



Emilio Bouza^{1*}
José Augusto García Navarro^{2*}
Sergio Alonso³
Juan Carlos Duran Alonso⁴
Carina Escobar⁵
Benito J. Fontecha Gómez⁶
María Isabel Galvá Borrás⁷
Amós José García Rojas⁸
Francisco Javier Gómez Pavón⁹
Diego Gracia¹⁰
José Gutiérrez Rodríguez¹¹
Martha Kestler¹²
Fernando Martínez Cuervo¹³
Francisco Javier Martín Sánchez¹⁴
Carlos Melero¹⁵
Rosario Menéndez Villanueva¹⁶
Patricia Muñoz¹⁷
Esteban Palomo¹⁸
Juan Manuel Pérez-Castejón Garrote¹⁹
José Antonio Serra Rexach²⁰
Sebastián José Santaeugenia²¹
Francisco José Tarazona Santabalbina²²
María Teresa Vidán Astiz²³

Infection control in long term care institutions for the elderly: A reflection document on the situation in Spain

¹Servicio de Microbiología Clínica y Enfermedades Infecciosas, Hospital General Universitario Gregorio Marañón, Departamento de Medicina, Universidad Complutense de Madrid (UCM), Instituto de Investigación Sanitaria Gregorio Marañón, y CIBER de Enfermedades Respiratorias (CIBERES CB06/06/0058), Madrid.

²Director General del Consorci de Salut i Social de Catalunya. Sociedad Española de Geriátrica y Gerontología

³Adjunto al director de LA RAZÓN y director del suplemento A TU SALUD

⁴Hospital San Juan Grande. Jerez

⁵POP (Plataforma de organizaciones de pacientes)

⁶Consorci Sanitari Integral. Consorci de Salut i Social de Catalunya.

⁷Residencia de Personas Mayores Heliópolis. Junta de Andalucía. Sevilla.

⁸Sección de Epidemiología y Prevención. Consejería de Sanidad de Canarias. Asociación Española de Vacunología (AEV).

⁹Servicio de Geriátrica. Hospital Central de la Cruz Roja "San José y Santa Adela". Universidad "Alfonso X el Sabio". Madrid

¹⁰Fundación de Ciencias de la Salud

¹¹Área de Gestión Clínica de Geriátrica. Hospital Monte Naranco, Oviedo. Instituto de Investigación Sanitaria del Principado de Asturias (ISPA). Grupo de Trabajo Infecciones y Vacunas de la Sociedad Española de Geriátrica y Gerontología.

¹²Servicio de Microbiología Clínica y E. Infecciosas, Hospital General Universitario Gregorio Marañón, Madrid.

¹³Centro Polivalente de recursos para personas mayores El Cristo. Adscrito al Organismo Autónomo ERA (Establecimientos Residenciales para Ancianos del Principado de Asturias). Sociedad Española de Enfermería Geriátrica y Gerontológica.

¹⁴Hospital Clínico San Carlos. Grupo de investigación de urgencias y emergencias del IDISCC. Facultad de Medicina de la Universidad Complutense de Madrid.

¹⁵Consultor Senior Instituto de Investigación. Hospital de la Princesa, Madrid.

¹⁶Servicio de Neumología. Hospital Universitario La Fe, Valencia

¹⁷Departamento de Medicina, Universidad Complutense de Madrid (UCM), Servicio de Microbiología Clínica y Enfermedades Infecciosas, Hospital General Universitario Gregorio Marañón, Instituto de Investigación Sanitaria Gregorio Marañón, y CIBER de Enfermedades Respiratorias (CIBERES CB06/06/0058), Madrid.

¹⁸Fundación de Ciencias de la Salud. Madrid.

¹⁹Dirección Asistencial, Badalona Serveis Assistencials.

²⁰Servicio de Geriátrica. Hospital General Universitario Gregorio Marañón. Profesor Titular de Medicina. Facultad de Medicina. Universidad Complutense CIBER de Fragilidad y Envejecimiento Saludable (CIBER-FES). Instituto de Salud Carlos III. Madrid

²¹Programa de Atención Integrada Social y Sanitaria de Cataluña. Departament de Salut. Generalitat de Catalunya.

²²Servicio de Geriátrica. Hospital Universitario de La Ribera. Alcira, València. CIBER de Fragilidad y Envejecimiento Saludable (CIBER-FES). Instituto de Salud Carlos III Madrid

²³Servicio de Geriátrica, Hospital General Universitario Gregorio Marañón. Madrid. Jefe de Sección de Geriátrica. Hospital General Universitario Gregorio Marañón. Profesor Asociado. Departamento de Medicina, Universidad Complutense. CIBER de Fragilidad y Envejecimiento Saludable (CIBER-FES). Instituto de Salud Carlos III. Madrid.

Article history

Received: 8 January 2023; Accepted: 15 February 2023; Published: 29 March 2023

ABSTRACT

A progressively increasing percentage of the elderly live during the last years of their lives in nursing homes. Although these institutions are intended to mimic life at home as much as possible, they have characteristics that make them quite similar to a "nosocomium", i.e. an establishment for the treat-

ment of the sick. The very coexistence among the elderly, the fact of sharing caregivers and the very significant exposure to third parties, together with the frequent predisposing diseases to infection in this population, make infection frequent among residents and also easily transmissible. This leads us to ask what can be done to prevent infection in this environment and more specifically what is the state of the art of the matter in a Western European nation such as ours. The Board of Trustees of the Health Sciences Foundation has asked itself a series of questions on the subject of infection prevention in Nursing Homes, the structure of procedures, the legislation available, compliance with the measures indicated, the best indicators of the processes and therefore, the need to promote in Spain a document of recommendations to avoid infections in this pop-

Correspondence:

Emilio Bouza MD, PhD.
Instituto de Investigación Sanitaria Gregorio Marañón.
C/ Dr. Esquerdo, 46
28007 Madrid, España
E-mail: emilio.bouza@gmail.com

*Both authors contributed equally to this manuscript.

ulation whose morbidity and mortality need not be highlighted. To this end, a multidisciplinary group of experts in different aspects of this problem has been convened and asked the proposed questions. The questions were discussed by the group as a whole and led to a series of conclusions agreed upon by the participants. The results of the meeting are reported below.

Keywords: Infections in the elderly, infection prevention, nosocomial infection, urinary tract infection, respiratory infection, skin and soft tissue infection, pneumonia.

Control de la infección en residencias de ancianos: Documento de reflexión sobre la situación en España

RESUMEN

Un porcentaje progresivamente creciente de las personas mayores viven durante los últimos años de su vida en residencias de ancianos. Dichas instituciones, aunque pretenden remediar lo más posible la vida en el hogar, tienen características que las hace bastante parecidas a un nosocomio, es decir a un establecimiento destinado al tratamiento de enfermos. La propia convivencia entre los ancianos, el hecho de compartir cuidadores y la exposición muy importante a terceras personas, junto con las frecuentes enfermedades predisponentes a la infección de esta población, hacen que la infección sea frecuente entre los residentes y que además sea fácilmente transmisible. Esto nos lleva a preguntarnos qué puede hacerse para prevenir la infección en este medio y más concretamente cuál es el estado del arte de la cuestión en una nación de Europa Occidental como la nuestra. El patronato de la Fundación de Ciencias de la Salud se ha formulado una serie de preguntas sobre el tema de la prevención de la infección en las Residencias de Mayores, la estructura de la misma, la legislación vigente, el cumplimiento de las medidas indicadas, los indicadores de los procesos y por ende, la necesidad de fomentar en España un documento de recomendaciones para evitar infecciones en esta población cuya morbilidad y mortalidad no necesitan ser resaltadas. Para ello, se ha convocado a un grupo multidisciplinar de expertos en distintos aspectos de este problema a los que se les han formulado las preguntas propuestas. Las preguntas han sido discutidas por el grupo en su conjunto y han conducido a una serie de conclusiones consensuadas entre los participantes. Pasamos, a continuación a relatar los resultados de la reunión.

Palabras clave: Infecciones en el anciano, prevención de la infección, infección nosocomial, infección urinaria, infección respiratoria, infección de piel y partes blandas, neumonía

INTRODUCTION

Nursing homes logically try to reproduce living conditions for their inhabitants as close as possible to those at home. However, they are still places where people with frequent and important underlying conditions live in close proximity to each other and share caregivers in a common habitat. In this sense,

nursing homes are also a nosocomium, i.e. a place where the sick are cared for and treated and where the transmission of pathogenic microorganisms is possible and frequent.

We know a lot about infection prevention measures in other nosocomial facilities, such as hospitals, but we know less about infection prevention in smaller institutions with fewer resources for this purpose, such as Long-Term Care Facilities (LTCF).

The aim of this work has been to try to compile the available information on infection control and prevention in LTCF in a Western European country such as Spain, trying to explore what room there is for improvement.

For this reason, the Board of Trustees of the Health Sciences Foundation formulated a series of questions on the existing regulations for the prevention of infection in LTCF in our country, on their degree of compliance and on the existing indicators used to monitor this process. The questions were distributed among a multidisciplinary group of experts in this field from very different points of view, including the vision of patients' associations, the media, people responsible for the administration, geriatricians, infectologists, microbiologists and other specialists.

Each question was assigned to a speaker and the conclusions were then discussed by the whole group to reach a summary of the situation accepted by all. What follows are the questions and answers that were asked. All authors have read and re-examined the complete text and gave their approval to it.

IS THERE A REGIONAL OR NATIONAL PROGRAM IN SPAIN ON INFECTION PREVENTION IN LONG-TERM CARE FACILITIES (LTCF)?

There is no common regional or national program on the prevention of nosocomial infection in LTCF, despite the fact that infectious diseases are an important cause of morbidity and mortality in the elderly, both in hospital care and in primary care consultations and, of course, in nursing homes.

In LTCF there is a high prevalence of nosocomial infection and colonization by multi-resistant microorganisms (MDR), as well as a high incidence of very often inappropriate antibiotic prescription [1].

It should also be taken into account that there is a high rate of patient transfers to referral hospitals and that there are very few diagnostic resources in nursing homes, making the management of nosocomial infection a real health problem.

The most frequent nosocomial infection is respiratory, followed by urinary tract, skin and soft tissue, gastrointestinal tract and ocular. Outbreaks can also occur relatively frequently and some centers have relatively high rates of colonization by MDR microorganisms, including colonization by methicillin-resistant *Staphylococcus aureus* (MRSA) and the presence of bacteria carrying extended-spectrum β -lactamases (ESBL).

In order to establish an effective plan for the prevention of nosocomial infection in LTCF, it is also necessary to take into

account the atypical presentation of infections in the elderly, for which reason it would be necessary to clearly define the diagnostic standards for infection in this setting. Although there have been attempts to introduce standardized criteria for defining infection in these centers, they have not been validated in our country and are not universally used [2].

Furthermore, unlike acute care hospitals, where there are high quality epidemiological studies for the monitoring and control of nosocomial infection [3], at this level of care there are no quality data that would allow immediate establishment of adapted prevention plans.

It would be absolutely necessary to establish nosocomial infection prevention plans to protect the population living in LTCF. This population is very vulnerable and is affected by other risk factors such as immunosuppression associated with advanced age, comorbidity, the use of immunosuppressive treatments and other risk factors that are very prevalent in the institutionalized population (pressure ulcers, bladder catheters, dysphagia, incontinence, etc.). The training of professionals does not have the level achieved in our hospitals (there is a high number of geroculturists with basic training and a very small number of nurses and physicians), which makes it difficult to establish measures to contain the risk of infection both in patients/residents and between them and the professionals working in the institutions [4].

An infection prevention plan in LTCF should be mandatory in all these centers and be accompanied by an appropriate training program for the professionals working in them, the establishment of a registry of infections by MDR microorganisms, the collaboration of the microbiology services and the health authorities of the area, and effective communication between these resources and primary and hospital care.

As an initial and minimum step, it would be necessary to develop a surveillance program, with special care in applying standard precautions, with special emphasis on hand hygiene. It is also advisable to measure the infection acquired in the center, either through point prevalence or incidence studies. It is also necessary to propose active policies for the correct use of antibiotics in this population.

Conclusion

There are no common regional or national nosocomial infection prevention programs specifically devoted to Long Term Care Facilities for the elderly.

It is urgent to establish a prevention plan with minimum requirements, at least, that includes training of professionals, an infection surveillance and registry system, collaboration with reference hospital services and an adequate antibiotic use policy.

IN THE ABSENCE OF A SPECIFIC REGULATION, WHAT DOES THE LAW IN SPAIN REQUIRE?

It has already been mentioned that there is no specific legislation for LTCF that focuses on specific protection against

the acquisition and transmission of infections in residents and staff. Indirectly, some of the legislation in force in Spain that is intended to protect workers against biological hazards in the workplace could be applied, although this is not specifically the focus of our discussion.

Regarding biosafety, the Biosafety Law (Law 15/1994 of June 3, BOE, 1994) must be applied, which incorporates the Community Directives (EEC, 90/219 of April 23, 1990) into the Spanish legal system. This law was developed in a Royal Decree (RD 664/1997, May 12, 1997, BOE, 1997), on the protection of workers against risks related to exposure to biological agents at work. The EU has advanced in this protection by including a directive on the protection of workers against risks related to exposure to biological agents at work (EEC 2000/54 / EC of the European Parliament and the Council of 18 September 2000).

There is another legislative block that develops the regulations on notifiable diseases and epidemic outbreaks but of the autonomous community of Catalonia (Decree 203/2015, of September 15) which creates the Epidemiological Surveillance Network of Catalonia and regulates the notification systems of notifiable diseases and epidemic outbreaks.

Finally, there are some specific regulations such as the protection against legionellosis (RD 865/2003, of July 4, 2003), which establishes the hygienic-sanitary criteria for the prevention and control of this disease in Spain (Decree 352/2004, of July 27), which establishes the hygienic-sanitary conditions for the prevention and control of legionellosis. Undoubtedly, all the legislative aspects on risk analysis and control of critical points in the food chain (ARCPC) included in different state royal decrees (RD 3484/2000, RD 2207/1995, RD 202/2000) are also applicable to nursing homes.

Conclusion

There is no specific legislation for protection against infection in LTCF in Spain. There is general legislation on aspects such as hygiene and measures against contamination in the food chain and specific legislation on protection against diseases such as legionellosis issued by both the autonomous communities and central government authorities.

WHAT SHOULD BE THE BROAD OUTLINES OF A POTENTIAL PREVENTION PLAN FOR COMMUNICABLE INFECTIONS IN LTCF?

Three major thematic areas can be distinguished in this potential plan.

1.- General prevention measures aimed at reducing the generic risk of infections related to care or the environment where there should be sections such as the following [1]:

- Environmental and surface cleaning and disinfection
- Hand hygiene
- Proper use of gloves, gowns or aprons, masks and eye protection.

- Proper handling of personal protective equipment
- Safe handling of waste and sharps
- Cleaning system, storage and transport of bed linen and user's linen
- Proper handling of invasive devices (intravenous lines, bladder catheters, feeding tubes, etc.).

2.-Specific protocols aimed at the prevention of the most prevalent infections in residential centers.

In the context of the care of institutionalized frail elderly people, it is necessary to adequately train professionals in the detection and appropriate management of the most prevalent infections in this type of patients. Thus, every residential center should have specific protocols on, at least [5,6]:

- Immunization schedule for residents and professionals (flu, pneumococcus, hepatitis B, SARS-CoV-2, ...).
- Prevention and management of urinary tract infection associated or not with incontinence-related devices (bladder catheter, absorbents, collectors, ...).
- Prevention and management of respiratory infection (bronchoaspirative, infection in the context of COPD patients, ...).
- Prevention of wound infection, pressure ulcers, vascular ulcers, peripheral venous insufficiency, ...)
- Prevention of food-borne infections or outbreaks in residential centers.
- Prevention and management of colonization and infection by MDR microorganisms such as MRSA, BLEE-producing bacteria, *Clostridoides difficile*, ...)

3.- Protocols oriented to antimicrobial stewardship.

Improving antibiotic use in the care of the institutionalized elderly in order to protect residents and reduce the threat of antibiotic resistance is a global priority. The Centers for Disease Control (CDC) and others recommends that all nursing homes take steps to improve antibiotic prescribing practices and reduce inappropriate antibiotic use [7-10].

Studies have shown that 40-75% of antibiotics prescribed in nursing homes may be unnecessary or inappropriate. The harms caused by antibiotic overuse are significant for frail, older adults receiving nursing home care. These harms include risk of *C. difficile* infection (CDI), increased adverse events and drug-drug interactions, and MDR colonization and/or infection.

There are some experiences in Spain and outside Spain [11-13], around PROA interventions (antimicrobial use optimization programs) in nursing homes. For example, the Geriatrics Service of Granollers proposes 12 interventions and measures to improve the optimization of antimicrobial treatment in this population [14]:

1. Avoid prescribing without a face-to-face medical assessment. This is related to an increase in the use of broader spectrum antimicrobials.
2. Reconsider the treatment of respiratory infections

that may not require antibiotics, such as viral bronchitis, influenza or microaspirations.

3. Avoid treatment of colonizations (especially decubitus ulcers without infection and bacteriuria).
4. Avoid unnecessary antimicrobial prophylaxis, especially for Urinary Tract Infections.
5. Avoid unnecessary use of topical antibiotics.
6. Assess the need for microbiological studies and antibiotic treatment in some end-of-life care situations.
7. Reconsider periodically the duration of antibiotic treatments.
8. Adjust treatments based on available microbiological results.
9. Promote parenteral-oral sequential therapy.
10. Use diagnostic and treatment protocols adapted to local data.
11. Monitor antimicrobial consumption.
12. Continuing education.

Conclusion

There is a need for a general plan with guidelines for the prevention and management of infections in LTCF with at least three major sections: general prevention measures, specific protocols for the prevention of the most prevalent infections, and antibiotic management plans. The plan should include hand hygiene, urinary tract infection, respiratory infection, skin and soft tissue infection, appropriate use of antimicrobials, and *C. difficile*-related infection.

IS IT NECESSARY FOR EACH LTCF TO HAVE A PHYSICIAN OR NURSE RESPONSIBLE FOR INFECTION CONTROL?

We believe so. To ensure compliance with any protocol or procedure in a nursing home, it is essential that it is led by a professional, who has the support and recognition of the center's management, and who is a reference point for the care team for the transmission of information to the rest of the professionals of both the center itself and the Public Health Service [15].

The presence of a physician in charge of each LTCF is not mandatory in different Spanish autonomous communities [16], But in order to be accredited, there must be nursing staff. Therefore, the responsible person could be, if there is one, the physician of the residence, or one of the nurses of the center.

The person assigned to be responsible for the care team of the LTCF must have sufficient knowledge and experience in the control and management of infectious diseases (clinical manifestations, mechanisms of transmission and spread, and prevention measures); have leadership and communication skills, as well as teamwork skills. He/she will be the one who must transmit all the information to the rest of the professionals

of the institution, as well as to the residents and their families, ensuring that all the necessary measures for the prevention of infections are carried out. On the other hand, he/she will inform the Public Health System of relevant events and also the Primary Care physician responsible for the care of the residence, as well as the Hospital Geriatric Specialized Services [17-19].

Their work is essential for the early detection of any case of transmissible infectious disease, as has been demonstrated in the COVID-19 pandemic, as well as for the rapid implementation of the contingency and isolation plan to prevent transmission to the rest of the residents.

Social and sanitary coordination is essential for the correct functioning of all these protocols, and should be promoted by the competent political authority, with very favorable experiences in different Communities during the present pandemic [20-23].

The SARS-COV-2 pandemic has highlighted the need for the figure of a Coordinator or person in charge in the residences for the prevention and control of the infection, being required by International Institutions (WHO) the State and the different Autonomous Communities [18,20,21,24,25].

Previously, there were numerous experiences that focused on studies of the prevalence of infectious diseases in geriatric centers (EPINGER), prevention of the transmission of MDR microorganisms during the care of colonized/infected residents in residential centers of the Junta de Andalucía. As well as with antibiotic optimization programs to promote their rational use (PROA).

The experience currently available should be used to prevent new outbreaks of this or any other infectious disease that can be transmitted in LTCF [23,26-28].

Conclusion

To ensure compliance with an infection control plan in nursing homes, a person responsible for it should be appointed within the LTCF healthcare team. This person will have the support of the institution's management and will be the center's point of reference, in charge of transmitting all the guidelines to the rest of the colleagues and to the residents and family members, as well as acting as a contact person with those responsible for health care in the Public Health Service. It must be a physician, if there is one, or a nurse.

WHAT MINIMUM ENVIRONMENTAL CONDITIONS SHOULD A LICENSED NURSING HOME HAVE?

It is necessary to emphasize that the LTCF are conceived as homes, not as health centers. In the specific case of the Community of Madrid, there is an order [29], which develops Decree 91/1990, of October 26, regarding the Authorization Regime for Services and Centers for Social Action and Social Services, which contains the criteria to be met by the centers. The following paragraphs extract those

sections referring to environmental conditions that appear in the document.

A.- Material requirements

- The Centers must be located in healthy and integrated areas or close to urban centers.

- Residential area units will not be admitted in basements or crawl spaces.

