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Inclusion of the prepared patient relatives in the process of early rehabilitation of onco-surgical patients in the department of anesthesiology and intensive care

A.K. Saetgaraev[1,2], I.L. Maximov[1]*, I.I. Zakirov[1,3], I.V. Shaymardanov[1,2], I.A. Grigoreva[1], M.E. Guryleva[1]

[1]Kazan State Medical University Kazan, Russia
[2]Tatarstan Cancer Center, Kazan, Russia
[3]Children's Republican Clinical Hospital of the Ministry of Health of the Republic of Tatarstan, Kazan, Russia

Abstract

Aim. To study the influence of the trained environment of geriatric onco-surgical patients on the quality of the interventions in the complex of early postoperative rehabilitation in the Intensive Care Unit (ICU).

Methods. The 96 patients aged 73.3±7.1 years operated on in the emergency onco-surgery clinic of the Tatarstan Cancer Center of the Ministry of Health of the Republic of Tatarstan between 2016 and 2020. Patients, similar in age and condition (American Society of Anaesthesiologists' Physical Status category IIIE) were divided into three equal groups: the first group — generally accepted measures for early rehabilitation were carried out by medical staff; the second group — the prepared relatives of the patient was additionally involved in rehabilitation; the control group — early rehabilitation was not carried out. The quality of nutritional support and measures to prevent pressure ulcers, cognitive function were assessed. Statistical processing was performed by using Microsoft Excel 2007 and IBM SPSS Statistics version 20 software. The statistical significance of data was determined by using the chi-square test at $p < 0.05$.

Results. The involvement of previously trained relatives made it possible to reduce the incidence of pressure ulcers grade IV to 0%. There was a significant difference in the volume of assimilated enteral oral feeding (180.6±20.8; 240.6±20.8; 80.5±10.2; $p < 0.05$) and the serum albumin level by 11 days after surgery (26.8±1.5; 28.9±1.2; 24.2±1.1 g/L, respectively; $p < 0.05$). Assimilation of enteral oral feeding improved 3 times compared with the control group and 1.5 times compared with the first group ($p < 0.05$). Indicators of cognitive status by the Mini Mental State Examination (MMSE) on the 6th day were 23.3±1.1; 25.3±1.1; 21.2±1.2 ($p < 0.05$), respectively.

Conclusion. A rationally organized preparation of the patient's environment for the implementation of care, participation in rehabilitation measures and the prevention of complications can improve outcomes of medical intervention and reduce the incidence of postoperative complications.

Keywords: information, preparation, education, patient, patient's environment, postoperative complications, rehabilitation, elderly and senile age, intensive care unit.

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Background. Today, in Russia, the treatment of patients at the inpatient stage is still based on the "traditional" paternalistic approach and, in most cases, does not involve the active participation of either patients or their relatives [1]. Moreover, there is active resistance (misunderstanding and reluctance) among the conservative part of the medical community and healthcare organizers in introducing an alternative approach that is highlighting the key role of informed, trained, and prepared patients and their environment [1]. As foreign experience shows, a prepared and trained environment for the patient helps the medical staff improve the treatment results in a medical institution, including the anesthesiology, resuscitation, and intensive care departments (ARICD) [2, 3]. The active involvement

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of the patient's environment in the treatment process requires a radical change in the mentality of medical workers and the principles of organizing treatment [4–6].

This study aimed to determine the influence of the trained environment of geriatric oncosurgical patients on the quality of the measures carried out in the complex of early postoperative rehabilitation in the ARICD.

Materials and methods. The study included 96 patients aged 73.3 ± 7.1 years (elderly and senile people according to the classification of the World Health Organization), who underwent laparotomy in the emergency oncosurgery clinic of the Tatarstan Cancer Center of the Ministry of Health of the Republic of Tatarstan between 2016 and 2020 for acute obstructive intestinal obstruction of tumor genesis under general and epidural anesthesia. The studied patients were selected and divided into three groups that did not differ in age, condition severity (IIIE on the scale of the American Society of Anesthesiologists), and surgery volume, which made it possible to exclude the appearance of errors in comparison between groups and in pairs.

– The first group consisted of 32 patients. In this group, medical personnel carried out generally accepted measures for early rehabilitation in intensive care according to the methodological recommendations of ReaBIT [7, 8].

