REPORT

«Development of methodology and implementation of auditing and mapping within the relationship of medical care and treatment in Saint-Petersburg health care organizations on the basis of European clinical treatment models (Finland)»

Report 133 p., Fig. 19, Tables 16, references 47, appendixes 8.

VALUE BASED MEDICINE, PROCESS MAPPING, PROCESS AUDITING, SEAMLESS INTERACTION, CARDIOLOGY

The purpose of this study is to develop recommendations on health care system improvement based on auditing and mapping in the health care system organization

The object of the study are health care processes implemented in Almazov NMRC and Saint-Petersburg Policlinic #74.

During the period of scientific research the following documents were developed:

1. Methodology of Audit and Value Stream Mapping in Primary Care;
2. Process auditing for seamless interaction of health care organizations, involved in cardiology.
3. Commentary concerning proposal by Concern “R-Pro”, St Petersburg project expert, for the development of a toolkit, for the mapping of existing practices of organizing seamless services at the Almazov Centre and Polyclinic 74 in the provision of medical care based on the value-based principles and applying the experience of Finland;
4. Recommedations on seamless interaction in primary health care implementation within the collaboration between ambulance-polyclinical organization and specialized cardiological care health treatment organization.

CONTENT

TERMS AND DEFINITIONS

This report uses the following terms which have the following definitions.

Business process – formalized medical organization process description, which is performed in any of the existing formats.

Process input – the initial action of the studied process.

Process output – the result of process implementation.

Value adding operations – operations which the client of the process (the patient) can not exclude from the process, but which can be improved.

Value creation flow map – a visual instrument that reflects material and information flows.

Process map – two-dimension graphic reflection of the process, which is defining main outlines of the value cration flow as it transfers from suppliers to clients via a certain process.

Client/customer of the process – the customer of a certain process, within which health care organization is creating a product or service (for the majority of processes in case of primary medical care the client would be the patient, yet the client of the process can also be the owner of the next process within the process flow, or, alternatively, an external organization).

Process owner – the employee of a medical organization, who has the full responsibility for implementation of a certain process, its result and all the efficiency indicators, and who has the right to distribute process resources.

Losses – operations that are not adding value.

Continious improvement – weekly activities on organizational processes efficiency increase, including systematic revealation and elimination of losses.

Process supplier – supplier of input data for a certain process of medical value creation within development of product or process (usually, the process supplier of the previous process in the process flow, or an external organization).

Value creation flow – the sequence of activities (both value adding and losses), which are aiming to transform materials and information into a final product (service) suitable for the client.

THE LIST OF ABBREVIATIONS

This report uses the following terms which have the following list of abbreviations:

AWP – automated workplace

BPM –business process management

LSS –Lean Six Sigma

AIS – automated information system

APMO PMS – ambulance policlinic medical organization for primary medical care

SISF – seamless integrated services flow

VAT – value adding time

HMT – high-tech medical treatment

PIL – process implementation length

CT – cycle time

CHD – coronary hearth disease

IS – information system

CDC – clinical diagnostic center (National Medical Information Center named after V.A.Almazov)

PM – process map

VCFM – value creation flow map

MPO – medical preventive organization

MIS – medical information system

MO – medical organization

OMI – obligatory medical insurance

PMSS – primary medical and sanitary support

VCF – value creation flow

RISIHCS – regional integrated state information health care syste

SMT – specialized medical treatment

CS – cardiovascular system

CHR – chronic heart disease

HMTC MO – medical organization of high tech medical treatment in cardiology

EPC – electronic patient card

INTRODUCTION

Report was developed under the framework of an INTTERREG international project (the Baltic Sea region) to drive BSR S3 Ecosystem. The main goal of this project is to develop innovation platform and value-based medical services management (both in the field of cardiology) in Saint-Petersburg, creation of the Living Lab/Hub and promotion of the pilot project results to the other medical specializations to increase the quality of health care and well-being.

The main expected outcome of the process is to create innovative model for health care organization in Saint-Petersburg (in the field of cardiology). This model is to be based on value-based approach, which would mean shifting focus of medical organizations to patients' interests and expectations from communication with the medical organization. At the same time it means that the results of patients' treatment can be measured and objectively assessed using big data arising from patient's electronic medical card. Resources for medical treatment are in this case are to be distributed in accordance with achieved results so a comparative analysis can be performed later. This would allow assessing the final effect, both for the patient and for the health care system.

These prerequisites define the goal of research, which is to develop recommendations on health care system improvement based on auditing and mapping in the health care system organization. This goal identifies the main tasks which need to be solved as a result of implemented research.

1. In collaboration with external experts (University of Tampere, Almazov Centre and Saint-Petersburg Polyclinic 74) the research team aims to develop and justify with the Customer of the research the methodology for mapping and autditing of the processes of interaction between Almazov Centre and Saint-Petersburg Polyclinic 74 at the point of primary care in Policlinic 74 and specialized cardiological care in Almazov Centre. The methodology has to include the necessary instruments and approaches which are implemented to ensure seamless medical treatment, principles of value-based medicine and assessment of information technologies efficiency in health care.

2. Audit the existing practice of interaction between primary health care organization and specialized treatment medical center at the point of primary care in the field fo cardiology in accordance with the developed methodology of mapping and auditing.

3. In collaboration with the external experts analyze the experience of Finnish clinics, which they have in interaction between primary health care organization and specialized treatment medical center.

4. Develop scientifically justified recommendations on organizing of seamless interaction in health care for the case of interaction between primary health care organization and specialized treatment medical center (in the field of cardiology), which can also be implemented in the other spheres of medical care, including what can be digitalized by efficient implementation of information technology.

5. To assess the perspectives of “Smart health” system development in terms of its further implementation in Russian health care (based on research results).

The object of this research is health care process set, which appears in Almazov Centre and Saint-Petersburg Polyclinic 74. The subject of this research are interrelations that appear in relationship of Almazov Centre and Saint-Petersburg Polyclinic 74 when the medical treatment is being in process.

The scientific research is using both quantitative and qualitative methods, analysis and synthesis, the current level of academic proficiency, thus allowing the authors to ensure valid and proven scientific results.

1 Methodology and supplementing instruments for primary health care auditing and mapping in a polyclinic or ambulance and in an organization providing specialized health care in the field of cardiology

1.1 General statements

For the moment, implementation of Lean methodology in the healthcare system is mainly focused on business process description and the attempts to improve these processes. This fact seems to be quite reasonable since business processes constitute a great part of work of any medical organization.

Business process description gives a medical organization a number of advantages. In the first instance, it provides information transparency and passableness. It basically means that the data exchange speed between the departments within one medical organization or with an external partner dramatically increases. It mainly happens due to the appearance of a clear data translation channel and the process actors who are responsible for its sustaining in a working order. Business process provides all the actors with a uniform understanding of what is happening which results in increase in interaction effectiveness.

It is business process development that lays the foundation for further continuous daily improvement of work of a healthcare facility. It is easier to improve a clear business process than a documented but a chaotic chain of activities and events.

Business process development facilitates mitigation of risks related to taking wrong and untimely management decisions which is vital when administering first aid.

However, this technical logical sequencing of the stages makes the core meaning and essence of the work (creating a chain of complementary medical services rendered ceaselessly) pale into insignificance. It implies that a patient will be sent for examination and treatment not only within the primary care administration but, when necessary, to other healthcare facilities. Practically, the main objective to be achieved at this stage is to develop pull-system.

Pull System is an organizational system in which the way of conducting an operation is defined by the customer's requests. Thus, the work within pull system contains the processes which satisfy a customer's request, i.e. add value. Identifying how and where value is added in the organization, as well as monitoring value stream are the key steps to eliminate all kinds of losses, including the losses created in the spheres of quality of medical care and patient's satisfaction with it.

The main tool is a value stream map. In this case, its usage has the most considerable effect. Thanks to VSM, it is possible to describe any process of administering a medical service and to develop value stream in a simple and clear visual form.

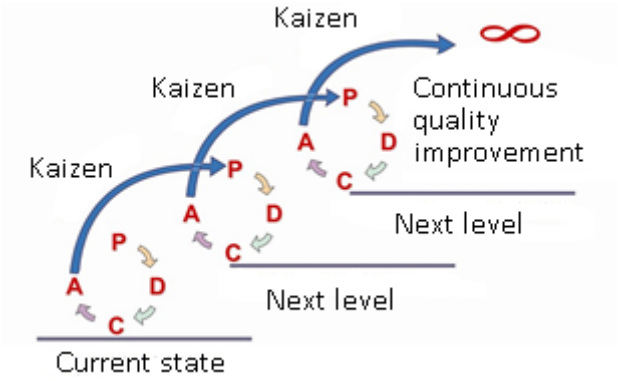
Administering primary care consists of a complex network of operations and activities. It is crucial for all stakeholders, including patients, to understand how a medical organization operates as a system. Value stream mapping allows building a holistic picture of the activities, functions and values-losses balance of a medical organization. It also enables every department and every employee to find and take their place in the organization and to see what their contribution to a final outcome exactly is.

This document represents the methodology for systematic development of value stream in administering primary care. Implementing this methodology implies gradual appliance of the necessary steps (from simple to more difficult ones) with the aim to achieve a final result, i.e. to create pull-system and consequently, to reduce losses and to improve the quality of primary care administration.

Developers of this system recommend the following sequencing of actions in order to create value stream which in its turn will allow not only to map pull system, but also to encourage the staff of a medical organization to make efforts to gradually improve their work.

1) Step 1. Conduct an audit of value stream in a medical organization within the focus area(s) – based upon the data from Polyclinic 74 and Almazov center which provide treatment in cardiology;
2) Step 2. Create a process map of the medical organization and transform the process map into a current state value stream map;
3) Step 3. Analyze the current state value stream map;
4) Step 4. Create a future state value stream map and elaborate a plan of its implementation based upon Daming cycle (Plan – Do – Check – Act) and Shukhart map.
5) Step 5. Constant improvement of all the aspects of the future state value stream map.

Every step is explained in details in chapters 4 and 5 of the present Methodology. Some recommendations on their efficient implementation are provided as well.



The objective of this methodology is to seamlessly implement administration of the primary care services in the whole chain of other medical services. It becomes possible after all the actions from the steps mentioned above are performed.

1.2 An algorithm for auditing the process in the value creation flow

1.2.1 Specific features of process auditing in primary health care

Audit is the first step of value stream mapping in a medical organization. Relevant factual data of the current state in the primary care process is essential for creating a value stream map. The data can only be obtained through auditing current processes and identifying a value stream.

Value stream audit starts with identifying the types of primary care services. Audit of each type of primary care services is performed in two steps: desk audit and field audit. In order to carry out audit, it is necessary to designate a project manager who would be fully responsible for the quality of data provided.

If audit is carried out using only internal resources of a MO, then it is preferably to designate at least two responsible employees from different departments, one of whom will take on the role of project manager. However, in order to make sure that the assessment is fair and unbiased, it is recommended to invite external auditors. The requirements to external auditors include their familiarity with the principles of Lean Production and skills of operating the tools of value stream mapping at the level not lower than that of LSS Green Belt as well as practical skills of value stream mapping and establishing a Pull System. An auditor may but is not obliged to be familiar with the principles of primary health care.

The first step to audit is desk audit. It implies studying audit documentation and carrying out surveys. In this step, the employees of the ACC fill in prepared survey forms and provide the necessary documentation on demand of project manager. You can find an

example of a survey structure in Annex 3. However, there are certain peculiarities in work processes of each MO that have to be taken into account at the stage of audit. Surveys are adjusted to specific needs of a medical organization, and process manager should obtain approval of its final content and structure from all stakeholders.

Then all the necessary arrangements to conduct the survey should be made, including providing clarifications on how to properly fill in the survey form, drafting and approving a list of participants and determining the amount of data that needs to be gathered during the survey.

As a matter of convenience, the survey is generally conducted via e-mail. The participants are then expected to submit completed survey forms at some point within the timeframe of several workdays.

Project manager is responsible for analyzing the data received through conducting the survey: they collect the data, accumulate it in a table and assess it to determine:

- Areas for field audit;
- Potential areas for implementing pilot projects of value stream mapping and optimization;
- Documentation to examine;
- List of participants for an interview.

After processing the survey results, the next step of audit is performed. Field audit is carried out on the premises of a medical organization at an agreed time and involves:

- inspection of certain focal areas relevant for value stream audit;
- a kick-off meeting with the employees;
- a short presentation about the aims and objectives of audit and VSM;
- interviewing managers and leading specialists in the chosen direction. Interviewing is conducted according to a pre-arranged schedule and is aimed at clarifying the operational princuples of isolated processes for properly mapping their value streams in order to increase effectivenes.

The interview results should be processed, organized and included into the final audit report. The final report shall include clear description of the current state of the process and value stream in the focal area with detailed descriptions of process stages, timing, extent to which the concept of value stream mapping and optimization is understood and accepted by the workers in the area.

Clear time limits should be set for conducting the audit. This rule is especially relevant when audit is performed using exclusively internal resources of a medical organization.

Basing on practical experience, experts recommend to stick to the following time limits:

1) The time spent on conducting the audit, including data analysis and drawing up a report should not exceed 10 workdays;
2) The time allocated to completing the survey should be sufficient, but not exceed 3-5 workdays;
3) The time allocated to conducting interviews should not exceed 1 workday, each interview should be limited to 1 hour.

Operating standards, production rates or information provided by process actors does not always qualify as quality data. Figures often fail to reflect the current situation, they can be overestimates or underestimates or outdated, etc.

When conducting audit, it is advisable to stick to the rule of unbiased data gathering. It implies that all performance measurements should be done by a project manager or consultant in person. All operations including timing of every step, compliance with instructions, etc. should be measured more than once – from 3 to 10 times – all measurements should be logged into a stopwatch study.

During in-person examination it should also be kept in mind that labor intensity and attentiveness tend to increase in presence of an outside observer in the workplace.

It is only by following the above mentioned principles that effective value stream mapping and optimization of primary care and stream of intercomplementary services can be delivered.

1.2.2 Medical and sanitary treatment directions in an primary health care interaction

Polyclinic № 74		National Medical Information Center named after V.A.Almazov
№	The name of the process	
1.	Primary health care arrangement: organizing doctor’s appointment or diagnostics (laboratory or instrumental)	Organizing primary doctor’s appointment, or diagnostics (laboratory or instrumental)
2.	Organizing doctor’s primary visit	Organizing doctor’s visit
3.	Communication between health care system employees and patients	Communication between health care system employees and patients
4.	Organizing urgent or emergency medical treatment	

5.	Organizing dispanseriation or preliminary medical examination	
6.	Organization of dispansery observation	
7.	Organization of rehabilitation	
8.	Organizing the referrals and preliminary appointments by the primary health care doctor to special medical treatment center for a visit or hospitalization	Organizing the referrals and preliminary appointments to the primary health care for dispanserization or continuous assessment
9.	Organization of telemedical consultancy	Organization of telemedical consultancy
10.	The use of information systems and services (electronic medical card, electronic certificate for incapacity to work electronic recipe etc.)	The use of information systems and services (electronic medical card, electronic certificate for incapacity to work electronic recipe etc.)
11.	Organization of information data flow of patients' data between doctors and medical organizations	Organization of information data flow of patients' data between doctors and medical organizations
12.	Assessment and registering in medical documents the results of patient's health condition and dynamics (same for a population group or patients' sample)	Assessment and registering in medical documents the results of patient's health condition and dynamics (same for a population group or patients' sample)
13.	Keeping record of registered patients' list and their disease history	
14.	Patients' reclamations processing organization	Patients' reclamations processing organization
15.	Assessment of the need for health resources at the primary stage of medical care	Assessment of the need for health resources at the required stage of medical care

1.3 Value creation flow development method

1.3.1 Reflection of the current state of the value creation flow

Conducting audit in compliance with the requirements described above ensures reliability of obtained data concerning the current state of a MO, its processes and value stream. However, it is often challenging to create a VS map using the obtained data, especially in the beginning of VS mapping implementation.

Hence, creating a process map can become an additional step between audit and VS mapping. In this case, a process map acts as a kind of a starting point for further mapping of

process stages, identifying problems in implementation of the process or its steps. Process mapping also helps to gain practical experience of visual process modeling as opposed to textual descriptions which are still prevalent in the medical field.

