

SCIENTIFIC FOUNDATIONS OF MEDICAL CARE IMPROVEMENT FOR ELDERLY PEOPLE WITH ACUTE ABDOMEN

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Abstract

Basic tendencies in the emergency surgical measures in case of acute diseases of the abdominal cavity organs within 2019-2021 are discussed in the study. The purpose of the study is establishment of main risk factors of pre-hospital mortality development due to complications of acute surgical diseases of the abdominal organs (ASDAO), effectiveness of primary prevention improvement, its diagnosis and management using innovative technologies. Methods of the study. A comparative analysis of the indicators covering 4 city health care centers where more than 90% of emergency surgeries are performed in case of acute diseases of the abdominal cavity organs of adult population in case of some disease entities combined by the general concept "acute abdomen". Main risk factors of acute surgical pathologies of the abdominal cavity organs development are low responsibility of people for preservation of their health, nonobservance of dietary pattern, eating of badly digestible food, alcoholic beverages, hypodynamia, absence of regular medical check-up of the patients with chronic pathologies of digestive tract, planned hospital admission and surgical treatment of the patients with ASDAO. The use of audio and video technologies during the medical examination of the abdominal patients has increased for 2019-2022 from 65.43% to 81.31%, a number of patients subject to qualitative planned screening examinations has increased by 15.21%, timeliness of medical-preventive activities has been increased by 11.16%, level of planned laboratory-instrumental examination techniques has been grown by 17.72% resulting in increase of share of the patients (11.16%) who were surgically treated on time. Improvement of quality of the periodic health examination of the patients with chronic pathologies of the abdominal cavity organs promoted reduction in the burden of acute appendicitis by 1.19‰, acute pancreatitis by 0.79‰, acute cholecystitis by 0.67‰, gastroduodenal ulcer by 0.48‰.

Keywords: risk factors of prehospital mortality, periodic health examination, "acute abdomen", audio and video technologies, surgical activity

INTRODUCTION

Necessity of continuous monitoring of the emergency surgical service's indicators on the whole and in the particular region is out of question. It allows not only planning and regulating development of surgical measures but using databases for performance of well-organized scientific researches with high level of evidence [1, 2, 3, 4]. Up to date there are no national registers on acute surgical diseases accompanied by high mortality in Kazakhstan contributing incomplete insight into status of the emergency surgical measures in the republic [5, 6, 7].

Non-epidemic chronic diseases of the abdominal cavity organs are met in all age-group populations (8, 9). Increase in frequency of chronic somatic diseases during decompensation stage has been established in case of an acute surgical pathology of elderly individuals impairing state of the patients and supplementary measures to patients' care management at pre-hospital stage are required [8, 9, 10, 11]. A comparative assessment of the results of the study demonstrated that in surgical elderly patients – 17.1 ± 0.2 cases, which is accurately higher than in middle-aged patients (10.3 ± 0.5 cases; $p < 0.05$). An acute surgical pathology is accompanied by hypertensive crisis in the middle age with frequency 7.4 ± 0.2 cases, at the elderly age – 21.8 ± 0.1 cases ($p < 0.05$). Age-dependent increase in the rate of arrhythmia syndrome is typical ($p < 0.05$). It was detected that the most frequent pathology for which case follow-up by a surgery is required, is osteoarthritis deformans. It was detected that varix dilatation of the lower extremities and its complicated progression was more frequent in elderly people (9.1 ± 0.1 per 100 patients) and senile age (9.2 ± 0.4 per 100 patients) in the group of patients with chronic surgical pathology without the least significant difference in indicators between the last groups. Digestive tract failure accompanied by food indigestion in the digestive tract, defecatory disorder [12, 13, 14], impairing due to alcoholic beverages, low-quality food, nonobservance of dietary pattern is observed among individuals of elderly and senile age, which promote diseases exacerbation resistant to pharmacotherapeutic therapy. These pathologies are frequently complicated and characterized by slight symptoms, resulting in wrong diagnostics and late surgical measures. There are such disease entities as acute appendicitis, acute cholecystitis, acute pancreatitis, perforated gastric ulcer (PGU) and duodenal ulcer (DU), acute gastro-duodenal bleedings (AGB), constricted hernia and acute intestinal obstruction (AIO), combined under general concept "acute abdomen" among them. Statistical data of the city surgical service for 2019-2021 demonstrated that the specific weight of mortality due to acute surgical diseases of the abdominal cavity organs is 85.2% of all mortality causes of elderly people. The level of pre-hospital mortality of the patients with acute surgical diseases of the abdominal cavity is stably high (4.7%). The number of surgeries is preserved at the level of 1.06-1.10 thousand per year for the analyzed period. An increase is noted due to increase of surgical activity which was 71.84% in 2019. Morbidity rate of acute appendicitis has been increased from 29.44% to 34.06%. Morbidity rate of acute cholecystitis and acute pancreatitis has been slightly changed within 2017-2019. AGB is on the 4th place on degree of incidence – 9.01%. A number of the patients with AIO has

