Acta Scientific Gastrointestinal Disorders (ISSN: 2582-1091)

Volume 4 Issue 10 October 2021

Research Article

The Effectiveness of Primary Syndromic Diagnosis in Diseases of the Upper Gastrointestinal Tract Using the Information System "Electronic Polyclinic" in Comparison with the Validated Questionnaire GSRS

Katkova Anastasiya Veniaminovna* and Mishlanov Vitaly Yuryevich

Department of Propaedeutics of Internal Diseases No. 1, State Educational Institution of Higher Professional Education Perm State Medical University Ministry of Health of Russian Federation, Russia

***Corresponding Author:** Katkova Anastasiya Veniaminovna, Department of Propaedeutics of Internal Diseases No. 1, State Educational Institution of Higher Professional Education Perm State Medical University Ministry of Health of Russian Federation, Russia.

Received: August 16, 2021

Published: September 25, 2021

© All rights are reserved by **Katkova Anastasiya Veniaminovna and Mishlanov Vitaly Yuryevich.**

Abstract

The aim of the study was to compare the results of primary syndromic diagnosis of diseases of the upper gastrointestinal tract using the gastroenterological module of the computer program "Electronic polyclinic" and the validated questionnaire GSRS. The material of the study was 20 patients with non-neoplastic diseases of the upper gastrointestinal tract and the control group consisted of 20 persons who were recognized as healthy according to the results of the medical examination of certain groups of the adult population on the basis of the Ministry of Health's order of the Russian Federation dated October 26, 2017 No. 869 n. All respondents were interviewed using 2 questionnaires: GSRS and the gastroenterological module of the interactive system "Electronic Polyclinic". Statistical analysis of the results was performed using the software package Statistica 10.0. Despite the slightly greater sensitivity of some symptoms of diseases of the upper gastrointestinal tract, obtained during an interactive examination using the computer program "Electronic polyclinic" than when using the GSRS questionnaire, the accuracy of their assessment was low (30 - 55%). Due to the syndromic principle, the accuracy of the diagnostic process has increased, to a greater extent when using the automated system "Electronic Polyclinic": the sensitivity of the method was 80% and the specificity - 90%; when using the GSRS questionnaire, the operating characteristics were 65% and 75%, respectively. According to the results obtained, a conclusion was made about a higher effectiveness of primary syndromic diagnosis when using the gastroenterological module of the computer program "Electronic Polyclinic" in comparison with the use of the GSRS questionnaire due to an increase in the number of detailed symptom-questions in the interactive questionnaire, up to 15 within one syndrome, taking into account the coefficients of significance every symptom.

Keywords: Questionnaires in Gastroenterological Diseases; Risk Factors; Clinical and Functional Status; Symptom Detailing; Syndromic Diagnosis

Abbreviations

GERD: Gastroesophageal Reflux Disease; GSRS: Gastrointestinal Symptom Rating Scale; Me: Median; Se: Sensitivity; Sp: Specificity

Introduction

An interview is an inexpensive and effective method of examining a patient and making a preliminary diagnosis, but a detailed

interview takes a significant amount of the doctor's time. In the medical practice of many countries, questionnaires are issued to the patient before being examined by a doctor. Based on the results of the survey, using questionnaires, the need for further examination of the patient is determined.

There are many different questionnaires, scales, calculators for identifying risk factors for diseases, assessing the patient quality of life, the severity of certain symptoms, stages of diseases, etc.

Improvement of the survey methodology determines the need for the emergence of additional interactive technologies [1], which would allow, and to preserve its dignity - the ability to study in detail the entire range of possible problems with human health, and to reduce the time of its execution, thereby eliminating a significant drawback of this method.

The complex system of assistance to a doctor in making a clinical decision "Electronic polyclinic" (Certificate of state registration No 2012614202) [5] meets the principles of interactivity and automation of the preliminary diagnostic process. One of its seven modules is gastroenterological. A number of publications contain data on the effectiveness of its use [15], but the possibilities of its wide application in practice require further study.

