

**The role of nurses in the prevention of multidrug-resistant microorganisms in an intensive care unit**

*El papel de los enfermeros en la prevención de microorganismos multirresistentes en una unidad de cuidados intensivos*

*A atuação do enfermeiro na prevenção de microrganismos multirresistentes em unidade de terapia intensiva*

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**Submission:** 01-05-2022**Approval:** 02-22-2022**Abstract**

The aim was to describe the risk factors for infection, describe how the spread occurs and propose improvements for quality work performed by professionals, in order to reduce the number, length of stay and number of deaths. In addition, seek to qualify the team so that they provide care based on scientific knowledge, adopting actions, planning measures and execution of the care provided. Through effective communication where everyone speaks objectively and clearly, so that there is quality and effectiveness in actions and reduce the proliferation of multi-resistant organisms.

**Descriptors:** Cross Infection; Intensive Care Units; Hospital Infection Control Program; Nursing; Nursing Care.

**Resumén**

El objetivo fue describir los factores de riesgo para la infección, describir cómo se produce la propagación y proponer mejoras para la calidad del trabajo realizado por los profesionales, con el fin de reducir el número, la estancia y el número de muertes. Además, buscar capacitar al equipo para que brinde una atención basada en el conocimiento científico, adoptando acciones, medidas de planificación y ejecución de la atención brindada. A través de una comunicación efectiva donde todos hablen con objetividad y claridad, para que haya calidad y eficacia en las acciones y se reduzca la proliferación de organismos multirresistentes.

**Descriptores:** Infección Hospitalaria; Unidades de Cuidados Intensivos; Programa de Control de Infecciones Hospitalarias; Enfermería; Atención de Enfermería.

**Resumo**

Objetivou-se descrever os fatores de risco de infecção, descrever como ocorre a disseminação e propor melhorias para um trabalho prestado com qualidade pelos profissionais atuantes, a fim de reduzir o número, tempo de internação e número de óbitos. Além disso, buscar qualificar a equipe de forma que prestem cuidados baseados em conhecimento científicos, adotando ações, medidas de planejamento e execução do cuidado prestado. Por meio de uma comunicação eficaz onde todos falam de forma objetiva e clara, para que tenha qualidade e efetividade nas ações e reduzam a proliferação de organismos multirresistentes.

**Descritores:** Infecção Hospitalar; Unidades de Terapia Intensiva; Programa de Controle de Infecção Hospitalar; Enfermagem; Cuidados de Enfermagem.

## Introduction

The nosocomial infection (HI) related to health care is any infection that is acquired after the hospitalization period, the infection can manifest during the hospitalization period or after hospital discharge.

The patient is susceptible to this type of disease for several reasons, whether physiological, such as an imbalance of the human microbiota, related to the patient's clinical status, invasive procedures, and physical, such as the environment, health team and materials used to manipulate them.

The highest prevalence of HI is within the Intensive Care Unit (ICU), around 30% of all infections reported in hospitals<sup>1</sup>.

This occurs because in the ICU there are patients in more serious health conditions that require care and continuous monitoring, have undergone invasive procedures or are unstable, requiring continuous support to maintain vital functions.

Antimicrobial resistance is one of the most persistent problems in the hospital environment, more precisely in the ICU, and this affects the whole world, quickly causing other types of pathology with major clinical consequences. That is why it is important to know the microbial profile of each infection to guide the chosen treatment. There are often errors in prescriptions or culture is not requested to know for sure which type of microorganism is being colonized.

The treatment chosen ends up being inadequate and, in most cases, it becomes harmful to the patient's body, especially in more severe patients<sup>2</sup>.

It should be noted that throughout history many antibiotics have been inserted in the care of infections. Thus, with the advancement of science, they made it possible to save lives and prevent the worsening of a patient's clinical condition. The inappropriate use of diagnostic and therapeutic resources significantly increases the risk of infection, the administration of antibiotics that do not match the particular type of microorganism, or self-medication end up favoring the multiplication of microorganisms resistant to certain groups of antibiotics<sup>3</sup>.

It is necessary to understand the causes and the aggressive agents for each response of the organism, varying from one organism to another, since one of the factors is the immune system, mainly the microbiota of the place, since the initial infection is installed depending on the response of the host's immune system, which, if the response is already critical, will be an infectious and lasting process, depending on the underlying pathology.

The infection is developed in the patient's body, which can be acquired in the community or in the hospital setting. In these two situations, colonization will result in an imbalance between the defense system and the organism, when subjected to treatments and hospitalizations, it settles in the place<sup>4</sup>.

In view of the team's performance in preventing the proliferation and occurrence of infections, there is the Infection Control Service Related to Health Care (SCIRAS) team, a multidisciplinary team composed of formally appointed higher-level health professionals.

