v. 1, n. 4, 2021

International Journal of Health Science

THE USE OF MEROPENEM IN AN INTENSIVE CARE CENTER IN A HOSPITAL UNIT IN CAMPOS DOS GOYTACAZES-RJ

Ronald de Oliveira
Universidade de Vassouras
Vassouras - RJ
https://orcid.org/0000-0002-9996-1228

André Luiz Vargas
Faculdade de Medicina Campos
Campos dos Goytacazes – RJ
http://lattes.cnpq.br/7438086003437669

Shalline Hermes Sampaio
Universidade Estadual do Norte Fluminense
Campos dos Goytacazes – RJ
http://lattes.cnpq.br/5999153924625665

Paulo Roberto Hernandes Júnior
Universidade de Vassouras
Vassouras – RJ
http://lattes.cnpq.br/7418862771895322

Juliana de Souza Rosa
Universidade de Vassouras
Vassouras – RJ
http://lattes.cnpq.br/5946602186499173

Hugo Felipe França de Souza
Universidade de Vassouras
Vassouras – RJ
https://orcid.org/0000-0003-0411-2942

Athaluama Pires da Silva Inocencio
Universidade de Vassouras
Vassouras – RJ
http://lattes.cnpq.br/4205715560898691

Michel Rodrigues Fassarella
Universidade Iguaçu
Itaperuna – RJ
http://lattes.cnpq.br/2851504343771226

Bruno Pereira Siqueira
Universidade Iguaçu
Itaperuna – RJ
http://lattes.cnpq.br/4962363680047642

Eveline de Almeida Luz
Hospital São José do Avaí
Itaperuna – RJ
http://lattes.cnpq.br/9588758794674407

Rossy Moreira Bastos Junior
Universidade Federal do Rio de Janeiro
Rio de Janeiro – RJ
http://lattes.cnpq.br/0075913838823892

Paula Pitta de Resende Côrtes
Universidade de Vassouras
Vassouras RJ
http://lattes.cnpq.br/9207835681849532

Abstract: The Intensive Care Centers (ICU) existing in hospitals and designed to welcome patients in serious condition with chances of survival, are sectors that require constant monitoring and much more complex care. Thus, the ICUs are equipped with a continuous monitoring system, which assists patients in serious condition or with decompensation of one or more organ systems. This study aims to identify and report critically ill patients using the antibiotic Meropenem. The surveys were carried out from January to June 2015 in a private hospital in the city of Campos dos Goytacazes - RJ. Data were searched from medical prescriptions and their due laboratory tests. Thus, 72 of the hospitalized patients 30 patients used Meropenem during this period. For this reason, an antibiogram is essential so that the therapy with the carbapenem can be done correctly and safely and, consequently, for the treatment to be successful.
Keywords: Intensive care unit, Meropenem, Pharmacological Treatment.

INTRODUCTION

The Intensive Care Unit (ICU) is intended for the hospitalization of patients with clinical instability and potential severity, excluding palliative care for terminally ill patients (POLLETO, 2012). It is a highly complex environment, reserved and unique in the hospital environment, as it proposes to establish monitoring and surveillance. Diseases are the most diverse, therefore, demanding a lot from the multidisciplinary team (OLIVEIRA, 2010).

Among the most common organic insufficiencies are cardiac (Hypertension, Infarction), neurological (Cerebral Vascular Accident, Alzheimer, Parkinson), hematological and renal (NOGUEIRA, 2002). In addition to Post-Surgical complications, Trauma, Bed sores, Obstructive Pulmonary Disease, Pneumonia, Diabetes, Sepsis.

Most patients are elderly, corresponding to 52% of ICU admissions, which, in turn, consume 60% of the daily rates and financial resources available for adult ICUs in the country (BONFADA, 2017) and, as they have a high degree of comorbidities associated compared to adults, end up aggravating their clinical condition even further. It must also be noted that a very significant number of these admitted patients come from other institutions and the vast majority have some pathology and infection (OLIVEIRA, 2010 and SCHWARTZMANN, 2010). In addition, patients bedridden for a considerable period favors the onset of nosocomial infection (TOPP, 2002), in addition to loss of skills and deterioration of organic systems (GUEDES, 2018).

