



Interdisciplinary Consensus on the Care of Elderly Patients with Hip Fractures Through an Orthogeriatric Approach

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ABSTRACT

INTRODUCTION. The development of an interdisciplinary consensus on the care of elderly and elderly patients with proximal femoral fractures is an urgent problem of modern medicine. The provisions of this Consensus will help to establish effective interaction between physicians of different specialties on the basis of their better understanding, which will contribute to the improvement of specialized medical care, saving lives and reducing disability of elderly patients with hip fractures through.

MAIN CONSENSUS CONTENT. Hip fractures through are one of the most frequent and severe complications of osteoporosis. Difficulties in the management of elderly and elderly patients with hip fractures through are due to both the severity of the injury itself and comorbidity, which is accompanied by high mortality and extremely poor quality of life of survivors. Effective management of such patients is possible only with the joint participation of doctors and nurses of surgical and therapeutic profiles within the framework of the so-called orthogeriatric approach. Experts in the field of traumatology and orthopedics, anesthesiology and resuscitation, geriatrics, regenerative medicine, clinical pharmacology, therapy, rheumatology and endocrinology on the basis of available clinical recommendations and orders of the Ministry of Health of the Russian Federation, literature data, scientific studies and general discussion have formulated the main provisions of the Consensus, interdisciplinary management of elderly and elderly people with hip fractures through.

CONCLUSION. The introduction of the Consensus provisions developed by experts into the practical work of specialized medical organizations in Russia will improve the quality of medical care for a complex category of elderly patients with hip fractures through, save many of their lives and reduce the level of disability, which will undoubtedly have positive social and economic consequences.

KEYWORDS: orthogeriatrics, hip fractures, specialized care, consensus, elderly and senile age

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Междисциплинарный консенсус по оказанию помощи пожилым пациентам с переломами проксимального отдела бедренной кости на основе ортогериатрического подхода

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РЕЗЮМЕ

ВВЕДЕНИЕ. Разработка междисциплинарного консенсуса по оказанию помощи пациентам пожилого и старческого возраста с переломами проксимального отдела бедренной кости является имеет высокую актуальность. Положения Консенсуса помогут наладить эффективное взаимодействие врачей разных специальностей на основе лучшего их взаимопонимания, что будет способствовать улучшению специализированной медицинской помощи, медицинской реабилитации и снижению инвалидизации пожилых пациентов с переломами проксимального отдела бедренной кости.

ОСНОВНОЕ СОДЕРЖАНИЕ КОНСЕНСУСА. Переломы проксимального отдела бедренной кости — одно из самых частых и тяжелых осложнений остеопороза. Сложности в лечении пациентов пожилого и старческого возраста с переломами проксимального отдела бедренной кости обусловлены как тяжестью самой травмы, так и коморбидностью, что сопровождается высокой летальностью и крайне низким качеством жизни выживших. Эффективное ведение таких пациентов возможно только при совместном участии врачей и медицинских сестер хирургического и терапевтического профилей в рамках так называемого ортогериатрического подхода. Эксперты в области травматологии и ортопедии, анестезиологии и реаниматологии, гериатрии, восстановительной медицины, клинической фармакологии, терапии, ревматологии и эндокринологии на основе имеющихся клинических рекомендаций и приказов Министерства здравоохранения Российской Федерации, данных литературы, проведенных научных исследований и общей дискуссии сформулировали основные положения Консенсуса, междисциплинарного ведения людей пожилого и старческого возраста с переломами проксимального отдела бедренной кости.

ЗАКЛЮЧЕНИЕ. Внедрение в практическую работу профильных медицинских организаций России разработанных экспертами положений Консенсуса позволит улучшить качество оказания медицинской помощи, в том числе медицинской реабилитации, сложной категории пожилых пациентов с переломами проксимального отдела бедренной кости, сохранить многим из них жизни и снизить уровень инвалидизации, что, несомненно, будет иметь позитивные социальные и экономические последствия.

КЛЮЧЕВЫЕ СЛОВА: ортогериатрия, переломы проксимального отдела бедренной кости, специализированная помощь, консенсус, пожилой и старческий возраст

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INTRODUCTION

This consensus was prepared by a group of experts from different specialties to improve the quality of specialized medical care for elderly patients with hip fractures, which are almost always a consequence of osteoporosis and increased risk of falls. Difficulties in the treatment of this category of patients are primarily due to the severity of the injury itself, as well as the high comorbidity of elderly patients and poor bone quality. The consensus was initiated by the Russian Fragile Age Alliance, which includes the Russian Association of Gerontologists and Geriatricians, the Russian Association on Osteoporosis, the Union of Rehabilitation Therapists of Russia, AO Trauma Russia and the OSTEORUS patient society. The Alliance was established to promote multidisciplinary management of elderly patients with osteoporotic fractures, including secondary prevention, in the health care system of the Russian Federation. Representatives of other Russian professional public medical organizations interested in optimizing the care of elderly people with fractures also took part in the work on the consensus.

A modern, effective and widely used option for providing medical care to elderly people with hip fractures worldwide is the creation of interdisciplinary team including surgeon and other physicians, who are able to provide high-quality specialized medical care when managing these patients together. However, physicians of different specialties tend to use guidelines and protocols developed within their own specialty. They often lack familiarity with the approaches of other specialists to the treatment of this group of patients. To address this gap, a group of expert-level specialists from various fields, including Traumatology and Orthopedics, Anesthesiology, Geriatrics, Rehabilitation, Clinical Pharmacology, Internal Medicine, Rheumatology and Endocrinology, collaborated on the creation and editing of this document. This collaborative effort spanned a period of six months, culminating in the development of a consensus as part of "A set of interventions aimed at preventing falls and fractures in the elderly and older adults." [1].

The authors hope that the prepared and negotiated formulations, as well as their rationale, will help to establish effective interaction between physicians of different specialties on the basis of their better understanding, which will contribute to improving specialized medical care, saving lives and reducing disability of elderly patients with hip fractures, and that the provisions of the consensus will eventually be included in various federal clinical guidelines governing the work of physicians of the relevant specialties.

The current state of care for elderly patients with hip fractures and possibilities for optimization (literature review)

Hip fractures are one of the most frequent and severe complications of osteoporosis. According to estimates, 112.000 hip fractures occurred in the Russian Federation in 2010, and by 2035, due to the growing proportion of elderly people in the population, their number will have increased up to 159.000 people [2]. The severity of hip fractures is determined by the outcomes characterized by high mortality and significant reduction in the quality of life, which, in turn, depend on the management of the patients concerned. Thus, the proportion of bedridden

patients one year after hip fracture in the group of those who received surgical treatment is 1.6 %, while in conservative management — 31.6 %, and complete restoration of function in the group of surgical treatment methods was observed in 25.6 % of patients, while in conservative management — in 11.1 % of cases [3, 4]. According to other data, mortality in the period from 14 months to 2 years after metal osteosynthesis was 27.2 %, after hip arthroplasty — 19.3 %, and on the background of conservative treatment — 43.9 % [5]. In general, mortality is lower in those centers with high operative activity, but, nevertheless, it remains at a high level (29.8 %) [6].

In the 2000s, about 27 % of patients with hip fracture were not admitted to a Trauma hospital [7]. Nevertheless, even in the 2020s, the proportion of patients discharged from a Trauma hospital without undergoing surgery averages at 20 % [5]. At the same time, low operative activity and non-compliance with the recommended timing of surgical intervention persist even in specialized centers of Traumatology and Orthopedics. For example, in one center, only 69.8 % of men with hip fracture underwent surgical intervention within a period of 3 to 384 days (66 days on average) [8]. The average number of days from injury to surgery for hip fracture is 11.3 [9], with only about 6 % of patients operated on in the first 48 hours after their injury [10].

Hip fracture patients have a high risk of recurrent fractures, in particular, in the first two years after the first fracture [11], with a 3-fold increased risk of recurrent hip fracture [12]. Within the next 12 to 30 months, 2.5 % to 3.7 % of these patients sustain a contralateral hip fracture [8, 12, 13]. This determines the need for the drug treatment of osteoporosis in patients with hip fractures in order to prevent recurrent osteoporotic fractures. The best way to ensure timely prescription of treatment to reduce the risk of recurrent fractures is to organize Fracture Liaison Services that reduce the time needed to assess and prescribe osteoporosis therapy and increase the proportion of patients receiving such treatment [14]. Meanwhile, a study conducted in one of Moscow inpatient clinics found that among 282 patients aged 50 and older with hip, vertebral or multiple fractures, osteoporosis was diagnosed in only 0.4 % of cases, and osteoporosis medications, as well as calcium and vitamin D preparations, were not recommended to any patient [15]. In the Cheboksary city, only 0.7 % of men with hip fracture had a recommendation for drug treatment of osteoporosis after discharge from a Trauma hospital [8].

