The Optimal Application of Robotic-surgical complexes (systems) in Abdominal Surgery: the logics and methodology of research

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Abstract

The article deals with determining the zones where it would be reasonable to use robotic-surgical systems (complexes) in conducting abdominal operations. It is not only the economic interests of a clinic, but the safety and the health of a patient that are regarded as criteria for optimality, as well as convenience and fatigability level of medical personnel. The article offers the logics and methodology for such a survey, which would consist of three blocks. At the start, on the basis of the experience of operations performed by the authors, the system of verifiable current hypotheses is structured. The second block deals with the content analysis (CA) of the publications relating to the description of respective medical cases, which partially allows to confirm the previously suggested hypothesis. The final stage will involve a survey in the form of a questionnaire of leading surgeons. The results of two first stages of work are presented in this article.

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**Introduction**

It is most typical for medicine and the healthcare system today to use up-to-date high-technology methods which involve the use of robotic surgery systems (complexes) (RSS). On the one hand, robot-assisted operations (RAO) are a method with a greater degree of precision, it is mini-invasive (low traumatic) as compared to open operations and even laparoscopic ones. It means greater safety for patients, and the lowered degree of risk and severity of further complications. This results, as a rule, in a shorter time spent in a clinic after the surgery. For surgeons the work with robotic surgery systems broadens their possibilities and even improves work convenience. All the above rational is essential for conducting complicated surgery, specifically, abdominal operations (abdominal cavity surgery).

There is, however, another side to. High-tech equipment is fairly costly (approximately 3 million dollars). Naturally, the costs for expendables and personnel training are unavoidable. For that matter the share of abdominal operations in the world with the use of robotic systems makes up only 30% of the total number [the Report of Intuitive Surgical Company for 2012].

The existing conflict of interests of patients, doctors and clinics means that there is a zone for preferred (as compared to laparoscopic and open operations) application of robotic surgical systems (complexes) in abdominal surgery. When selecting such a zone, the interests of patients regarding safety and severity of postoperative period should be taken into account, as well as the financial interests of patients, clinics and, if there are government programs for the use of advanced technology in medicine, the interests of the state.

The goal of the current survey is to create a system of rules for taking decisions regarding the use of RSS in abdominal surgery depending on the specifics of a patient, his/her diagnosis and concurrent (associated) diseases. The following objectives are set forth, specifically, to :

- identify the major reasons for selecting different techniques in conducting surgery on abdominal organs and [retroperitoneal space](http://www.multitran.ru/c/m.exe?t=2605330_1_2&s1=%E7%E0%E1%F0%FE%F8%E8%ED%ED%EE%E5%20%EF%F0%EE%F1%F2%F0%E0%ED%F1%F2%E2%EE);

- compare results of application of open (hand-guided) technology versus laparoscopic (LA) and robot-assisted technology in abdominal operations;

- assess clinical and economic effectiveness of operations with the use of various techniques, and also the probability of complications and seriousness thereof following each of them;

- create a system of rules of the rational selection of robotic surgical complexes in conducting abdominal operations.

In creating such a system of rules the disease of a patient (the diagnosis) will be taken into account, as well as localization of the tumor, the scope of operative treatment zone, requirements set to the precision of the operation and the specifics of the patient him/herself (body type and associated diseases). Apart from that, the interests of the clinic, organizational potential available to it and the interests of the doctors will be considered as influencing factors.

The goal of this article is to describe the logic and methodology of the current survey.

**Sources of information and the logic of study**

As it often happens in practical research, the logic thereof is largely determined by the pros and cons of the available sources of information.

А. Eponymous operations

Over the past several years (since 2009) in A.V.Vyshnevsky Institute of Surgery of the Ministry of Healthcare of the Russian Federation a considerable number of abdominal operations has been performed (open-type – 2,500, laparoscopic (LS) – 500, and robot-assisted (RA) – 140). Judging by the publications which are analyzed below, the number of robot-assisted operations is most considerable in the world.

The benefit of eponymous operations as a source of information is the profound knowledge of all medical cases. This allows to assess each patient and each operation performed, and also the progress and consequences thereof. At first sight, medical cases available for study allow to determine the reasons for the choice of the specific operative intervention (open-type, laparoscopic or robot-assisted), and later make certain generalizations in the form of rules.

