

Multiresistant pathogens in geriatric nursing – infection control in residential facilities for geriatric nursing in Germany

Multiresistente Erreger in der Altenpflege – Infektionsschutz in stationären Altenpflegeeinrichtungen in Deutschland

Abstract

Background: The increase of multidrug-resistant organisms (MDROs) causes problems in geriatric nursing homes. Older people are at increased a growing risk of infection due to multimorbidity and frequent stays in hospital. A high proportion of the elderly require residential care in geriatric nursing facilities, where hygiene requirements in nursing homes are similar to those in hospitals. For this reason we examined how well nursing homes are prepared for MDROs and how effectively protect their infection control residents and staff.

Methods: A cross-sectional study was performed on infection control in residential geriatric nursing facilities in Germany 2012. The questionnaire recorded important parameters of hygiene, resident and staff protection and actions in case of existing MDROs.

Results: The response was 54% in Hamburg and 27% in the rest of Germany. Nursing homes were generally well equipped for dealing with infection control: There were standards for MDROs and regular hygiene training for staff. The facilities provided adequate protective clothing, affected residents are usually isolated and hygienic laundry processing conducted. There are deficits in the communication of information on infected residents with hospitals and general practitioners. 54% of nursing homes performed risk assessments for staff infection precaution.

Conclusion: There is a growing interest in MDROs and infection control will be a challenge in for residential geriatric nursing facilities in the future. This issue has also drawn increasing attention. Improvements could be achieved by improving communication between different participants in the health service, together with specific measures for staff protection at work.

Keywords: infection control, nosocomial infections, nursing homes, elderly people, infection prevention

Zusammenfassung

Hintergrund: Die Zunahme multiresistenter Erreger (MRE) stellt für die Altenpflege ein großes Problem dar. Ältere Menschen haben eine höhere Infektionsgefährdung durch Multimorbidität und häufige Krankenhausaufenthalte. Ein großer Anteil älterer Menschen wird in stationären Altenpflegeeinrichtungen versorgt. Hygieneanforderungen sind ähnlichen von Krankenhäusern. Aus diesem Grund haben wir untersucht, wie gut die Einrichtungen auf MRE vorbereitet sind und was zum Schutz der Bewohner und Mitarbeiter getan wird.

Methodik: Eine Querschnittsuntersuchung zum Hygienemanagement in stationären Altenpflegeeinrichtungen wurde 2012 deutschlandweit durchgeführt. Der Fragebogen erfasste wesentliche Merkmale der Hy-

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giene, Fragen zum Bewohner- und Personalschutz sowie zum Umgang mit MRE.

Ergebnisse: Die Response in Hamburg betrug 54% und im Bundesgebiet 27%. Im Hygienemanagement sind die Einrichtungen allgemein gut aufgestellt. Standards und Vorgaben sind meist vorhanden, Hygieneschulungen werden regelmäßig durchgeführt. Zur Infektionsprävention wird immer Schutzkleidung zur Verfügung gestellt, häufig werden erkrankte Bewohner isoliert und Wäsche hygienisch aufbereitet. Probleme werden in der Kommunikation mit Krankenhäusern und Hausärzten genannt. 54% der Einrichtungen berichten über die Durchführung einer Gefährdungsbeurteilung.

Fazit: MRE ist ein bedeutsames Thema in der stationären Altenpflege. Der Infektionsschutz wird auch in Zukunft eine große Herausforderung darstellen. Verbesserungspotential lässt sich insbesondere in der Risikokommunikation und beim Arbeitsschutz erkennen.

Schlüsselwörter: Hygienemanagement, Infektionsschutz, nosokomiale Infektionen, Altenpflegeeinrichtungen, ältere Menschen, Prävention

Introduction

Because of the increases in life expectancy, many older people are cared for in facilities for geriatric nursing. In addition, demographic changes have led to an increase in the proportion of older people who require medical care. More and more patients are released early after inpatient hospital care, but then require outpatient or residential care in geriatric nursing facilities [1]. In 2011, 2.5 million people in Germany were in need of care. 30% of these were full-time residents in nursing homes. 85% of nursing home residents were at least 85 years old [2]. Older people are at increased risk of infection, for reasons including chronic diseases, multimorbidity, immune deficiencies, limited mobility and frequent admissions to hospital. As the function of the immune system decreases with age (immune senescence), an increase in nosocomial infections must be expected [3]. At the same time, it has been observed that antibiotic-resistant pathogens are increasing in hospitals [4]. This is presumably the reason that older people are increasingly being found to be colonised or infected with multiresistant pathogens (Multidrug-Resistant Organisms – MDROs) when they are transferred from hospital into a facility for geriatric nursing.