Among the questionnaires of the gastroenterological profile, 20 scales are proposed for assessing the clinical symptoms of gastroesophageal reflux disease (GERD), 12 of which are specific for GERD, and 8 scales are used to assess various gastroenterological diseases (including GERD). Of these 20 scales, 8 are intended for epidemiological studies, 7 are for diagnostic purposes, and only 5 are intended for the assessment of clinical symptoms [7]. Of these options, the questionnaire "Gastrointestinal Symptoms Rating Scale" (GSRS) is not designed for GERD [4]. The Russian-language version of GSRS was validated on 2000 patients in St. Petersburg; its high efficiency has been confirmed in many studies [3,8].

The structures of the gastroenterological interactive questionnaire "Electronic polyclinic" and the GSRS questionnaire are of the same type, they use symptomatic and syndromic principles of diagnosis, the same number of scales (syndromes), but the number of questions in them is significantly different.

Aim of the Study

The aim of the study was to compare the results of primary syndromic diagnosis of diseases of the upper gastrointestinal tract using the gastroenterological module of the computer program "Electronic polyclinic" and the validated questionnaire GSRS.

Materials and Methods

The material of the study was presented by 40 respondents, 20 of whom (11 women and 9 men) were patients with non-neoplastic diseases of the upper gastrointestinal tract, undergoing examination and treatment in the therapeutic department of the city clinical hospital No. 4 in Perm: 12 patients with chronic gastroduodenitis, 5 people with gastric and duodenal ulcers and 4 respondents with chronic pancreatitis, aged 15 to 83 years. To confirm the diagnosis, along with physical examination and laboratory methods (complete blood count, biochemical blood test, enzyme immunoassay for Helicobacter pylori infection), patients underwent fibrogastroduodenoscopy with biopsy, ultrasound examination of the abdominal organs and, if indicated, high-resolution computed tomography. The second (control) group consisted of 20 persons (11 were women and 9 were men, aged 19 to 25 years) who were recognized as healthy according to the results of the medical examination of certain groups of the adult population on the basis of the Ministry of Health's order of the Russian Federation dated October 26, 2017 No. 869n [9]. The exclusion criterion for the second group was the presence of complaints or dispensary observation for diseases of the gastrointestinal tract.

All respondents were interviewed using 2 questionnaires: GSRS and the gastroenterological module of the computer program "Electronic Polyclinic" (Certificate No. 2012614202), posted on the Internet (http://klinikcity.ru) [5].

The GSRS questionnaire includes 15 questions that reveal the manifestations of gastroenterological pathology in accordance with the gradation of the severity (intensity) of symptoms: does not bother (1 point), almost does not bother (2 points), slightly bothers (3 points), moderate discomfort (4 points)), significant discomfort (5 points), severe discomfort (6 points), very strong discomfort (7 points). The suggested questions are about the patient's well-being over the past week. The answers to the posed questions (set) make it possible to single out the following syndromes (scales): AP - abdominal pain syndrome, RS - reflux syndrome, IS - dyspeptic syndrome, DS - diarrheal syndrome, CS - constipation syndrome, as well as the general (summarized) result of the questionnaire. Higher values correspond to more severe symptoms and a lower quality of life [7].

The gastroenterological module of the automated system "Electronic polyclinic" identifies 28 clinical problems, scoring each symptom of the disease and uses 5 scales in accordance with the main syndromic diagnoses: gastric and intestinal dyspepsia syndromes, fever, cachexia, and autonomic dystonia syndrome (cen-

tral syndrome). At the same time, the number of questions in the gastroenterological module of the automated system "Electronic polyclinic" is about 87, taking into account all the detailing questions - 222. The point of separation of the probability (according to the automatic conclusion based on the results of a questionnaire survey using the interactive program "Electronic Polylinika") of the syndrome's presence and establishment - 40% or more - was obtained experimentally in previous studies [2].

Statistical analysis of the results was carried out using the Statistica 10.0 software package. The first stage of statistical analysis was to study the distribution of characteristics by groups. Since a number of the studied quantitative characteristics did not have a normal distribution, therefore, they are presented as a median (Me) and percentiles (25^{th} and 75^{th}).

To describe the qualitative data, the frequencies and proportions (in percent) with which certain values of the qualitative characteristics were encountered in the sample were used. The comparison of qualitative features was carried out with the compilation of contingency tables and the calculation of the nonparametric criterion χ^2 (chi-square) [6,10,11].

If the contingency table was 2 x 2 (i.e. at 1^{st} degree of freedom), the Yates amendment was applied. If the absolute frequencies of 2 x 2 in the contingency tables are less than 5, we used one-sided and two-sided versions of Fisher's exact test.

