

Lean-Management in Prevention of the Disease of Employees-Men in the Shipbuilding Industry

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Abstract

Introduction: The paper presents the contribution of the principles of lean management to the system of preventive measures aimed at reducing the incidence of male workers of shipbuilding and ship repair enterprises in the Astrakhan region. The proven high level of value of Lean-medicine in increasing the economic efficiency of a medical organization is not the only advantage and the basis for its use in healthcare practice. No less valuable is the study of the medical effectiveness of using the principles of Lean-management in the implementation of preventive measures aimed at reducing the impact of professional risk factors on the health status of workers in the shipbuilding industry.

Objective: Implementation of Lean-management principles in marine and industrial medicine as an effective medical and social investment aimed at reducing the incidence rate and the number of days of temporary disability.

Methods: Data for analysis were extracted from medical histories of inpatients and medical records of outpatients of the Russian Southern District Medical Center for the period 2015 - 2017. We applied methods of an expert examinations and mathematical modeling.

Results: An analytical model for assessing the influence of the principles of Lean-management on the effectiveness of the organization of medical care for male workers in shipbuilding and ship repair was built. A persistent reduction in the risk of developing professionally caused diseases by 25 - 30% and an increase in patient satisfaction with the quality of medical care provided was established. The implementation of the principles of Lean-management in the work of the clinic helped to significantly reduce the strength of the correlation between the factors of production hazards and the health of workers.

Conclusion: The introduction of the Lean-management principles in the work of the clinic allowed not only to optimize the work of this medical organization, increase staff satisfaction, reduce morbidity and the number of days of temporary disability, reduce financial costs, but also maintain the personnel potential in shipbuilding and ship repair enterprises in the Astrakhan region.

Keywords: Prevention; Risk; Incidence; Lean-Management; Employees-Men in the Shipbuilding Industry

Introduction

The main goal of the State program "Development of Shipbuilding for 2013 - 2030" is to achieve a fundamental improvement in the strategic competitive position of Russian shipbuilding in the world and to ensure the possibility of fully meeting the needs of the state and domestic business in modern shipbuilding products [1]. To achieve this goal, it is necessary to highlight one of the most important tasks: the development of the personnel potential of the shipbuilding industry and its consolidation in the organizations of the industry. The main expected result for this task is to ensure a high social effect from maintaining and increasing the number of highly qualified jobs in the shipbuilding and related industries. In recent decades, special attention in the shipbuilding industry has been paid to human resource management.

The specifics of the industry are such that most of the employees are men [2]. Men of working age - the gene pool of the state. Russia ranks first in Europe among the countries with the highest mortality rate for men under the age of 65, according to World Bank data, which estimates that 43% of men in Russia die before the age of 65. The life expectancy of men is affected by the state of the economy, and as a result, the financial situation of people, lifestyle, stress and the level of organization of medical care [3]. It is statistically proven that a healthy, physically prepared person is less prone to accidental and professional injuries due to a good reaction.

It has a higher resistance to diseases, penetrating radiation and the influence of harmful working conditions. That is why investing in the health of male employees of shipbuilding and ship repair companies is a priority. In this aspect, the healthcare industry is the most effective area of investment.

The search for effective methods of managing the health of male shipbuilders, active implementation of the principles of effective management in the practice of the primary level of the health care system and reducing the impact of occupational hazards on the health of shipbuilders were the basis for this study.

Goal of the Study

Implementation of Lean-management principles in marine and industrial medicine as an effective medical and social investment aimed at reducing the incidence rate and the number of days of temporary disability.

Research Materials and Methods

Data collection for analysis was performed from the medical card of the stationary patient (medical history) in an amount of 2450 pieces, medical records of patients who received medical care in the outpatient setting in the amount of 1290 pieces of Astrakhan clinical hospital in 2015 - 2017. The paper uses methods of expert assessments and mathematical modeling.

The study of morbidity of employees of shipbuilding and ship repair enterprises of the city of Astrakhan was carried out according to the data of the appeal to the Astrakhan clinical hospital and data of preventive medical examinations.

