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A COMPREHENSIVE ANALYSIS OF NEUROMUSCULAR BLOCKING AGENTS IN THE INTENSIVE CARE UNITS OF THE JORDANIAN ROYAL MEDICAL SERVICES HOSPITALS

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ABSTRACT:

Introduction: An essential part of patient treatment in critical care units (ICUs) is the accurate administration of neuromuscular blocking agents (NMBAs). It is crucial to comprehend the complex patterns of NMBA utilization in these crucial situations, when procedures and therapeutic interventions are delicate. It involves finding a careful balance between patient safety, treatment results, and efficacy in addition to drug delivery. Since NMBA administration decisions are complex and influenced by patient-specific problems, evolving procedures, and modern practices, a thorough examination is required. Therefore, in order to sort through the complexities and gain a deeper understanding of the clinical picture for making informed decisions and improving patient outcomes in critical care scenarios, a detailed examination of NMBA administration is required.

Objective: This retrospective study's main goal is to examine and clarify the patterns in the use of three particular NMBAs -Atracurium, Cisatracurium, and Rocuronium- in the ICU's at the Jordanian Royal Medical Services (JRMS) hospitals during the specified three years period.

Methodology: This study employs a retrospective analysis of electronic medical records from Hakeem Health System used in JRMS, extracting data on the frequency of Atracurium, Cisatracurium, and Rocuronium administration during 2019-2021.Then subjecting the collected data to quantitative analysis to recognize any trends and variations in NMBA usage.

Keywords: Neuromuscular blocking agents, Intensive care units, Jordanian Royal Medical Services Hospitals, Medication usage patterns, Atracurium, Cisatracurium, Rocuronium, Critical care, Trend analysis.

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1. INTRODUCTION:

1.1 Background

Neuromuscular blocking agents (NMBAs) are a critical care tool used to limit patient movement, facilitate mechanical breathing, and improve patient circumstances for a range of medical procedures[1,2,4]. Comprehending the NMBA usage patterns in ICUs is essential to customizing patient care approaches and guaranteeing the best possible results[6,9]. While literature on this topic exists, a focused analysis within the context of Jordanian Royal Medical Services hospitals offers a unique perspective on regional practices.

1.2 Objectives of the Study

The purpose of this study is to conduct a thorough analysis of the use of NMBAs over a three-year period in a subset of Jordanian Royal Medical Services hospitals. Specific objectives include identifying trends in Atracurium, Cisatracurium, and Rocuronium usage and exploring the implications of these findings for clinical practice.

1.3 Relevance to Jordanian Royal Medical Services Hospitals

The following hospitals were chosen for this study: Princess Haya Military Hospital, Prince Ali bin Al Hussein Military Hospital, Prince Hashem bin Al Hussein Hospital, King Hussein Medical Hospital, Queen Alia Heart Institute, King Talal Military Hospital, Queen Rania Pediatric Hospital, and Prince Hashem bin Abdullah II Hospital. It is crucial to comprehend how NMBA is used in these prominent institutions in order to customize interventions that are appropriate for Jordan's unique medical setting.

2. METHOD:

2.1 Study Design

In this observational study, the electronic medical records from Hakeem Health System which is used in JRMS are retrospectively analyzed with an emphasis on Atracurium, Cisatracurium, and Rocuronium in the ICUs of the chosen hospitals. By selecting an observational design real-world practices can be examined without impacting or changing how patient care is normally provided.

2.2 Participants

To ensure a diverse picture of medical practices, the study incorporates data from eight Jordanian Royal Medical Services Hospitals' intensive care units. Inclusion criteria encompassed hospitals that provided consent for participation and had consistent medication records for the study period.

2.3 Data Collection

Information about the use of Atracurium, Cisatracurium, and Rocuronium from 2019 to 2021 has been obtained from computerized hospital data. The total NMBA usage for each year among the chosen hospitals is summarized in Table 1, which serves as the foundation for additional investigation.

