"OVIDIUS" UNIVERSITY CONSTANTA

DOCTORAL SCHOOL OF MEDICINE

DOCTORAL FIELD MEDICINE

MANAGEMENT OF SURGICAL WOUND INFECTIONS AFTER ABDOMINAL SURGERY

ABSTRACT

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Keywords*: infection, abdominal surgical wounds, risk factors, management*

LIST OF ABBREVIATIONS

ASA- American Society of Anesthesiology

ECDC - European Centre for Disease Prevention and Control

NNIS- National Nosocomial Infection Surveillance

T Point- standard time

VSH- Erythrocyte sedimentation rate

CDC - Centers for Disease Control and Prevention, United States of America

HELICS- Hospital's in Europe Link for Infection Control and Surveillance

MS/ MPS – Ministry of Health/ Ministry of Public Health

SWI- surgical wound infection

ICU- intensive care unit

SPCIN- The Prevention and Control of Nosocomial Infections Service

Thanks

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Finally, I thank my family for their unconditional support and encouragement in difficult moments.

INTRODUCTION

Surgical wound infection is an important issue for granting healthcare professionals, surgical site infections having important implications related to patient morbidity and mortality, and healthcare costs. Among the consequences generated by the presence of this complication in operated patients developments there are: the negative influence on the healing process, increased mortality risk as well as social, professional, economic, legal implications.

Infection is a major complication in medicine, defined broadly as all functional disorders, lesions and systemic changes produced by the body's reaction to the intrusion and propagation of pathogens. The risk of surgical infection is directly proportional to the microbial dose of contamination and immune deficiency of the body, for the development of infection in the wound process being necessary that the total number of micro-organisms in one gram of tissue to be greater than 10^5-10^6 microbial cells [1].

Infections occurring after surgery on the digestive tract, are usually produced by gram-negative bacteria: Pseudomonas, Enterobacteriaceae (Escherichia coli) as well as staphylococci and fungi (Candida). In other situations staphylococci and streptococci are etiologically involved, gram negative bacteria are present in the case of sepsis and abscess. There may be different microorganisms in the surgical wound, forming polymicrobial communities [2].

It is shown that surgical infections occuring during the first 7-15 days after surgery are the result of contamination during surgery, and in cases with a longer period of incubation contamination occurs postoperatively, during patient care [1]. Surgical wounds can be contaminated during the evacuation of the collected fluids accumulated, a commonly performed surgical procedure. The open-drain wound dressing executing maneuvers can be gateways to the causative agents.

In 1992 Centers for Disease Control and Prevention, Atlanta-SUA, replaced the term *surgical wound infection* with *surgical site infection* [3]. The standardized criteria for definition and classification are performed by the Centers for Disease Control and Prevention and National Nosocomial Infection Surveillance [4] adopted subsequently by our Ministry of Public Health in Order nr.916/2006 [5]. Another classification was made according to the risk septic starting from Altemeier classification [6] of the types of surgical procedures, classification which allowed the calculation of the infectious risk index, facilitating the establishment of antibiotic therapy [7].

Risk factors for postoperative infections in abdominal surgery:

- *urgent solving*. Surgeries performed urgently are recognized as a risk factor associated with surgical wound infection because patients cannot be properly prepared.

- *the relatively long duration of the period of hospitalization* can result in preoperative colonization of the patient with the hospital flora and bacteria resistant to antibiotics.

- *preoperative preparation:* preoperative preparation and exploration, anesthetic and surgical risk assessment, preoperative nutrition, biological rebalancing, sanitizing the natural cavities [8].

- *surgical technique* and compliance with operating time*:* incorrect hemostasis, wound hematoma, poor vascularization of tissues, the degree of aggressiveness of surgical maneuvers upon the intervention.

- *infectious NNIS risk score* [9] was conceived by National Nosocomial Infection Surveillance in the USA, to calculate indices for predicting nosocomial infection risk for the surgical patient [10,11,12].

- *experience and size of the operating team*, an important factor in terms of available staff making up the operating team: surgeons, operating theater assistants.

- *sutures,* ensure the restoration of tissue continuity severed by their qualities: flexibility, strength, easy sterilization, high tolerance to biological materials, low price [13].

- *excessively long duration of surgery*- procedures requiring more than two hours are associated with higher rates of infection [14,15].

- *the type of the used field operators* is important in the quality and quantity of the material they are made of, they serving to provide insulation of the surgical wound and absorption.

- *the presence of drainage tubes*. Preventive dreinage is considered a risk factor ([6] and in colorectal surgery it is not essential [17,18,19]. Meticulous hemostasis, avoiding unnecessary dissection, lead to reduced postoperative hematoma and residual collections [20].

- *not using prophylactic antibiotics.* Infection is a constant risk in general surgery and pathogenic bacteria are found after surgical wound closure in 90% of them [21].

- *immediate postoperative care of the patient* falls to ICU ward staff, continuing to the general surgery ward until his discharge.

- *age* is generally a risk factor for postoperative complications but it is not associated with surgical wound infections [22].

- *smoking* exposes the deep vein thrombosis, which may increase the postoperative recovery period.

- *obesity* is specific risk factor for parietal infectious complications [23,24].

