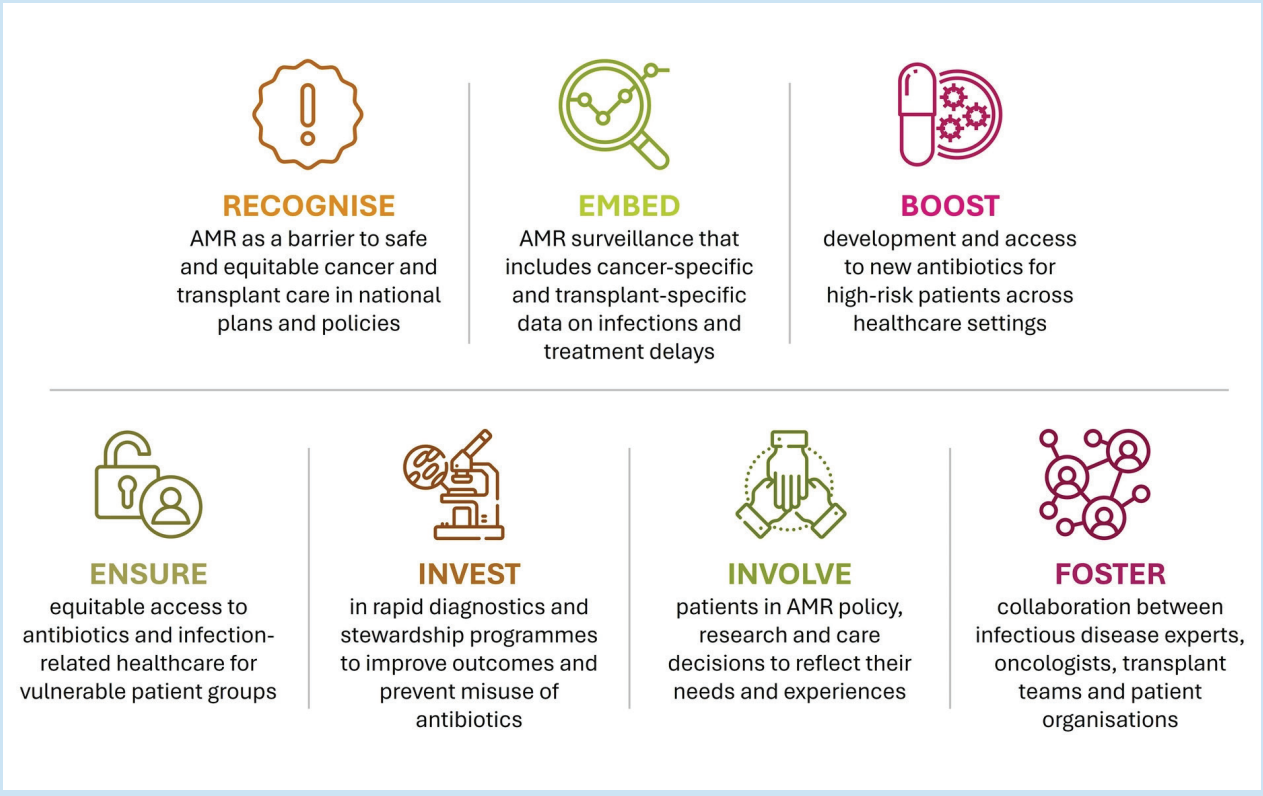
Patients should be involved, as well as being assessed frequently for AMR pathogens, and their treatment with antibiotics adjusted to the shortest possible duration. Patient access should not only be to antibiotics, but also to screening and laboratory facilities. Integrating the patient voice into AMR policy, stewardship design, and care planning is essential. Education is imperative for patients at high risk from AMR. Also vital is the need for patients to feel confident about reporting symptoms to their healthcare providers.

Finally, this narrative review emphasizes the pressing need to strengthen the antibiotic pipeline with appropriate financial incentives, increase research and development, and implement stewardship programmes. A coordinated approach is required to protect future health security and to preserve the benefits of effective antibiotic treatment for patients with cancer. ■

Call to Action: Safeguarding cancer care from AMR

The authors of the narrative review propose that the following actions should be prioritized:

- Recognize AMR as a barrier to safe and equitable cancer care, and incorporate it into national cancer plans and critical medicines policies.
- Embed AMR surveillance systems that collect cancer-specific data, including information on treatment delays, infection outcomes and mortality.
- Boost the development of new antibiotics and establish access mechanisms to ensure these treatments are available to high-risk patients in all healthcare settings.
- Ensure equitable access to antibiotics and infection-related healthcare services by implementing targeted access strategies tailored to high-risk patient groups.
- Invest in rapid diagnostic testing and antimicrobial stewardship programmes within oncology services to improve patient outcomes and reduce unnecessary antibiotic use.
- Involve patients in AMR policymaking, research and healthcare planning to ensure their experiences and needs inform decision-making and care delivery.
- Foster stronger collaborations between infectious disease specialists, oncologists and patient organizations to coordinate care pathways and drive sustained action on AMR.
- Develop and implement appropriate financial incentives to strengthen the antibiotic pipeline.



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1. Bassetti, M., Cardone, A., Cardoso, F. et al. Can We Lower the Burden of Antimicrobial Resistance (AMR) in Heavily Immunocompromised Patients? A Narrative Review and Call to Action. *Infect Dis Ther* 14, 2029–2052 (2025). https://doi.org/10.1007/s40121-025-01204-4