In institutions with a number equal to or less than 70 beds, the members can be composed of a doctor and a nurse with the function of promoting effective actions to reduce cases of Health Care-Related Infections (HAI) and proliferations, training the team.

The nurse, in turn, must train his team by inserting Standard Operating Procedures (SOP), qualifying and optimizing the correct use of PPE, hand hygiene, equipment and isolation, continuing education to comply with the imposed measures.

Therefore, the role of nurses in the prevention committee is essential for the prevention of HI, thus reducing the prevalence of bacterial resistance within the ICU and improving the quality of life of patients and professionals<sup>5</sup>.

This review was designed to describe the work of nurses in the prevention and treatment of patients with multidrug-resistant microorganisms within the Intensive Care Unit (ICU). In addition, describe the importance of updating and quality care based on scientific knowledge, with a critical eye to promote care and treatments with better results, in order to reduce infection and proliferation of multidrug-resistant microorganisms.

## Methodology

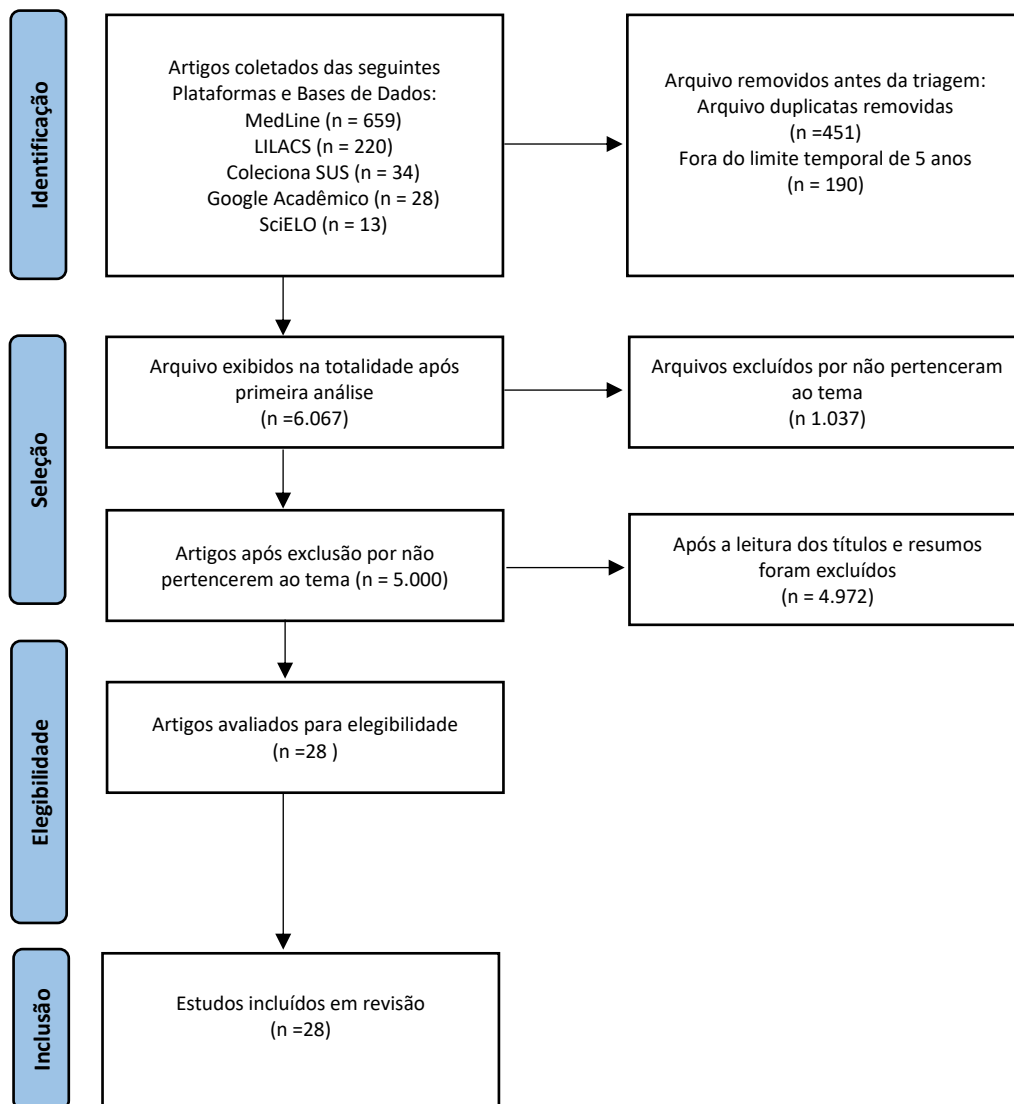
This is an integrative literature review. The search for articles took place between March and May 2021, in online databases such as Google Scholar, Scientific Electronic Library Online (SciELO), Latin American and Caribbean Literature on Health Sciences (LILACS), Coleciona SUS, National Portal of the Virtual Health Library (VHL).