- *malnutrition* is a risk factor due to mechanisms of reducing the defense, alteration of vital functions, thus predisposing to delayed healing. In case of emergency interventions, corrections will be made postoperatively [21].
- *the presence of untreated infectious foci* (neighborhood or remote) can disseminate hematogenically or by transfer leading to increased rates of wound infection in surgical sites from 3 to 5 times [25].

- *colonization by microorganisms.* If there is an endogenous source, the risk of infection of the surgical wound may increase 10 times [26,27].

- *the severity of the patient's underlying disease.* In a prospective study, the severity of the underlying disease (assessed as fatal, ultimately fatal or non-fatal) had a predictive value for developed infections: infection rate in patients with fatal disease was 23, 6% compared to 2.1% for non-fatal disease patients [28].

- *patient's general conditio.* (anaemia, hypoproteinemia, diabetes, cancer, cirrhosis). It has been shown that 10% to 30% of patients with cirrhosis undergoing abdominal surgery developed postoperative bacterial infections [29,30]. Patients affected by cancer, regardless of chemotherapy or radiation therapy have deficits in immunity proportional to the extension and severity of the disease [31,32].

- *significant immunosuppression.* In patients with Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome and those who use the long-term corticosteroid therapy, may be a risk factor associated with the patient.

- *prolonged antibiotic therapy* causes significant colonization with antibiotic-resistant bacteria, such as Methicillin Resistant Staphylococcus aureus and surgical wound contamination and infection raise special problems for the medical team.

- *contraceptive medication* containing estrogen-progestin combinations should be replaced with nonhormonal preparations at least 30 days prior to major surgery to decrease the risk of deep vein thrombosis or pulmonary embolism [33].

- *preoperative hospitalization and surgery* are stressful to the surgical patient who feels the intervention like an aggression, perceived consciously or unconsciously, building thus his own defense mechanisms.

- *the socioeconomic status* is difficult to assess because it is frequently analyzed in combination with other risk factors that contribute independently.

Surgical site infection causes local and general signs depending on the nature and aggressiveness of nucleation and on the reactivity of the body. Most serious complication for surgical wound infection are sepsis, toxic shock, septic metastases, increasing the risk of death of the patient.

Positive diagnosis is put on historical data, clinical signs and laboratory data.

The antimicrobial treatment is done initially under a presumptive diagnosis until the antibiogram allows the selection of the antibiotic, and if the patient does not respond within 24-72 hours of therapy, the antibiotic should be changed [34].

Given the major implications that they produce, poor data on the actual incidence, increasing of the resistance of the germs involved in their appearance, surgical infections are an important public health problem. Measures to prevent infections associated to healthcare are becoming a higher and higher concern for the authorities in the field, the increase in the quality of medical services is the desire of the management team whose activity is monitored by also considering the indicator called the "rate of nosocomial infections".

PERSONAL CONTRIBUTION

The study carried out for a period of three years is retrospective, includes patients who have undergone abdominal surgery, of which was selected the group that had postoperative surgical wound infections. We designed a worksheet that contains 40 parameters that form was completed for each patient and based on which we then compiled database.

Inclusion criteria:

- age
- presence of associated diseases (ASA risk assessment);
- presence of untreated infectious foci (nearby or remote);
- extended period of preoperative hospitalization;
- Increased duration of surgery;
- contaminated surgery type (classification Altemeier);
- presence of drain tubes, prostheses and sutures;
- not using prophylactic antibiotic / prolonged antibiotics;
- surgery patient with postoperative fever;
- operative wound with signs of inflammation;
- operative dehiscence wound;
- purulent discharge from the wound;
- infections within 30 days of surgery.

Data collection

Data sources consisted of the ward database DRG *(Diagnosis Related Groups)*, patient observation sheets, register of surgery protocol and the register of declaration of nosocomial infections, selecting the cases that have met the criteria for inclusion. The following were analysed, following the surgical patient care process (admission, preoperative preparation, surgical intervention, postoperative follow-up):

- distribution by sex and age groups;
- area of origin of the patients;
- duration of hospitalization before surgery;
- related disorders;
- preoperative preparation;

- type of surgery;
- duration of surgery;
- surgery number (same patient);
- used technique and suture materials, drainage;
- Antibiotic prophylaxis used;
- initiated drug therapy;
- postoperative care (dressing performance frequency);
- the number of cases diagnosed as abdominal surgical infections;
- actual incidence of these infections using CDC criteria for the definition of / HELICS /MS;
- kinds of germs involved;
- profile of the patient who developed infection;
- degreeof the bacteriological investigation of surgical infection and applied antibiotics.

The diagnosis of infection of the surgical wound respected the classification of the *Centers for Disease Control* Atlanta, USA and the provisions of Order MSP nr.916/2006.

Statistical processing was performed using Microsoft Excel 2010 and SPSS software *(Statistical Package for the Social Sciences)* v.20. The brute descriptive statistical parameters were calculated for all variables where this approach was considered potentially useful, the mean value, standard deviation, median, module, minimum and maximum number for continuous numeric variables and frequency for the category ones. Comparisons among the sets of data were made using *t Student* for data pairs. The ANOVA test was used to test significant differences between various media. Correlations were expressed by r Pearson correlation coefficient.

Results were presented following sequence of care activities that take place during a patient's hospitalization in general surgery ward, from the time and type of admission, clinical and paraclinical examination, practiced preoperative preparation, surgery, postoperative follow until discharge.