The sampling made up exclusively on the basis of eponymous operations, however, is fraught with serious drawbacks too, specifically:

- *potential subjectivity of assessments* relating to customs and stereotypes formed with the doctors’ team, the specifics of their experience, knowledge, skills and know-how of the surgeons, specifics of scientific school, etc.;

- a limited, and as a rule, an *insufficient number of medical cases to be mathematically strict proof, which are classified either by each type of surgery performed (open-type, LS, RA), or by kind of operative zones (*liver, pancreas, etc*).*

Given the above, one could arrive at the following conclusion. Eponymous operations are an important source of information that can be used to *form major hypotheses* relating to the optimal zone for the use of robotic surgery systems (complexes) in abdominal surgery. Such hypotheses, however, should be tried and tested by the experience of other surgeons, clinics and schools of science.

В. Articles of surgeons from different countries published in leading medical journals and dealing with the use of robotic surgical systems in abdominal operations.

As a rule, the main goal of publications dealing with operatic invasion is to describe a medical case in every detail, including the progress thereof, problems which arose during the surgery, and ways to resolve them. Sometimes, medical cases similar in certain parameters are generalized.

This survey analyzes twenty three publications in the world leading surgical journals. They include: Archives of Surgery, Yonsei Medical Journal, Journal of the Society of Laparoendoscopic Surgeons, Journal of Laparoendoscopic & Advanced Surgical Techniques, HPB: The Official Journal of the International Hepato Pancreato Biliary Association, Journal of Hepato-Biliary-Pancreatic Sciences, Journal of Gastrointestinal Surgery, Journal: Rozhl Chir, Chirurgia (Bucur), Records of the 25th Congress of Endosurgeons of Russia, Journal of Surgical Research, Transplant International, European Review for Medical and Pharmacological Sciences, Surgical Laparoscopy Endoscopy & Percutaneous Techniques, International Journal of Surgery, Journal of the Society of Laparoendoscopic Surgeons, and The International Journal of Medical Robotics and Computer Assisted Surgery [3-17, 19-26].

Though the number of articles taken for the analysis is, at first sight, not too large, they make up the greater part of all the existing publications relating to the issue in question[[1]](#endnote-1). It is accounted for by a relatively recent appearance of robots in surgery. The growth in the number of publications from year to year may be also a very good illustration to that. The sampling includes just four publications dealing with RAO which were published between 2003 and 2009. There were two publications in 2010, while in 2011 and 2012 the respective number was already five. The first half of 2013 saw already six articles on the issue.

The above thesis on the novelty in using robotic surgery systems and the rapidly increasing application thereof could be also confirmed by the information about the number of clinical cases used as a basis for publications coming out in different years. For instance, between 2003 and 2008, the articles were mostly based on the study of the medical records of just one patient. The publication of 2009 covers already 8 medical cases. Later on, against the background of the growing number of articles, they were based (average figures by the year) on 5, 29, 14 and 16 clinical events in 2010, 2011, 2012 and 2013 respectively.

As noted above, due to objective reasons, the number of publications analyzed is not too large. It should be taken into account, however, that all of them belong to several authors the number of which varies from 3 to 8. Thus, the survey takes into account the opinion of less than 130 specialists of high and topmost qualification. Moreover, the articles are based on a different number of clinical cases fluctuating between 1 and 70. On the whole, the survey analyzes over 340 clinical cases. From our standpoint, this gives the conclusions received on the basis of the analysis of such publications evidentiary force.

Since robotic surgery systems are highly technological and, therefore, fairly expensive, they are primarily used in the developed countries. Seven publications out of those analyzed, for instance, were created in the surgical centers of the USA (University of Illinois at Chicago; Endocrinology and Metabolism Institute, Cleveland Clinic, Cleveland; University of Pittsburgh Medical Center, Pittsburgh; University of Pittsburgh Medical Center; Tulane University School of Medicine, New Orleans). Six publications were written by the experts of the leading European countries, specifically: Italy, France, Belgium and Switzerland (Hospital San Matteo degli Infermi, Spoleto, Italy; Umbria San Matteo degli Infermi Hospital, Spoleto, Italy; Montsouris Institute, Paris, France; Hôpital de Hautepierre, Hopitaux Universitaires de Strasbourg, Strasbourg, France; University Hospital of Geneva, Geneva, Switzerland; University of Bern, Bern, Switzerland; Ghent University Hospital and Medical School, Belgium).