In addition, public education policies were sought to address this context, using the subsequent Descriptors in Health Sciences (DeCS) and Medical Subject Headings (MeSH): nosocomial infection; Intensive care unit, microorganism control agents, bacterial resistance, using the Boolean operator "AND".

The inclusion criteria established were: full texts and available in the databases mentioned above, in Portuguese and English published in the last 5 years in order to bring up-to-date data, which addressed the topic of multidrug-resistant microorganisms within the ICU and the role of nurses, which could answer the research question carried out through the PICO strategy: What are the measures and actions of trained and updated nurses in the context of ICU patients with multidrug-resistant infections, and the importance of control and treatment?

124 foreign language articles that did not agree with the central theme were excluded, the others were excluded after reading the abstract, however, texts that would not contribute to the research were excluded.





## Results

The information extracted from the studies were: title of the article, name of the authors, publication date, objective of the studies, main results and conclusion that were compiled into a table in Microsoft Word software.®.

For the elaboration of this integrative review, the following steps were followed: 01- Choice of the central theme to approach the subject; 02- Search for articles that match the theme; 03- selection of articles through exclusion by date, language and articles that do not match the central theme; 04- extraction of relevant information from each article; 05- Ordering of subjects; 06-Review of the results obtained.

**Chart 1.** Compilation of data obtained through the selection of articles for review. Ribeirão Preto, SP, Brazil, 2021

Title	Author	Year	Objective	Results	Conclusion
Impacto de estratégias multimodais para reduzir organismos multirresistentes em unidades de terapia intensiva cirúrgicas	Nongyao Kasatpibal, Kaweesak Chittawatwanarat, Nantana Nunngam, Daranee Kampeerapanya, Nongnut Duangsoy, Chanban Rachakom, Ubonrat Soison, Anucha Apisarnthanarak	2021	The effects of multimodal strategies on knowledge and practices in preventing transmission of multidrug resistant organisms (MDRO) among healthcare professionals (HCP), and to investigate MDRO transmission in two surgical intensive care units (SICUs).	After the intervention, median knowledge scores increased from 16.0 to 17.0 ( $p = 0.001$ ), and overall correct MDRO prevention practices increased from 76.6% to 94.0% ( $p < 0.001$ ). The MDRO transmission rate decreased from 25% to 0% ( $p < 0.001$ ).	Multimodal strategies can increase knowledge and practices to prevent MDRO transmission between HCPs and can reduce the rate of MDRO transmission in SICUs.
Impacto de medidas de limpeza e desinfecção ambientais unificadas e multicêntricas em infecções nosocomiais	Jing Huang, Can Cui, Shuli Zhou, Ming Chen, Hao Wu, Ronghua Jin, Xinyue Chen	2020	This study investigated the relationship between multidrug-resistant organism (MDRO) colonization in intensive care unit (ICU)	There were fewer MDRO homologues in the cleaning group than in the control group. In addition, the cleaning group had a shorter	Improved environmental cleaning and disinfection could reduce environmental MDRO buildup and suppress