Process map

Process mapping is one of the methods for schematic representation of a process. PM is a cut of two process parameters. The parameters that form the axes can be chosen according to the project objectives. The best combination with regard to VS mapping objectives is sequence of process steps and value-added chain. A general outline of a PM is represented in Fig.1.

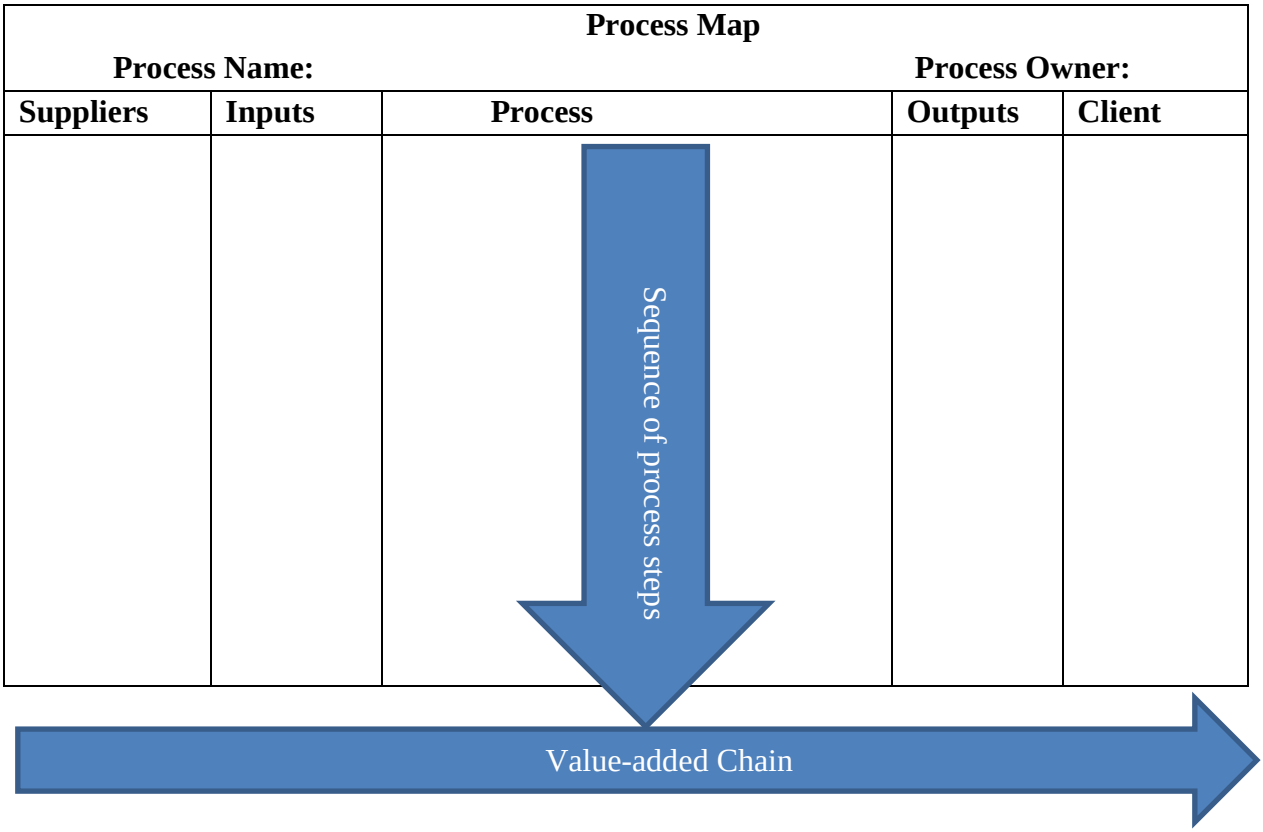


Fig.1. General Outline of a Process Map

Value-added chain starts with initial supplier and follows through to process customer. And that is exactly how this axis is generally visually described, it can be represented by the following algorithm: "supplier→input→process→output→client". The following elements can be added to this algorithm as well:

- requirements – a list of essential conditions for process running or accepting process results (the requrements can be established for each of the process outputs);

- resources – information concerning resources used in a process can be added to a process map for team discussions of improvement opportunities and their optimization;
- monitoring – the resources and actions that can potentially be needed for continuous monitoring of process quality can also be indicated in a process map,
- problems – a process map can also be a helpful tool for idetifying problems and bottlenecks,
- corrective actions – after assessing the identified problems, possible corrective actions can be proposed within the process map, which only makes it more informative.

All in all, process mapping offers a range of advantages. Clear sectioning allows for readability and its informational capacity makes it a great tool for shared use and team discussions.

Common Rules for Process Mapping

Compliance with the rules and algorithm for mapping ensures effectiveness of modeling and use of a process map. Therefore, it is preferable to strictly follow the following steps for creating an informative and relevant process map:

The following algorithm for process mapping is proposed:

1) Process mapping starts with gathering relevant data. This step is already included in the present Methodology as one of the audit stages. Therefore, it is the data gathered through audit that should be used in process mapping.
2) Identifying the place of a given process within the process network of an organization is important when process approach is complexly implemented in a MO. However, it is commonly not the case, and process mapping can occur at early stages of adopting process approach. Therefore, this step is necessary only when there is a formed process network.
3) Before setting to process mapping it is also important to decide whether to use standard elements alone or add some extra elements to the value added chain. It is no use adding every element possible in keeping with formalistic approach, the decision should be made only with reasonable and practice-oriented concerns specific for the given objective in mind.
4) The next step is to determine process limits, or, in other words, its initiation and completion. Process initiation is an event that acts as a trigger firing the modeled

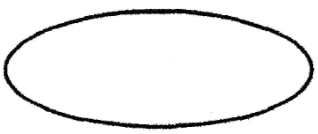
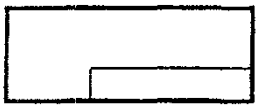
sequence of process steps. Process completion is generally an event which is determined by developer as the ending point of the process.

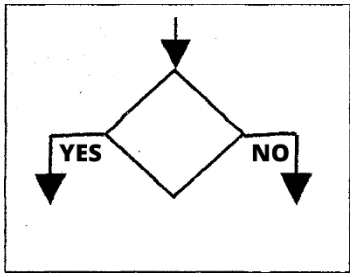
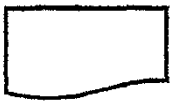
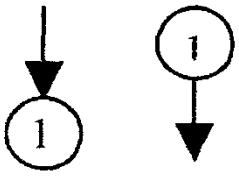
After implementing the preparatory steps mentioned above it is time to get to the actual mapping. Modeling can be done as a drawing on a sheet of paper or using MS Office Word. In order to make a process map, the following steps should be taken:

5) Divide a page into process map modelling sections as shown in Fig.1.
6) Give the process a name that will reflect its contents.
7) Specify a process owner. The worker that is identified as process owner will take full responsibility for process implementation and its outcomes. They should also have the right to ditribute all the resources necessary for successful process completion.
8) Model the sequence of process steps. For process map modeling use graphic elements shown in Table 1. For more convenience, they are also given in Annex 2. Designating a responsible persons for every process step can help to distinctively divide responsibilities of all process actors.
9) It could also be helpful to identify process efficiency indicators in order to facilitate efficiency evaluation. They can be presented under the body of the process map.

A process map made in compliance with all mentioned rules describes a value stream in its integrity showing its flow from supplier to customer through a certain process, but does not give thorough description of how value is added during the process. It is only by using value stream mapping that such analysis can be performed. The next paragraph provides insight on using this tool. Process map also acts as reference material for VSM, allowing for more detailed analysis of existing processes and establishing a pull system.

Table 1. Elements used for process mapping

Symbol	Process elements	Examples
	Event which launched a process or put it to an end	Request for proposal. New requirement from a customer.
	Action and actor	Holding a meeting – CEO. Giving a phone call – sales manager.

	Choosing an alternative solution. A question with two possible variants: yes/no, approved/denied, meeting the criteria/not meeting the criteria	Is there a mistake? Is the blank completed fully? Has the message been delivered?
	Document	Report, completed blank, minutes of a meeting
	Delay	Waiting for a message, waiting for a responsible manager's decision
	Transition to the next process element	After a document has been printed, it has to be registered
	Continuation	Proceeding to another page or another part of a table

Value Stream Mapping of Current State

VSM allows for thorough description of a value stream flow from supplier to customer. Value stream in primary care comprises all activities, whether value added or not, necessary to organize all main flows of ambulatory health operations from patient making an appointment to receiving high-quality medical services as well as managing paperwork.

Making a VSM is a key step of improving AHC processes, and a powerful tool for loss control as it helps to see a process in its integrity instead of focusing on a set of isolated steps and indicators. Not only does it allow for losses detection, but also facilitates loss control by identifying their causes.

VSM serves as a tool used to visually represent and analyze flows of medical staff, equipment, consumables, medications, etc. in a value stream as well as information flow.

As opposed to a process mapping that corresponds to push strategy, VSM allows to establish a pull system. Transition from push to pull is essential, as it contributes to customer satisfaction and cuts ineffective operations time thus reducing process cost.

VSM is applicable at all scales, from a single process to MO level, to inter-organizational level (full value stream). Starting with mapping a full value stream can be rather challenging, therefore, it is recommended that developers start at the single-process level and gradually transition to AHC level and only then tackling the inter-organizational level.

Current state VSM describes relevant stream indicators as of specific date.

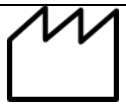
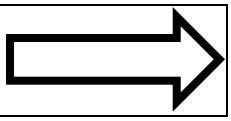
Within the framework of the present Methodology it is not practical to go into standard methods of current state value stream mapping, as in this case a VSM is created on the basis of an existing process map. Therefore, the method for creating a current-state VSM follows the following guidelines:

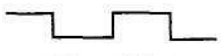
1) There is no need for additional preparation work as such fundamentals as process limits, mapping level and etc. were previously laid out in a process map.
2) VSM starts with duplicating reference information laid out in PM: process name, sequence of process steps, etc.
3) In VSM, operations are visually represented by rectangles (see Table 2) with captions containing information about operations and place of their implementation.
4) The next step is to depict material flow/patient trajectory from one process to another as well as information flow, it is usually done with lines. There can be more than one patient trajectory.
5) If batches of patients/documentation/items are queueing between processes, a special symbol for “Batch” is used. This symbol represents stalls/queues/batches. The number of elements waiting in a queue should be specified inside this symbol (see Table 2).
6) Timeline should be put under the value stream representation (see Table 2). Timeline should contain the information concerning the time spent on one patient/document/items going through operations/downtimes. Operation time is specified in sections of the timeline placed under operations, and queue time is specified under queues. If needed, a time span from maximum to minimum can be given instead of a specific period of time.
7) Information concerning transfer distance of transitioning from one process step to the other might also be specified in the PM. This indicator can be crucially

important and require significant optimization when it comes to PHC for elderly patients.

8) The last step is associated with a range of calculations providing figures concerning such fundamental parameters as process running time (PRT) and value-added time (VAT) that will be the main focus of improvement activities during optimization processes. VAT is calculated by adding VATs of all operations in a stream. In order to calculate PRT, all downtimes are added to overall stream VAT.

Table 2. Elements used for Value Stream Mapping

№	Term	Symbol	Description
1	Operation		Used to represent process operations
2	Input/Output		Used to represent process limits, describes outside suppliers, clients and external processes
3	Direction of material flow		Used to represent patients and items movement in a value stream
4	Batch		Used to represent downtimes/batches/queues. The number inside the triangle describes quantity (for example, number of people in a queue)
5	Exchange of information		Used to represent the process of on-stream data collecting. It is advisable to use this symbol to describe all additional operations
6	Conventional information exchange		Used to represent handling of hard copies
7	Digital information exchange		Used to represent handling documentation/information via special electronic system/application or e-mail
8	Additional information		Used to represent any piece of textual additional information of significant importance for analysis and potential improvement activities
9	Losses/ Problems		Used to represent identified losses or problems. Colored red. Number represents the order number of a problem.

10	Timeline		Operation/queue time or other

Value stream effectiveness evaluation is conducted to optimize the process under consideration. Optimization is built on detection and elimination of waste. In this case, the task is mainly narrowed down to analyzing a current state VSM and detecting the non-value adding elements.

The major part of optimization process lies in correlating the main indicators of a current state VSM (lead time and value added time). LD always exceeds VAT. Although it is necessary to understand to what extent these indicators differ in each case, since theoretically, one must exceed the other only by a pure process loss. If the loss is insignificant, it can probably mean that VS of an MO works efficiently enough. If, on the contrary, loss is significant, then it is necessary to start processing data gathered during an audit and related to the downsides and the problems of the process under consideration.

Process problems can be related to different kinds of losses:

- errors (in appointments, schedules, diagnoses, etc.);
- queues or patients' long wait for some documents/materials/things;
- unnecessary movements and getting around of staff/patients/materials;
- excessive stock;
- excessive unnecessary work.

However, process problems can also be associated with a whole range of such extra factors as:

- variability in operations;
- a bottleneck on a process map;
- noncompliance with regulations/instructions/standards or their total lack;
- violation of safety conditions of inpatients and staff's work space.

The main objective is to reduce losses and in doing so, optimize the process and enhance its effectiveness. In order to identify problems, it is necessary to analyze in details not only the whole process but also each element on its own. It will surely help to find the above mentioned problems and downsides, select the main ones and focus on them during the project.

1.3.2 Developing the optimal value creation flow

As a rule, optimized value stream mapping has the form of a future state VSM. The future state VSM contains an updated state of value stream with solved major problems and eliminated main losses (the ones which can be eliminated within the framework of a present project). In some cases, it is not unreasonable to create an ideal state VSM (the state in which all possible losses were eliminated). In this case, developers get an ideal VS which will guide a team through a process to attain the set objectives.

The basis for a future state VSM lies in creating a chain of processes, not a chain of separate steps. A chain of processes connects some separate processes with clients either via stream (no losses between operations) or via pull system. In pull system process produces only what customers demand and when they do it. Future state VSM is carried out on the basis of the same rules and symbols as is current state VSM. Future state VSM implies elimination of not all losses but only those whose elimination will have the greatest impact on a process.

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In order to create a future state VSM, it is advisable for a project manager to answer a few questions beforehand. Each of them is designed to facilitate VSM optimization.

- Is it reasonable to revise and enhance the existing instructions/procedures/standards?
- How well do we understand the client/the patient?
- Do we abide by their (the client/the patient) interests when making decisions?
- Usage of which resources can be reduced without damaging the process?
- What is the optimized duration of the stream?
- Which operations do not add value and can be eliminated from the VSM?
- Which operations can be interchanged to facilitate process optimization?
- Which operations can be fractured and divided between different staff members?
- Which operations can be merged together time-wise or space-wise?

- How can equipment and materials be placed to improve the process efficiency?
- How to organize the logistics of the patients and the medical staff in the best possible way?

After creating a future state VSM, it is necessary to make a future state roadmap and standardize the achieved improvements. In this case, standardization is needed to prevent losses and reversion to a previous state.

In other words, a future state VSM evolves into a current state VSM. Thus, a new cycle of creating a future state VSM begins. That is the way the principle of continuous improvement is implemented.

1.4 Software for value creation flow management

Today, it is clear that mapping and value stream management is completely digitalized. The clear advantages of digital format are replicability and availability of information transfer to any party at any given moment. Apart from that, there is a range of process management software applications that allow for more convenient process mapping and value stream maps optimization.

Basic schematic representation of a process can be done using any office software application (Word, Excel, Visio). They allow for compliance with the rules for process or value stream mapping while giving more graphic process representation than plain text. However, modeling with these tools can be rather time-consuming as they are not tailored for the purpose of mapping and map analysis. For instance, it is not feasible to make a process consisting of over 20-30 steps look clean and accessible of a sheet of paper, and such tool of representation would not be quite suitable for a notably large body of information. Moreover, even navigating among a hundred process maps to find the needed model would be too time-consuming.