been decreased to 6.79% and with constricted hernia to 3.68%. Proportion of the patients with PGU and DU is almost without changes within 3 years and is 4.14% for 2019. Postoperative mortality in 2018 and 2019 has reduced to 3.28% and 2.91%, accordingly. The highest mortality figures are noted in patients with acute pancreatitis, PGU and DU, AGB and AIO. The least controlled element in the medical aid arrangement system is untimely medical care seeking of population [15, 16, 17, 18]. About a half of total number of the patients (47.84%) with acute surgical pathology were admitted to the hospital later than 24 hours from the onset of initial symptoms, and the indicator in 2017 was 51.52%, in 2018 – 51.36%. The leading positions on duration of hospital admission later than 24 hours are taken by AIO, acute cholecystitis, acute pancreatitis and AGB. An increase of surgeries performed up to 6 hours (62.29%) was registered in 2019 compared to 2017 (60.55%) and 2018 (57.98%). A promising trend in improvement of emergency surgical measures for the patients with acute surgical pathology of the abdominal cavity organs is further introduction and wide distribution of the modern radiological methods of examination and the use of minimally invasive techniques [19, 20, 21, 22, 23]. Aid arrangement system for such patients is of primary importance in this complex problem on treatment of the patients with surgical emergencies of the abdominal cavity organs. So, the largest optimization is required for organizational system of timely medical care seeking of population, while the use of the single approach in diagnosis and management specified in the national clinical guidelines promotes reduced mortality indicators in the last few years.

The Purpose of the Study. Improvement of the emergency medical services arrangement to the elderly individuals with the acute surgical pathology of the abdominal cavity organs by means of timely hospital admission, correct diagnostics and application of high-tech surgical measures.

Materials and Methods. In the course of the work, we paid attention to sufficiency of the general statistical values. The materials were processed using absolute, average means. Using modern bibliographic sources, we have studied data on features of morbidity and mortality of the elderly individuals due to acute surgical pathologies of the abdominal cavity organs. We defined main risk factors, problems of the disease diagnostics, hospital admission and complications leading to increased hospital mortality of the patients.

Results. The provided materials demonstrate the dynamics of the acute abdominal pathology morbidity for nine-year period (2010-2018) and reflect the results of healthcare organizations of Shymkent city on special and emergency surgery subject to time factor from the disease onset to health encounter, duration of hospital admission. Morbidity dynamics of the elderly patients for 2010-2018 has been increased by 0.8%, accounted from 1272.9‰ to 1283.42‰ (Figure 1). Morbidity rate of the elderly women is higher than men by 12.83%.

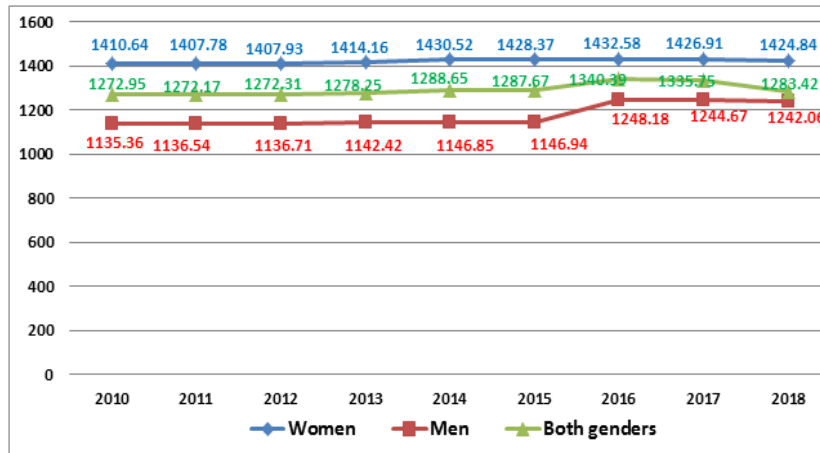


Figure 1: Dynamics of overall incidence rate of acute surgical pathologies of the abdominal cavity organs of the elderly patients based on 100000 of population.

According to statistical data of surgical departments of Shymkent city (Table3) the specific weight of acute appendicitis in structure of the acute surgical diseases of the abdominal organs (ASDAO) is 53.63%, and it is 46.71% in men, and 58.18% in women. An acute cholecystitis occurs in average in 17.70% of cases, more often in women (23.18%) than in men (12.58%). An acute intestinal obstruction (12.32%) takes the third place on the specific weight among ASDAO. At the same time, the occurrence in men (19.92%) is far of excess of the incidence rate in women (6.87%). Perforated duodenal ulcer and duodenal ulcer is on the fourth rank place on the prevalence rate of the disease, which specific weight was 2.76% (in men - 6.62%, in women - 0.38%). The specific weight of acute pancreatitis (2.50%) was higher in women (4.29% vs 1.27% in men). The sixth place is taken by acute gastro-duodenal bleeding with the specific weight of 2.28% (in men - 3.31%, in women - 1.21%).