In this perspective, the patients in the decubitus position follow the protocol of the Center for Hospital Infection Commission (CCIH) and, through the result of the antibiogram, opt for a safer and more effective treatment. Resistance to antimicrobials for systemic use is considered an aggravating factor and of great concern to public health, being of particular concern to hospitals due to the increase in the mortality rate, in addition to the high health cost (RODRIGUES, 2010).

Meropenem is a carbapenem antibiotic with an exceptionally broad spectrum of antibacterial activity in vitro (EDWARDS, 1989). They are B-lactams and have a coupled B-lactam ring and a five-element ring structure. Different from penicillins in that it is unsaturated and contains a carbon atom instead of a sulfur atom. This class has a broader spectrum of activity than most other B-lactam antibiotics (BRUNTON et al, 2012). The synthesis of meropenem represented an advance in the area of development of carbapenems, because, in addition to being stable to hydrolysis caused by most ß-lactamases, this compound is not hydrolyzed by renal dehydropeptidase I (GALES, 2002).

In this case, of the 72 patients hospitalized in the ICU, 30 of them used 100% of Meropenem as bacterial multi-resistance therapy.

GOAL

The objective of this article is to identify the use of antibiotics in the Intensive Care Unit, enabling the multidisciplinary team that works in the ICU to carry out the CCIH protocol in patients in the sector, thus contributing to the reduction of etiological factors related to the indiscriminate use of antibiotics.

METHOD

A descriptive study conducted from January to June 2015 is demonstrated. The target population consisted mainly of adults and elderly, aged between 50 and 90 years.

The data were obtained through the analysis of medical records, medical prescriptions and the Hospital Infection Control Commission. Thus, the variables collected were age, gender, hospitalization history, aggregated diseases, time of antibiotic treatment and death.

The field research was selected by medical prescription and, consequently, patients who used Meropenem during this period were separated.

Therefore, at the end of the research, data were added based on the frequency of occurrence and percentage of variables that are important, such as: age, sex, underlying disease, duration of antibiotic treatment, results of culture and empirical treatment, and death.

The ethical aspects of this research were respected in accordance with Resolution 196 of 10/10/1996, of the National Research Ethics Commission of the Ministry of Health, which stipulates regulatory ethical standards for research involving human beings.

This way, the anonymity of the patients involved was preserved and the authorization term was granted by the Hospital Management, thus allowing free access to the sector of the Intensive Care Unit and Hospital Infection Control Commission, as well as all the necessary data to carry out this search.

PROJECT

This is a sectional research, descriptive in nature, with a quantitative approach.

PRIMARY OUTCOME

Assessment of the impact of the implementation of the CCIH protocol and medical discussion on antibiotic use among patients under the ICU.

SECONDARY OUTCOME

Definition, sensitization and awareness of the medical team working at the ICU to carry out prescription criteria for hospitalized patients.

RISKS

They are minimal and are related to the possible estrangement of the team members when consulting the medical records by the researchers.

BENEFITS

Reduction in the prevalence of multiresistant bacteria, as well as in the patient's length of stay, with a consequent decrease in hospital costs, positively impacting the patient's prognosis.

RESULTS

Thirty prescriptions were evaluated, with patients aged between 50 and 90 years old, thus comprising 17 females and 13 males.

The main pathologies are represented in Figure 1.

The medical records, medical prescriptions and the report of the Hospital Infection Control Commission (CCIH) were observed. Therefore, the culture tests and the treatment were evidenced in an empirical way.

Regarding the antibiotics used, Meropenem 1g had the highest percentage, representing 100%, followed by Vancomycin 500mg with 50%, Piperacillin + Tazobactam 4.5g 40%, Amikacin 250mg/ml 23%, Polymyxin B 500,000 UI 20 %, Linezolid 2mg/ml 300ml 17% and others adding 7%.

The chart below shows the number of patients who died during this period. Thus, the percentage of deaths was 33% of patients, on the other hand, those who did not die accounted for 67% of patients.

