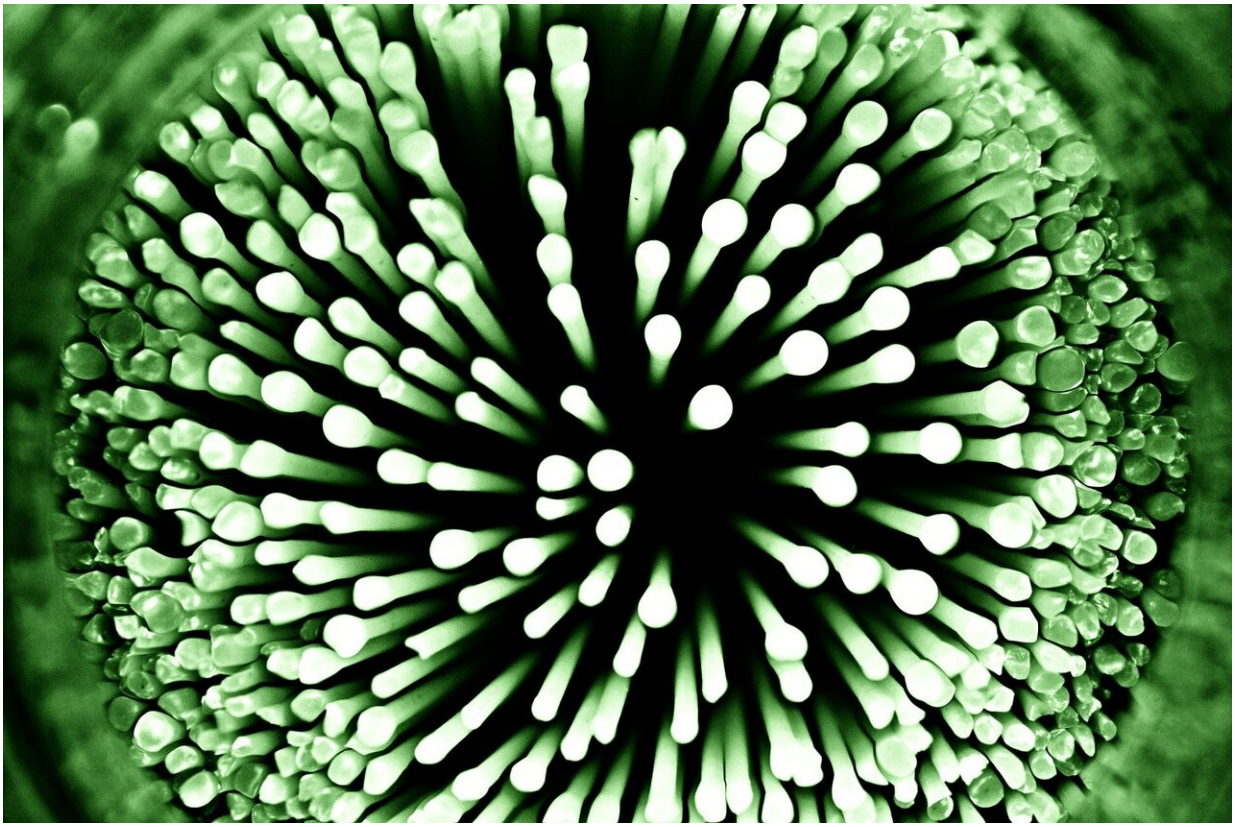
Drug resistance linked to antibiotic use and patient transfers in hospitals

October 27 2020



Credit: CC0 Public Domain

Understanding the role of antibiotic use patterns and patient transfers in the emergence of drug-resistant microbes is essential to crafting effective prevention strategies, suggests a study published today in *eLife*.

Antimicrobial resistance is a growing global health threat, but preventing it takes smart choices at the local level. The current findings, originally posted on bioRxiv*, provide insights on how antibiotic use patterns and patient transfers in hospitals drive the emergence of resistance, and suggest a new approach for tailoring prevention strategies to an individual hospital or ward.

"Hospitals continue to be important hotspots for antimicrobial resistance because of the confluence of frequent antibiotic use, fragile patients and the potential for highly resistant pathogens to spread through hospital wards when patients are transferred," explains lead author Julie Shapiro, Postdoctoral Fellow at the CIRI, Centre International de Recherche en Infectiologie, University of Lyon, France.

To help hospitals assess the best strategies for preventing the emergence of resistance, Shapiro and her colleagues employed a technique typically used in ecology to study the effect of antibiotic use and patient transfers on infections. They developed a computer model based on a year's worth of data around seven species of infection-causing bacteria, including drug-resistant strains, in 357 hospital wards in France.

"We found that the volume of antibiotic use at the hospital-ward level had a stronger influence on the incidence of more resistant pathogens, while patient transfers had the most influence on hospital-endemic microbes and those resistant to the last-line antibiotics carbapenems," Shapiro says.

They also found that the use of the penicillin antibiotic, piperacillin-tazobactam, was the strongest predictor of the emergence of bacteria that are resistant to the standard treatments for life-threatening blood infections. If this is confirmed in further studies, the authors suggest that the strategy of using piperacillin-tazobactam instead of carbapenems to prevent antimicrobial resistance may need to be reconsidered.

In fact, the study showed that the effects of antibiotic prescription and patient transfer patterns on the emergence of drug resistance varied among different microbes and types of infections, suggesting that a more individualized approach to preventing resistance is necessary.

"Our work highlights the need to tailor strategies against microbial resistance to specific pathogens," concludes senior author Jean-Philippe Rasigade, Associate Professor of Microbiology at the Hospices Civils de Lyon university hospital. "Applying the modeling techniques we used here to other healthcare settings could help inform local and regional antibiotic stewardship and infection control strategies."

More information: Julie Teresa Shapiro et al, Metapopulation ecology links antibiotic resistance, consumption, and patient transfers in a network of hospital wards, *eLife* (2020). DOI: 10.7554/eLife.54795

Provided by eLife