Nosocomial infections or healthcare associated infections (HAIs) are a special problem in geriatric nursing facilities. In the EU-wide point prevalence study HALT (Healthcare Associated Infections in Long-Term Care Facilities), infections of the respiratory and urinary tracts and of skin and soft tissues were most frequently reported [5]. In Germany, the study found that urinary tract infections were the most frequent HAIs [6]. Infections with resistant pathogens repeatedly present new medical challenges. They also prolong the duration of treatment and increase mortality and treatment costs [7], [8], [9].

The hygiene requirements in geriatric nursing facilities are similar to those in hospital [10]. As early as 2005, the Robert Koch-Institute published recommendations on the prevention of infections in long-term care facilities

[11]. However, several studies have shown that the quality of infection control in residential nursing facilities is inferior to that in hospitals [12], [13].

Hygiene is regarded as the primary preventive measure against the transfer of infections. Infection prevention is a critical issue for the staff of nursing homes. On the one hand, it is important to maintain the residents' living areas and privacy and to permit them an appropriate quality of life. On the other hand, staff must consider hygienic issues related to the prevention of infection, if they are to counteract the spread of MDROs within the facilities. Effective infection control should consider all these aspects and minimise the risk of infection in residential facilities for geriatric nursing – for both residents and staff. In this context, a study was performed in which infection control in residential geriatric nursing facilities was considered more closely. This was to examine how geriatric nursing facilities are prepared for MDROs and how effectively their infection control protects residents and staff.

Methods

In 2012, a cross-sectional study was performed on infection control in residential geriatric nursing facilities throughout Germany. The study included geriatric nursing facilities in which older people (over 65 years) are given residential care and qualified nurses are present 24 hours a day.

A comprehensive questionnaire was developed for the study, which recorded important parameters of the facility (number of staff, number of residents and levels of care), essential characteristics of infection control in the hygiene plan – including training and laundry processing, procedures for residents with MDROs and staff protection.

The survey was organised by two different institutions. The public health service in Hamburg (Gesundheitsamt Hamburg-Nord) wrote to 157 facilities for geriatric nursing, with the request to complete the questionnaire. 426 facilities for geriatric nursing in the rest of Germany were