Results and Discussion

As a result of preventive medical examinations of shipbuilders and ship repairers in the city of Astrakhan, a two-fold, statistically significant ($p < 0.05$) increase in the incidence from 3680‰ in 2015 to 6254.5‰ in 2017 was revealed. In the structure of pathological defeats of the workers of the shipyards in the years 2015 - 2017 the first place occupied the diseases of blood circulation system (25.4%), the second - illnesses of digestive organs and symptoms and signs of deviation from the norm (for 16.9% respectively), the third - diseases of the musculoskeletal system and connective tissue (11%), fourth - diseases of the eye and adnexa and diseases of the endocrine system (10% respectively), the fifth - diseases of the genitourinary system (9.8%) [4]. The indicator of the number of days of temporary

disability associated with morbidity indicated an increase in morbidity in the studied interval, increasing by 3.5 - 2.0 times according to the dynamics of morbidity. The values of the seasonality index indicated that male employees prefer to seek medical care in the spring and summer - in the midst of increased production activity and more intense exposure to aggressive production factors. An important component of the medical activity of the studied contingent of employees of shipbuilding and ship repair enterprises is their participation in periodic medical examinations [5,6]. The main task of periodic medical examinations at work is to identify early signs of occupational diseases or poisoning, as well as diseases that are not etiologically related to the profession, but in which continued contact with these occupational hazards is dangerous [7-9].

Medical care for employees of the shipbuilding and ship repair enterprises of the city of Astrakhan was carried out in a specialized medical institution specially organized for medical and sanitary services for people working in the river and sea fleets. Astrakhan clinical hospital - the only one in Astrakhan region Center of Professional Pathology at the Federal level.

Polyclinic, which opened in November 2018, is a participant in the pilot project "Lean-polyclinic", launched by the Ministry of Health of the Russian Federation in 2016 in conjunction with the Office of internal policy of the President of Russia with the participation of ROSATOM Corporation. The goal of this project was to improve the processes aimed at increasing patient satisfaction, accessibility of services, increasing efficiency and eliminating existing time, financial and other losses, as well as the organization of workplaces that ensure the safety and comfort of employees by applying the principles and tools of lean management. The main task of implementing lean management in the work of the clinic is to improve the quality of medical care, reduce all types of losses and achieve ideal conditions for the processes.

The use of Lean-management methods in the framework of pilot projects implemented in the Russian Federation over the past four years shows significant advantages in the work of medical organizations compared to traditional approaches in the organization of medical care. And taking into account the fact that Russian healthcare solves issues related to the health of the nation in conditions of severely limited financial resources, there is a need to develop and implement innovative approaches.

The key principle of Lean-management is the continuity of the flow, without delays and queues, due to the uniform loading of medical personnel, rational logistics of patients, staff and information, optimal layout of the organization's areas and elimination of all types of losses [10].

The implementation of the "Lean-polyclinic" project is most effective in a specialized medical center, which has the necessary resources to provide high-quality and specialized medical care and unique strategies that allow to fully meet the demand for high-quality and timely types of treatment and prevention of diseases for workers in the shipbuilding industry [11,12].

The main Lean-management tools used in this medical organization are:

1. The philosophy of Kaizen: The clinic follows the principles of patient focus, continuous changes in small steps, promotion of openness and creation of work teams, development of self-discipline, informing each employee, full involvement of staff, achieved through training at all levels of the organizational structure of the clinic.
2. Value-stream mapping: This is the most basic tool implemented in the work of the clinic, allowing all employees to see the strategic direction in which the clinic is moving, and clearly correlate the overall work and their personal goals. Mapping helped the medical organization communicate its strategy and objectives to each employee within the framework of the project to create a Lean-clinic [13]. The main purpose of mapping was to determine the graphic visualization of the process based on the current situation by building a scheme of all the links in the processes. This scheme helped to identify all the problem points. The main

problems in the clinic were identified and resolved as follows: a) queues and patient expectations; b) inefficient logistics (unnecessary movements, confusing routes); c) errors, inconsistencies; d) failures and errors in information flows, inconsistency of actions; e) bottlenecks, “bottleneck” (places of narrowing the flow of patients, in this case, the design of the building).

3. 5S system, the Philosophy of low-cost, successful, Lean-management: The clinic’s management implemented all five components of the 5S system: “sort”, “set in order”, “shine”, “standardize”, and “sustain”. The priority direction of this system implementation was the creation of comfortable and ergonomic workplaces for staff. The optimal organization of both the workplace and the work space allowed us to minimize losses: unnecessary movements and unnecessary movements, and to influence other types of losses.

