Economic Analysis of Requests for Laboratory Tests in Primary Health Care Centers

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1. INTRODUCTION

Health care reform is a costly process, which, among other things, brings the patient closer to the medical staff. All should take part because reform is not only the proportion of the budget, and health is still not financially independent. Since 1996 when it was adopted in the Federal Program of Reconstruction of the Health System at the Federation level, is gone furthest in reforming primary health care. Our study may be important for primary health care system content and that decision makers put the accent in the reform process in the sense that the new methods, models, funding and
organizational processes to rationalize the system of healthcare services by introducing modern technology, but more rational and cost-effective method and procedures (1).

Number of laboratory analysis has a great impact on the operations of the primary health center. Due to the fact that the payment of services is done by the number of service users in the interests of the institution that the number of unnecessary index reduces to a minimum. Organization of family medicine, medical-biochemical diagnosis is defined as a branch of diagnostic activities of the primary health care. To produce the results of laboratory tests needed are great material resources (2, 3). This is evident in the economic analysis where laboratory tests are valued with a score of: Search by type and material resources expended for analytical examination. These technical, financial and technical performances of laboratory medicine are not appropriately classified, as it is obvious in other industries, technology and other primary health care (PHC) and family medicine (FM). World Health Organization (WHO) in its key action program “Health for All” in the 21 century, as necessary emphasizes the education of health personnel (4, 5, 6, 7).

Assessment of medical laboratory technology should be implemented within the interdisciplinary team including: manufacturers of laboratory technology, employees in the laboratory, financiers of health care, patients, clinicians, and to use explicit analytical method (8).

This contributes to improving health care, especially in supporting development and regeneration of a wide range of standards, guidelines and other aspects of health care (9, 10, 11).

2. PROBLEM OF RESEARCH

Medical biochemistry laboratory diagnosis occupies a visible place in medicine, in all levels of health care, as well as material costs of primary, secondary and tertiary health care, because modern laboratory diagnostics, using different technologies and methods a physician can reach a lot of useful information about the status of the patient: standards, lifestyle, genetics, disease, drugs. In order to rationally utilize laboratory equipment and qualified personnel and enabling conscientious use of best evidence for decision making in diagnosis and treatment is necessary to better define indications for specific tests. It is estimated that at least 20-30% of money spent in health care can be rationally used and the focus of control should be placed precisely on diagnostic services. A significant segment: the diagnostic activities dominated by medical biochemistry, laboratory work and it are irrational to spend a significant percentage of the funds from the total health budget (13). Therefore, Health Insurance has to perform the permanent control and intervention and not only identify irrational consumption in the previous period (14).

Laboratory medicine, medical-biochemical diagnosis in primary health care is much represented. By organization of family medicine medical-biochemical diagnosis is defined as a branch of diagnostic services in primary health care. Earlier and now in medical-biochemical laboratories on a daily basis:

- Received a very large number of requests for medical-biochemical diagnosis;
- Users of laboratory diagnostic samples are taken for the required tests (preanalytical processing);
- Then is made analytic review of very large number of different tests, specific methods and technologies.

For these actions is necessary in the morning prior to admission of users and their demands that all jobs are properly prepared. On previous day should be provided and prepared: accessories, reagents and machines.

Morning daily routine work of preceding control and calibration equipment, methods and process quality control of work in the laboratory. Only after the fulfillment of the procedures followed overview of search control of samples.

After validating the results of daily quality control and after they met the criteria can be analytically examined samples from users.

These procedures are not sufficiently familiar to users and doctors, for that are very often necessary the direct telephone communication between them. To make the results of laboratory tests needed are huge material resources. This is evident in the economic analysis where laboratory tests are valued with a score of: search by type and material resources expended for analytical examination. These technical and financial performances of laboratory medicine are not appropriately classified as blatant as that in other industries, technology and other primary health care (PHC) and family medicine (FM).

3. GOALS

Goal: The overall objective of the research is to define a model of efficiency (or effectiveness) of medical-biochemical diagnosis for users with the requirements of units of family medicine (PM), in a representative sample of patients in the unit for the laboratory diagnosis of the Primary Health Care Center Gracanica.

Confirm what is the usefulness of the application of laboratory diagnosis in family medicine.

Determine the frequency of the need for laboratory tests in the therapeutic treatment of major diseases.