DISCUSSION

The present study showed a higher prevalence in elderly patients whose associated comorbidities were an aggravating factor for the infection, leading to pneumonia. In these patients, multiresistant bacteria are very common, thus justifying the option of a second treatment therapy with the use of Meropenem (SCHWARTZMANN, 2010).

Therefore, these patients were quite expressive, as these people often need hospitalization to take care of their clinical manifestations. Therefore, they are more vulnerable to acquiring infections than young adults due to physiological changes due to aging, in addition to invasive procedures. In addition, they have a reduced ability to react to infections, requiring special care when choosing antimicrobials, as they interact with many drugs that are often part of daily treatment.

The choice of treatment for these patients involves medical anamnesis, followed by the collection of their biological materials and, consequently, followed by culture. Subsequently, an assessment is carried out

Patologias prevalentes = prevalent pathologies

Patologia prevalente= prevalent pathology

Hipertensão = Hypertension

Diabetes = Diabetes

Pneumonia = Pneumonia

Hipertensão + diabetes = Hypertension + diabetes

Hipertensão + Pneumonia = Hypertension + Pneumonia

Hipertensão +Diabetes +Pneumonia = Hypertension +Diabetes +Pneumonia

Outros = Others

Figure 1: Prevalent Pathologies

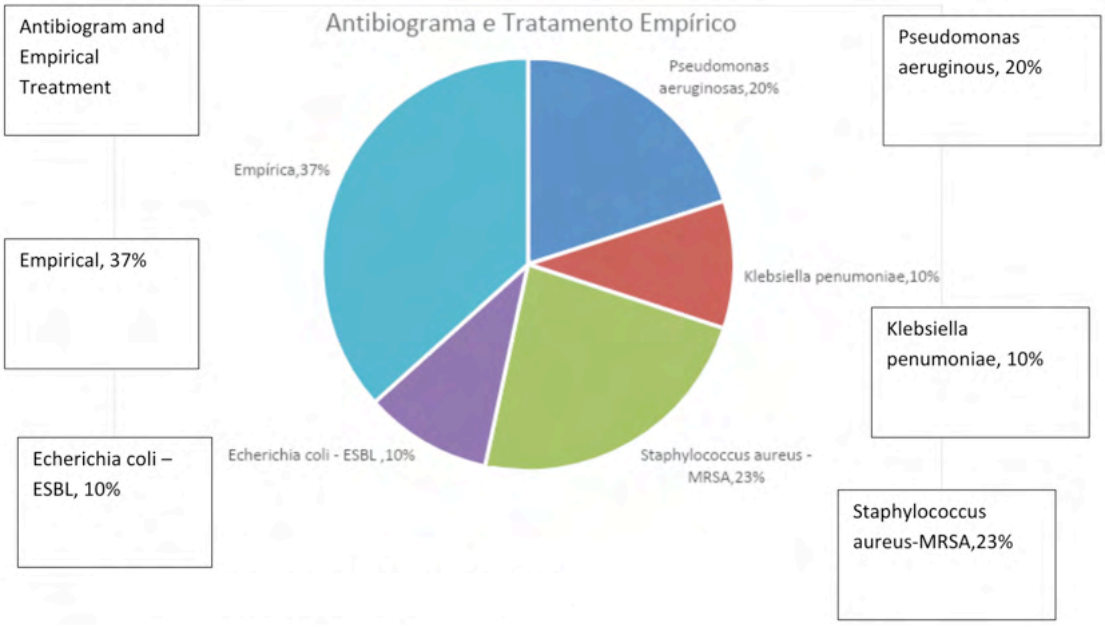
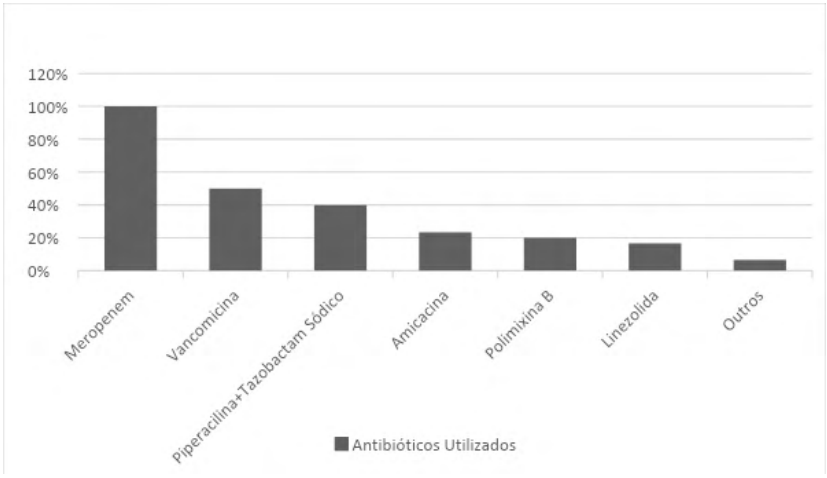