– The second group also consisted of 32 patients. Of the patients' relatives who expressed a desire to help in the work of medical personnel, 53 were selected. They went through the school of training, were included in the multidisciplinary rehabilitation team, and, during the period of the patient's stay in the ARICD, were allowed to assist in feeding a sick relative, care for the skin and mucous membranes, perform muscular-articular and respiratory exercises, and provide emotional and cognitive support (talked with patients, showed family pictures, recalled positive life events together, and told good news of a personal nature) under the guidance and supervision of the staffs. Since 2020, the program has been suspended because of known restrictions of the new coronavirus (COVID-19) infection.

– The control group consisted of 32 patients who did not undergo early rehabilitation in the ARICD. Data were collected retrospectively from medical documents from 2016 to 2017.

The assessment of the degree of development of pressure ulcers was performed following the industry standard protocol for managing patients. The clinical picture and severity of pressure ulcers in the sacral region were divided into four stages as follows: I, persistent hyperemia; II, persistent hyperemia; III, necrosis with muscle involvement; IV, necrosis to bone structures.

The clinical nutrition quality was assessed according to the order of the Ministry of Health of the Russian Federation No. 330 "On measures to improve medical nutrition in medical institutions of the Russian Federation." The assimilation volume of the prescribed oral enteral nutrition was determined (the so-called SIR FEEDING method). To evaluate the effectiveness, the dynamics of the content of blood serum albumin were assessed as one of the most paramount considerations and universal serum markers indicating malnutrition [9, 10]. The albumin concentration and reference values in the samples were determined using a Beckman Coulter AU480 analyzer (Brea, CA, USA) [10].

Clinical postoperative nutrition was calculated according to modern recommendations of daily intake of 30 kcal/kg, protein of 1.4 g/kg, fat of 2.5 g/kg, and carbohydrates of 4 g/kg [11, 12]. The consumption volume of additionally prescribed oral officinal specialized high-calorie nutrient-balanced liquid mixture was studied when switching from parenteral to enteral SIP FEEDING. The prescribed and assimilated amounts of food were considered. Then, the actual amount of assimilated food was converted into a percentage (%) of the prescribed one.

An integrative assessment of mental status in the perioperative period was performed. We used a short scale Mini-Mental State Examination (MMSE), which is recommended for clinical use in the perioperative period to primarily assess cognitive function state and screen for impairments, including dementia [13, 14]. This questionnaire consists of 30 items, and the normal MMSE scores are 28–30, mild cognitive disorders 24–27 points, mild dementia 20–23 points, moderate dementia 11–19 points, and severe dementia 0–10 points. The assessment was carried out before the operation and on days 2–6 of the postoperative period.

Statistical analysis was carried out using the software package Microsoft Excel 2007 and IBM SPSS Statistics 20. When comparing the mean values in normally distributed populations, the Student's *t*-test was used. Differences in indicators were considered statistically significant at $p < 0.05$. The accumulation, correction, and systematization of the initial information and visualization of the obtained results were carried out in Microsoft Excel 2007 spreadsheets. To check the equality of the medians of several samples, the Kruskal–Wallis test was used. The study was approved by the ethics committee (extract from the protocol of the local ethical committee of Kazan State Medical University No. 1 dated March 2, 2021).

Results. On the basis of the clinic of anesthesiology and resuscitation of the Republican Clinical Oncological Dispensary of the Ministry of Health of the Republic of Tatarstan, we organized "school of training" for patient's relatives to equip them with medical care skills. The selection was carried out jointly by the head of the clinic of anesthesiology and resuscitation and the head and the senior nurse of the ARIT by interviewing (offered clinical situational tasks and asked general questions) people who expressed their desire to stay with patients in the ARIT in the postoperative period, with patients' consent.

In this case, the patient's environment had to meet the following four main criteria:

– be adequate and represent a measure of responsibility for the patient (understand that there are no ideal treatment methods and a negative result of treatment is possible);

– be sociable (friendly and cooperative, but not intrusive);

– demonstrate interest and ingenuity (understand and delve into treatment methods and evaluate possible options for changing the situation);

– to be correct in relation to employees of a medical organization and patients.

For each criterion, the examiner secretly, without dubbing and discussing, gave participants a positive or negative score. The scores from each examiner were summed up, and the criterion for passing was a mean score of at least 3 points. Applicants who scored less than 3 points were not allowed to study. The selection results were not commented on or discussed with the casting participants.

The school program consisted of three study levels as follows: level I—60 min and levels II and III—30 min each (2 h in total).