Primary care is a massive complex of processes, each of which should be modeled and placed in a hierarchy of processes for more efficient management. Moreover, value stream mapping in a medical organization is more complex than, for example, in industries, as there is much less practical experience in the field of healthcare. Thus, it is clear that using office software applications for value stream mapping is not adequately effective, but can be opted for at the initial stage of adopting systematic mapping.

If specialized software is used, mapping will be much more convenient and much less time-consuming thanks to the software tools. Special applications help organize the information about existing VSMs and present it most conveniently.

Special applications for process and value stream mapping fall into the category of BPM (Business Process Management) systems. iGrafx BPM (Germany), ARIS (Germany), IBM BPM (USA), Business Studio (Russia), SoftExpert BPM (Brazil) and other are examples of such specialized applications.

BPM systems provide a wide range of tools allowing for qualified value stream mapping and management.

First of all, BPM systems offer special tools for mapping processes and value streams, as well as for establishing a hierarchy of maps: from high level VS maps to single-operation VS maps. It means that there is no need for developer to search for suitable mapping symbols as they are provided and organized in a special tool bar having the parameters determined for particular symbols, which makes mapping significantly less time-consuming. BPM systems allow for convenient viewing of all mapping elements and information about them in separately opening tabs. This feature allows for instant data access without overlaying and cluttering the process description. Apart from that, these applications help create templates for repeated use. Some of the applications also offer automated mapping check-up meaning that the system runs a background check ensuring that developer observes all modeling rules.

Secondly, a BPM is a massive database of a MO and its activities. This data can be used for improvement, staff training, process statistics, proper analysis and forecasting. Implementing a BPM system also mitigates the risks in such cases as, for example, an employee quitting their job. All information concerning their work is stored in the system, which makes it rather easy for a new worker to get to know the scope of work. Moreover, corresponding documents can be attached to any process of a VS map, or any process step in virtually any format. This feature provides synchronization of process flow and document management.

All in all, BPM systems offer a wide range of tools for VS mapping, measurement of its indicators, in-depth analysis and opportunities for improvement of any process. BPM systems also allow for rational decision making and their prompt implementation.

For examples of a process map and a VS map created in a BPM application iGrafx Process for Six Sigma, see Annexes B and C.

2 Structured description of the existing health care system elements interaction the studied medical organzations of Saint-Petersburg

2.1 The results of existing primary medical treatment practice in Saint-Petersburg Polychinic № 74

2.1.1 Overall Assessment of Healthcare System in Kronshtadtsky district of Saint Petersburg

In Kronshtadtsky district of St. Petersburg, there are two functioning healthcare institutions which administer primary medical care and specialized medical care: State Budgetary Healthcare Institution of St. Petersburg "City Ambulatory Care Clinic №74" (hereinafter referred to as ACC) and State Budgetary Healthcare Institution of St. Petersburg "Saint John of Kronshtadt City Hospital" (hereinafter referred to as hospital).

Ambulatory medical care

The bulk of ambulatory medical care in Kronshtadtsky district, which totals up to 340000 visits a year, is administered by ACC in 5 stand-alone units.

General Medical Unit is located at 2A Komsomol street. It is configured to allow 660 visits per shift, two-shift work schedule.

The personnel of General Medical Unit, charged with administering primary prevention, diagnostic and therapeutic care, consists of 67 physicians and 87 nurses.

General Medical Unit consists of such departments as two Internal Curative Departments with more than contractual 26000 patients, Primary Specialized Medical Care Department, Day-time Department for 12 patients maximum, Physiatrics Department with therapeutic exercise and physical medicine rooms, Hydropathical Establishment and Salt Therapy Room. The Unit also administers primary medical care for patients with dermatovenerological, psychoneurological and diabetic diseases. Hybrid Operating Room, freshly renovated in 2017, allows to perform outpatient surgeries. The Unit also has Endoscopy Room, X-ray Department and Ultrasonic Testing Room at its disposal.

The medical laboratory carries out the bulk of laboratory tests on biochemical specimens to obtain information about the Unit patients health and covers the needs of the district residents in running immunoassays detecting HIV, viral hepatitis and syphilis.

Disease Prevention Department, renovated in 2015, administers prevention health checkups of adults on one-stop principle which basically means that patient does not need to move around ACC a lot and spend time on multiple appointments. Successfully functioning School of Health for patients with diabetes, Hypertensive Disease Prevention Center and

consultation sessions for patients with high risks of certain diseases which aim to prevent disease progress constitute the part of Disease Prevention Department.

Children's Outpatient Unit №55, put into operation in 1991, is located at 13A Zosimov street and allows 300 visits per shift. The Unit operates at a two-shift work schedule. The personnel is charged with administering primary prevention, diagnostic and therapeutic care. Children's Outpatient Unit consists of such departments as Pediatric Department, Specialist Physicians Offices, School Medical Care Organization Center, Dental Office, Day-time Department for a maximum of 5 day-patients, therapeutic exercise and physical medicine rooms.

Children's Health Center operates at the premises of Pediatric Department and is a significant contributor to disease prevention among children and teenagers of Kronshtadtsky district. It is a part of the network of eight centers located in different districts of St. Petersburg.

Children's Outpatient Unit №55 is one of few St.Petersburg medical organizations administering medical social care to children and teenagers at the premises of "Youth consultation" program.

In the period of 2013-2015, all school nurse offices, previously subordinate to Kronshtadtsky district administration, became part of the School Medical Care Organization Center of Children's Outpatient Unit №55. The nurse offices have been renovated and fully equipped, the nurses have been granted with licenses which permits them to legally practice medicine. It allowed to propel school medical care to a new level as well as to achieve efficient cooperation with the educational institutions in terms of Children's Health.

The following departments and rooms facilitate the process of administering medical care in Children's Outpatient Unit №55: X-ray Department, Ultrasonic Testing Room and Medical Laboratory Department. Clinical Bacteriology Laboratory also provides its services to the patients.

Women's Care Clinic №43 and Emergency Medical Services Center are located at 24A Vosstaniya street.

Women's Care Clinic №43 is configured to allow 90 visits per shift, two-shift work schedule. The personnel consists of 6 physicians and 8 obstetricians. The Clinic administers primary specialized medical care to the women suffering from gynecologic diseases. Physicians and obstetricians are involved in active prevention work among women of reproductive age. Their main tasks are to reduce risks of pregnancy loss, raise women's

awareness of healthy pregnancy issues, prepare pregnant women for labor and administer pregnancy follow-up and postpartum care. There is also Day-time Department for 6 day-patients within the Clinic. Women attending Day-time Department usually face with pathologic pregnancies of all gestational ages. Moreover, the Clinic is equipped with an ultrasonic testing room.

Emergency Medical Services Center has a number of twenty-four-hour ambulance crews at its disposal: an anesthesiology and acute care crew, a general medical care crew, two paramedic crews, an acute care paramedic crew and a children's acute care crew. The first anesthesiology and acute care ambulance crew in Kronshtadt originated in 2014. The first acute care paramedic and children's acute care crew appeared in 2017 and 2018 respectively. Emergency Medical Services Center of Kronshtadtsky district leaves behind many other emergency centers of St.Petersburg in many respects: medical equipment, emergency ride timing and emergency ride timing of patients with coronary vascular diseases to the regional cardiovascular centers.

Dental Department is located at 6A Internatzionalnaya street and it is configured to allow 45 visits per shift, two-shift work schedule. Department consists of Dental Therapist Office, Dental Surgery Room, Orthopedics Room and Dental Laboratory. Department provides the whole spectrum of dental care, including endodontic treatment, periodentistry, dental implantation, osteoplasty and denture treatment. Periapical X-ray Room has also operated in Department since 2014. In 2019 X-ray Room obtained the equipment which finally made denture and sinuses laminography possible.

General Practitioner Department №3 constitutes a part of General Medical Unit but stands alone. It was opened in 2009, at 9 Stanyukovich street, on the ground floor. It allows up to 45 visits per shift, two-shift work schedule. It consists of three GP Offices, Predoctor Care Room, ECG Room, Medical Procedures Room and the front desk. More than 10000 people being contractual patients of Department are administered medical care here.

The Kronshtadtdsky district residents can seek medical attention not only in the departments of ACC but in the departments of the hospital as well due to the established structure and specialty within the network of healthcare institutions. Phthisiological outpatient care is administered both to adults and children in Phthisiological Hospital Department. Department also performs functions of a TB dispensary.

Acute care is administered to adults and children of certain ages in Hospital Emergency Room. It operates 24 hours a day.

The following inpatient departments are found in the hospital and admit the Kronshtadtdsky district residents as well as other St.Petersburg dwellers: Internal Curative Department (general practice and cardiology), Department of Surgery (surgery and traumatology), Neurology Department, Geriatrics Department, Obstetrics and Gynecology Department, Phthisiological Department, Nursing Care Department and Hospice.

Table 3. The structure of insured patients

The number of insured contractual patients										
Children						Working age		Insured senior citizens		Total
0-1 y.o. (infants)		1-4 y.o. (toddlers)		5-17 y.o.		18-59 y.o.	18-54 y.o.	60 y.o. and older	55 y.o. and older	
m	f	m	f	m	f	m	f	m	f	
149	140	924	863	3138	2 798	11164	10153	3 498	8605	4132

The characteristics of the ACC ambulatory visits for the period from 2018 to 2019 are given in Annex E.

Extent of adoption of medical information system (MIS) and of electronic medical record (EMR)

Medical information system is used by 30-70% of physicians who receive outpatients or treat day-patients for the following reasons (*)

Table 4. Assessment of Polyclinic #74 processes

Process	**Implementation in MIS**	**Extent of adoption**
Physician appointment / Timetable	Yes	Yes
Patient attendance / Creating a patient's EMR, including a consultative medical report	Yes	Needs further implementation in order to fully adopt*
Patient journey within long-term follow-up on the basis of age and sex	No	No
House call	Yes	Needs further implementation in order to fully adopt*
Telehealth consultation	No	No
Referrals for laboratory tests	Yes	Partially* (for another laboratory)
Referral to another outpatient facility for medical examinations and consultations	Yes	Yes

Long-term follow-up	No	No*
Electronic fit note	Yes	Yes
Discharge epicrisis	Yes	Yes
Physician appointment	Yes	Yes
Medical billing process	Yes	Yes

Table 5. Staff structure

Staff	**As of 01.01.2019**				**As of 01.01.2020**			
	Posts			the actual number of employees	Posts			the actual number of employees
	the number of posts allocated (measured by Full Time Equivalent (FTE))	the number of posts taken (measured by FTE)	%		the number of posts allocated (measured by (FTE))	the number of posts taken (measured by FTE)	%	
Physicians	181,25	162	89,3	148	185,5	171,25	92,3	156
Nursing personnel	290,25	256,75	88,4	212	293,5	253	86,2	207
Other	190	169,75	89,3	167	199,25	183,75	92,2	177
Total	661,5	588,5	88,9	527	678,25	608	89,6	540

ACC staffing is attained thanks to secondary employment.

ACC funding comes from a few sources: insurance payments (around 63%), city funds of St. Petersburg (around 30%) and some independent payments (up to 7%).

The insurance payments come from per-capita fundings (emergency ambulance or a district GP unit) and payments for rendered medical services .

City funds generally mean the same as financing provisions of public services by the city government.

Independent payments come from rendering paid medical services preceded by signing a contract with a person or an organization that buys these services.

The main steps of organizing primary health care administration in ACC, specialized health care administration in inpatient facilities and interoperability between them, including treating cardiac diseases, are identified and described.

Characteristics of Polyclinic volumes of health care in 2018-2019 is in the Appendix D.

Table 6. Diagnostic procedures in cardiology that are performed in Polyclinic #74

Laboratory*
Clinical blood test + platelets
Alanine aminotransferase
Aspartate aminotransferase
Creatine phosphokinase
Creatine phosphokinase-MB
Troponin
Creatinine
Potassium
International normalized ratio (INR)
Instrumental
Electrocardiography (ECG) 12-channel
Holter ECG monitoring (HM ECG)
24-hour blood pressure monitoring (ABPM)
Echocardiography (ECHOKG)

* - including the ones performed in the centralized lab

Table 7. Performance indicators in cardiology that are performed in Polyclinic #74

Indicator	2018	2019	Dynamics, %
Number of newly diagnosed CVD patients	383	454	18,5
Number of primary myocardial infarctions	64	47	-26,6
of them are of working age	19	17	-10,5
Number of repeated myocardial infarctions	6	3	-50,0
of them are of working age	3	1	-66,7
Number of primary strokes, of which of working age	102	53	-48,0
of them are of working age	26	15	-42,3
Number of repeated strokes	0	0	

The number of patients who underwent medical rehabilitation in the "cardiology" profile in the polyclinic	564	369	-34,6
The number of patients referred to specialized medical institutions and received HUD in the "cardiology" profile	34	50	47,1
The number of ECGs performed in the polyclinic for adult patients with the provision of ambulances. help	14912	17695	18,7
The number of echocardiograms performed in the clinic	0	45*	
The number of ECGs performed in the XM polyclinic	420	242	-42,4
The number of ABPM performed in the polyclinic	96	110	14,6
Number of written prescriptions for preferential treatment of drugs in the "cardiology" profile	6321	9716	53,7
The number of prescribed prescriptions for patients after AMI and ACCI, including after upper urinary tract infection	222	484	118,0
Deaths from CVD, of which working age	Adult population - 34 362 Of them working age - 22 570 Total deaths per 100 thousand - 148.68 Able-bodied person per 100 thousand - 39.9 The number of patients who died from ischemic heart disease (at home) - 58 Of these, of working age - 8	Adult population - 34,224 Of them of working age - 22 472 Total deaths per 100 thousand - 214.87 Able-bodied person per 100 thousand - 35.6 The number of patients who died from ischemic heart disease (at home) - 81 Of these, working age - 7	

	The number of patients who died from CVD (at home) - 5 Of them of working age - 1	The number of patients who died from CVD (at home) - 9 Of them of working age - 1	

***** - the doctor who can perform ECHOCG was employed in 2019

Analysis of mortality from the leading causes of cardiovascular mortality by place and age for 2018 and 2019

Table 8. The cardiological causes of mortality in Kronshtadt

Mortality reson	total	St. I. Kronshtadsky hospital	At home	Above 60	Including above 80	Working age	Year
CVD	35 OHMK 17	30 OHMK 13	5 OHMK 4	34	19	1	2018
	45 OHMK 19	36 OHMK 14	9 OHMK 5	39	26	6	2019
IHD	120	62	58	111	66	8	2018
	155	77	78	120	81	35	2019

The share of residents of the Kronstadt region who died from CVD, including ONMK, and coronary heart disease in 2018 and 2019, aged 80 years or more, ranged from 52 to 57%. The largest share of deaths of the working-age population was registered from coronary heart disease in 2019 (22.2%) with significant growth dynamics compared to 2018. The dynamics is observed against the background of a decrease in the incidence of primary and repeated heart attacks, including those of working age (table), i.e., mainly due to chronic coronary artery disease.

2.1.2 Directions for primary health care in the polyclinic

The main steps of organizing primary health care administration in ACC, specialized

health care administration in inpatient facilities and interoperability between them, including treating cardiac diseases, are identified and described.

The essential requirements to the processes and the deliverables which characterize the areas of expertise in outpatient facilities are defined and listed below: amounts of time allocated to healthcare delivery are accorded with Territorial Program of Free Healthcare Delivery in St. Petersburg; adherence to healthcare delivery procedures and standards are accorded to the provisions of Federal Law № 323-ФЗ dated November 11, 2011 "On Public Health Protection in the Russian Federation"; medical documentation and EMR completeness are accorded with the provisions of Order of Ministry of Health of the Russian Federation № 203н dated May 10, 2017 "On Assessment Criteria of Healthcare Delivery Quality"; completeness of patient's symptoms recording and accessibility of patient's health status in the medical documentation (EMR) for analyzing, including diagnostic test results and telehealth consultations are accorded with the provisions of Order of Ministry of Health of the Russian Federation № 203н dated May 10, 2017 "On Assessment Criteria of Healthcare Delivery Quality" and Order of Ministry of Health of the Russian Federation № 965н dated November 20, 2017 "On Procedures for Healthcare Services Organization and Delivery with the use of telecommunications technologies"; completeness of registration and availability of health resources, including medicine provision and healthcare services, for analysis require a regulatory document which sets requirements to information support of an activity in question which can be applied at the federal subject of Russia level as well as improvement of EMR and REGIZ platform; delivery of social benefits related to ACC healthcare administration to benefit-entitled citizens, e.g. supplemental drug coverage for certain categories of benefit-entitled citizens in accordance with the provisions of Act of Saint Petersburg № 728-132 dated November 9, 2011 "Social Code of Saint Petersburg"; procedures for reviewing citizen appeals are accorded with the provisions of Federal Law № 59-ФЗ dated May 2, 2006 "On Reviewing Citizen Appeals"; staff development is accorded with the provisions of Order of Ministry of Health of the Russian Federation № 926 dated November 21, 2017 "On Concept of Development of Continuous Medical and Pharmaceutical Learning in the Russian Federation for the period until 2021".