Evaluate the need for using laboratory diagnostics to try to prevent major diseases.

Promote the available test-index profile of laboratory diagnostics for early detection of risk factors for major diseases.

Evaluate the continued use of the (systematic reviews) laboratory diagnosis gives a picture of the health status of individuals in family practice.

Promote the available test-index profile of laboratory diagnosis of systematic reviews.

Conduct follow-up evaluation model of laboratory diagnosis in family medicine.

Determine the cost/benefit analysis of the financial effect of the use of laboratory diagnosis in family medicine.

Determine the cost/benefit analysis of the financial effect of the use of laboratory diagnostics in major dis-
es in family medicine.

Determine the cost/benefit analysis of the financial effect of the use of laboratory diagnostics with the requirements of normal laboratory test results in family medicine.

Determine the cost/benefit analysis of the financial effect of the use of laboratory diagnostics in the requirements with abnormal results of laboratory tests in family medicine.

Evaluate the need for model of the monitoring of laboratory diagnosis in family medicine in order to assess whether it is possible application in the development of information systems in primary health care (PHC) in order to better organize, monitor effectiveness and rationalization of laboratory diagnosis in family medicine.

To model the rationalization of laboratory diagnosis in family medicine results of the work “of models of monitoring of laboratory diagnosis in family medicine” aimed to evaluate and propose the main types of cost-analysis:

- Cost-of-illness analysis for determining the economic impact of the disease or condition, e.g., including the cost of the required laboratory tests.
- Cost-minimization analysis to determine the least expensive laboratory tests and diagnostic technologies that will produce the same effect.
- Cost-effectiveness analysis to compare the cost in currency units, the quantitative effects of non-currency units, such as the reduction of mortality and morbidity (CVD, metabolic syndrome, viral and other infectious diseases).
- Cost-utility analysis—which is a form of cost-effectiveness analysis that compares costs in currency units, with the effects in their impact, measured usually in patients on therapy, monitoring of laboratory test results, e.g. QALY.
- Cost-consequence analysis—which is a form of cost-effectiveness analysis that represents costs and effects of discrete categories without their accumulation or measurement.
- Cost-benefit analysis—when you compare the costs and benefits, which are quantified in place both currency units (represented by index of diseases).

Cost minimization analysis, cost-effectiveness and cost utility analysis, where it is necessary to include comparisons of alternative tests (anemia treatment by controlling the index: CBC, Hgb., the number of reticulocytes and iron in the blood), while cost-benefit analysis typically involves comparisons of alternative technologies, (Glucose-control, and automatic colorimetric analyzer), although it is not necessary.

Determine if “analysis models monitoring of laboratory diagnosis in family medicine ‘provides an adequate evaluation of laboratory test results and whether it can serve as a basis for writing scientific and technical publications.

4. MATERIAL AND METHODS

The study included a total of 1000 respondents. All subjects were users of primary health care in Primary Health Care Center Gracanica (Tužla Canton) in primary health care units have received requests for laboratory diagnosis.

This paper is an analysis of the representation requirements for the laboratory diagnosis by doctors in primary health care and the most frequent diseases in primary care.

An analysis is made of laboratory test results, based on requests for laboratory diagnosis by doctors and illnesses in primary care.

Made is analysis of the presence of normal and pathological laboratory test results from the request for the laboratory diagnosis by doctors in primary health care.

Made is an analysis of the most common laboratory tests requests, and based on requests for laboratory diagnosis by doctors in primary health care and the most frequent diseases in primary health care.

Incorporated is the economic analysis of laboratory test requests for the laboratory diagnosis by doctors in primary health care and the most frequent diseases in primary health care.

For the statistical analysis are used the Student t test and Chi square test.

5. RESULTS

General practitioners and family medicine doctors have a great need for laboratory diagnostics, which shows the representation of normal test results from the request for the laboratory diagnosis by doctors and illness in primary care.

A paper is an analysis of the most common laboratory tests requests, and based on requests for laboratory diagnosis by doctors in primary health care.

Incorporated is the economic analysis of the most common laboratory tests requirements for the laboratory diagnosis by doctors in primary health care and the most frequent diseases in primary health care.

This paper is an analysis of the representation requirements for the laboratory diagnosis by doctors in primary health care and the most frequent diseases in primary care.