The constructed analytical models for assessing the impact of Lean-management principles (reducing the waiting time for shipbuilders) of medical examinations, preventive procedures, and consultations of professional pathologists on the shipbuilders’ morbidity rates, reflected an average inverse correlation between the level of hospitalized patient morbidity and the change (decrease) in the waiting time for a shipbuilder to visit a polyclinic, and an inverse correlation between the average strength (0.5) of the number of shipbuilders who passed the polyclinic, and the length of stay of patients in the clinic.

The medical effectiveness of timely organized preventive measures: consultations on rational nutrition, compliance with the work and rest regime, training of employees with medical knowledge, implementation of the principle of time protection, creation of safe working conditions, and conducting single courses of therapy was 30% (Figure 1).

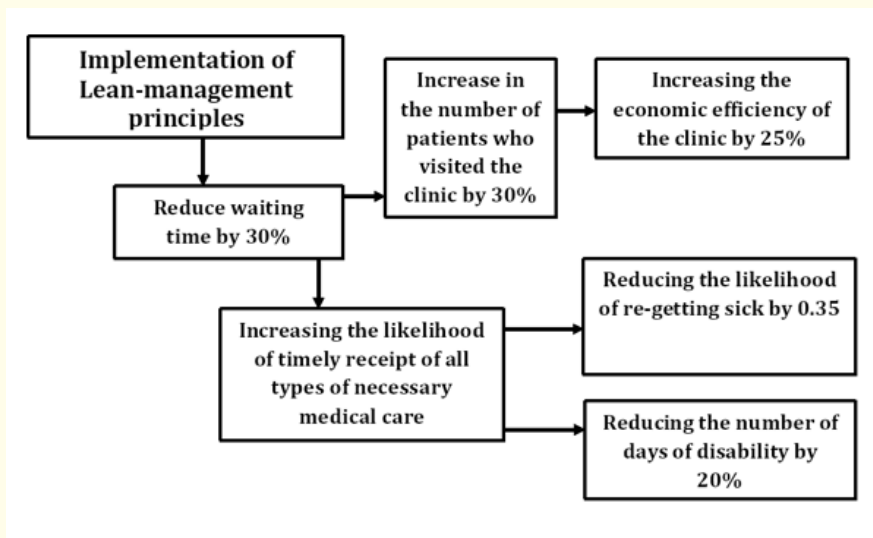


Figure 1: Analytical model for assessing the impact of Lean-management principles on the effectiveness of medical care for male workers in shipbuilding and ship repair.

Conclusion

Due to the high degree of public importance of the shipbuilding industry on the one hand and the presence of morbidity shipbuilders-men - with another, there was an objective necessity of an innovative approach to organization of medical care for the employees of the shipbuilding and ship repair industries through the implementation of principles of Lean-management in outpatient clinics to improve the quality of medical care and prevention.

This choice was due to the need for a widespread transition to personalized medicine, in which the patient receives care at the right time and in the right place, with the maximum level of comfort, which fully corresponds to another principle of Lean-management “Just-in-time”. As a result of the project implementation in 2018-2019, it was possible to reduce the time spent by patients on medical examination and medical examinations, without reducing the quality of medical care and the level of comfort. Taking into account the value of the seasonality index and the preferential treatment of male employees for medical care in the spring and summer, the volume of services provided in accordance with the demand for them has been increased. Patients with a high risk of developing diseases received the necessary consultations in the polyclinic, preventive treatment in a day hospital, medical rehabilitation services and referral to Spa-treatment. All activities were carried out taking into account the principles of complexity, consistency and continuity.

The analytical model of the impact of principles of Lean-management on the effectiveness of organization of medical care for male workers in the shipbuilding and ship repair reflects organizational health and economic efficiency of the project: reduction of waiting time by 30%, increase the number of patients by 30%, increased likelihood to receive timely medical care, reducing the number of disability days by 20%, reduced likelihood of getting sick again at 0.35.

The introduction of Lean-management principles in the work of the clinic has helped to significantly reduce the strength of the correlation between factors of occupational hazards and the health of employees.

There was a persistent 25-30% decrease in the risk of developing professionally-related diseases, and an increase in patient satisfaction with the quality of medical care provided.

The introduction of Lean-management principles in the work of the clinic allowed not only to optimize the work of this medical organization, increase staff satisfaction, reduce morbidity rates and the number of days of temporary disability, reduce financial costs, but also to preserve the personnel potential at shipbuilding and ship repair enterprises in the Astrakhan region.

Conflict of Interests

The authors declare no conflicts of interest.

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