The methodology of obtaining the deliverables for conducting audit was developed. It consists of: primary data sources: primary medical documents, registered forms, including those of state statistical monitoring, data base of all contractual patients on the base of "Ariadna" MIS implemented in ACC, patients registry, "Supplemental Drug Coverage"

program; data collection methods: reviewing documents and data base analysis.

The assessment (audit) of distinguished areas (processes) regarding the set requirements was conducted on the base of the elaborated mapping/audit methodology.

Inputs	Patient encounter (call-center contacts, front desk, online registration portal)
Process actors, algorithm/actions	Patient contacts ACC to book a physician appointment: - by contacting the appointment booking center of Kronshtadtsky district (+7 (812) 573-99-09, 8 a.m. – 8 p.m. on weekdays); - at the front desk in ACC units (8 a.m. – 8 p.m. on weekdays); - at the online registration portal www.gorzdrav.spb.ru (round-the-clock, seven days a week); - at the touch information terminals located in ACC units (8 a.m. – 8 p.m. on weekdays, 9 a.m. – 3 p.m. on Saturdays); - during attendance (physician books a follow-up appointment or refers to another physician for the first attendance). Physician refers patient for a diagnostic test or a blood test conducted in ACC during attendance and mainly via MIS.
Outputs	Patient appointment for a specific date and time
Customers	Patient, physician
Requirements	Booking a physician appointment during 24 hours from patient encounter. Booking a physician appointment or registering for diagnostic test in ACC during 24 hours from patient encounter. In case if it is impossible to do within this timeframe, patient is put on a waiting list and given a call when some patient denies their appointment due to some reasons and there is an available appointment in the timetable.
Monitoring	Medical Information System: the number of available appointments for first attendance appointment, the number of patients on a waiting list.
Non-conformities	No available appointments with a range of physicians and for instrumental tests within the set timeframes
Physician's appointment	
Inputs	Patient appointment for a specific date and time
Process actors, algorithm/actions	Physician and nurse (obstetrician-gynecologist and obstetrician) receive patient. Scheduled visit is only possible when preceded by an appointment. In case of acute emergency, booking appointment is not needed. Physicians' schedule includes both morning and evening appointments during the week. Physician asks patient about their symptoms, examines patient, analyzes the results of the available diagnostic tests, makes diagnosis, refers patient for supplemental diagnostic tests and consultations with other physicians to specify diagnosis (if needed) and assigns therapy.
Outputs	Diagnosis, referral/appointment for consultation/diagnostic test, regimen, drug therapy and diet recommendations, medical prescription, fit note, follow-up appointment
Customers	Patient, physician, specialist physicians, diagnostic centers, pharmacy
Requirements	Visiting physician within scheduled appointment timeframe. In case of acute emergency – within 2 hours from patient encounter

Monitoring	Medical Information System: the number of unavailable appointments and the number of available ones for acute emergency patient.
Non-conformities	Some physicians got their available appointments categorized in accordance with reasons and conditions of patient encounters (primary, follow-up, prevention, dispensary, acute emergency, day-patients, etc.)

Patients' referral of primary care physician to specialized medical facility for consultation or inpatient admission

Inputs	Referral for consultation/inpatient admission following the results of physician appointment
Process actors, algorithm/actions	Referral patient to a specialized medical facility for consultation or inpatient admission is done via online appointment scheduling service (either via the one operating on REGIZ platform or the other provided by Territorial Fund of Compulsory Medical Insurance; both services are widely used in St. Petersburg). The systems allow to book an appointment only for available dates and time. Putting patient on a waiting list is not envisaged as it then becomes necessary to attempt to book an appointment repeatedly during a follow-up appointment if it is possible (if there are any available appointments). This appointment booking model allows patient to get to specialized medical care facility right before appointment time and minimizes patient waiting time. If the other appointment booking model is used, patient/healthcare agent is given a paper referral to a physician during their attendance as well as a contact number of the specialized facility patient is being referred to.
Outputs	Patient appointment for a specific date and time of consultation/inpatient admission
Customers	Patient, physician, specialist physician
Requirements	Patient appointment for a specific date and time within 14 days period from the date of patient's attendance
Monitoring	Not applicable
Non-conformities	In most cases, online appointment booking is impossible due to the absence of available appointments. Waiting time when booking online a first appointment with physician and cardiologist exceeds 14 days. Waiting time when first calling Almazov NMRC Centre to book an appointment exceeds 14 days. No possibility of monitoring the need in consultations/inpatient admission.

Prevention of medical examination

Inputs	Patient encounter in Prevention Medical Examination Department during its working hours, prevention test booking by means of contacting a call-center, going to an online appointment platform, asking at the front desk or during a physician's attendance
Process actors, algorithm/actions	The first stage of long-term follow-up care of adult population is organized at Prevention Medical Examination Department. Patients provide patient intake, do anthrpometric tests and ECG, measure arterial and ophthalmotonous pressure, fasting blood sugar and blood cholesterol level with the guidance of nurses. Nurses book patient appointments for corresponding diagnostic tests (both laboratory and instrumental) and for a final physician visit within the period of long-term follow-up care.

	When conducting long-term follow-up care, the results of previous diagnostic tests (conducted within the past year) can be taken into account. Patient does diagnostic tests. During the final visit, physician determines patient's health group, decides if patient needs further examination, the second stage of long-term follow-up care included, and consults patient on their health risks. During the final visit, physician also refers patient to further diagnostic tests which are to be done at the second stage of long-term follow-up care if there is a need in them. Physician/nurse fills in only a paper long-term follow-up care record for patient. Electronic long-term follow-up care record is not needed then.
Outputs	Diagnosis, referral/appointment for consultation/diagnostic test, regimen, drug therapy and diet recommendations, medical prescription, fit note, follow-up appointment
Customers	Patient, physician, specialist physicians, diagnostic centers, pharmacy
Requirements	Completion of the first stage of long-term follow-up care in two ACC attendances
Monitoring	MIS: the number of patients that have completed long-term follow-up care process
Non-conformities	Inability to complete the first stage of long-term follow-up care in two ACC attendances due to the need for mammography screening which is characterized by long wait and one extra ACC attendance

Long-term follow-up health care mangement

Inputs	Putting patient on a list of patients who need long-term follow-up care
Process actors, algorithm/actions	Physicians (GPs, pediatricians, specialist physicians whose field of professional expertise covers patients' diseases) administer long-term follow-up care of patients who used to suffer from acute and chronic diseases. Follow-up appointment dates and a list and frequency of necessary diagnostic tests are determined by physicians basing on medical care administration standards and clinical practice guidelines for disease under concern from professional medical organizations. The patient's personal data gathered within long-term follow-up care, diagnostic test results, etc. are noted down in a paper long-term follow-up care record by physician or nurse.
Outcomes	Diagnosis, referral/appointment for consultation/diagnostic test, regimen, drug therapy and diet recommendations, medical prescription, fit note, follow-up appointment
Customers	Patient, physician, specialist physicians, diagnostic centers, pharmacy
Requirements	Diagnostic tests list, attendance frequency, health summaries controlled in accordance with a corresponding order of Ministry of Health of the Russian Federation
Monitoring	Not applicable
Non-conformities	Absence of long-term follow-up care of the patients who need it

Rehabilitation management. ACC does not provide rehabilitation services due to a corresponding license absence. Licence, in its turn, is only granted when Outpatient

Department of Rehabilitation and Aftercare is equipped in accordance with the corresponding standard. ACC does provide certain licensed services that are oriented to function recovery after some diseases such as therapeutic exercises and physical therapy.

Telemedical health consultancy management. The system of scheduled telehealth consultations, including online chats between physician and patient, is accorded with the Saint Petersburg legislation requirements of the Russian Federation and is currently being elaborated and tested.

Implementation of GLONASS-bsed monitoring of the ride

Acute emergency care management

Inputs	Patient encounter in ACC, calling an ambulance
Process actors, algorithm/actions	Acute emergency care outside a healthcare facility, including in-home healthcare services, is administered by ambulance brigades of ACC Emergency Medical Services Center. Acute emergency care when needed in ACC is administered by physicians and specialist physicians. Receiving acute patients with no appointment is scheduled for every hour (every two hours) in timetables of some physicians.
Outputs	Diagnosis, medical evacuation followed by inpatient admission, referral/appointment for consultation/diagnostic test, regimen, drug therapy and diet recommendations, medical prescription, fit note
Customers	Patient, physician, ACC diagnostic centers, hospital-based physician, pharmacy, Social Insurance Fund of the Russian Federation, patient's employer
Requirements	The whole timing for the examination and emergency ride should not exceed 2 hours
Monitoring	GLONASS-based monitoring
Non-conformities	Inability to receive an acute emergency call and to map a route in MIS with the use of a touch information terminal

Information system and services implementation

Inputs	Patient appointment
Process actors, algorithm/actions	Physician receiving an outpatient or treating a day-patient with use of MIS performs the following actions: - enters plaintext examination data concerning patient's condition; diagnosis causing presenting complaints; outcomes of medical procedures performed during examination; referrals to medical testing/specialized consultations; prescription and regimen. - generates electronic referrals to medical testing/consultations - makes appointments for return visits, appointments for referrals, for medical testing - issues fit notes Issues electronic prescriptions via a specialized e-service (to benefit-entitled citizens)
Outputs	Entry of examination data Electronic fit note

	Electronic prescription Electronic referral to medical testing
Customers	Patient, physician, diagnostic centers, Social Insurance Fund of the Russian Federation, patient's employee, pharmacy
Requirements	Regulations, standards and clinical practice guidelines with regard to relevant area (e.g. cardiology) and medical condition.
Monitoring	Certain electronic forms of medical documentation (number of forms issued per a certain department) Electronic prescriptions issued by each physician
Non-conformities	Unavailability of long-term follow-up care management (appointments planning, list of tests, etc.) via MIS

Staff-patient communication

Inputs	Arrangements for delivering medical care
Process actors, algorithm/actions	Front desk workers or nurse making calls (appointment reminder), call-center agents making calls (offering appointment date and time to patients on waiting list)
Outputs	Verifying and adjusting the treatment plan
Customers	Patient, medical staff
Requirements	Only applicable to appointment scheduling, patient feedback procedures are described above
Monitoring	MIS: number of appointment slots available for first appointment
Non-conformities	No indications for actions regulated by the requirements

Patients' data exchange

Inputs	Previously rendered medical care
Process actors, algorithm/actions	Patient data exchange between medical staff is performed using paper medical record and electronic medical record (plaintext examination reports, medical testing reports, numeric results of lab tests) for medical care purposes
Outputs	Currently rendered medical care
Customers	Patient, physicians, insurance companies, territorial Fund of Compulsory Medical Insurance
Requirements	Registering all rendered medical care records into paper medical record, registering certain medical documents into electronic medical record
Monitoring	Not available for paper records For electronic records – number per month, in the organization as a whole or per a certain department
Non-conformities	Some physicians do not entry data into electronic records

Patients' requests processing

Inputs	Patient requests
Process actors, algorithm/actions	Patient requests are accepted at the chief of medicine and deputy chiefs of medicine personal appointments, via e-mail as well as in written form both left in person and mailed. Reviewing and processing of requests is managed by the chief of medicine, heads of corresponding departments.
Outputs	Reply, resolution of the issue in question
Customers	Patients, medical staff, health authority

Requirements	Reply time should not exceed 30 days from request accepting
Monitoring	Reply time (according to patient request log)
Non-conformities	Few cases of late replies

Patients' requests management

Inputs	New case reported, change of disease pattern
Process actors, algorithm/action	In Saint Petersburg, there is Cancer Register and Post-Cardiovascular Surgery Diabetes Patients Register. The registers are not associated with MIS database.
Outputs	Statistical accounting of register data
Customers	Physicians, health authorities
Requirements	Entering data in compliance with format requirements
Monitoring	None
Non-conformities	None

measuring and registering health summaries of patients or patient population

Inputs	Physician examination, diagnostic tests
Process actors, algorithm/actions	Health summaries, including data collected through testing are registered in text format into paper medical record and electronic medical record, scanned copies can also be attached. Lab tests results are registered into EMR in numeric format and duplicated in hard copies.
Outputs	Entries in paper medical record and electronic medical record
Customers	Patients, physicians, insurance companies, territorial Fund of Compulsory Medical Insurance
Requirements	Registering all examination and testing results and health summaries into paper medical record, registering certain data into electronic medical record
Monitoring	None
Non-conformities	None

Assessment of demand for medical services is only partially possible. It can be performed by analyzing the number of taken appointment slots for certain services rendered in ACC. However, the lack of data on referrals to diagnostic testing and MIS operations in a format that is suitable for analysis does not allow for comprehensive assessment.

The existing procedure of interaction between an ACC and a specialized medical facility in case of inpatient admission of cardiac patients implies two types of admission: emergency inpatient admission and routine inpatient admission.

ACC emergency ambulance crews facilitate urgent patient admission to specialized healthcare facilities assigned by the responsible physician of the City Ambulance Service. In case of urgent admission caused in over 90% of cases by coronary syndrome, sophisticated medical equipment is available for conducting coronography and coronary stent insertion.

Routine in-patient admission is generally associated with medical conditions requiring

tertiary care. Such cases are identified by the ACC medical panel. Then patient is referred to consultation in a specialized healthcare facility that confirms the medical condition and determines the list of pre-admission testing. However, admission date is generally not specified and admission can occur several months later than the decision was made.

Table 9. Pattern of interaction between an ACC and an inpatient, including those treated in tertiary care

Inputs	Patient discharge
Process actors, algorithm/actions	Cardiologist, GP personally appoints a patient for examination, basing on the information in the Register for Tertiary Care Patients, assigns patient for long-term follow-up care (see process for long-term follow-up care)
Outputs	long-term follow-up care
Customers	Patients, physician
Requirements	Post-discharge patient examination
Monitoring	None
Non-conformities	None

A structured description of well-established interoperability within cardiac care administration in examined healthcare facilities of St. Petersburg is presented in Annex 2.

Development of assessment criteria of the received deliverables which characterize the actions of a primary care setting facility in the prioritized areas of expertise and include target indicator deliverables, identification of integrative deliverables of primary care setting facility actions in the prioritized areas of expertise and integrative deliverables calculation method

is possible within elaboration of processes monitoring system. It includes:

- specified requirements to a process and its results;
- re-audit of processes in accordance with specified requirements;
- process problems which need to be solved;
- risks of failing to achieve process objectives and ways of their minimizing ;
-tools for process monitoring, including a software application with an analytical module. It is practical to be implemented at the next stage of a project

We have prepared scientifically valid recommendations (proposals) for improving seamless interworking in primary care and interaction with specialized cardiologic medical facilities. These recommendations are not only applicable to cardiology, but to other branches of medicine as well, including use of modern software described below.

Areas of improvement that lead to more efficient interaction in cardiology:

- processes monitoring with regard to specific deliverables (as described above)

- assessing and registering health summaries as process and outcome deliverables;

evaluation (forecasting) of demand for healthcare resources at a certain level of medical care basing on health summaries of patients and patient population

It appears practical to identify actions aimed at improving the specified areas and planned outcomes in the next project step.

A roadmap for developing Guidelines on creating the Smart Healthcare innovative platform should be generated with regard to outcomes of implementing improvement actions in the above mentioned areas in the next step of the project.

