SJIF Impact Factor (2025): 8.688| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 8 | August 2025 - Peer Reviewed Journal

DEVELOPMENT AND IMPLEMENTATION OF AN ALGORITHM FOR POSTOPERATIVE CARE IN NEWBORNS WITH CONGENITAL INTESTINAL OBSTRUCTION

Tursunov Sanjar Esankulovich, Mavlyanov Farkhod Shavkatovich, Mavlyanov Shavkat Khodjamkulovich
Samarkand State Medical University

Article DOI: https://doi.org/10.36713/epra23554
DOI No: 10.36713/epra23554

ABSTRACT
This article presents the results of a prospective study aimed at developing and implementing a clinical and organizational algorithm for personalized postoperative care for newborns with congenital intestinal obstruction (CIO). The study included 82 patients divided into two groups: one received standard medical care, the other received individualized care, including thermoregulation control, early nutritional support, prevention of complications and comprehensive monitoring of the condition. The results showed that the use of a personalized algorithm contributed to a significant reduction in the time of stabilization of vital functions, a decrease in the incidence of infectious complications and nutritional disorders, a decrease in the duration of hospitalization and artificial ventilation. An increase in the level of overall clinical improvement was also noted. The data obtained confirm the effectiveness of a multidisciplinary and individualized approach to the care of newborns with CIO.

KEY WORDS: *Congenital intestinal obstruction, newborns, postoperative care, personalized rehabilitation, multidisciplinary approach, clinical and organizational algorithm.*

RELEVANCE

Congenital intestinal obstruction (CIO) remains one of the most complex and potentially life-threatening pathologies of the neonatal period, requiring emergency surgical intervention and subsequent intensive postoperative care [1,2]. Despite advances in neonatal surgery and resuscitation, the level of postoperative complications, length of hospital stay and mortality among this category of patients remain high, especially in conditions of limited resources and insufficient coordination between specialists [3,4].

Modern approaches to medical rehabilitation of newborns with CIO are largely standardized and do not always take into account the individual characteristics of the patient, which limits their effectiveness [5,6]. At the same time, global practice shows that the introduction of multidisciplinary, personalized care algorithms helps to reduce the number of complications, improve recovery processes and, as a result, reduce hospitalization periods and reduce mortality [7,8].

In this regard, the development and implementation of a clinical and organizational algorithm for personalized postoperative care for newborns with CIO, aimed at optimizing thermoregulation, nutritional support, preventing complications and comprehensive monitoring of the patient's condition, is a relevant area of modern neonatal medicine [9,10]. Such a solution meets the challenges of improving the quality of medical care, rational use of resources and improving long-term clinical outcomes in a vulnerable category of patients [11].

AIM OF THE RESEARCH

To develop and implement a clinical and organizational algorithm for postoperative care of newborns with congenital intestinal obstruction, aimed at reducing mortality, complication rates and hospitalization times through a multidisciplinary approach.

MATERIALS AND METHODS OF THE RESEARCH

The study included 82 newborns diagnosed with congenital intestinal obstruction (CIO) who were treated in the neonatal surgery department from 2022 to 2024. All patients underwent surgery and were divided into two observation groups comparable in age, birth weight, and the nature of the pathology. Group I (n = 42) received standard postoperative care according to current clinical protocols. Group II (n = 40) received personalized care according to a developed algorithm, which provided an individual approach to each patient. The algorithm included the following elements.

Thermoregulation control using both infrared and contact thermometers, with correction of thermal protection conditions; Early nutritional support: initiation of parenteral nutrition in the first hours after surgery, followed by transition to enteral feeding, under

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the constant supervision of a clinical nutritionist; Assessment and monitoring of the condition of the postoperative wound using modern atraumatic dressings and visual control technologies;

Prevention of infectious, inflammatory and metabolic complications through the use of antibacterial protection protocols, monitoring of glucose levels, electrolytes, lactate and other biochemical parameters.

Methods for assessing the effectiveness of the proposed algorithm included monitoring the time of stabilization of vital functions (heart rate, respiratory rate, oxygen saturation level, body temperature); accounting for the frequency of postoperative complications (infectious, metabolic, surgical); calculating the average duration of hospitalization; analysis of mortality in the study groups.

The data were processed using statistical methods: for quantitative variables – calculation of mean values, standard deviation and confidence intervals; for comparison of groups – Student's t-test and χ^2-test. Differences were considered statistically significant at $p < 0.05$.

RESULTS OF THE RESEARCH

During the comparative analysis of two groups of newborns with congenital intestinal obstruction who underwent postoperative rehabilitation according to the standard and personalized protocol, data were obtained that allow an objective assessment of the clinical effectiveness of the implemented approach. The results are presented in the form of quantitative and qualitative indicators, including the rate of recovery of vital functions, the dynamics of nutritional status, the frequency of postoperative complications, the duration of hospitalization and the mortality rate. Below are the main statistical data obtained during the study.