All of the above requires changes in the existing approaches to the management of elderly patients with hip fracture. The introduction of a new approach to surgical treatment with 100 % hospitalization and surgical treatment within 48 hours after the injury, despite the increase in direct medical costs, will lead to significant cost savings and will significantly improve the outcomes of treatment of geriatric patients with hip fracture [16].

The modern organization of care for elderly patients with hip fractures is based on a multidisciplinary approach involving a trauma surgeon, general practitioner/geriatrician, anesthesiologist, rehabilitation medicine specialist, nurses and other specialists, which is known as the orthogeriatric approach. Where appropriate (e.g. in lone patients) a multi-agency approach involving social

care is utilized. The three components of the orthogeriatric approach include treatment of the acute phase of the fracture by a multidisciplinary team, postoperative rehabilitation and long-term care, and prevention of recurrent fractures. The effectiveness of this organization of care has been proven. The adoption of an orthogeriatric approach and Fracture Liaison Service results in a 1.5 bed-day reduction in length of hospital stay, 28 % reduction in the in-hospital mortality, 19 % reduction in the risk of delirium, and 14–27 % reduction in the 30-day and annual mortality rates [17, 18]. In addition, orthogeriatric patients are less likely to develop pressure sores and have better functional and mental health outcomes [19]. It should also be noted that implementation of Fracture Liaison Service significantly reduces the risk of recurrent osteoporotic fractures [20].

There are different models of orthogeriatric care. These may be models involving only a consulting geriatrician visiting patients in the Trauma unit; an orthogeriatric ward specializing in the care of elderly patients with hip fractures; permanent work in the Trauma unit by a general practitioner who has received advanced training in geriatrics issues, etc. The advantages of any one of these models have not been proven [17].

Rehabilitation is an important part of the management of the elderly patient with hip fracture. The aim is to “eliminate impairments to facilitate patients’ functioning, increase their activity and engagement in social life, and improve their overall life quality” [21]. Rehabilitation of elderly patients is based on well-known principles: early start with the patient achieving an adequate level of analgesia through the multimodal use of various pharmacological agents and non-drug methods, continuity, succession, consistency, comprehensiveness, validity, as well as an individual approach, multidisciplinary nature and duration until positive dynamics are not lost [22, 23]. After surgical intervention for hip fracture in an elderly patient, rehabilitation measures should be carried out by a multidisciplinary rehabilitation team at all three stages: in the Intensive Care unit and specialized Trauma unit (the first stage of rehabilitation), an inpatient musculoskeletal Rehabilitation unit (the second stage of rehabilitation), an outpatient Rehabilitation unit or a day hospital (the third stage of rehabilitation). The multidisciplinary rehabilitation team consists of a physical rehabilitation specialist, a specialist in occupational rehabilitation, a medical psychologist, a rehabilitation nurse and a physician in physical and rehabilitation medicine, who heads the team¹.

For a more detailed study of the problem of a multidisciplinary approach to the care of elderly patients with fractures, it is recommended to use “Orthogeriatrics. The management of older patients with fragility fractures” — a manual for physicians edited by Falaschi P., Marsh D. [24] and “Fragility fracture nursing. Holistic care and management of the orthogeriatric patient” — a manual for physicians and nurses edited by Hertz K., Santy-Tomlinson J. [25].

¹ Order of the Ministry of Health of the Russian Federation dated 31.07.2020 No. 788n "On approval of the Procedure for organizing medical rehabilitation of adults" Available at: <http://publication.pravo.gov.ru/Document/View/0001202009250036> (Accessed 02.01.2025) (In Russ.)

Consensus provisions

Pre-hospital and pre-operative stages

- **All patients with hip fracture or suspected hip fracture should be referred to an institution providing specialized care in the field of traumatology and orthopedics to decide on the necessity and possibility of surgical intervention. Surgical intervention for hip fracture should be performed within 48 hours after the admission of the patient to such a hospital.**

If a hip fracture is suspected, all patients should be evacuated to a medical organization to verify the diagnosis, unless there are absolute contraindications to transport. All patients with a pathological hip fracture are recommended hospitalization and specialized surgical treatment in the field of traumatology and orthopedics within 48 hours with subsequent activation of the patient to increase survival rate [26, 27]. For this purpose, the patient should be referred or transferred within the defined time limits to a trauma center, a medical organization providing specialized, including high-tech medical care in the profile of traumatology and orthopedics [1]. It is recommended to minimize the duration of the preoperative period.

- **Upon admission to hospital, a hip fracture patient should be adequately anesthetized.**

To reduce the severity of pain syndrome and reduce the risk of delirium development, it is recommended to provide urgent and adequate analgesia to all patients with hip fracture, with due regard to the drugs administered during transportation. Lack of adequate anesthesia in an elderly patient causes additional discomfort during the presurgical examination, impairs positioning during the regional anesthesia, increases the incidence of postoperative complications (development of delirium, cardiovascular disorders), and causes a delay in activation.

Doctors and nursing staff of the unit where the patient is staying should ensure the control of pain syndrome: regular assessment of pain intensity, pain therapy using a multimodal approach according to a three-step pain management scheme (the “pain ladder” of the World Health Organization) [28]. A Numerical Rating Scale or a Visual Analogue Scale is recommended to measure pain intensity in patients with hip fracture [26]. The Pain Assessment in Advanced Dementia scale is used to identify pain and assess its intensity in patients with dementia [29]. It is recommended that the intensity of pain syndrome be assessed at the following time points: immediately on admission, 30 minutes after initial analgesic measures have been administered, and one hour after admission to the Trauma Department or Intensive Care Unit. Analgesia should be mandatory in all patients with pain intensity of more than 3 points at rest and 4 points on movement.

Paracetamol (parenterally) is currently the first-line drug of choice, but in monotherapy, it is insufficient for adequate analgesia [30]. Combined use of paracetamol with non-steroidal anti-inflammatory drugs should be carried out with mandatory consideration of the risk of side effects and contraindications to their administration (risk of gastrointestinal bleeding, liver dysfunction, renal failure with decreased glomerular filtration rate). The use

of narcotic analgesics (tramadol, promedol, morphine) is recommended only in case of severe pain syndrome (VAS score more than 6–7 points), if other methods of analgesia are ineffective, and the effect may be unpredictable due to significant comorbidity (cognitive impairment, cardiovascular and respiratory system abnormalities, hypovolemia, etc.) [31].

The experience of foreign colleagues, in addition to a limited number of domestic publications, testifies to the high effectiveness of various regional analgesia methods (fascia iliaca blocks, pericapsular blockade, etc.) when performed immediately upon admission to hospital [32, 33]. These techniques are relatively easy to perform in technical terms and are effective in more than 70 % of cases. At the same time, there is quite a marked variability in the frequency of their use both in different countries and in different hospitals in the same country (from 10 to 70 %). Patient-related factors (comorbidity) were found to influence the performance of regional analgesia in only 14 % of cases, the remaining 86 % being hospital- and anesthesiologist-dependent factors [34]. The analysis of Russian data and foreign experience shows that the key obstacles to the routine use of these methods are the forced delay of the patient in the Emergency Department, as well as the lack of personnel skilled in the technique and the lack of an equipped room to perform manipulations of regional anesthesia in compliance with the rules of asepsis and antisepsis.

- **In a Trauma hospital, elderly patients suffering from hip fractures are the responsibility of a multidisciplinary team.**

The patient's preparation for surgery and postsurgical follow-up should be performed by a multidisciplinary team that includes an orthopedic trauma surgeon, an anesthesiologist, a geriatrician (or a general practitioner with additional training in geriatrics), a medical rehabilitation physician, nurses, and, if necessary, physicians from other specialties [1]. The severity of chronic somatic diseases and decompensation of the patient's organs and systems are assessed jointly by the attending trauma orthopedic surgeon and geriatrician [35].

- **During the preoperative period, screening for frailty, assessment of nutritional status, cognitive impairment and risk of delirium are recommended for all hip fracture patients.**

These activities are carried out by a geriatrician or, in the absence of a geriatrician in the hospital, by an internist. Screening for frailty syndrome is carried out using the "Age is not a hindrance" questionnaire, dementia screening is carried out using the Mini-cog test, nutritional status is determined by the Mini-nutritional assessment (MNA) or the NRS-2002 scale. Decreased cognitive function, malnutrition and frailty are risk factors for the development of postoperative delirium. Malnutrition increases the risk of postoperative complications — surgical site infection, pneumonia, urinary tract infection and requires mandatory correction in the postoperative period, and in case of postponement of surgical intervention for any indication — also in the preoperative period [31, 36]. Preoperative identification of delirium is performed using the Confusion Assessment Method (CAM) scale [37].