The null hypothesis was rejected, the differences were considered statistically significant at $p < 0.05$.

Results and Discussion

With the help of a questionnaire survey of practically healthy persons, respondents were identified who noted the presence of periodic symptoms of diseases, which we regarded as signs of impaired functional status (risk factors for the development of diseases). The GSRS questionnaire is intended to assess the quality of life (observation) of patients with diseases of the gastrointestinal tract and is not intended to diagnose diseases of the digestive system. Diagnostically significant degrees (2 - 7 points) of severity (intensity) of symptom-questions in GSRS have not been previously studied or proposed.

In the course of our study, when comparing patients with non-neoplastic diseases of the upper gastrointestinal tract with apparently healthy persons, the significant numbers of points by symptoms were determined and the level of significance of differences was calculated (Table 1). In order to reduce the size of the table, it indicates the symptoms and those critical values (points) for which significant differences were obtained: pain in the epigastric region (more than 5 points), nausea (more than 4 points), bloating (more than 4 points), heartburn (more than 3 points).

Symptom	Critical value (1-7 points)	Patients, (%) (n = 20)	Practically healthy persons, (%) (n = 20)	p
Pain in the epigastric region	5 and more	30	0	**0,0202 0,0101***
Heartburn	3 and more	30	5	0,0915 0,0457*
Nausea	4 and more	40	10	0,0648 0,0324*
	5 and more	35	0	**0,0083 0,0042***
Rumbling in the stomach	4 and more	40	40	1,0000
	5 and more	20	5	0,3416
Bloating	4 and more	30	5	0,0915 **0,0457***
	5 and more	25	0	**0,0471 0,0236***
Relief from flatulence	4 and more	25	0	**0,0471 0,0236***

Table 1: Prevalence and confidence level of differences in symptoms of gastrointestinal diseases depending on their score (GSRS).
p * - When using the one-sided version of Fisher's exact test;
p - Statistically significant differences are in bold.

Sensitivity (Se) of the listed symptoms in the group of patients did not exceed 30 - 40%. Attention was drawn to the fact that such a sign of impaired functional status as rumbling in the abdomen was equally common (40% of cases) in the control group of practically healthy individuals in comparison with the group of patients, which indicates the need to take into account the coefficients of the significance of the symptoms of the disease in the diagnostic process.

Table 2 shows the frequency of occurrence of gastroenterological symptoms and the degree of reliability of differences in groups

according to the results of a questionnaire survey of patients with non-neoplastic diseases of the upper gastrointestinal tract and apparently healthy persons using the gastroenterological module of the computer program "Electronic Polyclinic". The point gradation of the severity of symptoms in the computer program "Electronic polyclinic" is not provided.

Symptom	Patients, (%) (n = 20)	Practically healthy persons, (%) (n = 20)	p
Pain in the epigastric region	60	30	0,1110 0,0555*
Hungry pains	35	15	0,2733
Heartburn	30	10	0,2351
Belching	50	55	1,0000
Nausea	55	25	0,1053 0,0527*
Vomiting	25	0	**0,0471** **0,0236***
Rumbling in the stomach	50	60	0,7506
Bloating	40	20	0,3008
Relief from flatulence	40	20	0,3008

Table 2: The prevalence and confidence level of differences in symptoms of gastrointestinal diseases ("Electronic clinic").
p * - When using the one-sided version of Fisher's exact test;
p - Statistically significant differences are in bold.

Despite the slightly greater sensitivity of individual symptoms of diseases of the upper gastrointestinal tract, obtained during the interactive survey using the gastroenterological module of the computer program "Electronic Polyclinic" than during the questionnaire survey using the GSRS questionnaire, the accuracy of their assessment was also low (for example, Se of the symptom "nausea" was 55%).

How many questions should a questionnaire include in order to accurately diagnose diseases (health problems)? How many symptoms should be considered in each syndrome? These and a number of similar questions are among the fundamental in the structuring of a medical survey and the preparation of questionnaires that allow diagnosing diseases with high accuracy.