The application of robotic surgery systems, however, is gradually increasing in other countries too. The use of this advanced equipment in China (four publications in the leading medical journals of the world) and South Korea (Yonsei University College of Medicine, Seoul, Korea; Pamela Youde Nethersole Eastern Hospital, Hong Kong SAR, China; Second Artillery General Hospital, Beijing, China) is quite noteworthy. Former socialist countries also start using robotic surgical systems: in the Czech Republic (Chirurgicá klinika, Praha), Romania (Fundeni Clinical Institute, Bucharest), and also in Russia (Regional Clinical Hospital, Khanty-Mansiisk). It should be noted that the articles of the authors from the above countries, which could be termed conventionally as “developing” countries, have started being published in the leading world medical journals only in the past two or three years.

The study of the publications in the leading medical journals showed that the definition of the optimal application zones for each of surgical techniques has not yet been as an aime for a survey. Therefore, the articles do not necessarily provide those characteristics of medical cases which are needed for testing the hypotheses developed on the basis of eponymous materials. Apart from that, a considerable part of information provided is of a descriptive, that is, qualitative nature.

The choice of specific medical equipment and devices in a specific case may be influenced by numerous objective and subjective reasons. Depending on the financial status of a patient and his/her medical insurance policy either a cheaper, or a more expensive type of surgery may be selected. The degree of knowledge of the new technology and the ability to skillfully use thereof by the surgeons may also impact such choice.

Anyway, a considerable number of medical cases described and the possibility to generalize the opinion of many specialists who represent different countries, schools of science and clinics, make publications an important source of information to test the hypotheses regarding the optimal application zone of the robotic surgical systems (complexes) in abdominal surgery.

Certain inaccuracies in the analysis of the articles may be accounted for the following:

* Subjective approach of each author in describing medical cases;
* Subjective perception of the researcher when analyzing certain fragments of articles and an inexact interpretation thereof;
* Incomplete correspondence of the description of medical cases to the system of hypotheses checked;
* Absence in most articles of comparisons between robot-assisted and other types of operations.

Due to such inaccuracies, the test of suggested hypotheses regarding the optimal application zones for robotic surgical systems in performing abdominal operations cannot be considered final.

С. Expert opinions of the leading surgeons on the issue under consideration

Supposedly, the leading surgeons of the world who use various technologies in performing abdominal operations, including robotic surgery systems, have all the necessary knowledge for the comprehensive expert evaluation of the issue under consideration.

Nonetheless, the preliminary analysis of our own information and publications of other authors is also necessary. The result of such an analysis allows to ask experts certain specific questions. By adequacy we mean the following: firstly, the questions should be fully covering all the aspects of the issue described; secondly, they should unequivocally either confirm or, vice versa, disprove the hypotheses set forth before.

Under the conditions of territorial estrangement of experts and their engagement in medical activity, not analytical studies, a preferred form to get expert assessment is a questionnaire, with the use of the so-called “yes-no” (“closed”) questions with the offered limited options for answers. For such questions to be developed preliminary research is also needed. The above rationale shows the necessity of all the previous stages of research (the analysis of eponymous operations and a huge number of articles devoted to the operations performed by other surgeons.)

The benefit of using questionnaires as a method to gather information is a possibility to generalize the opinions of the leading specialists and get an expert opinion exactly on the issue of interest and its specific aspects. In the event of partially “opening” (offering a multiple choice) the questions (that is, including “other” as an option for an answer into the list of responses), the list of hypotheses may be expanded.

The questionnaire, just as any other method of gathering information, is not free from deficiencies. We believe that the pros of the method include:

- the novelty of the method when applied to the analysis of medical issues and also turning for the opinion of the leading surgeons of the world as experts, which could be difficult for respondents and therefore decrease the number of responses and the adequacy thereof;

- impossibility within the framework of a survey to test new ideas which emerged as the result of responses to the questions set in the questionnaire.

