Traumatism of floating crew of the river fleet

Shapovalov KA

Abstract

Introduction
Carriage of cargo on the river vessels is the most convenient and cost-effective mode of transport in countries with a developed system of navigable rivers and canals. The North river basin is one of the largest in extent and difficult navigation conditions on the territory of the Russian Federation. It covers the basins of major rivers of the Northern Dvina, Pechora, Mezen and Onega. The floating crew of river vessels transport household goods to the areas of the Republic of Komi, Archangelsk, Kirov and Vologda regions. In most serviced areas, river transport is the only mode of transport for cargo in bulk, so its role is of vital economic importance for the region. This article discusses the traumatisms of a floating crew of the river fleet.

Materials and methods
The analysis of accidents of floating crews of river fleets of the northern river basin covers 377 work-related injuries in river vessels with a temporary disability, as well as 462 medical histories of this contingent with injuries admitted to a surgical hospital. River transport in many countries and regions is the only mode of transport for the transport of bulk goods. Their diversity, especially their loading, transportation and unloading by the floating crew, leads to increased psychological stress among members of the deck crew and captains of river vessels.

Results
The high intensity of navigation on the rivers often creates a narrow fairway on river vessels threatening injuries from the onset of the situation. The frequency of accidents on the river vessels is high (132.9 per 1000 workers). High risk of accidents in the older age groups is associated with a decrease in demands and controls the observance of safety on the part of the administration for river vessels and ports complacency and loss of vigilance in carrying out works on the vessel victims. Works of high danger on river vessel are mooring, maintenance of deck machinery, moving the ladders and decks. The main types of damage to the river fleet are fractures of various bones, bruises, wounds, burns and traumatic amputations. Use of alcoholic beverages by the floating crew of the river fleet is set to 8.9% of the injuries. Deaths resulted on river vessels is 18.5% of injuries and accidents. Two-thirds of all hospitalised injuries based on surgical hospitals are received by floating crews of the river fleet out of production, which include in the home, pedestrian traffic, transport and road accidents, sports and suicide attempts. The majority of patients had surgical methods of treatment (86.1%); postoperative complications are rare; they returned to work without a definition of disability in 99.1% of floating crews of river vessels.

Conclusion
River transport in many countries and regions is the only mode of transport for the transport of bulk goods. The floating crew of the river fleet carried freight on vessels in unusual and adverse weather conditions.

Introduction
Carriage of cargo on the river vessels is the most convenient and cost-effective mode of transport in countries with a developed system of navigable rivers and canals. The North river basin is one of the largest in extent and difficult navigation conditions on the territory of the Russian Federation. It covers the basins of major rivers of the Northern Dvina, Pechora, Mezen and Onega. The floating crew of river vessels transport household goods to the areas of the Republic of Komi, Archangelsk, Kirov and Vologda regions. In most serviced areas, river transport is the only mode of transport for cargo in bulk, so its role is of vital economic importance for the region. Besides intrabasin traffic, the floating crew deliver cargo on vessels sailing in Murmansk, Narjan-Mar, Mezen, Onega and the Baltic ports; the Volga; Kama and Don. Navigating the northern basin is held in unusual weather conditions. Spring openings of the pool may occur earlier than usual and at lower horizons. This puts additional pressure on the organised employment of expediatory importation of goods into the side of the river and quickly chalking towing rafts and rafts of winter. After the flood, a rapid drop in water level may occur below critical levels, resulting in work around the side rivers to shrink to 6–8 days. The aim of this review was to discuss traumatisms the floating crew of a river fleet face on their journeys.