Table 1: The total NMBA usage for each year among the chosen hospitals

Medication	2019	2020	2021
Atracurium	85	145	145
Cisatracurium	85	123	130
Rocuronium	94	101	49
Total	264	369	324

Additional information, such as patient demographics and specific indications for NMBA administration, was not included in this study but may be valuable for future research.

2.4 Data Analysis

Statistical analysis involving calculating the percentages of the change in NMBA usage for the study period was done allowing for the identification of trends and variations. Graphical representations were also employed to enhance data visualization and facilitate a more intuitive understanding of the results.

3. RESULTS:

3.1 Overview of Neuromuscular Blocking Agent Usage

Table 2and Figure 1 provide a detailed breakdown of Atracurium, Cisatracurium, and Rocuronium usage across the eight hospitals over the years 2019 to 2021. In 2019, the total NMBA usage was 264, increasing to 369 in 2020, and subsequently decreasing to 324 in 2021. This general pattern encourages a closer investigation at individual medications and medical facilities to find underlying trends.

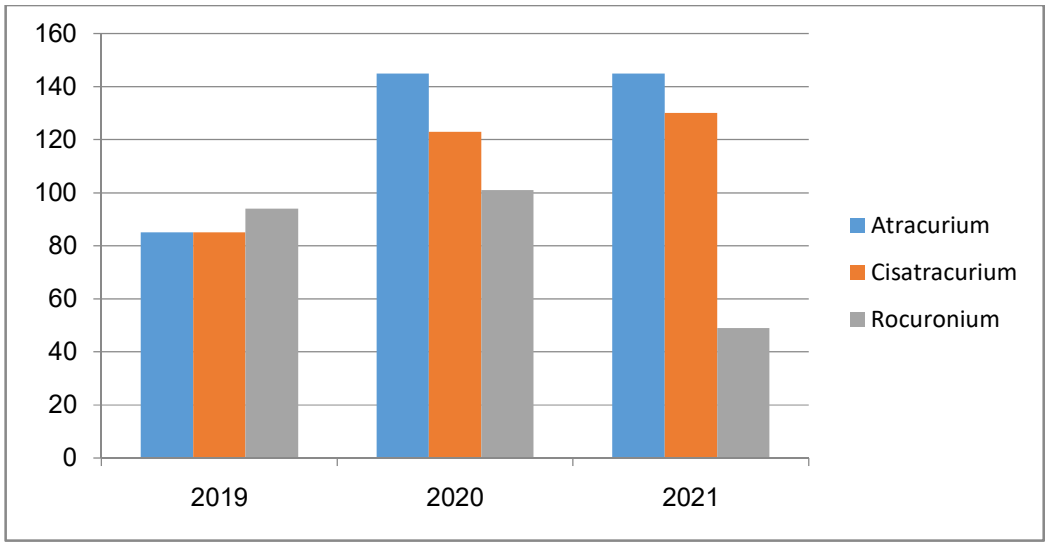

Figure 1: Frequency of Atracurium, Cisatracurium, and Rocuronium usage across the eight hospitals

3.2 Year-wise Analysis

Analyzing patterns over the course of the three years reveals how the consumption of NMBA is. In 2021, there was a notable decline in the usage of Rocuronium, whereas Atracurium and Cisatracurium remained rather stable. Comprehending the underlying causes of these variations is crucial in order to maximize medication usage and improve patient outcomes (Table 2).

Table 2: Frequency of Atracurium, Cisatracurium, and Rocuronium usage across the eight hospitals

Medication	2019	2020	2021	% Change (2019-2020)	% Change (2020-2021)
Atracurium	85	145	145	70.59%	0.00%
Cisatracurium	85	123	130	44.71%	5.69%
Rocuronium	94	101	49	7.45%	-51.49%
Total	264	369	324	39.77%	-12.20%

4. DISCUSSION:

4.1 Clinical Implications

The analysis of NMBA usage has direct implications for clinical practice. Making better-informed decisions while administering NMBAs is made possible by knowing the causes of variation in medication usage, which may enhance patient outcomes[14,15,16]. For instance, the reported decline in the use of Rocuronium in 2021 could be attributed to modifications in clinical practices, new findings, limitations of supplies, or changes in patient demography.