- The areas must be sufficiently ventilated and illuminated, preferably with natural light.

- They shall have drinking water, with adequate pressure, from the public water supply. If it comes from water catchment or capacity, they shall have a reserve tank with capacity for at least one day.

- Hot water in sanitary appliances and kitchen with a temperature higher than 40°C.

- Heating that guarantees a temperature equal to or higher than 20°C.

- Evacuation of water to the municipal sewage system or to a sewage treatment plant. In any case, it is forbidden to pour into cesspools.

- Bedrooms: Usable area of 5.50 square meters per person in the case of disabled persons and 7.50 square meters per person in the case of wheelchair users.

- The maximum capacity per bedroom will be six people. The bedrooms must have natural light and ventilation.

- Toilets: When they are collective, they will be differentiated by sex. The minimum endowment will be a toilet, a sink, a shower and a bidet for every six people or fraction exceeding two people.

- Living quarters: With a minimum area of 1.80 m², per resident, (depending on the recording) with a minimum of 12 square meters.

- The resulting surface may be subdivided into smaller ones and, in any case, when it is larger than 60 m², it must be separated to allow for different environments: play area, reading area, TV, etc.

- The living rooms must be exterior.

- Dining room: It shall have a surface area of at least 1 m² per person, with a minimum of 10 m².

B.- Functional requirements

It shall be guaranteed that all users receive, by their own means or those of others, the necessary medical attention.

- There shall be a first-aid kit conveniently located and signposted, and a correct hygienic-sanitary organization shall be guaranteed.

- Personnel: They shall be adequate in number and specialization to provide the corresponding services. The full-time staff/user ratio will be 0.25 for valid users; and 0.35 for assisted users.

- Every user will have, in his or her bedroom, a suitable lockable closet with shelves and hangers; a bed equipped with

a bed base, mattress and the corresponding clothing; a bedside table; a light point with a lamp or wall lamp at the head of the bed; a power outlet; a mat.

- Each room will have shutters, blinds or curtains that can block the passage of outside light.

- Varied menus and dishes will be provided according to the needs of the users. The menus will be previously supervised by a physician, in order to ensure adequate dietary and caloric intake. In addition to the regular menu, other dietary menus will be prepared for those users who require them. Meals and cooked dishes, either with its own service or with an arranged service, will arrive at the appropriate temperature to their recipients. Likewise, there must be a cold chain to preserve and store food.

- Daily personal hygiene must be guaranteed for users who cannot look after themselves, and as often as circumstances require.

- The change of linen and underwear of the users shall be done whenever necessary, and in any case daily. Other garments shall be changed as often as necessary.

- The change of bed linen shall be made whenever required by circumstances, and in any case weekly, as well as each time there is a new admission. The same periodicity shall be required for towels, napkins, tablecloths and other linen.

- Special attention shall be paid to the maintenance, upkeep and repair, if necessary, of furniture, installations and premises, in order to prevent their deterioration, as well as to all machines, boilers, installations or instruments which, if they involve a high potential risk, shall be handled exclusively by authorized installers.

- Every Center, in addition to complying with the general legislation in force on hygiene and health, must guarantee, in a special way:

The general and permanent cleaning of the building and its dependencies, especially those of more intense use, as well as its disinfection.

The annual disinsectisation and rat extermination, or as many times as circumstances require.

The establishment of specific rules or guidelines for the personnel in matters of hygiene, of obligatory and verifiable compliance. In Centers serving risk sectors, infection and contagion prevention measures shall be adopted, as well as the necessary periodic sanitary controls.

Cleaning and disinfection of crockery and cutlery after use, as well as other instruments in common use.

In centers with a capacity of more than 50 users, there should be a suitable space for the temporary storage of waste in closed buckets.

This law is clear on the basic environmental requirements for residences for the elderly, although the "tolerance with "dormitories for up to 6 people, toilets for 6 people or very low staffing ratios" is surprising.

Conclusion

There is a specific regulation of the Consejería de Integración Social of the Community of Madrid that contains the environmental criteria to be met by the centers. In relation to the minimum conditions, the regulation is very clear about the location of the LTCF and the material and functional requirements, although it seems too tolerant in some other aspects.

WHAT ARE THE ESSENTIAL DATA IN ASSESSING THE RISK OF INFECTION OF A PERSON LIVING IN A LTCF?

It is a requirement to have an individual file for each user, which includes a complete assessment history, treatments, social and medical reports. At the time of admission to a nursing home, the resident arrives with an Individual Care Plan prepared by the Dependency Service, drawn up by whomever the regional regulations establish. These are usually social workers or multidisciplinary teams. In other countries (Germany) it is drawn up by the healthcare field. The user provides all the medical information available to him/her.

In the comprehensive geriatric assessment (CGA), for which different scales can be used, at least the following aspects should be included:

- Personal preferences and advance directives
- Quality of life
- Physical status: basic and instrumental activities of daily living, gait and balance, frailty
- Mental status: cognitive and affective
- Social status including primary caregiver overload
- Nutritional status
- Sense organs (sight, hearing)
- Complete and up-to-date pharmacological treatment
- Risk of falls and pressure ulcers
- Pain

On the specific point of the subject that concerns us, which is the assessment of the risk of infection on admission, we have not found standard recommendations, but we believe it is necessary to have at least the following data in the patient's file [5]:

Vaccination against influenza [30]

Vaccination against SARS-CoV-2 [31-33]

Vaccination against Varicella-Zoster Virus [34]

Evaluation of *S. aureus* nasal carrier status in specific circumstances [35-40]

Pneumococcal vaccination and types of vaccines received [41-44].

Verification of tetanus and pertussis vaccination status.

PPD and IGRA [45, 46]

History of past international travel

Conclusion

In addition to the Comprehensive Geriatric Assessment (CGA), an assessment of the risk of infection should be carried out on admission to nursing homes, the specific items of which are far from being agreed upon and far from constituting a standard. In our opinion, they should include, at least, the vaccination status against preventable viral diseases such as influenza, SARS-CoV-2 and Varicella-Zoster, the immunity status against pneumococcal infection, the existence or not of latent tuberculosis and the colonization status against multi-resistant bacteria such as MRSA.

WHAT VACCINES SHOULD BE OFFERED TO PERSONS LIVING IN A NURSING HOME?

In the elderly, vaccination takes on greater importance because their immune system is aged and their capacity to respond to infectious processes is diminished, thus increasing the risk of developing serious complications following infections. This statement is especially relevant in people living in LTCF for the elderly, where the presence of comorbidity, functional dependence and cognitive impairment puts them at greater risk of falling ill and, if they do fall ill, more clinical complications and a higher risk of death [47].

The Spanish Society of Geriatrics and Gerontology [48] recommends systematic vaccination of the elderly against influenza, pneumococcus and tetanus. Likewise, depending on personal history and individual risk factors, vaccination against pertussis and Varicella-Zoster virus infection may also be indicated. Regarding the influenza vaccine, for this type of population and with the aim of increasing its effectiveness, it is recommended to use vaccines with increased immunogenicity.

Likewise, in residential centers for the elderly, the objective should be to achieve a minimum annual vaccination coverage against the influenza virus of over 75%, both in institutionalized persons and in the health and direct care personnel of the centers [49-55].

It should be noted that vaccination of elderly persons against SARS-CoV-2 (COVID-19) is indicated from the beginning of the year 2021. A considerable number of vaccines against SARS-CoV-2 are under study and research. In our country, institutionalized elderly people have been vaccinated with RNA-messenger (RNAm) vaccines [56-58] and they are currently receiving a booster dose.

As established in the vaccination strategy against COVID-19 of the Ministry of Health, depending on the results of future clinical trials, the data registered in the Drug Pharmacovigilance System and the distribution and availability of vaccine doses, the most appropriate vaccines for each health condition, age group, risk factors and place of residence can be selected from among the different types of vaccines.

Conclusion

Elderly people living in residential centers should be properly vaccinated against influenza, pneumococcus, tetanus and SARS-CoV-2. Likewise, in certain cases it would also be advisable to administer vaccines against diphtheria and Varicella-Zoster virus. Likewise, health-care and direct care personnel in the centers should be vaccinated, at least, against influenza and SARS-CoV-2.

WHAT MEASURES HAVE BEEN SHOWN TO BE EFFECTIVE IN REDUCING URINARY TRACT INFECTION IN THE ELDERLY?

Urinary tract infection (UTI) is the most frequently reported infection in long-term care facilities. [59] and accounts for 30-40% of healthcare-associated infections. On the other hand, the presence of asymptomatic bacteriuria in institutionalized patients is high, with figures of 25-50% in women and 15-40% in men [4]. This bacteriuria is benign, and several studies have shown that the treatment of asymptomatic bacteriuria, whether or not accompanied by pyuria, is of no benefit and may even be harmful [60]. Therefore, screening and treatment of asymptomatic bacteriuria is not recommended. However, a frequent problem in nursing homes is that of patients with nonspecific clinical deterioration, without symptoms or localizing signs and presenting a positive urine culture. The diagnosis of symptomatic UTI requires the presence of dysuria or fever, chills or confusion plus some other genitourinary symptom (urinary frequency, flank pain, hematuria...) [61]. However, very often, those residents who present with altered mental status, falls, lack of appetite or more awkward mobility and have a positive urine culture are diagnosed with UTI, leading to overdiagnosis and inappropriate use of antibiotics, which is very common in these centers [62]. In recent years, many initiatives have been developed to improve the management of this problem and to optimize the use of antibiotics in residential centers. An important randomized study conducted in several nursing homes demonstrated how the implementation of treatment algorithms based on guidelines, i.e. treating only those UTIs (in non-catheterized patients), in which symptoms associated with the genitourinary system were observed, was safe and was associated with a clear reduction in antibiotic use [63]. Despite this, the application of these criteria in patients with advanced dementia remains a matter of debate and overuse of antibiotics is especially prevalent in this subgroup of patients. A descriptive study in patients with advanced dementia living in nursing homes showed that only 19% of probable UTIs treated with antibiotics met these criteria [64]. Another subsequent study [65,66] found that, although most suspected infections in severely demented and institutionalized patients were treated with antibiotics, this treatment was not associated with any improvement in survival.

The specific measures that have been shown to reduce urinary tract infection are well known: treating only symptomatic infections, minimizing the use of bladder catheters, catheter and perineal hygiene measures, avoiding urinary and

fecal retention, avoiding a sedentary lifestyle, improving hydration or performing antibiotic prophylaxis when changing catheters only in cases of traumatic catheterization. However, in our opinion, its implementation in the residential setting is variable and subject to improvement.

Many programs and interventions have been put in place to decrease the rate of urinary tract infection in residential facilities ranging from different models of staff education, antibiotic stewardship programs, inclusion of the role of infection preventionist or multimodal intervention programs.

Antibiotic stewardship programs have demonstrated clear benefits in hospitals and acute care settings. Some studies have also demonstrated their effectiveness in residential centers when the program includes education strategies, local guidelines and periodic review and feedback on antibiotic use [66,67]. In the case of urinary tract infection, these programs have been shown to decrease treatment rates of asymptomatic bacteriuria and improve compliance with antibiotic prophylaxis [68], although they have been insufficient to decrease the total amount of antibiotics used for suspected UTIs [69]. In 2016 the Centers for Medicare and Medicaid Services (CMS) regulations [70] included a requirement that nursing homes and long-term care facilities develop an infection prevention program that should include an antibiotic use optimization program and the inclusion of a trained agent specifically dedicated to infection prevention [71], and list the following as core actions of the program: involved leadership, pharmacy knowledge, education, action, collection and periodic reporting of infection data.

In a baseline analysis, prior to the implementation of this standard in the residencies, it was shown that the most frequent existing measures were: the existence of written guidelines on antibiotic use and the registry of antibiotics used. The more specific and time-consuming policies, such as the use of forms for each antibiotic use, the existence of approval mechanisms or the control of appropriateness of use, were used less frequently and improved when the figure of the trained preventivist was in place [70]. The lack of nursing knowledge of antibiotic policies was a major obstacle to their implementation. The involvement in the programs of the medical director of the LTCF, the nursing director and the specific preventivist is key to their implementation, for several reasons, including the high mobility of health personnel in these centers [72].

In a survey conducted in different US facilities on infection prevention and control programs in residences and the changes between 2014 and 2018 (after the CMS rule) revealed a clear increase in "antibiotic stewardship" programs. In the specific context of UTI the measures that had significantly increased were: the existence of reminders about decreasing catheter use, the use of external collectors, and the use of ultrasound probes to detect postvoid residual and avoid retentions. The policies that were associated with the greatest increase in these preventive measures were: 1) the existence of specific certified courses and training programs, local certified courses or courses through scientific societies, 2) the lower

number of beds in the residence, but not the lower occupancy rate, and 3) the public ownership of the residence, 4) the lower number of beds in the residence, but not the lower occupancy rate, and 5) the lower number of beds in the residence [10,73]. These observed changes could not, however, demonstrate an impact on overall antibiotic utilization or a decrease in MDR infections.

Conclusion

The most effective measures to reduce UTI in elderly nursing home residents consisted of: treating only symptomatic urinary tract infections, minimizing the use of catheters, adopting perineal hygiene measures, avoiding urinary and fecal retention, avoiding a sedentary lifestyle, improving hydration, and not performing antibiotic prophylaxis when changing catheters except in cases of traumatic catheterization.

Programs to optimize the use of antibiotics, the recording of infections, the incorporation of a "preventivist" or infection consultant, staff education, the existence of accessible protocols and the involvement of the medical director of the residency are key to its success.

WHAT MEASURES TO REDUCE RESPIRATORY INFECTION HAVE BEEN SHOWN TO BE EFFECTIVE IN LTCF?

Respiratory infections are a very frequent cause of morbidity and mortality in nursing homes whose etiological diagnosis has improved with the inclusion of new diagnostic technologies [74-76]. As for viral etiology, influenza, Respiratory Syncytial Virus (RSV) infection, Coronavirus and Metapneumovirus infections stand out [49,77-81]. The most important bacterial pneumonia are pneumococcal pneumonia, [42,82,83] and polymicrobial aspiration pneumonia [84]. Legionellosis and tuberculosis are less common [45,85]. Finally, fungal infection, particularly Invasive Pulmonary Aspergillosis may occasionally occur, especially in immunocompromised patients with COPD who combine the use of corticosteroids and broad-spectrum antibiotics [86,87].

Measures to prevent respiratory infections in nursing homes for the elderly must take into account intrinsic and extrinsic risk factors for infection.

In relation to the environment, the effective measures are included in the World Health Organization (WHO) document, which brings together the guidelines and recommendations to be followed, in addition to incorporating an immunization plan for healthcare personnel [88,89]. There are recommendations for the maintenance of ambient air quality in these institutions and programs for the control of legionellosis [90].

There is literature suggesting that indoor concentrations of particulate and gaseous pollutants in nursing homes often exceed comparable outdoor environments nearby. Unlike outdoors, indoor air quality (IAQ) in nursing homes is not regulated by legislation and is rarely monitored. Therefore, an action

plan has been proposed to assess air quality in nursing homes and evaluate it periodically. This proactive approach can pave the way for the establishment of mandatory standards for indoor air quality in nursing homes that will promote the health, well-being and quality of life of LTCF residents and reduce medical costs [91].

As regards the control of legionellosis in residences for the elderly, there is no uniform legislation in the different countries and, when it exists, it is frequently not complied with. We therefore believe that this regulation and the corresponding periodic environmental control would be advisable [92].

In the individual aspects, there is no doubt that the implementation of vaccination programs for both residents and caregivers is an essential factor for the reduction and control of respiratory infection by influenza viruses and SARS-COV-2 [30,33,49,55,93-96]. There are also prospects for the use of a vaccine against RSV in the elderly population [97].

Antivirals are not recommended as chemoprophylaxis, except as part of interventions to control institutional outbreaks of influenza [98-101]. Its efficacy, for the most widely used (Oseltamivir), in a systematic review of 9 randomized clinical trials involving 4,328 patients [102], estimates a 21% reduction in symptoms versus placebo in the infected population; fewer lower respiratory tract complications requiring antibiotics for more than 48 h and fewer hospital admissions for any cause. Observational studies find association between the use of Oseltamivir and mortality reduction [103] but no randomized trial has demonstrated this. All have been conducted in healthy individuals where the mortality rate due to influenza is very low.

The efficacy of pneumococcal vaccination is linked to its antigenic composition [polysaccharide (PPV) and polyvalent conjugate (PCV)] and to the impact and application of PCV7, PCV10 and PCV13 in individuals over 65 years of age [104,105]. PPV23 efficacy data [106] are conclusive for protection from invasive disease, against all-cause pneumonia in low-income countries, and in chronically ill adults. It was not associated with a substantial reduction in all-cause mortality, possibly because of heterogeneity or lack of power of the studies.

In the CAPiTA trial (Community-Acquired Pneumonia Immunization Trial in adults) [107] PCV13 was compared in immunocompetent adults over 65 years of age versus placebo in a randomized, double-blind trial involving 84,496 adults aged 65 years or older. The protective efficacy of this vaccine for different points was estimated between 45% and 75.0%.

Conclusion

There are both environmental (air quality) and individual (vaccines) protective measures capable of reducing the incidence of respiratory infection in nursing homes, both in the case of infections caused by viruses (Influenza, SARS-COV-2) and bacterial infection (e.g. Pneumococcus). In most cases, however, legislation and its implementation are necessary.

HOW IS SKIN AND SOFT TISSUE INFECTION PREVENTED IN ELDERLY INSTITUTIONALIZED RESIDENTS?

Skin and soft tissue infections (SSTIs) acquired in residential facilities are common, with an estimated prevalence of 5% [108], the third most frequent cause of infection after urinary and respiratory infections in this group of patients. Overall, 10% of the elderly who take antibiotics in nursing homes do so because of a skin or soft tissue infection [109] which are of diverse etiology including viral, bacterial, fungal and, occasionally, parasitic. Institutionalized persons present a greater number of risk factors for SSTI due to frequent malnutrition, immunosuppression, comorbidity and higher cognitive and functional dependence, with urinary and fecal incontinence [110].

The most frequent point of entry for skin and soft tissue infections are solutions of continuity due to small wounds, trauma and surgical wounds [111]. Finally, health care centers and nursing homes have a high prevalence of skin and soft tissue infections and colonization by MDRs, among which MRSA stands out, with a carrier rate in health care centers and nursing homes that ranges between 8% and 25% [112].

For all these reasons, the prevention and control of SSTIs is an important challenge. However, the literature is scarce in well-conducted clinical trials that evaluate the efficacy of the different methods for their prevention and the recommendations are generally based on experiences obtained in other groups or on recommendations based on indirect studies or on expert opinion [113,114].

In diabetic patients, it is a fact that poor glycemic control increases the incidence of SSTI [115,116].

Another aspect of SSTI prevention is frequent skin cleansing, taking special care of the skin folds (submammary and inguinal), which should be dried with soft towel touches, avoiding the application of alcoholic lotions such as colognes or drying substances such as talcum powder, and the use of cotton garments is useful. The main problem of the skin of the elderly is skin dryness or xerosis, which affects 80 percent of people over 75 years of age, and which is combated with an adequate intake of liquids and the application of moisturizing creams all over the body surface on a daily basis.

There is data suggesting that periodic chlorhexidine showers decrease the incidence of MRSA infections but this has been done mainly in younger groups such as the military [117,118] and there is no evidence of its efficacy in institutionalized elderly populations.

There is also no evidence of the need for routine nasal decolonization to prevent MRSA infections in patients admitted to nursing homes. It is advisable to evaluate carrier status upon admission to the institution, before outbreak situations, and in patients who return or go to hospitals or change institutions.

Therefore, it is not necessary to screen for nasal carriers of *S. aureus* in general, unless there is a history of having been

colonized or infected in close contact with a colonized/infected case or if the resident has a history of having recently been in other centers with an endemic situation or active outbreak [17,18,119].

Colonization of an elderly person by MRSA should not be a reason for exclusion for admission and participation in a health care center. Patients colonized or infected by MDR microorganisms should, whenever possible, be placed in a single room, not isolated and following universal measures. If this is not possible, they should share a room with another person with the same problem. If this is also not possible, they can share a room with another person who does not have ulcers, wounds, catheters, drains or probes. They should never share a room with an immunosuppressed user. In case of ulcers or colonized skin wounds, these must be well treated and covered with a dry dressing before sharing activities in common rooms of the residence. There should be no restrictions on visitors, since in general, they have a low risk of acquiring an infection due to the protection of their saprophytic flora and can establish contact, but with the appropriate hygienic measures (hand washing, use of gloves and disposable gown if necessary). Nor are worker controls necessary, except in the case of outbreaks if it is suspected that they may be the epidemiological cause.

Conclusion

Skin and soft tissue infections (SSTI) are frequent in the elderly population living in LTCF. Their reduction requires general hygiene measures and control of predisposing factors such as skin lacerations or uncontrolled blood glucose.

There is no evidence of the need for routine screening for *S. aureus* carrier status, nor of the efficacy of systematic nasal decontamination or intermittent use of chlorhexidine showers.

WHAT INDICATORS ARE NEEDED TO MONITOR THE PREVENTION OF INFECTION CAUSED BY VIRUSES IN NURSING HOMES? HOW OFTEN SHOULD THEY BE OBTAINED?