### Table 1. Representation of normal and pathological results of laboratory tests by doctors

| Test     | General practice | Family medicine | Specialist |
|----------|------------------|-----------------|------------|
|          | Normal No. %     | Pathol. No. %   | Normal No. % | Pathol. No. % | Normal No. % | Pathol. No. % |
| SE       | 89(36%)          | 142(62%)        | 77(34%)    | 148(66%)      | 43(45%)      | 52(55%)       |
| CBC      | 25(844%)         | 50(16%)         | 217(79%)   | 59(21%)       | 116(70%)     | 50(30%)       |
| BS       | 252(74%)         | 89(26%)         | 210(72%)   | 82(28%)       | 100(87%)     | 15(13%)       |
| CHOL     | 104(46%)         | 122(54%)        | 77(42%)    | 112(54%)      | 16(44%)      | 20(56%)       |
| HDL CHOL | 24(89%)          | 3(11%)          | 4(80%)     | 1(20%)        | 2(67%)       | 1(33%)        |
| TGL      | 131(58%)         | 96(42%)         | 100(53%)   | 87(47%)       | 19(56%)      | 15(44%)       |
| UREA     | 105(90%)         | 12(10%)         | 108(94%)   | 7(6%)         | 26(100%)     | 0             |
| CREAT    | 150(91%)         | 15(9%)          | 117(90%)   | 13(10%)       | 59(95%)      | 3(10%)        |
| URIC     | 5(71%)           | 2(29%)          | 17(85%)    | 3(15%)        | 3(100%)      | 0             |
| TBLI     | 12(92%)          | 1(8%)           | 25(86%)    | 4(14%)        | 3(60%)       | 2(40%)        |
| ALT      | 129(85%)         | 238(15%)        | 132(82%)   | 29(18%)       | 40(89%)      | 5(11%)        |
| AST      | 139(92%)         | 13(8%)          | 140(88%)   | 20(12%)       | 44(96%)      | 2(14%)        |
| AF       | 17(90%)          | 2(10%)          | 17(100%)   | 0             | 8(100%)      | 0             |
| FIBRINO  | 4(36%)           | 7(64%)          | 19(53%)    | 17(47%)       | 0            | 2(100%)       |
| CRP      | 10(77%)          | 3(23%)          | 19(86%)    | 3(14%)        | 8(89%)       | 1(11%)        |
| Ca       | 13(93%)          | 1(7%)           | 14(100%)   | 0             | 3(100%)      | 0             |
| P        | 12(100%)         | 0               | 13(100%)   | 0             | 4(100%)      | 0             |
| GGT      | 1(100%)          | 0               | 3(100%)    | 0             | 0            | 0             |
| CK       | 0               | 0               | 0          | 0             | 1(100%)      | 0             |
| Urine    | 187(60%)         | 128(40%)        | 152(56%)   | 121(44%)      | 87(57%)      | 68(43%)       |
and pathological results of laboratory tests by physicians. Table 1 has shown presence of normal and pathological results of laboratory tests in the number of requests: the general practitioners, doctors of family medicine and other specialists in primary health care in the Primary Health Care Center Gracanica. It is interesting to note that the majority of the requested tests, such as HDL cholesterol, uric acid over 70% of the results have the character of the normal value which is not the case for fibrinogen, where the distribution is such that it detects a high prevalence of pathology (71%). These results suggest a need for rationalization of diagnostic tests. When these results are from the aspects of the type of doctors who demanded this kind of analysis can be concluded that the doctors at the level of laboratory tests had no significant difference in the percentage representation of normal and pathological results. Representation of normal compared to pathological results of the most important tests is shown in Table 1. The differences were not statistically significant between different groups of doctors or the general practitioner, family doctor and specialists.

Frequency of normal and pathological results by doctors

Results of laboratory tests in the study were analyzed by doctors and grouped as normal and pathological results of laboratory tests.

The largest number of normal laboratory test results in the total required by specialist or a minimum number of pathological results of laboratory tests as an indicator of the health status of individuals. Analysis of the demands (1000), the number of tests (5333) there was no significant difference in the number of pathological and normal results in the total number by doctors per test.

5.1. Economic analysis of laboratory tests as required in primary healthcare center

The value of search is expressed in points for ease of comparison. Economic value of 5333 laboratory tests was 84312 points (1 point is 0.80 KM).

In Table 3 is shown the total representation of the overall evaluation of the tests.