Materials and methods
The analysis of traumatism of a floating crew of the river fleet is the second ranking position in the structure of morbidity of this contingent.
and makes up 21.4% of the cases. The material covers the analysis of 377 work-related injuries on river vessels with temporary disability, as well as 462 medical histories of floating crew with various injuries admitted to a surgical hospital. It was analysed: demographic indicators of a floating crew of the northern water pool; data of the accounting-reporting of the medical documentation: (a) regular reports of the vessel’s medical staff; (b) vessel’s medical journals (form N 074); (c) medical cards of the outpatients (form N 025); (d) extracts from patients’ medical records (form N 27); (e) medical records of patients (form N 003); (f) reports on the causes of temporary disability (form 16 TD) and (g) acts of accidents on board of the ship (form N 1). The diagnosis of alcohol intoxication was established on the basis of the conclusion of the ambulance doctor, ER doctors, teams of surgeons and the concentration of alcohol in the blood. In all these cases, diagnosis of ‘alcohol intoxication’ was made as a secondary diagnosis. Production injuries on ships in alcoholic intoxication have been reflected in the certificate about the accident on manufacture on the form N 1. While working on the material, the following methodological approaches have been used: systematic, comprehensive, integrative, functional, dynamic, process, regulatory, quantitative, administrative and situational. Methods of analysis included were analysis and comparison. Techniques used were group, the absolute and relative values, averages, time series, continuous observation of detail and generalisation.

**Results**

A variety of cargos, especially their loading, transportation and unloading, lead to increased psychological stress among members of the deck crew and the captains of river vessels. The relatively short transitions from one port to another increase the number of mooring operations, which are among the least mechanised operations. The high intensity of navigation on the rivers often creates narrow channels on vessels threatening injuries from the onset of the situation. The introduction of new types of river vessel seaworthily, with increased use of automated control systems for mechanisms, makes high demands on the health of the floating crew. Permanent residence in the riverine area of physical, chemical and psychological factors often leads to flight disruption adaptation mechanisms of the body, the appearance of pathological reactions that result in workplace traumatism.

The frequency of injuries on the river vessels is high (132.9 per 1000 workers). Women (71.2) working on them is 2.1 times less than that of men (148.9). The share of women’s traumatism in the overall structure is only 11.0% of cases. The most common injuries are seen in persons under 20 years of age (23.7). In the age group of 30–40 years, the number of injuries has steadily declined (155.5 and 67.9). And in groups of up to 50 years of age or older, a marked increase in injuries of more than two times (140.1 and 146.7) has occurred. High risk of accidents in the older age groups is associated with a decrease in demands and controls, the observance of safety on the part of the administration of the vessel and ports of complacency.

The share of injuries of various essential services of vessels varies. Thus, the floating crew of Services of Operation accounted for 66.4% of vessels affected, while Service of Technical operation – 30.0% and Service of Life Support – 3.6%. Among vessels experts of a river fleet, there is a high level of traumatism among officers: of which the captains (337.3), the skippers (non-self-captains of vessel, 203.7), navigators (177.4) and mechanics (155.5). This is due to the large volume of carrier-labour complex conditions of the voyage assignments. In essence, the river vessel makes a flight at constant passage narrows. The lower psychological pressure, high levels of mechanisation of labour and operator activity are mainly explained by the lower traumatism rates in privates: minders (105.1) and sailors (83.2).