Viral pathogens cause a significant proportion of infections in the elderly, mainly respiratory and skin infections. For example, in a recent study, 31.6% of the elderly with respiratory infections had a viral etiology (41.8% among out-of-hospital infections and 25.7% among nosocomial infections) [120] and the most frequent was influenza (14% of all patients studied). RSV is also a significant pathogen in this population [121,122].

The number of patients in a nursing home who get the flu and the number of residents and workers who are vaccinated are, in our opinion, clear indicators of the quality of care provided to the elderly in this respect [123]. These would be the most important indicators, in our opinion. But, if possible, some more could be included, as we will see below.

As we have mentioned, some of the most frequent viral infections are preventable by vaccination, so it is convenient to have a record of whether the elderly person has been vaccinated, the date of the last vaccination, whether he/she has antibodies or whether he/she needs to be vaccinated. Therefore, when the patient is admitted to the nursing home, I believe it is convenient to know his serology status against the human immunodeficiency virus (HIV), and against hepatitis A, B and C viruses. We believe that it should also be recorded when the patient was vaccinated against hepatitis A and B and make sure that he has received the previous year's influenza vaccine [124], COVID-19 and, as soon as it is available in our environment, the Varicella Zoster Virus (VZV) vaccine for adults.

In addition to the above, and whenever possible, the percentage of workers, residents, and visiting family members who have received the influenza vaccine should be recorded each year. A recent study (SHELTER study) conducted in 57 nursing homes in 7 European countries has shown that both correct vaccination against influenza and pneumococcus reduce mortality among residents, regardless of their comorbidities and functional and cognitive status [124-126]. This evidence, together with the reduction in influenza mortality in vaccinated patients, makes it an essential quality objective.

On the other hand, it is clear that the degree of influenza vaccination among nursing home employees, which ranged from 15-97% in a North American study, is clearly considered a quality criterion, since non-compliance with this obligation puts residents at unacceptable risk of suffering serious consequences [127]. It is also highly advisable to insist to family members that they should not visit their elderly with symptoms of respiratory infection or having recently been in contact with a sick person.

It is also advisable to record the number of visits to the emergency room that the elderly require and their causes [128]. Admissions due to upper respiratory infection or pneumonia and associated mortality should be recorded [129].

Finally, it also seems advisable to make sure that absolutely all new workers have received specific training on how to prevent and recognize nosocomial infections, as multicenter studies have shown that these training activities substantially improve the safety of interns and the quality of care [130]. These proposals are summarized in Table 1.

Conclusion

Indicators of the process of prevention of viral infection in nursing homes should include data on previous infection by viruses such as HIV, HBV, HCV, SARS-COV-2, Influenza and RSV on admission to the institution.

During follow-up, parameters such as vaccination rates against the different viral pathogens among residents and staff, as well as episodes of infection by these viruses and the hospital admissions they required, should be available.

Table 1	Indicators related to viral infection in nursing homes.
Indicators on admission of the elderly to the nursing home	Serology against hepatitis A, B and C, VZV, SARS-CoV-2 Previous year's vaccination status against influenza, COVID-19 and VZV when available.
Annually in each patient	Annual flu vaccination registry When available, VZV vaccine registry
Annually throughout the residence	Influenza cases in the LTCF Cases of RSV in the residence Cases of Zoster in the residence Visits to the emergency department for upper respiratory tract infections Percentage of staff, interns and visiting family members who have received flu vaccine Percentage of newly hired staff who have received training in nosocomial infection prevention Consumption of alcohol-gel for hand hygiene in the nursing home

WHAT ARE THE PARAMETERS ON SARS-COV-2 INFECTION STATUS THAT SHOULD BE AVAILABLE IN NURSING HOMES?

It is not the purpose of this discussion to insist on the terrible impact that COVID has had on the elderly population and particularly among those living in nursing homes but to establish what should be the program of action for nursing home authorities to prevent diseases such as COVID-19 and its easy transmission among residents.

The challenges that the COVID-19 pandemic has posed to LTCF have been analyzed and summarized in several publications. Giri et al [131] reported a meta-analysis of publications on the subject. They retrieved 348 articles, of which 76 were included in the thematic review. Eight articles referred to asymptomatic transmission, 24 to resident-related factors (e.g., comorbidities, nutrition, cognition), 13 to facility characteristics (e.g., physical space, occupancy, facility ownership), 21 to staffing (e.g., staffing levels, staff-to-resident ratio, staff multi-employment), and 10 to external factors (e.g., availability of personal protective equipment, health and social care policies in place). The papers also examine responses to issues that arose including diagnostic testing, isolation and grouping of residents, staff protection and support, promotion of wellness, and technological innovations [131].

Proper planning and design of the built environment promotes infection control strategies in nursing home facilities. Findings can be used to guide the redesign, renovation, and modification of nursing home facilities for COVID-19 control of future public health emergencies. [132].

Among the measures that deserve special mention are:

1.- The massive use of diagnostic tests that has made it possible to identify a high proportion of asymptomatic or oligosymptomatic patients and to take the pertinent isolation measures [133].

Isolation measures

2.- The rapid classification of residents, based on their COVID history and diagnostic tests, allows these institutions to create separate areas and circuits for "positive" persons who have overcome the disease or who have evidence of disease activity [134].

3.- Adequate allocation of staff, particularly prior to vaccination, allowed, in these separate units, to assign to a particular caregiver staff, those unvaccinated and who had not passed the disease.

Prior to vaccination, in non-COVID patient areas, it was appropriate to place caregivers who had passed the disease and were considered reasonably immunized against it [135].

4.- A very severe restriction of visitation is considered to be an effective method for the prevention of COVID in these institutions [136] and written guidelines for visits should be available.

5.- Isolation periods for SARS-CoV2 infected patients classically established that residents should remain in isolation for a full 14 days after diagnosis of COVID-19 although it is possible that shorter times may be equally valid. It should be kept in mind that prolonged isolation predisposes residents to greater physical and mental deconditioning.

6.- Actions on personnel

It is very important to work with caregivers in nursing homes, given that during the COVID pandemic there have been high levels of dissatisfaction, stress and anxiety among them [137,138]. Psychological and professional support policies are needed to complement clear and consistent guidelines on the procedures for handling different situations.

The recommendations of the Japanese Geriatric Society are interesting in this regard [139].

Conclusion

The parameters that can best indicate the situation of COVID-19 and its prevention in nursing homes are, in

Table 2	Indicators of the pneumonia process in nursing homes for the elderly
Management of infection	Initial antibiotic in <8 hours in diagnosed pneumonia / Total pneumonias Pneumonias with hypoxemia treated with O ₂ /total pneumonias with hypoxemia Pneumonias referred to hospital /total pneumonias Change to oral antibiotic if clinical stability criteria are met/total pneumonias Pneumonia deaths/ Total pneumonias
Prevention	Influenza vaccination for residents Pneumococcal vaccination for residents Vaccination for workers

our opinion, the following:

1.- Evolution of the percentages of residents and staff vaccinated against COVID-19.

2.- Number of new cases detected each month in both residents and staff members, differentiating between those occurring in vaccinated and unvaccinated patients.

3.- Evolution and number of outbreaks of infection.

4.- Last date of revision and update of protocols for prevention and management of COVID-19.

IN NURSING HOMES, WHAT ARE THE BEST INDICATORS OF THE EVOLUTION OF BACTERIAL RESPIRATORY INFECTION?

Since viral infection and its indicators have already been discussed in other sections, we will focus on pneumonia as a quality parameter to be monitored in nursing homes.

In community-acquired pneumonia (CAP), which is the most severe expression, quality of care indicators identify and measure care that is associated either with a better prognosis of the process or with a better use of treatments. Most indicators have been described in hospitalized patients and in populations other than nursing homes. However, for the ACOVE (Assessing Care of Vulnerable Elders) expert group, pneumonia is one of the target processes for defining indicators and implementing quality of care [140,141]. In these indicators, they exclude the group of patients with advanced cognitive impairment or with a life prognosis of less than 6 months.

The indicators selected in pneumonia and/or influenza by this group are eight in total. They comprise infection management indicators and infection prevention indicators (Table 2). Although there have been reviews of pneumonia in the elderly [105], There are few studies that analyze the impact of quality indicators on pneumonia care in nursing homes. In people with advanced dementia, mortality is very high despite the use of antibiotics, and even if life is prolonged, it may be only in days, lengthening the dying process.

As a starting requirement, in nursing homes, it is essential

to have an advance directives document to know the patient's desire to escalate treatment, referral to hospital, intubation or others. These data should be recorded in the clinical history to be taken into account in decision making for the diagnostic and therapeutic management of pneumonia.

Among the infection management and evolution indicators, three related to antibiotic treatment and oxygen therapy stand out. In relation to the evolution of the respiratory infection, a universal indicator in the management of pneumonia is the use of antibiotics in the first 8 hours after the diagnosis of pneumonia. This is based on several studies that demonstrate a higher survival of patients when antibiotics are started in the first 8 hours from diagnosis. For this reason, in the various SEPAR regulations [142] and in a consensus on infections in the elderly [143] is a universal recommendation and an indicator included among those recommended for nursing homes.

Simultaneously, the measurement of O₂ saturation to determine the need for oxygen therapy and its subsequent prescription and delivery is included as an indicator of quality of care. If it is indicated and not prescribed, the reason for this should be indicated in the clinical history, since it may be due to the patient's decision.

The third indicator for assessing the evolution is the need for transfer to hospital due to worsening and the need for therapeutic escalation, expressed as a percentage of the total number of pneumonias or infections. There are some programs developed specifically in nursing homes in the USA that include as an indicator the reduction of hospitalization of patients to enhance treatment in the nursing home. This program called INTERACT (Intervention to reduce acute care transfer) has also been analyzed to determine its safety, given that it could cause complications or have adverse effects if this measure is promoted and reduces necessary hospitalizations. The study conducted has shown no negative consequences on patients [144].

The last indicator of evolution and management is the change from intravenous to oral medication when clinical stability occurs, as long as there is capacity for oral intake. Clinical stability is possibly the best indicator of good therapeutic response

Table 3 Clinical stability criteria in patients with pneumonia

Heart rate < 100 bpm
Respiratory rate < 24 rpm
Axillary temperature \leq 37.2 °C
Systolic blood pressure > 90 mmHg
O ₂ saturation > 90%
Adequate level of consciousness

and good evolution. Therefore, in daily practice, clinical stability criteria are used for decision making and include the duration of antibiotic treatment, among other things [142]. In the published guidelines on CAP, it is contemplated that if the patient has a temperature less than or equal to 37.2°C in the last 48-72 hours and does not have more than one instability criterion, the antibiotic regimen can be terminated. In general, in the use of antibiotics, more days than necessary are prescribed with the potential problems of adverse effects such as CDI and others. The different components included in these criteria are respiratory rate (RF), heart rate (HR), axillary temperature, systolic BP, O₂ saturation and level of consciousness. The cut-off points for establishing clinical stability are detailed in Table 3. Clinical stability is usually achieved within 3-4 days of treatment in patients hospitalized for pneumonia. It should be considered that in elderly patients or those with multiple pathologies, stability can be delayed until day 5-7 without this meaning that there is a poor evolution. In fact, a publication on people living in nursing homes shows that up to 57% achieve clinical stability within 5 days of correct treatment. It is also necessary to consider each person's previous situation. If there were data on the patient's O₂ saturation at baseline, the cut-off point established to consider stability should be the return to baseline saturation and not necessarily to normal saturation. In the same way, the level of consciousness must be assessed with reference to the previous situation.

Among the infection management and evolutionary indicators, those related to early initiation of antibiotic treatment and its de-escalation, oxygen therapy and its subsequent outcome in terms of the need for hospitalization or mortality stand out.

Conclusion

Nursing homes should have figures on the evolution of the incidence density of pneumonia in the population they serve. In addition, the proportion of cases requiring oxygen therapy and hospital referral are desirable parameters. The proportion of patients with pneumonia who receive antibiotic treatment within 8 hours of diagnosis, the time to clinical stabilization, the duration of antimicrobial treatment and the time to switch to oral treatment should also be known. Undoubtedly, mortality should be included among the process indicators.

WHAT METRICS SHOULD BE USED AS INDICATORS OF GASTROINTESTINAL INFECTION IN NURSING HOMES?

Gastrointestinal infection is one of the frequent causes of infection outbreaks in nursing homes. In addition to immunosenescence, seniors frequently use medications such as proton pump inhibitors whose undesirable short- and long-term effects are well known [145-147].

Among the most frequent causes of enteric infection outbreaks in LTCF are viral pathogens such as Norovirus, Rotavirus, Calicivirus and Astrovirus [148] and bacterial such as *Clostridium perfringens* [149] and *Clostridioides difficile* [150, 151]. In a review of publications on outbreaks of enteric infections in nursing homes, the publications of 75 outbreaks are used for a meta-analysis. Sixty-nine percent of the outbreaks were associated with viral agents and 31% with bacterial agents. Transmission was mainly foodborne (52%) for those of bacterial origin and person-to-person (71%) for viral outbreaks. Norovirus infection was associated with 58% of hospitalizations but the ones with the highest mortality, however, were enteric infections caused by *Salmonella* sp. The control measures for these outbreaks are mainly general and food hygiene measures but none of the 75 published outbreak reports evaluated the effectiveness of the recommendations suggested to control each outbreak [151].

C. difficile infections (CDI) are often the consequence of untimely antibiotic use, particularly in the elderly who are on fluoroquinolones and proton pump inhibitors [152-154]. The elderly are a recognized risk group for CDI and outbreaks of CDI in institutions for the elderly are well known [155-162].

The parameters that, in our opinion, would allow a follow-up of gastrointestinal tract infection (GTI) in this population are the following:

- 1.- Incidence density of diarrhea in the institution (sum of patient days with diarrhea versus total daily stays).
- 2.- Evolution of the number of outbreaks of enteric infection and their etiology.
- 3.- Documented episodes of *C. difficile* infection.
- 4.- Days of treatment with oral antibiotics and fluoroquinolones per 1,000 stays in the institution.

Conclusion

Gastrointestinal infections can cause outbreaks in nursing homes. We believe that it is necessary to have specific protocols for their prevention and management. The most elementary indicators of these processes seem to us to be the incidence density of diarrhea, outbreaks of enteric infection and their causes, episodes of *C. difficile* infection and consumption of orally administered antimicrobials.

HOW SHOULD THE PROBLEM OF URINARY TRACT INFECTION BE FOLLOWED UP WITH FIGURES?

Urinary Tract Infection (UTI) accounts for 49% of all in-

fections in nursing homes and its incidence is estimated to be around 1 episode per 1000 stays in studies in Austria [163] and Germany [164]. ITU criteria must be strict [165] avoiding over-interpretation of simple positive urine cultures without clearly attributable symptomatology.

The frequency of indwelling urinary catheters among elderly patients in LTCF varies between 3-12%, being higher in men than in women [60,108]. Urinary catheter-associated UTI is a common cause of sepsis, hospital admission and antimicrobial use that often leads to subsequent colonization with multidrug-resistant microorganisms (MDR) [166,167].

In patients with urinary catheters, the prevalence of bacteriuria is 100% and the incidence of symptomatic UTI is estimated at 3-7 episodes per 1,000 catheterization days [166, 168]. Symptomatic UTI, defined as the presence of fever not attributable to another cause, has been estimated at 6 to 11 episodes per 1,000 catheterization days in institutionalized elderly people [169].

In this regard, it is important to correctly diagnose symptomatic UTI and differentiate it from asymptomatic bacteriuria [170]. The Infectious Diseases Society of America (IDSA) guidelines define urinary tract infection as the growth in culture of $\geq 10^3$ CFU/mL of uropathogenic bacteria in the presence of symptoms or signs consistent with urinary tract infection with no other identifiable source in a patient with indwelling urethral, indwelling suprapubic, or intermittent urethral catheterization. Compatible symptoms include fever, suprapubic or costovertebral angle tenderness, and unexplained systemic symptoms such as altered mental status, hypotension, or evidence of a systemic inflammatory response syndrome. [171].

Regarding prevention, there are few randomized controlled studies measuring the efficacy of preventive measures for UTI secondary to bladder catheterization. Among the most important measures are to perform bladder catheterization only when necessary and to remove the catheter as soon as possible. Intermittent catheterization may reduce the risk of bacteriuria, and is associated with a lower risk of complications and bacteremia [108].

For the control of UTI in nursing homes [164] surveillance of symptomatic UTI episodes (1,000 catheter-days/1,000 resident-days) and monitoring of resistant organisms in urine of catheterized patients is recommended in order to detect an increase in incidence or an infectious outbreak.

The indices we suggest to monitor this process in nursing homes could be the following:

- 1.- Proportion of residents with bladder catheterization or other permanent urine diversion procedures.
- 2.- UTI episodes per 1000 days of stay.
- 3.- Proportion of episodes of UTI caused by MDR.

Conclusion:

The effectiveness of surveillance and monitoring of UTI in nursing homes should be tracked by indices such

as the number of patients with bladder catheterization or other urine diversion procedures, UTI incidence density, and the proportion of episodes caused by MDR microorganisms.

SHOULD THERE BE A REGISTRY TO TRACK PRESSURE ULCERS?

In a recent systematic review that included 17 valid studies, the frequency of pressure ulcers is estimated very variably in different nations. Prevalence rates ranged from 3.4 to 32.4% although the large differences in prevalence in different countries are not explained by methodological differences and data from many developed nations are missing [172].

In a study of more than 700 nursing homes in Japan, the prevalence of pressure ulcers was 9.6% and the monthly incidence was 1.9% [173] and in the United States in a sample of 2,936,146 residents in LTCF had stage 2, 3 or 4 pressure ulcers in 8.4% and deep tissue infections in 1.7% [174].

We are therefore talking about a frequent problem with multiple risk factors including peripheral vascular disease, immobility and low hemoglobin and albumin blood concentrations. It is essential to have multidisciplinary teams for prevention, specific protocols for assessment and care, and therapeutic and preventive means to address this problem [173,175]

The minimum data set needed to address pressure ulcer follow-up should include assessment of residents' risk of pressure ulcers on admission, quantification and classification of pressure ulcers, and a management manual with periodic reviews [176]. It is necessary to have the so-called "minimum data set" (MDS) to be taken into account for the assessment and scales such as the PUSH (Pressure Ulcer Scale for Healg), the PSST (Pressure Sore Status Tool), the DESING scale, the CODED scale or RESVECH 2.0 [177-182]

For all these reasons, we believe that the set of parameters aimed at monitoring the problem of pressure ulcers as a predisposing element to skin and soft tissue infection should include the evaluation of the risk of suffering from such ulcers both on admission and periodically, the prevalence of ulcers and their categorization, and the verification of the periodic review of a document for their prevention and management. In addition, episodes of skin and soft tissue infections should be recorded, as mentioned in a previous section.

Conclusion

It is necessary that follow-up records in nursing homes include the classification of residents according to the risk of pressure ulcers, the evolution of the prevalence of pressure ulcers and their classification by severity. It is also necessary to record the number of episodes of skin and soft tissue infections over time and evidence of the periodic review of written protocols for prevention and treatment of pressure ulcers.

HOW SHOULD THE PROBLEM OF COLONIZATION AND INFECTION BY MULTI-DRUG RESISTANT (MDR) BACTERIA IN A NURSING HOME BE MONITORED?

Infections and colonizations by multidrug-resistant microorganisms (MDR) are a worldwide known problem of growing importance that is no longer limited to hospitals and is also increasingly affecting other healthcare facilities such as nursing homes [73,183-187]. The subject has been reviewed in depth by Rodriguez-Villodres et al. recently [188] showing that the prevalence of colonization by different MDRs is highly variable from one continent to another.

O'Fallon et al. conducted a study with active search for MDRs in nursing home residents and found that 22.8%, 0.6% and 11.1% were colonized by MDR gram-negative bacteria, vancomycin-resistant enterococci and MRSA, respectively. MDR gram-negative bacteria were recovered in 3 (1.8%) of the 175 environmental samples cultured [189].

Elderly residents in these facilities present several risk factors for MDR colonization or infection, in particular, chronic diseases, multimorbidity, immunodeficiencies, limited mobility and frequent transfers between hospital and residence lead to an increased risk of healthcare-associated infections and, consequently, MDR carrier status [164,188,190]. A very important and modifiable risk factor is the high use of antimicrobials during the year in the institution.

In addition to the morbidity-mortality aspects, a European study has recently shown that nursing homes face costs per patient with MDR infection estimated at an average of 12,682 euros per case (ranging from 2,449 to 153,263 euros per episode). In this study, the mean duration per case of MDR infection in nursing homes was 163.3 days [191].

In general, the literature estimates that the success of decolonization measures in nursing homes is very low [192]. The reasons given are, on the one hand, poor health conditions of elderly residents combined with poor compliance and, on the other hand, lack of hygienic knowledge of nursing staff.

In 2019, the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) developed a guideline to provide recommendations on decolonization regimens targeting BGN-MDR carriers in all settings [193].