- **In the perioperative period, all patients with hip fractures should receive vitamin D3 (cholecalciferol) orally at a dose of 50.000 IU (once or for 2–3 days), followed by a dose of 800–2000 IU per day. The exception is patients who were taking vitamin D prior to admission, it is recommended to continue cholecalciferol at a maintenance dose.**

Vitamin D deficiency is extremely common in patients with hip fracture: the mean serum 25(OH)D level is 9.90 ng/ml, the incidence of deficiency is 89 %, and severe deficiency is defined in 49 % of cases [38]. Low vitamin D levels increase the risk of delirium by 48 %, the risk of re-hospitalization within 30 days for other reasons by 64 %, and the risk of new hip fracture by 2.8 times [39]. Recovery of functional activity on the Barthel scale in patients after hip fracture has a clear inverse relationship with serum 25(OH)D concentration [40]. Vitamin D deficiency also leads to hypocalcemia, which is observed in 25 % of elderly patients with hip fractures and prevents timely and effective antiresorptive therapy for osteoporosis [8].

A patient with a 25(OH)D deficiency or insufficiency should be treated to correct this condition. Among patients with vitamin D deficiency who received a single 100.000 IU dose of cholecalciferol, fewer orthopedic complications were noted in the first 30 days after surgery for hip fracture [39]. A short-term vitamin D saturation therapy will also allow osteoporosis therapy to be initiated in the near future.

According to the Russian "Osteoporosis" Guidelines, vitamin D deficiency is treated only with cholecalciferol (vitamin D3) due to a lower metabolic degradation. According to the drug instructions, patients with recent (up to 90 days) hip fracture who have not previously taken vitamin D preparations are recommended to take a single dose of vitamin D 50.000–125.000 IU orally or intramuscularly before zoledronic acid administration. To maintain 25(OH)D levels above 30 ng/ml, the recommended dose of cholecalciferol is 1000–2000 IU per day [41].

- **If it is impossible to perform the operation in the first day, it is recommended to start drug preventive treatment of venous thromboembolic complications using low molecular weight heparin, unfractionated heparin or fondaparinux immediately after the patient's admission to hospital, and in case of high risk or ongoing bleeding, such prevention should be carried out by non-drug measures.**

All elderly hip fracture patients are at high risk of venous thromboembolic complications [42, 30]. On admission, it is necessary to clarify whether the patient is taking antiaggregants or anticoagulants on a regular basis and, if so, to assess the risk of bleeding to determine the further management of the patient: the possibility of postponing surgery or the need to neutralize the effect of anticoagulants or antiaggregants [43, 44]. After surgery, acetylsalicylic acid can be resumed as soon as hemostasis is achieved, and clopidogrel, ticagrelor or prasugrel — in 24–48 hours [45].

In the postoperative period, anticoagulants should be continued until the patient regains the expected motor activity, but not less than 5 weeks after surgery. In this case, it is possible both to continue administration of parenteral

drugs and to transfer the patient to oral anticoagulants: dabigatran etexilate, rivaroxaban, if it is impossible to prescribe them — vitamin K antagonists (warfarin) [42]. To prevent the development of adverse events, when choosing an anticoagulant for an elderly patient, it is necessary to assess renal function (calculate creatinine clearance) and clarify the list of drugs that he/she takes constantly for therapeutic indications [42].

- **In the surgical treatment of elderly patients with hip fractures, it is essential to perform perioperative antibiotic prophylaxis for surgical site infection.**

In accordance with the current regulatory documentation in the Russian Federation (SanPiN 3.3686-21) and Guidelines [30, 46], in order to achieve an effective concentration of antibacterial drugs in tissues and blood serum at the time of skin incision to prevent infection of the area of surgical intervention, antibiotics should be administered intravenously within 30 to 60 minutes before skin incision, and when using vancomycin — 2 hours before skin incision. The recommended duration of prophylactic antibiotic administration should not exceed 24 hours after the end of surgery. Additional doses may be justified for prolonged (more than 3 hours) operations [47]. Prolongation of prevention of surgical site infections after surgical intervention up to 48–72 hours is possible in case of hip arthroplasty in a patient with hip fracture.

The main drugs for perioperative antibiotic prophylaxis in any orthopedic surgery are cefazolin (average preoperative dose — 2.0 g, single dose 1.0 g) or cefuroxime (average preoperative dose — 1.5 g, single dose 0.75 g), in case of intolerance to cephalosporins — clindamycin (single dose — 0.6–0.9 g) or vancomycin (single dose — 1.0 g). The latter is also the drug of choice at risk of infection caused by methicillin-resistant strains of *S.aureus* [46].

- **The risk of cardiovascular complications and postoperative respiratory failure should be identified preoperatively.**

In elderly and senile patients, it is recommended to preoperatively assess the risk of cardiovascular complications using the Lee cardiovascular risk index and to assess respiratory risk using the postoperative respiratory failure risk scale [31].

- **In order to prevent delirium as well as to treat delirium and agitation in elderly patients, special programs aimed at reducing the negative impact of an unfavorable environment, creating psychological comfort for patients and ensuring the fullness of their physiological needs are recommended throughout their stay in hospital.**

It is impossible to completely prevent delirium and agitation, but it is possible to significantly reduce the risks of their development through the introduction of special prevention programs, which in turn will reduce the economic costs of treating patients and reduce the number of days they spend in hospital. To reduce the risk of developing agitation and delirium, physicians and nursing staff of the department should reduce the impact of unfavorable external environment on the patient and ensure his psychological comfort. This includes switching off

sound and light indications (taking them to a central point, reducing volume and brightness to the extent possible considering the patient's safety), the patient's access to glasses and hearing aids, switching off lights at night, using screens, ensuring that relatives can visit the patient [37]. It is also necessary to ensure psychological comfort and awareness of the elderly patient with hip fracture and, if necessary and if the patient agrees, of his relatives about his condition and the course of treatment [48, 35]. To reduce the risk of delirium and agitation, it is necessary to ensure the patient's full physiological functions: stool regularity control, intestinal stimulation, early initiation of enteral nutrition (in the absence of contraindications). It is recommended to limit and minimize the routine use of enemas. The surgeon should determine the indications for cleansing enemas in the perioperative period [35].

Non-drug therapies for agitation should be favored and the sedation/rest level of the patient should be monitored regularly [37]. Non-medication prevention and treatment of delirium should be based primarily on the elimination of factors that provoke its development. These include elimination of polypharmacy, sleeping pills, sedatives, anticholinergics and antihistamines; unusual environment (stress associated with a change of location or environment); intoxications (infectious and non-infectious); hypoxia/intravenous ventilation; shock; hypovolemia; hypothermia; dehydration; malnutrition, hypoalbuminemia and metabolic disturbances (electrolytes, glucose, acid-base status); sleep deprivation; pain syndrome; constipation [37].

If it is impossible to correct behavioral disorders by non-pharmacological methods, as well as in case of direct threat to the life and health of the patient and medical staff against the background of psychomotor agitation, antipsychotic therapy is recommended for use in the minimum effective dosage in the shortest possible time and is most appropriate in the hyperactive variant of delirium. Delirium therapy is recommended to start with atypical antipsychotics. In patients with delirium with psychomotor agitation, it is recommended to use ziprasidone in the form of lyophilisate for preparation of solution for intramuscular injection (initial dose — 10 mg, maximum — 40 mg) or risperidone (initial dose — 0.5 mg) with repeated administration not earlier than 2–4 hours after the first dose [37].

- **For early recovery from surgery, traditional 8–12-hour preoperative fasting is not recommended. If there is no risk of aspiration syndrome, the patient can consume clear liquids 2 hours before anesthesia, solid food — 6 hours before the start of anesthesia.**

Prolonged fasting before surgery reduces glycogen reserves in the liver and causes postoperative insulin resistance. Therefore, the last solid food intake should be 6 hours before surgery. Administration of 50 grams of carbohydrates 2 hours before surgery reduces the risk of postoperative insulin resistance by 50 % and preserves its anabolic effects. Supplementation with amino acids or branched-chain amino acids also helps to ensure a positive protein balance before surgery. Therefore, two hours before surgery, patients may be prescribed sipping or carbohydrate drinks containing 50 grams of carbohydrates (e.g. 150 ml of sweet tea or glucose solution) with/without 12 g of amino acids or amino acids with branched side

chains. Carbohydrate load before surgery does not affect the development of complications and does not lead to adverse effects regardless of the amount of fluid drunk. Anesthesiologist's assessment of the risk of regurgitation or aspiration is mandatory [36, 48, 49].