4.2 Contextual Analysis

More research should be done on the unique contextual elements that affect the use of NMBA in Jordanian Royal Medical Services institutions. The observed variances may be attributed to variations in patient groups, prevalent medical conditions, and

cultural issues. Hospitals collaborating can make it easier to share expertise and create standardized protocols that are appropriate for the medical environment in Jordan.

5. CONCLUSIONS:

5.1 Summary of Findings

In conclusion, this study offers a thorough examination of the use of NMBA at Jordanian Royal Medical Services Hospitals critical care units. The information shows patterns and variations in the use of Atracurium, Cisatracurium, and Rocuronium in various years at various hospitals. Even though there are some trends that match international standards[10,11,12], the study stresses how critical it is to comprehend and adjust to Jordan's particular medical environment.

5.2 Significance of the Study

By providing insights unique to Jordanian Royal Medical Services Hospitals, this research adds to the body of knowledge already available on the use of NMBAs. It also serves as a foundation for improving patient care strategies, optimizing drug utilization, and improving clinical procedures in the intensive care unit.

5.3 Recommendations for Further Research

The study lays groundwork for additional investigation into the variables impacting the use of NMBA in Jordanian healthcare environments. Subsequent studies may explore indications unique to patients, the natural tendencies of clinicians, and how changing medical knowledge affects medication delivery procedures[15]. Furthermore, cooperative research combining several healthcare facilities might offer a more thorough comprehension of Jordan's NMBA utilization trends.

6. LIMITATIONS OF THE STUDY:

6.1 Methodological Limitations

It is important to recognize various methodological limitations even if this study offers insightful information about the use of neuromuscular blocking agents in the intensive care units of Jordanian Royal Medical Services hospitals. The study's observational design limits our capacity to determine the causal linkages between the administration of NMBA and particular influencing elements. Drug use trends and patterns are recognized, but a more thorough investigation of the fundamental causes of observed variances is not possible with this design.

Furthermore, the study's retrospective design raises the risk of absent or inconsistent data. Using the hospital records that already exist could leave out important information about the indications that are unique to each patient, the preferences of medical professionals, and other circumstances that affect the administration of NMBA. This restriction emphasizes the need for caution when making firm judgments regarding the actual causes of usage trends that have been observed.

6.2 Data Limitations

This study's data, which was mostly taken from hospital records, offers an insightful overview of how NMBA was used over the study period. Our analysis's depth is limited, nevertheless, by the lack of further patient-specific data such as comorbidities, disease severity, and particular clinical indications for NMBA administration. A more thorough investigation of patient demographics and clinical settings is necessary to comprehend the contextual elements that influence the use of NMBAs in critical care.

Furthermore, the study's only dependence on the supplied drug data (Table 1) makes it challenging for us to truly comprehend how NMBA consumption fits into larger healthcare procedures. More qualitative information from professional interviews or a qualitative investigation of hospital procedures, may provide deeper understanding of the rational processes that go into the administration of NMBAs.

6.3 Generalizability

The findings we have obtained may not be generally applicable to other healthcare environments or geographical areas; it is limited to the hospitals of the Royal Medical Services in Jordan. The way that NMBA is used may vary depending on differences in patient demographics, medical procedures, and the availability of resources in various institutions and healthcare systems. Therefor when applying the study's findings to larger groups or circumstances, caution should be used.

CONFLICT OF INTEREST: The authors of this research affirm that none of the concepts, strategies, execution, or reporting of this study was motivated

by a conflict of interest. The conduct and interpretation of the study has not been impacted by any financial or non-financial relationships with external entities, pharmaceutical companies, or any other groups that would have a vested interest in the research's conclusions.

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