We were not able to find a firm recommendation on the parameters that should be systematically obtained to correctly monitor this problem, nor on the impact that obtaining them has on its control. Therefore, our current recommendation does not require a systematic search for MDR colonization in institutions for the care of the elderly. However, we believe it is advisable to record infections caused by MDR microorganisms and to monitor them, meaning the following: Extended Spectrum Beta-lactamase (ESBL) producing Enterobacteriaceae, Carbapenemase producing Enterobacteriaceae, MDR *Pseudomonas aeruginosa*, MDR *Acinetobacter baumannii* and MDR *Stenotrophomonas maltophilia*. Among the gram-positive microorganisms we should include MRSA, vancomycin-resistant *Enterococcus* (VRE) and *C. difficile* although in the latter case it is not genuinely an MDR.

Conclusion

We recommend the recording of episodes of infection caused by multidrug-resistant microorganisms (MDR) and not the systematic search for colonization by these microorganisms, which should only be carried out as part of actions derived from specific problems. This recommendation is due to the fact that the evidence is currently insufficient to provide recommendations for or against any intervention in patients colonized with MDR.

SHOULD THERE BE A REGISTRY ON THE USE OF ANTIMICROBIAL AGENTS IN NURSING HOMES?

Improving the use of antimicrobials in any healthcare setting (human and veterinary) is a national priority, and this applies to all settings, hospital and residential [194].

Between 40-70% of antibiotics (ATB) prescribed in a healthcare setting are unnecessary and sometimes inappropriate and, as a pharmaceutical group, they are the most prescribed in a residential facility.

The judicious use of antibiotics reduces the emergence of resistance, avoids adverse effects and lowers costs [195].

It is recommended that all facilities have a policy on antibiotic use (PROA program), for which the CDC has developed a program focused on 7 key elements [196]:

- Commitment of the center to carry out an antibiotic policy program.
- Responsible for the program: physician or pharmacist with specific training.
- Antibiotic expert pharmacist.
- Documented action plan.
- Traceability of treatments.
- Periodic reports of results to prescribers and nurses.
- Training program.

The approach to the use of ATB in institutionalized settings is not an exclusively local problem; it must be understood in territorial terms. The exchange of patients and, therefore, of the microbiota means that the resistance maps of the centers must be drawn up according to the resistance profiles of a specific territory.

For infection control in residential centers, there are a series of safe practices that should be "mandatory", such as the use of gloves, hand hygiene (with its 5 moments) and the occlusion of wounds or ulcers. In addition to these practices, there are several measures to implement infection control and prevent the spread of MDRs such as the use of closed system urine collectors, optimizing oral hygiene, and monitoring of high prevalence infections: especially urinary tract infections.

Situations in which ATB use should be avoided are viral respiratory infections, asymptomatic bacteriuria and indiscriminate use of topical ATBs.

At the present time, ATB prescribing and administration

software can allow systematic recording or analysis of prescribing profiles. But more important than having or not having such a registry is the development of a global program on infection control in the centers. This program, if coordinated on a territorial basis, is much better, since the resistance profiles are linked to a territory and to the reference hospitals of the Health Area.

In the implementation of these programs, it can be useful to take as a reference the recommendations of the 7 key points elaborated by the CDC (Centers of Disease Control) for hospitals and later adapted to the institutional environment [7,196,197].

Therefore, to the question of whether there should be a registry on the use of ATB in nursing homes, the answer is yes, but especially within the framework of a global program on the rational use of antibiotics and coordinated with the policies and resistance maps of the territory.

Conclusion

The consumption of antimicrobials in a nursing home should be a quality indicator. The denominator to be used can be the 1,000 days of stay and the numerator can be given in total Defined Daily Doses and of the large groups of antibiotics.

IS THERE A NEED FOR A "TELE-ADVISOR" WITH EXPERTISE IN INFECTION CONTROL IN THE LTCF? WHAT WOULD HIS/HER JOB BE?

As we have indicated, the optimal and more than desirable situation is to approach infection control in residential centers from a territorial perspective, which, in our country, is articulated around the territorial PROA programs. This "tele-counselor" should play a key role in leading and validating the treatment and infection control programs in the residential centers in his or her area of reference.

His task would be to serve as a link between the residential centers and the reference hospital of the territory, to elaborate and validate the resistance maps of the most frequent microorganisms in the most prevalent infections (mainly urinary and cutaneous).

- Protocolization of the prescription. Analysis of action plans.
- Control of the resistance profile of the center and preparation of the resistance map of the Health Area.
- Individualized prescription support in specific cases (MultiR, nosocomial outbreaks, restricted ATB policies).
- Participation in the territorial PROA.
- Validate and collaborate in the training program of the professionals of each center.
- Monitor number of UTIs and most common microorganisms.
- Monitor bronchoaspirations.
- Establish empirical treatment protocols.

- Empower professionals. Role of nursing experts in infection control.

- Avoid movement restrictions.
- Create infection control culture.
- Implementation of safe practices.

Conclusion

We consider the figure of the "tele-counselor" to be very necessary, who should be a professional with extensive training in geriatrics and infectious diseases, reporting to the territorial Health Services, who can act by stimulating and advising on valuable practices, monitoring local and area resistance patterns and leading-implementing PROA policies in his or her area of reference. Given the great variability among the different residential centers, this figure must ensure compliance with the recommended guidelines, the follow-up of MDR infections, the appearance and control of possible outbreaks of infections and the training programs for professionals.

IS FEVER A GOOD MARKER OF INFECTION IN THE ELDERLY, AND ARE DAYS WITH FEVER PER YEAR A PARAMETER TO BE MEASURED?

Fever, whether present or absent, is not a good marker of infection in the elderly if it is not accompanied by other values. Up to 30% of older adults with active bacterial or viral infections do not have fever [198,199]. Likewise, the presence of fever is not an exclusive marker of infection, as elevated body temperature may be related to other clinical entities such as: the presence of tumors, pharmacological interaction (such as neuroleptic malignant syndrome), metabolic causes (such as thyrotoxicosis) or fever that appears after excessive sun exposure, as in the case of heat stroke [198,199].

Given the unspecificity of fever as a symptom caused by multiple conditions, fever days per year is not a useful parameter in relation to the presence of infections [200]. On the other hand, the number of proven annual infections is important (those for which there is microbiological evidence as well as clinical compatibility). In this case, especially in urinary tract infections, it is possible to implement a non-pharmacological prophylaxis or, in case of lack of success of the previous one, also pharmacological prophylaxis.

Conclusion

Fever is not a good marker of infection in the older adult as it is neither sufficiently sensitive nor sufficiently specific for the presence of infection.

WHAT SHOULD A CHECKLIST INCLUDE TO PREVENT INFECTION IN ELDERLY PEOPLE LIVING IN NURSING HOMES?

Structured interventions, such as the introduction of in-

fection control packages or checklists, are very useful in increasing compliance with infection control measures and decreasing nosocomial infection rates [201,202].

A checklist is a tool to assist in the work; it generally consists of a list of tasks that when performed are verified with a check mark. It is an instrument with the following positive indicators: it improves quality standards and the use of good practices, allows critical information to be condensed, helps reduce errors of omission and facilitates reproducible evaluation. It has its limitations and should be avoided as it is time-consuming to avoid compromising work performance.

The "check-list" should have the order of workflow and routine established in resident care. For its implementation, it is necessary to carry out a series of programs in the organizational culture of the institution: an educational and training plan for users of the checklist, support for professionals to clarify doubts, piloting before implementation and periodic updating of its content. It should be supported by the person or persons responsible for the infection prevention plan of the residential center [203].

The "check list" can be focused on individual patients but it can also be done periodically with the resources of the whole institution. The one dedicated to assessing the situation of individual patients could include, among others, the following items:

Checking the proper functioning of the hand hygiene device closest to the patient's bed. [114,204,205].

The presence of endovascular lines and the question of the need to maintain them.

The presence of bladder catheters or other urinary drainage devices and the question of the need to maintain them.

The existence of tachypnea or O₂ saturation by pulse oximetry less than 94%.

The existence of pressure ulcers

The existence of skin and soft tissue infections.

Administration of antimicrobials within the last 24 h.

Recent deterioration of the patient's alertness or consciousness content.

Indication of any form of isolation

Communicating the benefits of implementing a check-list to the professionals who carry it out facilitates their incorporation into their daily tasks since it provides positive reinforcement for their involvement.

Conclusion

Understanding by "check-list" the systematic review of aspects of infection prevention or detection in residents of long-term care facilities, we recommend that a daily check of some items be performed on each individual. This should include checking the proper functioning and availability of hydroalcoholic gels for hand hygiene, the existence and need for maintenance of invasive procedures such as IV or urinary catheters, and the presence

of signs suggestive of infection in various organs as well as the need for maintenance of antimicrobial therapy.

WHO SHOULD SIT AT A CONSENSUS TABLE TO ELABORATE A PROGRAM SUCH AS THE ONE WE ARE DISCUSSING?

Infection prevention and control should be seen as a team effort in which everyone, representatives of institutions and organizations, the scientific and medical community, residential centers and their direct and indirect care personnel, as well as the patient himself, should take part.

The public administration is key not only in its regulatory role and as guarantor of the protection and safety of citizens and, in particular, of the most vulnerable groups, but also in the monitoring of regulatory compliance. Its role in the dissemination of guidelines, health recommendations and rigorous information focused on prevention and action in the event of infection is also relevant.

On the other hand, the role of healthcare professionals is fundamental. In addition to doctors, nurses, pharmacists and other professionals linked to geriatrics and gerontology, nurses and physiotherapists are direct care staff and in addition to performing activities such as administering medication, carrying out cures, rehabilitation exercises and changing catheters, they can provide an assessment of the patient's condition and the special care that the person needs. In addition to geriatricians, specialists in infectious diseases and clinical microbiology, internists, preventive medicine and other specialists are needed for specific issues. These specialists should be delegates of their corresponding Scientific Societies.

In addition, health and social workers are knowledgeable about the patient's situation, the person's environment and the support required to prevent and control infections.

Prevention strategies should be developed in routine geriatric care and in any type of health or residential center. The management of the centers should be represented to ensure that safety and protection protocols are applied by all staff, both direct and indirect care (kitchen staff, cleaning, maintenance, etc.). In this sense, it is necessary that information is disseminated to all levels of the organization and that all personnel working in the facilities, as well as other personnel who may have access to the center, are aware of and apply measures to guarantee the protection of the resident and the rest of the personnel. Likewise, it is necessary to provide these personnel with the necessary resources for the correct development of these protocols and actions.

Promoting the co-responsibility of the patient and his/her environment in this area is essential. It is necessary to know the doubts and barriers they face in order to work on a preventive program that really meets their needs and is effective. It is essential to encourage a health-promoting attitude in its different aspects and preventive interventions in gerontological clinical practice. In addition, it is necessary to undertake awareness and communication actions to explain to residents,

their relatives and caregivers the preventive measures and, also, the corrective measures in the event of infection, in order to encourage the greatest possible collaboration. In this sense, patients' associations become a valuable ally, acting as a channel to get the information to these groups and also to convey the needs to public decision-makers and other parties involved.

Finally, the media become an important source of information and play an educational role that cannot be overlooked. The role of the media helps to shape opinion and raises awareness, as a preliminary step to a change in behavior focused, in this case, on the protection of the individual.

We would like to end with a reflection on the commitment of society in general to our elderly and also to their families and caregivers, both formal and informal. We are experiencing an aging population that is leading to a significant and progressive increase in morbidity associated with chronic and degenerative processes, which are often disabling. Therefore, there is an increasing number of elderly people with health conditions that require support. For this support to be effective, to meet existing needs and to protect the individual, it is necessary for all the agents involved to work in a coordinated and cohesive manner, with flexibility and leadership.

Conclusion

The elaboration of a document-proposal for the prevention of infection in nursing homes should include health professionals, both physicians, pharmacists and nurses of different specialties, the most involved scientific societies, administrators and managers of nursing homes, patients' associations and representatives of the administration and the media.

WHO IS RESPONSIBLE FOR SUCH AN INITIATIVE? HEALTH AUTHORITIES? SCIENTIFIC SOCIETIES? PATIENT ORGANIZATIONS/ SENIORS' ASSOCIATIONS?

The responsibility for taking the initiative to establish infection control programs in nursing homes lies with the health authorities.

It is the health authorities who should establish what type of registers should be set up, clearly indicating their content (variables to be collected), the source of the data, the periodicity, the subsequent analysis and the reports to be issued. It should also be established who is responsible for data collection and for establishing infection control programs in these centers.

The scientific content of the program should always be established in collaboration with the country's scientific societies and reference experts (research centers and universities) to ensure that the latest available knowledge is available at all times.

Patients and citizens should be informed of the record of infection in these centers, as well as the programs put in place to control it. The reporting of nosocomial infection outbreaks

and the measures taken to prevent their recurrence should also be made public. Transparent information on the risks of infections in these centers should also be the responsibility of the health authorities.

As these centers are mostly privately managed and with very tight financing (in Spain the budget dedicated to long-term care is 0.7% of GDP, compared to an average of 2.5% of GDP in the EU-8), any infection control program should be accompanied by the corresponding economic report to prevent centers from failing to implement it adequately for economic reasons.

In addition to the health authorities in the establishment of plans and their monitoring and follow-up, the involvement of hospital reference services and pharmacy services is very important for the control of an adequate use of antibiotics in this population.

It is also necessary to be very strict in the monitoring of the vaccination schedule in this population, leaving its compliance to the primary health care services.

Patient organizations should be informed of the establishment and monitoring of the control plan, of the incidents in its development, of the existence of nosocomial infection outbreaks and of the measures to be adopted during visits to these centers to minimize the risk. The design of the plan should be technical.

Conclusion

The initiative for the establishment of nosocomial infection control plans in nursing homes is a responsibility of the health authorities. The results of the control parameters should be in the public domain.

WHAT CAN BE APPLIED FROM ALL THIS TO THE ELDERLY LIVING AT HOME?

The prevention of infection in the elderly living in their own homes, although not primarily the subject that concerns us, is also an aspect of the utmost interest. It has many points in common with what has been discussed for nursing homes, but also differential aspects. In addition, the place of residence of the elderly is variable and there are often changes of residence from their own home to long-stay residences and vice versa.

In view of the need to decide how to apply these measures in older adults living in the community, we will refer to those pertinent to the prevention of infection and the reduction of the risk of communicable diseases. These measures must be coordinated from the Primary Care setting and are an inseparable part of the connected fabric of our health system.

Aspects such as the vaccination program and schedule for the elderly do not merit emphasis in this section and readers are referred to other sources [47,104].

The most common home infection is respiratory infection, followed by urinary tract infection and skin and soft tissue in-

fection, and in its fundamental aspects the prevention of infections of these organs follows the same principles as in the case of patients living in nursing homes [206,207].

A particular aspect of infection prevention in the elderly living at home is the possible acquisition of infections from younger members of the family community. Good examples are Influenza, RSV and more recently and dramatically SARS-CoV-2.

Another very important aspect is the programs to improve the use of antimicrobials (PROA programs) that exist at the community level in Primary Care in some areas, led by Family Physicians [11,28,208-212]. There is evidence that the inappropriate use of antibiotics has direct consequences on the increase of infections by MDR microorganisms, taking into account that between 30-50% of antibiotic prescriptions are inappropriate.

It is therefore interesting to evolve to a system that eliminates all barriers between the patient's home and the health system and leads to the use of new technologies to promote multidirectional communication for the benefit of all types of patients who at some point in their evolution or permanently will remain in the community.

Conclusion

Infection prevention programs for the elderly living at home are also necessary. They should be coordinated by Primary Care and include vaccination programs, prevention of the most frequent infectious syndromes in the elderly, the acquisition of infection from younger people in the family environment and finally PROA programs for the rationalization of the use of antibiotics at home.

DO WE KNOW WHAT PROPORTION OF ELDERLY PEOPLE DIE IN NURSING HOMES AS A RESULT OF INFECTION?

It is difficult to know the causes of death of patients living in nursing homes, because there is no reliable registry of them. This is a problem that exists in different countries and is described in the literature, so the data are not accurate most of the time. In the cases in which the cause of death has been evaluated, it is generally taken from death certificates, with the limitations that this implies [213].

The main study on this subject, carried out years ago in the USA, evaluated the cause of death in people over 60 years of age who lived in nursing homes and during a 15-year follow-up. During this period, 75% died, 2,372 of the 3,164 people included in the study, with a mean age of 81+/-8 years. The main cause of death was cardiovascular in 63% of cases, followed by infections in 21%, most of them (15% of the total) sepsis of urinary origin, followed by respiratory infections [213].

More recently, Braggion and co-workers in the Veneto (Italy) [214] evaluated mortality rates, their determinants, and causes of death in 19,392 subjects aged ≥ 65 years admitted to

nursing homes during 2015-2017. Mortality peaked in the first 4 months after admission, and thereafter, the monthly mortality rate fluctuated around 3% in men and 2% in women. Overall mortality was 34% at one year. The most represented causes of mortality were cardio-cerebrovascular diseases, neurodegenerative diseases, respiratory diseases and infections. In the table of causes provided by this work, pneumonia appears as the cause of 4% of deaths, sepsis with 3.2% and a miscellaneous of other infections with 4.2%. In Spain, according to the "Envejecimiento en red" (Ageing network) report, the mortality rate due to infections in the total population over 65 years of age is about 80 /100,000 inhabitants and year and is one of the few that did not vary between 2006 and 2017 [215].

In a study carried out in public nursing homes in Madrid in 2013, and published as a doctoral thesis, all the deaths of patients living in LTCF were studied, which numbered 713 out of a total of 5,956 places, representing 12%. The average length of stay of the deceased was 37 months. A total of 57.7% died in the nursing home and 42.2% in the hospital at a mean age of 88.9 years. The principal cause of death was not collected in 51% of cases and was due to pneumonia and other infectious processes in 8% of cases, followed by heart failure, tumors and dementia. The accompanying chronic diseases were most frequently hypertension, dementia and osteoarticular disease [216].

A study predicting mortality within one year after admission to a nursing home does not include infection among the main risk factors [217].

Conclusion:

The proportion of elderly dying in nursing homes as a direct consequence of infection is poorly known since the few studies available have been done on the basis of death certificates. The data obtained allow us to estimate that infection is a direct cause of death in at least 8 to 12% of the elderly. Pneumonia and sepsis of urinary origin are the leading causes.

ARE THERE DATA ON THE IMPACT OF IMPLEMENTING A PROGRAM SUCH AS THE ONE WE DISCUSS ON THE QUALITY OF LIFE AND SURVIVAL OF THE ELDERLY?

In the literature it is possible to find multiple initiatives dedicated to improving specific problems related to nosocomial infection in nursing homes. Examples are studies to optimize the management and prevention of urinary tract infections [218,219], hand hygiene [220] or the use of intravenous fluids and antimicrobial agents [221]. There is not as much evidence on the effectiveness of global programs such as those discussed in this paper, let alone their impact on quality of life and survival [222]. A systematic review of different interventions showed that studies with a positive impact on residents tended to change worker behavior, but that such changes in worker practices did not always lead to a better prognosis for residents [223]. The authors rec-

ommended very concrete initiatives (improving oral care, for example). The study demonstrated the most frequently encountered challenges (frequent staff turnover, work overload, attitudes, lack of resources, etc.).

Some of the elements that should be included are recording of infections and follow-up cultures, hand hygiene, isolation precautions, training programs for residents and staff, and a good antimicrobial use control program [201].

The results of a program aimed at reducing nosocomial infection in five nursing homes by improving surface cleaning and hand hygiene have been published. It included online training, recording of surface cleaning, monitoring of hand hygiene compliance, reporting of diagnosed infections, and a survey of workers. Only a non-significant reduction in total infections (6.7%) and lower respiratory tract infections (19.9%) was achieved [224]. There were no significant differences in the number of antimicrobial treatments, nor in hospitalization rates before and after the intervention. The vast majority of workers supported the intervention.

Continuing education of workers is an aspect that certainly deserves great attention. A study conducted in 184 American nursing homes with 1,626 participants showed that only 36% knew the meaning of pyuria, only 28% knew the indications for urine culture and less than 30% had learned the correct way to perform hand hygiene [130]. Another study showed that the training and qualifications of the nosocomial infection manager in each residence was related to indicators of good antimicrobial use, but was not related to patient survival [225].

Nursing homes must meet quality criteria, but voluntary inclusion in national surveillance systems, at least in the United States, did not occur until there was a financial incentive to report CDI episodes. The residences that signed up first were those that already had more quality criteria, reflected in a higher rate of pneumococcal vaccination [226]. A U.S. study examined whether voluntary accreditation of nursing homes, adopting government quality requirements and undergoing audits, had a favorable impact on patient well-being [227]. The variables considered were: vaccination rate against influenza and pneumococcus; pain; delirium; pressure ulcers and health inspection scores. A total of 246 accredited nursing homes were compared with 15,393 control nursing homes. Accredited nursing homes demonstrated better quality on all indicators analyzed.

Conclusion

It is not clear which interventions are the most effective in improving the quality of life and survival of patients in Long Term Care Facilities. The implementation of nosocomial infection prevention programs in nursing homes should pursue very specific objectives and include aspects of training of both workers and residents. It is recommended that nursing homes adhere to official control and audit programs.

HOW SHOULD THIS INFORMATION BE DISPLAYED AND USED IN THE DAILY LIFE OF A NURSING HOME?