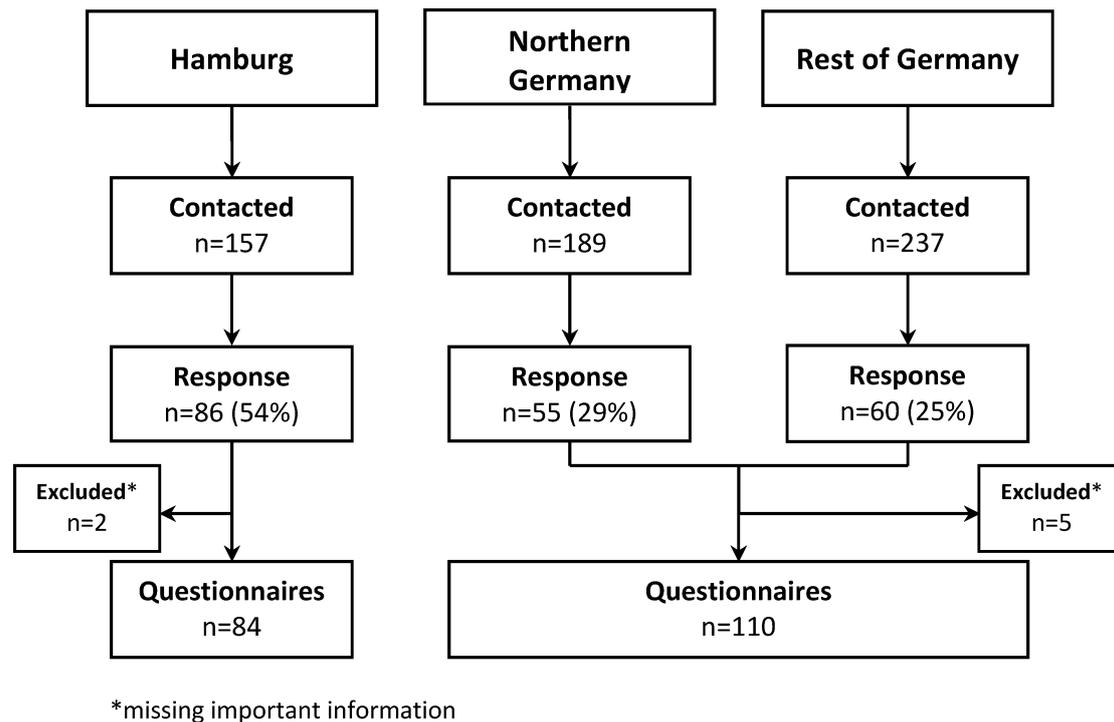


Figure 1: Study description for infection prevention and control in geriatric nursing homes, Germany 2012

requested by a university research institute to participate in the study. For this purpose, two random samples were taken. The first sample consisted of 189 North German facilities (Lower Saxony, Schleswig-Holstein, Mecklenburg-West Pomerania), in which a personal interview was performed with the management of the facility, the nursing manager, or another competent person in the facilities. In the second sample, letters were sent to 237 facilities for geriatric nursing throughout Germany, with the request to complete the questionnaire.

The statistical evaluation was descriptive, with a comparison between the Hamburg and the all-Germany samples. Differences were examined with Fisher's exact test. The level of significance was specified as $p < 0.05$.

Results

A total of 194 questionnaires on infection control could be evaluated from facilities for residential geriatric nursing. From Hamburg, questionnaires from 86 facilities for geriatric nursing were included (response 54%). In North Germany, an interview based on the questionnaire was performed in 55 facilities (response 29%). 60 questionnaires were evaluated from the all-Germany postal survey (response 25%). 7 questionnaires had to be excluded from the evaluation due to missing basic information (total number of residents) (see Figure 1).

In Hamburg, mostly larger geriatric nursing facilities took part in the survey; 45% of the facilities had more than 100 residents. In contrast, in the other federal states, most participants (81%) were smaller facilities, with up to 100 residents. The residents in the individual facilities

were distributed over all levels of nursing. In the geriatric nursing facilities surveyed in Hamburg, there were more residents in each level of nursing. There were parallel differences in the numbers of nursing and cleaning staff, as well as the numbers of general practitioners (GPs). The essential characteristics of the participating geriatric nursing facilities are summarised in Table 1.

The other results are similar for the two investigations; there were only isolated differences between the surveys in Hamburg and in the rest of Germany (see Table 2). In general, the geriatric nursing facilities were well equipped for dealing with infection control: In 98% of the facilities there were standards for dealing with MDROs, which are contained in the hygiene plans. There are regular hygiene training sessions – at least annually or related to special events. Also audits or inspections by trained hygiene staff are performed regularly. Medical visits are mostly accompanied by nursing staff, although interdisciplinary case discussions are performed in only 73% of facilities.

There are major differences in the processing of the residents' laundry. In approximately 40% of all facilities, the service is provided by external suppliers. 20% of facilities wash the laundry themselves, predominantly with an industrial washing machine. The laundry of infected residents is mostly processed with a disinfecting detergent.

When a resident is transferred (or returned) from hospital to residential geriatric nursing, 71% of the surveyed facilities in Hamburg are provided with information about the presence of MDROs. In the rest of Germany, only 41% were provided with this information, although half the participants reported that they were at least *usually* provided with this information. Problems in communicat-

Table 1: Characteristics of geriatric nursing homes in Hamburg and rest of Germany, 2012

	Hamburg (n=84)	Rest of Germany (n=110)
	n (%)	n (%)
Residents per nursing home		
≤50 residents	18 (21.4)	37 (33.6)
51–100 residents	28 (33.4)	52 (47.3)
≥101 residents	38 (45.2)	21 (19.1)
	<i>Median (P25–P75)*</i>	<i>Median (P25–P75)</i>
Residents with		
Level of care 0	5 (1–10)	2 (0–5)
Level of care I	31.5 (16.5–50)	24 (11–35)
Level of care II	32 (16.5–48)	25 (17–36)
Level of care III	13 (8–21)	11 (6–17)
Number of		
Nursing staff	45.5 (26–61)	33 (21–45)
Cleaning staff	6 (4–10)	5 (3–8)
General practitioners	11 (6–17.5)	8 (5–12)

*P25–P75: 25th percentile – 75th percentile

ing information about MDROs were most often thought to be located at the interfaces between the geriatric nursing facility and the hospital or between the geriatric nursing facility and the GPs.

