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Short Report

Swimming pool policies for carriers of highly-resistant micro-organisms receiving rehabilitation care in the Netherlands

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Sir,

Preventing the spread of highly-resistant micro-organisms (HRMOs) is one of the ways to combat the growing problem of antimicrobial resistance [1]. This is particularly important in healthcare settings, where antimicrobial resistance is usually prevalent, and vulnerable patients are at risk of becoming colonized and infected by HRMOs. In the Netherlands, carriers of HRMOs are cared for in isolation [2]. Healthcare facilities (HCFs) have an obligation to prevent non-carriers from becoming colonized or infected, but at the same time, carriers should have all opportunities to receive the necessary and available care and treatments [3]. This can be a particular challenge in rehabilitation centres, as a range of activities outside patient rooms are essential for the patient's recovery. One of these activities is aquatic exercise, which has beneficial effects on pain, physical function and quality of life [4]. To the best of our knowledge, there are no publicly available guidelines in English, either national or international, on HRMOs and the use of swimming pools for rehabilitation purposes. As such, we conducted a survey to determine the current policies of Dutch HCFs regarding this topic. The survey included general questions about the facility and swimming pool, as well as specific questions about the policies regarding the use of the swimming pool by carriers of different HRMOs. These specific questions focused on extended-spectrum β -lactamase (ESBL)-producing Enterobacterales, vancomycin-resistant *Enterococcus faecium*, carbapenemase-producing Enterobacterales, meticillin-resistant *Staphylococcus aureus* and highly resistant non-

fermenting bacteria (including *Pseudomonas aeruginosa* and *Acinetobacter baumannii*). Through online searches, all rehabilitation centres and rehabilitation departments within hospitals in the Netherlands were screened for the presence of a swimming pool, after which a survey was sent to all centres that mentioned the presence of a swimming pool. In total, 23 HCFs were contacted, of which 18 responded (78%). Of these 18, three HCFs did not have a swimming pool for patients that rehabilitated in a clinical setting. Thus, 15 respondents were included. Of these 15, two were hospitals with a rehabilitation centre in-house (13.3%), and 13 were separate rehabilitation centres with a clinical ward (86.7%). The proportion of HCFs that allowed carriers of the different HRMOs to use the swimming pool is shown in Figure 1. When HCFs allowed HRMO carriers to use the swimming pool, this was always with additional precautions. Examples of these were: no diarrhoea, no wounds, additional hand disinfection by the patient, separate changing, no use of toilets or showers in the swimming pool area, and cleaning and disinfection of surfaces that were touched by the patient. The reported precautions by HRMO category are given in the online supplementary material, as well as answers to questions regarding size and use of the pool, and chlorine level.

There was large variety in policies regarding the use of swimming pools in a clinical setting by carriers of HRMOs. This is a reflection of the absence of guidelines, but also the limited knowledge about the transmission of micro-organisms in swimming pools. Infections after a visit to a swimming pool have been described for *P. aeruginosa*, which can cause folliculitis [5]. However, if proper chlorination and other basic hygiene measures are in place, the risk of developing such an infection after a visit to a swimming pool is thought to be low. A study on the presence of different

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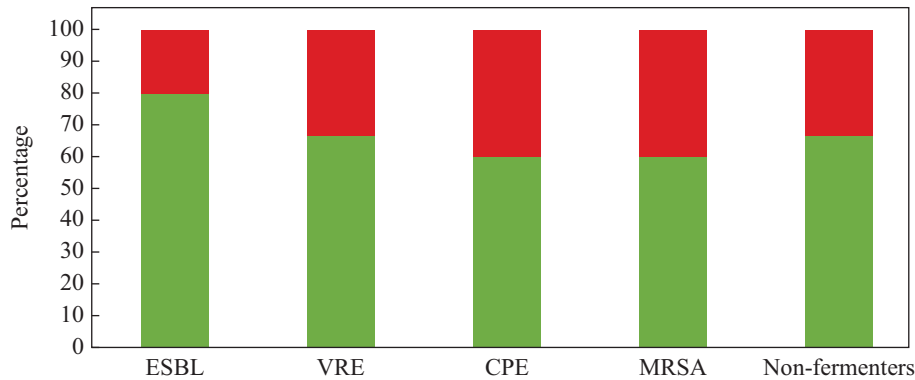


Figure 1. Proportion of healthcare facilities ($N=15$) that allowed carriers of different highly-resistant micro-organisms (HRMOs) to use a swimming pool in a clinical setting. Green bars, allowed with additional precautions; red bars, not allowed. ESBL, extended-spectrum β -lactamase-producing Enterobacterales; VRE, vancomycin-resistant *Enterococcus faecium*; CPE, carbapenemase-producing Enterobacterales; MRSA, methicillin-resistant *Staphylococcus aureus*.

HRMOs in and around hospital therapy pools revealed a high proportion of non-fermenting bacteria but very few Enterobacterales, indicating a low risk of survival of these bacteria [6]. On the other hand, recent work that focused on the transmission of antibiotic resistance genes (ARGs) showed that a wide range of ARGs are present in swimming pools [7]. It was also shown that ARGs can be picked up by people that use swimming pools [7]. Another possible argument against allowing HRMO carriers in swimming pools is the finding that chlorine exposure may promote the exchange of ARGs [8].

The results of our survey revealed that rehabilitation-specific guidelines are needed, with evidence-based recommendations regarding HRMO carriage and use of swimming pools. For carriers of ESBL-producing Enterobacterales, we propose a provisional recommendation that they should be given the opportunity to use swimming pools, if no diarrhoea and no wounds are present, and with additional precautions such as additional hand hygiene and separate changing. The chances of Enterobacterales surviving in a properly chlorinated pool are probably low. This is in line with the results of our survey, which showed that the majority of HCFs allow carriers of ESBL-producing Enterobacterales to use the swimming pool in a clinical setting, with additional precautions. However, further research should be performed, specifically addressing risks of transmission of the different HRMOs and their genes in these settings and including measures to reduce the risk of transmission, to obtain more evidence that can support recommendations.

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Author contributions

M.S., W.B., F.t.L.H., A.V and J.S. conceptualized the study. M.S. prepared and conducted the survey, interpreted the data and prepared the first manuscript. W.B. prepared and conducted the survey. A.V. and J.S. supervised the preparation of the survey, interpreted the data and edited the

manuscript. All authors commented on or edited drafts and approved the final version of the manuscript.

Conflict of interest statement

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jhin.2023.08.022>.

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