The results of the questionnaire may be a serious foundation for forming conclusions relating to the validity of the suggested hypotheses and also for planning new research on optimal zones of application of robot assisted operations in abdominal surgery.

**Methodology and the first results of the survey**

А. The results of the analysis of RA operations performed in A.V.Vyshnevsky Institute of Surgery

The analysis of the RA operations expertise accumulated in A.V.Vyshnevsky Institute of Surgery made it possible to formulate the following hypotheses.

Hypothesis 1. When a decision on the use of robotic surgical system in performing abdominal operations is taken, the specifics of a patient, the diagnosis and pending operation should be taken into account.

Hypothesis 2. The major advantages of robot assisted operations impacting such a decision are a low injury level (mini-invasiveness) and high level of precision, which result in bringing down the probability and severity of complications during the intra-operative and post operative periods.

Hypothesis 3. The most important conditions for the preferred use of robotic surgical systems in performing abdominal operations are relatively small neoplasms and localization of pathology in hard-to-reach zones.

Hypothesis 4. Apart from purely medical conditions, the optimal application zone for robot assisted surgery is determined by technological, financial and economic, as well as organizational aspects.

В. Analysis of medical articles dealing with the application of various techniques in conducting abdominal surgery

Content analysis (CA) developed by the American scholars H.Lasswell and B.Berelson [1, 2] was used as a method for studying publications that deal with robotic assisted surgery experience in abdominal surgery. The principal characteristic features thereof are listed below:

- a clearly defined system of goals, which as a rule, does not concur with the goals of the authors of materials analyzed;

- predominant use of qualitative, specifically, textual information in the analysis, not quantitative data;

- possibility in conducting a survey to unify the works of different authors, their opinions and expertise, and as regards medical research – clinical cases.

Given such specifics, it seems necessary to attract the maximal number of sources (and/or volume of materials) to exclude inaccuracies in the assessments of experts making such assessments, not only the inaccuracies committed by the authors of the publications.

In order to conduct CA, it is necessary, first and foremost, to identify the blocks of information which are particularly significant (the so called “system of categories”) and which should be analyzed in each publication. In relation to this particular survey, and proceeding from the formed system of hypothesis, such categories include the specific features of the patient, his/her diagnosis, specifics of operations performed and post-operative period.

Further on “units for analysis” are defined: that is, specific elements of information or such characteristics thereof that will be studied and evaluated (both in quantitative and qualitative terms). Examples of such units of analysis regarding the category “specific features of a patient” are his/her age, body-build and gender. Insofar, the first unit may be evaluated in quantitative terms, the second one – either in qualitative, or in quantitative terms (for instance, through the introduction of a “body mass index” indicator), while the third one may be evaluated in qualitative terms.

Further use of qualitative characteristics in computations leads to the necessity to encode thereof. Each option is attached a serial number which is not analyzed as a quantitative value, but serves for referring a specific situation to a certain class (for instance, 1 stands for a man, 2 – for a woman.)

As noted above, the publications analyzed have, as a rule, their own goals which do not concur with those of the researcher. Therefore, the units of analysis taken for evaluation may appear in the text in a rather voluntary, most often vague form. In this connection, certain rules which allow to decide whether to take a certain fragment of a text into account or not. Text interpretation should be also developed in advance. It is necessary, for instance, to develop gradation for the severity of complications emerging in the course of operation and in the post-operative period (light, medium, serious), and a list of potential wordings which would allow to refer a specific medical event to one of the above.

For the necessary characteristics to be reliably fixed, the content of the publications should allow to unequivocally describe the system of rules (the so-called, “formalization principle”.) Moreover, it is required that the content elements to be analyzed should be appearing with sufficient frequency (“the statistic relevance principle”).

By the time this article was written, CA was had been applied to publications dealing with liver surgery. Proceeding from the system of the above hypothesis, the categories and units of analysis would include the following:

1. Requisites of a publication (name of the journal, name of the article, year and number of issue, pages, full name of the author (co-authors), country of the clinic’s location, name of the clinic) – a support category.
2. Quantitative characteristics of the number of medical cases on which the article is based (general number of observations, and the number of observations grouped in conformity with the patient’s diagnosis).
3. Specific features of a patient:

- age;

- gender;

- body build (asthenic, normosthenic, hypersthenic).