Level I training was conducted jointly by the heads of the departments as follows: an oncologist-surgeon, a rehabilitation therapist, a medical psychologist, and a senior nurse. It included theoretical issues of organizational and legal relationships and sanitary and epidemiological features of the work organization of ARICD, which was devoted to the concepts of anesthesia and anesthesia, features of the anatomy of the human body and oral cavity, rules of asepsis and antiseptics, and nutritional features in the perioperative period. The participants were taught about rules for anti-decubitus measures and breathing exercises, devices that reduce skin pressure (such as pillows, foam rubber, and rollers), rules for lifting and moving the patient except for friction and tissue shift and maintaining a comfortable state of the bed (shaking off crumbs and straightening bed folds), and the basics of skincare. The participants were also taught about the emotional and cognitive characteristics of ARICD patients and examples of the organization of psychological support that were given to patients. The training material was presented in an accessible form, without complex and scientific terms, using demonstration technologies, presentations, and educational films.

Level II training was conducted by a resuscitator, a rehabilitation therapist, and a senior nurse of the ARICD. During the simulation session, the anti-decubitus measure technique was practiced on a full-length mannequin, and manual skills of oral hygiene, enteral tube feeding, and oral feeding (SIP FEEDING) were practiced on a head model.

Under the guidance of the senior nurse of the ARICD, level III training included directly practicing the acquired manual skills on a relative-patient in the intensive care unit. Trained relatives were then assigned to a mentor nurse and involved in patient care as a part of a multidisciplinary rehabilitation team.

During the period of COVID-19, the work of the school had to be suspended, but the obtained positive results gave a reason to plan an open prospective study on the effectiveness of the care and rehabilitation of patients with the involvement of volunteer relatives trained in our school than those with traditional rehabilitation in ARICD. The study aimed to introduce anesthesiology into the clinic and intensive care of the Republican Clinical Oncological Dispensary of the Ministry of Health of the Republic of Tatarstan and, possibly, to disseminate our experience.

The degree of pressure ulcer development was assessed in all three groups. (The assessment was carried out on the 10th day of being in ARICD.) Results revealed that all patients (100%) acquired a pressure ulcer in the sacral region, but the degree of its severity in the observation groups differed.

Based on the industry standard, in the first group (n = 32), 59% of patients were diagnosed with I degree pressure ulcer severity, 28% with II degree, 10% with III degree, and 3% with IV degree. In the second group (n = 32), the ratio was different and showed a decrease in the severity of clinical manifestations of pressure ulcers: I degree in 80%, II degree in 16%, III degree in 4%, and IV degree in 0%. The indicator analyses of the control group (n = 32) showed that 16% had I degree (least), 52% had II degree, 22% had III degree, and 10% had IV degree (most severe) [15].

Compared with the results obtained, it can be seen that the first two groups—undergoing rehabilitation under the ReabIT protocol [7] and the ReabIT with relatives involved in rehabilitation—have a mild degree of pressure ulcers, where-

as the control group had a significant increase in the severity of bedsore manifestations. In addition, a decrease in the proportion of cases of necrotic manifestations can be observed. Comparing the control group with generally accepted rehabilitation methods and the patient group whose rehabilitation is involved in their environment, we can conclude that the control group has a fairly high frequency of severe pressure ulcers (IV degree, necrosis; 10%) than the first (3%) and second groups (0%).

We studied the quality indicators of clinical enteral oral nutrition using the SIP FEEDING method (Tables 1 and 2). We compared the volumes of prescribed and assimilated nutrition, as well as the albumin content in all groups.

At the same time, concerning the assimilation of enteral oral nutrition, patients in the early rehabilitation group with the involvement of relatives had higher rates of actual consumption of enteral nutrition in the postoperative period (Table 2).

The differences between the groups and in pairs are significant ($p < 0.05$), except for the "amount of prescribed food" indicator ($p = 0.891$), which had no significant difference and proved the homogeneity of the indicators of the compared groups. Of the prescribed volume, the assimilation volume of enteral oral nutrition (SIP FEEDING) was 25.5% in the control group, 57.3% in the first group, and 82.9% in the second group (Table 1).

Malnutrition is an independent risk factor for increased complications, mortality, hospital stay length, and costs [11, 12]. Our study revealed that the control group, which did not receive rehabilitation, had low results of consumption and assimilation volume, whereas the first and second groups showed good results. Moreover, patients who received the program of enteral oral nutrition (SIP FEEDING) from both medical workers and relatives had the highest rates.