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entre pacientes em unidades de terapia intensiva			patients and ICU surface bacterial contamination status.	ICU stay and a significantly lower mortality rate.	MDRO colonization in ICUs, thereby reducing nosocomial infections and improving adverse patient outcomes.
Intervenções de enfermagem no controle da sepse na unidade de terapia intensiva	Ana Claudia Souza Lopes Lima, Carina Marinho Picanço	2013	To identify nursing interventions in the control of sepsis in the Intensive Care Unit.	The nurse assumes responsibility for implementing the packages of measures (prevention Bundles), advising on the importance of these measures for patient safety.	There is a need to value knowledge and the systematic applied to health care, as there is a call for awareness of the entire team, namely, that nursing actions save lives.
Avaliação pré e pós-COVID-19	Gilberto Gambero Gaspar	2021	To compare health-related infections (HCRIs) reported between January 2018 and January 2020.	Antimicrobial resistance increased during the pandemic, especially for <i>Klebsiella pneumoniae</i> isolates.	The susceptibilities of major pathogens associated with HCRIs in the ICU have changed and should be considered in the treatment of COVID-19.
O enfermeiro na prevenção de infecções em terapia intensiva	Mariléia Stube, Carina Talice Stube Herman, Eliane Raquel Rieth Benetti, Eniva Miladi Fernandes Stumm	2016	To evaluate the actions of nurses regarding the prevention of infections in intensive care units.	The results of this research signaled changes that can and should be carried out by nurses working in intensive care.	Among the activities that can be carried out, we highlight the formation of study groups in line with the CCIH.
Resistência Bacteriana	Marcela Ramos	2020	Describe how bacterial resistance occurs.	Once the most frequent bacteria and their characteristics are known, it is possible to adopt strategies to prevent infections during the patient's hospitalization.	Continuing education and training of health professionals present in the hospital is essential to avoid hospital infections.
Atuação do enfermeiro no controle de infecção hospitalar em unidade de terapia intensiva (UTI)	Julio Borges de Oliveira, Terezinha RibeiroFrancalino, Maria Luiza Ferreira da Silva, Antônio Carlos de Araújo Júnior	2016	The importance of nursing professionals in the control and improvement of HAIs.	Errors are possibly due to an excessive working day.	We conclude with the certainty that it is vital to value the work of the team of professionals.
Controle De Infecções Relacionadas à Assistência À Saúde (PNPCIRAS) 2021 a 2025	Technical Team GVIMS/GGTES/Anvisa	2021	Define national strategic goals and actions for the prevention and control of HAI and MR in health services for the period from 2021 to 2025.	This Operational Plan aims to direct the activities to be developed by GGTES/ANVISA, in partnership with state/district/municipal coordinations for HAI control.	Considering the evaluation of the results obtained by PNPCIRAS 2016-2020 and based on the best available scientific evidence.
A atuação do enfermeiro na prevenção de infecção hospitalar em UTI adulto	Bárbara da Silva e Silva Cunha, Lúcia de Fátima da Silva Andrade	2011	To identify the impact of nurses on hospital infection prevention processes in an Intensive Care Unit.	The research complied in all aspects with Resolution No. 196/96 on research with human beings, which highlights ethical principles in research with human beings, and was authorized by the hospital's management.	The nurse as a health professional proves to be important in the process of hospital infection control in the ICU.
<i>Acinetobacter</i> : o que é, sintomas, como acontece a infecção e tratamento	Marcela Lemos	2021	Describe about <i>Acinetobacter</i> and how the infection occurs.	Recently, phage therapy was effective in the treatment of multidrug-resistant <i>Acinetobacter baumannii</i> , in which bacteriophages were able to eliminate the bacteria.	Each bacteriophage is responsible for fighting one or a group of bacteria and, therefore, in the treatment of diseases, a "cocktail" of bacteriophages can be made.

**Discussion**

After the tabulation of the articles found, the exhaustive reading of the data contained in the table and the analysis of the information contained therein, 03 categories emerged for thematic discussion, they are: The importance of nurses in the correct technique of hand hygiene and equipment such as main way of preventing the spread of multidrug-resistant microorganisms; The nurse as responsible for updating and training professionals based on scientific evidence in the care of patients in the Intensive

Care Unit; Optimization of Communication between the professional nurse and the multidisciplinary team in order to reduce the spread of multidrug-resistant microorganisms.

**The importance of nurses in the correct technique of hand hygiene and equipment as the main way to prevent the spread of multiresistant microorganisms**

When we talk about the prevention of multi-resistant bacteria, the main form of prevention cited in 100% of the articles is the 05 moments of hand hygiene. In a study,



there is a description of these moments that must be performed and their importance. The table included in the research shows the types of PPE and in which sectors they are used, and hand hygiene is found in all sectors. In line with this, another study indicates the importance of nurses (a) as a pivot in the knowledge of diseases and the impact they affect on our lives, because if professionals work with knowledge of what can happen, care is greater, and not use care only by protocol, but awareness<sup>6,7</sup>.

According to data obtained in another study, an Intensive Care Unit where two groups of patients were selected, the patients who stayed longer in the hospital, where the place was not properly cleaned, exhibited the same strain as the objects frequently handled within the ICU, the infection rate increased by 25% in patients with more than 48 hours of hospitalization<sup>8</sup>.

### **The nurse as responsible for updating and training professionals based on scientific evidence in the care of patients in the Intensive Care Unit**

The nurse is responsible for the team that works within the ICU, so it is up to him to carry out strategies to train the team, with the aim of preventing infection and dissemination of superbacteria. It is extremely important for nurses to look critically at ICU patients, as they are more exposed to invasive and immunosuppressed mechanisms. They should be aware of the signs and symptoms of infection, know when isolation of these patients should be carried out and what types of precautions will be taken in order to prevent horizontal transmission.