Figure 2: Antibiogram and Empirical Treatment



Meropenem = meropenem

Vancomicina = Vancomycin

Piperacilina +Tazobactam Sódico= Piperacillin + Sodium Tazobactam

Amicacina = amikacin

Polimixina B = Polymyxin B

Linezolida = Linezolid

Outros = Others

Antibióticos utilizados = Antibiotics used

Figure 3: Antibiotics used during the study period.

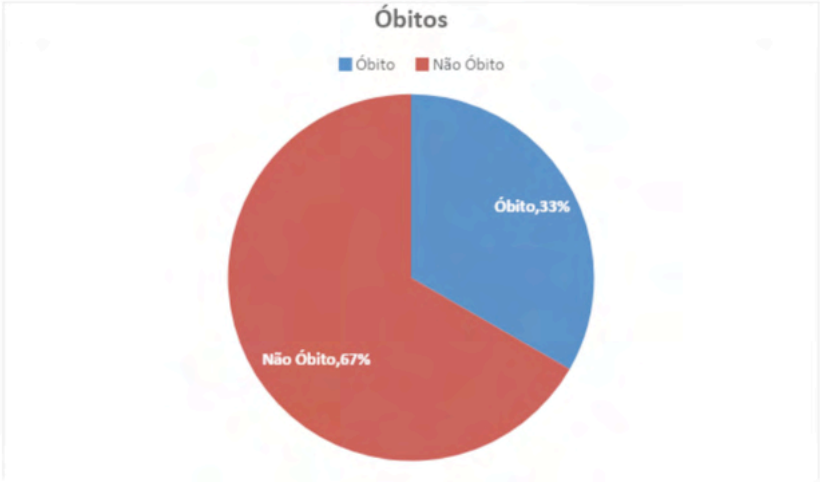


Figure 4: Deaths

Óbitos =Deaths

Óbito = Death

Não óbito = No death

with the multidisciplinary team to determine the therapy.

It is also important to emphasize that, in cases where patients with community-acquired infection, treatment is empirically done more frequently. For this reason, patients from other institutions, other inpatient units of the hospital or from the community itself are already admitted to these sectors with some antimicrobial treatment and, somehow, over time they developed bacterial resistance. Therefore, at the sign of infection and in view of the result confirming the resistance picture, the clinical staff opts for treatment with Meropenem associated with another class of antibiotic, such as (Vancomycin, Piperacillin, Amikacin, Polymyxin B, etc.) as the treatment demonstrated quite successful. As also shown in Figure 2, where about 37% of the treatments were presented empirically. However, culture results add up to 63% of the cases, reinforcing the importance of this laboratory test.

It is noteworthy that nosocomial infection was also very common in these patients over 04 days of hospitalization, in general it manifesting within 48 hours after admission. Thus, it is the most common nosocomial infection in ICUs and has the highest morbidity and mortality (OLIVEIRA, 2010). Evident characteristic in figure 2 of the research where the result of the antibiogram is identified with several multiresistant strains, mainly Pseudomonas aeruginosa 20%, Echerichia coli – ESBL 10%, Klebisiella pneumoniae 10%, Staphylococcus aureus – MRSA 23%.

Therefore, in view of this, it has been shown to be a huge challenge to control hospital infections with broad-spectrum antibiotics, such as the use of the carbapenem class.