If MDROs colonisation or infection develops, the affected resident is usually isolated. This was more frequent in Hamburg ($p < 0.05$). This was most often in a single room (>96%), which is feasible in most buildings. Barrier nursing (wearing additional protective clothing) was also frequent (Hamburg 78%, other 69%), in contrast to cohort isolation (Hamburg 16%, other 29%). In about 80% of all geriatric nursing facilities, the residents were given training on hand disinfection; this was either regular or related to events, e.g. after an outbreak. When MDROs had developed, the residents and particularly their families were almost always informed orally and, in most cases, also in writing.

In 94% of geriatric nursing facilities, work clothes were worn. However, the employer only provided this clothing in 77% (Hamburg) or 75% of the facilities (other federal states, either fully or partially). On the other hand, all surveyed facilities provided adequate protective clothing for the care of ill or infected residents. In 21% of the facilities, staff with chronic skin diseases gave care to residents with MDROs. Only half of all facilities (54%) performed a risk assessment for staff infection. (These questions were not asked in Hamburg).

Discussion

There is growing public interest in multiresistant pathogens. This issue has also drawn increasing attention in residential geriatric nursing. This study on infection control has shown that MDROs is a current problem during daily work in residential geriatric nursing facilities. The hygiene plan is regularly performed. Various efforts are also made to prevent infection, such as isolating infected residents,

hygienic laundry processing, hand disinfection training for the residents and information once a MDROs case has been reported. There are deficits in the communication of infection risk between the various participants. There is also scope for improving protection at work.

There have been several studies in Germany on hygiene and infection protection in geriatric nursing facilities. These studies have focused on different problems, depending on the client and the objectives. As a result, comparison is limited and restricted to individual points (if at all). For example, the studies performed by the Frankfurt am Main Health Office should be mentioned. The experience from these studies and the results on hygiene monitoring in geriatric nursing facilities have been published and are continuously updated [14], [15], [16]. In addition, Hansen et al. [17] have studied the hygienic problems of dealing with laundry and rubbish. Other studies have recorded the prevalence rates of nursing-associated infections in nursing facilities [6], [18] or deal with Methicillin-resistant *Staphylococcus aureus* (MRSA) [12] and only discuss comparable questions peripherally.

The 2011 amendment to the Law on Protection from Infection [19] is intended to improve the basic conditions for preventing and combating nosocomial infections, particularly MDROs, and provides legally binding instructions at the federal level. This serves to strengthen the recommendations published by the Commission for Hospital Hygiene and Infectious Disease Prevention (KRINKO). Moreover current scientific knowledge can be used to support decisions with legal liability [20]. In 2005, KRINKO published recommendations on infection prevention that were directly tailored for nursing homes [11], and which can still be used as a basis. In 1999 KRINKO provided recommendations for preventing the particular antibiotic-resistant pathogens MRSA in medical facilities [21]. Now these are replaced [22].

Table 2: Study results in infection control issues in residential facilities for geriatric nursing, 2012