5.2. Economic analysis of performed tests by doctor

Requirements include a variety of tests and the different number of points required for testing by doctors. In Table 4 are presented the number of tests and the number of points that bear these tests. The economic value of the index expressed through the number of points for general practitioners was 37190 (44.1%) points. The economic value of tests that are required by family medicine doctors is 33681 (40%) points. The economic value of tests that are required by specialists: pediatricians, gynecologists and specialists in occupational medicine were 13441 (15.9%) points.

Analytical review of laboratory tests has values in points. The type and number of tests per doctor has a different number of points which bear these tests.

Similar was percentage share of tests and the percentage evaluation in points of the tests required by general practitioners and family medicine physicians or 44% of the share index of for GPs and 40.7% share index for doctors of family medicine and 15.3% for specialists.

| Test   | General practice | Family medicine | Specialist |
|--------|------------------|-----------------|------------|
|        | No. tests | No. points | No. tests | No. points | No. tests | No. points |
| SE     | 231       | 924     | 225       | 900       | 95        | 380        |
| CBC    | 305       | 7930    | 276       | 7176      | 166       | 4316       |
| BS     | 341       | 4774    | 292       | 4088      | 115       | 1610       |
| ALT    | 152       | 2888    | 161       | 3059      | 45        | 855        |
| AST    | 152       | 2888    | 160       | 3040      | 46        | 874        |
| CRP    | 13        | 182     | 22        | 308       | 9         | 117        |
| Ca     | 14        | 182     | 14        | 182       | 3         | 39         |
| P      | 12        | 180     | 13        | 195       | 4         | 60         |
| GGT    | 1         | 30      | 3         | 90        | 0         | 0          |
| CK     | 0         | 0       | 0         | 1         | 19        |
| Urine  | 315       | 5355    | 273       | 4641      | 155       | 2635       |
| Total  | 2348      | 37190   | 2167      | 33681     | 818       | 13441      |

Table 4. Representation of points and number of laboratory tests by type of doctor
Form the total value of the index score requirements of GPs are 44.1%, the requirement of family doctors account for 40% and requirements of other specialists make up 15.9%.

General practitioners after the review of patients in family medicine offices mostly requested in this order the following tests: glucose, urine, CBC, SE, TGL; Chol, ALT, AST, creatinine, which amounted to 34109 points (40.9%).

Doctors of Family Medicine (FM) after examination of the patient in family medicine offices mostly requested the following tests: glucose, CBC, urine, SE, Chol, TGL, ALT, AST, creatinine, which amounted to 29914 points (35.5%).

Other specialty doctors in primary health care mostly requested in this order the following tests: CBC; urine; BS;

Given that doctors required different number of tests by illnesses and a variety of tests: this is a different number of points at the required tests and diseases.

Table 5 shows the total economic value of the required examinations and tests in the 1000 individual requests for laboratory diagnosis by the group compared to the ICD classification. The highest costs are in metabolic diseases including diabetes (E00-E90), 25.2% of points where the most common tests: urine will cost 3128 points, CBC costs 3978 points, 3220 points will cost glucose, cholesterol test costs 1884 points and 2320 points triglycerides of total 14530 (17.2%) points. The following are the costs of respiratory diseases (J00-J99) 20.2% points, where the most common tests: urine will cost 2805 points, CBC costs 4320 points, 2030 points will cost glucose, cholesterol test costs 936 points and triglycerides 1232 points for a total of 11323 (13.4%) points. Then follow the costs of urinary tract diseases (N00-N99) 18.4% points, where the most common tests: urine costs 2788 points, CBC costs 4056 points; glucose costs 3302 points, cholesterol and triglycerides tests 828 and 1088 points for a total of 12062 (14.1%) points while second place have hypertension, 15.4% of the total number of points.

Frequency distribution of laboratory tests by diseases, and frequency distribution of points value of laboratory tests are indication for more comprehensive recommendations for action in the economic analysis of laboratory tests in the Primary Health Care Center and possible rationalization.

Laboratory tests for diseases have different frequency representations.
Thus the number of points for different laboratory tests in different diseases.

The economic analysis in the search requirements of the most common diseases we see that the highest point value has diseases in this order: diabetes (25.2%), respiratory (20.2%), urinary disorders (18.4%) and hypertension (15.4%). Correlation between total score and the normal number of requests by the most frequent diseases: provides economic value by 1 order of request medical results bear 11.5%, in the case of family medicine physician results carry 32.6% of points and found the results of pathological tests had 11.4% points. The table shows that the requirements found in the metabolic syndrome carry the largest number of points, 34222 points (40.7%).