Referring to the work of Professor L.N. Yasnitsky., *et al*. it was the determination of the probable number of factors in the system that was the most significant reason for such a low assessment of the prospects for computerization of the diagnostic process. Internal diseases, in all their variety of symptoms, appear to be an unusually large array of data, the systematization of which requires the use of approaches that are not fully known to information technologies [12-14]. In the scientific medical literature for each disease, possible characteristic combinations of clinical symptoms are described, the simultaneous appearance of which is due to a single developmental mechanism. But, the patient may have no signs of the described combinations, some may be missed in the process of interviewing the patient due to the verbal and cognitive characteristics of the patient filling out the questionnaire or answering the doctor's questions, some may change over time or have different the degree of severity at various severity and stage of the pathological process. At the same time, an excessive number of questions that do not affect the final result make the questionnaire cumbersome; thereby can form a patient's mistrust towards the survey methodology and its results.

The scales (syndromes) presented in the GSRS questionnaire are short: they combine (by summing points) only 2, 3, maximum 4 signs of diseases. When comparing 2 groups (patients with non-neoplastic diseases and "practically healthy persons") according to these scales, statistically significant differences were obtained (Table 3).

Scale	Critical value (1-7 points)	Patients, (%) (n = 20)	Practically healthy persons, (%) (n = 20)	p
"Abdominal pain"	5 and more	50	20	0,0958 **0,0479***
"Reflux Syndrome"	5 and more	65	30	0,0562 **0,0281***
	6 and more	50	20	0,0958 **0,0479***
"Dyspeptic syndrome"	9 and more	50	35	0,5224
	10 and more	20	20	1,0000
	11 and more (Me - 8,5 (5; 13,5))	40	10	0,0648 **0,0324***

Table 3: The prevalence and confidence level of differences on the scales depending on their score (GSRS questionnaire).
p * - When using the one-sided version of Fisher's exact test;
p - Statistically significant differences are in bold.

On the "Reflux syndrome" scale (Figure 1), which includes heartburn, belching of sour or bitter contents and nausea, differences were obtained when using not only one-sided, but also two-sided versions of Fisher's exact test. When comparing groups on the "Dyspeptic Syndrome" scale (Figure 2), which included 4 question-symptoms (presence and severity of rumbling in the abdomen; feeling of fullness, bloating; belching with air and relief from flatulence), statistically significant differences were obtained (on one-sided version of Fisher's exact test), but only with a threshold value of "11 points" significantly higher than the median (Me) in the group of patients - 8.5 (5.0; 13.5) points, where 5.0 and 13.5 are the 25th and 75th percentile.

Figure 1: Range chart for reflux syndrome (GSRS).

Figure 2: Range chart for dyspepsia syndrome (GSRS).

The sensitivity and specificity (Sp) values of the GSRS complex scales (syndromes) of the questionnaire, as in symptomatic diagnostics, were not high enough (Se = 50 - 65%, Sp = 70 - 80% - for the scale "Reflux syndrome"; Se = 40%, Sp = 90% - for the scale "Dyspeptic syndrome").

In our opinion, in addition to the grouping of symptoms, their detailed specification is the most important task of primary medical diagnostics. The expediency of clarifying questions is explained by providing the patient with a greater variety of proposed options, among which the likelihood of finding a suitable one for each individual is much higher. So, comparing the questionnaires in terms of the number of detailing questions in dyspeptic syndrome, their increase to 15 in the interactive system "Electronic polyclinic" - more than 3 times, compared with GSRS, made it possible to obtain higher operational characteristics of the method of automatic syndromic diagnosis (Figure 3) with Se = 80% and Sp close to 100% (95%) (Table 4).

Figure 3: Range chart for gastric dyspepsia syndrome ("Electronic polyclinic").

Syndrome	Patients, (%) (n = 20)	Practically healthy persons, (%) (n = 20)	p
Gastric dyspepsia syndrome (automatic result)	80	5	**0,0000**
Intestinal dyspepsia syndrome (automatic result)	20	30	0,7164

Table 4: The prevalence and confidence level of differences in syndromes ("Electronic clinic").
p - Statistically significant differences are shown in bold.

The low sensitivity of the intestinal dyspepsia syndrome in the group of patients can be explained by the localization of the pathological process in the upper floor of the gastrointestinal tract.

