



## Concept, Definition and Classification of the Intra-abdominal Hypertension in Pregnancy

D.V.Marshalov <sup>1</sup>, I.A.Salov <sup>1</sup>, E.M.Shifman <sup>1</sup>, A.P.Petrenko <sup>1</sup>, A.Ioscovich <sup>1\*</sup>

### Article History:

Received 8 December 2013  
Accepted 7 January 2014  
Revised 25 December 2013  
Available online 7 January 2014

### Keywords:

Classification  
Concept  
Definition  
Intra-abdominal Hypertension  
Pregnancy

### Corresponding Author:

Alexander Ioscovich, V.I.  
Razumovsky Saratov State Medical  
University, Department of  
Obstetrics and Gynecology of  
Medical Faculty, Saratov, Russia.  
Email: aioscovich@gmail.com

### Abstract

The problem of formulating the concept and definition of the essence of intra-abdominal hypertension (IAH) is one of the important in the study of this condition. The accumulation of a large number of scientific facts that characterize the current stage of development of medicine requires a more careful attention to the methodological aspects in theoretical and practical issues.

Conceptual system – is an important part of scientific research. The meaning and definition of the scientific study is difficult to overestimate, it is in them aspects of reality are reflected in the abstract summary form. Such important categories as logical judgment, reasoning, cannot be determined without definition, the laws of logic and logical methods of scientific research: the definition, the proof of the axioms, assumptions, there can be a causal connection between the phenomena cannot be applied. The basic attention is given to methodological aspects of a problem of an intraabdominal hypertension at pregnancy in this article. The informal-logic analysis of the conceptual device, available classifications of an intraabdominal hypertension is carried out; own definition and classification are offered.

1 - V.I. Razumovsky Saratov State Medical University, Department of Obstetrics and Gynecology of Medical Faculty, Saratov, Russia.

## Introduction:

The problem of formulating the concept and definition of the essence of intra-abdominal hypertension (IAH) is one of the important in the study of this condition. The accumulation of a large number of scientific facts that characterize the current stage of development of medicine requires a more careful attention to the methodological aspects in theoretical and practical issues.

Conceptual system – is an important part of scientific research. The meaning and definition of the scientific study is difficult to overestimate, it is in them aspects of reality are reflected in the abstract summary form. Such important categories as logical judgment, reasoning, cannot be determined without definition, the laws of logic and logical methods of scientific research: the definition, the proof of the axioms, assumptions, there can be a causal connection between the phenomena cannot be applied. Cannot be understanding between researchers.

E.K. Voishvillo and M.G. Degtyarev so formulate a definition in that way: «We summarize some of the classes In terms of things, i.e. sets qualitatively similar in some respects items. Generalizations are achieved by allocating it to the total, which is typical for this class of objects» (1).

Consistently «high» level of intra-abdominal pressure (IAP) is summarizing indication for abdominal hypertension. It should be noted that the definition of literature IAH have some differences that can cause the uncorrect conception of clinicians enough about the process under study.

According to the decision of the International Conference of Experts on Intra-abdominal Hypertension and Abdominal Compartment Syndrome, IAH is persistent or recurrent abnormal increase recorded by IAP greater than 12 mm Hg (2). The key word in this definition: «pathological», there by conclusion that IAH – a pathological condition is generating. Perhaps this conclusion is based on the analysis of normal and pathological variables IAP. Since the normal level of IAP is from 0 to 5 mm Hg, IAP values greater these values are pathological (3). Then definition looks illogical: «In adult patients in critical

condition level IAH 5-7 mm Hg considered the norm» (4). Is it norm of pathology?

The medical literature is quite common to come across mention of intra-abdominal hypertension in pregnancy, but it described by IAH in pregnancy as a phenomenon, seen as a given, and, it has a priori character. Is there a pregnancy IAH corresponding to this concept? When does it occurs? How to evaluate it?