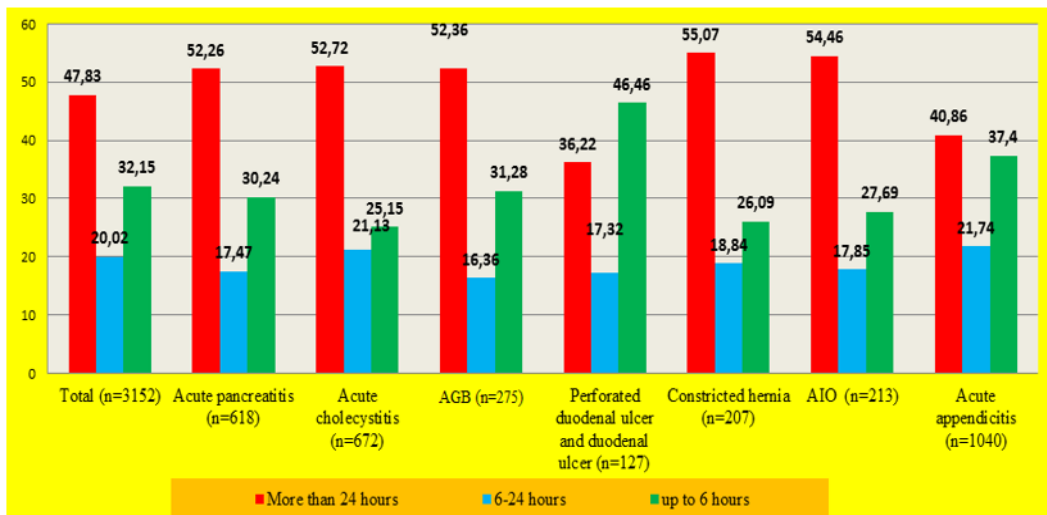
In case of acute surgical pathology of the abdominal cavity organs, an increase in the rate of chronic somatic states at decompensation stage is determined, impairing the state of the patients and supplementary measures on the patient's care management at the prehospital stage is required (Table 1).

Table 1: Comparative assessment of prevalence rate of chronic somatic pathology at the decompensation stage associated with acute abdominal surgical diseases of individuals in the middle and elderly age groups (per 100 patients).

Chronic somatic pathologies	Authenticity of indicators' difference (-P-) in various age groups		
	Middle	Elderly	- P –authenticity of indicators' difference
Decompensation of chronic cardiac failure	10.31 ± 0.53	17.12 ± 0.21	p< 0.05
Hypertensive crisis	7.47± 0.23	21.79 ± 0.15	p< 0.05
Paroxysmal atrial fibrillation	2.26 ± 0.07	5.84 ± 0.19	p< 0.05
Frequent ventricular arrhythmia	10.37 ± 0.92	21.49 ± 1.08	p< 0.05
Diabetes mellitus decompensation	5.11 ± 0.24	7.12 ± 0.58	p< 0.05
Recrudescence of chronic obstructive pulmonary disease	2.09± 0.72	5.31 ± 0.19	p< 0.05
Recrudescence of bronchial asthma	2.29 ± 0.82	7.02 ± 0.58	p< 0.05
Psychotic disorders	2.0 3± 0.17	17.78 ± 2.10	p< 0.05

Against the background of the acute abdominal surgical pathology in the middle-aged patients, decompensation of chronic cardiac failure occurred in 10.31 ± 0.53 of cases, among elderly patients - in 17.12 ± 0.21 of cases ($p < 0.05$). An acute surgical pathology is accompanied by a hypertensive crisis in the middle age with frequency 7.47 ± 0.23 of cases, in the elderly age - 21.82 ± 0.14 of cases ($p < 0.05$). Paroxysmal atrial fibrillation occurred in the patients of the middle-aged patients in average in 2.26 ± 0.07 of cases, in elderly patients in 5.84 ± 0.19 of cases ($p < 0.05$). Frequent ventricular arrhythmia was established in the middle-aged patients in 10.37 ± 0.92 of cases, in elderly patients in 21.49 ± 1.08 of cases. Decompensation of diabetes mellitus, chronic obstructive pulmonary disease (5.31 ± 0.19 ; 2.09 ± 0.72), exacerbation of bronchial asthma (7.02 ± 0.58 ; 2.29 ± 0.82) and psychotic disorders (17.78 ± 2.10 ; 2.05 ± 0.17) occurs in the elderly patient accurately frequently ($p < 0.05$) compared to the middle-aged individuals (7.12 ± 0.58 ; 5.11 ± 0.24 , accordingly). It was detected that varix dilatation of the lower extremities and its complicated progression was more frequent in elderly people (9.08 ± 0.17 per 100 patients) and senile age (9.08 ± 0.17 per 100 patients) in the group of patients with chronic surgical pathology without the least significant difference in indicators between the last groups. Digestive tract failure accompanied by food indigestion in the digestive tract, defecation disorder, impairing due to alcoholic beverages, low-quality food, and nonobservance of dietary pattern is observed among individuals of elderly and senile age, which promote diseases exacerbation resistant to pharmacotherapeutic therapy. These pathologies are frequently complicated and characterized by slight symptoms, resulting in wrong diagnostics and late surgical measures. This suggests an increase in the degree of surgical risk of the elderly patients. Therefore, there is a demand for optimization of outpatient-polyclinic surgical measures for the patients of elder patient groups.