The aspects that we consider key to the knowledge of this information in the residence are:

1. The existence of an education program on infections and on the measures that work, which is periodically given to all the technical staff, geroculturists, the residents themselves and their families. These education programs should also involve the health professionals of the health centers responsible for nursing home care.
2. The involvement of the medical and care managers in the nursing home (medical director, nursing director...) in facilitating participation in infection prevention programs.
3. The use of easily visible panels, posters with information, algorithms useful in decision making (e.g., in case of suspected urinary tract infection, or in case of fever without clear focus, or in case of a COVID +....).
4. The existence of a registry on infections and antibiotic use in each residence, monitored sectorially like the one we are discussing.
5. The inclusion of all these data among the important data to be evaluated in the quality control of the residences:
 - a) existence of preventive programs,
 - b) register of infections both treated in the nursing home and referred to the hospital,
 - c) record of vaccinations
 - d) existence of a consultant
 - e) contingency plans for epidemics such as COVID.
6. Preparation of an annual report on infection in residences by Public Health / General Directorate of Social and Health Centers.

Conclusion

Information on quality control indicators in nursing homes should be discussed periodically among all levels of nursing home workers. They should be transmitted to the health authorities who will anonymously distribute them widely, not only to professionals but also to family members.

SHOULD THE HEALTH AUTHORITY REQUIRE A SET OF DATA LIKE THE ONES WE ARE TALKING ABOUT INTO A CENTRAL DATABASE FOR PROFESSIONAL AND PUBLIC KNOWLEDGE?

Management to prevent healthcare-associated infections is a typical example of the use of one of the general principles of quality management in healthcare institutions: each institution should compare its own infection rates for defined risk groups of patients with reference data and identify problems relating to specific types of infection in particular clinical care

units. This comparison should stimulate a careful analysis of the process of care and options for improvement [228].

In order to achieve good infection control management within health care institutions, surveillance strategies should be designed according to the specific needs of the institutions. [229].

The implementation of a registration system and the reporting of infections to a central database is a measure that has proven to be effective in increasing knowledge of infections and establishing health policies for the control and prescription of antibiotics [230]. Experience in nursing homes is limited, even at the international level.

Since 2012 the enrollment of residences for infection reporting to the National Health Safety Network (NHSN) in the United States has been a national priority since the Centers for Disease Control and Prevention (CDC) put the spotlight on LTCF [231].

The assessment made by the nursing homes that have registered in the NHSN is positive: they consider that reporting provides greater awareness of infection prevention, provides motivation to develop a prevention program and improves the quality of care in the centers.

Other advantages that the recording and reporting of infections can provide are to reinforce the detection of infections, to establish a correlation between the infection rate of a nursing home or nursing homes in a care area with triggering factors, to facilitate the tracking of an outbreak, to compare nursing homes by encouraging best practices, to promote studies to evaluate the impact of prevention measures carried out, and to promote patient safety [232].

In the United States, it was found that the benefits were perceived in centers that participated on a voluntary basis but also in centers that participated on a mandatory basis. The main reason for not wanting to participate was the workload involved or the absence of a professional to take responsibility for this task [233].

Therefore, the answer to the question posed is affirmative. From our point of view, reporting a process makes one responsible for that process. However, in order for the implementation to be successful, an adequate knowledge of the most prevalent infections in nursing homes must be obtained beforehand [234], carry out training programs for center professionals and provide them with a double support, internal and external, to clarify doubts, consolidate learning and maintain motivation.

In the hospital setting there is more tradition and knowledge of the importance of submitting information with a "feed-back". It is very important for motivation that the residences obtain information from the data they provide to the registry system, which should be accompanied by an analysis of the data collected and a proposal for intervention [234]. The subsequent evaluation should assess the quality of the data submitted and the suggested intervention. This is a positive stimulus for whoever generates the information.

Conclusion

Recording and reporting infections to a central database is an effective measure to increase knowledge, develop prevention programs, analyze health care and improve the quality of services provided.

The data collected should be publicly available so that their analysis can benefit the center itself, but also other residential centers by promoting best care practices.

The participation of a nursing home in an infection registry system and the quality of the data provided, as well as the impact of the prevention measures carried out, should be considered as care indicators in the evaluation of a nursing home.

IS THE PRESS AWARE OF THIS ISSUE AND WHAT ROLE SHOULD IT PLAY?

It is difficult to say whether journalists working in the media are sufficiently aware of the situation in nursing homes and the control of infections that can occur in them. In our opinion, the answer is no, and there are several reasons for this. The first, and fundamental, is the lack of specialization prevailing in the written press, radios, televisions and web pages. The previous economic and financial crisis had its consequent impact on the media. The former newsrooms, divided into areas with specialists in different subjects (economics, politics, events, religion, environment, education, health, etc.) were adapting to an environment marked by lower sales of copies and/or a drop in advertising revenues. This led to staff reductions and the emergence of the figure of the generalist journalist, a professional who knows everything, but, in reality, hardly knows anything. Thus, it is not uncommon that journalists who used to report on religion or science have had to start reporting in recent years on television, culture, entertainment, or political parties, to cite just a few examples. The result has been a worsening of the quality of reporting that has become more acute over time. Not only are the news stories on a variety of subjects worse, but also less information of their own is being produced, which pushes all the media to deal with the same subjects, reducing the information spectrum. The second reason for the media's neglect of information on nursing homes is purely journalistic. Information on senior centers competes for space in the society and local sections with others on religion, education, environment, health, science and, sometimes, even events. We know from experience that it is very difficult to get a space with these competitors when, on top of that, it has been reduced as a consequence of the economic crisis. If there are ten news items on different topics and there are only three pages to publish them, information on residences has all the chances of being left out. And a third factor is the intrinsic nature of the information on this type of care for the elderly. What is newsworthy in the information on LTCF? There is usually little and, moreover, it is a field in which the principle of "good news is not news" applies: in the end, only negative

news ends up being published or disseminated. Positive news has no place.

The outbreak of the pandemic in March 2020 brought information about nursing homes and the elderly out of ostracism and suddenly became front page news, especially during the first wave. In our opinion, the information disseminated about what happened in them was biased by political confrontation and conditioned by the three evils I mentioned above, producing a sort of "perfect storm". The image that was finally transmitted to the public by the media was that the facilities were a perfect breeding ground for the spread of the virus, governed by satrap and exploitative businessmen, and left to their own devices by the health authorities. This image does not coincide with reality despite the avalanche of deaths allegedly due to Covid-19 that occurred inside them, especially during the first wave of the pandemic. The residences have been in the news again since the third wave, coinciding with the vaccination process against the SARS-CoV-2 virus that has been carried out in them since December 27th. The authorities judiciously decided to start inoculating the doses in this group because it is the one with the highest case fatality rate. Specifically, from June 22 to the present day, 22% of those over 90 years of age who were infected have died from Covid, a percentage which stands at 14.2% among those aged 80 to 89 years and 5.3% among those aged 70 to 79 years, according to data compiled by the Carlos III Health Institute and the National Epidemiological Surveillance Network.

Conclusion

The mass media has little and deficient information on the problems of infection transmission in nursing homes and on the possibilities of reducing these risks. The reasons for this are to be found in the decrease of specialized health sections in many media since more than a decade ago.

WHAT ETHICAL ISSUES ARE RAISED BY THE TOPICS AND POSITIONS THAT HAVE BEEN DISCUSSED THROUGHOUT THIS MEETING?

Our era is peculiar for several reasons. One of them is that people's average life expectancy has more than doubled compared to earlier times, such as the beginning of the 20th century. This phenomenon has been accompanied by others no less significant: the secondary and tertiary sectors of the economy have come to occupy most of the population, so that as the countryside was depopulated, urban concentrations became megacities. Another phenomenon of no lesser importance has been the access of women to productive work. All this has created a new situation, unprecedented in the annals of human history, which no one could have foreseen and for which no one was prepared.

Let us briefly recall the previous situation, which, with no great variations, had been maintained over several millennia, at least from the Neolithic revolutions until the arrival of the industrial revolution. The first took place at different dates in

different places, but the average figure is around 5,000-3,000 BC. The second, the so-called industrial revolution, began in England in the mid-19th century, but did not become global until well into the 20th century. Between these two dates, the human species remained in a type of society that is often referred to as "agricultural culture". The basic occupation was the cultivation of the land, a task assigned to men. These were the so-called "productive" activities. The other major sector was that of "reproductive" activities, reserved for women, who were responsible, among other things, for raising children and caring for the elderly. This was carried out in dwellings that today are called "patriarchal" (think of the Catalan farmhouses, the Galician pazos or the Castilian manor houses), in which three or even four generations coexisted, and in which there was a permanent system of care for children, the elderly and the sick. The elder, on the other hand, was the most revered member of the community, if only because he was the origin, not only biologically but also economically, of the whole group.

This is what sociologists usually call the "patriarchal family". In it there were several very significant facts. One, that there were always elders in it. Another, that they were respected and revered for their own condition. And a final one, that they all considered it natural that they should be cared for in their own home. To throw them out or send them elsewhere would have been considered socially and morally execrable.

Things began to change with the industrial revolution. Industrial warehouses appeared in the suburbs of the cities, if only because cheap labor was plentiful there. The large patriarchal dwellings gave way to apartments or city apartments, in which only one generation, or at most two, can live. This is the so-called "nuclear family". Since both members of the family need to work, caring for children, the elderly and the sick is almost impossible. Exceptionally, acute situations can be taken care of, but certainly not chronic ones. In such cases, the support of other institutions is necessary. In the case of illnesses, these are hospitals, which are now taking on a new role, taking on a special role. And in the case of the elderly, the solution has been found in the establishment of an extensive network of assisted living facilities. The very organization of life in modern society has made them indispensable.

The old man usually looks at these institutions with a sidelong glance and with caution. He is well aware that in the traditional society, the one in which he was born, the old people's home was judged as morally and humanly negative. The old man had dedicated his life to his family, and it seemed logical that the family should not abandon him when he was no longer useful. In fact, the impossibility of caring for the elderly in the family has generated an enormous guilt complex in many families, who continue to consider themselves obliged not to abandon their elders, despite the near impossibility of doing so in the situation of nuclear families.

It is clear that families cannot be blamed. But the problem does not end there. We have organized modern society around the basic principle of the economy, efficiency. This became the

Table 4 Mortality in nursing homes. Adapted from Glette et al [15].

Country	Date	Approach to measuring COVID-19 linked deaths in care homes	Total number deaths linked to COVID-19*	Number of deaths of care home residents linked to COVID-19	Number of deaths in care homes linked to COVID-19	Number of care home resident deaths as % of all COVID-19 deaths	Number of deaths in care homes as % of all COVID-19 deaths
Australia	22/01/2021	C	909	685		75%	
Austria	24/01/2021	C	7,328	3,243		44%	
Belgium	19/01/2021	C + P	20,457	11,722	8,854	57%	43%
Canada	23/01/2021	C + P	18,974	11,114		59%	
Denmark	19/01/2021	C	1,837	719		39%	
Finland	22/01/2021	C	644		243		33%
France	20/01/2021	C + P	71,342	30,395	21,646	43%	30%
Germany	22/01/2021	C	50,642	14,066		28%	
Hong Kong	25/01/2021	C	169	32	0	19%	0%
Hungary	27/08/2020	C	612	142		23%	
Ireland	13/12/2020	C + P	2,110		1,084		51%
Israel	25/10/2020	C	2,404	861		36%	
Netherlands	15/01/2021	C	12,774	6,529		51%	
New Zealand	12/01/2021	C + P	25		16		64%
Norway	20/01/2021	C	533		318		60%
Portugal	10/01/2021	Unclear	7,803	2,254**		29%**	
Singapore	24/01/2021	C	29	4	0	14%	0%
Slovenia	17/01/2021	C	3,371	1,875		56%	
South Korea	07/09/2020	C	336	27	0	8%	0%
Spain	22/01/2021	C + P	66,557	26,328		40%	
Sweden	18/01/2021	C + P	9,949	4,656	4,249	47%	43%
England (UK)	15/01/2021	C + P	88,674	29,381	21,615	33%	24%
Wales (UK)	15/01/2021	C + P	5,884	1,470	1,267	25%	22%
N. Ireland (UK)	15/01/2021	C + P	2,124	862	642	41%	30%
Scotland (UK)	17/01/2021	C + P	7,448	3,266	2,867	44%	38%
United Kingdom	As above	C + P	104,130	34,979	26,391	34%	25%
United States	07/01/2021	C + P	357,124	139,699		39%	

C: confirmed; P: probable

guiding category of human activity from the 18th century onwards, when, with Adam Smith and his disciples, economics became a scientific discipline. And this is the criterion that governs industrial work, which revolutionized human life from that same century onwards. In industrial society, in contrast to agricultural society, the culture of efficiency dominates. Thus, inefficient people become part of the debit side, not the credit side, together with the sick, the lazy, the thugs, etc.

The old, by definition, is inefficient. In modern culture, this has a very negative social and even moral connotation. It is

not that citizens consciously and intentionally undervalue the elderly. It is an unconscious process, and therefore much more subtle and difficult to control. In the age of efficiency, the elderly are seen as a hindrance, a burden or a burden. This leads, also unconsciously, to their discrimination. To the point that one does not know what to call an elderly person, because the terms all end up having negative connotations. The Latin term for old is senex, whose opposite is iuvenis. One is either iuvenis or senex. These are terms that in classical Latin were applied only to living beings, and especially to people. For things other terms were used, vetus and novus. A book is new or old, etc.

Well, in the modern world, unlike what happened in all previous centuries, the old man will be called "old" (derived from *vetus*), so that "senecto" (derived from *senex*) will be relegated to the category of cultism. And since old is a clearly derogatory term when applied to human beings, others have been sought to replace it. One is "elder", which comes directly from the French, and the other from the Latin *antiquus*. Despite appearances, it is no less discriminatory than *vetus*, because it is also a term referring to things, not people.

So what to call them? From this point on, the proliferation of euphemistic terms began. There has been talk of "passive classes", of "third age", of "senior citizens", of "elderly people", etc. Basically, we do not know what to call them properly, because the terms, although at first they may seem correct, soon take on a negative meaning, which brings back the specter of discrimination.

It is also a problem to properly name discrimination against the elderly. In English, the term "ageism" has taken hold and was soon imported into our language as "ageismo". Some, more purist, proposed as an alternative "etaísmo" or "edaísmo". The *Fundéu* of the Real Academia Española says that the correct term is "edadismo", which, however, has not yet been incorporated into the official dictionary.

From all that has been said so far, it would seem natural that the mistreatment of the elderly would take place in family homes, given their precarious conditions. But the Covid-19 pandemic has shown that discrimination is so subtle and so widespread that it also affects those institutionalized in assisted living facilities, and that those who are trained to care for and assist this type of person are not exempt from it. In this regard, the data that have just become known are very revealing. Of every 100 institutionalized in nursing homes, 17 have died during the pandemic in the Community of Madrid, 14 in those of Castilla la Mancha and 11 in those of Castilla-León and Extremadura. The number of deaths in homes for the elderly is close to 30,000, according to provisional data from the Ministries of Social Rights, Health and Science and Innovation.

According to IMSERSO data, during the first wave it is possible to "estimate as plausible a range between 47% and 50% of deaths in residences with respect to the total number of deaths due to COVID-19 disease in the first wave. If this estimate is valid, and according to some preliminary international studies, the Spanish case would be situated in terms of percentage of deaths of users of residential centers with respect to the total number of COVID-19 deaths in intermediate parameters for the first wave, similar to those of the United Kingdom (45%), France (46%), Sweden (46%), Scotland (47%) or Northern Ireland (49%); significantly below Belgium (61%), Australia (75%), Canada (80%) or Slovenia (81%) and above Denmark (35%), Austria (36%), Israel (39%) or Germany (39%) [18] (Table 4).

The total number of deaths in nursing homes has not yet been calculated, but according to IMSERSO data, as of May 31, 2021, "there is a very high impact on excess mortality in people with care in nursing homes, with an excess of deaths

of 26,299 people (10.56% of the total number of dependent people cared for in nursing homes). While highlighting that such excess was concentrated in the months of March-May, while in June 2020-January 2021 excess mortality was similar regardless of the place of provision, except in October 2020 and from February 2021 where there was lower excess mortality in people with residential care than in home support" [235].

(The total number of deaths due to COVID-19 includes only those confirmed, so the figures may be lower than the real ones, particularly in the first part of the pandemic).

A certain percentage of deaths in nursing homes, not easy to quantify, is due to the biological condition of the elderly, with a clear decrease in biological reserves and immune response. But another percentage, not negligible, has to do with the lack of specialized care, sometimes with overcrowding and, finally, with the fact that in certain places they have been discriminated against, denying them transfer to health centers. In the case of Spain, this has even been stated in guidelines issued by some autonomous communities.

Conclusion.

The great moral problem in the elderly population is discrimination, which ends up being mistreatment, and which is sometimes overt, but other times it is subtle and, on certain occasions, is even unknown even to the people who practice it. Hence the need to educate the population in general, and particularly those who are directly involved in nursing home care.

TRANSPARENCY DISCLOSURE

For transparency purposes, please note that GSK has contributed to the funding of this publication. Its contents reflect the authors' own opinions, criteria, conclusions and/or findings, which may not necessarily coincide with those of GSK. GSK always recommends the use of its products in accordance with the data sheet approved by the health authorities.

REFERENCES

1. Department of Health and Health Protection Agency UK. Prevention and control of infection in care homes - an information resource. 2013. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/214930/Care-Home-Resource-Summary-Feb14-2013pdf.
2. Department of Health and Human resources, Agency for Healthcare Research and Quality. A Unit Guide To Infection Prevention for Long-Term Care Staff. 2017. Available at: <https://www.hqr.gov/hai/quality/tools/cauti-ltc/modules/resources/guides/infection-prevention.html>. Publication No. 16(17)-0003-4-EF March 2017.
3. Serrano M, Barcenilla F, Limón E. [Nosocomial infections in long-term health care facilities]. *Enfermedades infecciosas y microbiología clínica*. 2014;32(3):191-8. DOI: 10.1016/j.eimc.2013.11.007
4. Dwyer LL, Harris-Kojetin LD, Valverde RH, Frazier JM, Simon AE, Stone ND, et al. Infections in long-term care populations in