RESULTS

During the studied period, in the General Surgery I Ward a number of 2445 patients underwent surgery. The lot selected according to the inclusion criteria established diagnosed with infection of abdominal site surgical wound was composed of 75 patients, representing 3.06% of the operated patients.

Of the patients studied, the highest percentage was the urgent inmates (72%), the remainder being admitted under a referral issued by a GP / specialist or by transfer from other sections after a sure diagnosis .

Age of patients in the group showed 55.88 ± 19.27 years average, the minimum age is 10 years, maximum 92 years. The most affected age group was 51-70 years (40% of cases) due to flaws associated *(figure no.1).* Both ANOVA and *Student t* test showed that age, according to the sex of patients, is insignificant in the occuring of infections of the abdominal surgical wound (p = 0.052).

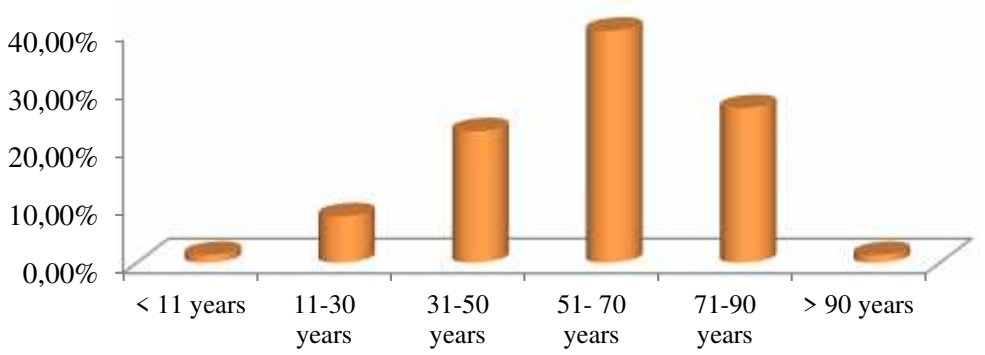

Figure no.1 Distribution of patients by age

Patients in the study come from both the rural and the urban, hospital rank allowing service provision of emergency medical care in the territory ascribed and increasing addressability. Men accounted for 56% of the study group (61.90% from urban and rural areas 38.09%), and women 44% (60.60% in urban and 39.39% in rural areas).

The sex of patients is generally associated in the surgical literature to surgical wound infections, but some studies say that men are more likely to present colonization with multiresistant bacteria [35]. In this study, male patients who experienced abdominal surgical wound infections were the majority, but methicillin-resistant Staphylococcus aureus was isolated more for women.

The hospitalization period of patients who received operative wound because of complications was 19.09 ± 11.23 days standard deviation, a higher average and maximum number recorded for women (58 days). The correlation between patient age and the number of days of hospitalization was significant, r = 0.274. Given that the

average length of stay is an indicator of quality management department and that the optimal duration of stay for general surgery is set to 7 days it finds its negative influence on the business of management.

Preoperative hospitalization averaged 2.14 ± 2.98 days standard deviation, the trend being to shorten the time in the section *(figure no.2)* to prevent the colonization of patients with hospital germs but also because medical maneuvers performed for diagnostic and therapeutic in this period favors contamination.

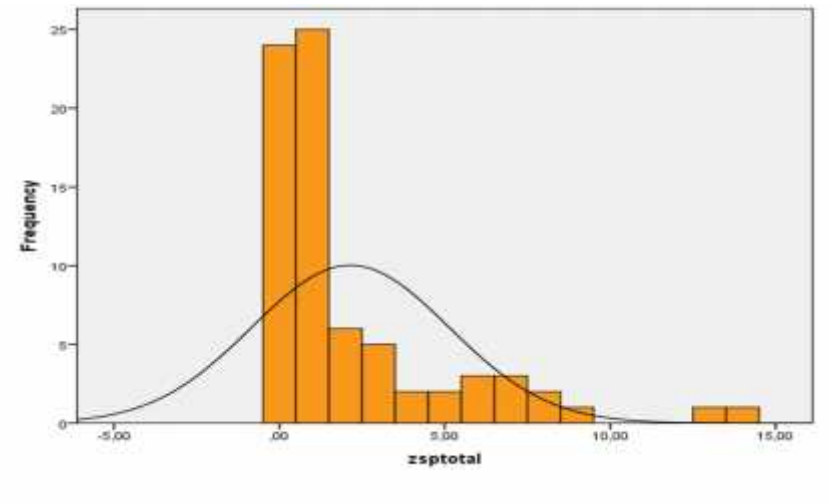

Figure no.2 Histogram of preoperative variable number of hospital days

The correlation between patient age men during their preoperative hospitalization was significant (r = 0.294), time required to compensate for associated diseases. Correlation with infectious NNIS risk score for the whole group studied was also significant (r = 0.271), demonstrating that we try to reduce this period by applying standardized preoperative preparation.

Preoperative preparation procedure started with providing mental preparation, the hygienic care, monitoring of vital functions, providing a preoperative diet. Patients were prepared by performing preoperative clinical examination, laboratory and the preanesthetic, specifying background on surgery, types of anesthesia previously incurred, and the drug treatment followed until admission.