The traditional quality assessment criterion of surgical measures are indicators of clinical mortality of the patients [5]. Clinical mortality directly depends on the duration of hospital admission of the patients with surgical emergencies of the abdominal cavity organs. The least controlled element in the medical aid system arrangement is untimely medical care seeking of the population. 47.83% of the total number of the patients with acute surgical pathology were admitted to hospital later than 24 hours from the onset of the initial signs of the disease, while the indicator in 2020 was 51.62%, in 2021 - 51.27%. The leading positions on period of hospital admission later than 24 hours are taken by constricted hernia (55.07%), AIO (54.46%), acute cholecystitis (52.72%), AGB (52.36%), acute pancreatitis (52.26%). (Figure 2)



Figures 2: Period of hospital admission of the patients with acute surgical pathology of the abdominal cavity organs (absolute numbers in % of data on hospital admission periods).

An increase of share of surgeries performed within 6 hours (32.15%) is observed in 2021 compared to 2020 (30.55%) and 2019 (27.98%). The highest mortality is observed in patients with acute pancreatitis (18.98%), perforated duodenal ulcer (13.79%), acute gastro-duodenal bleeding (12.50%), acute intestinal obstruction (11.05%). Untimely hospital admission, somatic diseases with decompensation of vital internals and late surgical measures lead to serious complications and rise mortality rates (2019 - 3,80‰, 2020 - 3,79‰ and 2022 - 3,48‰) (Table 2)

Table 2: Postoperative mortality of patients with acute surgical pathologies of abdominal cavity organs by separate disease entities in 2019-2021.

Disease Entity	2020			2021			2022		
	Number of postoperative patients	Number of deceased	Postoperative mortality	Number of postoperative patients	Number of deceased	Postoperative mortality	Number of postoperative patients	Number of deceased	Postoperative mortality
Acute appendicitis	1693	9	0.55	1697	9	0.53	1661	10	0.59
Acute intestinal obstruction	389	43	11.05	9	42	10.71	8	33	8.54
Constricted hernia	278	19	6.83	274	16	5.83	280	18	6.4
Perforated gastric ulcer and duodenal ulcer	87	12	13.79	83	10	12.04	85	10	11.76
Acute gastro-duodenal bleeding	72	9	12.50	80	8	10.00	73	7	9.59
Acute cholecystitis	559	20	3.57	552	20	3.62	556	17	3.05
Acute pancreatitis	79	15	18.98	81	15	18.51	83	15	18.07
Total	3157	127	3.80	159	120	3.79	3154	110	3.48

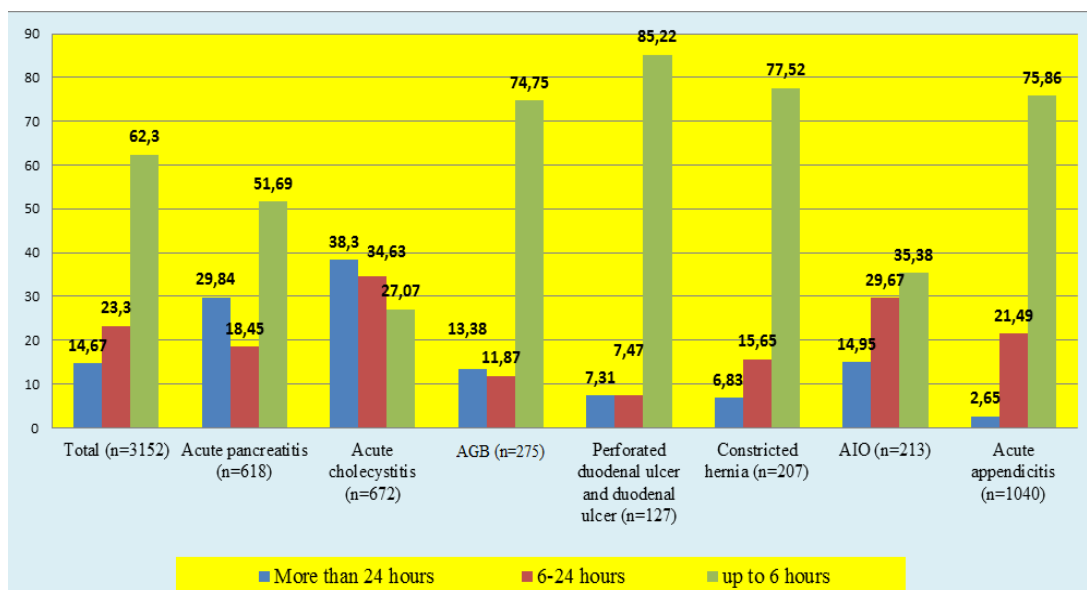


Figure 3: Terms of surgical measures in patients with acute surgical pathology of abdominal cavity organs (in %) for 2022

In spite the general reduction in the level of surgical emergencies in the Republic of Kazakhstan since the beginning of XXI century by 28%, related to development of selective surgery for cholelithiasis, abdominal hernias, treatment success of peptic ulcer

and modernization of instrumental diagnostics (laparoscopy, ultrasound, CT), study of morbidity patterns of urgent surgical pathology, immediate results of surgical treatment plays an important role in the advance planning of the work of the surgical service in various scales - from the whole country to a separate multi-specialty hospital [4].