	Hamburg n (%)	Rest of Germany n (%)	p-Value
Infection control			
Standards for MDROs implemented	78 (97.5)	108 (98.2)	1.0
Standard decolonisation regime	72 (87.8)	86 (80.4)	1.0
Training about MDROs	79 (95.2)	108 (98.2)	0.4
<i>annual*</i>	42 (52.5)	59 (55.7)	0.6
<i>biannual</i>	29 (36.3)	24 (22.2)	0.05
<i>in case of MDROs</i>	58 (72.5)	45 (44.1)	<0.001
Implementation of audits	76 (100.0)	77 (75.5)	<0.001
Medical visits attended by nursing staff	77 (95.1)	106 (98.1)	0.7
Interdisciplinary case discussions	56 (72.7)	79 (72.5)	1.0
Laundry preparation			
Doing laundry			
<i>outsourcing</i>	30 (36.1)	46 (41.8)	0.5
<i>in-house laundry</i>	16 (19.3)	22 (20.0)	1.0
<i>either</i>	37 (44.6)	42 (38.2)	0.4
In case of in-house laundry, use of			
<i>industrial laundry machine</i>	48 (88.9)	54 (84.4)	0.6
<i>disinfecting detergent</i>	53 (96.4)	60 (95.2)	1.0
Infection prevention/Behavior in case of MDROs			
MDROs Information from hospital			
<i>yes</i>	57 (71.3)	45 (41.3)	
<i>no</i>	23 (28.8)	11 (10.1)	n.a.
<i>usually</i>	n.a.	53 (48.6)	
Problems in communication with			
<i>Hospitals</i>	60 (71.4)	57 (75.0)	0.7
<i>General practitioners</i>	32 (38.1)	37 (50.7)	0.2
<i>Patient transfer staff</i>	16 (19.0)	12 (16.7)	0.8
Isolation precautions for MDROs	78 (96.3)	92 (86.0)	0.03
Application of *			
<i>Single room isolation</i>	78 (96.3)	88 (97.8)	0.7
<i>Barrier nursing</i>	63 (77.8)	64 (68.8)	<0.001
<i>Cohort isolation</i>	13 (16.0)	21 (28.8)	0.4
Appropriate facilities	72 (85.7)	85 (81.6)	0.7
Hand hygiene training for residents	65 (81.3)	84 (76.4)	0.5
Information about MDROs to			
<i>Residents</i>	83 (100.0)	85 (77.3)	<0.001
<i>Relatives</i>	83 (100.0)	110 (100.0)	1.0
Information given			
<i>orally</i>	78 (98.7)	105 (96.3)	0.4
<i>written</i>	61 (89.7)	76 (74.5)	0.1
Precautions for health care workers			
Wearing working clothes	78 (94.0)	103 (93.6)	1.0
Working clothes provided			
<i>yes</i>	65 (79.3)	64 (62.2)	
<i>no</i>	17 (20.7)	26 (25.2)	n.a.
<i>partly</i>	n.a.	13 (12.6)	
Protective clothing provided	84 (100.0)	103 (100.0)	1.0
Staff with chronic skin diseases provide care to MDROs residents	n.a.#	22 (20.4)	n.a.
Risk assessment performed	n.a.#	50 (53.8)	n.a.

* multiple answers possible; # question not asked; n.a. – not applicable

Infection control

The geriatric nursing facilities provide their residents with the domestic centre of their lives. The feeling of privacy is strengthened when they wear their personal clothes. In this context, processing the laundry and eliminating possible pathogens is of essential importance. For laundry hygiene, KRINKO recommends a disinfectant procedure for bedclothes, as these are usually not restricted to the individual resident. In contrast, the residents' personal laundry can be washed within the domestic area. In the event of an outbreak or MRSA colonisation, a disinfectant washing procedure is recommended for the affected resident's laundry with body contact – underclothes, towels and flannels [11]. In our study, the laundry was predominantly processed by external companies – at least partially. Only 20% of the facilities exclusively washed the laundry themselves. Hansen et al. [17] found similar results: 50% of the surveyed facilities had the clothes cleaned by external laundries and only 25% processed the laundry themselves. Our study found that more than 80% of the facilities had an industrial washing machine available for washing within the facility. In contrast to domestic machines, industrial machines guarantee that the desired temperature is reached and that the disinfectant is precisely dosed [23].

Infection prevention/actions taken when MDROs is found

The study showed that there are frequently problems in transmitting information between the various participants in the health service – particularly with the hospitals and GPs. Problems that were often mentioned include information on residents' MDROs colonisation or infection on transfer or return from hospital. This was often provided too late, or not at all, which led to organisational difficulties in the geriatric nursing facilities. As early as 2005, the KRINKO recommendations on preventing infection in nursing homes stated that, when a patient is referred or transported, information should be provided that permits appropriate protective or hygienic measures [11]. The medical care of the residents is exclusively provided by GPs, so there could be problems with this interface too. The facilities felt that the GPs often failed to understand their difficulties when having to deal with MRSA colonisation or infections. In some cases, the sense and necessity of some hygiene or disinfection procedures and taking control swabs were called into doubt or were simply refused. One possible explanation for the problems with smears may be that payment for the medical service of MRSA smears was only introduced in April 2012 and even afterwards is only accepted under specific conditions (§ 87 Abs. 2a SGB V).