For the continued education of their team, it is important for nurses to be always up to date to carry out training and take data based on scientific knowledge and elaboration of SOPs for the awareness of the team. Also, prepare internal evaluations and bring doubts and problems to be discussed and solved. With the results, draw up an action plan to optimize the service provided. Nurses must always be open to suggestions and work together with the multidisciplinary team. The adoption of preventive methods reduces the number of infections and reduces hospitalization time, reducing financial costs for the institution.

The team's efforts in the prevention and control of infection in their work sector are reflected in all other sectors and are related to health promotion and mortality reduction.

### **Optimization of Communication between the professional nurse and the multidisciplinary team in order to reduce the spread of multidrug-resistant microorganisms**

Improved communication between teams is essential for good care. Through dialogue, it is possible to discuss the patient's health status, improving the relationship between all the members of the multidisciplinary team, improving the assistance provided, mainly in the shift changes so that there is no pending and the service is continuous, maintaining the quality and effectiveness in actions.

The nurse should guide the team on the correct way of handing over the shift, handling and caring for patients,

avoiding measures that may weaken care. Thus, carelessness that could lead to contamination by multidrug-resistant microorganisms is avoided.

Therefore, team attitudes regarding the use and scheduling of antibiotics, always paying attention to their correct indications for certain microorganisms and establishing effective communication should be used by health professionals. Thus, care work will be facilitated and it becomes a work tool for the continuity of the shift and quality in the care provided, avoiding cross-infection or infections due to incorrect use of antibiotics.

### **Intensive Care Unit**

The Intensive Care Unit (ICU) is a closed unit for complex care, it serves to accommodate patients with unstable health status and who need constant monitoring, with some type of compensation. It is divided according to the case (adult, pediatric and neonatal) in some hospitals it can be divided according to the specialty and can be surgical, cardiology, neurological, for example. It provides continuous treatment, 24-hour monitoring, specific equipment for each case and need, where specialized and trained professionals work in the area.

The Intensive Care Unit was created from the "Post Anesthetic Recovery Rooms" where patients were monitored after neurosurgery at Johns Hopkins Hospital in 1926 by Dr. Walter Dandy to bring critical patients closer to healthcare professionals to facilitate and improve care and monitoring<sup>9</sup>.

The ICU is an important space for nursing activities, where the nurse is responsible for training and organizing the team, leadership and decision-making. That is why it is important that they are qualified professionals in the area and are prepared for any intercurrent. The quality of the service provided has a direct impact on the health and safety of the patient, and of the professional himself. Therefore, it is important to exchange correct information and a well-trained and organized team.

All people entering the Intensive Care Unit must take special care with hygiene, wear specific clothes, personal protective equipment (PPE), and perform hand hygiene every time they perform a procedure or whenever they have direct contact with the patient with the purpose in the prevention and reduction of microorganisms circulating in the place<sup>5</sup>.

### **Personal Protective Equipment**








Personal Protective Equipment (PPE) is essential in the hospital environment, especially in an Intensive Care Unit. They are surgical mask or N-95, long-sleeved waterproof apron, goggles or easy protector, disposable procedure gloves and hand hygiene that must be performed with soap and water before and after contact with the patient.

It is the care of all patients, regardless of the underlying pathology. These premises, therefore, are intended to minimize exposure to pathogens, especially respiratory pathogens such as COVID-19. PPE is for individual



use and must be changed whenever you finish the procedure or come into contact with another patient<sup>6</sup>.

Figure 2. List of PPE per professional. Ribeirão Preto, SP, Brazil, 2021

Trabalhadores envolvidos nos atendimentos	Equipamentos de Proteção Individual						
							
Triagem (se não for possível manter a distância mínima de um metro dos pacientes com sintomas gripais): Incluem-se recepcionistas, ACS, ACE, motoristas, administrativo e segurança)	X	X					
Avaliação e atendimento de casos suspeitos (técnicos de enfermagem, enfermeiros, médicos...)	X	X	X	X	X		
Procedimentos geradores de aerossóis (técnicos de enfermagem, enfermeiros, médicos...)	X		X	X	X	X	X
Manejo de Pacientes Críticos (Emergência e UTI)	X		X	X	X	X	X
Atividades de apoio realizadas a menos de 1 metro dos pacientes suspeitos ou confirmados (ACE, ACS e motoristas)	X	X	X	X	X		

Source: Ministry of Health.