The submitted study on the state of surgical emergencies for the patients with the acute surgical pathology of the abdominal cavity organs in Shymkent city allows the authors to make some generalizations. For the last year, the share of the patients admitted to hospital later than 24 hours from the disease onset has slightly reduced from 51.27% (2018) to 47.84% (2019), which is one of the main factors affecting the mortality rate, and indirectly indicates the availability of surgical measures. Attention should be paid to reduction of post-surgery mortality from 3.57% (2017) to 2.91% (2019). A promising trend in improvement of emergency surgical measures for the patients with acute surgical pathology of the abdominal cavity organs is further introduction and wide distribution of the modern radiological methods of examination and the use of minimally invasive techniques. Aid arrangement system for such patients is of primary importance in this complex problem on treatment of the patients with surgical emergencies of the abdominal cavity organs. The least controlled element in this system is untimely medical care seeking of the population, while the use of the single approach in diagnostics and management specified in the national clinical guidelines promotes reduction of mortality rates in the last few years. 97.28% of elderly patients who obtained timely clinical care noted improvement in health (Figure 4). 59.87% among them recovered completely, and substantial health improvement is noted in 37.41% of the patients. State of health is not changed only in 2.72% of postoperative patients. Cases of hospital mortality were not established in the mentioned group of the patients. The specific weight of the patients with ASDAO with late hospital admission and severe complications who noted improvement in health after the surgery was 79.84%, and mortality rate has increased to 20.16.

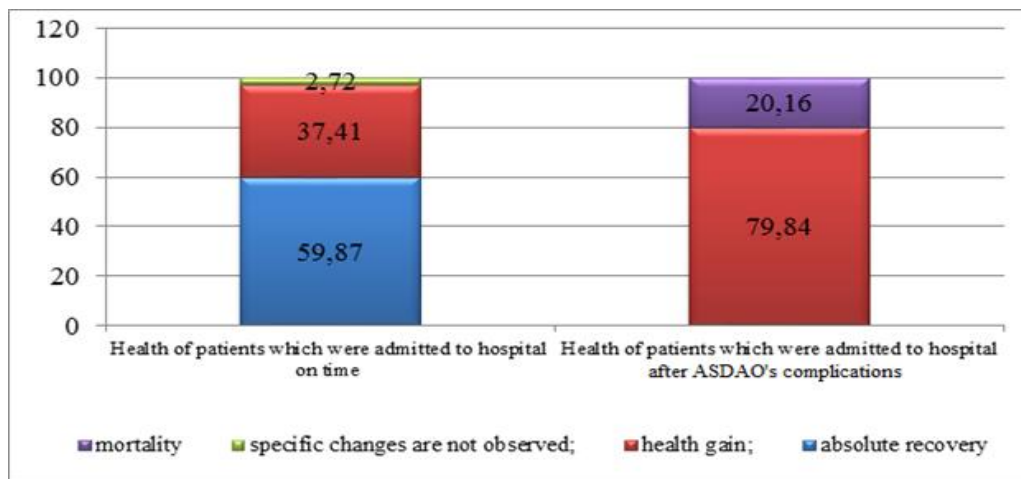


Figure 4: Health status of patients with ASDAO's complications depending on terms of surgical measures.

The main causes of the increased clinical mortality are absence of outpatient periodic health examination of the patients with chronic somatic diseases (22.97%), untimely hospital admission after the onset of the initial signs of acute surgical pathology of the abdominal cavity organs (27.68%), incorrect primary medical diagnosis (26.24%), untimely reference to a physician in case of the initial signs of acute surgical pathology, refusal of hospital admission of the patient due to incorrect diagnosis by admitting physician (Figure 5). The quality and lifestyle of the patients, as well as the degree of medical activity of the patients, contribute to formation of the level of clinical mortality of the patients.

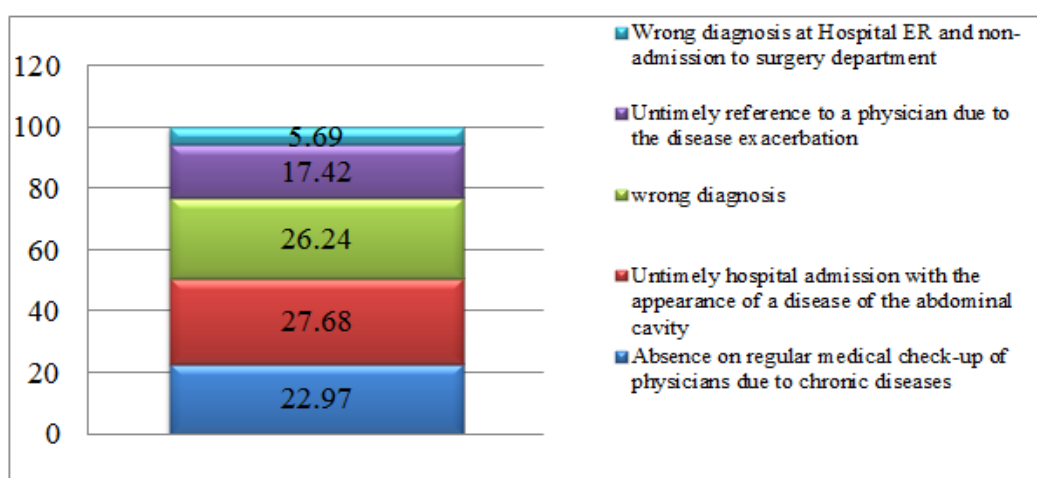


Figure 5: Main causes of hospital mortality level increase because of ASDAO's complications (in %)