2.1.4 Structural description fo the interaction practice in cardiology health care treatment in primary medical organization

A structured description of the existing practice of interaction in the provision of medical care in the field of "cardiology" in the surveyed institutions of St. Petersburg is presented in Appendix D on the example of the initial and repeated examination of polyclinic doctors (district general practitioner or general practitioner).

Thus, at this stage of the project, according to the developed methodology, an audit of the processes in the main areas of the Ministry of Defense was carried out.

The development of criteria for assessing the obtained indicators characterizing the activities of the primary care institution in the selected areas, including target values for the indicators, the determination of integral indicators of the institution's activities in the selected areas, the methodology for calculating integral indicators is possible when forming a system for monitoring production processes and is advisable at the next stage of the project, containing:

- refined requirements for the process and the result of the process,

- re-audit of processes in accordance with the refined requirements,

- problems within the process that require solutions and ways to solve them,

- risks of failure to achieve the results of processes and ways to minimize them,

- tools for monitoring processes, including software containing an analytical module.

Evidence-based recommendations (proposals) have been developed to improve the organization of seamless interaction in the primary health care system in an outpatient clinic

and interaction with an institution providing specialized care in the "cardiology" profile, which is also applicable in other areas of health care, like cardiology, including with the use of modern information technologies (presented in section 4).

2.2 CDC Almazov center auditing results

2.2.1 General assessment of cardiological health care in Saint-Petersburg 8

According to Petrostat data for 2018, the total incidence of diseases of the circulatory system is 34,300. 5 per 100,000 population, the primary incidence is 2,413. 6 per 100,000. The first place, both in the general and in the primary morbidity, is occupied by diseases characterized by an increase in blood pressure. In the second and third places in the number of cases are various forms of coronary heart disease and cerebrovascular diseases.

In 2018, inpatient care for diseases of the circulatory system was provided by 19 medical organizations, 9 of which were regional vascular centers, at the Almazov National Research Medical Center.

Structure and tasks of the CDC Almazov center

The Almazov Research Center is one of the largest and leading scientific and medical institutions in the Russian healthcare system.

The Center includes clinical units (the main clinical complex, the treatment and rehabilitation complex, the children's treatment and rehabilitation complex, the perinatal center, the A. L. Polenov RNINI) that provide both inpatient and outpatient medical care (within the framework of the activities of the consultative and diagnostic center (CDC).

The priority activity of CDC Almazov center is the provision of specialized outpatient medical care, and one of the leading profiles is the treatment of patients with diseases of the circulatory system. In this context, the tasks of the CDC Almazov center are to advise patients referred from primary care hospitals to clarify the diagnosis, perform complex research methods and prepare for cardiac surgery.

General assessment of the contingent of patients with cardiovascular diseases referred for consultation in the CDC Almazov center from among the citizens of St. Petersburg and the characteristics of visits under the compulsory medical insurance policy in the "cardiology" profile for 2019.

In 2019, 101,342 consultations were performed in the CDC Almazov center National Research Medical Center, including 43267 within the framework of the MHI. According to the profile "cardiology" (including cardiovascular surgery, arrhythmology), 46947 consultations were conducted, within the framework of the CHI-26563. According to this profile, 26424 patients received consultations, the average age of which was 63 years, 45% of men).

60% of all consultations in the "cardiology" profile were provided to patients with CHD and rhythm disorders of various origins. Figure 2 shows the distribution of patients according to the main diagnosis, which served as a reason for applying to the CDC Almazov center.

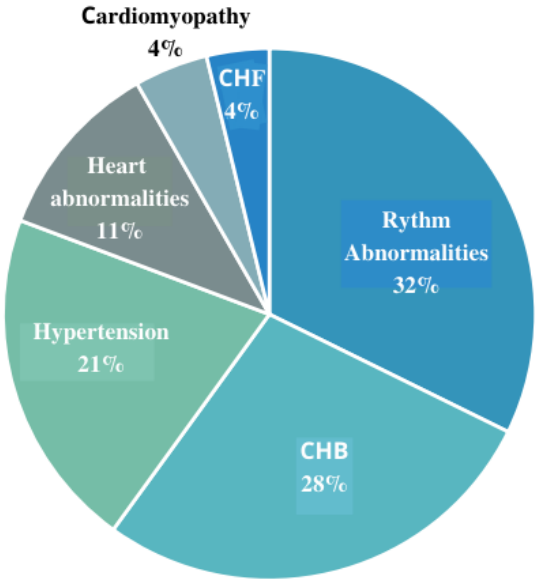

Figure 2 – Distribution of the main cardiological diagnosis

In addition to receiving cardiologists, patients were provided with narrow-profile consultations of doctors in specialized offices. In the office, programming of implantable devices was performed in 3,227 PIX programming (including CRT) for 2,968 patients. 329 patients received consultations at the center for atherosclerosis and lipid metabolism disorders. 3823 consultations were conducted for 1304 patients with CHF (including after heart transplantation). In the control room of anticoagulant therapy, 2446 consultations were conducted for 1104 patients. In the department of the day hospital of the KDC of the Federal State Budgetary Institution of the National Research Medical Center. Consultations were held for 402 patients in the "cardiology" profile of Almazov.

3843 patients were sent to the selection committee to decide on the provision of VMP in the profile "cardiovascular diseases". The selection committees were conducted in four main areas (coronary heart disease, non-coronary heart disease, rhythm disorders, vascular surgery), the distribution of the areas is shown in Figure 3.

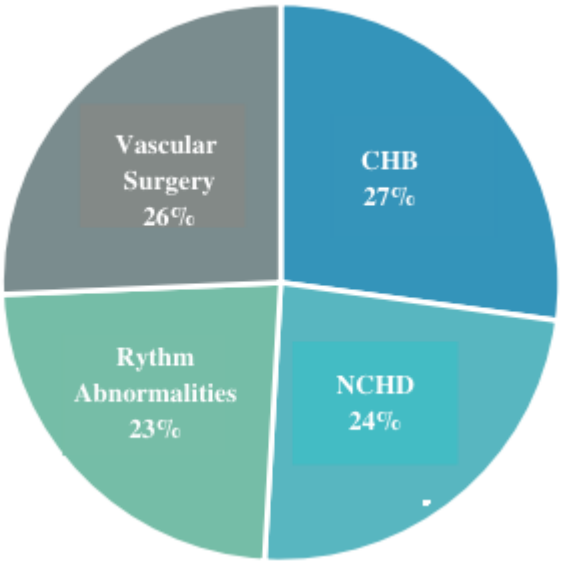

Figure 3 – Patients' distribution according to examining committees profiles

Through the appointment of a cardiologist, 2,875 patients were sent to the selection commissions, of which the indications for the provision of HTMC were determined in 1,943 patients. In order to further provide high-tech medical care (preparation of patients for hospitalization of the HTMC) at the CDC FGBU NMITs them. V.A. Almazov performed 7998 consultations for 3446 patients.

Staff sufficiency in CDC Almazov center

In addition to receiving cardiologists, patients were provided with narrow-profile consultations of doctors in specialized offices. In the programming room of implantable devices, 3,227 PEC programming (including ICD, CRT) was performed for 2,968 patients. 329 patients received consultations at the center for atherosclerosis and lipid metabolism disorders. 3823 consultations were conducted for 1304 patients with CHF (including after heart transplantation). In the control room of anticoagulant therapy, 2446 consultations were conducted for 1104 patients. In the department of the day hospital of the CDC Almazov

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CDC Almazov center has a strong staff of specialists who provide cardiological care. Cardiologists make up 42% of the total staff (55 individuals holding 22.5 positions). They include specialists of various highly specialized profiles who manage patients on problems of arrhythmology, lipidology, chronic heart failure, anticoagulant therapy, etc. The personnel structure is strengthened by the presence of scientific staff. Most of the doctors who conduct the appointment are engaged in conducting scientific research on the basis of the V. A. NMITS. At the same time, out of all the doctors of the CDC Almazov center National Research Medical Center, 26 phys. persons (20%) the main place of employment is the scientific department.

A significant part of the personnel structure is occupied by freelance employees: among cardiologists, their number is 21 individuals. face (38%). The general structure of specialists is shown in Figure 4.

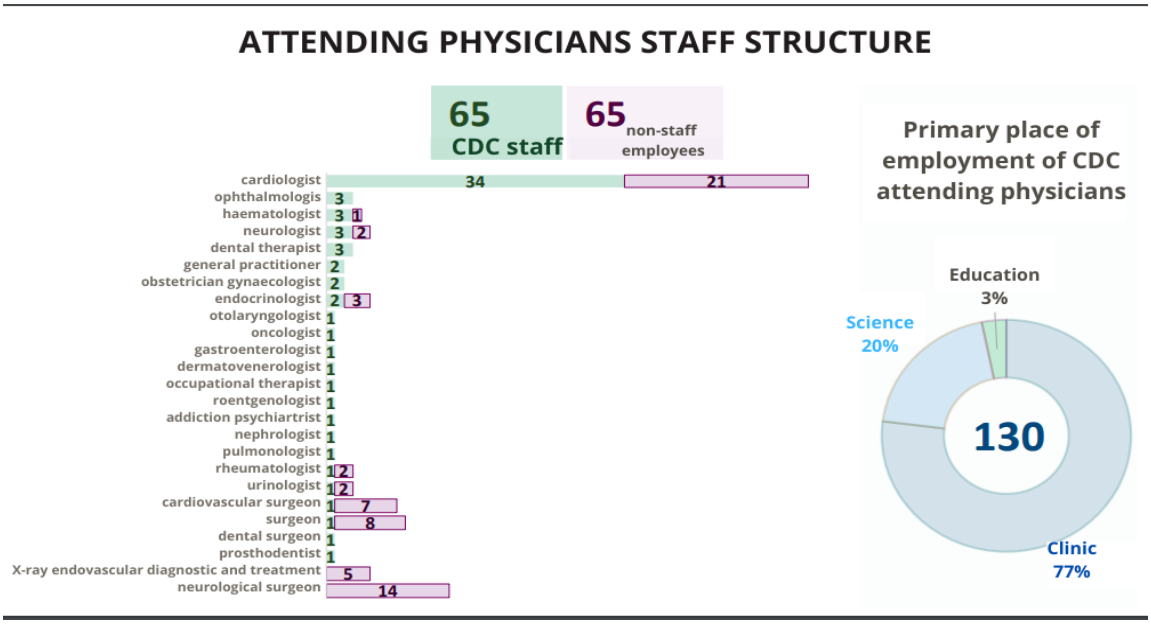

Figure 4 – CDC Almazov center doctors' structural profile

In addition to receiving cardiologists, patients were provided with narrow-profile consultations from various highly specialized profiles that manage patients on problems of arrhythmology, lipidology, chronic heart failure, anticoagulant therapy, etc. The personnel structure is strengthened by the presence of scientific staff. Most of the doctors who conduct the reception are engaged in conducting scientific research on the basis of the CDC Almazov center, while of all the doctors of the CDC Almazov center, 26 phys. persons (20%) the main place of employment is the scientific department.

A significant part of the personnel structure is occupied by freelance employees: among cardiologists, their number is 21 individuals. face (38%). The general structure of specialists is shown in Figure 4.

In addition to the cardiologists themselves, the management of patients with a cardiological profile is also carried out in close cooperation with doctors of other specialties, which provides a comprehensive examination of patients in controversial clinical situations and in the presence of comorbid pathology.

Despite the scale of the cardiology service, due to the mass flow of patients referred or self-referred to the CDC Almazov center, the demand for consultation with a cardiologist exceeds the availability of this type of medical care.

2.2.2 Identification of the processes and systems required to pursues seamless health care for the patients with heart diseases

For a long time now, health services around the world have been seeking integration and reconciliation of two major goals of modern medicine – improvement of healthcare quality and efficient use of healthcare resources. This trend has led to formulating a new paradigm in health service structuring and evaluating its effectiveness that is value-based medicine.

Quality control of health service allows for assessing the effectiveness of a healthcare system as well as for determining strategies for its improvement.

Methods of quality audit of medical care fall into 4 general categories:

1. structure assessment
2. process assessment
3. outcome assessment
4. patient satisfaction assessment

Although process approach is relatively new to the Russian health service, it has been globally proved to be an efficient tool of medical organization management. Process approach allows for modelling activities of a medical organization down to a chain of

interconnected processes and helps identify criteria for quality assessment as well as for providing insight into adequate resources supply and legal support. The fundamental tool of process approach is process mapping.

A three-level quality management system is used for managing quality and achieving continuity and sustainability of healthcare. Seamless interworking in line with principles of value-based medicine ensures effective operation of healthcare service.

Figure 1 schematically represents an overview of the system of interaction between ambulatory care clinics and Almazov National Medical Research Center that administer specialized medical care in cardiology and identifies directions that are subject to audit.

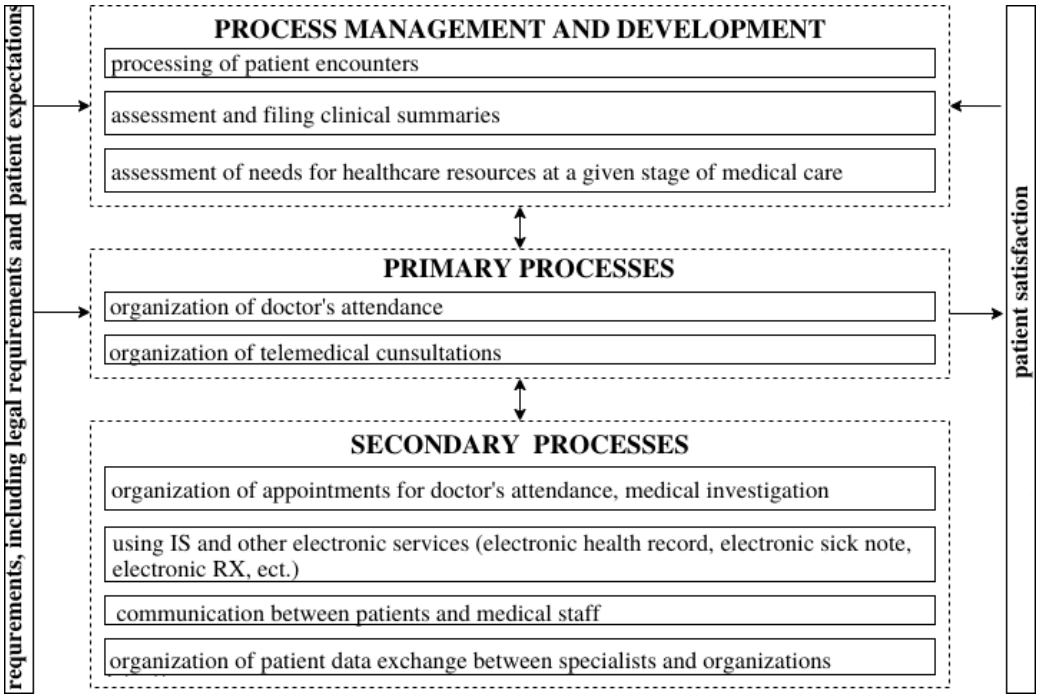

Figure 5 – Directions of interaction between ACCs and Almazov NMRC when administering specialized medical care in cardiology

In compliance with Guidelines on Process Management in Quality Management System P 50-601-46-2004 developed by Federal Unity Enterprise Russian National Scientific Research Institute of State Standard Certification (VNIIS), mapping of management and development as well as of primary and secondary processes ensuring continuity of primary care has been performed for NMRC.

An additional auxiliary process is the organization of referral for rehabilitation and dispensary observation in an outpatient clinic.

2.2.3 Processes assessment criteria and auditing

Assessing the necessity of directing patients to CDC Almazov center

On the basis of the main objectives of CDC Almazov center, as a provider of specialized medical treatment, which include: the definition of indications and the selection of the provision specialized medical treatmen, the formation and maintenance of groups of temporary dynamic monitoring, patient selection for clinical trials and research programs, counseling for patients requiring expert assessment of the controversial clinical situation, criteria for arbitrary directions were considered:

- the direction in routine clinical situations requiring specialist advice CDC Almazov center,
- referral of patients without the volume of examinations necessary for making a diagnosis and deciding on the further tactics of patient management (with the exception of such examination methods as stress echo-KG, MRI of the heart MSCT-aortic angiography).