- the United States. *Journal of the American Geriatrics Society*. 2013;61(3):342-9. DOI: 10.1111/jgs.12153
5. Chami K, Gavazzi G, de Wazières B, Lejeune B, Carrat F, Piette F, et al. Guidelines for infection control in nursing homes: a Delphi consensus web-based survey. *The Journal of hospital infection*. 2011;79(1):75-89. DOI: 10.1016/j.jhin.2011.04.014
 6. Tinelli M, Tiseo G, Falcone M. Prevention of the spread of multi-drug-resistant organisms in nursing homes. *Aging Clin Exp Res*. 2021;33(3):679-87. DOI: 10.1007/s40520-020-01746-2
 7. Gouin KA, Kabbani S, Anttila A, Mak J, Mungai E, McCray TT, et al. Implementation of core elements of antibiotic stewardship in nursing homes-National Healthcare Safety Network, 2016-2018. *Infection control and hospital epidemiology*. 2021:1-5. DOI: 10.1017/ice.2021.209
 8. Crespo-Rivas JC, Guisado-Gil AB, Peñalva G, Rodríguez-Villodres Á, Martín-Gandul C, Pachón-Ibáñez ME, et al. Are antimicrobial stewardship interventions effective and safe in long-term care facilities? A systematic review and meta-analysis. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. 2021. DOI: 10.1016/j.cmi.2021.06.003
 9. Aliyu S, Travers JL, Heimlich SL, Ifill J, Smaldone A. Antimicrobial Stewardship Interventions to Optimize Treatment of Infections in Nursing Home Residents: A Systematic Review and Meta-Analysis. *J Appl Gerontol*. 2021:7334648211018299. DOI: 10.1177/07334648211018299
 10. Agarwal M, Estrada LV, Stone PW. Nursing Home Antibiotic Stewardship Policy and Antibiotics Use: 2013-2017. *Journal of the American Medical Directors Association*. 2021. DOI: 10.1016/j.jamda.2021.06.031
 11. Serrano M, Barcenilla F, Limón E, Pujol M, Gudiol F. Prevalence of healthcare-associated infections in long-term care facilities in Catalonia. *VINCat Program. Enfermedades infecciosas y microbiología clínica*. 2017;35(8):505-10. DOI: 10.1016/j.eimc.2015.11.011
 12. Ricchizzi E, Latour K, Kärki T, Buttazzi R, Jans B, Moro ML, et al. Antimicrobial use in European long-term care facilities: results from the third point prevalence survey of healthcare-associated infections and antimicrobial use, 2016 to 2017. *Euro Surveill*. 2018;23(46). DOI: 10.2807/1560-7917.Es.2018.23.46.1800394
 13. Morrill HJ, Caffrey AR, Jump RL, Dosa D, LaPlante KL. Antimicrobial Stewardship in Long-Term Care Facilities: A Call to Action. *Journal of the American Medical Directors Association*. 2016;17(2):183.e1-16. DOI: 10.1016/j.jamda.2015.11.013
 14. Hospital General de Granollers. Doce intervenciones PROA en Centros Sociosanitarios. Available at <https://www.saludcastillayleones/portalmedicamento/es/boletines/boletin-mensual/noticias-destacadas/12-intervenciones-proa-centros-sociosanitarios>. 2019.
 15. Glette MK, Røise O, Kringeland T, Churrua K, Braithwaite J, Wiig S. Nursing home leaders' and nurses' experiences of resources, staffing and competence levels and the relation to hospital readmissions - a case study. *BMC health services research*. 2018;18(1):955. DOI: 10.1186/s12913-018-3769-3
 16. Junta de Andalucía, Consejería para la Igualdad y Bienestar Social, Mayores. DGdP. Normativa sobre Centros Residenciales de Personas Mayores. Consejería de Igualdad y Bienestar Social. Junta de Andalucía. Disponible en: https://www.juntadeandalucia.es/export/drupaljda/Normativa_centros_mayores.pdf. 2007:1- 78.
 17. Organización Mundial de la Salud. Prevención y control de infecciones en los centros de atención de larga estancia en el contexto de la COVID-19. 2020:6.
 18. Ministerio de derechos sociales y agenda 2030. Secretaría de Estado. Informe del grupo de trabajo de Covid en Residencias. Ministerio de Derechos Sociales y Agenda 2030. Available at: https://www.msbsgob.es/ssi/imserso/docs/GTCOVID_19_RESIDENCIAS.pdf. 2020:115.
 19. Ministerio de Sanidad Consumo y Bienestar Social. Guía de prevención y control frente al COVID-19 en residencias de mayores y otros centros de servicios sociales de carácter residencial. 2020.
 20. Junta de Andalucía. Consejería de Salud y Familia. Estrategia de actuación en residencias de mayores y centros sociosanitarios de la consejería de salud y familias Plan de actuación en Residencias, Consejería de Salud Junta de Andalucía Available at: <https://www.juntadeandalucia.es/export/drupaljda/SyF-DocumentoPlanActuacionResidencias.pdf>. 2020:34.
 21. SERGAS. Medidas de prevención y control de riesgo de diseminación del covid-19 y otras enfermedades infecciosas de transmisión por contacto (incluido gotas) en las residencias de ancianos. Available at https://coronavirussergasgal/Contidos/Documents/263/IRR_060420_Residencias_Control_infecci%e3%b3n.pdf. 2020:9.
 22. Médicos sin Fronteras. Plan de contingencia para residencias. Organización de servicios y estructuras.5.
 23. Gobierno de Aragón, Departamento de Sanidad y Departamento de Ciudadanía y Derechos Sociales. Guía para la elaboración del plan de contingencia destinado a centros de servicios sociales de naturaleza residencial para la atención de personas mayores y personas con discapacidad. 2020. Available at: <https://www.aragon.es/documentos/20127/2523242/Guia+de+Plan+de+contingencia+residencias+240720-.pdf/c3a443b7-b0c6-07e1-ad78-c9819119405d?t=1596625169>
 24. World Health Organization. Prevención y control de infecciones en los centros de atención de larga estancia en el contexto de la COVID-19. Available at http://apps.who.int/iris/bitstream/10665/112656/1/9789241507134_eng.pdf. 2020.
 25. Ministerio de Sanidad. Documento técnico Recomendaciones a Residencias de Mayores y Centros Sociosanitarios para el Covid-19. Ministerio de Sanidad. 2020:9. Available at: https://www.sanidad.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Centros_sociosanitarios.pdf
 26. Menéndez R. La Geriatria de Enlace con residencias en la época de la Covid-19. Un nuevo modelo de coordinación que ha llegado para quedarse. *Revista Española de Geriatria y Gerontología*. 2021;56:157-65. DOI: <https://doi.org/10.1016/j.regg.2021.01.002>
 27. Organización Médica Colegial. Covid-19 y las residencias y centros sociosanitarios. Organización Médica Colegial.17. Available at: <https://www.cgcom.es/covid-19/informacion-y-documentacion/comision-asesora>

28. Sociedad Española de Geriatria y Gerontología. Recomendaciones para el manejo de la epidemia Covid en Residencias de Mayores. Sociedad Española de Geriatria y Gerontología. 2020:4.
29. Consejería de Integración Social de la Comunidad Autónoma de Madrid. Orden 612/1990, de 6 de noviembre, por la que se desarrolla el Decreto 91/1990, de 26 de octubre, relativo al Régimen de Autorización de Servicios y Centros de Acción Social y Servicios Sociales. Available at http://www.madrid.org/wleg_pub/secure/normativas/contenidoNormativajsf? 1990.
30. Spreckelsen O, Luque Ramos A, Freitag M, Hoffmann F. Influenza vaccination rates before and after admission to nursing homes in Germany. *Aging Clin Exp Res*. 2018;30(6):609-16. DOI: 10.1007/s40520-017-0825-5
31. Ye P, Fry L, Liu H, Ledesma S, Champion JD. COVID outbreak after the 1st dose of COVID vaccine among the nursing home residents: What happened? *Geriatr Nurs*. 2021;42(5):1105-8. DOI: 10.1016/j.gerinurse.2021.06.022
32. Unroe KT, Evans R, Weaver L, Rusyniak D, Blackburn J. Willingness of Long-Term Care Staff to Receive a COVID-19 Vaccine: A Single State Survey. *Journal of the American Geriatrics Society*. 2021;69(3):593-9. DOI: 10.1111/jgs.17022
33. Salmerón Ríos S, Mas Romero M, Cortés Zamora EB, Taberero Sahuquillo MT, Romero Rizos L, Sánchez-Jurado PM, et al. Immunogenicity of the BNT162b2 vaccine in frail or disabled nursing home residents: COVID-A study. *Journal of the American Geriatrics Society*. 2021;69(6):1441-7. DOI: 10.1111/jgs.17153
34. Senderovich H, Grewal J, Mujtaba M. Herpes zoster vaccination efficacy in the long-term care facility population: a qualitative systematic review. *Curr Med Res Opin*. 2019;35(8):1451-62. DOI: 10.1080/03007995.2019.1600482
35. Sasahara T, Ae R, Yoshimura A, Kosami K, Sasaki K, Kimura Y, et al. Association between length of residence and prevalence of MRSA colonization among residents in geriatric long-term care facilities. *BMC geriatrics*. 2020;20(1):481. DOI: 10.1186/s12877-020-01885-1
36. Harrison EM, Ludden C, Brodrick HJ, Blane B, Brennan G, Morris D, et al. Transmission of methicillin-resistant *Staphylococcus aureus* in long-term care facilities and their related healthcare networks. *Genome Med*. 2016;8(1):102. DOI: 10.1186/s13073-016-0353-5
37. Szabó R. [Prevalence and predisposing factors of methicillin-resistant *Staphylococcus aureus* in long-term care facilities. An international view]. *Orv Hetil*. 2016;157(27):1071-8. DOI: 10.1556/650.2016.30427
38. Schora DM, Boehm S, Das S, Patel PA, O'Brien J, Hines C, et al. Impact of Detection, Education, Research and Decolonization without Isolation in Long-term care (DERAIL) on methicillin-resistant *Staphylococcus aureus* colonization and transmission at 3 long-term care facilities. *American journal of infection control*. 2014;42(10 Suppl):S269-73. DOI: 10.1016/j.ajic.2014.05.011
39. Evans ME, Kralovic SM, Simbartl LA, Freyberg RW, Obrosky DS, Roselle GA, et al. Nationwide reduction of health care-associated methicillin-resistant *Staphylococcus aureus* infections in Veterans Affairs long-term care facilities. *American journal of infection control*. 2014;42(1):60-2. DOI: 10.1016/j.ajic.2013.06.004
40. Brugnaro P, Fedeli U, Pellizzer G, Buonfrate D, Rattu M, Boldrin C, et al. Clustering and risk factors of methicillin-resistant *Staphylococcus aureus* carriage in two Italian long-term care facilities. *Infection*. 2009;37(3):216-21. DOI: 10.1007/s15010-008-8165-1
41. Stevenson CG, McArthur MA, Naus M, Abraham E, McGeer AJ. Prevention of influenza and pneumococcal pneumonia in Canadian long-term care facilities: how are we doing? *Cmaj*. 2001;164(10):1413-9.
42. Thomas RE. Pneumococcal Pneumonia and Invasive Pneumococcal Disease in Those 65 and Older: Rates of Detection, Risk Factors, Vaccine Effectiveness, Hospitalisation and Mortality. *Geriatrics (Basel)*. 2021;6(1). DOI: 10.3390/geriatrics6010013
43. McConeghy KW, Davidson HE, Canaday DH, Han L, Saade E, Mor V, et al. Cluster-randomized trial of adjuvanted vs. non-adjuvanted trivalent influenza vaccine in 823 U.S. nursing homes. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2020. DOI: 10.1093/cid/ciaa1233
44. Ino H. Vaccine mandate in long-term care facilities. *Geriatr Gerontol Int*. 2020;20(10):995-6. DOI: 10.1111/ggi.14023
45. Arnedo-Pena A, Juan-Cerdán JV, Romeu-García M, Sorribes-Segura S, Tirado-Balaguer M, Gil-Fortuño M, et al. Vitamin D status and latent tuberculosis infection: conversion in nursing homes, Spain. *Int J Tuberc Lung Dis*. 2020;24(3):278-86. DOI: 10.5588/ijtld.19.0365
46. Khan A, Rebhan A, Seminara D, Szerszen A. Enduring Challenge of Latent Tuberculosis in Older Nursing Home Residents: A Brief Review. *J Clin Med Res*. 2019;11(6):385-90. DOI: 10.14740/jocmr3763
47. Bouza E, Ancochea-Bermúdez J, Campins M, Eirós-Bouza JM, Fargas J, García Rojas A, et al. The situation of vaccines for the prevention of infections in adults: An opinion paper on the situation in Spain. *Rev Esp Quimioter*. 2019;32(4):333-64. PMC: 6719651
48. Sociedad Española de Geriatria y Gerontología. Recomendaciones de vacunación para adultos y mayores y calendarios vacunales 2019-2020. Available at <https://www.segges/media/descargas/VACUNAS-SEGG-2019-2020pdf>. 2019.
49. Thomas RE. Reducing Morbidity and Mortality Rates from COVID-19, Influenza and Pneumococcal Illness in Nursing Homes and Long-Term Care Facilities by Vaccination and Comprehensive Infection Control Interventions. *Geriatrics (Basel)*. 2021;6(2). DOI: 10.3390/geriatrics6020048
50. Boey L, Roelants M, Vandermeulen C. Increased vaccine uptake and less perceived barriers toward vaccination in long-term care facilities that use multi-intervention manual for influenza campaigns. *Hum Vaccin Immunother*. 2021;17(3):673-80. DOI: 10.1080/21645515.2020.1788327
51. Kenny E, McNamara Á, Noone C, Byrne M. Barriers to seasonal influenza vaccine uptake among health care workers in long-term care facilities: A cross-sectional analysis. *Br J Health Psychol*. 2020;25(3):519-39. DOI: 10.1111/bjhp.12419
52. Bechini A, Lorini C, Zanobini P, Mandò Tacconi F, Boccalini S, Grazzini M, et al. Utility of Healthcare System-Based Interventions in Improving the Uptake of Influenza Vaccination in Healthcare Workers at Long-Term Care Facilities: A Systematic Review. *Vaccines (Basel)*. 2020;8(2). DOI: 10.3390/vaccines8020165

53. Tan HY, Lai E, Kunasekaran M, Chughtai AA, Trent M, Poulos CJ, et al. Prevalence and predictors of influenza vaccination among residents of long-term care facilities. *Vaccine*. 2019;37(43):6329-35. DOI: 10.1016/j.vaccine.2019.09.021
54. Shireman TI, Ogarek J, Gozalo P, Zhang T, Mor V, Davidson HE, et al. Cost Benefit of High-Dose vs Standard-Dose Influenza Vaccine in a Long-Term Care Population During an A/H1N1-Predominant Influenza Season. *Journal of the American Medical Directors Association*. 2019;20(7):874-8. DOI: 10.1016/j.jamda.2018.12.003
55. Campbell J. Influenza vaccination for healthcare workers who care for people aged 60 or older living in long-term care institutions. *Int J Nurs Pract*. 2019;25(3):e12730. DOI: 10.1111/ijn.12730
56. Shrotri M, Krutikov M, Palmer T, Giddings R, Azmi B, Subbarao S, et al. Vaccine effectiveness of the first dose of ChAdOx1 nCoV-19 and BNT162b2 against SARS-CoV-2 infection in residents of long-term care facilities in England (VIVALDI): a prospective cohort study. *The Lancet Infectious diseases*. 2021. DOI: 10.1016/s1473-3099(21)00289-9
57. Munitz A, Yechezkel M, Dickstein Y, Yamin D, Gerlic M. BNT162b2 vaccination effectively prevents the rapid rise of SARS-CoV-2 variant B.1.1.7 in high-risk populations in Israel. *Cell Rep Med*. 2021;2(5):100264. DOI: 10.1016/j.xcrm.2021.100264
58. Mor V, Gutman R, Yang X, White EM, McConeghy KW, Feifer RA, et al. Short-term impact of nursing home SARS-CoV-2 vaccinations on new infections, hospitalizations, and deaths. *Journal of the American Geriatrics Society*. 2021. DOI: 10.1111/jgs.17176
59. Matthews SJ, Lancaster JW. Urinary tract infections in the elderly population. *Am J Geriatr Pharmacother*. 2011;9(5):286-309. DOI: 10.1016/j.amjopharm.2011.07.002
60. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM. Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2005;40(5):643-54. DOI: 10.1086/427507
61. Loeb M, Bentley DW, Bradley S, Crossley K, Garibaldi R, Gantz N, et al. Development of minimum criteria for the initiation of antibiotics in residents of long-term-care facilities: results of a consensus conference. *Infection control and hospital epidemiology*. 2001;22(2):120-4. DOI: 10.1086/501875
62. Juthani-Mehta M, Quagliarello V, Perrelli E, Towle V, Van Ness PH, Tinetti M. Clinical features to identify urinary tract infection in nursing home residents: a cohort study. *Journal of the American Geriatrics Society*. 2009;57(6):963-70. DOI: 10.1111/j.1532-5415.2009.02227.x
63. Loeb M, Brazil K, Lohfeld L, McGeer A, Simor A, Stevenson K, et al. Effect of a multifaceted intervention on number of antimicrobial prescriptions for suspected urinary tract infections in residents of nursing homes: cluster randomised controlled trial. *BMJ (Clinical research ed)*. 2005;331(7518):669. DOI: 10.1136/bmj.38602.586343.55
64. Mitchell SL, Shaffer ML, Loeb MB, Givens JL, Habtemariam D, Kiely DK, et al. Infection management and multidrug-resistant organisms in nursing home residents with advanced dementia. *JAMA internal medicine*. 2014;174(10):1660-7. DOI: 10.1001/jamainternmed.2014.3918
65. Dufour AB, Shaffer ML, D'Agata EM, Habtemariam D, Mitchell SL. Survival After Suspected Urinary Tract Infection in Individuals with Advanced Dementia. *Journal of the American Geriatrics Society*. 2015;63(12):2472-7. DOI: 10.1111/jgs.13833
66. Monette J, Miller MA, Monette M, Laurier C, Boivin JF, Sourial N, et al. Effect of an educational intervention on optimizing antibiotic prescribing in long-term care facilities. *Journal of the American Geriatrics Society*. 2007;55(8):1231-5. DOI: 10.1111/j.1532-5415.2007.01250.x
67. Pettersson E, Vernby A, Mölstad S, Lundborg CS. Can a multifaceted educational intervention targeting both nurses and physicians change the prescribing of antibiotics to nursing home residents? A cluster randomized controlled trial. *The Journal of antimicrobial chemotherapy*. 2011;66(11):2659-66. DOI: 10.1093/jac/dkr312
68. Zabarsky TF, Sethi AK, Donskey CJ. Sustained reduction in inappropriate treatment of asymptomatic bacteriuria in a long-term care facility through an educational intervention. *American journal of infection control*. 2008;36(7):476-80. DOI: 10.1016/j.ajic.2007.11.007
69. Nicolle LE. Antimicrobial stewardship in long term care facilities: what is effective? *Antimicrobial resistance and infection control*. 2014;3(1):6. DOI: 10.1186/2047-2994-3-6
70. Centers for Medicare & Medicaid Services (CMS) H. Medicare and Medicaid Programs; Reform of Requirements for Long-Term Care Facilities. Final rule. *Fed Regist*. 2016;81(192):68688-872.
71. Rummukainen ML, Jakobsson A, Matsinen M, Järvenpää S, Nissinen A, Karppi P, et al. Reduction in inappropriate prevention of urinary tract infections in long-term care facilities. *American journal of infection control*. 2012;40(8):711-4. DOI: 10.1016/j.ajic.2011.09.013
72. Crnich CJ, Jump R, Trautner B, Sloane PD, Mody L. Optimizing Antibiotic Stewardship in Nursing Homes: A Narrative Review and Recommendations for Improvement. *Drugs & aging*. 2015;32(9):699-716. DOI: 10.1007/s40266-015-0292-7
73. Agarwal M, Dick AW, Sorbero M, Mody L, Stone PW. Changes in US Nursing Home Infection Prevention and Control Programs From 2014 to 2018. *Journal of the American Medical Directors Association*. 2020;21(1):97-103. DOI: 10.1016/j.jamda.2019.10.020
74. Checovich MM, Barlow S, Shult P, Reisdorf E, Temte JL. Evaluation of Viruses Associated With Acute Respiratory Infections in Long-Term Care Facilities Using a Novel Method: Wisconsin, 2016-2019. *Journal of the American Medical Directors Association*. 2020;21(1):29-33. DOI: 10.1016/j.jamda.2019.09.003
75. Childs A, Zullo AR, Joyce NR, McConeghy KW, van Aalst R, Moyo P, et al. The burden of respiratory infections among older adults in long-term care: a systematic review. *BMC geriatrics*. 2019;19(1):210. DOI: 10.1186/s12877-019-1236-6
76. Carnahan JL, Shearn AJ, Lieb KM, Unroe KT. Pneumonia Management in Nursing Homes: Findings from a CMS Demonstration Project. *J Gen Intern Med*. 2021;36(2):570-2. DOI: 10.1007/s11606-020-05885-0
77. Rios P, Radhakrishnan A, Williams C, Ramkissoon N, Pham B, Cormack GV, et al. Preventing the transmission of COVID-19 and