To prevent infection in geriatric nursing facilities, the KRINKO recommends consistent adherence to standard hygiene measures, which normally suffice to counteract further spread of the pathogens. If there are risk factors,

the measures may have to be adapted to the situation. Thus, isolation of the colonised or infected residents is not demanded in principle, but it is recommended that this should be considered in the individual case [11]. In our study, the great majority of facilities reported that they isolated their residents in the event of MDROs disease. This was almost always single room isolation, with 70–80% barrier nursing. The exact details remain unclear. As most facilities have enough rooms, single room isolation is easy to implement. It is not clear from our study results whether this also includes isolation from social contacts. In the context of infection prevention, it is important to find the balance between the residents' domestic environment and the necessary medical or hygienic measures to avoid infection transmission. Although isolation measures for MRSA have been found to be effective in hospitals, this is not always necessary for geriatric nursing facilities [24]. Isolation can lead to severe depression and anxiety [25], particularly in older people [26].

Staff protection

With MDROs, staff protection is also important. For employees in the health service, MRSA prevalence rates between 2% and 15% have been observed in non-outbreak situations [27]. One study found the MDROs prevalence rate of 6.3% in geriatric nurses; 3.1% of the staff were colonised with MRSA, 3.1% with extended-spectrum beta-lactamase (ESBL) and 1.6% with vancomycin-resistant *enterococcus* (VRE) [28]. Current statistics from the Institution for Statutory Accident Insurance and Prevention in the Health and Welfare Services (BGW) confirm that the risk to staff is relevant. Between 2007 and 2011, a total of 389 suspected cases of occupational disease from MRSA were reported to the BGW. Within the same period, the infection was recognised as an occupational disease in 42 cases [29]. In general, the risk of an occupational MRSA infection appears to be rather low. However, the consequences of an MRSA infection can be severe and can even lead to years of unfitness for work [30].

Hand hygiene is regarded as the basic hygienic measure for personal protection and to avoid pathogen transmission [11]. Hygienic hand disinfection is simple, cheap and effective, although compliance is not always adequate [31]. As an additional measure, the employer must provide staff with adequate protective clothing [32]. The issue of work clothes is a controversial matter in geriatric nursing. Our study showed that work clothes are not worn everywhere and, particularly, that they are not always provided by the employer. In Frankfurt am Main, 85% of the surveyed facilities provided their staff with work clothes [16]. Hansen et al. [17] made similar findings: in approx. 90% of the facilities, work clothes were worn and in 74% the employer provided the staff with work clothes – at least in part. However, the facility did not always process the work clothes. In an earlier study from the Frankfurt Health Office, wearing private clothes rather

than work clothes was felt to be a problem [14]. Other authors have pointed out the necessity of proper processing to achieve complete decontamination of pathogens [33], [34].

Limitations

The present study has some limitations. The low response rate and the difficulties in recruiting geriatric nursing facilities that are willing to participate have also been reported by other authors [17]. It can be assumed that only “good” facilities – those with functioning infection control – responded, so that the result is distorted by selection bias. There may also be an interviewer bias, as the facilities were more likely to respond and to give the desired answers when the questions were put by the Health Office (the special authorities) with their legal responsibilities, rather than by the university research facility.

The questionnaire was unable to consider all aspects that would also be important in considering infection control in geriatric nursing facilities. For example, there was no information on the proportion of residents with dementia in each facility, as it can be assumed that their compliance with protective measures would be limited [17]. Our survey is also unable to distinguish between urban and rural geriatric nursing facilities. The survey also failed to cover laundry processing in certified laundries or data on the processing of work clothes. Information on the proportion of geriatric nurses and hygiene staff with professional qualifications could provide additional information on the proper implementation of the KRINKO recommendations on infection control in geriatric nursing facilities.

Conclusion

In geriatric nursing, there is growing interest in MDROs and the related issue of infection prevention from appropriate control. The implementation of specific measures for infection protection will be an important challenge in the future. Improvements could be achieved by improving communication between the different participants in the health service, together with specific measures for staff protection.

Notes

Competing interests

The authors declare that they have no competing interests.

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