- **Preoperative nutritional support is indicated in patients with initial nutritional deficiency or when it is impossible to perform surgical intervention within the first 48 hours in patients at high risk of its development.**

Preoperative nutritional support may be given in the form of enteral oral nutrition, enteral tube feeding, parenteral nutrition, or mixed nutrition (enteral-parenteral), depending on the patient's ability to absorb enterally administered substrates. Oral enteral support is also given to all patients who, for any reason, are unable to meet more than 50 % of their energy requirements through natural nutrition [36].

- **It is recommended to start medical rehabilitation of elderly patients with hip fractures in the preoperative period for the purpose of early activation and prevention of complications in the postoperative period.**

The task of the preoperative period is to train the patient in correct deep thoracic and diaphragmatic breathing, coughing to prevent the risks of complications from the cardiovascular, respiratory and digestive systems [22].

- **It is imperative that pre-operative work-up is conducted in accordance with the recommended parameters. Furthermore, any extension of these examinations must be strictly justified by established indications.**

Preoperative examination should include objective assessment of somatic status, consultation with an internist or geriatrician, laboratory tests, ECG, and ultrasonic dopplerography of lower limb veins. The list of laboratory tests in a patient with hip fracture includes: general clinical blood analysis; biochemical analysis: glucose levels, creatinine levels with calculation of glomerular filtration rate (GFR), alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyltransferase (GGT). It is not recommended that all hip fracture patients routinely undergo a coagulogram (automated coulometer test). It is justified when there are clinical indications (warfarin use, established coagulopathy) to determine the timing of surgical treatment and the choice of anesthesia method [26, 30].

It is recommended to include additionally in the list of laboratory tests for patients with hip fractures: levels of total calcium, inorganic phosphorus, alkaline phosphatase activity to determine contraindications to antiresorptive therapy of osteoporosis [27, 41], sodium — to determine the need to postpone surgery (see below) [50], and in frailty patients — the level of 25(OH)D in order to choose the optimal dosing regimen of vitamin D3 (cholecalciferol) [29].

In all patients with suspected hip fracture, it is recommended to perform pelvic overview radiography, proximal femur and hip joint radiography on the side of the injury in straight and axial projections for diagnostic purposes. In instances where clinical and radiological data exhibit a discrepancy, it is advised that patients undergo

computed tomography (CT) of the hip joint or magnetic resonance imaging (MRI) of bone tissue from a single region. The data obtained from these imaging methods are known to possess a high degree of sensitivity and specificity in the diagnosis of hip fracture. In cases where intra-articular hip fracture (fracture of the neck and/or femoral head) are suspected, it is recommended that all patients undergo CT or MRI of the affected hip joint (one joint) in order to facilitate diagnosis and establish the most appropriate treatment plan [30].

Additional methods of examination and consultations with specialized experts should not be the reason for delaying surgical intervention. Preoperative therapy should be aimed at stabilizing functions that can be corrected (anemia, cardiac rhythm disturbances, dehydration). Management of chronic conditions (cardiac, renal, pulmonary) should not delay surgical treatment. According to the Guideline of the Association of Anesthetists of Great Britain and Ireland, 'acceptable' reasons for delaying surgery may include hemoglobin concentration less than 80 g/l, plasma sodium concentration less than 120 or more than 150 mmol/l, potassium concentration less than 2, 8 or more than 6.0 mmol/l, uncontrolled diabetes, uncontrolled or acute left ventricular failure, cardiac rhythm disturbances with ventricular rate > 120 per minute, pneumonia complicated by sepsis, coagulopathy that can be compensated for [50].

Surgical intervention

- **Patients with hip fracture have very few contraindications to surgical treatment.**

Contraindications to emergency surgical treatment for hip fractures (fracture osteosynthesis or hip arthroplasty) are as follows:

- acute myocardial infarction or acute cerebral circulatory failure;
- pneumonia with the need to put the patient on artificial lung ventilation;
- surgical emergency requiring immediate surgical treatment;
- diabetes mellitus with decompensation of carbohydrate metabolism (requires urgent transfer to insulin therapy or control of insulin therapy by nursing staff in preparation for surgical treatment);
- coma of any etiology;
- chronic or acute purulent infection in the area of the proposed incision;
- terminal stage of the disease, which resulted in the patient's inability to move even before the fracture occurred;
- pronounced cognitive impairment or mental illness that resulted in the patient's inability to move before the fracture occurred.

All other comorbidities at the decompensation stage can be considered as contraindications only if they cannot be converted to the subcompensation stage within 24-48 hours of intensive therapy [30].

The following measures are needed to decide the treatment strategy for patients with hip fractures accompanied by acute or chronic severe somatic pathology:

- in case of acute coronary syndrome (unstable angina pectoris, acute myocardial infarction) — consulting a cardiologist;

- in case of severe cardiac rhythm and conduction disorders (atrioventricular blocks of II-III stages, tachyform of atrial fibrillation with heart rate over 120 per minute) — transfer to the intensive care unit to stabilize the condition;
- in case of decompensation of diabetes mellitus (glycosuria, ketonuria) — transfer to the intensive care unit, consulting an endocrinologist;
- in case of development of senile psychosis (aggression towards others, loss of self-care skills, hallucinosis, delusional disorders) — consulting a psychiatrist;
- in the presence of acute surgical pathology — consulting a surgeon;
- in case of venous thrombosis with an episode of pulmonary embolism — consulting a cardiovascular surgeon;
- in case of chronic renal failure requiring extracorporeal detoxification — consulting a nephrologist for surgery in the interdialysis period (not earlier than 6 hours after the latest procedure);
- in acute anemia, accompanied by a decrease in hemoglobin level below 70-80 g/l — transfer to an intensive care unit, transfusion of erythrocyte-containing components. In chronic anemia, transfusion of erythrocyte-containing components is prescribed only for correction of respiratory and/or cardiovascular failure due to anemia and not responding to the main pathogenetic therapy².

Conservative treatment of hip fracture in the absence of medical contraindications is performed if the patient refuses to undergo surgical intervention, and in cases of his/her legally established incapacity — upon the refusal of his/her guardians.

In the event of the patient being categorized within the IV–V functional class of the American Society of Anesthesiologists (ASA) and in consideration of the severity of any concomitant pathology, there is a high probability of decompensation of the cardiovascular and respiratory systems of the patient in the event of the cancellation or postponement of surgery. A decision regarding surgical intervention for the treatment of life-threatening conditions is thus taken. The decision on surgical intervention for the treatment of life-threatening conditions, contraindications to surgery or the need to postpone surgical intervention is made by a concilium of three specialists: orthopedic surgeon, anesthesiologist, internist/geriatrician, with a clear and detailed reflection of the reasons in the medical history. History of an acute myocardial infarction treated with angiography with stenting and angioplasty, including in the days before the injury, is not a contraindication to surgical treatment for urgent indications. If a hip fracture patient has an acute cerebral circulatory disorder, the decision on surgical intervention is made by a concilium based on the prognosis of the stroke course and the patient's current condition [30].

• **Skeletal traction as primary therapeutic immobilization for hip fractures is not indicated.**

In patients aged over 50 years who have sustained a hip fracture, skeletal traction is not recommended due to the high risk of complications, including delirium, hypotension and hypodynamic response [30]. In exceptional cases, when transfer of the patient to the specialized care hospital is temporarily impossible or there is no technical possibility to perform urgent surgical intervention, it is necessary to perform damped skeletal traction as a primary therapeutic immobilization to eliminate displacement of bone fragments and partially relieve pain syndrome. Appropriate care should be provided to prevent pressure sores and infectious complications [51].

• **In the surgical treatment of hip fractures, the focus should be on interventions that are least traumatic and minimally invasive, with the aim of enabling immediate loading of the operated limb upon completion of the surgical procedure. These interventions should be carried out by a surgeon with extensive experience in this field.**

Surgery of hip fracture patients over 60 years of age is performed with the aim of restoring limb support in the early postoperative period and allowing for the earliest possible activation and rehabilitation. For this purpose, either implants providing dynamic fixation of bone fragments or hip joint endoprostheses are used.

Surgical treatment is recommended for all types of femoral neck fractures (FNF) in patients over 60 years of age. In Garden I and II types of femoral neck fractures, osteosynthesis is recommended and one of the following designs should be used: parallel inserted spongiosis cannulated screws with washers; a dynamic femoral screw system or a fracture fixation plate with three bone dynamic screws inserted in parallel and fixed in the plate. Hip arthroplasty is recommended for the treatment of Garden III and IV types of fractures. Total hip arthroplasty is recommended in the group of functionally active patients over 60 years of age with an active lifestyle prior to injury. Unipolar (monopolar or bipolar) arthroplasty is recommended for patients exhibiting low motor activity, cognitive dysfunction and severe somatic pathology. Consequently, each patient should undergo individual evaluation when selecting the type of endoprosthesis.