There were stating publications describing a fact of having high IAP during pregnancy in recent times, and these studies are limited only by the third trimester and the postpartum period. The authors note that the level of IAP in uncomplicated pregnancy reaches 15-22 mm Hg (5,6,7), in a contractions – 25 mm Hg (5), and after a surgical delivery – 16 mm Hg, which exceeds the value of IAP in patients general surgical population (6,8,9).

In the dictionary of medical terms under the Hypertension (Hypertension) is given such definition «high blood pressure, i.e. excess of arterial blood pressure above normal blood pressure are observed in the members of this age group». In this definition, the main feature of hypertension is the excess pressure above normal pressure.

«Hypertension (hypertensio; hyper + lat. Tensio – voltage, syn. Hypertension) – is the increased hydrostatic pressure in the blood vessels, hollow organs or body cavities» this definition was given by large medical dictionary (2000). The main determining factor for hypertension in this definition is – high pressure, which can be considered as a variant of normal.

On the other hand, the arterial, pulmonary, portal, intracranial hypertensions are considered as a pathological states. With all of these conditions are diagnosed some degree polysystemic dysfunction on the basis of one of the pathogenetic factors – high pressure. All of them are registered in the International Classification of Diseases (ICD).

So, the «high» IAP (more than 12 mm Hg) during pregnancy is the norm, or it is an intra-abdominal hypertension? Or a IAH should be called physiological?

In addressing the problem of intra-abdominal hypertension, researchers are

constantly operate three terms – IAP, IAH, syndrome intra-abdominal hypertension (SIAH). However, some authors identify these concepts using them alternately (2). Thus, V.A. Gurianov et al. in their work write: «...morbid obesity and pregnancy are a chronic form of intra-abdominal hypertension syndrome» (10).

According to the rule explicitly defining the scope defines the concept should be equal to the amount determined by the concept. The main part of the notion of intra-abdominal hypertension syndrome – is a syndrome. Syndrome - is consistently observed a set of symptoms (signs), united by a common pathogenesis. Which kind of complex symptoms IAH can be identified by normal pregnancy?

In our opinion, the increase in IAP during pregnancy without showing clinical symptoms and resulting organ (system) dysfunctions can be regarded as a physiological IAH. The closest analogy is the concept – a physiological blood loss, especially for obstetrics specific concept. If IAH a pregnant starts to cause any systemic violations, similar to blood loss, IAH should be considered pathological.

After the formulation of the concept of pathological IAH, the next step is its definition (creating definition). This term denotes a logical method that has to disclose the content of the concept and the result of the application of this technique, also this word means approval, revealing the essence of any object, and an indication of minor party items, including those that are not sufficient to distinguish it from all other objects, and are called so incomplete definitions. Usually they are used when the power is insufficient study subjects. Apparently, we have faced exactly this situation in this paper.

Moreover, it is useful to recall the definition such as «diagnosis - is a brief conclusion about the disease, its nature, complications and outcomes, physician formulated on the basis of his observations, the patient's complaints, the results of objective research methods and expressed in terms of the stipulated accepted classification and nomenclature of disease» before finding a place IAH in the structure of the diagnosis

(11). That way, IAH can be complication or outcome of the disease, but it cannot be disease entities (entity of the disease).

So, in one case due to pathological IAH, for example, obesity, severe adhesions in the abdominal cavity, multiple pregnancy, or a combination of these factors can lead to the development of aorto-caval syndrome, functional intestinal, placental insufficiency, for pre-eclampsia and will carry the primary character. In other case, the abnormal IAH may occur secondarily due to inadequate therapy, capillary leak in severe pre-eclampsia and sepsis.

Thus, pathological IAH during pregnancy – is a complication which is defined as «the pathological process, which is, first, the adverse deviation from the typical («uncomplicated») under physiological flow of pregnancy related pathogenic and morphological features of the latter, and secondly, adverse effect of medical or surgical treatment of complications of pregnancy «or as» another defeat (disease) caused by a complication that is complication complications».