- other coronaviruses in older adults aged 60 years and above living in long-term care: a rapid review. *Syst Rev*. 2020;9(1):218. DOI: 10.1186/s13643-020-01486-4
78. Kain DC, McCreight LJ, Johnstone J. Dealing with coronavirus disease 2019 (COVID-19) outbreaks in long-term care homes: A protocol for room moving and cohorting. *Infection control and hospital epidemiology*. 2020;1-2. DOI: 10.1017/ice.2020.1302
79. Dosa D, Jump RLP, LaPlante K, Gravenstein S. Long-Term Care Facilities and the Coronavirus Epidemic: Practical Guidelines for a Population at Highest Risk. *Journal of the American Medical Directors Association*. 2020;21(5):569-71. DOI: 10.1016/j.jamda.2020.03.004
80. Bosco E, van Aalst R, McConeghy KW, Silva J, Moyo P, Eliot MN, et al. Estimated Cardiorespiratory Hospitalizations Attributable to Influenza and Respiratory Syncytial Virus Among Long-term Care Facility Residents. *JAMA Netw Open*. 2021;4(6):e2111806. DOI: 10.1001/jamanetworkopen.2021.11806
81. Liao RS, Appelgate DM, Pelz RK. An outbreak of severe respiratory tract infection due to human metapneumovirus in a long-term care facility for the elderly in Oregon. *J Clin Virol*. 2012;53(2):171-3. DOI: 10.1016/j.jcv.2011.10.010
82. Poscia A, Collamati A, Carfi A, Topinkova E, Richter T, Denkinger M, et al. Influenza and pneumococcal vaccination in older adults living in nursing home: a survival analysis on the shelter study. *Eur J Public Health*. 2017;27(6):1016-20. DOI: 10.1093/eurpub/ckx150
83. Black CL, Williams WW, Arbeloa I, Kordic N, Yang L, MaCurdy T, et al. Trends in Influenza and Pneumococcal Vaccination Among US Nursing Home Residents, 2006-2014. *Journal of the American Medical Directors Association*. 2017;18(8):735.e1-e14. DOI: 10.1016/j.jamda.2017.05.002
84. Omura T, Matsuyama M, Nishioka S, Sagawa S, Seto M, Naoe M. Association Between the Swallowing Reflex and the Incidence of Aspiration Pneumonia in Patients with Dysphagia Admitted to Long-term Care Wards. *Arch Phys Med Rehabil*. 2021. DOI: 10.1016/j.apmr.2021.06.012
85. Cristino S, Legnani PP, Leoni E. Plan for the control of Legionella infections in long-term care facilities: role of environmental monitoring. *Int J Hyg Environ Health*. 2012;215(3):279-85. DOI: 10.1016/j.ijheh.2011.08.007
86. Machado M, Valerio M, Álvarez-Uría A, Olmedo M, Veintimilla C, Padilla B, et al. Invasive pulmonary aspergillosis in the COVID-19 era: An expected new entity. *Mycoses*. 2021;64(2):132-43. DOI: 10.1111/myc.13213
87. Guinea J, Torres-Narbona M, Gijón P, Muñoz P, Pozo F, Peláez T, et al. Pulmonary aspergillosis in patients with chronic obstructive pulmonary disease: incidence, risk factors, and outcome. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. 2010;16(7):870-7. DOI: 10.1111/j.1469-0691.2009.03015.x
88. World Health Organization. WHO Guidelines Approved by the Guidelines Review Committee. *Infection Prevention and Control of Epidemic- and Pandemic-Prone Acute Respiratory Infections in Health Care*. Geneva: World Health Organization Copyright © World Health Organization 2014.; 2014.
89. Dey P, Halder S, Collins S, Benons L, Woodman C. Promoting uptake of influenza vaccination among health care workers: a randomized controlled trial. *Journal of public health medicine*. 2001;23(4):346-8. DOI: 10.1093/pubmed/23.4.346
90. Lynch RM, Goring R. Practical Steps to Improve Air Flow in Long-Term Care Resident Rooms to Reduce COVID-19 Infection Risk. *Journal of the American Medical Directors Association*. 2020;21(7):893-4. DOI: 10.1016/j.jamda.2020.04.001
91. Reddy M, Heidarinejad M, Stephens B, Rubinstein I. Adequate indoor air quality in nursing homes: An unmet medical need. *Sci Total Environ*. 2021;765:144273. DOI: 10.1016/j.scitotenv.2020.144273
92. Barker KA, Whitney EA, Blake S, Berkelman RL. A Review of Guidelines for the Primary Prevention of Legionellosis in Long-Term Care Facilities. *Journal of the American Medical Directors Association*. 2015;16(10):832-6. DOI: 10.1016/j.jamda.2015.05.015
93. Nisbet LC, Cobbledeick AM, Smith TE, Bryant PA, Lawrence J. Opportunistic influenza vaccination in the home: broadening access in isolated times. *Arch Dis Child*. 2020. DOI: 10.1136/archdischild-2020-320273
94. Frentzel E, Jump RLP, Archbald-Pannone L, Nace DA, Schweon SJ, Gaur S, et al. Recommendations for Mandatory Influenza Vaccinations for Health Care Personnel From AMDA's Infection Advisory Subcommittee. *Journal of the American Medical Directors Association*. 2020;21(1):25-8.e2. DOI: 10.1016/j.jamda.2019.11.008
95. Menéndez Colino R, Merello de Miguel A, Argentina F, Barcons Marqués M, Chaparro Jiménez B, López Hernández P, et al. [Evolution of COVID-19 at nursing homes from the second wave to vaccination. Description of a coordination program between Primary Care, Geriatrics and Public Health.]. *Rev Esp Salud Publica*. 2021;95.
96. McConaghy M, Sartaj M, Conway BR, Aldeyab MA. An assessment of the impact of the vaccination program on coronavirus disease 2019 (COVID-19) outbreaks in care homes in Northern Ireland-A pilot study. *Infection control and hospital epidemiology*. 2021;1-2. DOI: 10.1017/ice.2021.169
97. Stephens LM, Varga SM. Considerations for a Respiratory Syncytial Virus Vaccine Targeting an Elderly Population. *Vaccines (Basel)*. 2021;9(6). DOI: 10.3390/vaccines9060624
98. Rubin MS, Nivin B, Ackelsberg J. Effect of timing of amantadine chemoprophylaxis on severity of outbreaks of influenza a in adult long-term care facilities. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2008;47(1):47-52. DOI: 10.1086/588658
99. Dolamore MJ. Influenza prophylaxis in the long-term care facility: a case-control study of the risk factors for adverse drug reactions to amantadine. *Curr Ther Res Clin Exp*. 2003;64(9):753-63. DOI: 10.1016/j.curtheres.2003.11.001
100. Stewart RJ, Flannery B, Chung JR, Gaglani M, Reis M, Zimmerman RK, et al. Influenza Antiviral Prescribing for Outpatients With an Acute Respiratory Illness and at High Risk for Influenza-Associated Complications During 5 Influenza Seasons-United States, 2011-2016. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2018;66(7):1035-41. DOI: 10.1093/cid/cix922

101. Havers FP, Campbell AP, Uyeki TM, Fry AM. Commentary: A Historical Review of Centers for Disease Control and Prevention Antiviral Treatment and Postexposure Chemoprophylaxis Guidance for Human Infections With Novel Influenza A Viruses Associated With Severe Human Disease. *The Journal of infectious diseases*. 2017;216(suppl_4):S575-s80. DOI: 10.1093/infdis/jix065
102. Dobson J, Whitley RJ, Pocock S, Monto AS. Oseltamivir treatment for influenza in adults: a meta-analysis of randomised controlled trials. *Lancet (London, England)*. 2015;385(9979):1729-37. DOI: 10.1016/s0140-6736(14)62449-1
103. McGeer A, Green KA, Plevneshi A, Shigayeva A, Siddiqi N, Raboud J, et al. Antiviral therapy and outcomes of influenza requiring hospitalization in Ontario, Canada. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2007;45(12):1568-75. DOI: 10.1086/523584
104. Bouza E, Brenes FJ, Díez Domingo J, Eiros Bouza JM, González J, Gracia D, et al. The situation of infection in the elderly in Spain: a multidisciplinary opinion document. *Revista española de quimioterapia : publicación oficial de la Sociedad Española de Quimioterapia*. 2020;33(5):327-49. DOI: 10.37201/req/057.2020
105. Henig O, Kaye KS. Bacterial Pneumonia in Older Adults. *Infectious disease clinics of North America*. 2017;31(4):689-713. DOI: 10.1016/j.idc.2017.07.015
106. Moberley S, Holden J, Tatham DP, Andrews RM. Vaccines for preventing pneumococcal infection in adults. *The Cochrane database of systematic reviews*. 2013;2013(1):Cd000422. DOI: 10.1002/14651858.CD000422.pub3
107. Bonten MJ, Huijts SM, Bolkenbaas M, Webber C, Patterson S, Gault S, et al. Polysaccharide conjugate vaccine against pneumococcal pneumonia in adults. *The New England journal of medicine*. 2015;372(12):1114-25. DOI: 10.1056/NEJMoa1408544
108. Jump RLP, Crnich CJ, Mody L, Bradley SF, Nicolle LE, Yoshikawa TT. Infectious Diseases in Older Adults of Long-Term Care Facilities: Update on Approach to Diagnosis and Management. *Journal of the American Geriatrics Society*. 2018;66(4):789-803. DOI: 10.1111/jgs.15248
109. Yogo N, Gahm G, Knepper BC, Burman WJ, Mehler PS, Jenkins TC. Clinical Characteristics, Diagnostic Evaluation, and Antibiotic Prescribing Patterns for Skin Infections in Nursing Homes. *Frontiers in medicine*. 2016;3:30. DOI: 10.3389/fmed.2016.00030
110. Hahnel E, Blume-Peytavi U, Trojahn C, Dobos G, Jahnke I, Kanti V, et al. Prevalence and associated factors of skin diseases in aged nursing home residents: a multicentre prevalence study. *BMJ open*. 2017;7(9):e018283. DOI: 10.1136/bmjopen-2017-018283
111. LeBlanc K, Woo KY, VanDenKerkhof E, Woodbury MG. Skin tear prevalence and incidence in the long-term care population: a prospective study. *J Wound Care*. 2020;29(Sup7):S16-s22. DOI: 10.12968/jowc.2020.29.Sup7.S16
112. Abizanda Pea. Vacunación y políticas de prevención y manejo de infecciones en el medio residencial. *Tratada de medicina geriátrica 2nd Edition. Fundamentos de la atención sanitaria a los mayores*. Elsevier España 2020:1019-27.
113. Maelegheer K, Dumitrescu I, Verpaelst N, Masson H, Broucke C, Braekveld P, et al. Infection prevention and control challenges in Flemish homecare nursing: a pilot study. *Br J Community Nurs*. 2020;25(3):114-21. DOI: 10.12968/bjcn.2020.25.3.114
114. McNeil JC, Fritz SA. Prevention Strategies for Recurrent Community-Associated *Staphylococcus aureus* Skin and Soft Tissue Infections. *Curr Infect Dis Rep*. 2019;21(4):12. DOI: 10.1007/s11908-019-0670-0
115. Hine JL, de Lusignan S, Burleigh D, Pathirannehelage S, McGovern A, Gatenby P, et al. Association between glycaemic control and common infections in people with Type 2 diabetes: a cohort study. *Diabet Med*. 2017;34(4):551-7. DOI: 10.1111/dme.13205
116. Wasson NJ, Varley CD, Schwab P, Fu R, Winthrop KL. "Serious skin & soft tissue infections in rheumatoid arthritis patients taking anti-tumor necrosis factor alpha drugs: a nested case-control study". *BMC Infect Dis*. 2013;13:533. DOI: 10.1186/1471-2334-13-533
117. Morrison SM, Blaesing CR, Millar EV, Chukwuma U, Schlett CD, Wilkins KJ, et al. Evaluation of methicillin-resistant *Staphylococcus aureus* skin and soft-tissue infection prevention strategies at a military training center. *Infection control and hospital epidemiology*. 2013;34(8):841-3. DOI: 10.1086/671278
118. Millar EV, Schlett CD, Law NN, Whitman TJ, Ellis MW, Tribble DR, et al. Opportunities and Obstacles in the Prevention of Skin and Soft-Tissue Infections Among Military Personnel. *Mil Med*. 2019;184(Suppl 2):35-43. DOI: 10.1093/milmed/usz105
119. Junta de Andalucía. Secretaría Genral de Salud Pública y Consumo. Dirección General de Salud Pública y Ordenación Farmacéutica. Servicio de Vigilancia y Salud Laboral. Recomendaciones para la prevención de la transmisión de microorganismos multirresistentes durante la atención a residentes colonizados/infectados en centros residenciales. 2017:75.
120. Ye C, Zhu W, Yu J, Li Z, Fu Y, Lan Y, et al. Viral pathogens among elderly people with acute respiratory infections in Shanghai, China: Preliminary results from a laboratory-based surveillance, 2012-2015. *Journal of medical virology*. 2017;89(10):1700-6. DOI: 10.1002/jmv.24751
121. Kestler M, Muñoz P, Mateos M, Adrados D, Bouza E. Respiratory syncytial virus burden among adults during flu season: an underestimated pathology. *The Journal of hospital infection*. 2018;100(4):463-8. DOI: 10.1016/j.jhin.2018.03.034
122. Falsey AR, McElhane JE, Beran J, van Essen GA, Duval X, Esen M, et al. Respiratory syncytial virus and other respiratory viral infections in older adults with moderate to severe influenza-like illness. *The Journal of infectious diseases*. 2014;209(12):1873-81. DOI: 10.1093/infdis/jit839
123. Sloss EM, Solomon DH, Shekelle PG, Young RT, Saliba D, MacLean CH, et al. Selecting target conditions for quality of care improvement in vulnerable older adults. *Journal of the American Geriatrics Society*. 2000;48(4):363-9. DOI: 10.1111/j.1532-5415.2000.tb04691.x
124. Pu Y, Dolar V, Gucwa AL. A comparative analysis of vaccine administration in urban and non-urban skilled nursing facilities. *BMC geriatrics*. 2016;16:148. DOI: 10.1186/s12877-016-0320-4
125. Grosholz JM, Blake S, Daugherty JD, Ayers E, Omer SB, Polivka-West

- L, et al. Accuracy of influenza vaccination rate estimates in United States nursing home residents. *Epidemiology and Infection*. 2015;143(12):2588-95. DOI: 10.1017/S0950268814003434
126. Hutt E, Reznickova N, Morgenstern N, Frederickson E, Kramer AM. Improving care for nursing home-acquired pneumonia in a managed care environment. *The American journal of managed care*. 2004;10(10):681-6.
127. Daugherty JD, Blake SC, Grosholz JM, Omer SB, Polivka-West L, Howard DH. Influenza vaccination rates and beliefs about vaccination among nursing home employees. *American journal of infection control*. 2015;43(2):100-6. DOI: 10.1016/j.ajic.2014.08.021
128. Hsieh VC, Hsieh ML, Chiang JH, Chien A, Hsieh MS. Emergency Department Visits and Disease Burden Attributable to Ambulatory Care Sensitive Conditions in Elderly Adults. *Scientific reports*. 2019;9(1):3811. DOI: 10.1038/s41598-019-40206-4
129. Warshaw G, Mehdizadeh S, Applebaum RA. Infections in nursing homes: assessing quality of care. *The journals of gerontology Series A, Biological sciences and medical sciences*. 2001;56(2):M120-3. DOI: 10.1093/gerona/56.2.m120
130. Trautner BW, Greene MT, Krein SL, Wald HL, Saint S, Rolle AJ, et al. Infection Prevention and Antimicrobial Stewardship Knowledge for Selected Infections Among Nursing Home Personnel. *Infection control and hospital epidemiology*. 2017;38(1):83-8. DOI: 10.1017/ice.2016.228
131. Giri S, Chenn LM, Romero-Ortuno R. Nursing homes during the COVID-19 pandemic: a scoping review of challenges and responses. *Eur Geriatr Med*. 2021;1-10. DOI: 10.1007/s41999-021-00531-2
132. Wang Z. Use the Environment to Prevent and Control COVID-19 in Senior-Living Facilities: An Analysis of the Guidelines Used in China. *Herd*. 2021;14(1):130-40. DOI: 10.1177/1937586720953519
133. Sanchez GV, Biedron C, Fink LR, Hatfield KM, Polistico JMF, Meyer MP, et al. Initial and Repeated Point Prevalence Surveys to Inform SARS-CoV-2 Infection Prevention in 26 Skilled Nursing Facilities - Detroit, Michigan, March-May 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(27):882-6. DOI: 10.15585/mmwr.mm6927e1
134. Blain H, Rolland Y, Schols J, Cherubini A, Miot S, O'Neill D, et al. August 2020 Interim EuGMS guidance to prepare European Long-Term Care Facilities for COVID-19. *Eur Geriatr Med*. 2020;11(6):899-913. DOI: 10.1007/s41999-020-00405-z
135. Collison M, Beiting KJ, Walker J, Huisingh-Scheetz M, Pisano J, Chia S, et al. Three-Tiered COVID-19 Cohorting Strategy and Implications for Memory-Care. *Journal of the American Medical Directors Association*. 2020;21(11):1560-2. DOI: 10.1016/j.jamda.2020.09.001
136. Paananen J, Rannikko J, Harju M, Pirhonen J. The impact of Covid-19-related distancing on the well-being of nursing home residents and their family members: a qualitative study. *Int J Nurs Stud Adv*. 2021;3:100031. DOI: 10.1016/j.ijnsa.2021.100031
137. McGilton KS, Escrig-Pinol A, Gordon A, Chu CH, Zúñiga F, Sanchez MG, et al. Uncovering the Devaluation of Nursing Home Staff During COVID-19: Are We Fuelling the Next Health Care Crisis? *Journal of the American Medical Directors Association*. 2020;21(7):962-5. DOI: 10.1016/j.jamda.2020.06.010
138. Senczyszyn A, Lion KM, Szcześniak D, Trypka E, Mazurek J, Ci-
ułowicz M, et al. Mental Health Impact of SARS-COV-2 Pandemic on Long-Term Care Facility Personnel in Poland. *Journal of the American Medical Directors Association*. 2020;21(11):1576-7. DOI: 10.1016/j.jamda.2020.09.020
139. Kuzuya M, Aita K, Katayama Y, Katsuya T, Nishikawa M, Hirahara S, et al. The Japan Geriatrics Society consensus statement "recommendations for older persons to receive the best medical and long-term care during the COVID-19 outbreak-considering the timing of advance care planning implementation". *Geriatr Gerontol Int*. 2020;20(12):1112-9. DOI: 10.1111/ggi.14075
140. Saliba D, Solomon D, Rubenstein L, Young R, Schnelle J, Roth C, et al. Quality indicators for the management of medical conditions in nursing home residents. *Journal of the American Medical Directors Association*. 2005;6(3 Suppl):S36-48. DOI: 10.1016/j.jamda.2005.03.022
141. Saliba D, Solomon D, Rubenstein L, Young R, Schnelle J, Roth C, et al. Quality indicators for the management of medical conditions in nursing home residents. *Journal of the American Medical Directors Association*. 2004;5(5):297-309. DOI: 10.1097/O1.Jam.0000136960.25327.61
142. Menéndez R, Torres A, Aspa J, Capalastegui A, Prat C, Rodríguez de Castro F. Neumonía adquirida en la comunidad. Normativa de la Sociedad Española de Neumología y Cirugía Torácica (SEPAR). Actualización 2020 Community-Acquired Pneumonia Spanish Society of Pulmonology and Thoracic Surgery (SEPAR) Guidelines 2020 Update. 2020;10. DOI: 10.1016/j.arbres.2020.01.014
143. González-Castillo J, Martín-Sánchez FJ, Llinares P, Menéndez R, Mujal A, Navas E, et al. Guidelines for the management of community-acquired pneumonia in the elderly patient. *Revista española de quimioterapia : publicacion oficial de la Sociedad Española de Quimioterapia*. 2014;27(1):69-86.
144. Tappen RM, Newman D, Huckfeldt P, Yang Z, Engstrom G, Wolf DG, et al. Evaluation of Nursing Facility Resident Safety During Implementation of the INTERACT Quality Improvement Program. *Journal of the American Medical Directors Association*. 2018;19(10):907-13.e1. DOI: 10.1016/j.jamda.2018.06.017
145. Durazzo M, Campion D, Fagoonee S, Pellicano R. Gastrointestinal tract disorders in the elderly. *Minerva Med*. 2017;108(6):575-91. DOI: 10.23736/s0026-4806.17.05417-9
146. Freedberg DE, Kim LS, Yang YX. The Risks and Benefits of Long-term Use of Proton Pump Inhibitors: Expert Review and Best Practice Advice From the American Gastroenterological Association. *Gastroenterology*. 2017;152(4):706-15. DOI: 10.1053/j.gastro.2017.01.031
147. Eusebi LH, Rabitti S, Artesiani ML, Gelli D, Montagnani M, Zagari RM, et al. Proton pump inhibitors: Risks of long-term use. *J Gastroenterol Hepatol*. 2017;32(7):1295-302. DOI: 10.1111/jgh.13737
148. Šubelj M, Učakar V. An outbreak of acute gastroenteritis associated with group A Rotavirus in long-term care facility in Slovenia. *Wien Klin Wochenschr*. 2015;127(11-12):415-20. DOI: 10.1007/s00508-014-0672-8
149. Utsumi M, Makimoto K, Quroshi N, Ashida N. Types of infectious outbreaks and their impact in elderly care facilities: a review of the literature. *Age and ageing*. 2010;39(3):299-305. DOI: 10.1093/