Anesthetic risk ASA was established in the pre-anesthetic examination, predominantly score anesthetic III and IV. Among the comorbidities listed as risk factors obesity showed high percentages (10.66%), metastases (6.66%), diabetes (5.33%) anemia (4%). Correlation between ASA score and age in males was highly significant (r = 0.637), as well as the correlation with the number of days of hospitalization (r = 0.477), indicating that the associated pathology had major influence on surgical wound infections in elderly patients, increasing the number of days of hospitalization and costs. A strong positive correlation was also found in female patients, ASA score was correlated with older age (r = 0.608) and the number of days of hospitalization (r = 0.453).

Gastric and intestinal surgery was the majority, followed by pancreatic, liver, biliary tract and gallbladder surgery *(figure no.3)*, this group subsequently allowing standard classification assigned during surgery. In some cases two interventions were performed concomitantly (ex.chistectomie - cholecystectomy, appendectomy, ovariectomy). Wound complication was recorded in high percentages for acute appendicitis and tumors.

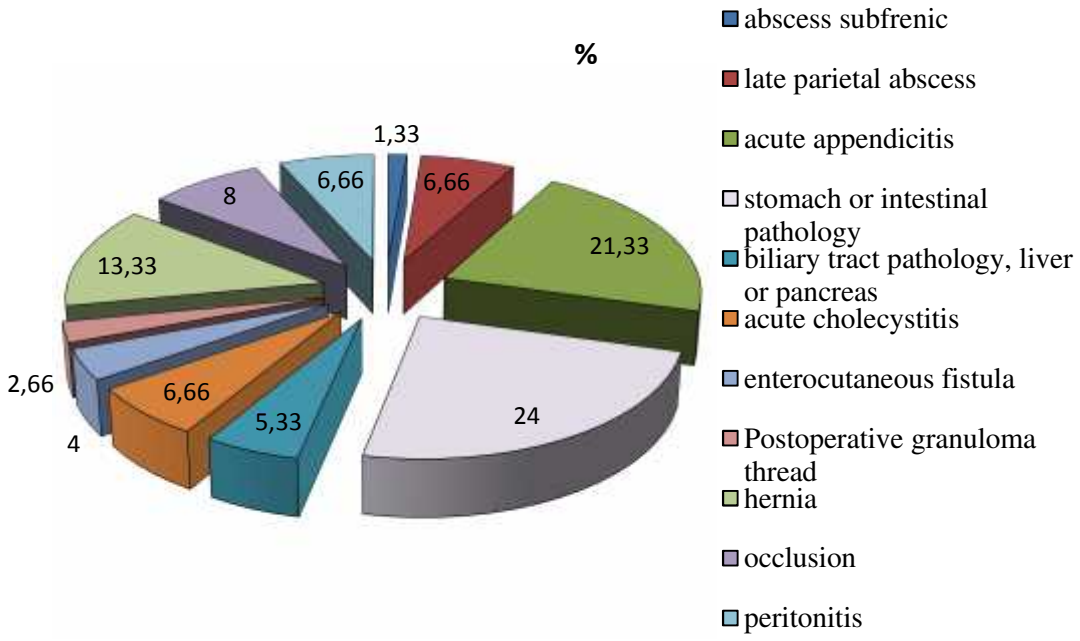

Figure no. 3 Distribution of cases according to principal diagnosis

Infections that occurred in appendectomy wounds represented a major proportion *(table no.1)*.

Table no.1 Type of interventions made

Intervention performed	**%**
Granuloma ablation	6,66
Abdominal rectum amputation	1,33
Appendectomy	21,33
Cholecystectomy	8
Cystectomy (hydatid liver)	1,33
Colectomy-enterectomie	12
Cure hernia	12
Colostome dissolution	4
Abscess drain	14,66
Exploratory laparotomy	4
Rectal sigmoidectomy	9,33
Greater omentum resection, ties	5,33

Postoperative drainage is considered a major risk factor in the occurrence of surgical wound infection, is a matter still debated by professionals, the limiting of the clean drainage interventions being associated with a favorable postoperative evolution [36]. Some authors consider that in colorectal surgery abdominal drainage is unnecessary, favoring retrograde bacterial colonization [37,38]. In the present study were used within 3 drainage tubes, according to the surgical intervention.

"T point" Duration is standard deployment time of surgery. Increased duration of over 120 minutes, handling of tissues, the type of hemostasis, removal of devitalized tissue, increase the potential risk of occurrenceof hypothermia and bacterial multiplication. Point T in this study showed an average of 78.20 minutes with a standard deviation of 43.39 minutes, a minimum of 20 minutes and a maximum of 210 minutes. Moving to the left of the Gaussian curve indicates the tendency to reduce operative time (*figure no.4).* The importance of this variable is given by the fact that, in addition to the direct impact on surgical maneuvers, exceeding the value of time for the type of intervention increases the NNIS infectious risk.