The exact level of IAP, which is characterized as IAH is still a matter of debate. Earlier in the literature dominated interval was 15-18 mm Hg (2), with some works were describing the negative impact of the IAP already at a level of less than 8 mm Hg (12). Currently, according to the recommendations of the World Society of the Abdominal Compartment Syndrome (WSACS) is the level of IAH – 12 mm Hg. Art (2). It should be noted that the reduced level is the average value of the index affects the development of organ dysfunction that results from a multicenter study of patients requiring intensive care.

Focusing only on the numerical values of IAP, some researchers have come to ambiguous conclusions. Thus, E.E. Frezza et al. in his article «Morbid obesity causes chronic increase of intraabdominal pressure» make a conclusion about the absence of IAH in patients with morbid obesity, the level of IAP does not reach the value of 12 mm Hg (13).

However, in earlier studies it was observed that the level of IAP 7,5 mm Hg already leads

to the manifestation of organ failure and requires initiation of therapy (12).

Level differences as a criterion and the severity of IAH are shown in table 1.

The logical conclusion is that to allocate only numbers of IAP as the only parameter that characterizes the IAH is wrong.

It is obvious that the increase in IAP above the normal range, even without any clinical symptoms, will eventually lead to organ and system dysfunction. However, the greater importance is the swiftness of the increase of IAP (14).

Usually pathological processes are considered as acute and chronic in traditional medicine (states are described as a lightning-fast, sub-acute, protracted, and so on, are comparative and descriptive occupies an intermediate position among the major). When analyzing the characteristics of the IAH presented during pregnancy, it can be conclusion that this is, of course, a chronic, protracted process that is clearly reflected in the well-known classification (Table 2).

We draw attention to the fact that the current classification of IAH defines pregnancy as a factor in the development of chronic forms of IAH, along with conditions such as obesity and ascites, thus associating with the pathology of pregnancy, resulting in the IAH as a complication. Is it entitled?

It should be noted that the division of chronic IAH in severity in this classification is not provided. This is explained by fact that is patient over time to adapt at chronic form of IAH comparing to the rapid increase in IAP.

The question is: to what level IAP does adaptation which is not manifested organ dysfunction clinic, remain with prolonged increase? Which criterions of compensate of chronic IAH? When we should talk about the urgent IAH against the background of chronic, as decompensation of chronic IAH?

The literature presents a large number of similar examples: myocardial infarction, as a manifestation of acute heart failure with coronary heart disease, which is a chronic form of heart failure, chronic form of acute liver failure is a rapid decline in the functions of liver and other organs that develops over several weeks after exposure to aggravating

factors (indirect: bleeding from varicose veins, sepsis, etc., direct: drug- induced hepatotoxicity) in a patient with previously compensated chronic liver failure, or terminal liver failure, which occurs in chronic decompensated patients due to progressive irreversible deterioration in the background of chronic liver disease, acute renal failure in the chronic form, caused by i diffuse sclerosing glomerulonephritis, asthma status in bronchial asthma, acute fetal distress at chronic intrauterine hypoxia, etc.

The next question is how to classify on the basis of the existing IAH severity (Table 1) to determine the severity of acute IAH, which may be the cause of acute surgical pathology, on the background of IAH at pregnancy? These questions currently have no answers. We have already touched on the essence of the issue in the definition of the syndrome of intra-abdominal hypertension, which can also be considered from the standpoint of the dialectical relationship of form and content categories. Under the content we understand a set of existing elements and processes under the form – the internal structure of the content, the laws of the relationship between elements.

Currently, IAH definition of the syndrome looks like: «This is a resistant increase in IAP greater than 20 mm Hg (with APP (abdominal perfusion pressure) < 60 mm Hg, or without it), which is associated with the manifestation of organ failure / dysfunction» (2).

From the analysis of this definition, it follows that the form – is a syndrome of intra-abdominal hypertension and the content, in the context of pregnancy – is an abnormal abdominal hypertension, manifested organ failure / dysfunction.