DHS osteosynthesis is recommended as the method of choice in the treatment of stable pertrochanteric fractures (31A1.2 according to the AO/OTA classification). In unstable pertrochanteric fractures (31A1.3, 31A2 AO/OTA), intramedullary lockable osteosynthesis with a proximal femoral rod is recommended. Proximal femoral rods are recommended for subtrochanteric fractures (32-A/B/C.1 AO/OTA) and intertrochanteric reverse fractures (31A.3 AO/OTA), with the distal end of the fixator 0.5-2 cm proximal to the arch of the intermuscular fossa (Blumensaat line) [30].

The operative procedure should be performed in such a way that the elderly patient can fully load the operated leg from the first steps with additional support ("walkers") [30]. Patients over 60 years of age cannot dose the load. They require stable internal fixation that provides full body weight load immediately after the surgery, irrespective of the type of fracture [30].

² Ministry of Health of the Russian Federation. The Clinical Guidelines Rubricator. Clinical Guidelines "Iron Deficiency Anaemia" 23.10.2024. Available at: https://cr.minzdrav.gov.ru/preview-cr/614_2 (Accessed 02.01.2025) (In Russ.)

It is crucial that surgical procedures performed at night are associated with a higher risk of complications. Therefore, it is strongly advised that these operations be conducted exclusively during the day by experienced and qualified surgical teams [30].

- **The choice of anesthesia method (different types of regional or general anesthesia) in patients with hip fractures should be tailored to the functional status of the patient, the qualifications of the anesthesiologist and the resources available at a particular institution.**

Currently, there is no conclusive evidence on the advantages of one or another method of anesthesia. The results of studies conducted in the last decade and published in the available literature indicate that there are no significant differences in one-year survival, the incidence of delirium in the postoperative period, and the severity of pain syndrome in the early postoperative period in groups of patients who underwent regional or general anesthesia [52–54]. However, regional anesthetic techniques are most commonly recommended because of reduced intraoperative blood loss and reduced risk of venous thromboembolic complications [30, 50].

The use of regional anesthesia may be limited by antithrombotic drugs prescribed to the patient. At the same time, contraindications to neuroaxial methods of anesthesia should not be a reason to postpone surgical intervention. In these cases, it is advisable to choose general anesthetic techniques that allow to perform the surgery sooner [43].

- **In elderly and senile patients, it is recommended that the depth of anesthesia be monitored.**

The doses of anesthetics required for induction and maintenance of general anesthesia and sedation decrease with age. Lack of dose adjustment may lead to relative anesthetic overdose and prolonged significant arterial hypotension; therefore, monitoring the depth of anesthesia in patients at increased risk of adverse postoperative outcomes is recommended in any type of general anesthesia [31].

Early postoperative stage

- **The need for early enteral nutrition (oral or tube feeding) should be assessed immediately after the patient is transferred from the operating theatre.**

Early enteral nutrition reduces the risk of any type of infection, the average length of stay of the patient in hospital, reduces the risk of loss of muscle mass and accelerates the rate of wound healing [36, 49].

- **Screening for dysphagia should be performed when patients are switched to regular oral nutrition in the postoperative period.**

Oropharyngeal dysphagia 72 hours after surgical intervention for hip fracture develops in 34 % of elderly patients. Screening for dysphagia includes clinical examination of the patient and a test of three swallows. Depending on the patient's condition, the test of three swallows can be performed within 3–6 hours after surgery. In elderly patients, daily assessment of the ability to take adequate nutrition should be carried out, as well as an

assessment of the risk of food aspiration. Patients with removable dentures should be able to use them. All elderly and senile patients undergoing surgery should be in an elevated position with the head of the bed raised and sit as upright as possible during meals and for one hour after meals [31, 55].

- **In the early and late postoperative period, all patients after hip fracture should receive adequate nutrition.**

The daily protein requirement ranges from 1.6 g/kg/day to 2.0–3.0 g/kg/day. The patient should consume 20–40 g of protein at each meal. The daily fat requirement is 0.8–2 g/kg/day or 20 % — 25 % of the daily calorie intake. The recommended daily dose of omega-3 fatty acids is 2 g, omega-6 fatty acids — 10 g. Daily requirement in carbohydrates is 3–5 g/kg/day.

Elderly patients after hip fracture and surgery should also be prescribed supplementary nutrition to reduce the risk of postoperative complications. The caloric content of sipping mixtures should be at least 400 kcal/day, including 30 or more grams of protein per day [56].

Parenteral nutrition in the postoperative period is prescribed in the following cases: from the 1st–2nd day together with enteral nutrition in patients with initial pronounced nutritional insufficiency; from the 4th–5th day in cases when it is impossible to provide with enteral intake more than 60 % of the energy requirement during the first 72 hours; in patients at high risk of developing nutritional insufficiency with expected contraindications to early enteral nutrition during 3 days or more of the postoperative period.

Complete balanced nutrition in the postoperative period will help prevent the development of malnutrition and loss of muscle mass, reduce the risk of infections, shorten hospitalization and earlier recovery of the patients concerned [33, 49, 57].

- **During their hospital stay, all elderly patients should be given interventions to reduce the risk of skin and soft tissue injuries and infections.**

In view of the high risk of infections and soft tissue damage in elderly patients with hip fractures, physicians and nursing staff should promptly prevent skin and soft tissue injuries and infections: initial and regular assessment of skin condition, regular change of absorbent nappies, use anti-decubitus mattresses, provide care for decubitus wounds [26].

- **Rehabilitation measures for elderly patients after hip fracture are recommended to start in the hospital immediately after surgical intervention and to continue throughout hospitalization (the first stage of rehabilitation). In the early and late postoperative periods, physical exercises are recommended to improve the quality of life and reduce the risk of disability.**

There are no contraindications to rehabilitation and activation of patients with hip fractures. Rehabilitation measures should be carried out in all patients without exception in the postoperative period of treatment of hip fracture. It is recommended to start activation of the patient within 24 hours after surgery.

The early postoperative period lasts for the first 1–2 weeks after surgery, during which acute postoperative reactive inflammation and healing of the postoperative wound occur. The objectives of rehabilitation during this period are prevention of postoperative complications from the cardiovascular and respiratory systems, gastrointestinal tract, prevention of trophic disorders, primarily bedsores, reduction of soft tissue edema and creation of optimal anatomic and physiological conditions for healing of tissues traumatized during surgery. This period corresponds to the first stage of rehabilitation and usually takes place in a Traumatology Department.

Basic rules in the early postoperative period after hip surgery are as follows:

1. When doing most exercises in the supine position on a bed or sitting on a chair, the patient should have a wedge-shaped pillow (a bolster can be used) between the legs to recline the operated limb up to 10–15 degrees.
2. It is contraindicated for patients to bend the operated leg in the hip joint more than 90 degrees.
3. Any passive or forced movements of the hip joint that cause pain should be avoided.
4. Internal rotation and adduction should be avoided.
5. From the first days after surgery, to prevent deep vein thrombophlebitis, it is recommended to perform active movements in the ankle joint (alternating dorsal and plantar flexion) and to bandage the whole operated leg.
6. The patient should only stand up and apply axial load to the operated leg under the strict supervision of a physiotherapist.
7. Any movements and transfers should be made with the support of the operated limb by the exercise therapy instructor or with the help of a healthy leg.

The motor regime depends on the specifics of the performed surgery (type of access, reliability of fixation of components) and should be agreed with the operating surgeon. During the first 5–7 days of rehabilitation, the patient is indicated a gentle motor regime. To prevent postoperative complications, breathing exercises, correct positioning of the operated limb, exercises to improve blood and lymph circulation, functional state of the lower limb muscles are prescribed. In the postoperative period, a cushion is placed between the patient's legs to ensure easy withdrawal and neutral position of the operated limb.

From the first day after surgery, the patient is prescribed breathing exercises, active exercises for the joints of the healthy leg (hip, knee, ankle), isometric exercises for the muscles (gluteal, quadriceps, biceps femoris, lower leg muscles) of the operated limb, passive exercises for the operated hip joint on a functional splint with a gradual increase in the flexion angle. Exercise on the splint for 15–30 minutes, 3–5 times a day. In addition, the patient is taught to lift the pelvis with the support of the elbows and the foot of the operated leg.

On the 1st–3rd day after surgery, it is recommended to perform the Thomas test (bending the healthy leg in the hip and knee joints with pulling the knee to the abdomen with the hands). When doing this exercise, the heel of the sick leg presses on the bed (hip extensors are strengthened). 3–10 exercises are performed 3–10 times a day.