It is also known that the indiscriminate use of carbapenems in the Intensive Care Unit has promoted selective pressure on the body's natural barrier, which provides resistance to treatment with antimicrobials. In fact, the proportion of metall-producing multiresistant Pseudomonas aeruginosa - beta lactamase (MBL) is of extreme concern to public health agencies, despite little field research, a similar characteristic found in the study (GONÇALVES, 2009).

The study of the use of antimicrobials is of paramount importance, also being relevant in economic terms, since these drugs account for one of the groups in which expenditures on hospital treatments with drugs are higher. Especially when it comes to carbapenems, their cost is very high.

Among the antibiotics used by patients in this research, Meropenem stands out, a potent broad-spectrum B-lactam (BRUNTON et al., 2012) It acts on both gram-negative, gram-positive and anaerobic bacteria. Virtually all gram-negative bacteria, including those producing B-lactamases, are extremely sensitive to Meropenem. Its use is of great therapeutic importance, especially in elderly patients with a history of bacterial multi-resistance. Followed by Vancomycin 500mg 50%, Piperacillin + Tazobactam 4.5g 40%. There is an association protocol between Meropenem and another antibiotic in the therapy for these patients with characteristics of nosocomial infection, as shown in figure 3.

Therefore, constant surveillance of hospital infections and the development of appropriate policies to control the use of antimicrobials are a high priority. This has been the challenge of the Hospital Infection Control Commission (CCIH) team, which aims to mitigate the risks and ensure the rational use of antibiotics. Considering that antimicrobials are medicines of great importance and that they have a high frequency of use, a similar characteristic found in the study by RODRIGUES, 2010.

In Figure 4, the death rate of 33% was mainly evidenced by the patient's life history, age and associated comorbidities, further aggravating the condition of these patients, in which

pneumonia, sepsis, septic shock, etc. stand out. On the other hand, there was a significant value of 67% of patients who responded well to treatment with Meropenem and other classes of antimicrobials (OLIVEIRA, 2010).

CONCLUSION

The result of this research demonstrated the prevalence of adult and elderly patients in the Intensive Care Unit (ICU) aged above 50 years old, with long stays in this unit and with considerable risk factors. For this reason, the associated comorbidities were fundamental for the worsening of the physical condition and, therefore, bacterial infections in these patients stood out. The research also showed a number of multiresistant bacteria very common in the elderly. Thus, the use of Meropenem and other classes of associated antibiotics, such as Vancomycin, Piperacillin + Tazobactam, Amikacin, Polymyxin B, etc., was observed in the study as a therapeutic option for bacterial resistance. These antibiotics in combination proved to be pharmacologically very effective, and their use in the Intensive Care Unit is of paramount clinical and therapeutic importance.

On the other hand, the Hospital Infection Control Commission (CCIH) must control prescriptions, providing continuing education to health professionals.

Ultimately, it is necessary to further study the use of antimicrobials and, consequently, intensify pharmacovigilance and pharmacotherapy studies so that it has greater clinical relevance. Thus, only this way can we manage to alleviate resistant strains in the hospital environment.

REFERENCES

Associação de Medicina Intensiva Brasileira. Consenso Brasileiro de Sepse. 2003. Available on the website:< http://www.smaconsultores.com.br/sepse1/>. Accessed on: September 5th, 2015.

BONFADA, D., SANTOS, M. M. dos, LIMA, K. C., & GARCIA-ALTÉS, A. (2017). **Survival analysis of elderly patients in Intensive Care Units**. Revista Brasileira de Geriatria e Gerontologia, 20(2), 197–205. doi:10.1590/1981-22562017020.160131

EDWARDS, J. R., WILLIAMS, S., & NAIRN, K. (1989). Therapeutic activity of meropenem in experimental infections. Journal of Antimicrobial Chemotherapy, 24(suppl A), 279–285. doi:10.1093/jac/24.suppl_a.279.

GONÇALVES, D. C. P. S., Lima, A. B. M., Leão, L. S. N. de O., Carmo Filho, J. R. do, Pimenta, F. C., & Vieira, J. D. G. (2009). **Detecção de metalo-beta-lactamase em Pseudomonas aeruginosa isoladas de pacientes hospitalizados em Goiânia, Estado de Goiás**. Revista Da Sociedade Brasileira de Medicina Tropical, 42(4), 411–414. doi:10.1590/s0037-86822009000400010.