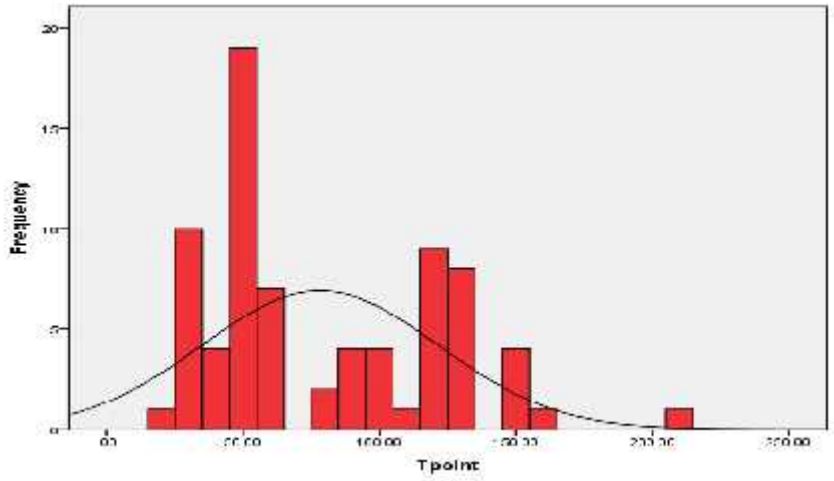

Figure no.4 Histogram of the variable duration surgery - T point

The composition of the operator team is relevant to the time of the intervention. The number of team members significantly influences its deployment because a sufficient number of surgeons, organized in a homogeneous, experienced team guarantees a good timing of intervention and a proper surgical technique. The highest percentage of surgery was performed by teams of two surgeons (60%), complemented by assistants (29.33%) in the operating block, the correlation of this factor with time allocated to the intervention being weakly significant, r = 0.194.

The classification (Altemeier) of the types of surgery was done after the completion of the surgery, with particular importance in the calculation of the infectious surgical risk. Surgeries that prevailed in the selected study group patients were those clean-contaminated (35%) and those dirty and infected (36%) *(figure no.5).*

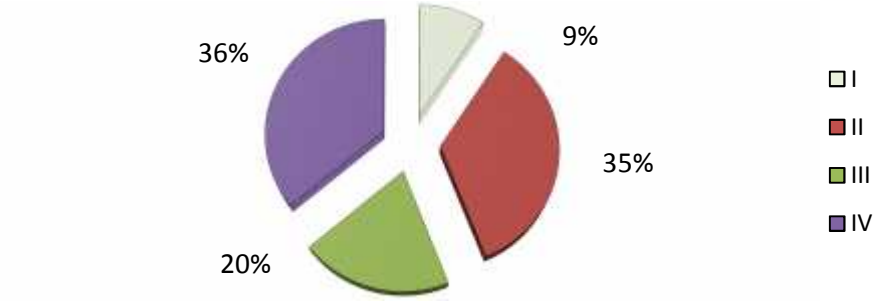

Figure no.5 Graphical representation of surgery classification (%)

For the women patients studied the interventions which prevailed were those clean-contaminated and for men, infected. The correlation between the type of surgery and the number of drain tubes is significant, r = 0.344, which demonstrates their usefulness for the drainage of abdominal secretions. The correlation between "T point" and the type of surgery (r = 0.348) is significant), stronger for male patients (r = 0.469), demonstrating that septic, complicated interventions require a prolonged time and an appropriate surgical technique.

According to the classification recommended by Order MSP nr.916/2006 infections detected were classified into superficial surgical wound infection (29.33%) and deep surgical wound infection (70.66%).

Reported to the number of patients discharged from the surgery ward in the studied period there were 0.24% IPC after cholecystectomy and 0.81% after colon surgery. Appendectomies have owned a majority (21.33%), followed by evacuation and drainage of purulent collections (14.66%), colectomies (12%). In the study group, 13% were infected wounds following surgery to repair abdominal wall defects (hernias and incisional hernias) responsible being Staphylococcus aureus (4%).

The pathology of tumor was 22.66% of the studied cases, the infection with Escherichia coli being predominant in these patients (29.41%), particularly in males (23.52%).

Infectious NNIS risk score was established for each patient depending on the duration of surgery, anesthetic risk score classification ASA and type of surgery. It is noted that the percentage of patients presented NNIS score 2 *(figure no. 6).*

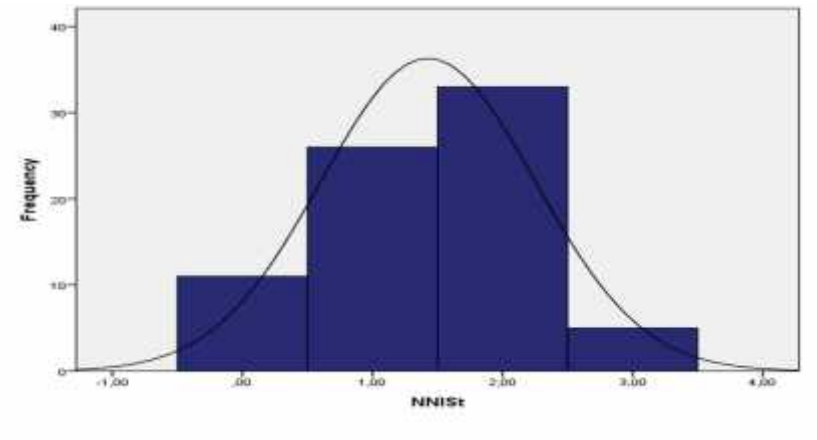

Figure no.6 NNIS score variable histogram

NNIS correlation with the members of the operating team was significant for the whole group studied (r = 0.288). It was highly significant the correlation of the infectious risk score with the number of drain tubes (r = 0.422), more evident in male patients (r = 0.529), where the infected interventions prevailed. The correlation with the age of the patients was significant (r = 0.264), stronger for women this time, due to flaws associated (r = 0.353). Another significant correlation was with the duration of hospitalization, stronger in women (r = 0.529) than in men (r = 0.325), demonstrating that due to the type of intervention, the associated comorbidities and wound complications, women were hospitalized for a longer time.

