ORIGINAL ARTICLE

RELIABILITY OF THE ALDRETE KROULIK INDEX IN THE POST-ANESTHETIC RECOVERY ROOM

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ABSTRACT

Objective: To analyze the reliability of the data recorded in the Aldrete and Kroulik Index (AKI) in the Post-Anesthetic Recovery Room (PARR). **Materials and method:** Cross-sectional and documentary study conducted in the Post-anesthetic Recovery Room of a university hospital in northeastern Brazil. Data were collected from perioperative nursing care records of 203 patients admitted to the PARR, who underwent elective surgeries from January to September 2019. The reliability analysis included the evaluation of: incompleteness and agreement of the AKI records, through an adapted score and Intraerclass Correlation Coefficient (ICC), respectively. **Results:** All variables in the study presented a "very low incompleteness" score (below 5%) in the AKI. The parameters "oxygen saturation", "muscle activity", "breathing" and "consciousness" showed excellent/satisfactory agreement classification. The variable circulation presented "unsatisfactory" classification and reveals a fragility of the care team to correctly calculate this parameter. **Conclusions:** The reliability of the records reveals satisfactory completeness of the AKI and excellent/satisfactory agreement in four of the five parameters evaluated in the post-anesthetic recovery room. However, the observed failures cause legal repercussions, compromise patient safety and interfere with the quality of postoperative care.

Keywords: Perioperative Nursing. Nursing Care. Anesthesia Recovery Period. Evaluation Study. Surgicenters.

INTRODUCTION

The Post-Anesthetic Recovery Room (PARR) is a complex and dynamic unit whose work processes are based on interprofessional practices. This area belongs to the physical plan of the Surgical Center, an environment endowed with robust infrastructure and diversity of specific medical equipment to enable the synchronous performance of the nursing and anesthesiology team during the immediate postoperative period[1].

It focuses on the embracement of the patient after the end of surgery, in the immediate postoperative (IPO) period, critical phase that requires monitoring and timely interventions aimed at preventing or treating respiratory, cardiovascular and renal complications, for example. In view of the criticality of the patient's health status in the IPO, the nurse of the unit must assess the patient safely and effectively[2].

Factors such as circulation, breathing, state of consciousness, pain intensity, motor activity, muscle strength and body temperature should be analyzed in the physical examination of patients admitted to PARR, in addition to the evaluation of the operated site, catheters, drainages and venous infusions. Thus, the nursing team should remain vigilant to the risks inherent in the anesthetic-surgical procedure until the anesthetic reversal, in order to ensure a safe recovery, through patient monitoring by professionals with the aid of instruments and scales, such as the

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Ramsey sedation scale, Steward's Index and the Aldrete and Kroulik Index[3].

In 1970, the Aldrete and Kroulik Index (AKI) was developed, a numerical system for post-anesthetic evaluation, updated in 1995, in order to systematize the observation of physiological conditions and the discharge of the patient from the post-anesthetic recovery room[4].

The AKI is a guiding instrument of perioperative nursing care that contributes to the practice of nurses in the evaluation of anesthetic regression. This is a simple and effective scale that evaluates five parameters: motor, respiratory, circulatory, neurological activity and peripheral oxygen saturation of the patient after the end of the surgical procedure. For each item, a score ranging from 0 to 2 points is assigned, ranging from the most severe condition to the restored condition, respectively. Thus, a sum between 10 and 8 points indicates that there are favorable clinical conditions and determines that the patient showsPARR discharge conditions[4].

The nurse is the health professional who stands out in the context of PARR care for having specific skills and knowledge to assist patients undergoing surgery of different complexities in the recovery of physiological balance and the achievement of safe discharge and without immediate risks of post-operative complications. Nurses are responsible for carefully assessing health conditions, developing specific and individualized care plans, and supervising their execution, performing complex activities, and training their staff to assess and record AKI parameters[5].

The nursing records regarding the parameters of the AKI subsidize the conduct of evaluation and safe discharge of the surgical patient in PARR. However, there is a question about the reliability of these data. Based on this point, the problem and the need to verify the confidence of the records of this scale under study arise. Hence, the following guiding question arises: What is the reliability of the records in the parameters of the Aldrete and Kroulik Index by the nursing team in the care of patients in a university hospital in northeastern Brazil? Thus, this article aims to analyze the reliability of the data recorded in the Aldrete and Kroulik Index in the Post-Anesthetic Recovery Room.