Strengthening of the abductor and adductor muscles of the operated thigh is carried out by doing the “Hula-

hula” exercise: legs straight, foot in a rear bending position, simultaneous pulling down (lengthening) of one leg and pulling up (shortening) of the other leg. 4–10 exercises 5–10 times a day.

During the same period, the operated patient is allowed to sit up in bed. From the position “half-sitting with legs down”, the patient performs leg extension in the knee joints and holds the position for 3–5 seconds (the foot is in a dorsal flexion position when performing the exercise). 8–10 exercises are performed 3–10 times a day. During the same period of time, the patient is verticalized with bilateral support on walkers or high crutches) under the supervision of an instructor in exercise therapy.

A week later, the patient is allowed to turn onto the abdomen and return to the back, which can be done through the healthy leg. When turning over the healthy leg, a pillow should be placed between the legs. When turning over the operated leg, the patient can place the palm of the hand under the operated thigh. Turns on the stomach and back are performed 3–10 times a day.

From the position “lying on the stomach”, the patient performs 5–15 active flexions and extensions of the legs in the knee joints 5–10 times a day and 3–10 active extensions of the operated leg in the hip joint 3–5 times a day. In the beginning, this exercise should be performed in the starting position “hands under the hips”.

Lying on the stomach with the knees bent at a 90-degree angle, the patient crosses and spreads the shins of the operated and healthy legs. When doing this exercise, it is important to control the position of the feet. 5–10 exercises are performed 3–5 times a day [22, 23, 30, 58].

From the 5th to 7th day after surgery, exercises are prescribed from the initial standing position. The muscles (extensors, abductors and flexors) of the operated hip are strengthened and stretched in the standing position with bilateral support.

Standing on the toes, the patient performs balancing with tension of the hip extensor muscles. The patient's hands are placed on a support and the feet are shoulder width apart. The patient lifts the heels of the feet and simultaneously tenses the gluteal muscles, keeping the position for 3–5 seconds. 5–15 exercises are performed 5–10 times a day.

Strengthening of the hip extensors is performed from the following starting position: the operated leg is behind; the healthy leg is half-bent. Raising the heel of the operated leg, the patient tenses the extensors of the operated joint. It is recommended to remain in this position for 3–5 seconds. 5–15 exercises are performed 5–10 times a day.

The thigh retraction muscles are well strengthened by performing the “rumba” exercise (the patient's legs are shoulder-width apart and the patient transfers the weight of his body from one leg to the other). This exercise stretches the adductor muscles of the thigh at the same time. 10–15 exercises 5–10 times a day. Exercises using a footrest are prescribed to strengthen the thigh abductor muscles and stretch the adductor muscles of the thigh. In the position ‘healthy leg on the footrest’ (hands on the support), the withdrawing muscles of the operated leg are tensed. The tension should be maintained for 3–5 seconds. 5–10 exercises are performed 5–10 times a day.

Tense the adductor muscles of the operated thigh in the position ‘operated leg on the stand’ (hands on the support).

It is necessary to maintain the tension for 1–3 seconds. 3–5 exercises are performed 3–5 times a day.

When leaning on a support with the operated leg bent in the hip joint (hands on the support), the flexor muscles of the operated hip are tensed. 5–10 exercises are performed 5–10 times a day. The height of the support while performing this exercise is gradually increased.

In addition to static exercises, active movements in the operated hip joint in the standing position (flexion, extension, abduction) are prescribed. While doing these exercises, the patient stands on the healthy leg on a stand 5–8 cm high, with hands on the support and the back straight. Each exercise is performed 5–10 times, repeating up to ten times a day [22, 23, 30, 58].

- **Learning to walk starts early (from the second day after surgery) and continues in the late postoperative period.**

Patients are taught walking in individually tailored ways, with consideration for factors such as age, physical status, and the nature of the surgical intervention. The majority of patients commence their walking training with the use of a walker, typically within one to two days, and subsequently transition to two crutches. Certain patients are taught to walk on crutches at once [22, 23, 30, 58].

- **Interventions for the prevention of recurrent fractures (diagnosis and initiation of osteoporosis treatment, fall prevention program, development of a follow-up plan) should start already in the Traumatology Department.**

Elderly and senile patients following hip fracture are often unable to attend outpatient facilities because they have objective barriers in the form of frailty or comorbidities, prolonged hospitalization, discharge to rehabilitation facilities or long-term care facilities, making the role of the orthogeriatric clinic ideal in the prevention of recurrent fractures in this group of patients [59]. It is recommended that osteoporosis treatment be initiated during the patient's hospital stay with a clear follow-up plan, guidelines for management of comorbidities and reduction of the risk of falls [27]. It has been shown that the rate of prescription of osteoporosis treatment after hip fracture is highest when a recurrent fracture prevention program organized within an orthogeriatric clinic not only identifies and assesses patients but also initiates osteoporosis treatment [60].

- **In order to establish the systematic detection and treatment of osteoporosis among hip fracture patients, Fracture Liaison Service should be introduced in Traumatology Department to identify patients with osteoporosis, initiate osteoporosis therapy, reduce the risk of falls, and draw up a plan for further management of the patient in outpatient settings.**

Effective services for the prevention of recurrent fractures should include all major parts of care for older patients after fracture: identification of patients, screening to assess risk of fracture, falls and possible causes of secondary osteoporosis, patient information, initiation of drug and non-drug treatment, and integration of the patient into long-term follow-up by the primary care physician and other specialists [41, 61, 62]. The importance

of organising Fracture Liaison Service on the grounds of a Trauma hospital with a dedicated nurse coordinator has been demonstrated in Russia, and its introduction has significantly improved the identification of patients to be treated for osteoporosis [14, 41]. The achievement of relevant qualitative and quantitative benchmarks needs to be continually analysed for effective Fracture Liaison Service [63].

Guidelines of the Ministry of Health of the Russian Federation "Complex of measures aimed at preventing falls and fractures in elderly and senile persons" provide a "Patient routing scheme for the prevention of recurrent fractures"[1], where all patients with a confirmed fragility fracture due to osteoporosis who are being treated in inpatient Traumatology Department or Surgery Department (with traumatology beds) should be registered by the coordinator, after which their data should be entered into the vertically integrated medical information system for information transfer and routing to district physicians, general practitioners and, if indicated, geriatricians, endocrinologists and rheumatologists.

- **Treatment of osteoporosis aimed at preventing further fractures (mainly antiresorptive therapy in combination with vitamin D and calcium supplementation) should be initiated in the immediate postoperative period after patient's verticalization before discharge from hospital or in the Rehabilitation Department.**

According to "Osteoporosis" Guideline of the Ministry of Health of the Russian Federation [41], the presence of hip fracture in a patient is a diagnostic criterion for osteoporosis that does not require confirmation by DXA densitometry or calculation of the 10-year fracture risk using FRAX. In other words, the diagnosis of osteoporosis is made clinically and treatment can be started immediately after the hip fracture. This approach is important because of the high risk of recurrent fractures in the immediate aftermath of hip fracture. The 10-year incidence of contralateral hip fracture is 12.9 %, of which almost 70 % occurs in the first 2 years [64], and those over 80 years of age have the highest risk [12]. The later osteoporosis treatment is administered after hip fracture, the greater the risk of recurrent fractures [65]. The aforementioned facts, in conjunction with the incapacity of elderly patients to visit outpatient clinics in a timely manner following their discharge, necessitate the initiation of osteoporosis therapy in a Trauma hospital (Center) without delay.

Prevention of recurrent osteoporotic fractures in patients with hip fracture involves specific pharmacotherapy [28, 41, 66]. Administration of calcium and vitamin D preparations alone does not stop the loss of bone mineral density during the first six months after fractures [67].

It has been proved that zoledronic acid in patients with hip fractures reduces not only the risk of recurrent hip fracture by 41 %, but also mortality by 28 % [68], and in comparison with those who did not receive this treatment, the reduction in mortality and preservation of functional capabilities of the patient are registered after its first administration [69]. The use of zoledronic acid after hip fracture is safe: more than 80 % of orthogeriatric patients had no contraindications to zoledronic acid administration [70]. The immediate and long-term safety of the drug when

administered in the first 1–2 weeks after surgical treatment of hip fracture has been proved [71], including infusion on the day of discharge from a Trauma Center [72]. At the same time, there is no evidence of a negative effect on fracture union when injectable bisphosphonates are administered in the first two weeks after a fracture [73, 74].