4. Characteristics of diseases

- diagnosis (hepatocellular cancer (GCC), cholangiocellular cancer (CCC), metastases, haemangeoma, focal nodular hyperplasia, cystic tumors, [nonparasitic hepatic cyst](http://www.multitran.ru/c/m.exe?t=2597218_1_2&s1=%ED%E5%EF%E0%F0%E0%E7%E8%F2%E0%F0%ED%E0%FF%20%EA%E8%F1%F2%E0%20%EF%E5%F7%E5%ED%E8)s, echinococcus, adenoma, other);

- associated diseases (cardiovascular diseases, respiratory system pathology, kidney pathology, cirrhosis, hepathises, other);

- previously undergone surgery;

- localization (зposterior segments (VII-VII) of the liver, anterior segments of the liver);

- the size of the excised tumor (considerably smaller than 10 cm in the maximal component, about 10 cm, considerably larger than 10 cm).

1. Characteristics of the operation

- kind of an operation (resection of the posterior liver segments, resection of anterior liver segments, anatomic liver resection);

- the necessity of a simultaneous surgery (оan operation on several abdominal organs);

- duration of operation (in minutes);

- duration of docking (placement of trocars and devices and connecting to robotic surgical system) (in minutes);

- duration of use of the robotic surgical system (in minutes);

- extent of blood loss (1 – at least 100 ml; 2 - between 100 and 500 ml; 3 – between 500 and 800 ml; 4 - between 800 and 1,200 ml; 5 - over 1200 ml);

- extent of operative injury (1 - minimal; 2 - average; 3 - maximal);

- conversion (the necessity to switch from laparoscopic or robotic surgery to a standard “open” operation);

- the length of laparotomic access (the maximal length of incision necessary to perform an operation/ removal of macro medication) (см);

- intraoperative complications;

- number of intraoperative complications;

- names for intraoperative complications.

1. Characteristics of post-operative period

- the extent of the pain syndrome during the post-operative period (minimal, average, maximal);

- presence of post-operative complications;

- number of post-operative complications;

- name of postoperative complications (hemorrhage, hematoma, bile leakage, biloma, fluid accumulations, pleurisy, pneumonia, abscess, anastomotic leak, liver decompensation, other).

- severity of postoperative complications (minimal, average, maximal);

-necessity of a recurrent operation to manage the complications

7. Characteristics of the patient’s stay in a clinic

- duration of stay in a clinic during the postoperative period (bed-days);

- disability acquired after the surgery performed.

For further analysis the so-called “code matrix” is developed where all identified characteristics are placed along one axis, and along the other – all analyzed sources. Each cell has the evaluations of the respective characteristic which are offered in a certain publication. Thus, the encoding matrix is a data base formed on the basis of the publications.

The final assessment in performing quantitative or “frequency” content analysis may be received in the form of a unit weight (ratio) of a certain category. For the purpose, the number of units which fix the particular category taken for the analysis is divided by the total number of analyzed units. The number of patients, for instance, who acquired intraoperative complications, shall be divided by the total number of patients.

The analysis received with the application of CA information made it possible to arrive at fairly profound conclusions. Since such conclusions are primarily of medical interest, just one example may illustrate the idea. The authors analyzed the influence of experience in performing operations on anatomic liver resection with the application of robotic surgery systems on the duration of such operations. A graph was drawn illustrating the dependence of an average duration of such operations as compared to the total number of all types of operations which are covered in the publication (see Figure 1). On the axis of abscissas the number of clinical cases which make up the basis of the publication are marked, on the axis of ordinates – the average duration of the operation (with the account of the number of patients in each sub-group).

Figure 1. The dependence of duration of operation on anatomic liver resection on the total number of all kinds of operations with the use of robotic surgical systems.

A conclusion may be drawn that with the increasing expertise in using robotic surgical systems, the variance in the duration of operations is going down, and in relation to operations on anatomic liver resection, the duration of operations fluctuates within the range of 200 and 320 minutes. With the training process underway, the duration of an operation is drawing near 200 minutes. For the sake of comparison, the average duration of an operation with the use of LO reaches 220 minutes (within the range of 161 and 362), while with open intervention the respective figure is 204 (in the range of 128 and 366). [18]. Hence, surgeons who are experienced in performing robot assisted operations will achieve a decrease in the duration of the operation.

