

Long-lasting austerity in the Greek health care system: Could it influence the efforts to limit the spread of carbapenem-resistance in Europe?

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The worldwide spread of carbapenem-resistant (CR) Gram-negative bacteria and mainly carbapenemase-producing Enterobacteriaceae (CPE) harboring KPC, VIM, NDM-1 and OXA-48-type genes is a public health issue of major importance that has led several European countries to adopt measures in order to prevent their dissemination. Indeed, healthcare associated infections due to CR Gram-negatives are causing a significant rise in morbidity and mortality, increased periods of hospitalization and consequent economic impact¹. In the European continent, the highest rates of carbapenem resistance are presented in the southern countries and numerous reports, many of them involving Greece, indicate that CR bacteria can be disseminated to northern countries via patient transfer or colonized travelers from endemic areas².

Due to the critical situation, a nationwide action plan under the name “Prokroustes” (<http://www2.keelpno.gr/blog/?p=1140&lang=en>) has been issued by the Hellenic Center for Disease Control and Prevention (HCDCP) since 2010. It has two major objectives: (i) the surveillance of infections attributed to multidrug-resistant strains of *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii* via compulsory notification to the HCDCP, for the estimation and follow-up of the incidence of these infections in hospitalized patients and (ii) the implementation of infection control measures, emphasizing on the isolation or cohorting of patients with infection or colonization and compliance with hand hygiene and contact precautions. Moreover, cost-effective phenotypic tests based on the use of carbapenemase-inhibitors have been developed by a Greek study group^{3,4} and adopted by almost all Greek hospitals for the early detection and differentiation of the currently known types of carbapenemases and the subsequent early implementation of infection control measures. Later, in 2014, the intensification and close monitoring of the infection control measures has been decided, emphasizing on active surveillance for identification of CPE-carriers and of the healthcare personnel compliance with contact precautions and hand hygiene. Recent reports showed that where strict measures can be applied, the dissemination of CR *K. pneumoniae* can be restricted⁵, and the containment of carbapenem resistance rates may be achieved⁶.

Obviously though, the implementation of infection control measures requires means and adequate personnel in both hospital wards and clinical laboratories. On the contrary, since 2010, the year in which a tremendous financial crisis hit Greece, until recently that the Greek economic tragedy has garnered global attention, both funding and personnel have been enormously reduced in the Greek healthcare system.

In return for loans from the International Monetary Fund (IMF) and European institutions, consecutive Greek governments agreed to adopt harsh austerity measures that initially restricted the public health expenditures to not more than 6% of the gross domestic product⁷. A series of reforms were applied to deal with accumulating structural problems of the past, including the merging of large insurance schemes, reduction of pharmaceutical expenses and enhancing of mechanisms involved in purchasing medical supplies⁸. Moreover, recruitment of new personnel has been blocked since 2010 with the exception of limited single-year medical contracts mainly in hospitals where certain departments endanger to shut down due to lack of specialized personnel. Even these contracts had no extension or renewal options until the end of 2014. Meanwhile, wages have been gradually reduced, and retirement age increased, leading to a wave of applications for early retirement by health workers⁹. Moreover, the inability to afford the cost of private health services by a large portion of the population has led to increasing trends in hospital admissions, visits to rural health centers and a significant increase in laboratory tests demand¹⁰.

Overall, the cost has been significantly reduced, and many malfunctions were corrected. Nevertheless, the personnel in many clinics and laboratories, as well as the available means of clinical laboratories, have been restricted so much that the implementation of infection control measures is often considered by healthcare workers as unattainable. Additionally, due to political crises in countries outside Europe, Greece, because of its geographic position, is daily receiving large numbers of immigrants from countries where novel carbapenem-resistance determinants are present, like Pakistan where NDM-1 producing- Enterobacteriaceae are spread and from territories where the situation is not at all documented,

like Syria, Bangladesh, and African countries.

The abatement of infectious disease control mechanisms in times of social austerity and budget cuts in public health care is the perfect recipe for epidemics¹¹ and now, why not, for the further dissemination of CR bacteria. It is true that prevention expenses are difficult to justify even in times of prosperity. On the other hand, carbapenem resistance remains a worrying global problem with an enormous burden in human lives and hospitalization expenses¹².

While the wealthiest countries have started taking initiatives to tackle antibiotic resistance as was decided at the G7 summit in June 2015 in Germany, the situation in known endemic areas like Greece and India is not likely to improve significantly in the near future whereas not enough information is available for a large part of the globe. Thus, the current approach to the problem may soon prove shortsighted as bacteria obviously are not limited by borders. Time will show how this situation will evolve in Europe where more austerity has been lately decided for Greece, probably the continent's most endemic corner regarding carbapenem resistance.

Conflicts of interest

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