The most common injuries occur on river vessels when working in the engine room, mooring, maintenance, deck machinery, moving the ladders and decks. In the study of the influence of length of service on the frequency of injuries, river men found that the highest traumatism is installed in workers with experience of 1 year (319.7). It decreases slightly in the next 2 years (289.1). And only with a significant increase of skills does frequency of traumatism decrease down to 50.4 after having worked for 15 years. Reducing injuries of floating crew with little work experience due to a number of psychological (development of a new specialty, the practical application of the theoretical knowledge gained in the river schools, the development of safe methods of work) and organisational reasons (it is this contingent of workers on the river fleet where maximum attention is given to the prevention of injuries and accident cases through workshops, technical training, knowledge testing safety). The results of this systematic effect of systematic work appeared immediately. At the same time, the weakening of control over a group of experienced river men, the allocation of which the main criterion is the length of service, leads to a weakening of preventive measures and the professional contingent lose sight of the vessel administration and department safety. The floating crew with large production experience often violate safety rules, unauthorised use of techniques that lead to the creation of traumatic situations on vessels, which, as the study showed, are often implemented in accidents.
Riverine injuries are applied predominantly blunt (83.4%  81.5). Thermal destruction (9.2) is more common than injuries with a sharp object (6.6). Use of alcoholic beverages by the floating crew of the river fleet is set to 8.9% of injuries (9.9)\textsuperscript{26–29}. In the summer, in the midst of river, traffic is marked and has the highest rate of injury (47.5). In autumn and in the non-durable spring in the North Navigation (late April – May), the number of injuries lowers (40.5 and 23.4, respectively). Fluctuations in riverine injury within the weekly cycle are from 20.1 to 14.5 from Tuesday to Sunday.

The distribution of injuries in separate stages of the voyage is set on the number of features of the river fleet. While in flight, floating crews received 35.7% (39.9) of accidents. For the rest, the vessel works during their stay in port during loading and unloading (72.5). It should be noted that at the port of registry, workers of river vessels are injured 1.7 times less than in other ports. Here the influence of unusual conditions and characteristics of the handling of mooring devices and the maximum intensity of the ship’s papers when docking the ship and deck machinery and preparation of holds for the delivery and reception on board the cargo, which, in turn, leads to a violation of the stereotype of industrial action and improper technical methods, ending work-related injuries\textsuperscript{30}.

Accidents on river boats lead to monotrauma (95.3). Among polytrauma (16.9), multiple trauma occurs more frequently than combined\textsuperscript{31}. Neediness of river men in patient treatment for injuries received on board is 49.5 cases per 100 workers. Emergency care to the floating crew of the river fleet was carried out in all hospitals in the area of navigation. Therefore, river men hospitalisation during the testimony is in the most favourable term: the first 6 h after the injury received in the surgical hospital is in 65.1% of the victims on ships and in the time up to 12 h – 84.8%. The main types of damage to the river fleet are a variety of bone fractures (30.0), contusions (20.8), wounds (19.5), burns (10.5) and traumatic amputations (6.6). Specific gravity hand injuries in the structure exceed 26.4% of cases\textsuperscript{32–34}. In case of injury to the hand, wounds dominate with (40%), then fractures (24.6%) and traumatic amputations (22.1%). Bruises and sprained fingers are extremely rare. The second place is occupied by ranking shin injury (12.5). Among them are fractures (63.5% cases), injuries (26.1%) and wounds (10.4%). When damaged, the forearm (7.9) in the river fleet workers health care providers should be prepared to provide the necessary and sufficient aid for fractures of their bones (66.5%) and injuries (8.7%). Injuries to the thorax (7.2) followed by injuries (64.1%) rarely lead to serious injury. Out of every five spinal injuries are accompanied by three and two injuries – fractures without spinal cord injury. Head injury (6.6) in riverine accident ships makes up a small part (5.7%) of the total and in half of the cases lead to a closed head injury: a concussion. Wounds and head injuries are five times less likely to shake. Foot injury at the riverine occurs equally as often with head injuries (6.6), and the structure damage is dominated by fractures, wounds and injuries reported 2.9 times less often\textsuperscript{35}. On the seventh frequency, knee injury is (5.9), wherein only two species observed damage: bruises – 77.5% and patellar fracture – 22.5% of cases. Damage to the organ of vision (3.3) shows the prevalence of wounds over foreign bodies and burns\textsuperscript{36}. The number of open fractures in the riverine is high (8.5)\textsuperscript{37}. In the structure of fractures, they constitute 27.8% of cases. Burns in river transport occur in every tenth of injury (10.1%). Their size, typically, 3%–5% II–III A degree preferentially localised on the hands, face, legs and chest\textsuperscript{38}. Injuries and accidents on board lead to fatal outcomes in 18.5% of cases\textsuperscript{39}.