Content analysis of publications allowed us to justify part of the suggested hypotheses. It was determined that in conducting surgery on liver it is reasonable to use robotic surgical systems in the following cases:

- in the event of older age patients;

- in the event of neglected cases with relatively small neoplasms;

- in the event of localization of pathology in hard-to-reach areas (VII and VIII segments of liver).

Moreover, it was demonstrated that the use of robotic surgical systems in operations on liver leads to the following consequences:

- decrease in the volume of blood loss in the cause of operation;

- minimal size of the operative trauma;

- minimal extent of the pain syndrome in post-operative period;

- decreased stay in the clinic after the surgery;

- lower probability of lethal cases and disability.

Further on, it is planned to conduct a similar survey for other kinds of abdominal operations (on pancreas and lien.) This will allow to draw conclusions on abdominal operations as a whole.

Unfortunately, the absolute majority of publications do not contain information about the body type of patients, their associated diseases, previous operations, time of docking, etc. Hypotheses on the influence thereof and the nature of such interdependencies may be tested only along with other methods, primarily the expert survey.

С. The survey of the leading surgeons performing abdominal operations

Since the issue of the optimal zone selection in using the robotic surgery systems in abdominal operations was sufficiently well studied at the preliminary stage, the authors selected questionnaires as a method to receive expert information. After the preparatory process is completed, letters requesting to respond to the questions on the list will be sent out to the leading surgeons of the world.

The main blocks of the questionnaire, the purpose thereof, and the method to process results will be described below.

1. **“Personal information” (the so called passport) (**full name of a surgeon, gender, age, position, country, clinic, e-mail address and telephone number).

The questions included into the “passport” are used to achieve the following goals:

1. Description of the sampling (gender composition, list of countries, etc.);
2. Proof that characteristics of the sampling are identical to those of the general aggregate (of all operating surgeons);
3. “Segmentation” of responses to subsequent questions, in other words, testing whether men and women provide the same responses to the questions, whether there is any dependence on age, etc.
4. **Qualification of the respondent**

The qualification of the respondent is evaluated on the basis of his/her working record as a surgeon, the number of abdominal operations performed (with the breakdown by open-type, LS, and robot-assisted), the number of other kinds of robot-assisted surgery (thoracal, cardiologic, gynecological and urological), and also the number of operations performed as a console surgeon.

The definition for the qualification of a respondent is necessary for the implementation of the following goals:

1. - description of a sampling in relation to the qualification of the respondents;
2. - evaluation of the qualification of each respondent;
3. - identification of the impact of the respondent’s qualification and the nature thereof on his/her assessments.

**2. Evaluation of the potential to use robot-assisted surgery and other types of operations**

It is necessary to assess the opinion of the respondents regarding the necessity to use robotic-surgical systems in abdominal surgery on the whole and in each kind of operation in particular, as well as consider the existing exceptions. Apart from that, it is suggested that opinions be studied on whether there will be a gradual transfer from LS operations to robot-assisted ones.

This block is designed to

1. - determine responses for each question;
2. - evaluate the optimistic perception index of robot-assisted operations perception;
3. - determine the dependence of responses on individual characteristics of the respondent (primarily, qualification).

**3. Advantages and disadvantages of robot-assisted operations as compared to other types of operations**:

1) Intra-operative criteria, including an average duration of an operation, average volume of blood loss, extent of an operative trauma, safety of a patient in the course of surgical intervention, other criteria which, in the respondent’s opinion, should be taken into account;

2) Postoperative criteria (intensity of the pain syndrome during the postoperative period, probability of postoperative complications and the severity thereof, probability of a recurrent operation to manage complications and ease the severity thereof, the average duration of the stay in a clinic after the operation, other postoperative criteria which should be taken into account;

3) Criteria for the medical personnel (degree of comfort for the operating surgeon, his/her fatigability in the course of operation, degree of comfort for all other members of the surgical team and their fatigability, requirements that the console surgeon should be experienced in laparoscopic surgery, as well as the other members of the surgical team, other);

4) Criteria for the clinic (the average self-costs of the operation, the maximal term for the use of the equipment, the maximal possible number of operations for the same team during the day, other).