In this definition SIAP also presents another category of content – «APP <60 mm Hg or without it», which can be seen as a cause, effect or condition.

Based on the fact that this indicator reflects the adequacy of visceral blood flow, apparently, perfusion-metabolic imbalance should be considered as the most competent concept in determining the probable basis (cause) of the polysystemic dysfunction, including the whole of pathological changes.

However, the reason is not implementing its decisive role without conditions that are a combination of factors and circumstances that are required for the occurrence of a particular investigation. In our case – the SIAH development. These conditions should be considered as the overall reactivity, determined by a combination of age, comorbidity and the degree of genetically determined to respond to the possibility of stressors. These provisions in the pathogenesis SIAH still virtually ignored, although they largely determine its specificity.

It is well known that during pregnancy all of the woman's body systems undergo a functional reorganization, representing an adaptive and a protective process, that is in violation of adaptation can take such a nature that it stops to be a protective and takes on the character of the pathological process that begins to threaten the patient's life and can cause its death.

Thus, based on the laws of formal and dialectical logic, and on basic tenets of the theory of determinism, we consider it is appropriate definition of the syndrome of an abdominal hypertension:

Abdominal hypertension syndrome – is a complication that occurs when intra-abdominal hypertension in conditions of varying resistance of the organism with the development of perfusion-metabolic imbalance and showing by various degrees of dysfunction of organs and tissues.

Of course, we should say that we do not claim on the full and final definition of the syndrome of intra-abdominal hypertension, it may has disadvantages and can be considered as an intermediate or school.

In the development SIAH of obstetric patients profile of the role played by the following contributing factors:

**Factors contributing to the reduction of stretch the abdominal wall:**

- 1) Directly related to pregnancy and labor:
  - painful tension of abdominal wall (contractions , inadequate analgesia in the postoperative period);
  - edema ( pre-eclampsia / eclampsia );
  - convulsive readiness / convulsions ( pre-eclampsia / eclampsia ).

2) are not directly related to pregnancy and labor:

- obesity (especially abdominal type);
- availability of post-operative scars on the anterior abdominal wall;
- suturing of the abdominal wall in its high-tension (for surgical interventions in the later stages of pregnancy);
- infiltrates, hematoma of abdominal wall (postoperative wound complications).

**Factors contributing to the increase in abdominal contents:**

1) Directly related to pregnancy and labor:

- polyhydramnios;
- multiple pregnancy;
- macrosomia.

2) are not related to pregnancy and labor:

- hepato-and splenomegaly;
- tumors of the abdominal cavity;
- abdominal aortic aneurysm;
- intestinal ileus.

**Factors contributing to the pathological accumulation of fluid and gas in the abdominal cavity:**

1) Directly related to pregnancy and labor:

- ascites, caused by abnormal pregnancy (ovarian hyperstimulation syndrome , HELLP- syndrome);
- hemoperitoneum (impaired ectopic pregnancy, uterine rupture);
- Delayed gastric emptying and intestinal contents, constipation, flatulence.

2) are not related to pregnancy and labor:

- pancreatitis, peritonitis;
- ascites, caused by decompensation of chronic portal hypertension (cirrhosis of the liver, liver cancer, pancreatic cancer, Budd-Chiari syndrome);
- postoperative intestinal paresis, pneumatosis of the intestine;
- pneumoperitoneum ( after laparoscopic diagnostics and treatment).

Factors contributing to the reduction of stretch the abdominal wall and abnormal fluid accumulation in the abdomen, also attributed the syndrome of "capillary leak ".

**Factors contributing to the development of the syndrome of "capillary leak ":**

1) Directly related to pregnancy and labor:

- ovarian hyperstimulation syndrome;
- pre-eclampsia / eclampsia / HELLP-syndrome;

- Fluid therapy in the amount of more than 150 ml / kg / day in pregnant women with preeclampsia / eclampsia, cumulative positive water balance.