METHOD

This is a cross-sectional, documentary study with a quantitative approach, conducted in a PARR attached to the structural space of a Surgical Center, reference in high complexity surgeries, located in a university hospital in northeastern Brazil. The study was conducted from January to September 2019. The post-anesthetic recovery room under study consists of nine beds with multiparameter monitors, designed to receive surgical patients in the immediate postoperative period of medium- and large-sized procedures, of 13 surgical specialties. It has a care team composed of: three nursing technicians, a nurse and an anesthesiologist, responsible for individual monitoring and continuous evaluation of the surgical patient, from admission to discharge from the PARR.

The mean number of surgical procedures performed by month (N=425) was considered for the sample calculation, with a significance level of 95% and sample error equal to five percentages; therefore, the sample size was 203 patients. The study included adult patients of elective surgeries, of both sexes and aged equal to or greater than 18 years. Exclusion criteria were those that were occasionally in the immediate postoperative period in the PARR and that, due to some complications, worsening of the surgical or physiological condition, had to return to the operating room for surgical reopening or be transferred to the intensive care unit.

The perioperative record is a four-page instrument guiding nursing care to the surgical patient in the hospital, from the immediate preoperative moment to discharge from the Surgical Center. The perioperative record includes variables related to the preoperative visit, patient admission to the SC, safe surgery checklist, intraoperative and immediate postoperative period in PARR, anesthetic regression by the Aldrete and Kroulik index incorporated in this instrument. The nursing team of the Surgical Center is responsible for the complete fulfillment of this instrument.

The logistics of the study was to analyze the reliability of the records of the perioperative record, specifically those related to the immediate postoperative period in PARR, as

well as the records of the AKI, completed by the nursing team. For this, the researchers prepared a form extracting sociodemographic, clinical and surgical data, all contemplated in the perioperative record, in order to analyze their agreement.

The following steps were considered: as soon as the nursing professionals of the PARRperformed the post-anesthetic evaluation of the patient and filled in the AKI data in the medical record, the researchers immediately used their own instrument and made the same evaluation with the patients, in order to make the pairing of the records made by the nursing team of the sector with those made by the researchers. Another analysis performed in this data pairing was the incompleteness of the records. Data collection took place in the first six months of the total time of the research.

Two nursing graduate students, members of the Perioperative Academic League, a nurse with experience in care and management of the Surgical Center and a nursing postgraduate student working in perioperative studies participated in the study. All involved linked to the federal public university of northeastern Brazil. To understand the objectives of the research and the reliable application of the instrument, they received previous intensive training by the researchers and creators of the research, lasting two weeks. The training took place in two consecutive moments: the first through realistic simulations carried out at the institution of origin of the researchers during a week; the second moment through the direct application of the instrument performed in the PARR of the research field, also lasting one week. This last training was considered a pilot test; however, the data collected were not included in the sample.

To evaluate the agreement between the AKI data, two parameters were applied: incomplete filling and reliability of the records.

The incompleteness of the filling referred to the non-fulfillment, considered incomplete due to lack of information. The following items were adopted for the calculation of incompleteness the score system[6] adapted[7], namely: very low incompleteness, when the variable presents less than 5% of incomplete fulfillment; low incompleteness (5.0 to 9.9%); regular incompleteness (10.0 to 19.9%); high incompleteness (20.0 to 49.9%) and very high incompleteness (50.0% or more) of incomplete data fulfillment.

To measure reliability, the Intraclass Correlation Coefficient – (ICC) was used, assuming the non-random character of the interviewers. The ICC is one of the most used statistical tools for measuring the reliability of measurements and, the closer to 1 (one) the ICC value, the greater the homogeneity between the variables, that is, the more concordant and reliable they are[8]. An agreement was considered unsatisfactory when the ICC was below 0.40, satisfactory between 0.40 and 0.75, and excellent when the ICC was above 0.75[8].

The data were organized in the Excel program and the statistical analysis was made in the statistical program STATA 14.0. In all tests, the significance level adopted was $p < 0.05$.

The research complied with the ethical requirements regulated in Resolution n. 466/2012 of the National Health Council. Approved by the Research Ethics Committee with an opinion number 2,039,927. The agreement of the patients to participate in the research and signature of the Informed Consent Form (ICF) were made as soon as the patient entered the SC, still in the embracement room, lucid and oriented, before any pre-anesthetic medication. At this time, they were approached, clarified about the content of the research and its respective risks and benefits, as well as about the confidentiality of the data collected.

RESULTS

Regarding the characterization of the 203 study participants, 55.7% were male; age group between 29-50 years for 45.8% of the sample; married marital status (60.1%); coming from the capital São Luís (65.1%); complete high school education (43.8%). Concerning ethnicity, 61.5% said they were brown (data not shown).