Table 1
Characteristics of the examined patients

Indicator	Group I (n=42)	Group II (n=40)	p-value
Average gestational age, weeks	38.2 ± 1.1	38.1 ± 1.3	0.76
Average birth weight, g	2950 ± 370	2900 ± 390	0.58
Male gender, n (%)	26 (61.9%)	25 (62.5%)	0.95
Prevalence of jejunal atresia, n (%)	18 (42.9%)	17 (42.5%)	0.97

This Table 1 contains the main demographic and clinical characteristics of patients in the two study groups: Group I (n=42), which received a personalized medical rehabilitation program, and Group II (n=40), which received standard postoperative care.

Comparative analysis of gestational age showed that the average values in patients of both groups were comparable: 38.2 ± 1.1 weeks in group I and 38.1 ± 1.3 weeks in group II (p=0.76), which indicates the absence of statistically significant differences.

The average birth weight was also similar between the groups: 2950 ± 370 g in group I and 2900 ± 390 g in group II (p=0.58), without significant differences.

The distribution by gender showed an equal proportion of boys - 61.9% and 62.5% in groups I and II, respectively (p=0.95).
The incidence of jejunal atresia as the main nosological form in the structure of congenital intestinal obstruction was almost identical: 42.9% in Group I and 42.5% in Group II (p=0.97). The obtained data confirm that the study groups were comparable in terms of the main demographic and clinical characteristics at the time of inclusion in the study. This ensures the correctness of the subsequent comparison of the effectiveness of the rehabilitation programs used and reduces the likelihood of the influence of initial differences on the results.

Table 2
Assessment of the time frame for recovery of vital functions (in days)

Parameter	Group I	Group II	p-value
Stabilization of body temperature	4.3 ± 1.2	2.1 ± 0.6	<0.001
Restoration of breathing (SpO_2>95%)	3.5 ± 1.0	2.4 ± 0.7	<0.01
Restoration of hemodynamics	5.2 ± 1.6	3.0 ± 1.1	<0.001

Table 2 presents comparative data on the recovery times of vital functions in patients of the two study groups.
It was found that body temperature stabilization in children in group II occurred significantly faster - on average after 2.1 ± 0.6 days compared to 4.3 ± 1.2 days in group I ($p < 0.001$).

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Restoration of respiratory function, assessed by the level of oxygen saturation (SpO_2> 95%), also occurred significantly earlier in patients of group II - 2.4 ± 0.7 days versus 3.5 ± 1.0 days in group I ($p < 0.01$). The most pronounced differences were found in the time frame for hemodynamic restoration: 3.0 ± 1.1 days in group II and 5.2 ± 1.6 days in group I ($p < 0.001$).

Thus, the obtained results indicate a statistically significant and clinically important acceleration of vital function stabilization in patients of group II. This may indicate greater effectiveness of the rehabilitation management model applied in this group, including early stabilization and a personalized approach.

Table 3
Frequency of early postoperative complications

Type of complication	Group I (n=42)	Group II (n=40)	p-value
Infectious complications	12 (28.6%)	4 (10.0%)	0.028
Eating disorders/intolerance	10 (23.8%)	3 (7.5%)	0.035
Seam divergence	4 (9.5%)	1 (2.5%)	0.17

Table 3 presents a comparative analysis of the frequency of early postoperative complications in patients of the two study groups. In Group I, where the standard postoperative management scheme was used, significantly more complications were registered compared to Group II, where a personalized rehabilitation program was used.

Infectious complications were observed in 28.6% of patients in Group I versus 10.0% in Group II ($p = 0.028$), which is statistically significant. Nutritional disorders and intolerance were observed in 23.8% of patients in Group I versus 7.5% in Group II ($p = 0.035$), also significant. Suture dehiscence was observed in 9.5% of cases in Group I and 2.5% in Group II ($p = 0.17$), this difference did not reach statistical significance.

The results of the table demonstrate a significant reduction in the incidence of infectious complications and nutritional disorders in the group with a personalized approach to postoperative rehabilitation. This indicates a positive effect of individualized therapy on clinical outcomes in the early postoperative period.

Table 4
Length of hospitalization and IT support

Indicator	Group I	Group II	p-value
Average length of hospital stay, days	24.1 ± 6.3	17.6 ± 4.5	<0.001
Duration of mechanical ventilation, days	5.4 ± 1.5	3.2 ± 1.0	<0.001
Need for rehospitalization	6 (14.3%)	1 (2.5%)	0.048

Table 4 presents a comparative analysis of the duration of hospitalization, the need for artificial lung ventilation (ALV), and the frequency of readmission in patients of the two study groups. The average duration of hospitalization in group I was 24.1 ± 6.3 days, while in group II it was significantly less, 17.6 ± 4.5 days ($p < 0.001$), indicating a faster recovery of patients in group II. The duration of ALV was also significantly less in patients of group II (3.2 ± 1.0 days) compared to group I (5.4 ± 1.5 days), the difference is statistically significant ($p < 0.001$). The need for readmission was observed in 14.3% of patients in the first group and only in 2.5% in the second group, with a reliable difference ($p = 0.048$).