Postoperative caring of the patients started immediately after surgery, postoperative follow-up measures aimed at patients: early mobilization, fighting pain, vomiting and intestinal paresis, antithrombotic prophylaxis, monitoring of vital functions, antimicrobial therapy, surgical wound care. The presence of the drainage tube lead to the appearance of local signs, in these cases drained secretion significantly increased the number and frequency of dressing carried out. Wound dehiscence was reported in 2.66% of cases.

Elements of diagnosis of surgical wound infection were constituted by local signs together with clinical signs *(figure no.7).*

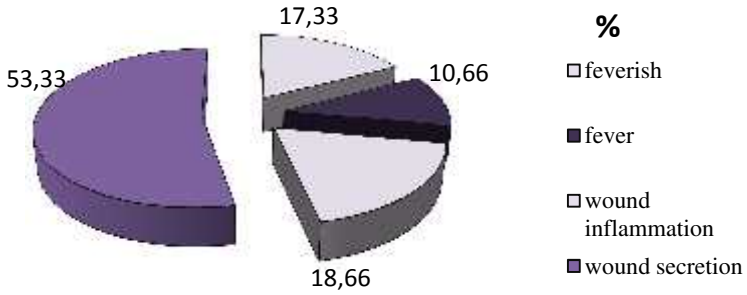

Figure no.7 Presence of the elements of patients diagnoses in the study group

Bacteriological examination of collected secretions (pus, peritoneal fluid) was performed for the diagnosis of infection in 68% of cases. In most patients the initial harvest was made intraoperatively (44%) constituting a prediction of subsequent wound infection. It was repeated 7 days in 4% of the cases. Most infections were caused by Escherichia coli (21.33%), followed by those caused by coagulase-positive staphylococci (12%), the coagulase-negative (6.66%), 8% were methicillin-resistant. 10.66% have been implicated in combinations of two or more bacterial strains *(figure no.8).*

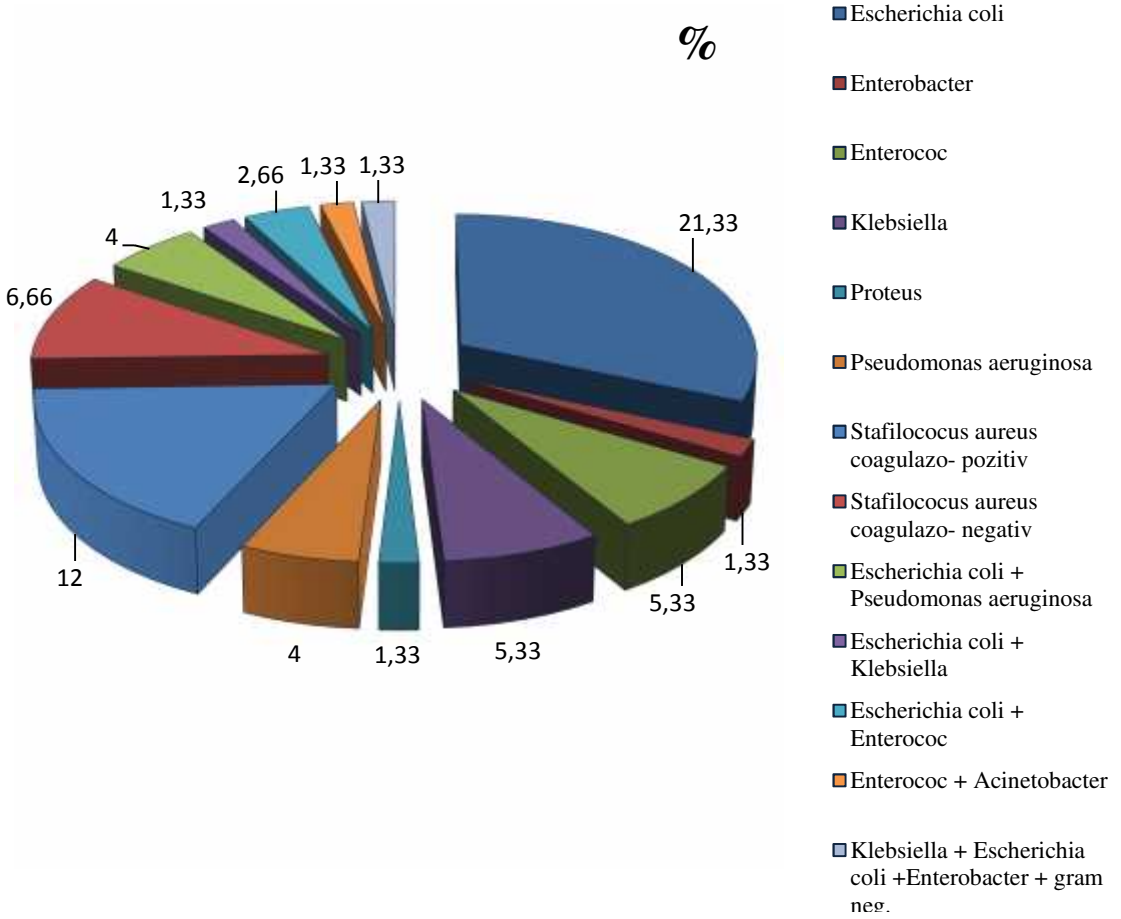

Figure no.8 Distribution of microbial strains isolated from surgical wound secretion (male-female)