Regarding the preoperative clinical conditions of surgical patients, 59.6% did not present comorbidity and 40.4% did. Hypertension was the most frequent preexisting disease (53.1%), followed by Hypertension plus Diabetes Mellitus (18.5%). The most frequent surgical size was size I (72.4%). Concerning the

surgical specialty, 31.1% underwent general surgery, followed by urologic (24.2%) and orthopedic (12.8%). The general anesthesia was the most used (43.8%). The dorsal surgical position (59.6%) was the most used (Table 1).

Table 1. Sample distribution according to the surgical variables of patients inPARR (n=203), São Luís, Maranhão, Brazil, 2019.

Variable	N	%
Comorbidities		
No	121	59.6
Yes	81	39.9
Ignored	1	0.5
Reported comorbidities		
Arterial Hypertension	43	53.1
Arterial Hypertension and Diabetes	15	18.5
Other comorbidities*	14	17.3
Diabetes	9	11.1
Surgical size		
Size I (up to 2 hours)	147	72.4
Size II (2 – 4 hours)	56	27.6
Surgical specialty		
General	63	31.1
Urology	49	24.2
Orthopedics	26	12.8
Neurosurgery	16	7.9
Coloproctology	16	7.7
Head andNeck	14	6.9
Digestive system	8	3.8
Others**	11	5.6
Type of Anesthesia		
General	89	43.8
Epidural administration	80	39.4
Combined	17	8.4
Local	14	6.9
Peridural administration	3	1.5
ASA* physical condition classification**		
ASA I	132	65.1
ASA II	64	31.5
ASA III	7	3.4
Surgical positioning		
Dorsal	121	59.6
Ventral	33	16.3
Side	13	6.4
Other****	36	17.7

*Other comorbidities: hepatitis B, depression, epilepsy, asthma, chronic kidney disease, congestive heart failure and neuropathies.
**Other specialties: Vascular (5), Thoracic (3), Oral and Maxillofacial (2) and Plastic (1).
***ASA: American Society of Anesthesiology.
****Other Surgical positioning: gynecological or lithotomy.

Regarding the incompleteness of the fulfillment, all variables had percentages of non-fulfillment below 5%, and the data had classification of very low incompleteness. For data reliability/agreement analysis, the ignored/unfilled (blank) data were excluded. Considering the ICC values, the parameter "oxygen saturation" had excellent reliability (0.78); the parameters "muscle activity", "breathing" and "consciousness" had satisfactory reliability (0.51/0.42/0.41, respectively). The parameter "circulation" obtained ICC of 0.37, therefore, obtained agreement classified as unsatisfactory (Table 2).

Table 2. Incompleteness and reliability of data fulfillment in the Aldrete Kroulik Index (n = 203), São Luís, Maranhão, Brazil, 2019.

AKI Parameters	Incomplete fulfillment		Data reliability		
	N	%	ICC	ICC 95%	p-value
Muscle Activity	1	0.49	0.51	0.0000-0.9228	<0.0001
Breathing	4	1.97	0.42	0.0000-0.9613	0.031
Circulation	2	0.99	0.37	0.0000-0.5641	0.0009
Consciousness	3	1.48	0.41	0.0000-1.0705	<0.0001
Oxygen Saturation	1	0.49	0.78	0.3900-1.1873	<0.0001

DISCUSSION

The PARR is a complex unit within the hospital context, aimed at the assistance of surgical patients in IPO, submitted to some anesthetic procedure, whether at local, regional or general level, and who are in the phase of anesthetic reversal. It is a critical period and requires intensive care until these patients reestablish protective reflexes, level of consciousness and stable vital signs. It requires a specialized technological and human framework for support. The PARR care team under study is composed of nurse, nursing technician and anesthesiologist. In this context, the nurse who works in PARR must have knowledge, competence and technical qualification to guide his/her team to conduct a safe, individualized and quality assistance[9].

The AKI is applied at regular intervals in the first hour of critical patient follow-up, in order to assist in the monitoring of physiological conditions and to systematize predictive parameters of patient discharge from PARR. Therefore, the correct application and recording of AKI data provide positive and safe results to the patient in an anesthetic regression period[4].

The average age group found in this study was young adults, corroborating the research conducted in the PARR of reference units in Pernambuco, in which 45.8% were young adults[10]. In the case of age and surgical risks, a study in PARR reveals that age is not precisely an independent indicator, that is, morbidity and mortality is closely related to the patient's clinical situation rather than chronological age[11].