### Hospital Epidemiological Surveillance

According to the Federal Official Gazette, Ordinance No. 1693, of July 23, 2021, the Hospital Epidemiological Surveillance (VEH) was included in the Epidemiological Surveillance in order to strengthen it in the hospital environment. The VEH consists of an aggregation of services that detects the need for individual or collective changes, which will be carried out by the Hospital Epidemiology Nuclei (NHE) with the aim of developing strategies and collecting data for new strategies and plans to strengthen health surveillance. . The activities performed are: elaborating an epidemiological diagnosis of the hospital unit, implementing and reviewing its work plan annually, adopting the flow of notification of diseases and conditions of compulsory notification (DNC) and events of interest to public health established by the Ministry of Health, notify cases and deaths that occurred in hospitals, opportunely feeding the official notification systems of the Health Agency. In addition, to develop and maintain an active search system for the detection of infections, adverse events, diseases and notifiable diseases and work-related injuries in patients hospitalized and treated in emergency rooms, inpatient units and outpatient clinics. In addition, to elaborate and maintain an active search operation for the detection and notification of deaths that occurred in the hospital environment, monitor, evaluate and disseminate the profile of hospital morbidity and mortality<sup>10</sup>.

### SCIRAS and CCIRAS

According to Law No. 9431, of January 6, 1997, it describes the obligation of the Service for the Control of Infections Related to Health Care, in all hospitals in the country, due to the risk offered within the hospital environment for the user and the healthcare team, health services they provide. The ordinance describes that the

Unified Health System (SUS) is responsible for actions and promotions for the prevention of diseases and infections.

Carry out inspection involving health surveillance and other services provided by the municipality of each hospital and developing inspection activities in accordance with the quality and safety requirements of services provided to patients. The role of the Infection Control Service Related to Health Care is to develop measures and actions to control infections in the hospital environment. The team must be composed of medical service, nursing service, pharmacists, laboratory service and microbiology and administration.

If the number of beds is equal to or less than 70 (seventy) it can only be composed of the medical service and the nursing service, both qualified and specialized. It is up to SCIRAS to prepare and adapt the hospital infection prevention program according to the needs of each hospital, together with the Commission for the Control of Infections Related to Health Care (CCIRAS) which determines actions to be followed.

Yet another function of this inspection body and health actions is the implementation of the Sanitary Surveillance program according to the protocol and the supervision of the service provided and training the team in the prevention and routines of each sector. In addition, supervise the rational use of antibiotics and hospital products, investigate and track disease outbreaks, propose and implement improvements, define ways of antimicrobial control together with the Pharmacy Commission, carry out audit visits in the sectors to ensure the safety of the service. provided, carry out the elaboration of an internal hospital infection control commission. Thus, holding monthly or biweekly meetings with all sectors to collect data and numbers of cases of infections related to hospital care.



Notifications to the Health and Epidemiological Surveillance Service of cases and suspected diseases according to protocols established by the institution to ensure the implementation of the measures imposed in each sector. Also, establish forms of evaluation and gather information for indicators.

O enfermeiro é essencial frente à Comissão de Controle de Infecção Relacionada a Assistência à Saúde, na coordenação, acompanhamento e avaliação, na garantia da prevenção e educação em saúde e, assim, garantir o funcionamento do programa em hospitais públicos e privados<sup>11</sup>.

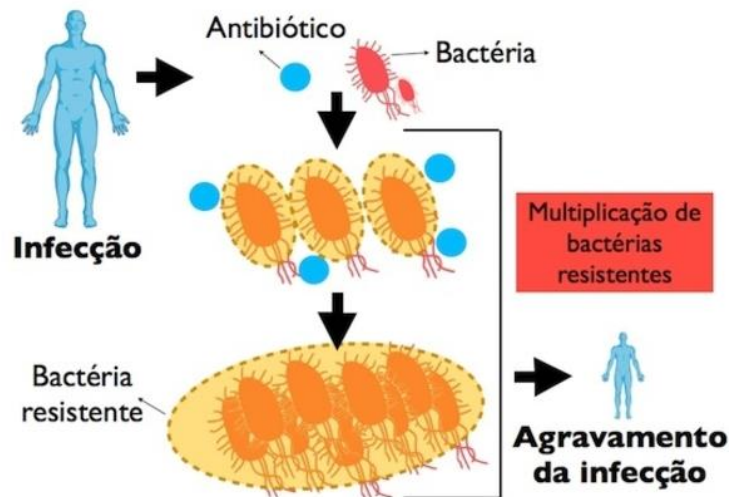
### Bacterial resistance

Bacterial resistance is the ability of the bacterium to resist some type of action or antibiotic due to a mechanism of mutation and actions in which it starts to adapt. This is due

to the incorrect use of antimicrobials, and thus establishes a mechanism for the multiplication of resistance microorganisms. Therefore, the action of the antibiotic in use is no longer effective in the treatment of the infection, which may delay the length of stay and lead to a worsening in the patient's clinical condition.