The results presented in the table demonstrate that patients in Group II had significantly better clinical and organizational indicators: shorter hospital stays, less need for artificial ventilation, and a reduced likelihood of rehospitalization. This confirms the effectiveness of the proposed treatment and rehabilitation approach used in Group II.

Table 5
Mortality and overall clinical improvement

Indicator	Group I	Group II	p-value
Mortality	4 (9.5%)	1 (2.5%)	0.17
Overall clinical improvement (scale ≥75%)	30 (71.4%)	37 (92.5%)	0,012

Table5 shows a comparative analysis of mortality and overall clinical improvement in patients of the two study groups after completing the rehabilitation program. In Group I, fatal outcome was recorded in 4 patients (9.5%), while in Group II - in one patient (2.5%). Despite the quantitative difference, statistical significance was not achieved ($p = 0.17$). A significant difference was noted in the indicators of overall clinical improvement: in Group I, significant improvement (≥75% on the assessment scale) was observed in 30 patients (71.4%), while in Group II - in 37 patients (92.5%), which is statistically significant ($p = 0.012$).

The results of the table indicate a pronounced clinical advantage of the complex personalized rehabilitation used in Group II, which is confirmed by a significantly higher level of overall clinical improvement. At the same time, a decrease in mortality in this group is also noted, but the difference is statistically insignificant, which may be due to the limited

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DISCUSSION

The conducted study aimed at assessing the clinical effectiveness of a personalized algorithm for postoperative rehabilitation of newborns with congenital intestinal obstruction (CIO) revealed a number of significant advantages of the proposed approach compared to the standard protocol. The results obtained from the analysis of clinical, functional, nutritional and organizational indicators demonstrate the high effectiveness of multidisciplinary personalized patient management tactics.

First of all, it is important to note that the initial characteristics of the patients (Table 1) did not have statistically significant differences, which confirms the comparability of the groups and excludes the influence of the initial parameters on the treatment outcomes. This strengthens the reliability of the conclusions about the influence of a specific rehabilitation approach on the outcomes of the disease.

The recovery of vital functions in newborns in Group II (Table 2) was significantly accelerated, where a personalized care scheme was used. The differences in the time of body temperature stabilization, restoration of breathing and hemodynamics are especially pronounced. This indicates the high efficiency of the proposed algorithm, including continuous monitoring and adapted support measures.

Analysis of complications (Table 3) also confirms the advantages of the personalized program. The frequency of infectious complications and nutritional disorders was significantly lower in Group II, which is probably due to the earlier start of nutrition, strict control of nutritional support, and the use of modern methods of prevention. Although the differences in the frequency of suture divergence did not reach statistical significance, the overall trend is also in favor of Group II.

The results of Table 4 highlight not only the clinical but also the organizational and economic efficiency of the new approach: patients from Group II demonstrated a significantly lower need for mechanical ventilation, a reduced duration of hospitalization, and an earlier transition to enteral nutrition. All these factors directly contribute to a reduction in treatment costs, an increase in the throughput of departments, and a decrease in psychological stress in parents.

Of particular note are the data in Table 5, which reflects the results in the context of mortality and overall clinical improvement. Despite the lack of statistical significance in the mortality rate, there is a clear downward trend in this indicator in the group with personalized rehabilitation. A significant increase in the proportion of patients with significant clinical improvement (92.5% versus 71.4%) confirms the overall success of integrating an individualized multidisciplinary approach.

Thus, the discussion of the study results gives grounds to assert that the introduction of a personalized algorithm of postoperative care in newborns with CIO ensures faster recovery, reduces the incidence of complications, optimizes organizational parameters of treatment and improves clinical outcomes. This emphasizes the need to revise existing standards in favor of more flexible and adapted rehabilitation strategies, especially in neonatal surgical practice.

CONCLUSION

The study confirmed the high clinical and organizational effectiveness of a personalized approach to postoperative rehabilitation of newborns with congenital intestinal obstruction. A comparative analysis of two cohorts showed that the introduction of an individualized care algorithm based on interdisciplinary interaction and active monitoring of the patient's condition contributes to the accelerated restoration of vital functions, a decrease in the incidence of postoperative complications, improved tolerance and rates of nutritional support, and a reduction in the duration of hospitalization.

Despite the comparability of the groups in terms of baseline parameters, patients receiving personalized care demonstrated better clinical outcomes, including a significantly higher level of overall clinical improvement. The observed trend toward lower mortality in this group requires further confirmation in larger samples.

The obtained data allow us to recommend the introduction of personalized rehabilitation protocols into the routine practice of neonatal surgical departments as a more effective and safer alternative to standard approaches.

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