As for the presence of comorbidities, the most frequent was Arterial Hypertension (53.1%). SAH is a chronic disease, a precursor of cardiac alterations with changes in blood flow, which causes a reduction in cardiac output and tissue perfusion and, consequently, an increase in the chance of developing lesions resulting from surgical positioning[12,13]. In addition, cardiovascular instability is a frequent manifestation in the postoperative period, requiring the nursing team to check and record, at regular intervals, blood pressure, which is the parameter intended to assess the circulation by the AKI to detect and treat early post-anesthetic complications, ensuring patient safety[14].

The size, type of surgery and most frequent anesthesia were, consecutively, size I (72.4%), general surgery (31.1%) and general anesthesia (43.8%). Another study with 65 patients aimed at identifying more prevalent nursing diagnoses in the post-anesthetic recovery room found general anesthesia as the most frequent (86.1%), followed by spinal anesthesia, with 7.7%%[15]. Such characteristics are marked by the care profile of hospital institutions. Especially after general anesthesia, the care team should deal with characteristic manifestations of anesthetic awakening, such as the return of laryngeal reflexes, cough, nausea, vomiting, psychomotor agitation, hypothermia, decreased level of consciousness. In view of these circumstances, the AKI evaluation should be performed at shorter intervals, according to the severity of the patient, in order to optimize the assistance in IPO and provide a safe discharge fromPARR[16].

The classification of the physical status of patients proposed by the ASA is considered one of the prognostic indexes for mortality and postoperative complications. Most of the patients in this study were classified with ASA I, suggesting, at the end of the anesthetic-surgical procedure, fewer complications, better evaluation of AKI and a positive clinical evolution during anesthetic regression in PARR[17].

Although there is a presumption of complete fulfillment of the AKI, since it involves essential

data for the assistance of patients in IPO and guidelines for discharge from the PARR, the analysis of the data allowed the statement that, in some perioperative records, the fulfillment of the AKI was incomplete. The incompleteness parameter was classified as very low (percentage below 5%) for all variables studied. Similarly, research conducted in the PARR of a referral hospital in Boa Vista found that 8.3% of the data were not completed and that 91.6% obtained the completeness of the information[18].

From the moment the patient is admitted to the PARR until discharge from this sector, the nursing team needs to proceed with the proper records and the nurse needs to observe any change in the vital signs and parameters of the AKI. Any failure in this annotation can compromise the reliability of records, quality and safety of nursing care. In addition, another consequence is to expose the patient to increased risks of complications and adverse events caused by the discontinuity of care provided[7].

Despite the failures in the fulfillment, from these findings, the information of the perioperative form on post-anesthetic evaluation has very low incompleteness or satisfactory fulfillment and denote, in terms of evaluation, a parameter of significant score used for data analysis. It means that the nursing team tries to fulfill a key role of care: record the care provided. However, some variables were not filled in, an occurrence that can be attributed to lack of attention, carelessness or lack of knowledge, factors that greatly compromise the completeness of patient care[19].

Regarding the reliability/agreement of the completed data, of the five variables studied, four had excellent/satisfactory agreement (oxygen saturation, muscle activity, breathing and consciousness), but the variable "circulation" presented unsatisfactory classification. The measurement of the circulation parameter requires skill and requires calculations to evaluate the percentage of reduction or not of pre-anesthetic blood pressure levels in relation to the levels after anesthesia. Thus, the maximum score (two) is attributed to a variation of up to 20% of the pre-anesthetic value, not being considered a complication; and the minimum score (zero), if the variation is higher or lower than 50% of the preoperative

level[4].

This difficulty was observed among the PARR team, as evidenced by the robust reliability analyses. This non-conformity in the accuracy of the registration of the item circulation, in the AKI, refers to unfavorable factors that compromise the correct description of this parameter, such as: the need to use a formula to perform mathematical calculation, the unavailability of a calculator in the sector and, consequently, the lack of knowledge about the scale for proper interpretation of postoperative blood pressure levels[4].

Given these findings, the nursing team has a weakness in calculating this index during care. This detection becomes an important intervention tool for the management of PARR in order to propose measures of permanent education and in-service training in order to improve the reliability of this parameter of post-anesthetic evaluation by the nursing team[20]. Incorrect fulfillment or lack of theoretical knowledge compromise the safety and standard of nursing care provided in the immediate postoperative period in the PARR[21,22].

Regarding the patient's stay in the PARR, the study shows that over 85% remained for a period of one to two hours in post-anesthetic recovery. Nursing is the professional category closest to the postoperative patient, which allows the observation and management of signs and symptoms that may delay surgical recovery[23]. Therefore, this length of stay in PARR is conducive to recovery, anesthetic regression and stabilization of the surgical patient's vital signs, through qualified nursing care that conditions the discharge of the sector for the first hospitalization unit in safety and comfort[24].