### Table 6. Frequency of required and point for laboratory tests by diseases

| Test | General practice | Family practice | Specialist |
|------|------------------|-----------------|------------|
|      | No.points norm.test | No.points path.test | No.points norm.test | No.points path.test | No.points norm.test | No.points path.test |
| SE   | 356(38%)          | 568(62%)        | 308(34%)   | 592(66%)        | 172(45%)          | 208(55%)          |
| CBC  | 6630             | 1300            | 5642       | 1534            | 3016              | 1300              |
| BS   | 3528(74%)        | 1246(26%)       | 2940       | 1148            | 1400              | 210               |
| CHOL | 1248(46%)        | 1463(54%)       | 924(42%)   | 1354(58%)     | 192(44%)          | 240(56%)          |
| HDL HOL | 912             | 114              | 152        | 38              | 76                | 38                |
| TGL  | 2096(58%)        | 1536(42%)       | 1600(53%)  | 1392(47%)     | 304(56%)          | 240(44%)          |
| UREA | 1470             | 168              | 1512       | 98              | 364               | 0                 |
| KREAT | 1800             | 180              | 1404       | 156            | 708               | 36                |
| URI  | 75(71%)          | 30(29%)         | 255        | 12              | 9                 | 6                 |
| TBIL | 36               | 3                | 75         | 12              | 9                 | 6                 |
| ALT  | 2451             | 437              | 2508       | 551            | 760               | 95                |
| AST  | 2641             | 247              | 2660       | 380            | 836               | 38                |
| AF   | 527              | 62               | 527        | 248            | 0                 | 0                 |
| FIBRINOG | 52(36%)        | 91(64%)         | 247(53%)  | 221(47%)     | 0                 | 26(100%)          |
| CRP  | 140              | 42               | 266        | 42             | 112               | 14                |
| Ca   | 169              | 13               | 182        | 0              | 39                | 0                 |
| P    | 180              | 0                | 195        | 0              | 60                | 0                 |
| GGT  | 30               | 0                | 90         | 0              | 0                 | 0                 |
| CK   | 0                | 0                | 0          | 19             | 0                 | 0                 |

| Urine | 3172(60%) | 2176(40%) | 2584(56%) | 2051(44%) | 1479(56%) | 1156(44%) |
| Total | 27513     | 9677       | 24071      | 9610       | 9871       | 3570       |

### Table 7. Frequency of test points in case of normal and pathological results by the type of doctor

we include this in this screening, it can be concluded that all patients in the study population was effectively to perform immediately urinalysis, cholesterol, triglycerides, SE, and fibrinogen, because the large presence of even more pathological results than the normal. All other analysis on the basis of such indicators was economically unjustifiable to perform in screening (glucose, CBC, creatinine, urea, AST, ALT, Ca, and P). It is necessary to establish criteria for rational requests of supplemental tests with clear guidelines.

In general practice normal test results carry 32.6% of points and found pathological results bear 11.5%, in case of family medicine physician normal results had 28, 5% points and the results of pathological tests had 11.4% points.

Figure 2. Representation of economic point value of test results

In 1000 requests for laboratory diagnostics in the Diagnostic Services for laboratory diagnostics was examined 551 samples for SE which is required by doctors of PHCC Gracanica. Normal results of SE were 38% and 62% pathological. General practitioners requested a total of 231 tests or 42% SE tests out of which 38, 5% was normal result, and 61.5% pathological results. Family medicine requested 225 SE tests or 40, 8% of which with the normal result was 34.2%, and 65.8% pathological. Other specialists have requested that test in 95 cases or 17.2%, of which the results were normal in 45.2%, and pathological in 54.8%. The frequency of pathological and normal SE results in family practice there is no significant differences.

If we apply the cost-effectiveness analysis of the data about frequencies of pathological and normal results found in family practice: the ratio of points of pathological and normal re-
From a total of 2204 points for the SE, 62% of points have been spent for pathological findings.