The result is similar to albumin indicators. In the early rehabilitation group with the involvement of relatives, the patients had a faster increase of albumin content in the postoperative period. The normal concentration of albumin in the blood is 34–54 g/L [10]. Our results showed that the three groups had an initial decrease in albumin in the preoperative period (28.1 ± 1.1 g/L in the first group, 28.6 ± 1.8 g/L in the second group, and 29.2 ± 1.1 g/L in the control group; $p = 0.891$). There is no significant difference between the groups before surgery. A blood serum level analysis on the 11th day of the postoperative period revealed significant differences in the groups (Fig. 1). The results were higher in the first (26.8 ± 1.5 g/L) and second groups (28.9 ± 1.2 g/L) than in the control group (24.2 ± 1.1 g/L; $p < 0.05$); the maximum values were in the second group.

Table 1. Prescribed and assimilated amount of oral nutrition

Nutrition volume	Control group	Group 1	Group 2
Prescribed nutrition (mL)*	320.0	315.0	290.0
Assimilated nutrition (mL)*	80.5	180.6	240.6
Assimilated portion (%)	25.5	57.3	82.9

*Arithmetic mean.

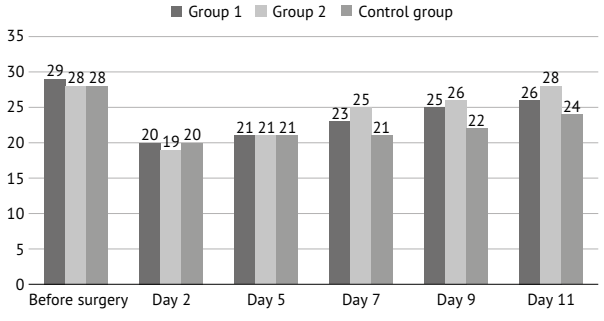

Fig. 1. Dynamics of the albumin level changes in the preoperative and postoperative periods

The albumin levels of the three groups can also be compared by their difference in the preoperative and postoperative periods. The diagram presents the average result of the difference in the blood albumin content of the groups and its range before and on day 11 after surgery. The analyses was carried out using the Kruskal–Wallis test; for a more accurate description of the observed trends, the Mann–Whitney test was used to assess the differences in indicators when comparing groups in pairs and between all groups.

In terms of restoring the albumin content to the preoperative level, the control group had the worst result, whereas the second group returned to the initial norm by the end of the observation period (Fig. 1).

In addition, we studied the presence and degree of cognitive impairment that could (or have occurred) in geriatric cancer patients in the postoperative period. As recommended by the medical community for documenting patients' responses for

Table 2. Comparison of the prescribed and assimilated volume of enteral nutrition

Nutrition volume	Control group	Group 1	Group 2	$p_{к-1}$	$p_{к-2}$	p_{1-2}
Prescribed nutrition (mL)	320.0±40.6	315.0±35.4	290.0 ±44.2	0.891	0.891	0.891
Assimilated nutrition (mL)	80.5±10.2	180.6±20.8	240.6 ±20.4	<0.05	<0.05	<0.05

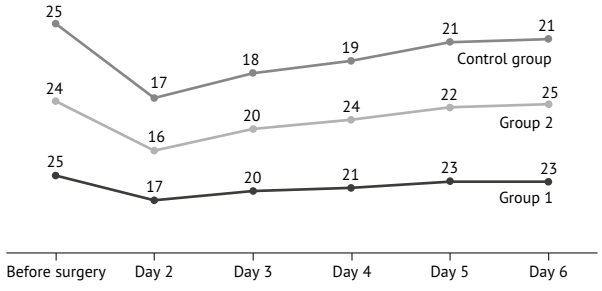

Fig. 2. Dynamics of changes in the cognitive function index according to a short scale for assessing mental status in three observed groups before surgery and in the postoperative recovery period

treatment, we used the MMSE (or Folstein test) six times (before surgery and on days 2–6 after surgery), as it is sensitive enough to track cognitive changes in humans over time. The purpose of the MMSE test was not to diagnose any specific nosological pathology but to evaluate the dynamics of patients' cognitive recovery.

Before the operation, there was a decrease in the primary indicators compared with the norm (the MMSE norm is 28–30 points), which we interpreted as mild cognitive impairments and explained by the age factor. At this stage, the indicators of all the groups were similar (25.1 ± 1.1, 24.1 ± 1.2, and 25.1 ± 1.2 points in the first, second, and control groups, respectively); there was no significant difference between them ($p > 0.05$).