It was established during the survey that the quality of life of 90.31% of the patient is good. At the same time, 91.26% of respondents are sedentary and do not bother themselves with physical exercises. Moreover, they do not follow a meal plan. There are a lot of elderly people who eat 1-2 times (53.94%) and 5-6 times (8.93%) per day among them. 62.43% of respondents eat hardly digest food from animal fat, fried meat, potatoes and starchy foods before going to bed. There is a high percentage of individuals with defecatory pattern abnormalities (92.58%) among the elderly patients. Among them, in 7.42% of respondents the bowel movement is 1 time per day, 72.34% - 2 times per week, and 20.24% of respondents after administration of laxative drugs (Figure 6). People with unhealthy lifestyle are frequently met among the patients who suffered from ASDAO. 31.45% of male respondents drink alcohol, share of such people among women is 2.32%. If the specific weight of smoking male respondents is up to 63.64%, such share among women respondents is 7.28%. 94.87% of elderly women look after themselves, while male respondents think about maintenance of their health far less (83.68%).

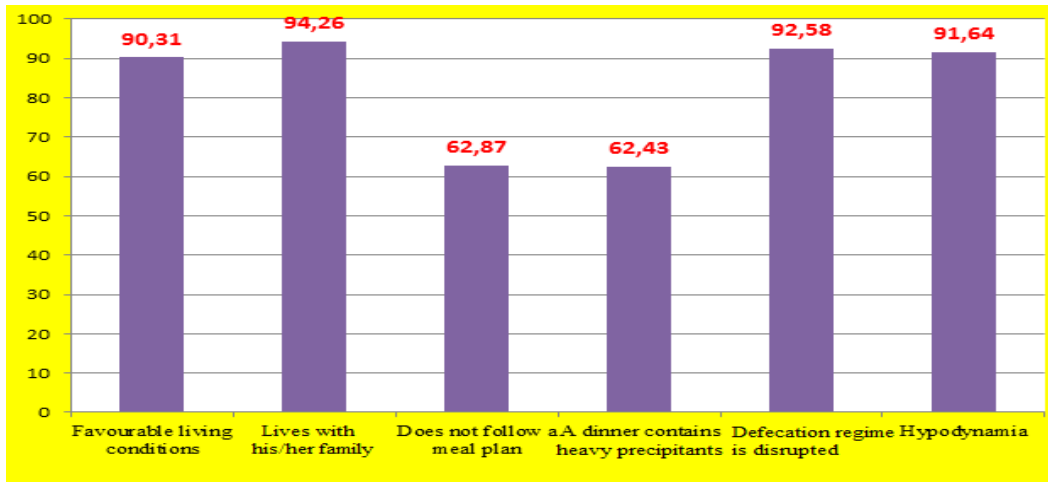


Figure 6: Bowel movement frequency of elderly patients with ASDAO depending on physical activity and exercises, dietary pattern and quality, as well as composition of taken food (in %).

Moreover, the level of sanitary literacy of elderly patients (28.43%) and female patients (38.72%), as well as medical activity (21.48% and 64.77%, respectively) of respondents contribute significantly to the increase in the mortality rate (Figure 7).

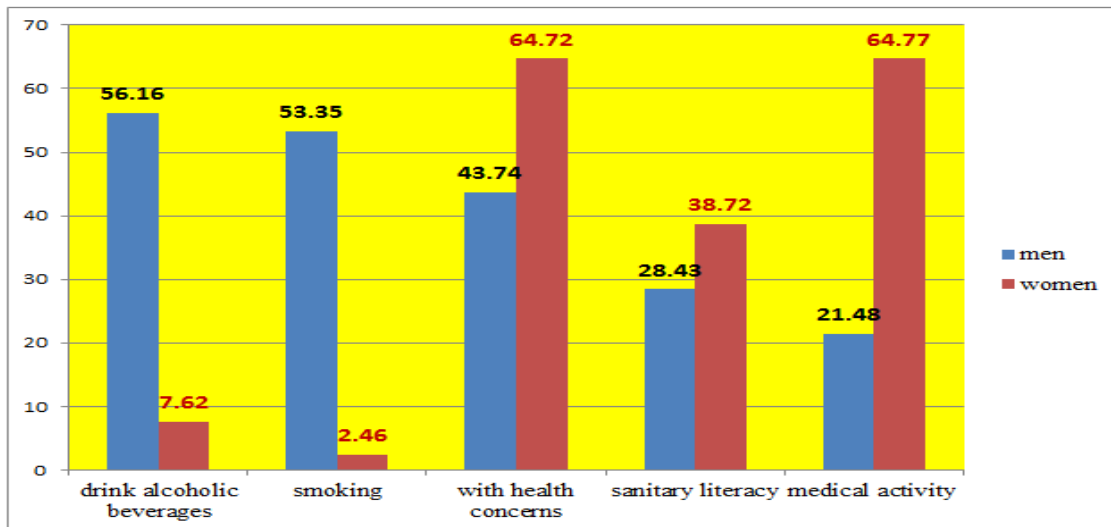


Figure 7: Prevalence of negative health causes related to the lifestyle on mortality level of patients with ASDAO (in %).