- ageing/afq029
150. Taslim H. Clostridium difficile infection in the elderly. *Acta Med Indones.* 2009;41(3):148-51.
151. Greig JD, Lee MB. Enteric outbreaks in long-term care facilities and recommendations for prevention: a review. *Epidemiology and infection.* 2009;137(2):145-55. DOI: 10.1017/s0950268808000757
152. Bermejo Boixareu C, Tutor-Ureta P, Ramos Martínez A. [Updated review of Clostridium difficile infection in elderly]. *Rev Esp Geriatr Gerontol.* 2020;55(4):225-35. DOI: 10.1016/j.regg.2019.12.003
153. Felsen CB, Dodds Ashley ES, Barney GR, Nelson DL, Nicholas JA, Yang H, et al. Reducing Fluoroquinolone Use and Clostridioides difficile Infections in Community Nursing Homes Through Hospital-Nursing Home Collaboration. *Journal of the American Medical Directors Association.* 2020;21(1):55-61.e2. DOI: 10.1016/j.jamda.2019.11.010
154. Appaneal HJ, Caffrey AR, Beganovic M, Avramovic S, LaPlante KL. Predictors of Clostridioides difficile recurrence across a national cohort of veterans in outpatient, acute, and long-term care settings. *Am J Health Syst Pharm.* 2019;76(9):581-90. DOI: 10.1093/ajhp/zxz032
155. Novakova E, Kotlebova N, Gryndlerova A, Novak M, Vladarova M, Wilcox M, et al. An Outbreak of Clostridium (Clostridioides) difficile Infections within an Acute and Long-Term Care Wards Due to Moxifloxacin-Resistant PCR Ribotype 176 Genotyped as PCR Ribotype 027 by a Commercial Assay. *J Clin Med.* 2020;9(11). DOI: 10.3390/jcm9113738
156. Marincu I, Bratosin F, Vidican I, Cerbu B, Turaiche M, Tirnea L, et al. Predictive Factors for the First Recurrence of Clostridioides difficile Infection in the Elderly from Western Romania. *Medicina (Kaunas).* 2020;56(9). DOI: 10.3390/medicina56090439
157. Grace E, Chahine EB. Updates on Clostridioides (Clostridium) difficile Infection With Emphasis on Long-Term Care. *Sr Care Pharm.* 2019;34(1):29-42. DOI: 10.4140/TCP.n.2019.29
158. Endres BT, Dotson KM, Poblete K, McPherson J, Lancaster C, Bassères E, et al. Environmental transmission of Clostridioides difficile ribotype 027 at a long-term care facility; an outbreak investigation guided by whole genome sequencing. *Infection control and hospital epidemiology.* 2018;39(11):1322-9. DOI: 10.1017/ice.2018.230
159. Donskey CJ, Sunkesula VCK, Stone ND, Gould CV, McDonald LC, Samore M, et al. Transmission of Clostridium difficile from asymptotically colonized or infected long-term care facility residents. *Infection control and hospital epidemiology.* 2018;39(8):909-16. DOI: 10.1017/ice.2018.106
160. Mallia G, Van Toen J, Rousseau J, Jacob L, Boerlin P, Greer A, et al. Examining the epidemiology and microbiology of Clostridium difficile carriage in elderly patients and residents of a healthcare facility in southern Ontario, Canada. *The Journal of hospital infection.* 2018;99(4):461-8. DOI: 10.1016/j.jhin.2018.01.020
161. Guh AY, Mu Y, Baggs J, Winston LG, Bamberg W, Lyons C, et al. Trends in incidence of long-term-care facility onset Clostridium difficile infections in 10 US geographic locations during 2011-2015. *American journal of infection control.* 2018;46(7):840-2. DOI: 10.1016/j.ajic.2017.11.026
162. Asempa TE, Nicolau DP. Clostridium difficile infection in the elderly: an update on management. *Clinical interventions in aging.* 2017;12:1799-809. DOI: 10.2147/cia.S149089
163. König E, Medwed M, Pux C, Uhlmann M, Schippinger W, Krause R, et al. Prospective Surveillance of Healthcare-Associated Infections in Residents in Four Long-Term Care Facilities in Graz, Austria. *Antibiotics (Basel).* 2021;10(5). DOI: 10.3390/antibiotics10050544
164. Engelhart ST, Hanses-Derendorf L, Exner M, Kramer MH. Prospective surveillance for healthcare-associated infections in German nursing home residents. *The Journal of hospital infection.* 2005;60(1):46-50. DOI: 10.1016/j.jhin.2004.09.037
165. McGeer A, Campbell B, Emori TG, Hierholzer WJ, Jackson MM, Nicolle LE, et al. Definitions of infection for surveillance in long-term care facilities. *American journal of infection control.* 1991;19(1):1-7. DOI: 10.1016/0196-6553(91)90154-5
166. Nicolle LE. Infection prevention issues in long-term care. *Current opinion in infectious diseases.* 2014;27(4):363-9. DOI: 10.1097/qco.0000000000000071
167. Nicolle LE, Gupta K, Bradley SF, Colgan R, DeMuri GP, Drekonja D, et al. Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America.* 2019;68(10):1611-5. DOI: 10.1093/cid/ciz021
168. Stevenson KB, Moore J, Colwell H, Sleeper B. Standardized infection surveillance in long-term care: interfacility comparisons from a regional cohort of facilities. *Infection control and hospital epidemiology.* 2005;26(3):231-8. DOI: 10.1086/502532
169. Pigrau C. [Nosocomial urinary tract infections]. *Enfermedades infecciosas y microbiología clinica.* 2013;31(9):614-24. DOI: 10.1016/j.eimc.2012.11.015
170. Bagchi S, Watkins J, Norrick B, Scalise E, Pollock DA, Allen-Bridson K. Accuracy of catheter-associated urinary tract infections reported to the National Healthcare Safety Network, January 2010 through July 2018. *American journal of infection control.* 2020;48(2):207-11. DOI: 10.1016/j.ajic.2019.06.006
171. Hooton TM, Bradley SF, Cardenas DD, Colgan R, Geerlings SE, Rice JC, et al. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America.* 2010;50(5):625-63. DOI: 10.1086/650482
172. Anthony D, Alosoumi D, Safari R. Prevalence of pressure ulcers in long-term care: a global review. *J Wound Care.* 2019;28(11):702-9. DOI: 10.12968/jowc.2019.28.11.702
173. Igarashi A, Yamamoto-Mitani N, Gushiken Y, Takai Y, Tanaka M, Okamoto Y. Prevalence and incidence of pressure ulcers in Japanese long-term-care hospitals. *Arch Gerontol Geriatr.* 2013;56(1):220-6. DOI: 10.1016/j.archger.2012.08.011
174. Ahn H, Cowan L, Garvan C, Lyon D, Stechmiller J. Risk Factors for Pressure Ulcers Including Suspected Deep Tissue Injury in Nursing Home Facility Residents: Analysis of National Minimum Data Set 3.0. *Adv Skin Wound Care.* 2016;29(4):178-90; quiz E1. DOI:

- 10.1097/01.Asw.0000481115.78879.63
175. Lee YJ, Kim JY, Dong CB, Park OK. Developing risk-adjusted quality indicators for pressure ulcers in long-term care hospitals in the Republic of Korea. *Int Wound J*. 2019;16 Suppl 1(Suppl 1):43-50. DOI: 10.1111/iwj.13024
176. Ayello EA. CMS MDS 3.0 Section M Skin Conditions in Long-term Care: Pressure Ulcers, Skin Tears, and Moisture-Associated Skin Damage Data Update. *Adv Skin Wound Care*. 2017;30(9):415-29. DOI: 10.1097/01.Asw.0000521920.60656.03
177. Bates-Jensen BM, Cadogan M, Osterweil D, Levy-Storms L, Jorge J, Al-Samarrai N, et al. The minimum data set pressure ulcer indicator: does it reflect differences in care processes related to pressure ulcer prevention and treatment in nursing homes? *Journal of the American Geriatrics Society*. 2003;51(9):1203-12. DOI: 10.1046/j.1532-5415.2003.51403.x
178. Stotts NA, Rodeheaver GT. Revision of the PUSH Tool using an expanded database. *Pressure Ulcer Scale for Healing. Adv Wound Care*. 1997;10(5):107-10.
179. Maklebust J. PUSH Tool reality check: audience response. *Pressure Ulcer Scale for Healing. Adv Wound Care*. 1997;10(5):102-6.
180. Thomas DR, Rodeheaver GT, Bartolucci AA, Franz RA, Sussman C, Ferrell BA, et al. Pressure ulcer scale for healing: derivation and validation of the PUSH tool. The PUSH Task Force. *Adv Wound Care*. 1997;10(5):96-101.
181. Sussman C. Presenting a draft pressure ulcer scale to monitor healing. *Adv Wound Care*. 1997;10(5):92.
182. Bates-Jensen BM. The Pressure Sore Status Tool a few thousand assessments later. *Adv Wound Care*. 1997;10(5):65-73.
183. Pfungsten-Würzburg S, Pieper DH, Bautsch W, Probst-Kepper M. Prevalence and molecular epidemiology of methicillin-resistant *Staphylococcus aureus* in nursing home residents in northern Germany. *The Journal of hospital infection*. 2011;78(2):108-12. DOI: 10.1016/j.jhin.2011.02.011
184. Greenland K, Rijnders MI, Mulders M, Haenen A, Spalburg E, van de Kasstele J, et al. Low prevalence of methicillin-resistant *Staphylococcus aureus* in Dutch nursing homes. *Journal of the American Geriatrics Society*. 2011;59(4):768-9. DOI: 10.1111/j.1532-5415.2011.03325.x
185. Reynolds C, Quan V, Kim D, Peterson E, Dunn J, Whealon M, et al. Methicillin-resistant *Staphylococcus aureus* (MRSA) carriage in 10 nursing homes in Orange County, California. *Infection control and hospital epidemiology*. 2011;32(1):91-3. DOI: 10.1086/657637
186. Rooney PJ, O'Leary MC, Loughrey AC, McCalmont M, Smyth B, Donaghy P, et al. Nursing homes as a reservoir of extended-spectrum beta-lactamase (ESBL)-producing ciprofloxacin-resistant *Escherichia coli*. *The Journal of antimicrobial chemotherapy*. 2009;64(3):635-41. DOI: 10.1093/jac/dkp220
187. Murphy CR, Quan V, Kim D, Peterson E, Whealon M, Tan G, et al. Nursing home characteristics associated with methicillin-resistant *Staphylococcus aureus* (MRSA) Burden and Transmission. *BMC Infect Dis*. 2012;12:269. DOI: 10.1186/1471-2334-12-269
188. Rodríguez-Villodres Á, Martín-Gandul C, Peñalva G, Guisado-Gil AB, Crespo-Rivas JC, Pachón-Ibáñez ME, et al. Prevalence and Risk Factors for Multidrug-Resistant Organisms Colonization in Long-Term Care Facilities Around the World: A Review. *Antibiotics (Basel)*. 2021;10(6). DOI: 10.3390/antibiotics10060680
189. O'Fallon E, Schreiber R, Kandel R, D'Agata EM. Multidrug-resistant gram-negative bacteria at a long-term care facility: assessment of residents, healthcare workers, and inanimate surfaces. *Infection control and hospital epidemiology*. 2009;30(12):1172-9. DOI: 10.1086/648453
190. Peters C, Schablon A, Bollongino K, Maaß M, Kaß D, Dulon M, et al. Multiresistant pathogens in geriatric nursing - infection control in residential facilities for geriatric nursing in Germany. *GMS hygiene and infection control*. 2014;9(3):Doc22. DOI: 10.3205/dgkh000242
191. Huebner C, Roggelin M, Flessa S. Economic burden of multidrug-resistant bacteria in nursing homes in Germany: a cost analysis based on empirical data. *BMJ open*. 2016;6(2):e008458. DOI: 10.1136/bmjopen-2015-008458
192. Ruscher C, Schaumann R, Mielke M. [The challenge of infections and multiresistant bacteria among the elderly living in long-term care facilities]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*. 2012;55(11-12):1444-52. DOI: 10.1007/s00103-012-1555-7
193. Tacconelli E, Mazzaferri F, de Smet AM, Bragantini D, Eggimann P, Huttner BD, et al. ESCMID-EUCIC clinical guidelines on decolonization of multidrug-resistant Gram-negative bacteria carriers. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. 2019;25(7):807-17. DOI: 10.1016/j.cmi.2019.01.005
194. The White House. NATIONAL STRATEGY FOR COMBATING ANTI-BIOTICRESISTANT BACTERIA. 2014:37. Available at: http://obamawhitehouse.archives.gov/sites/default/files/docs/carb_national_strategy.pdf
195. Lim CJ, Kong DC, Stuart RL. Reducing inappropriate antibiotic prescribing in the residential care setting: current perspectives. *Clinical interventions in aging*. 2014;9:165-77. DOI: 10.2147/cia.S46058
196. Centers for Diseases Control and Prevention. Core Elements of Hospital Antibiotic Stewardship Programs. 2019.
197. Palms DL, Kabbani S, Bell JM, Anttila A, Hicks LA, Stone ND. Implementation of the Core Elements of Antibiotic Stewardship in Nursing Homes Enrolled in the National Healthcare Safety Network. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2019;69(7):1235-8. DOI: 10.1093/cid/ciz102
198. Norman DC, Yoshikawa TT. Fever in the elderly. *Infectious disease clinics of North America*. 1996;10(1):93-9. DOI: 10.1016/s0891-5520(05)70288-9
199. Norman DC, Grahn D, Yoshikawa TT. Fever and aging. *Journal of the American Geriatrics Society*. 1985;33(12):859-63. DOI: 10.1111/j.1532-5415.1985.tb05441.x
200. Outzen M. Management of fever in older adults. *Journal of gerontological nursing*. 2009;35(5):17-23; quiz 4-5. DOI: 10.3928/00989134-20090331-02
201. Montoya A, Cassone M, Mody L. Infections in Nursing Homes: Epidemiology and Prevention Programs. *Clinics in geriatric medicine*.

- 2016;32(3):585-607. DOI: 10.1016/j.cger.2016.02.004
202. Smith PW, Bennett G, Bradley S, Drinka P, Lautenbach E, Marx J, et al. SHEA/APIC guideline: infection prevention and control in the long-term care facility, July 2008. *Infection control and hospital epidemiology*. 2008;29(9):785-814. DOI: 10.1086/592416
203. Hales B, Terblanche M, Fowler R, Sibbald W. Development of medical checklists for improved quality of patient care. *International journal for quality in health care : journal of the International Society for Quality in Health Care*. 2008;20(1):22-30. DOI: 10.1093/intqhc/mzm062
204. Fuentes V et al. Recomendaciones para la Prevención de la Transmisión de Microorganismos Multirresistentes durante la Atención a Residentes Colonizados/Infectados en Centros Residenciales. 2017:75.
205. World Health Organization. Hand hygiene in outpatient and home-based care and long-term care facilities: a guide to the application of the WHO multimodal hand hygiene improvement strategy and the "My Five Moments For Hand Hygiene" approach. 2012.
206. Torres A, El-Ebiary M, Riquelme R, Ruiz M, Celis R. Community-acquired pneumonia in the elderly. *Semin Respir Infect*. 1999;14(2):173-83.
207. Torres OH, Gil E, Comas MT, Saez ME, Clotet S, Ramirez HD, et al. [Impact of a multidimensional intervention in elderly patients with community-acquired pneumonia: IMIEPCAP clinical trial]. *Rev Esp Geriatr Gerontol*. 2016;51(1):37-43. DOI: 10.1016/j.regg.2015.09.004
208. Fūri J, Widmer A, Bornand D, Berger C, Huttner B, Bielicki JA. The potential negative impact of antibiotic pack on antibiotic stewardship in primary care in Switzerland: a modelling study. *Antimicrobial resistance and infection control*. 2020;9(1):60. DOI: 10.1186/s13756-020-00724-7
209. Giry M, Pulcini C, Rabaud C, Boivin JM, Mauffrey V, Birgé J. Acceptability of antibiotic stewardship measures in primary care. *Med Mal Infect*. 2016;46(6):276-84. DOI: 10.1016/j.medmal.2016.02.001
210. Zetts RM, Stoesz A, Garcia AM, Doctor JN, Gerber JS, Linder JA, et al. Primary care physicians' attitudes and perceptions towards antibiotic resistance and outpatient antibiotic stewardship in the USA: a qualitative study. *BMJ open*. 2020;10(7):e034983. DOI: 10.1136/bmjopen-2019-034983
211. Zetts RM, Garcia AM, Doctor JN, Gerber JS, Linder JA, Hyun DY. Primary Care Physicians' Attitudes and Perceptions Towards Antibiotic Resistance and Antibiotic Stewardship: A National Survey. *Open Forum Infect Dis*. 2020;7(7):ofaa244. DOI: 10.1093/ofid/ofaa244
212. Badalona Serveis Assistencials. PROA atención Primaria 2021.
213. Aronow WS. Clinical causes of death of 2372 older persons in a nursing home during 15-year follow-up. *Journal of the American Medical Directors Association*. 2000;1(3):95-6.
214. Braggion M, Pellizzari M, Basso C, Girardi P, Zabeo V, Lamattina MR, et al. Overall mortality and causes of death in newly admitted nursing home residents. *Aging Clin Exp Res*. 2020;32(2):275-80. DOI: 10.1007/s40520-019-01441-x
215. Envejecimiento en Red - EnR. Un perfil de las personas mayores en España, 2019 Indicadores estadísticos básicos. 2019:38. Available at: envejecimiento.csc.es/estadisticas/indicadores/residencias/indez.html
216. Campos-Dompedro JR, JM. RC. Mortalidad en centros residenciales para mayores dependientes: estudio de variables asociadas. . Tesis doctoral T38413 Disertación 2016 Available at: Universidad Complutense de Madrid Servicio de tesis doctorales y publicaciones académicas <https://ucmonworldcat.org/>. 2016.
217. van Dijk PT, Mehr DR, Ooms ME, Madsen R, Petroski G, Frijters DH, et al. Comorbidity and 1-year mortality risks in nursing home residents. *Journal of the American Geriatrics Society*. 2005;53(4):660-5. DOI: 10.1111/j.1532-5415.2005.53216.x
218. Nace DA, Hanlon JT, Crnich CJ, Drinka PJ, Schweon SJ, Anderson G, et al. A Multifaceted Antimicrobial Stewardship Program for the Treatment of Uncomplicated Cystitis in Nursing Home Residents. *JAMA internal medicine*. 2020;180(7):944-51. DOI: 10.1001/jamainternmed.2020.1256
219. Mody L, Greene MT, Meddings J, Krein SL, McNamara SE, Trautner BW, et al. A National Implementation Project to Prevent Catheter-Associated Urinary Tract Infection in Nursing Home Residents. *JAMA internal medicine*. 2017;177(8):1154-62. DOI: 10.1001/jamainternmed.2017.1689
220. Lai CC, Lu MC, Tang HJ, Chen YH, Wu YH, Chiang HT, et al. Implementation of a national quality improvement program to enhance hand hygiene in nursing homes in Taiwan. *Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi*. 2019;52(2):345-51. DOI: 10.1016/j.jmii.2018.09.007
221. Romøren M, Gjelstad S, Lindbæk M. A structured training program for health workers in intravenous treatment with fluids and antibiotics in nursing homes: A modified stepped-wedge cluster-randomised trial to reduce hospital admissions. *PLoS one*. 2017;12(9):e0182619. DOI: 10.1371/journal.pone.0182619
222. Simmons S, Schnelle J, Slagle J, Sathe NA, Stevenson D, Carlo M, et al. AHRQ Comparative Effectiveness Technical Briefs. Resident Safety Practices in Nursing Home Settings. Rockville (MD): Agency for Healthcare Research and Quality (US); 2016.
223. Low LF, Fletcher J, Goodenough B, Jeon YH, Etherton-Bear C, MacAndrew M, et al. A Systematic Review of Interventions to Change Staff Care Practices in Order to Improve Resident Outcomes in Nursing Homes. *PLoS one*. 2015;10(11):e0140711. DOI: 10.1371/journal.pone.0140711
224. McConeghy KW, Baier R, McGrath KP, Baer CJ, Mor V. Implementing a Pilot Trial of an Infection Control Program in Nursing Homes: Results of a Matched Cluster Randomized Trial. *Journal of the American Medical Directors Association*. 2017;18(8):707-12. DOI: 10.1016/j.jamda.2017.03.003
225. Stone PW, Herzig CTA, Agarwal M, Pogorzelska-Maziarz M, Dick AW. Nursing Home Infection Control Program Characteristics, CMS Citations, and Implementation of Antibiotic Stewardship Policies: A National Study. *Inquiry : a journal of medical care organization, provision and financing*. 2018;55:46958018778636. DOI: 10.1177/0046958018778636
226. Dick AW, Bell JM, Stone ND, Chastain AM, Sorbero M, Stone PW. Nursing home adoption of the National Healthcare Safety Network Long-term Care Facility Component. *American journal of infection*

- control. 2019;47(1):59-64. DOI: 10.1016/j.ajic.2018.06.018
227. Wagner LM, McDonald SM, Castle NG. Impact of voluntary accreditation on short-stay rehabilitative measures in U.S. nursing homes. *Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses*. 2013;38(4):167-77. DOI: 10.1002/rnj.94
228. Gastmeier P, Behnke M, Reichardt C, Geffers C. [Quality management for preventing healthcare-acquired infections. The importance of surveillance]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*. 2011;54(2):207-12. DOI: 10.1007/s00103-010-1200-2
229. Gudiol F. [Prudent use of antibiotics and suggestions for improvement in long-term-care facilities]. *Enfermedades infecciosas y microbiología clínica*. 2010;28 Suppl 4:32-5. DOI: 10.1016/s0213-005x(10)70040-9
230. European Centre for Disease Prevention and Control (ECD). Protocol for point prevalence surveys of healthcare-associated infections and antimicrobial use in European long-term care facilities. Version 2.1. 2015:60.
231. Fu CJ, Agarwal M, Dick AW, Bell JM, Stone ND, Chastain AM, et al. Self-reported National Healthcare Safety Network knowledge and enrollment: A national survey of nursing homes. *American journal of infection control*. 2020;48(2):212-5. DOI: 10.1016/j.ajic.2019.08.016
232. Stone PW, Chastain AM, Dorritie R, Tark A, Dick AW, Bell JM, et al. The expansion of National Healthcare Safety Network enrollment and reporting in nursing homes: Lessons learned from a national qualitative study. *American journal of infection control*. 2019;47(6):615-22. DOI: 10.1016/j.ajic.2019.02.005
233. Mukamel DB, Ye Z, Glance LG, Li Y. Does mandating nursing home participation in quality reporting make a difference? Evidence from Massachusetts. *Medical care*. 2015;53(8):713-9. DOI: 10.1097/mlr.0000000000000390
234. Sánchez Ferrín P, Fontecha Gómez BJ. [Infection epidemiology in gerontology centers]. *Rev Esp Geriatr Gerontol*. 2011;46(2):61-2. DOI: 10.1016/j.regg.2010.12.003
235. Comas-Herrera A, Fernandez JL, Hancock R, Hatton C, Knapp M, McDaid D, et al. COVID-19: Implications for the Support of People with Social Care Needs in England. *J Aging Soc Policy*. 2020;32(4-5):365-72. DOI: 10.1080/08959420.2020.1759759