In the analysis of a variety of 462 injuries of the floating crew of river vessels, hospitalised surgical clinics have identified a number of specific features\textsuperscript{40, 41}. The frequency of hospitalisation of the river fleet workers for injuries to the surgical ward was almost 1.2 times less than that of fishermen and sailors. Both men and women are less likely to be hospitalised than their counterparts in the transport and fishing fleets. The share of young riverine 20–29 years was the highest – 32.7% compared with other age groups 30–39 years – 21.4%, 20 years and 40–49 years – 15.9%, over 50 years – 14.1%. Among the riverine admitted to the surgical clinic with injuries, most are representatives of the Maintenance Service – 58.6%, while the operation of ships – 37.3% and life – 4.1%. The share of marine specialists in the structure of the victims was not the same, including the minders – 26.4%, sailors – 23.6%, skippers – 13.2%, captains – 11.4%, mechanics – 10.5%, navigators – 8.2% and other professionals – 6.7%. The frequency of hospitalisation in the surgical clinic was the greatest with captains (324.0), skippers (359.4), navigators (204.3) and mechanics (189.4)\textsuperscript{42}. In the riverine, the number of work-related injuries based on hospitals was almost twice as much as by specific weight (35.5%) and frequency (57.8) than for sailors and fishermen. This is due to the fact that in most cases, transport and fishing vessel care is provided in the ship’s medical centre. Therefore, in the clinic, they can only come with the most severe injuries requiring hospital treatment for a period over the remaining period of time of flight from the moment of injury. Occupational injuries requiring hospitalisation in the river vessel conditions are obtained by carrying out works related to maintenance and repair.

Research Study
mechanisms of the engine room, moving around the decks and gangways, mooring, hatch covers, as well as maintenance of deck machinery, at the controls, loading and unloading, maintenance team and passengers.45

But the bulk of the injuries (which is two-thirds of all hospitalised injuries) based on information received in surgical hospitals outside the production sector, including in the home, pedestrian traffic, transport and road accidents, sports and suicide attempts. The frequency of lesions in the influence of alcohol at the river in men is 1.6 times less than that of the fishermen and 1.1 times than that of the sailors.44–46

The floating crew of the river vessels marked seasonality of hospitalisation. The maximum is in the summer (36.1%) and is significantly reduced in the autumn (27.9%) due to the decrease in the volume of river traffic and freeze-up in the Severodvinsk river basin.47 In the winter, the number of hospitalised with injuries was 13.9% of the total, which were exclusively domestic. The opening of navigation, the first flight in the spring, increases the number of victims (up to 22.1%). The largest number of riverine hospitalised in the Surgical clinic on a Sunday is almost one in five traumas (19.4%). The largest number of accidents occurs in the parking lot of the ports (66.5%).45,49

Workers of river vessels often receive mono traumas than poly traumas. Among the latter marked with shipboard are multiple (74.2%), combination of injuries (21.0%) and combined ones (4.8%). Mono focus damage outweighs poly focus ones.

Patients hospitalised in the first 6 h are 34.1% and 44.6% in the first 24 h after injury. Treatment received at a later date is 5.8% in river men. The most common river men were hospitalised in a surgical hospital with fractures (65.7), injuries (4.0), contusions (17.9), traumatic brain injury (11.1) and burns (9.7).50,51