On the 2nd day after the surgical intervention was performed under general anesthesia, there was a sharp drop in indicators compared with that on the preoperative period, and this drop was also parity (17, 16, and 17 points, respectively), which also showed the absence of significant differences between the compared groups. We interpreted this as a manifestation of acute postoperative cognitive dysfunction and a reaction to general anesthesia.

Subsequent 2-day interval assessments showed positive dynamic cognitive impairment indicators in all patients, but the groups differed in the recovery rate of cognitive abilities.

So, the Folstein test (MMSE) scores improved in patients who underwent early rehabilitation without the participation of trained relatives on the 6th day (23 points), but it did not reach the initial preoperative value (25 points).

In the control group, the Folstein test (MMSE) indicators had slower dynamics (25.1 ± 1.1 points before surgery and 21 ± 1.3 points on day 6 after surgeries). The value did not return to the initial indicators, and the difference between the primary and final measurements is reliable ($p < 0.05$).

In the group of patients who underwent primary rehabilitation and were additionally monitored and cared for by trained relatives, the dynamics of restoration of impaired neuropsychological functions were faster and more noticeable (24.2 ± 1.1 points before surgery and 25.1 ± 1.1 points on the 6th day). In the postoperative period, the Folstein test (MMSE) score was not significant, but it was higher than the baseline, which was not recorded in other groups (Fig. 2).

Differences in neuropsychological status indicators were not significant between the first (25.1 ± 1.1 points) and second groups (23.1 ± 1.1 points) at the end of the observation (on day 6 after surgery) but were significant between the second (25.1 ± 1.1 points) and control groups (21 ± 1.3 points; $p < 0.05$). We made a conclusion about the beneficial effect of early rehabilitation of patients on the dynamics of neuropsychological processes and the positive role of relatives in helping the medical staff with not only the care but also the mental function activation of patients in the ARICD.

Discussion. A rationally organized process of informing, educating, and preparing the patient's relatives for general care, rehabilitation activity participation, and possible complication prevention under the guidance of medical personnel in ARICD conditions improves the results of medical care for geriatric patients with acute obstructive intestinal obstruction of tumor genesis.

By the postoperative 10th day, severe IV degree pressure sores were reported in 3% of patients for standard early rehabilitation and 0% in patients with standard early rehabilitation with the involvement of relatives in the care, which demonstrates an advantage over the absence of early rehabilitation (10%).

The participation of relatives has a positive effect on the quality of the organization of clinical enteral oral nutrition (SIP FEEDING). The assimilation volume of enteral SIP FEEDING was 25.5% in the control group, 57.3% in the first group, and 82.9% in the second group of the prescribed volume. Albumin content indicators in the blood was higher in the group with the participation of trained relatives (28.9 ± 1.0 g/L) than in the group with traditional rehabilitation (26.8 ± 1.5 g/L; $p < 0.05$)

The inclusion of the patient's communication with their relatives in the ARICD into the program for preventing cognitive-differential disorders facilitated patients' return to their original social status and provided cognitive-emotional disorder rehabilitation. The MMSE indices in the postoperative period in patients who underwent early rehabilitation (23.3 ± 1.1 points) were lower than in those who underwent early rehabilitation with the involvement of trained relatives (25.3 ± 1.1 points; $p < 0.05$).

CONCLUSIONS

1. The involvement of a trained and informed environment of a geriatric patient under the supervision of medical personnel in the treatment and rehabilitation process in the ARICD of an oncological institution contributes to the improvement of the quality of medical care by reducing the severity of purulent-infectious complications caused by pressure ulcers, reducing cognitive impairments, and improving the indicators of nutritional status restoration.

2. As a part of the creation of partnerships between medical personnel and the patient, it is advisable to involve an informed, trained, and prepared environment (relatives) for patients in the early rehabilitation process.

Author contributions. A.K.S. and I.I.Z. worked with patients and their relatives, physically examined the patients, and wrote a medical literature analysis. I.L.M. analyzed regulatory legal acts and wrote a text. I.V.Sh. analyze regulatory legal acts and performed scientific editing. M.E.G. carried out the ethical support of the work and consulted on the conduct of clinical trials and statistical calculations. I.A.G. collected the materials and formed the tables and their description.

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