When the antibiotic is chosen and administered correctly, the bacteria are weakened and their multiplication is delayed or eliminated from the body. On the contrary, the bacteria starts to multiply even in the presence of antibiotics, which can cause even more serious infections that are difficult to treat because of their resistance. There are bacteria that are resistant to just one type of antibiotic and those that are resistant to multiple strains. These, called superbugs or multidrug-resistant bacteria, such as *Klebsiella*<sup>12</sup>.

Figure 3. Bacterial resistance. Ribeirão Preto, SP, Brazil, 2021



Source: Ministry of Health.

In 2015, the World Health Organization (WHO) carried out a global plan for the prevention of antimicrobial resistance. The plan provides educational measures for professionals to promote guidance and training in the form of training. The objective is to raise the awareness of professionals about the severity of antimicrobial resistance and inappropriate use of antibiotics. It should encompass all professionals from all hospital sectors. One of the reasons for misuse is the lack of knowledge or outdated information, hospital facilities facilitate the proliferation of microorganisms, the environment can limit some measures, such as distancing. Therefore, it is important that the plan encompasses all areas to address these challenges in order to control the spread of bacteria and prevent bacterial resistance<sup>13</sup>.

Bacterial resistance can affect people of any age, and it cannot be completely prevented. However, some people are at greater risk of infections than others who undergo invasive procedures, surgeries, and long hospital stays. According to analyzed studies, by 2050, more than 10 million people will die each year because of bacterial

resistance, that is, a number greater than the number of cancer deaths per year<sup>14</sup>.

### How does antibiotic resistance happen?

Bacterial resistance occurs due to the misuse of antibiotics, that is, without medical advice, incorrect prescription of the same, incompatible dosages or not respecting the administration schedule, in addition to the abandonment of the treatment<sup>12</sup>.

In this way, the mechanism of adaptation and resistance of the bacteria against the antibiotic that was used may occur. These interruptions and non-adherence to adequate treatment affect the body with the proliferation of bacteria, which become resistant to other types of antibiotics<sup>12</sup>.

### Bacterial resistance in patients with COVID-19

SARS-CoV-2 emerged in the world in 2019. However, the first case in Brazil occurred in February 2020, patients who were hospitalized usually have comorbidities. Many patients who were hospitalized need invasive procedures such as Mechanical Ventilation and Central

Venous Access, due to the involvement of the lungs by the virus. These patients can acquire bacterial infections, so an infection caused by a virus can turn into a bacterial infection due to the length of hospital stay and invasive procedures. Thus, health services are overloaded, due to inadequate care and lack of professionals and lack of resources. COVID-19 has resulted in a high rate of insertion of antibiotic therapy within the ICU for patients in critical conditions due to

Respiratory Syndrome, leading to a large increase in antimicrobial resistance and increased mortality rates<sup>15</sup>.

The following table compares rates of Staphylococcus Aureus resistance to Oxacillin, Acinetobacter Baumannii resistance to Carbapenems and Klebsiella pneumoniae resistance to Polymyxin B between January 2018 and July 2020 in an Intensive Care Unit in a hospital in Ribeirão Preto, SP, Brazil, Brazil.

**Table 1.** Increased resistance during hospitalization for COVID-19. Ribeirão Preto, SP, Brazil, 2021

Microorganisms	Resistance rate (%)
Resistance of Staphylococcus aureus to oxacillin	35/47 (74,4%)
Resistance of Acinetobacter baumannii to carbapenem	136/173 (78,6%)
Klebsiella pneumoniae resistance to carbapenemases	153/246 (62,1%)
Polymyxin B resistance of Klebsiella pneumoniae	37/246 (15,0%)

Source: Anvisa.

### Acinetobacter baumannii

Acinetobacter is a type of bacteria frequently acquired in the hospital environment, called Health Care Related Infection (IRAS) currently present in 31 species. The Acinetobacter Baumannii species is resistant to most antibiotics used so far. It is a bacterium that affects the respiratory system causing difficulty breathing and chest pain, also the urinary system and bloodstream causing pain when urinating, cloudy urine, fever, dizziness and nausea. Therefore, it is very important to evaluate signs and symptoms, request specific tests for early detection so that treatment can be started as soon as possible, so that the clinical picture does not worsen.

Hands are the main source of contamination as they touch surfaces contaminated by an infected person and pass it on to another. Acinetobacter Baumannii is typically found in patients admitted to the Intensive Care Unit for long periods of stay, because it affects people with a fragile immune system, with tracheostomy, skin wounds, use of a catheter and who breathe with the help of devices and usually stay in the lungs.

The bacteria is adhered to the catheter forming biofilms, as it is very resistant, it quickly multiplies, increasing

the length of hospital stay and causing complications. As this bacterium is resistant to antibiotic therapy, a treatment option is by bacteriophages, which are basically viruses that have the ability to fight Acinobacter bacteria, improving the person's quality of life. It is an old treatment, however, effective because of bacterial multidrug resistance. The person affected by this bacterium must be isolated with precaution by contact to carry out the treatment<sup>16</sup>.