Previously, the conclusion that zoledronic acid should not be given within 2 weeks after surgery was based on an analysis of a small subgroup of patients in the HORIZON trial who were given the drug in the next 2 weeks after surgery. They demonstrated a statistically insignificant reduction in the risk of recurrent fractures (wide confidence interval) in contrast to the statistically significant reduction in the risk of fractures in those who received zoledronic acid 4–6 weeks after surgery [75]. Meanwhile, two meta-analyses showed good bone mineral density gains at 12 months and no evidence of delayed fracture consolidation in those patients who were administered zoledronic acid early [76, 77].

It is very important for the prevention of symptomatic hypocalcaemia to administer zoledronic acid in patients who have not previously taken vitamin D only after a short loading therapy of 50000 IU of cholecalciferol (vitamin D3) taken once or for 2–3 days. It is also necessary to consider contraindications to the administration of the drug, in particular, the rate of glomerular filtration less than 35 ml/min and hypocalcaemia. If there is a fever after zoledronic acid administration (so-called flu-like syndrome), non-steroidal anti-inflammatory drugs or paracetamol are used [41].

Before discharge from a trauma center

- **When planning the discharge of a patient with hip fracture, it is necessary to ensure transfer to the second stage of rehabilitation in a “in-patient facility - in-patient facility” manner.**

The plan of further management of the patient with hip fracture after discharge from the hospital and his/her routing are drawn up with the participation of members of the interdisciplinary team in the medical institution providing care for patients with hip fractures, considering the second and third stages of rehabilitation [35]. After surgery for hip fracture, rehabilitation measures continue after discharge from the Traumatology Department in the Rehabilitation Department of multidisciplinary hospitals or Rehabilitation Centres (Departments) focusing on “musculoskeletal and peripheral nervous system pathology” (second stage of rehabilitation) [30]. It is considered optimal to discharge the patient to the rehabilitation center on the 5th–7th day after surgery and to activate the patient with the help of additional means of support [27, 41]. The patient may be referred to a Geriatric Unit for evaluation and treatment. The indication for hospitalization to a Geriatric Unit is the need to prolong the period of treatment in inpatient conditions in order to restore the lost ability for self-care after surgery for hip fracture [29].

Discharge of a frailty patient after surgery should be as soon as possible after recovery of his/her basic physiological functions and adaptation to any deficits that may exist, provided that the patient is living independently and/or has the necessary social support and care [78].

Before discharge from a Trauma Center, if there is no possibility of a second stage of rehabilitation, it is

recommended to reassess the social status of the patient and determine whether the patient has the necessary social support. For single patients in need of care, social support should be organized, the patient should be referred to social care institutions and the patient should be enrolled in the long-term care system [79].

Patients with medical indications for palliative care are referred to medical institutions providing palliative care in accordance with the “Regulations on the organization of palliative care” order³.

- **Before hospital discharge, all patients with hip fracture should be screened for frailty followed by a comprehensive geriatric assessment.**

In elderly and elderly patients, if there is no screening for frailty in the perioperative period, it is recommended to use the questionnaire “Age is not a hindrance” in order to identify geriatric syndromes and determine the treatment strategy for such patients [30]. It is recommended that a personalized program be developed for the prevention of recurrent falls and fractures, with consideration given to the patient’s individual risk factors for falls. This program must include the education of the patients themselves, as well as educational materials for patients and their relatives or caregivers [61].

Frailty patients are recommended to consult a geriatrician for a comprehensive geriatric assessment with the development of an individual patient management plan including physical activity, nutrition, cognitive training, consultations with specialists in accordance with the identified geriatric syndromes and conditions affecting the course of frailty, optimization of drug therapy with due consideration of STOPP/START criteria, use of means and methods that adapt the environment to the functional capabilities of a patient [29].

- **When a patient with hip fracture is discharged from hospital, the patient’s data should be transferred to the medical institution at the place of residence for successive management of the patient for the prevention of recurrent fractures, including prevention of falls and treatment of osteoporosis, as well as correction of geriatric syndromes.**

It is recommended to hand over the personalized management plan after hip fracture to the physician who directly follows up the patient (general practitioner, district physician, family physician), in order to ensure a joint successive long-term follow-up. An individualized management plan is carried out by the doctor directly supervising the patient jointly with the geriatrician. The

³ Order of the Ministry of Health of the Russian Federation and the Ministry of Labor and Social Protection of the Russian Federation dated 31.05.2019 No. 345n/372n “On approval of the Regulation on the organization of the provision of palliative care, including the procedure for interaction between medical organizations, social service organizations, and public associations, other non-profit organizations operating in the field of health protection.” Available at: <http://publication.pravo.gov.ru/Document/View/0001201906270031> (Accessed 02.01.2025) (In Russ.)

plan may be revised based on the results of monitoring the patient's functional status. Repeat comprehensive geriatric assessment of a frailty patient is recommended at least once every 12 months [29].

- **Upon discharge from hospital, the patient's relatives or caregivers should be informed of the patient's follow-up plan and given comprehensive information about the organization of care at home.**

Upon discharge from hospital, an individualized management plan should be discussed with the patient and/or family/caregivers to ensure that the plan is consistent with the patient's goals and priorities and that family/caregivers are involved in its implementation. The patient or caregivers should be informed of the need for and timing of prescribed medication to prevent them from self-cancelling or changing previously prescribed medication. Consultations for patients can be organized via telemedicine [35, 80].

It is recommended to implement educational programs for patients with hip fracture and their relatives in order to shorten the recovery period and improve their quality of life [35, 81].

Upon discharge from a trauma center

- **Upon discharge from a Trauma Center, it is recommended to continue rehabilitation activities in inpatient medical rehabilitation units for patients with musculoskeletal dysfunction (second stage of rehabilitation), and to finish them in medical rehabilitation units of a day hospital, sanatorium, out-patient department of a polyclinic or at home (third stage of rehabilitation).**

The late postoperative period begins on the 7th–15th day after surgery and lasts for 4–8 weeks (up to 10–12 weeks after surgery). The late postoperative period is conventionally divided into two: the early recovery period, which corresponds to the second stage of rehabilitation and is carried out, as a rule, in inpatient conditions (inpatient rehabilitation department) and the late recovery period, which corresponds to the third stage of rehabilitation and lasts from 6 to 10–12 weeks after surgery. The main objectives of the late postoperative period are the restoration of mobility, self-care skills, professional and social activity.

3–4 weeks after surgery, exercise therapy in a swimming pool is prescribed. In 2–3 weeks after surgery, exercising on an exercise bike without a load for 3–10 minutes 1–2 times a day at a speed of 8–10 km/h with heart rate and BP control and walking on a treadmill with body weight support are possible. From the 15th day after surgery, massage of the operated limb is prescribed after a control ultrasound examination of the lower limb veins. 3–4 weeks after surgery, exercise on a bilateral stable platform is possible. 4–5 weeks after surgery, walking on a treadmill with multichannel myostimulation during walking can be prescribed. From the 7th week after surgery, the complex of therapeutic physical training is extended and becomes more complicated. Most of the exercises are performed in the supine position. The number of repetitions of each movement and the intensity of muscle tension are increased [22, 23, 30, 59].

- **Patients with hip fracture at all stages of rehabilitation in the early and late postoperative periods are recommended to consult a clinical psychologist and, if indicated, to undergo cognitive-behavioral therapy to improve the quality of life.**

Elderly people with hip fracture commonly experience emotional instability, reactions to stress, anxiety, trauma and other psychological symptoms. These can have a huge impact on the person and their caregivers [82, 83].

- **In patients with hip fracture in early and late postoperative periods (at all stages of rehabilitation), occupational therapy is recommended to improve quality of life and reduce complaints.**

The primary objective of occupational therapy is to enhance the quality of life for patients, enabling them to achieve maximum autonomy in their daily activities, including labor, education and recreation. If the patient's life activities are permanently limited, the occupational therapist adapts the environment (place of residence, rehabilitation, education, recreation, etc.), selects adaptive devices to improve the quality of life, reduce dependence on care and prevent aggravation of disability^{4,5} [84].

- **Compliance with guidelines on osteoporosis treatment and non-drug interventions should be continued with long-term follow-up of patients at the place of residence with assessment of adherence, effectiveness, side effects and correction of prescriptions if necessary.**

When a patient transitions from the inpatient phase of care, which included initial counselling on prevention of recurrent fractures, to primary care, factors leading to discontinuation of medication or low adherence and compliance may occur [85, 86]. Lack of regular intake of anti-osteoporotic drugs and low adherence to non-drug interventions results in a halving of clinical effectiveness and a doubling of the cost per quality-adjusted life year [87]. Effective interdisciplinary communication is considered very important in the transfer of patients from fracture prevention services to the care of primary care physicians [85, 88].