GALES, A. C., MENDES, R. E., RODRIGUES, J., & SADER, H. S. (2002). **Comparação das atividades antimicrobianas de meropenem e imipenem/cilastatina: o laboratório necessita testar rotineiramente os dois antimicrobianos?** Jornal Brasileiro de Patologia e Medicina Laboratorial, 38(1), 13–20. doi:10.1590/s1676-24442002000100004

GUEDES, L. P. C. M., OLIVEIRA, M. L. C. de, & CARVALHO, G. de A. (2018). **Deleterious effects of prolonged bed rest on the body systems of the elderly - a review**. Revista Brasileira de Geriatria e Gerontologia, 21(4), 499–506. doi:10.1590/1981-22562018021.170167

BRUNTON, L. L; CHABNER, B. A; KNOLLMANN, B. C. **As Bases Farmacológicas da Terapêutica de Goodman & Gilman.** 12ª Edição. Editora: Artmed.

NOGUEIRA, L.D., SOUSA, R.C., PADILHA, K.G., & KOIKE, K. (2012). **Clinical characteristics and severity of the patients admitted to the public and private ICUS**. Texto & Contexto Enfermagem*, 21*, 59-67.

OLIVEIRA, A. C., KOVNER, C. T., & SILVA, R. S. (2010). **Nosocomial Infection in an Intensive Care Unit in a Brazilian University Hospital.** Revista Latino-Americana de Enfermagem, 18(2), 233–239. doi:10.1590/s0104-1169201000020001.

OLIVEIRA A. C., SILVA R.S., PISCOYA M. E., IQUIAPAZA R A. **Resistência bacteriana e mortalidade em um centro de terapia intensiva**. Rev. Latino-Am. Enfermagem. nov-dez 2010.

POLLETO S, SANTINA JS, BETTINELLIA LA. **Dilemas do enfrentamento da morte de pacientes Idosos**. Rev Ciênc Juríd Empres. 2012;13(2):49-55.

RODRIGUES, F. A., & BERTOLDI, A. D. (2010). **Perfil da utilização de antimicrobianos em um hospital privado.** Ciência & Saúde Coletiva, 15(suppl 1), 1239–1247. doi:10.1590/s1413-81232010000070003.

SCHWARTZMANN, P. V., VOLPE, G. J., VILAR, F. C., & MORIGUTI, J. C. (2010). **Pneumonia comunitária e pneumonia hospitalar em adultos.** Medicina (Ribeirao Preto. Online), 43(3), 238. doi:10.11606/issn.2176-7262.v43i3p238-248.

ANNEXES

Unimed Campos
www.unimedcampos.com.br
Rua Visconde de Itaboraí, 427 Pq. Rosário
CEP: 28027 142 Campos dos Goytacazes - RJ
T. (22) 2101-0650

Campos dos Goytacazes, 03 de fevereiro de 2015.

CARTA DE AUTORIZAÇÃO

O Hospital Unimed Campos, através da Administração Hospitalar, vem por meio deste conceder autorização para acesso, coleta de dados, elaboração e, posteriormente, divulgação do Projeto Científico intitulado por **"A UTILIZAÇÃO DO MEROPENEM EM UM CENTRO DE TERAPIA INTENSIVA EM UMA UNIDADE HOSPITALAR DE CAMPOS DOS GOYTACAZES-RJ"**, realizada pelos autores Ronald de Oliveira e André Luiz Vargas, a ser realizada no corrente ano, nesta instituição. Para tal, os autores terão livre acesso aos dados relacionados a pesquisa, sejam impressos ou contidos no sistema operacional. É de responsabilidade dos autores a integridade ética e profissional dos dados coletados e informações repassadas, cumprindo com as leis de sigilo e proteção das informações que, principalmente, identificam os pacientes.

Dr. Luiz Fernando Ferreira Sampaio
Diretor de Recursos Próprios
Hospital Unimed Campos