2) are not directly related to pregnancy and labor:

- acidosis;
- coagulopathy (platelets less 50000/mm<sup>3</sup> or activated partial thromboplastin time is 2 times higher than normal, or international normalized ratio greater than 1.5);
- bacteremia;
- sepsis;
- polytransfusion (more than 10 doses of packed red blood cells per day).

The presence of these factors in patients is an indication for permanent monitoring of intra-abdominal pressure (IAP).

Evaluation of the severity of pregnancy SIAH we propose to carry out on the basis of the developed scale by us (table 3).

Main criterias include the level of IAP and the presence of organ dysfunction. The level of IAP is assessed taking into account the gestational age and body mass index pregnant. In the I trimester of abnormal levels of IAP in pregnant women without obesity is an excess of 8 mm Hg, with obesity - 12 mm Hg, in II - 13 and 16 mm Hg, in the III trimester - 21 and 23 mm Hg.

The auxiliary criteria include indicators of tissue perfusion. Regarded as the most appropriate indicator of splanchnic perfusion index of abdominal perfusion pressure (APP = BP mean - IAP), according to our research, is not informative in chronic gestational hypertension and preeclampsia. A study conducted in our clinic showed highly informative assessment of the perfusion of internal organs, including the utero- fetoplacental complex method to control the basal blood flow and transcutaneous oxygen tension in the area of the posterior vaginal side.

Also the dynamic of changes has the meaning for 4 - 6 hours. Progression of violations indicates severe SIAH.

Each of the criteria has a score of. With a score of less than 2 - no SIAH, with the amount of 2 to 3 points - SIAH compensated, with 4 - 5 points - subcompensated, and with more than 5 points - decompensated SIAH. It should be noted that the importance of risk

factors for SIAH different at different stages of pregnancy - at term, it is expressed as.

SIAH in obstetrics is clinically significant, but poorly studied problem. Existing IAH criterias proposed by the World Society for the intra-abdominal compartment syndrome, do not take into account the peculiarities of the physiological changes during pregnancy and are not always applicable in obstetrics. The conventional algorithm of treatment of SIAH can be used in patients obstetric profile, but it has its own characteristics and needs further investigation.

In this article, we also attempt to formal-logical analysis of existing classifications IAH, SIAH and synthesis of new, in view of factors - pregnancy.

Following the analysis presented classifications considered highlights (members of the division) on which they are built, they are: variants of the course (chronic, sub-acute, acute), and staging the degree of violation of functions (in the classification is presented as the degree of IAH: I, II, III, IV) (2).

According to the definition of hypertension («excess pressure above normal pressure observed in the members of this age group»), any excess over the normal IAP should be considered IAH. In case of the absence of clinical signs of organ dysfunction, by analogy with the classification of syndrome disseminated intravascular coagulation (DIC) proposed by the International Society on Thrombosis and Haemostasis (15), IAH should be defined as «overt», with the appearance of the criteria of organ dysfunction - as «non-overt». Although the «non-overt» IAH does not require intensive care, but doctors should aim for vigilance and prevention measures. From our point of view, IAH should be evaluated by the degree of compensation as a single (holistic) of the pathological process: compensation, subcompensation, decompensation. Framework for the diagnosis of these steps can also serve different characteristics within and inter-system save (or absence) of functional connections both in single-level (horizontal) and hierarchical (vertical) distribution. But this issue is so complex that remains under

investigation. The obvious one is the definition of SIAH as the stage decompensated IAH.

According to embodiments of the flow should also identify temporal characteristics of development: rapidly progressive IAH – with the development of organ dysfunction symptoms persist for a few hours, days, and slowly developing – with the development of these same symptoms in a matter of weeks. Thus, given the above, we propose the following classification of intra-abdominal hypertension (Fig. 1).

IAH is divided into two grounds: the current options (define specificity) and the degree of dysfunction.