Instructional guidelines — "A set of measures aimed at preventing falls and fractures in elderly and senile persons" [1] in the section "Guidelines for patient management to prevent recurrent fractures" recommend that patients should be re-examined 3–6 and 12–18 months after registration in the vertically integrated medical information system. "Osteoporosis" Guideline [41] confirm that a long-term follow-up of the patients should be ensured

⁴ Order of the Ministry of Health of the Russian Federation dated 31.07.2020 No. 788n "On approval of the Procedure for organizing medical rehabilitation of adults" Available at: <http://publication.pravo.gov.ru/Document/View/0001202009250036> (Accessed 02.01.2025) (In Russ.)

⁵ Order of the Ministry of Health of the Russian Federation dated 02.05.2023 No. 206n "On approval of qualification requirements for medical and pharmaceutical workers with higher education". (Accessed 02.01.2025) Available at: <http://publication.pravo.gov.ru/document/0001202306010041> (In Russ.)

in the existing out-patient Fracture Liaison Service or they should be referred to primary care or specialist physicians for this purpose.

- **In patients with frailty syndrome and malnutrition, after hospital discharge nutritional support is recommended to maintain body weight and preserve functional status.**

In patients with a high risk of falls, frailty, malnutrition, and sarcopenia syndromes, it is recommended to increase protein intake to 1.0–1.5 g/kg body weight per day and, if necessary, nutritional support to increase muscle mass and reduce the risk of falls, provided that the glomerular filtration rate is at least 30 ml/min/1.73 m² [61].

- **All hip fracture patients need measures to prevent falls.**

Fall prevention is recommended, with individual risk factors for falls taken into account. All elderly and senile patients are advised to receive counselling on safe living conditions and footwear selection for primary and secondary prevention of falls. They are also advised to wear individually selected specialized insoles to correct gait disorders and ensure correct foot positioning to reduce the risk of falls [61]. A combination of vitamin D and calcium supplementation has been recommended for all patients after hip fracture to reduce the risk of falls [29, 61]. When vitamin D deficiency is found, the recommended preparation is cholecalciferol at a total saturating dose of 400.000 IU for 8 weeks with further transition to maintenance doses of 1000–2000 IU daily orally [29].

- **It is recommended to provide preventive care for depression in patients who have sustained hip fracture.**

Doctors and medical staff together with a geriatrician provide a range of measures to prevent depression, including healthy sleep, minimal use of sedatives and pills, maintenance of social activity, and psychological support [79].

Further training of medical staff

- **Physicians and nurses involved in the care of hip fracture patients should be trained in the management of elderly patients with hip fracture, and general practitioners and district physicians should be trained in the management of patients after hip fracture in the outpatient setting.**

It is recommended for medical educational institutions to develop and implement educational programs of additional professional education for doctors, middle and junior medical personnel regarding the features of management of patients with hip fracture in the in-patient and out-patient settings in order to improve their functional status and quality of life [35, 89].

Open questions in orthogeriatrics, requiring further research

Orthogeriatrics in Russia is taking its first steps, and many topical issues important for the implementation of an effective interdisciplinary approach to the management of elderly patients with bone fractures remain poorly understood. The experts considered it important to formulate the main directions of scientific research in this area in order

to facilitate the organization of an optimal model of care for elderly people with hip fractures in our country.

Organization of care for patients with hip fracture

Epidemiological aspects of hip fracture in the Russian Federation, including trends in recent years, remain poorly studied. It is necessary to study the routing schemes for patients with hip fracture in different regions of the Russian Federation and comparative evaluation of their effectiveness.

It is necessary to analyze the state of medical care for patients with hip fractures in Russia, the existing problems and their causes. In particular, in order to optimize hospitalization flows to bring the patient to a specialized hospital as soon as possible, it is important to know how hip fracture patients are routed. Statistical data on the care of patients with hip fracture are needed, in particular the proportion hospitalized, the proportion operated on, the types of surgery performed, hospital mortality and annual mortality following fracture.

There is a need to assess the availability of equipment and facilities in specialized orthopedic hospitals to successfully perform surgery in relevant patients, in particular the required implants and tools for their insertion. Research into the effectiveness of different variants of multidisciplinary teams providing care for patients with hip fracture, as well as the order of interaction between the specialists included, can undoubtedly be of benefit. In particular, it is important to work out the organizational issues of interaction between anesthesiologists and geriatricians and other specialists from the moment the patient arrives at the hospital. Studies aimed at investigating the clinical and economic effectiveness of various models of orthogeriatric care are promising.

Recurrent fracture prevention services

It is necessary to analyze different models of the organization of Fracture Liaison Service in medical institutions of the Russian Federation in the in-patient and out-patient settings with an analysis of their clinical and economic effectiveness, including the impact of fracture prevention services on reducing the risk of fractures of various localizations in Russia compared to conventional medical care. It is necessary to make it mandatory to analyze the achievement of qualitative and quantitative criteria of the effectiveness of the work of fracture prevention services in various institutions in Russia. In our country there have been no prospective studies of the outcomes of hip fractures depending on the provision or absence of medical treatment of osteoporosis and prevention of falls.

There is a need to establish continuity of care for patients included in fracture prevention services after discharge from hospital, with the involvement of primary care physicians. It is important to analyze the options for organizing the transfer of patients with hip fractures to inpatient Rehabilitation and Geriatric Units and the main problems in the organization of this section of medical care, as well as the possibilities and approaches to the organization of the first stage of rehabilitation, its main participants and the results of its work.

In order to develop advanced training programs, it is necessary to identify the level of knowledge of general practitioners who consult patients with hip fracture in

hospital on various sections of geriatrics, including the scope required for the management of patients at this stage, as well as what additional knowledge is needed for a general practitioner providing this type of care.

The speciality of Traumatology and Orthopedics

We need targeted scientific studies with a comparative evaluation of the outcomes of different variants of osteosynthesis and hip arthroplasty for intra-articular (medial) and extra-articular (lateral) fractures of the proximal femur. Special studies are needed to analyze the quality of fragment repositioning and fixator positioning and the impact of these factors on the functional outcome of osteosynthesis in pertrochanteric and subtrochanteric fractures.

The speciality of Medical Rehabilitation

Promising trends in this speciality are the search for and analysis of the effectiveness of new methods of rehabilitation of elderly patients with hip fracture and frailty; study of factors determining rehabilitation forecast and rehabilitation potential in this category of patients, algorithms for dosing of the functional load.

The speciality of Anesthesiology and Resuscitation

It is advisable to continue research to determine the advantages of one or another type of anesthesia (all types of general and regional anesthesia) depending on the severity and nature of concomitant pathology in profile patients, as well as considering the risks of developing certain complications. It is necessary to develop optimal analgesia schemes in elderly patients with hip fractures in the perioperative period. It is also of interest to study the pathogenesis and methods of correction of bone cement implantation syndrome.

The speciality of Geriatrics

Studies focusing on the clinical and economic effectiveness of different orthogeriatric care models, the prevalence of geriatric syndromes in patients with hip fractures, and the influence of geriatric status assessment and correction on the risk of postoperative complications and mortality in this patient category appear to be promising.

CONCLUSION

The organization of modern specialized multidisciplinary medical care for elderly patients with hip fractures is an urgent requirement of the time, which can not only significantly improve the results of treatment of this complex category of patients, but also provide important positive social consequences in the form of reducing the proportion of their disability and increasing life expectancy in our country.

The main provisions underlying the orthogeriatric approach to the management of older people with hip fractures include mandatory hospitalization with early high-quality surgical treatment and subsequent active rehabilitation, consideration of comorbid conditions and geriatric syndromes, and prevention of recurrent osteoporotic fractures that can offset the results of successful treatment. For this purpose, it is necessary to organize the routing of the patients in such a way that they are delivered as soon as possible to a specialized hospital with all the necessary specialists and adequately equipped operating theatres. Preoperative preparation, as well as postoperative treatment and rehabilitation of these patients, should be carried out by multidisciplinary teams in which a representative of each of the involved specialties is familiar with the tasks to be performed and the specifics of the work of their colleagues. This Consensus is primarily aimed at improving mutual understanding and facilitating the organization of cooperation between specialists of different specialties involved in the treatment of elderly patients with hip fractures.

Experts representing various disciplines of clinical medicine have formulated agreed provisions in this Consensus on the basis of available regulatory documents of the Ministry of Health of the Russian Federation (Guidelines and Orders), as well as published results of investigations. The co-authors of the Consensus are convinced that their implementation in the practical work of specialized medical facilities in Russia will improve the quality of medical care for a complex category of elderly patients with hip fractures, save the lives of many of them and reduce the level of disability, which will undoubtedly have positive social and economic effects.

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