Antibiotic therapy was instituted as prophylaxis or therapy in the presence of signs of inflammation / infection, being kept until the arrival of the antibiotic. Cephalosporins of generation III *(figure no. 9)* were used in most cases and anti-inflammatory and analgesic medication. The average number of days of antibiotic treatment was 8.86 ± 6.72 days, maximum of days occurring in a patient with hemorrhagic rectal occlusion who presented postoperative stercoral fistula and gram negative infection. The correlation between the number of days of antibiotic and NNIS score was significant (r = 0.237), stronger in women (r = 0.571). Antibiotic therapy was initiated preoperatively, as evidenced by the strong correlation with the preoperative period (r = 0.479) and duration of hospitalization (r = 0.460). Significant is the correlation period of antibiotic treatment - type of surgery (r = 0.256) and the correlation period of antibiotic treatment - number of drain tubes (r = 0.261). The

correlation with the actual time of surgery is highly significant (r = 0.357) as is the one with the anesthetic risk (r = 0.376).

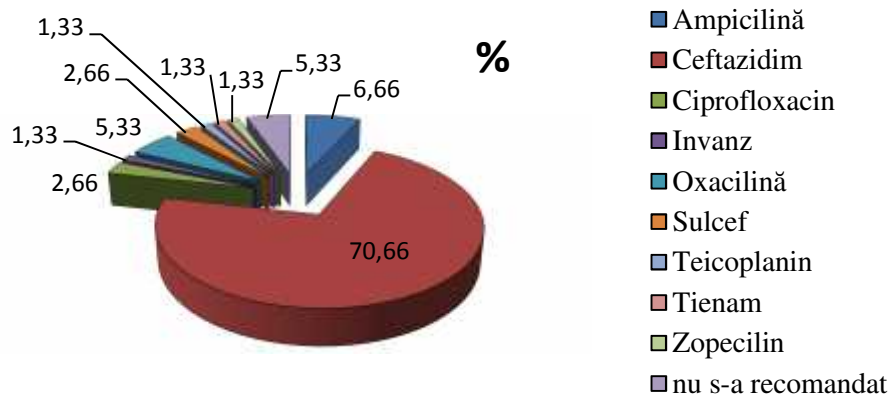

Figure no.9 Distribution of antibiotics administered

Local treatment of wound targeted use antiseptic solutions commonly used in surgical service, the classic dressing (made sterile gauze pads), new types of dressings recommended (silver ions, polyurethane) being hard accessible financially despite the practical advantages: easy inspection of the wound, postoperatory shower performed by the patient, maintaining an optimal environment of temperature and humidity at the wound, reducing the number of dressings required if purulent wounds.

The stay in ICU section averaged 1.49 ± 0.98 days, with a higher average for women. The correlation hospital ICU - age was not significant, however with the anesthetic risk is highly significant for the study group (r = 0.398), with a strong significance in men (r = 0.519).

General surgical ward hospitalization averaged 16.70 ± 9.99 days for the entire group studied, with a maximum of 52 days in males and 45 days in women, the correlation with age is significant (r = 0.245).

The declared nosocomial infections had a percentage of 9.33% of cases - compared to the number of surgical wound infections in the study, the percentage of women is higher than men. Microbiological diagnosis revealed the presence of methicillin-resistant Staphylococcus in the secretions of abdominal surgical wound.

Among patients who developed abdominal operative wound infection, 25, 33% were readmitted within 30 days of discharge requiring surgical reintervention, which demonstrates the association of this complication with care in the health system.

The cost of solving such a surgical case could not be determined, the only reference is the average calculated per day of hospitalization, thus increasing costs in proportion to the increasing number of days of hospitalization of the patient. On the other hand, in general surgery it was noted the practice of discharging patients very soon after surgery, before complete wound healing [39], and the orientation of the patients to ambulatory surgery in order to reduce costs. After discharge, the patient was treated in the ambulatory network, losing touch with the hospital doctor.

CONCLUSIONS

- The true incidence of abdominal surgical wound infections in General Surgery Ward I in the Galaţi County Emergency Hospital was 3.06% for the period studied, cataloged as superficial infections 29.33% and 70.66% as deep infections.

- Gastric and intestinal surgery was predominant favouring thus infectious complications due to contamination with aerobic and anaerobic bacteria, followed by pancreatic, liver, biliary tract and gallbladder surgery.

- Wound strains isolated were the operators of 21.33% Escherichia coli, coagulase-positive Staphylococcus aureus 12%, coagulase-negative Staphylococcus aureus 6.66%, enterococci and Klebsiella equal percentage 5.33%. As particularity, strains of methicillin-resistant Staphylococcus aureus have been isolated from wound secretions collected from women.

- Reported to the study group, there were 9.33% reported nosocomial infections, the percentage of women is higher than men, but in this context a majority of methicillin-resistant Staphylococcus aureus belonged to male patients (5.33%).

- Emergency surgery (surgery practiced in the first 24 hours of admission) was required in 32% of cases, being a risk factor due to limitations in preoperative preparation procedures and insufficient compensation of associated pathology.

- The age group most affected was the 51-70 years, the average age being affected more in women than men, the correlation with the duration of stay is significant.

- Extending hospitalization exerted a negative influence on costs.