The specific weight of elderly patients with individual symptoms of abdominal pathology who did not refer to a surgeon is very high. For example, the specific weight of the individuals who visited a surgeon was 26.73% among the patients with stomach and bowel bleeding, the remaining 73.27% attended a primary care physician. Patients with signs of complications of gastric and duodenal ulcers also attended a primary care

physician frequently (69.87%) or other physicians (1.79%) of the polyclinic, and share of the patients who attended surgeons was only 28.34%. 96.59% of the patients with suspected acute appendicitis were seen by a surgeon and referred to hospital admission, and 3.41% of the patients were initially examined by primary care physicians. In case of the initial signs of acute pancreatitis and cholecystitis (96.68% and 83.72%) the patients were examined by surgeons, but a considerable number of such patients (3.32% and 16.28%) were initially examined by primary care physicians (Figure 8). The analysis of the obtained scientific data is indicative of low sanitary literacy of elderly patients.

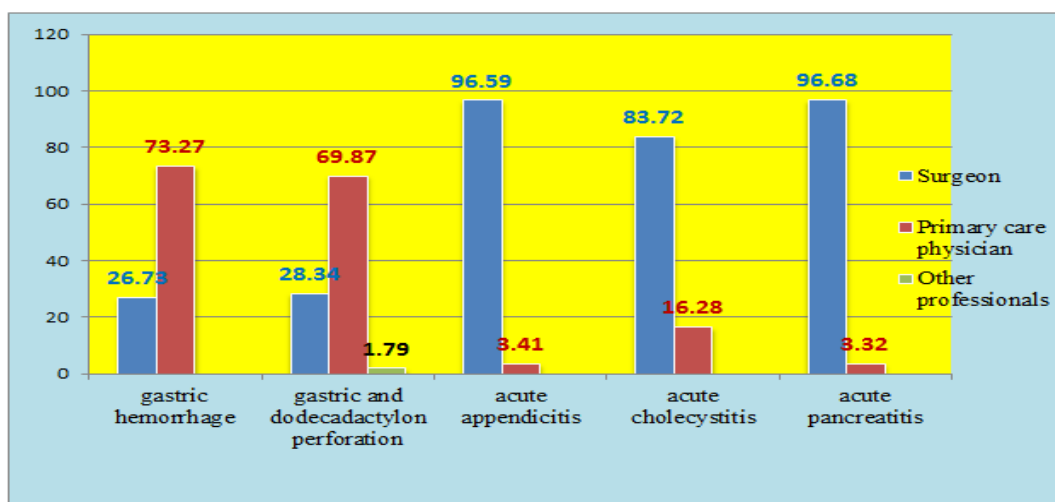


Figure 8: Breakdown of the patients examined by the various medical specialists of outpatient-polyclinic companies with the initial signs of abdominal surgical pathology.

Development of the model of the initial outpatient medical examination of the patients with an abdominal surgical pathology, improvement of knowledge of primary care physician and wide application of the modern diagnostic audio and video technologies in outpatient-polyclinic companies is required for this circumstance. The use of the modern audio and video technologies for diagnostics and management of complications caused by surgical pathologies of the abdominal cavity organs provides meaningful results (Figure 9). The use of innovative technology in the outpatient surgical practice from 65.43% in 2019 to 81.31% resulted in increase of the share (11.16%) of the patients who obtained timely comprehensive treatment. 50% of them used curative measures within the framework of medical and economic standards. Moreover, the number of the patients of outpatient companies subject to qualitative screening examinations has been increased by 15.21%, timeliness of the onset of medical-preventive activities has been increased by 11.16%, the level of the planned laboratory-instrumental examination methods has been grown by 17.72% and coverage of the patients by medical-preventive activities by 14.77%.