We focus that the GSRS questionnaire does not use the coefficients that take into account the Se and Sp of each specific trait. For example, when assessing separately each of the 4 symptoms of the "Dyspeptic Syndrome" scale of the GSRS questionnaire, as already mentioned above, attention is drawn not only to the low sensitivity (Se = 40%), but also the very low specificity (Sp = 60%) of such symptom, like rumbling in the abdomen, which was observed with equal frequency in the group of patients with non-neoplastic diseases of the upper gastrointestinal tract, and in the control group of practically healthy individuals (Table 1). At the same time, in a comparative analysis of symptoms such as "flatulence" (with a separative significance of "5 or more points") and "passage of gas through the intestines, which is accompanied by a decrease in the feeling of bloating" (4 or more points), we obtained statistically significant differences using both variants of Fisher's exact test. In the automated system "Electronic polyclinic", the coefficients of the significance of each symptom are used, taking into account its operational characteristics, which, in our opinion, also allows to increase the diagnostic accuracy of the method.

Conclusion

In comparison with the use of the validated GSRS questionnaire an increase in the number of detailed symptom-questions taken into account during examination using the gastroenterological module of the computer program "Electronic Polyclinic", up to 15 within one syndrome, taking into account the coefficients of the significance of each symptom, increases the effectiveness of primary syndromic diagnosis.

Conflict of Interest

There is no financial interest or conflict of interest.

Bibliography

1. Bezrukov NS., *et al*. "Automated system disease diagnosis". *Management Problems* 5 (2007): 75-80.

2. Chuchalin AG., *et al*. "Bioethics, artificial intelligence and medical diagnostics". State Educational Institution of Higher Professional Education Perm State Medical University Ministry of Health of Russian Federation (2019): 183.

3. Kudryashova IV. "Early diagnosis of chronic pancreatitis from the position of use of ultrasound imaging and evaluation of quality of life". Educational and methodical recommendations for medical students, interns, residents of medical schools, gastroeterologov surgeons. Smolensk (2003): 21.

4. Kulich KR., *et al*. "Reliability and validity of the Gastrointestinal Symptom Rating Scale (GSRS) and Quality of Life in Reflux and Dyspepsia (QOLRAD) questionnaire in dyspepsia: A six-country study". *Health and Quality of Life Outcomes* 6 (2008): 12.

5. Mishlanov YaV., *et al*. "Certificate of state registration of the computer program by 12.05.2012. No 2012614202". Electronic polyclinic. Issued by the Federal Service for Intellectual Property (2012).

6. Peacock JL and Peacock PJ. "Oxford Handbook of Medical Statistics". New York: Oxford University Press (2010): 517.

7. Rabeneck DA., *et al*. "SODA (Severity of Dyspepsia Assessment): A new effective outcome measure for dyspepsia-related health". *Journal of Clinical Epidemiology* 54.8 (2001): 755-765.

8. Revicki DA., *et al*. "Reliability and validity of the Gastrointestinal Symptom Rating Scale in patients with gastroesophageal reflux disease". *Quality of Life Research* 7.1 (1998): 75-83.

9. Russian Ministry of Health Order on 26.10.2017, No 869n On approval of the medical examination of certain groups of the adult population (2017).

10. Tishkov AV., *et al*. "Statistical Analysis of 2 × 2 Tables in Diagnostic Research". SPb.: Publishing house SPbGMU (2013): 20.

11. Vlasov VV. "Effectiveness of diagnostic tests". M.: Medicine (1988): 256.

12. Yasnitsky LN., *et al*. "Diagnosis and prognosis based on neural networks flow cardiovascular diseases". *Medical Equipment* 3 (2013): 42-44.

13. Yasnitsky LN., *et al*. "Neural network system of rapid diagnosis of cardiovascular diseases". *Perm Medical Journal* 28.4 (2011): 77-86.

14. Yasnitsky LN., *et al*. "Priorities and conditions for the development of intelligent medical systems". The scientific and practical importance in the diagnosis impedance internal diseases: Materials of the First Ros. Conf. Perm. honey. Zh. App. 25.1 (2008): 170-173.

15. Zhigulev AN., *et al*. "Assessment of gastrointestinal symptoms in gastric cancer using the online automated system". Electronic polyclinic. Vrach 29.12 (2018): 57-62.

Volume 4 Issue 10 October 2021

© All rights are reserved by Katkova Anastasiya Veniaminovna and Mishlanov Vitaly Yuryevich.