- The duration of preoperative hospitalization and the hospitalization in the ICU section, through invasive medical maneuvers involved, was an important risk factor, the correlation with patient age and infection risk score was significant.

- Associated pathology (scale ASA physical status III and IV) for both sexes are strongly correlated significantly with age, resulting in increased number of days of hospitalization.

- The time needed to perform the surgery did not exceed the standard time, its variations affecting only infectious NNIS risk score calculation.

- Number of members of the operating team, consistent and experienced, was not really a risk factor.

- Classification of surgery, important to calculate the risk of infections, framed the identified surgical wound infections as belonging to the clean-contaminated surgery and infected surgery.

- Significant correlation between standard time "T point" and the type of surgery has shown that interventions with septic time require laborious surgical techniques and sometimes extended time.

- Infectious risk score correlated strongly with the number of drain tubes used in septic interventions.

- Antibiotic prophylaxis performed targeted Cephalosporins of generation III, contrary to recommendations made by guidelines for antibiotic prophylaxis for gastrointestinal surgery, digestive surgery, favoring the selection of multiresistant bacteria.

- 25.33% were readmitted from the studied cases, requiring surgical reintervention, which demonstrates the association of surgical infections with healthcare.

- Quality indicators of the management of the department have changed through the growth of the period of hospitalization for patients who had surgical wound infections, nosocomial infections reported by treating physicians, readmissions within 30 days of discharge for the same type of care.

- It is desirable the involvement and active cooperation of the microbiology laboratory for epidemiological purposes to identify potential problems and to assess the quality of care in hospital
- The introduction of a monitoring program for patients discharged from the department of surgery is necessary to identify healthcare-associated infections.

- The echo on the economic indicators and the quality of the department notifies the need to adopt procedural standards so as to guide management of the surgical patient to prevent / identify / treat correctly abdominal surgical wound infections.

PROPHYLAXIS OF SURGICAL WOUND INFECTIONS

Surgical wound infections are unwanted complications in surgery, so it is a delicate subject that deals with the responsibility of the surgeon and his team, making it necessary to adopt and respect in each hospital some measures to prevent postoperative infectious complications:

- accommodation in rooms with minimal patient beds, equipped with clean hospital effects, wards equipped with bathroom and shower;
- shortening of the preoperative hospitalization to a maximum of 48 hours;

- standardized preoperative preparation in both elective surgery and in the emergency surgery;

  - perform appropriate clinical and laboratory investigations;

  - identify existing infections and correct any associated flaws;

  - proper antibiotic prophylaxis, adapted to the type of surgery, with therapeutic levels maintained throughout the intervention, according to practice guidelines in force;

- noting the indication and duration of antibiotic prophylaxis in the observation sheet;
- limiting the use of broad-spectrum antimicrobials, rigorous documentation in the patient records of the reasons for their use;
- proper preparation of the digestive tract according to the proposed intervention;
- preparation of the operative field by trimming hairiness with scissors / clippers immediately before the intervention;
- performing preoperative shower with antimicrobial soap;
- protection of the place of future surgical incisions with sterile dressing;
- improvement in patients' records on anesthetic risk;
- infectious risk calculation for each surgical patient;
- modification of the infectious NNIS risk index for laparoscopic surgery;
- routine medical records of all data related to surgery (technique practiced, interventions classification, duration, surgical team members, reinterventions)

➢ following of standards of behavior and practice related to the operating theater:

- decontaminating air and surfaces;
- professional installation of air purification and sterilization in the OR;
- proper sterilization of instruments;
- proper surgical practice of hand washing and skin disinfection;
- use of completely sterile equipment in the operating room;
- avoid shortcomings of aseptic technique;
- correct choice of surgical technique limiting excessive dissection;
- limited use of ligatures and sutures, use of appropriate and good quality suture material and prosthesis;
- avoidance of excessive drainage and choice of the restricted suction, rigorous control of hemostasis, meticulous skin closure;
- limiting the number of members of the operating team, reducing traffic in the operating room, keeping doors of the operating room closed;

➢ shortened stay in the ICU ward and invasive maneuvers performed in perfectly aseptic conditions;

➢ adequate oxygen postoperatively;

- monitoring the condition of the surgical wound, drainage tubes and dressings;
- monitoring the number of dressings made, the policy development in the dressing room (aseptic / septic), patient record in special record registers;
- using the modern types of dressing for infected surgical wound care (nanocrystalline coating of silver, polyurethane film, polyacrylate fibers activated in Ringer solution, calcium alginate fibers;
- records of wards where patients are accommodated/ transferred;
- microbiological evaluation of surgical wound secretion;
- SPCIN notification in case of multidrug-resistant microorganisms infection;
- effective antibiotic and supportive treatment, avoidance of unnecessary prolongation of antibiotic prophylaxis, early move from parenteral to oral administration;
- compliance with universal precautions designed to reduce the risk of transmission of microorganisms by direct or indirect contact;
- continuing education of the care team about the concept of infection control;
- protection of the care team by conducting medical examinations and vaccinations;
- development of prevention and control strategies to prevent the emergence and spread of antimicrobial-resistant microorganisms;
- development of clear protocols of patient follow-up after discharge;
- designing of a plan to identify, transfer, discharge and readmission of patients with antibiotic-resistant microorganisms;
- patient and carers education program related to postoperative rehabilitation.

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