On the first ground, we offer a two-component model:

- by the presence of organ dysfunction clinic: overt, non-overt. When pregnancy is identical definitions of IAH are: physiological, pathological.

- at the time of development (rapidly progressing, slowly developing).

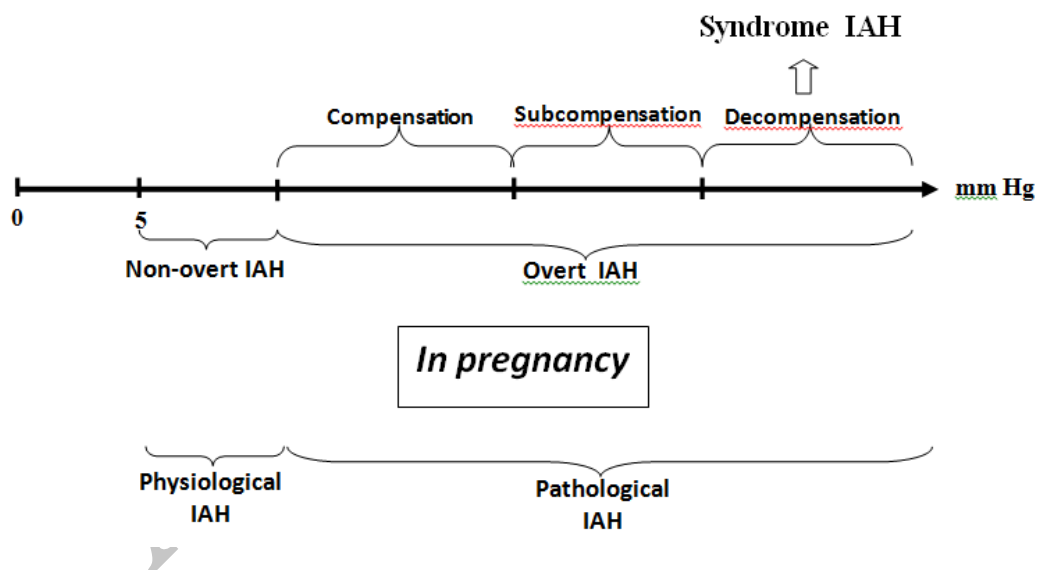
On the second ground, we offer conventional medicine in the traditional division into three degrees of dysfunction: compensation, subcompensation, and decompensation.

Thus, the formal-logical and dialectical study of the conceptual apparatus of intra-abdominal hypertension in pregnancy has allowed him to formulate the concept, definition and a classification.

### Conflicts of interest:

Authors declare that there is no any conflict of interest.

**Figure1.** Classifications IAH



**Table 1.** Classifications of intra-abdominal hypertension (IAH)

Degree IAH	level IAH		
	Burch J.M. et al. (1996)	Sugrue M., Hilman K.M. (1998)	Malbrain L.N.G. et al. (2006)
I degree	7,5-11 mm Hg	10-15 mm Hg	12-15 mm Hg
II degree	11-18 mm Hg	15-25 mm Hg	16-20 mm Hg
III degree	18-25 mm Hg	25-35 mm Hg	21-25 mm Hg
IV degree	>25 mm Hg	>35 mm Hg	>25 mm Hg

**Table 2.** Forms of intra-abdominal hypertension

Form	Develops over	Etiological factor
Chronic	Weeks, months	Pregnancy, obesity, ascites, tumor
Subacute	Days	With a combination of etiologic factors and predisposing conditions
Acute	Hours, days	Trauma, intra-abdominal bleeding, pneumoperitoneum
Hyperacute	Minutes, seconds	When laughing, coughing, physical activity

**Table 3.** Scale SIAH diagnosis in obstetrics

Criteria of SIAH	Scoring of sign
The presence of conditions associated with SIAH	No: 0 points Yes: 2 points
The level of IAP (depending on the duration of pregnancy)	Under physiological norm: 0 points Most of the physiological norm: 1 point
Signs of organ dysfunction: - Hemodynamic disorders - Violations of urinary function of renal - Respiratory disorders	No: 0 points There are: 1 point (estimated for each system separately, the maximum total score of 3)
Indicators of tissue perfusion	Norm: 0 points Decline: 1 point
Dynamics of changes for 4 - 6 h	Progression of disorders: 1 point No change: 0 points