Within 1000 requests for laboratory diagnosis in the Diagnostic laboratory Services 747 samples were tested for CBC as requested by doctors of PHCC Gracanica. Normal CBC results were obtained in 78.7% and pathological results in 21.3%. General practice requested a total of 305 CBC tests of 40.8% of which the normal results had 83.6%, and pathological results 16. 4%. Family medicine requested 276 tests or 36.9% of which the normal results was in 78.6%, and pathological results in 21.4%. Other specialists have requested 166 index 22.3% of which the normal result of CBC had 69.8%, and pathological results 30.2%. If we apply the cost-effectiveness analysis of the data frequencies of pathological and normal results in family practice: the ratio of points of pathological and normal results is 16. 4%. Family medicine requested 166 index 22.3% of which the normal result of CBC had 69.8%, and pathological results 30.2%. If we apply the cost-effectiveness analysis of the data frequencies of pathological and normal results in family practice: the ratio of points of pathological and normal results is 16. 4%.

From a total of 19422 points for CBC, 21% of points have been spent for the pathological findings.

Within 1000 requests for laboratory diagnosis in the Diagnostic laboratory service were tested 748 samples for glucose, which were requested by doctors of PHCC Gracanica. Normal result was in 75.1% and pathological in 24.9%.

General practitioners requested a total of 341 BS tests or 45.6% of which the result of normal blood glucose are found in 73.9%, and pathological results in 26.1%. Family medicine requested 292 BS test or 39.0%, of which the results with normal blood glucose had 71.9% and pathological results in 28.1%. Other specialists have requested 115 BS tests or 15.4%, of which the results with normal blood glucose had 86.9%, and pathological results of 13.1%.

The frequency of pathological and normal results of glucose by the doctors in family practice shows no significant differences.

If we apply the cost-effectiveness analysis of the data frequencies of pathological and normal blood glucose results in family practice: the ratio of points of pathological and normal results of glucose is 2394/6468 = 0.37. From a total of 10472 points for glucose tests, 23% of points have been spent for pathological glucose findings.

In 1000 requests for laboratory diagnosis in the Diagnostic laboratory were examined 451 samples for cholesterol, which required doctors of PHCC Gracanica. Normal result was in 43.6% and the pathological results in 56.4%.

General practitioners requested a total of 226 cholesterol tests, or 50.1%, of which the results of normal cholesterol was 46% and pathological results 54%. Family medicine requested 189 cholesterol tests, or 41.9%, of which 41.7% had normal results, and pathological results were 58.3%. Other specialists have requested 36 cholesterol tests or 8%, of which 44.4% had normal results and pathological results in 55.6%.

In the frequency of pathological and normal cholesterol levels by the doctors there is no significant difference. If we apply the cost-effectiveness analysis of the data frequencies of pathological and normal cholesterol levels found in family practice: the ratio of points of pathological and normal cholesterol result is 2807/2178 = 1.29.

From a total of 5400 points for 450 cholesterol tests, 56% of points have been spent for the pathological findings of cholesterol.

In 1000 request for laboratory diagnosis in the Diagnostic laboratory service was tested 35 samples on HDL-cholesterol, which requested doctors of PHCC Gracanica. Normal results of HDL-cholesterol were 85.7% and the pathological 14.3%.

General practitioners requested a total of 27 HDL-cholesterol tests, or 77.1%, of which 88.8% were normal results, and pathological results in 11.2%. Family medicine requested 5 HDL-cholesterol tests, or 14.3%, of which 80% had normal results and pathological results in 20%. Other specialists requested 3 HDL-cholesterol tests, or 8.6%, of which 66.6% had normal results and pathological results in 33.4%.

If we apply the cost-effectiveness analysis of the data frequencies of pathological and normal HDL cholesterol found in family practice: the ratio of points the results of pathological and normal HDL cholesterol is 152/1064 = 0.2.

From a total of 1330 points for 35 HDL cholesterol tests: 14% of points have been spent for the pathological findings of HDL cholesterol. In 1000 required laboratory tests in the Diagnostic laboratory service are tested 448 samples of triglycerides, which were requested by doctors of PHCC Gracanica. Normal triglycerides had 55.8% and the pathological 44.2%. General practitioners requested a total of 227 triglycerides tests, or 50.6%, of which the results were normal in 57.7%, and pathological in 42.3%.

If we apply the Cost-of-illness-Frequency Analysis of pathological and normal results in family practice: i.e., the ratio of points of laboratory tests of normal and pathological results were on table 8.