The objectives of this block are listed below:

- testing the conclusions received previously regarding the benefits and deficiencies of robot-assisted operations and getting new ideas on the issue;

- tuning in the respondents to further more complicated questions.

**4. Determining the recommended devices and equipment for various types of abdominal operations**

The authors propose a list of kinds of operative interventions in performing liver surgery. In relation to each of such kind of interventions a respondent is offered to assess which devices and equipment he/she would prefer to use.

The goal of this block is to determine kinds of operative interventions for which a certain operative technique is preferable. This results in determining

1. -the zones for which most respondents determined the only possible type technology (robot-assisted, laparoscopic or open).
2. – the “mixed zones” with uncertain choice of technique and/or degree of categorical certainty of assessments (responses);
3. – the “indefinite zone” corresponding to the response:“any type of surgery” (depending on circumstances)” received from most of the respondents.

Moreover, this block leads the respondents still the more to two subsequent questions which are the most important and complicated ones for this survey.

**5. Depending on which factors the application of robotic-surgery systems is preferable?**

The respondent is offered to mark all the correct options, from his/her viewpoint, including

- diagnosis;

- localization of pathological process in a hard-to-reach zone;

- the extent of a paraplazm;

- the area for operative intervention and manipulations;

- strict requirements to the precision of surgical actions;

- the body-build of the patient;

- the age of the patient;

- the existence of associated diseases;

- the necessity of high quality visualization of the operative zone;

- other factors.

The assessments received allow to identify the most important factors determining the preferred use of robotic surgery systems in performing abdominal operations.

**6. The nature of the factors identified and the impact thereof on the preferred use of robot-assisted operations (RAO)**

The respondents are offered to assess the nature of factors listed in block 5 and the degree of impact thereof on the choice of RAO.

The responses to the questions of this block allow to determine the degree of each factor on the choice of RAO. For the purpose it is necessary to

1. - identify marginal assessment values for each factor, and also to determine its average value (with the account of the respondents’ qualification and without the account thereof) and the dispersion;
2. - range the factors by the degree of impact thereof.

As a result, it will be possible to arrive at conclusions regarding relatively optimal zones for robotic-surgery systems in performing abdominal operations from the medical standpoint.

**7. The degree of impact of technological, organizational, financial, economic, and other aspects hindering the application of robotic-surgery systems**

This block will provide assessment of various problems in the course of decision-making regarding the use of robotic surgical systems in performing abdominal operations, including:

1. Technological difficulties (lack of feedback in robot-assisted manipulations, small area of surgical interventions, absence of EndoWrist technology (EndoWrist is a working part of a device which repeats the motion of the human hand) in ultrasonic scissors, etc);
2. Financial and economic difficulties (highly expensive technical service, the cost of instruments and expendables, etc.);
3. Organizational difficulties (absence of specially assigned operating theatre, absence of the sufficient set of instruments and devices for multi-shift work, absence in the clinic of a uniform doctrine for mini-invasive interventions determining medical necessity for robot-assisted operations, etc.)

This block is necessary to assess the degree of impact of all other (non-medical) factors whose impact was not analyzed in the course of study of the publications on the basis of CA.

The information obtained will be processed in a way similar to that used for the previous block.

Currently, the electronic version of this questionnaire is being finalized and it will be placed in the Internet.

Conclusions

Though the work on the above research project has not yet been completed, the first results were presented at the XX Congress of Association of Surgeons-Hepatoligists of the CIS countries, and evoked a considerable interest in the medical community. However, from the authors’ standpoint, it is not just purely medical conclusions that are of significance. A possibility to use such unusual methods for medicine as content analysis of articles and expert assessments of leading specialist is most promising. Moreover, getting together within the framework of one research team experts from principally different areas of knowledge, in this particular case surgeons and systems analysts, has a huge potential.

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1. The articles of the medical collective working in the A.V. Vyshnevsky Institute of Surgery were hot taken into account in the content analysis, which allowed to avoid the influence thereof on the results received. [↑](#endnote-ref-1)