Based on the analysis of the EMC (both using the results of the audit of the validity of the referral to the CDC Almazov center and the expert evaluation of the EMC data), it was found that more than a third of patients (36.7%) were referred to the CDC Almazov center unreasonably.

Assessment of fullness and completion of primary diagnostics of the patients sent to CDC Almazov center

In order to make a correct diagnosis and make a decision on further management tactics, including the need to provide specialized and high-tech medical care, the patient referred for consultation to the CDC Almazov center should provide a number of examinations performed as prescribed by the attending physician of the institution providing primary health care. The scope of such studies, which are necessary in various clinical situations, is regulated by the recommendations approved by the Scientific and Practical Council of the Ministry of Health of the Russian Federation, the Russian Society of Cardiology, and the Doctor of Medicine.

Insufficient examination of patients at the stage of follow-up at the doctor's place of residence leads to an increase in the number of repeat appointments per patient and, ultimately, to a decrease in the availability of medical care in the institution providing specialized care.

We analyzed the sufficiency of examinations of patients referred to the CDC Almazov center. One-third of patients (33.2%) referred to the CDC

It should be noted that in several cases (4.8%), the results of surveys of unsatisfactory quality were presented (incomplete protocols of XM-ECG and ECHO-CG, the presence of contradictory information in the conclusions, the lack of recording of studies on electronic media, the period of limitation of the survey is more than 6/12 months), which also required additional examination, including in the conditions of the CDC Almazov center.

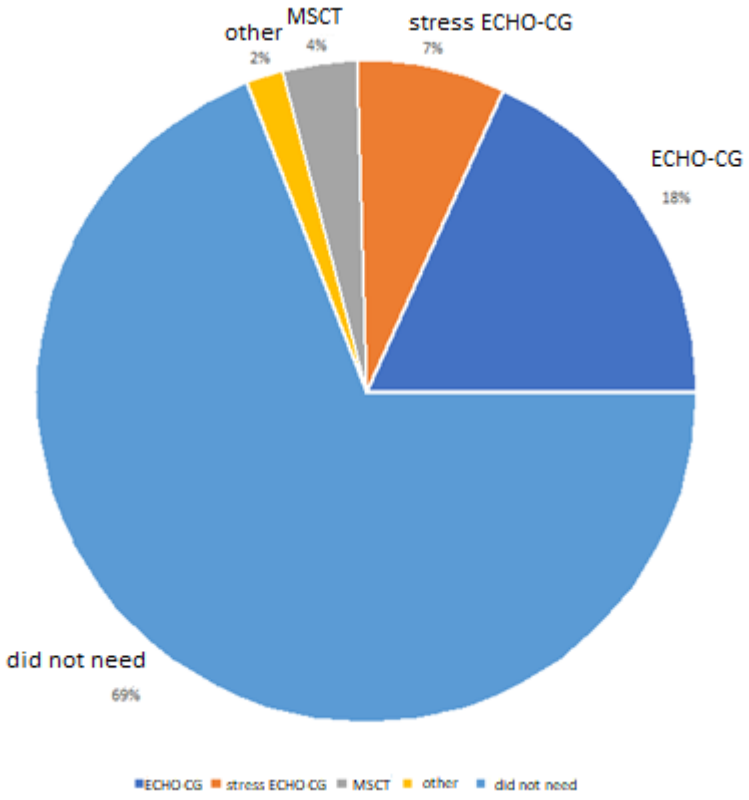

Figure 6 – The need in extra diagnostics of the patients

Assessment of fullness and completion for rehabilitation of the patients sent to CDC Almazov center

For patients receiving cardiac surgery at the CDC Almazov center, the first stage of rehabilitation begins in the intensive care unit in the early postoperative period and continues in cardiac surgery departments.

The second stage of cardiorehabilitation is carried out in the departments of cardiac rehabilitation.

Upon discharge from the hospital of the CDC Almazov center, the patient is issued a discharge document containing information about the treatment, examination, rehabilitation measures and recommendations, including recommendations for continuing drug therapy,

diet, lifestyle, physical activity, and recommendations for further dynamic follow-up (examinations, consultations of specialists) at the place of residence. Patients are also recommended to be monitored by a cardiologist at the place of residence, including for the purpose of implementing the third (polyclinic) stage of cardiorehabilitation.

The third stage of rehabilitation is extremely important and should continue throughout the patient's life. It is at this stage that continuity between inpatient and outpatient health care facilities should be ensured.

Assessing the level of interaction with regional information systems

The CDC Almazov center uses the quality management system to maintain outpatient records and inpatient medical records, however, there is no integration of the qMS MIS with regional information systems.

Interaction with AIS and REGIZ is carried out in a "one-sided" manner: doctors of primary health care institutions can register a patient for a consultation at

- the CDC Almazov center, however, there is no possibility of communication between the employees of the CDC

- with a patient. Thus, the CDC Almazov center does not have the opportunity to warn the patient about the visit and confirm the record or correct the record in case of force majeure. As a result of the lack of feedback from the institution with the patient who was initially registered for an appointment, the share of patient absences increases significantly: in the structure of patient absences for an appointment at the Almazov National Medical Research Center by appointment, the share of patients registered via AIS/REGIS is 20%.

Assessing the fulness and structure of medical data in the electronic medical card (in case of heart diseases

In the existing form of electronic outpatient records, there are the following sections: complaints, medical history, life history, epidemiological history, general examination, diagnosis, recommendations.

Structured information is provided in the following sections: life history, epidemiological history, general examination. The presence of a clear structure, mandatory items, as well as fields for free text input provides complete and unified data about the patient. However, a number of sections need to be revised.

The "complaints" section is a field for free text input. The analysis of filling in this field revealed defects in filling in the main pathologies of the CCC:

- lack of a complete description of chest pain in accordance with the criteria of typical / atypical angina pectoris (Rose questionnaire for angina pectoris, recommendations for CHD);

- no indication of the maximum values of blood pressure (BP) in the case of destabilization/newly detected arethrial hepertension (AH) (in accordance with the existing recommendations, the values of blood pressure (degree of AH) are the most important factor in determining the treatment strategy and risk stratification);

- incomplete description of the symptoms of chronic heart failure (CHF), which makes it difficult to identify this syndrome and determine the FC of CHF (lack of a description of the symptoms of CHF in accordance with the SHOKS (modif. Mareeeva,), definition of FC by NYHA).

In the section "anamnesis of the disease", the items, despite their structure, are poorly adapted to the existing needs and features of cardiological reception. In this regard, most doctors enter the history data in the field for free text input. When analyzing the completeness of the introduction of anamnesis data, the following most common defects were found:

lack of data on the onset/duration of the disease (mainly for GB, CHD),

lack of data on the dynamics of the disease (the current condition/deterioration is most often described, but not data on the course of the disease),

lack of data on previous surgical treatment,

lack of data on the therapy taken, including anticoagulant therapy, if indicated,

lack of results / summary of the results of examinations conducted outside of the Almazov National Research Medical Center, which are important for determining the diagnosis, risk stratification, selection of therapy and deciding on the further tactics of patient management.

In the section "anamnesis of life", the sections "heredity" and "smoking" are most often left blank, which is important for stratifying the risk of CVD diseases (recommendations of GB, CHD).

The main points of the section "Epidemiological anamnesis" in most cases are filled in to the required extent, however, this section does not contain such an item as the presence of COVID-19 in the anamnesis, which is extremely relevant at present.

Thus, the predominance in the structure of fields for free text input leads to incomplete and unstructured information in the patient's outpatient chart. The introduction of structured statuses with the introduction of mandatory fields can significantly improve the quality and

completeness of maintaining an electronic outpatient card, and is also a prerequisite for conducting analytical work.

- incomplete description of the symptoms of chronic heart failure (CHF), which makes it difficult to identify this syndrome and determine the FC of CHF (lack of a description of the symptoms of CHF in accordance with the SHOKS (modif. Mareeeva,), definition of FC by NYHA).

The use of telemedical technologies in interaction with medical services system and the patients

The use of remote technologies makes it possible to ensure the availability of medical care in conditions of territorial remoteness, restrictions due to the sanitary and epidemiological situation, and avoids the irrational use of health resources by allowing the patient to be referred to a medical organization.

In the CDC Almazov center, there is a sufficient material and technical base for conducting telemedicine consultations (TMK), both "doctor-doctor" and "doctor-patient", however, "doctor-patient" consultations are currently in the NMIC

The subsystem "Telemedicine" GIS.The REGIZ "doctor-doctor" has been operating at the CDC Almazov center since February 2020. 49 TMCs have been performed since then. Figure 7 shows the distribution of consultations by profile.

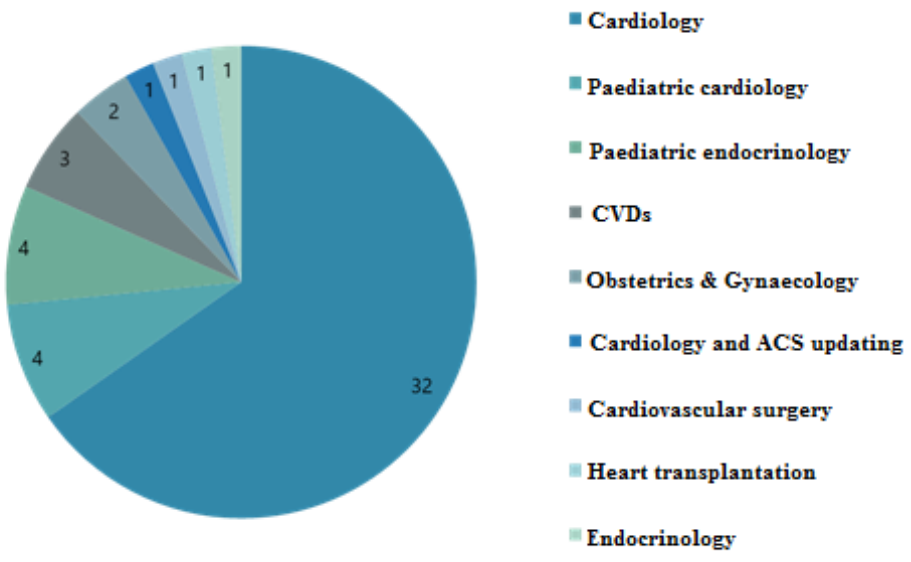

Figure 7 – Telemedical consultations profile distribution

To unify the procedure for providing assistance in the CDC Almazov center, the regulations for conducting telemedicine consultations are in effect.

Within the framework of the proposed methodology, after collecting reliable information about the process (conducting an audit of the process), data is obtained that is used to build a flow map.

2.2.4 Process mapping

2.2.4.1 Primary doctor's appointment registering or registering for laboratory and instrumental diagnostics organization

A process system for this direction (the way how identified processes are sequences and interconnected) is described in Fig.8.

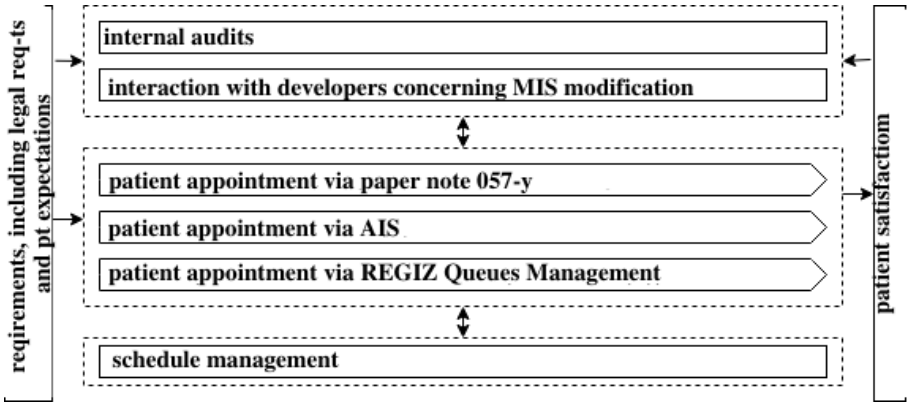

Figure 8 – Identified processes system description

The basic management process for this direction is drafting and administering a schedule of specialized medical care organization.

The schedule draft is prepared by the head nurse of the corresponding department basing on staff roster, leave and shift rosters as well as time tracker with regard to working hours and resources, capacity of state-funded medical care determined by committee on territorial program development. Doctor's attendance time is determined in lune with current standards established by the order of Ministry of Health of the Russian Federation № 336 dated November 14, 1997 "On Improvement of Diagnostic Center Activity". After obtaining approval from the head of the department and the chief physician of MO, the scheduled is registered into MIS qMS by the head nurse (see Fig. 9 and Table 10).

Figure 9 – Flow Chart of Schedule Management Process

Table 10 – Structured Description of Schedule Management Process

costumers/stakeholders	internal – consulting physicians outside – referring physician/front desk staff/call-center staff stakeholders – patient
Inputs 1. requirements (including legal requirements and patient expectations) resources required	input-schedule drafting 1. requirements: doctor's attendance time – in line with the order of MH of the RF № 336 dated November 14, 1997 2. resources: head nurses, heads of departments, chief physician infrastructure - MIS qMS information - staff roster, leave and shift rosters, time tracker (form №T-13)
actions	head of department approval, chief physician approval
outputs	data registering in MIS (head nurse)
Interaction with other processes, IS	MIS qMS 1. patient appointment 2. internal audits 1) interaction with developers concerning MIS modification
timing and sequencing	primary - 1, 2, 3
indicators	binary indicator of scheduling

There are three ways for an ACC physician to refer a patient to a specialized medical care facility: by using a paper referral form as with form 057/y-04, or by using AIS INFORM MP or REGIZ Queue Management (see Fig. 10 and Table 11).

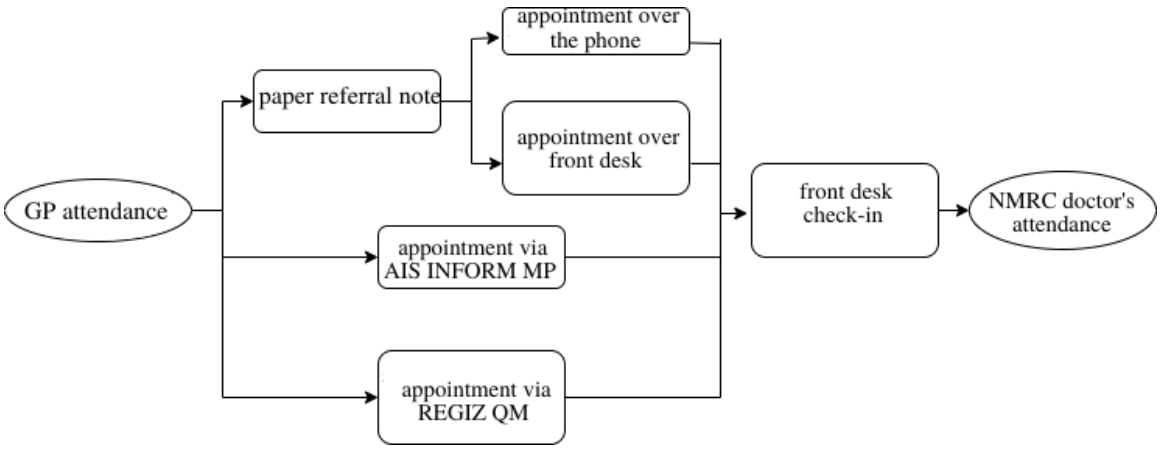

Figure 10 – Flow Chart of Appointment Making for Doctor's Attendance or Medical DiagnosticTests (laboratory, instrumental)

Table 11 – Structured Description of Appointment-Making Process

customers, stakeholders	internal – consulting physician outside – patient stakeholders – referring physician
Inputs 1. requirements (including legal requirements and patient expectations) resources required	input – GP attendance 1. referral as with form 057/u-04 validity period - no applicable regulations (letter of MH of the RF №17-8/3065416-31880 dated July 03, 2019) waiting – Local Program of Government-Funded Healthcare in Saint Petersburg for 2020 and planned period of 2021 and 2022 2. staff – front desk staff equipment – front desk staff WKS information – CHI policy, ID, Individual compulsory health insurance account number (SNILS) (if available)
actions	drafting a paper appointment note, appointment over the phone/over front desk, appointment via AIS INFORM MP/REGIZ QM front desk check-in: hospital chart, electronic medical record
outputs	doctor's attendance
interaction with other processes, IS	AIS INFORM MP, REGIZ QM, MIS qMS 1.internal audits 2.interaction with developers concerning MIS modification 1) 3.specialized medical care facility schedule managing
timing and sequencing	primary – 12 secondary – 3
indicators	share of patient appointments over paper referral/ AIS INFORM MP, REGIZ QM

In order to ensure high quality of medical care, processes of monitoring and improvement are implemented in the organization, including dynamic check, interactions interaction with developers concerning MIS modification. (see Figure 11 and Table 12).