In contrast to the sailors and fishermen, river men often come with lower leg injuries, including fractures (64.1%), injuries (18.0%), injuries (15.4%) and Achilles tendon ruptures (2.5%). Chest injuries are the second rank place. The structure of the thorax damage frequency and the specific weight fractures predominate over wounds and bruises. Head injury in the floating crew of river vessels is only in third position, as with crews of other fleets. Closed head injuries are concussion (12.6), head injuries (2.3), soft tissue injuries (1.3) and fractures of the skull base (0.8). Traumatic amputation of fingers served as an indication for hospitalisation in 41.7% of river men (8.4) admitted with injuries of the hand and fingers, broken bones – 29.2%, injuries – 16.7%, with damaged tendon injuries of fingers in 4.2%. With injuries of the knee, the floating crew of the river fleet were hospitalised with a meniscus tear (7.6), wounds and damage to ligaments (by 2.3). In sixth place in frequency localisation of damage is stop.52,53 River men arrive with foot bone fractures, wounds and bruises of various locations. Trauma of the forearm should be noted with a high incidence of fractures, soft tissue injuries and damage to the ulnar and median nerves. Fractures of the clavicle were 81.8%, breaks the acromio-clavicular joint injuries among the entire zone. Damage to the abdominal area is blunt abdominal trauma (45.4%), abdominal injuries (36.4%) and penetrating wounds (9.1%) of the abdomen without damaging the internal organs, with single organ injuries (9.1%). In spinal injuries, boatman comes with fractures and bruises.54,55

Surgical treatments were used in 55.0% of the victims of the floating crew of river vessels, including 19.1% – debridement injury (31.1), 36.9% – other types of surgery (58.6). In other cases, a conservative treatment. In the process of rehabilitation of the crew for injuries was reported in 15.5% of patients. Recovery occurred in 99.1% of the victims. Adverse outcomes ending in the establishment of disability were obtained in 0.9% of patients. Deaths were not.

Discussion

The author has referenced some of his own studies in this review. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964), and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

The level of injury in deck workers of river vessels is highest compared with machine command and commander of the composition. Women of the floating crew of the river fleet were injured two times less often. The groups most at the risk of injury on river vessels are captains, skippers, navigators and mechanics when working in the engine room, mooring, maintenance, deck machinery, moving the ladders and decks. The highest injury was installed at the floating crew with experience of 1 year. Injuries often occur as a result of thermal injury. Precipitating agent is alcohol intoxication (8.9% above the injury).55,60 In the flight, the crew received only 35.7% (39.9) damage, and the rest – when the vessel works during their stay in port during loading and unloading. In the port of registry, river men were injured 1.7 times less than in other ports. In the structure of productive lesions, the river fleet is dominated by fractures of various bones, bruises, wounds, burns and traumatic amputations. Brush damaged in riverine is most often the weight of her in more than 26.4% of cases. Every four fractures in the riverine are open in 27.8% of cases. Burns found in every 10 cases.
Conclusion

- River transport in many countries and regions is the only mode of transport on the transport of bulk goods. The floating crew of the river fleet carried freight on vessels in unusual and adverse weather conditions.
- A variety of cargos, especially their loading, transportation and unloading by the crew, lead to increased psychological stress among members of the deck crew and the captain of the ship. The relatively short transitions from one port to another increase the number of mooring operations, which exclusively are by hand. The high intensity of navigation on the rivers often creates a narrow fairway traumatogenous situation on ships.
- The frequency of injuries on the river vessels is high (132.9 per 1000 workers). Women of the number of crew are injured two times less often than men. High risk of accidents in the older age groups is associated with a decrease in demands and controls on the observance of safety on the part of the administration of ships and ports, complacency, loss of vigilance in carrying out marine works victims.
- Works at high risk of river vessels are mooring, maintenance of deck machinery, the movement of the ladders and decks.
- Volume rendering of qualified and specialised surgical care is determined by the nature and severity of injuries in river men. The main types of damage to the river fleet are a variety of bone fractures (30.0–1000 employees), contusions (20.8), wounds (19.5), burns (10.5) and traumatic amputations (6.6). Specific gravity hand injuries in the structure exceed 26.4% of cases.
- Use of alcoholic beverages by the floating crew of the river fleet is set to 8.9% of injuries. Injuries and accidents on board led to fatal outcomes in 18.5% of cases. 

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Research Study

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Research Study

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