**References:**

1. Vojshvillo E.K., Degtjarev M.G. logic. Moscow: «Vlados-Press»; 2001 (in Russian).
2. Malbrain M.L., Cheatham M.L., Kirkpatrick A., Sugrue M. Results from the International Conference of Experts on Intra-abdominal Hypertension and Abdominal Compartment Syndrome. *Intensive Care Med.* 2006; 32: 1722-32.
3. Balogh Z., Jones F., D'Amours S., Parr M., Sugrue M. Continuous intra-abdominal pressure measurement technique. *Am. J. Surg.* 2004; 188: 679-84.
4. Cheatham M.L., White M.W., Sagraves S.G. Abdominal perfusion pressure: a superior parameter in the assessment of intra-abdominal hypertension. *J. Trauma.* 2000; 49: 621-6.

5. Marshalov D.V., Shifman E.M., Salov I.A., Petrenko A.P. Choice of anesthesia surgical delivery, depending on the severity of intra-abdominal hypertension. In: Mat. XII ses. MNOAR, Moscow, 2012; 27 (in Russian).
6. Al-Khan A., Shah M., Altabban M., Kaul S., Dyer K.Y., Alvarez M. et al. Measurement of Intraabdominal Pressure in Pregnant Women at Term. *J. Reprod. Med.* 2011; 56 (1-2): 53-7.
7. Abdel-Razeq S.S., Campbell K., Funai E.F., Kaplan L.J., Bahtiyar M.O. Normative postpartum intraabdominal pressure: potential implications in the diagnosis of abdominal compartment syndrome. *Am. J. Obstet. Gynecol.* 2010; 203 (2): 149.
8. Marshalov D.V., Shifman E.M., Salov I.A., Petrenko A.P. The dependence of the dynamics of post-surgical intra-abdominal pressure in postpartum women with obesity on the method of anesthesia. In: Mat. XII ses. MNOAR, Moscow, 2012; 23 (in Russian).
9. Sugrue M., Hilman K.M. Intra-abdominal hypertension and intensive care. In: Yearbook of intensive care and emergency medicine. Edited by Vincent J.L.: Berlin, Springer-Verlag; 1998.
10. Gur'janov V.A., Tolmachev G.N., Volodin A.V. Intensive care of pregnant women with arterial and abdominal hypertension. *Novosti anesteziologii i reanimatologii.* 2009; 1: 28-32 (in Russian).
11. Vasilenko V.H., Grebeneva A.L., Mihajlova N.D. Propedevtika vnutrennih boleznej. – Moscow: «Medicina»; 1974 (in Russian).
12. Burch J.M., Moore E.E., Moore F.A., Franciose R. The abdominal compartment syndrome. *Surg. Clin. North. Am.* 1996; 76: 833-42.
13. Frezza E.E., Shebani K.O., Robertson J., Wachtel M.S. Morbid obesity causes chronic increase of intraabdominal pressure. *Dig. Dis. Sci.* 2007; 52 (4): 1038-41.
14. Marshalov D.V., Petrenko A.P. The role of chronic abdominal hypertension in obstetric pathology. III Vseros. obrazov. kongress «Anestezija i reanimacija v akusherstve i neonatologii»: Mat. kongres. Moscow, 2010; 70-2 (in Russian).
15. Toh C. H., Hoots W. K. SCC on Disseminated Intravascular Coagulation of the ISTH. The scoring system of the Scientific and Standardisation Committee on Disseminated Intravascular Coagulation of the International Society on thrombosis and haemostasis: a 5-year overview. *J. Thromb. Haemost.* 2007; 5: 604–6.