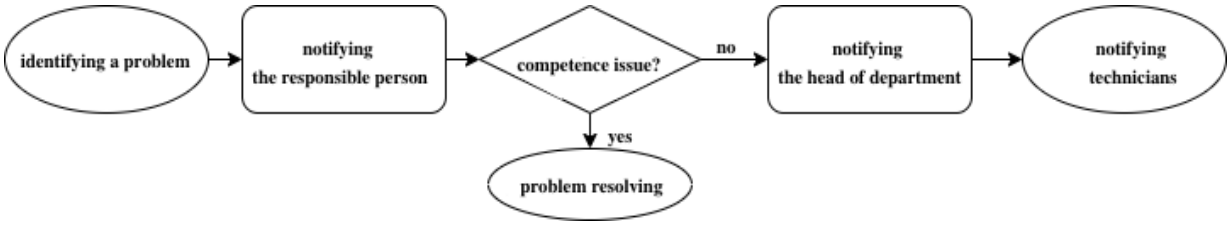

Figure 11 – Flow Chart of Interaction with Developers Process

Table 12 – Structured Description of Interaction with Developers Process

customers, stakeholders	internal – technicians stakeholders – patients, consulting doctors, referring physicians
Inputs 1. requirements	input – identifying a problem 1.expectations of patients, referring doctors – problem

(including legal requirements and patient expectations) resources required	resolving 2. information – memo staff – head of department responsible persons and technicians
actions	notifying responsible persons, head of department
outputs	notifying technicians
interaction with other processes, IS	1. patient appointment 2. specialized medical care facility schedule managing 1) internal audits
timing and sequencing	parallel – 1,2,3
indicators	number of troubleshooting requests

A responsible person is notified basing on the data collected through MIS qMS and patient requests. The data is registered and integrated. Propositions for improvement of consultation and diagnostic clinic staff performance are formulated basing on the data.

2.2.4.2. Arrangement of doctor's appointment

Within this direction, the following aspects of interaction are inspected: patient data exchange between medical organizations, assessment and registration of health summaries, using information systems and services as data resources.

Doctor's attendance is carried out in line with criteria established in article 2.1 of Annex to Ministry of Health of the Russian Federation № 203н dated May 10, 2017 "On establishing criteria for medical care quality control". The data is registered in a form №025/y "Medical record of patient receiving ambulatory care" (see Fig. 12 and Table 13)

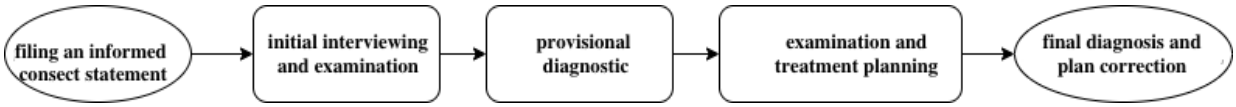

Figure 12 – Flow Chart of Doctor's Attendance Process

Table 13 – Structured Description of Doctor's Attendance Process

customers, stakeholders	external – patient stakeholders – referring physician
Inputs 1.requirements (including legal requirements and patient expectations) 2.resources required	input – filing an informed consent statement 1.expectations of patients – receiving high quality medical care 2.infrastructure – MIS and electronic medical record staff – consulting doctor
actions	initial interviewing and examination; provisional diagnosis, examination and treatment planning
outputs	diagnosis, examination and treatment plan correction

interaction with other processes, IS	MIS qMS, REGIZ 1.workplace arrangement 2.schedule management 3.patient routing 4.internal audits 1) 5.medical care quality control
timing and sequencing	primary – 3, 4, 5 secondary – 1,2
indicators	filling out all sections of patient chart; informed consent statement

All doctors of CDC Almazov center are provided with WKS with MIS installed and register all rendered services in MIS as well as filing electronic medical records. State-funded services billing is performed basing on the data provided by qMS. MIS admins carry out monitoring and improvement processes basing on the system data and memos.

qMS data is not interchangeable with account form №025/y "Medical record of patient receiving ambulatory care" due to the lack of doctor's encrypted digital signature.

As qMS is not integrated with regional information systems, exchange of patient medical data (consultation summaries, medical tests results) with ACCs in digital format is unavailable.

Use of MIS is regulated by the following internal regulations:

1. CDC Almazov center C Order №23 dated January 15, 2018 "On qMS Medical Information System Use"

2. CDC Almazov center Decree №48 dated November 24, 2017 "On electronical medical record filing in MIS qMS".

Basing on the consultation data, doctor determines the strategy of patient treatment in line with the objectives of continuity and sustainability of primary care (Fig. 13 and Table 14).

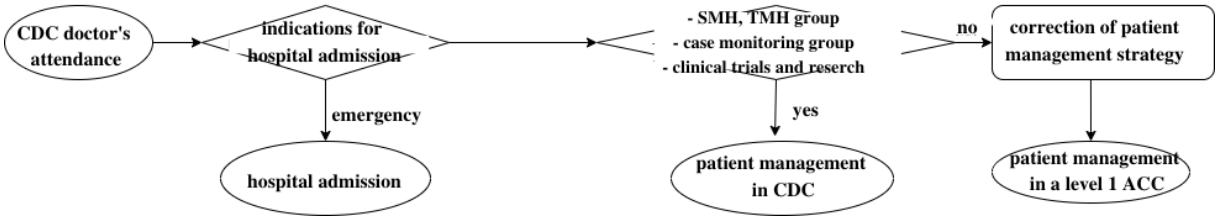

Figure 13 – Flow Chart of Patient Routing Process

Table 14 – Structured Description of Patient Routing Process

customers, stakeholders	internal – residential doctor external – patient, referring doctor

Inputs 1. requirements (including legal requirements and patient expectations) resources required	attendance of consultation and diagnostic clinic doctor 1. – 2. infrastructure – qMS, REGIZ staff – residential doctor, consultation and diagnostic clinic doctor, medical commission, referring doctor
actions	determining indications for hospital admission, patient management in a consultation and diagnostic clinic, correction of strategies for patient management
outputs	hospital admission, patient management in a consultation and diagnostic clinic, patient management in a level 1 ACC
interaction with other processes, IS	MIS qMS, REGIZ 1. schedule management 2. patient attendance 3. internal audits 1) medical care quality control
timing and sequencing	primary – 3, 4, 5 secondary – 1,2
indicators	share of patients having received specialized medical care of all patients referred share of patients referred to case monitoring group share of patients chosen for clinical trials and research

2.2.4.3 Telemedical treatment organization

Implementation of telemedical consultations is essential for seamless interworking in line with principles of value-based medicine ensuring effective operation of healthcare service. According to section 10 of article 10 of the Federal Law № 323 dated July 31, 2020 (version dated July 31, 2020) “On fundamental healthcare principles in the Russian Federation” (with amendments going into effect on September 1, 2020) implementation of telemedical technologies allows for ensuring accessibility and quality of medical care.

Administering medical care with use of remote technologies is carried out using Telemedicine subsystem of REGIZ (see Fig. 14).

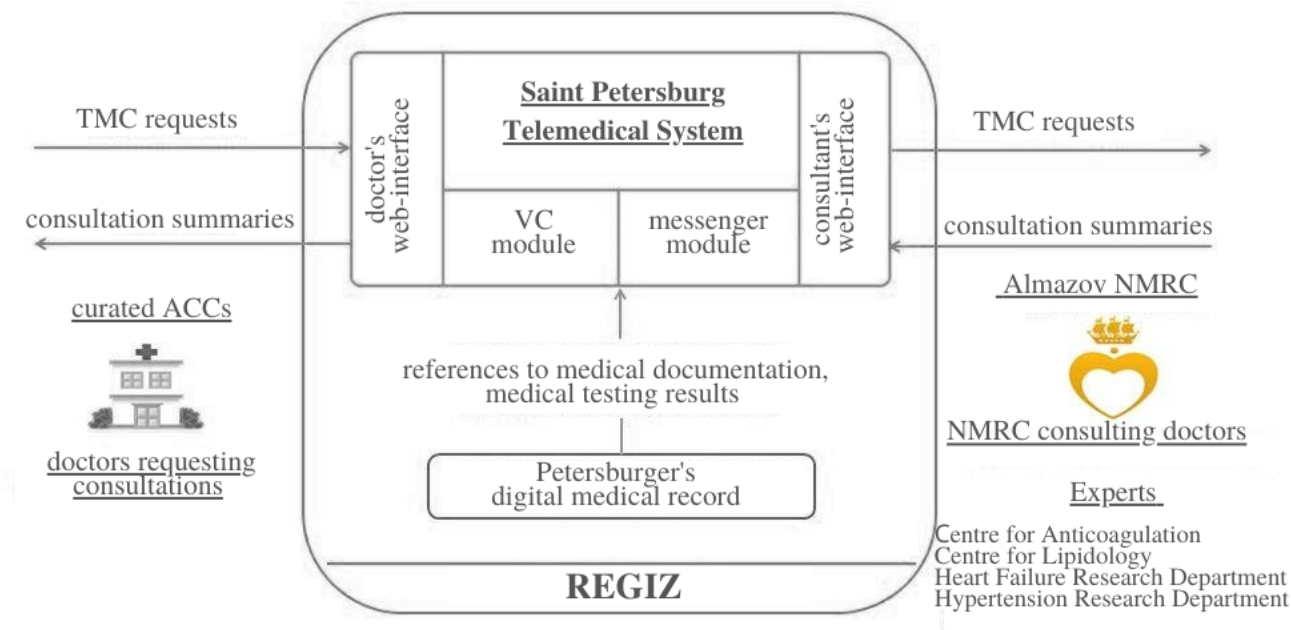

Figure 14 – Interactions with use of Telemedicine subsystem of REGIZ

The following management processes are carried out within the framework of telemedical consultations implementation: creating and managing accounts, scheduling, requests routing.

Responsible person determines which medical workers should be allowed access to REGIZ Telemedicine (medical worker's data should be registered in the Federal Register of Medical Workers of the MH of the RF). In case a worker should be denied access, the responsible person blocks their account. A schedule based on weekly workload is drafted with regard to the list of consulting doctors, and the data are registered into REGIZ Telemedicine.

Whenever a consultation request is received request routing process is triggered (Figure 15 and Table 15).

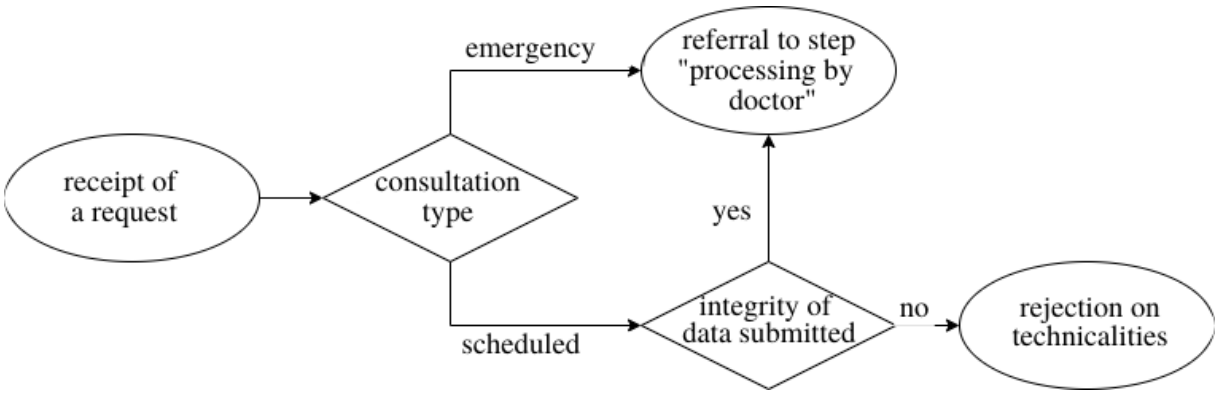

Figure 15 – Flow Chart of Request Routing Process

Table 15 – Structured Process Description of Request Routing Process

customers, stakeholders	internal – consultant external – submitting person stakeholder – patient
Inputs 1. requirements (including legal requirements and patient expectations) resources required	receipt of a request 1. waiting time for receiving a TMC should not exceed waiting time for receiving conventional medical care, set by the Local Program of Government-Funded Healthcare in Saint Petersburg 2. infrastructure – access to REGIZ Telemedicine staff – coordinator information – data for TMC (Name, D.O.B, CHI policy details and medical information)
actions	assessing of consultation type assessing the integrity of data submitted
outputs	referral to step “processing by doctor” rejection on technicalities
interaction with other processes, IS	1. accounts management 2. schedule management 3. telemedical consultation 4. internal audits 1) interaction with developers concerning MIS modification
timing and sequencing	primary – 3 secondary – 1,2 parallel – 4,5
indicators	share of requests rejected out of total requests received share of requests referred to step “processing by doctor” out of total requests received

In case if a consultation was determined to be of scheduled type, request data is referred to step “processing by doctor”. At the step “processing by doctor” medical service is rendered (see Fig. 16 and Table 16).

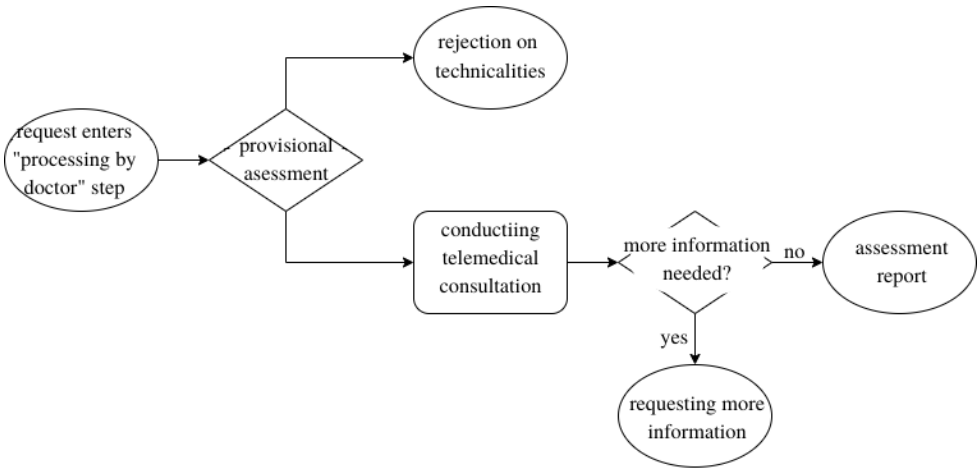

Figure 16 – Flow Chart of Conducting a Telemedical Consultation Process

Table 16 – Structured Description of Conducting Telemedical Consultation Process

customers, stakeholders	external – referring person
Inputs 1. requirements (including legal requirements and patient expectations) resources required	receipt of a request request entering "processing by doctor" step 1. waiting time for receiving a TMC should not exceed waiting time for receiving conventional medical care, set by the Local Program of Government-Funded Healthcare in Saint Petersburg 2. infrastructure – access to REGIZ Telemedicine, WKS staff – consultant medical information
actions	provisional request assessing conducting telemedical consultation
outputs	rejection on technicalities requesting more information conducting telemedical consultation
interaction with other processes, IS	1. request routing 2. REGIZ Telemedicine REGIZ
timing and sequencing	secondary
indicators	share of requests completed out of total requests received

2.2.4.4 Internal auditing process organization

In order to ensure dynamic control, internal audits are conducted (see Figure 17 and Table 17)

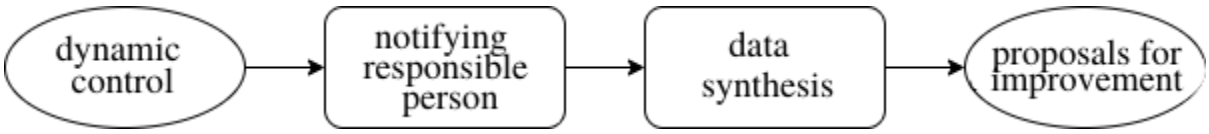

Figure 17 – Flow Chart for Internal Audit Process

Table 2 – Structured Description of Internal Audit Process

customers, stakeholders	internal – doctors, front desk and call-centre staff, heads of departments, head nurses, chief of medicine external – ACC doctors, patients
Inputs 1. requirements (including legal requirements and patient expectations) resources required	dynamic control of appointment system 1. patient expectations – timely rendered service (Local Program of Government-Funded Healthcare in Saint Petersburg); compliance of rendered services with healthcare standards 2. information– MIS qMS data staff – doctors, front desk and call-centre staff, heads of departments, head nurses, chief physician
actions	notifying responsible person data synthesis
outputs	proposals for improvement
interaction with other processes, IS	MIS qMS 1. scheduled appointment for doctor's attendance, medical tests 2. doctor's attendance 1. patient routing 2. conducting telemedical consultations written requests processing
timing and sequencing	parallel - 1, 2, 3, 4, 5
indicators	number of identified non-conformities to standards of medical care accessibility and quality

According to the order of the Ministry of Health of the Russian Federation № 226н dated May 16, 2017 "On establishing standards for quality control of medical services, with the exception of medical services administered under the legislation of the Russian Federation concerning compulsory health insurance" quality control should be conducted in order to identify non-conformities in administering medical care, including assessment of compliance with time limits of administering healthcare services, as well as to ensure accuracy of choice of prevention techniques, diagnostics, treatment and rehabilitation methods.