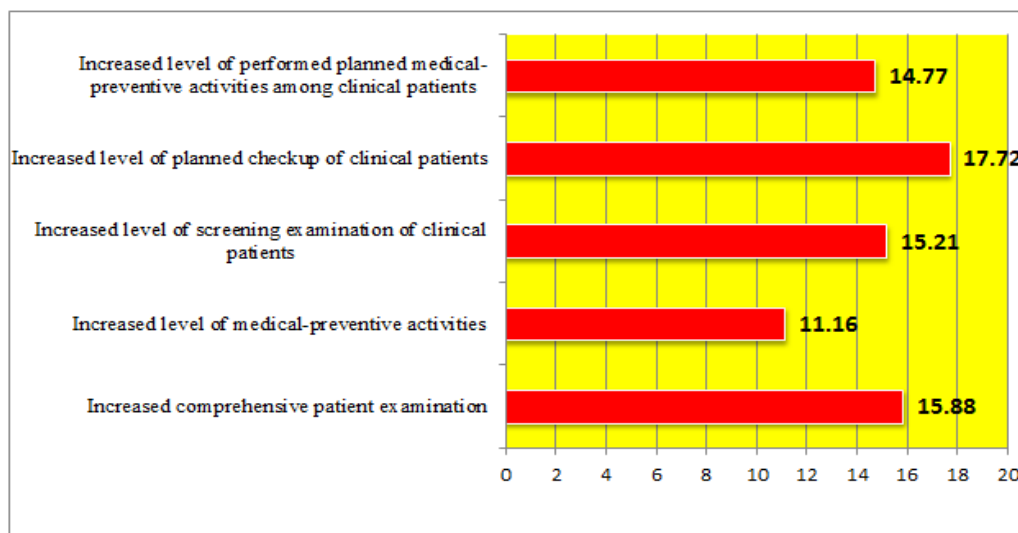


Figure 9. Effectiveness of preventive measures increase among clinical group of patients with chronic pathologies of abdominal cavity organs covered by an examination using audio and video technologies (in %)

Improvement of quality of periodic health examination of the patients with chronic pathologies of the abdominal cavity organs promoted reduction in the burden of disease (Table 3) by ASDAO.

Table 3: Reduction in the burden of disease in the result of optimization of periodic health examination of the patients with chronic pathologies of the abdominal cavity organs performed in 2019-2022 (per 1000 of population)

Surgical emergencies of the abdominal cavity organs	Average level of morbidity rate (M±m)		Relative reduction in the indicator level (per 1000 of patients)
	2012-2018	2019-2022	
Acute appendicitis	896.82±21.92	894.91±19.47	-1.91
Acute cholecystitis	108.47±9.51	107.80± 8.93	-0.67
Acute intestinal obstruction	13.14± 1.21	13.02±1.09	-0.12
Constricted hernia	9.26±0.87	9.18± 0.78	-0.08
Acute pancreatitis	138.73±11.42	137.94±11.36	-0.79
Penetration of gastric ulcer and duodenum	73.29±6.54	72.81±6.42	-0.48
Gastrointestinal bleeding	38.79±3.69	38.5±3.51	-0.29

Including on acute appendicitis by 1.19%, acute pancreatitis by 0.79%, acute cholecystitis by 0.67%, gastroduodenal ulcer by 0.48%.

DISCUSSION

Comprehensive study of the problem related to morbidity, complication and mortality of the elderly patients related to acute surgical pathologies of the abdominal cavity organs

demonstrated undervaluation of importance of surgical measures at pre-hospital stage to elderly people. Surgeons of outpatient clinics are focused on patient's care management of young and middle age, but the task of the regular medical check-up of individuals of elder age groups is not solved properly. Poor knowledge in the area of prevention and responsibility for preservation of its health is noted among this cohort due to low level of hygiene publicity. Factors of unhealthy diet, consumption of alcoholic beverages and hardly digestible food in diet of elderly people is widely distributed. All these circumstances are intensified by low accessibility level of emergency medical services to patients, when such stations are located at considerable distance, there are no modern mobile machinery, experienced physicians and non-asphalt roads. 77% of population in districts of Turkestan region lives in the country where specialized surgical departments, experiences abdominal surgeons and innovative technologies and modern examination methods are available only in district centers and cities. Therefore, it is necessary to look for another arrangement of medical aid to elderly patients adapted to the abovementioned conditions of the cut-off rural area. Firstly, it is necessary to change psychological pattern of people, having aimed them toward strengthening of their responsibility for preservation of their health. To improve sanitary literacy and for strengthening of healthy lifestyle. To intensify propaganda on observance of dietary pattern and eating of digestive food for digestive organs. To maintain strict control over physicians of rural medical centers on work with outpatient groups of elderly patients and verify appropriateness of planned examinations and health-related food. They should plan season examinations of elderly patients by surgeons having arranged a lecture on prevention of acute surgical pathologies of the abdominal cavity organs. Surgeons must plan an elective surgery due to disease exacerbation of the abdominal cavity organs. All these curative and managerial activities will reduce the level of risk factors of exacerbation of surgical pathologies of the abdominal cavity organs, pre-hospital and postoperative mortality of the elderly patients.

CONCLUSIONS

1. Main risk factors of acute surgical diseases of the abdominal cavity organs are low responsibility of people for their health, failure to follow a dietary regime, eating poorly digested food, alcohol intake, hypodynamia, lack of medical supervision of patients with chronic diseases of the digestive tract, lack of planned hospital admission and surgical treatment of the patients with ASDAO.
2. The use of innovative technologies during the examination of the patients in polyclinic surgical practice increased from 65.43% in 2019 to 81.31%, the number of the patients who subject to qualitative planned screening examination has grown by 15.21%, timeliness of the beginning of medical-preventive activities has increased by 11.16%, the level of laboratory and instrumental examination methods has grown by 17.72% resulted in increase of share of the patients (11.16%) who obtained timely surgical treatment.

3. Improving the quality of medical check-ups for patients with chronic abdominal organ pathologies has contributed to a reduction in the incidence of acute appendicitis by 1.19%, acute pancreatitis by 0.79%, acute cholecystitis by 0.67%, gastroduodenal ulcer by 0.48%.

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