Acinetobacter baumannii are resistant to Carbapenems, which are the drugs that belong to penicillins, cephalosporins and monobactams, which are the broadest in terms of antibiotic therapy. The WHO classifies as urgent the creation of new antibiotics for the treatment of infections caused by this bacterium.

Currently, only ten drugs are possible to be inserted. Studies are being carried out for the inclusion of new treatments such as polymyxins, tigecycline, eravacycline and cefiderocol<sup>17</sup>.

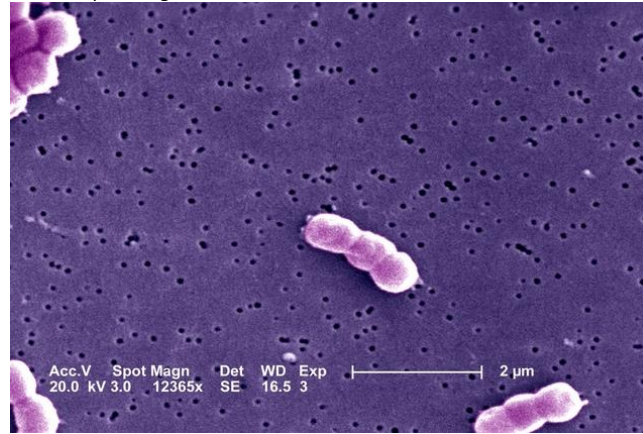
For the prevention of Acinetobacter baumannii, it is necessary to take extra care of health professionals in the management of patients. Hygienize your hands very well, always use PPE, pay attention to the correct cleaning of equipment and respirators used by patients colonized by the bacteria in question<sup>18</sup>.

**Figura 4.** Mode of transmission of Acinetobacter baumannii. Ribeirão Preto, SP, Brazil, 2021



Source: RBAC Journal.





### The nurse in ICU infection control

It is known that, in the hospital environment, hand hygiene, antiseptic measures and equipment asepsis are very strict, and very charged in all sectors. Small measures that seem simple can save lives and shorten a patient's hospital stay. When these disinfection and cleaning measures were totally unknown, the mortality rate was extremely high, patients were hospitalized and affected by pathologies, which today are known as infections acquired in the hospital environment<sup>5</sup>.

For control and prevention, it is first necessary to understand that infections are classified as endogenous (the patient's own microorganism) and exogenous (microorganisms foreign to the patient's organism). The most common infections acquired in the ICU environment are respiratory tract (pneumonia) due to ventilatory support, catheter-associated urinary tract infection (UTI) and bloodstream infections due to invasive devices and these accounts for 60% of cases of infection inside the ICU.

These patients are constantly undergoing invasive procedures, consequently increasing the risk of exposure. Several types of microorganisms cause nosocomial infections, but the ones that most affect are those of the human microbiota itself, that is, the microorganisms most present in the environment as an Intensive Care Unit are Gram-positive coccus (*Staphylococcus*), normally found in the skin and bacilli gram negative (*Enterobacter* sp) found in the mucous membranes, and cause pneumonia and inflammation<sup>5</sup>.

Thinking about the care provided to patients and their safety in the practice of techniques, nurses must develop measures to maintain, through actions and

techniques of their practices, the safety of the professional to avoid cross-contamination.

It is extremely important to use PPE when handling patients in the ICU, given that most hospitalized patients have compromised immune systems. Therefore, the less direct contact with the patient, the better for their safety. When coming into contact with another patient, Personal Protective Equipment must be changed and sanitized. However, lucid patients need psychological support, provided by the unit's nurse, the patient must be informed about their conditions, and that precautions must be taken for their own safety. Doubts must be clarified to avoid feeling lonely. Therefore, organization and educational strategies are important in order to promote information and skills necessary for the prevention of infections within the Unit<sup>7</sup>.

### Conclusion

The nurse is the main point when it comes to the prevention of multidrug-resistant microorganisms in the ICU. It is of great importance both in prevention and in raising awareness of the entire team, so continuing education is essential for a well-trained team and SCIRAS performs this service through training and lectures, in addition to providing care to critically ill patients. Based on everything that was previously seen during the research carried out, it can be said that a trained team, with effective communication, works with a focus on preventing infections, drastically reducing the rate of circulating multidrug-resistant microorganisms and thus reducing the mortality rate in hospitalized patients in ICU. It promotes, therefore, shorter hospitalization time and avoids other types of diseases and consequently reduces financial costs for the institution.

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