### Table 8. The frequency of normal and pathological test results in our sample

| Test       | SE | Path./Norm. | CBC | BS | Chol | HDL | Tgl. | Urea | Cr. | ALT | AST | Urine |
|------------|----|-------------|-----|----|------|-----|------|------|-----|-----|-----|-------|
|            | 1.8| 0.2         | 0.4 | 1.3| 0.2  | 1.1 | 0.1  | 0.1  | 0.2 | 0.1 | 0.7 |       |

6. DISCUSSION AND CONCLUSIONS

There is a different representation of the normal results of laboratory tests and pathological results of laboratory tests done in the Biochemical-Hematological Laboratory of the PHCC Gracanica. In our study, from a total of 1000 requests for testing, 69% was tests with normal results and 31% tests yielded pathological results. It is interesting to note that the majority of the required tests, such as HDL-cholesterol, uric acid in over 70% of test results have the character of the normal value which is not the case for fibrinogen, where the distribution is such that it detects a high prevalence of pathology (71%). These results suggest a need for rationalization of diagnostic tests. When these results are seen from the aspects of the type of doctors who requested this kind of analysis it can be...
concluded that between the doctors at the level of laboratory tests we did not find significant difference in the percentage of normal and pathological results.

Analytical review of laboratory tests have examined its economic value expressed in points and the point value is defined by (0.80 KM). The economic value of the index is expressed through the number of points and for the general practitioners it was 37190 (44.1%) points. The economic value of tests that were requested by family medicine doctors was 33681 (40%) points. The economic value of tests that were requested by specialists: pediatricians, gynecologists and specialists in occupational medicine were 13441 (15.9%) points. A similar is representation in percent of tests and percent evaluation of the tests for general practitioners and family medicine or the share index of GPs was 44%, share index of 40.7% for doctor of family medicine and 15.3% for specialists.

Economic analysis of the number requested laboratory tests by diseases indicate a different number of points at the requested tests and diseases. The highest costs are related to the diabetes (E00-E90), or 25.2% points, followed by costs for respiratory diseases (J00-J99), or 20.2% and then the costs of urinary tract disease (N00-N99), or 18.4%. If we take as a criterion that 27.1% of the population is affected, then based on the cost criteria and playability points on the pathological test results across all types of doctors. If we include this in the screening, it can be concluded that all patients in the study population was effectively to perform immediately urinalysis, cholesterol, triglycerides, SE, and fibrinogen, because the large presence of even more pathological results than the normal. All other analysis on the basis of such indicators was economically unjustifiable to perform in screening (glucose, CBC, creatinine, urea, AST, ALT, Ca, and P). It is necessary to establish criteria for rational requests of supplemental tests with clear guidelines.

By percentage most common laboratory tests in the leading disease or metabolic syndrome, requested by doctors in family practice were as follows: Chol., TGL., glucose, ALT, AST, SE, urine creatinine and urea. General practitioners were requesting most often cholesterol and triglycerides test, family medicine doctors requested less cholesterol and triglycerides tests and hmore Ca, P, fibrinogen, ALT, AST, urea and glucose levels as from the level of economic cost of these analyses has its justification. If we take the criterion that 27% of the population is affected, then the criteria of cost, feasibility of spent points on pathological test results is: 62% SE, 53% fibrinogen, 56.4% cholesterol, triglycerides 44.2%, 42.7% of urine. If we apply in the cost-effectiveness analysis the data on frequencies of pathological and normal results in family practice, the ratio of points of laboratory tests of normal and pathological results where up to 27% of pathological results; it may be required to ask a question for request of certain unnecessary laboratory tests.

Cost-Utility Analysis can be compared with the cost-effectiveness analysis, considering that with this analysis costs are expressed in monetary units, and gain in non monetary, often the quality of life or QALY (Quality adjusted life years). This analysis applies, for example the value of prevention, systematic laboratory tests in improving the quality and survival of patients diagnosed. Usability (utility) is the basis for evaluating the application of results of laboratory diagnostics in preventive examinations. In cost-utility analysis results can be expressed as the cost of obtaining healthy health care users. “Better safe than sorry.” It’s always so and the results of this analysis indicate if they invest in prevention will later be saving in the treatment of e.g. metabolic syndrome, hepatitis, respiratory, urinary diseases, and anemia of children, and populations of other age groups (3, 15, 16). Cost-benefit analysis measures the total cost of laboratory tests with the overall benefits and cost savings resulting from implementation of laboratory test (11,17). From 5333, requested tests we found 1651 pathological result. These tests have cost 22857 points which is 27.1% of total points of requested examinations, and may be viewed as the ratio of total costs expressed in monetary units with total benefits. The percentage of pathological results of laboratory tests in the previous analysis shows the usefulness of the results of requested tests in health and healing.