CONCLUSION

The study allowed the analysis of the reliability of the AKI data in the PARR. Regarding the reliability of the post-anesthetic evaluation data, the incompleteness parameter was classified as very low, demonstrating compliance in the fulfillment of the AKI. Concerning the agreement of the data of the five variables studied, four had excellent agreement. There was difficulty in the evaluation of the circulation parameter, which verifies the

variation of blood pressure levels in relation to the preoperative period.

This failure may be related to the lack of knowledge of the formula to perform the calculation, the unavailability of the calculator in the workplace, and inattention by the nursing team in the registration and evaluation of the circulating parameter.

A weakness perceived by the authors was the non-intervention of health education when faced with unsatisfactory reliability results in one of the five parameters of the AKI. Future studies should aimat intervening immediately in similar situations. Therefore, more studies should be developed aiming at promoting patient safety and continuous improvement of care within the post-anesthetic recovery room and surgical processes, including actions of permanent education and training in service.

CONFIABILIDADE DO ÍNDICE ALDRETE KROULIK NA SALA DE RECUPERAÇÃO PÓS-ANESTÉSICA

RESUMO

Objetivo: Analisar a confiabilidade dos dados registrados do Índice de Aldrete e Kroulik (IAK) na Sala de Recuperação Pós-Anestésica (SRPA)**. Materiais e método:** Estudo transversal e documentalrealizado na Sala de Recuperação Pós-Anestésica de um hospital universitário do nordeste brasileiro. Os dados foram coletados das fichas de assistência de enfermagem perioperatória de 203 pacientes admitidos na SRPA, submetidos a cirurgias eletivas,dejaneiro a setembro de 2019.Para análise da confiabilidade, foram avaliados:incompletude e concordânciados registros do IAK, através deescore adaptado e Coeficiente de Correlação Intraerclasse (ICC), respectivamente. **Resultados:** Todas as variáveis em estudo apresentaram escore "muito baixa incompletude"(inferior a 5%)no preenchimento do IAK. Os parâmetros "saturação de oxigênio", "atividade muscular", "respiração" e "consciência" apresentaramclassificação de concordância excelente/satisfatória. A variável circulação apresentou classificação "insatisfatória" e revela uma fragilidade da equipe assistencialpara calcular corretamente este parâmetro.**Conclusões:** A confiabilidade dos registrosrevela completude satisfatória do IAK e concordância excelente/satisfatóriaem quatro dos cinco parâmetros avaliados na sala de recuperação pós-anestésica. Entretanto, falhas observadas ensejam repercussões legais, comprometem a segurança do paciente e interferem na qualidade da assistência pós-operatória.

Palavras-chave: Enfermagem Perioperatória. Cuidados de Enfermagem. Período de Recuperação da Anestesia. Estudo de Avaliação. Centros Cirúrgicos.

CONFIABILIDAD DEL ÍNDICE ALDRETE KROULIK EN LA SALA DE RECUPERACIÓN POSANESTÉSICA

RESUMEN

Objetivo: analizar la confiabilidad de los datos registrados del Índice de Aldrete y Kroulik (IAK) en la Unidad de Recuperación Posanestésica (URPA). **Materiales y método**: estudio transversal y documental realizado en la Unidad de Recuperación Posanestésica de un hospital universitario del nordeste brasileño. Los datos fueron recogidos de los registros de asistencia de enfermería perioperatoria de 203 pacientes admitidos en la URPA, sometidos a cirugías electivas, de enero a septiembre de 2019. Para el análisis de la confiabilidad, fueron evaluados: incompletitud y concordancia de los registros del IAK, a través de la puntuación adaptada y el Coeficiente de Correlación Intraclase (ICC), respectivamente. **Resultados:**todas las variables en estudio presentaron puntuación "muy baja incompletitud" (inferior a 5%) en lacumplimentación del IAK. Los parámetros "saturación de oxígeno", "actividad muscular", "respiración" y "conciencia" presentaron clasificación de concordancia excelente/satisfactoria. La variable circulación presentó clasificación "insatisfactoria" y revela una fragilidad del equipo asistencial para calcular correctamente este parámetro. **Conclusiones**: la confiabilidad de los registros revela completitud satisfactoria del IAK y concordancia excelente/satisfactoria en cuatro de los cinco parámetros evaluados en la unidad de recuperación posanestésica. Sin embargo, fallas observadas conllevan repercusiones legales, comprometen la seguridad del paciente e interfieren en la calidad de la asistencia postoperatoria.

Palabras clave: Enfermería Perioperatoria. Cuidados de Enfermería. Período de Recuperación de la Anestesia. Estudio de Evaluación. Centros Quirúrgicos.

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