The percentage of normal laboratory test results in the previous analysis shows the usefulness of the results of requested tests in health care.

If we separate the rates of pathological findings of glucose, lipids, we can analyze the cost of making these tests, which indicates the possibility of rationalization of laboratory diagnosis using self-control, self-discipline or self-criticism both the patients and doctors. For the development of laboratory services with offered plenty of laboratory tests, a good selection and interpretation of results, with a range of other factors with more rational approach can be continuously used in the prevention, diagnosis and therapy. In studies of this type account can be taken and the concept of evaluation contingent-CV as a measure of readiness for the allocation of funds by individuals or groups: labor organizations for systematic, periodic preventive examinations in pilot projects. Analyses of this kind such is determination of HgA1C markers of hepatitis B, C can be difficult to determine the economic benefit: improvement of health to prevent epidemics of infectious or noninfectious diseases today such as the metabolic syndrome. Analysis of test results showing presence of the disease, the possibility of therapeutic monitoring and the need for research into the causes of disease, or preventing these diseases, using grouped search for disease (6). But by the use of specific test profiles can be obtained faster and more cost-effective result. For reasons of transparency and harmonization of economic methods and terms should be adopted guidelines for the implementation of some analysis, especially for cost-effectiveness analysis, as the most complete. Total of 5333 economically analyzed had value of 84312 points, and from that family practice requested 4515 tests which are economically valued to the
70871 points.

In family practice 3100 laboratory test results were with normal values and 1415 of the results of laboratory tests had pathological results. Economics analyzes the price of normal laboratory test results was 51584 points which is 72.8% of the total price index of family practice and the price of pathological laboratory test results was 19 287 points or 27.2%.

Analysis of the points frequency of pathological results for the most common laboratory tests showed that up to 27% pathological results had these tests in family practice: CBC, glucose, HDL cholesterol, urea, creatinine, ALT, AST, and may ask question about unnecessary requests or needs for certain laboratory tests.

Cost-of-illness-analysis is used to determine the economic impact of laboratory testing on health. In family practice price of laboratory test with pathological results was 19287 points. In family practice cost of laboratory tests: blood glucose, triglycerides, and urine pathological results were 4958 points. Price index of the total requested tests: glucose, triglycerides, and urine were 25482 which could be mainly in family practice quickly diagnosed or rationalized, which could be saved and get the same result of health.

Cost of technology becomes an obstacle for small laboratories as well as those provided in family medicine. Worldwide, there have been changes in the organization of laboratories to convert these units into the family medicine centers for taking samples that are to be processed at larger laboratories. The aim of this new organization is the need for the availability of services as close as possible to the patient and to take advantage of sophisticated, expensive technology and knowledge that are financially inaccessible to small laboratories. For laboratory medicine to survive these major changes should take advantage of advances in information technology and the digital revolution (18, 19). Well-designed (re)organization of the laboratory, where family medicine and the laboratory experts are connected and work together will increase the diagnostic value of laboratories. With this concept, laboratory professionals, beside successful management of human, financial and labor resources will provide the diagnostic expertise in health care. The role is that it so good with the cooperation of the patient, doctor of family medicine and management of medical-biochemical laboratories still produce rapid, safe and high quality findings (20, 21, 22).

And what to say at the end? In today's system of organization of Health care in the Federation BiH, there are few studies that take into account the need for reform and rationalization of health care, and that there have not compromised the health care system and the implementation of the quality of health care (23). To success we need to be driven by the quality, enthusiasm, cost/benefit that is the rationalization that is used in the model of health care, i.e., treatment, diagnosis, where among other things today emphasizes the effect. The question is whether it can survive a system where everyone has the right to all? Thus, the ratio of points of laboratory tests of normal and pathological results can be observed and proposed as a criterion for assessing the performance using laboratory tests in family medicine: the laboratory tests that are economically justifiable to demand in an analytical review of a laboratory test that can be rationalized (24).

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