All cases of delivering medical services are subject to randomized spot audit within the framework of medical services quality control process (process of measurement (monitoring and improvement)). At MO scale, quality evaluation is conducted by heads of

departments (level 1), deputy chief physician (level 2) and MO's medical assessment board (level 3). Evaluation can be conducted for isolated cases of rendering medical care (sport evaluation), as well as for a body of cases grouped according to a certain thematic (thematic evaluation). Cases that provoked complaints, complaints of patient's relatives and other stakeholders are subject to compulsory evaluation.

2.2.4.5 Assessing medical employees and patients' communication

Conflicts that may occur between patients and medical personnel represent an important aspect of effectiveness of interaction between ACCs and organizations delivering specialized medical care in cardiology. Communication can either be verbal or nonverbal. Verbal communication includes written language (patient encounters and requests) and spoken language (when making an appointment or during doctor's attendance). In line with employment position instructions, medical personnel performance is regulated by principles of work and deontological ethics. All controversial situations are subject to compulsory investigation in line with applicable regulations. In order to promote standardization, algorithms of interaction with patients were developed (e.g. algorithm for counseling on leading healthy lifestyle, giving consultations on primary and secondary preventive measures for noninfectious diseases), Mystery Patient Program is also implemented.

Patient requests and encounters processing involves compulsory registration of all cases in 1C Workflow Software. Requests must not contain violations of rights and liberties of others (including foul language, threats to life, health, possessions, etc.), no disclosure of requests information is allowed (see Fig. 18 and Table 18).

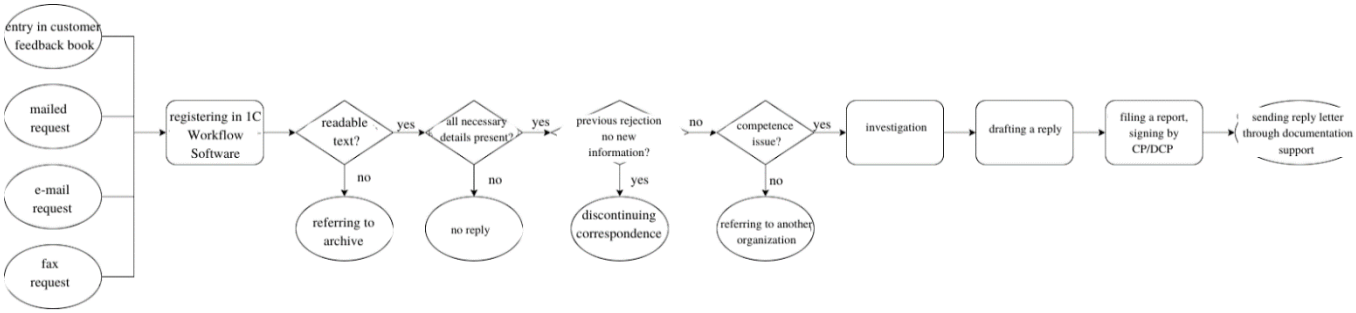

Figure 18 - Flow Chart of Request Processing Process

Table 3 – Structured description of the process of handling written appeals

customers, stakeholders	internal – responsible persons external – requesting patients, other organizations
Inputs 1. requirements (including legal	dynamic control of appointment system book of customer feedback entries, requests sent by mail, e-mail and fax 1.Requests must not contain violations of rights and liberties

requirements and patient expectations) resources required	of others (including foul language, threats to life, health, possessions, etc.) patient expectations – request satisfaction no disclosure of requests information is allowed 2. infrastructure – means of communication, 1C staff – documentation support tem, chief physicians of departments, deputy chief physicians of departments
actions	Registering in C1, request processing, drafting a reply, filing a report, signing by CD, DCD
outputs	referring to archive, no reply, discontinuing correspondence, sending a reply through documentation support
interaction with other processes, IS	MIS qMS 1. scheduled appointment for doctor's attendance, medical tests 2. doctor's attendance 3.patient routing 4.conducting telemedical consultations 1C Work Flow Software
timing and sequencing	parallel - 1, 2, 3, 4
indicators	share of satisfied requests out of total requests received

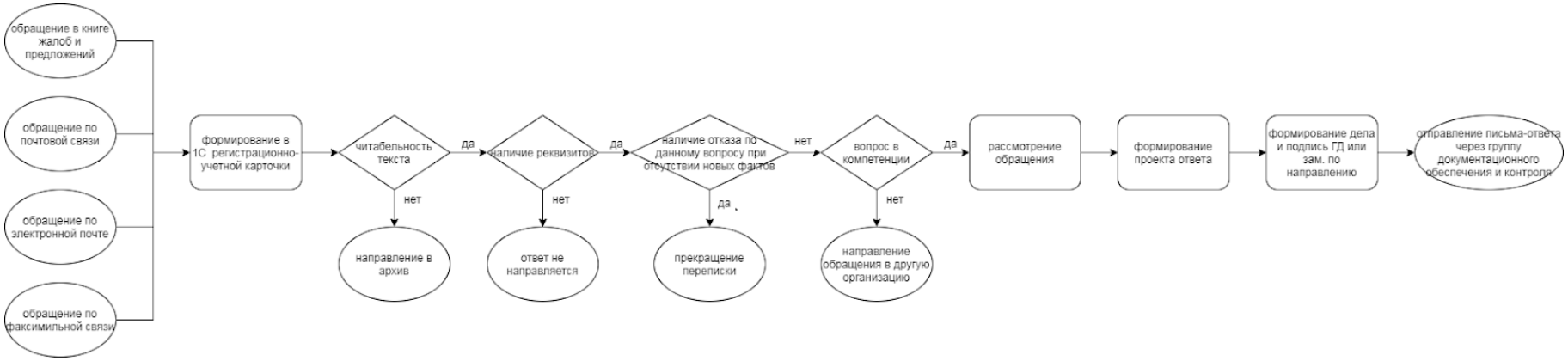

Figure 19 – Flow Written addresses processing flow chart

2.2.5 Negative features characterizing the efficiency of cardiological patients' treatment and the ways to eliminate them

Based on the mapping of processes of interaction between CDC Almazov center and ACCs, as well as on the results of internal analysis and audit of medical care processes, we have identified a number of main factors that cause a decrease in the treatment effectiveness of patients with cardiovascular diseases (Figure 20).

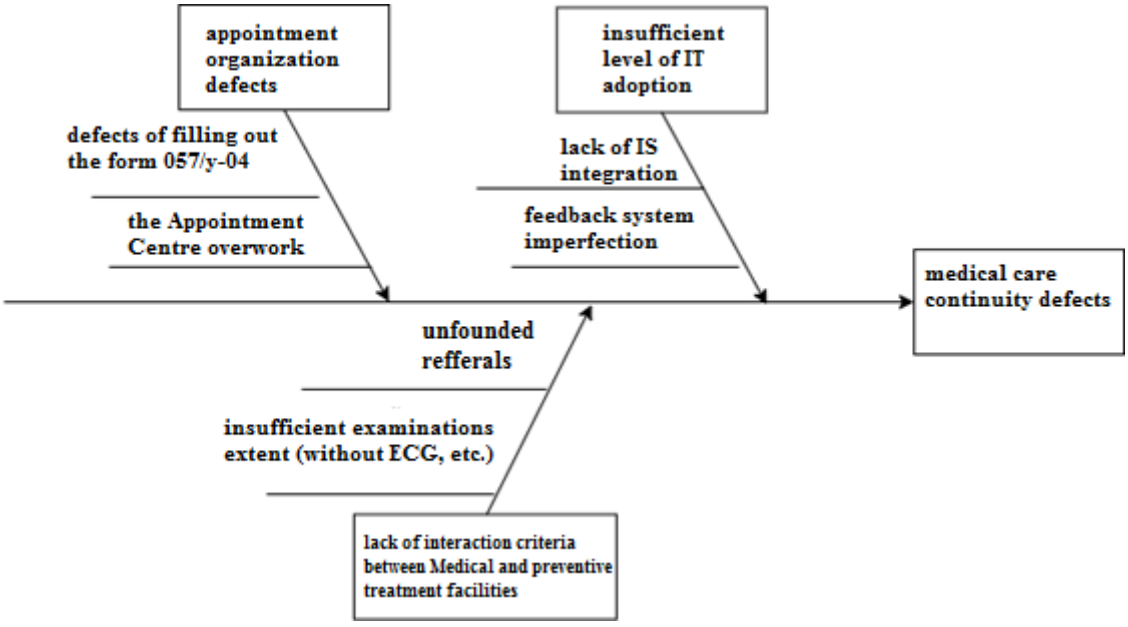

Figure 20 – Factors that Cause a Decrease in the Effectiveness of Interaction between CDC and ACCs

Table 19 provides a description of the negative factors that reduce the quality of specialized medical care when interacting with ACC institutions and ways to solve the identified problems in line with principles of process approach.

Table 19 – Factors that Cause a Decrease in the Effectiveness of Interaction between CDC and ACCs

Process	Factors	Solutions
Appointment organization	• incorrect filling of documentation (non-compliance with the form 057/y-04 (Referral for hospitalization, rehabilitation treatment, examination, consultation) • the Appointment Centre	• Working with referring agencies, creating recommendations and regulations for filling out the form 057/y-04 · the call center staff expansion; the technical infrastructure improvement.

Process	Factors	Solutions
	overwork – lack of practical implementation of the feedback system (for appointment via AIS/REGIZ)	– Improvement of interaction with AIS/REGIZ systems, including integration of qMS MIS.
Communication with the patient	– Non-compliance of specific psychological nuances for medical institution production processes	• Creating guidelines and recommendations for working with patients ("Service standards for the work of the CDC clinic administrators") • creating regulations for the administration of electronic schedule of medical appointments – training and professional development programs for employees in the field of service standards and patient care.
Use of MIS in NMRC	· Lack of integration of the qMS MIS with regional information systems. • Insufficient filling of the Electronic medical history. –	• Development of interaction between local and regional MIS. · Implementation of the rules for maintaining an outpatient card in the CDC. – Implementation of a common sample for filling out the cardiologist appointment status (Appendix 3).
Patient routing	· Unfounded patients referral for consultation in the CDC; • insufficient patients examination when referring to the CDC; – no feedback from the doctor who referred the patient to the CDC.	• Creating guidelines for Medical and preventive treatment facilities of

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		– increase in the number of the "doctor-doctor" TMC.
Use of telemedicine technologies	• Low number of requests for TMC from Medical and preventive treatment facilities of PHC; • insufficient information provided for performing TMK. – absence of "doctor-patient" TMC.	• Working with Medical and preventive treatment facilities of PHC to increase interest in TMC. • Improvement of platforms for conducting TMC. – implementation of a unified sample for providing information when submitting a request to TMC (Appendix F).

Thus, at this stage of the project, according to the developed methodology, an audit of the processes in the main areas of activity of the Ministry of Defense was conducted, KPIs were built and the transformation of KPIs into KPSCS of the current state was started.

Completion of the creation of the current state CPSC with subsequent evaluation and analysis. The construction of the target / future state CPSC and the creation of a transition plan to it, as well as the continuous improvement of all aspects of the resulting CPSC, will be implemented in the next stage of the project during piloting.

3 External European expert (University of Tampere) commentary on developed methodology for existing health care processes auditing and mapping, based upon the key European clinics experience (Finland)

3.1 Project aims and scope

The S3 Ecosystem project is supported by the Interreg BSR EU program, and includes eight partners from the Baltic Sea Region countries. Smart specialisation (S3) is said to be the European Union's most ambitious regional innovation policy programme with the aim to boost Baltic Sea Region competitiveness. All regions have their unique approach to S3 and selection process of thematic innovation priorities influenced by their historical backgrounds, research and business traditions, economic structures and innovation policies. Within the BSR S3 Ecosystem Platform project, St Petersburg partner is focusing on healthcare, aiming at the development of innovation platform and a manual on the value-based healthcare services in sphere of cardiology in St Petersburg, for the establishment of living Lab/hub and distribution of the pilot results to other regions, to other healthcare/medicine specialties, which will help to open a new page in the provision of medical care, in improving the quality of human life. The content and focus of the project is based on the many-years practical collaboration within the Innovation Agreement between the St Petersburg City, Russian Federation (RF), and the Tampere City , Finland Republic, of 7.10 2015, Smart Health Agreement between the St Petersburg City Healthcare Committee, RF, and Pirkanmaa Hospital District, Finland of 26.10.2016, Smart City Agreement between the St Petersburg City and Tampere City of 15.6.2018, Collaboration Agreement between the Almazov Centre, the Tampere University and the Baltic Institute of Finland of 2016. Important results were jointly achieved through the preparatory of the ES3 Ecosystem project, supported by Tampere University, the Tampere City and Pirkanmaa Hospital District in 2016-2019.

The Methodology of Audit and Value Stream Mapping in Primary Care (further - Methodology), proposed by Concern "R-Pro"is based on the principles of Lean Manufacturing, aiming at introducing those principles to the healthcare system. It includes thorough description of general provisions, explanation of terms, definitions and algorithms, methodology of value-chain mapping, software support for value-chain management. The Methodology is a resource for further development of the toolkit for mapping of existing practices of organizing seamless services at the Almazov Centre and Polyclinic 74 in the provision of medical care on the value-based principles. The mapping methodology will be further developed with help of external expertise and include a guideline for manual, that will describe of how to implement a test-bed for value-based healthcare services identifying successful healthcare /Finland approaches and

practices for wide dissemination and impact. Integration of international /Finland experience for the St Petersburg Smart Heart platform will be implemented

The visionary plan is to start moving towards outcome-based health care in St. Petersburg and Russia. It is clearly understood that this process will be a quite demanding task and it will take many years to make it work fully. Therefore, the only way to get moving is to start proceeding gradually with the help of limited pilot actions. As described further, electronic patient data in the format of well-structured EPR (electronic patient record) supported with comprehensive telemedical data services will be crucially important as the basis for well-organized seamless health service system. In Almazov Centre in St. Petersburg there is an urgent need to find a way to properly and meaningfully create a best practice-based patient adoption system to help the Centre to achieve and maintain a strong record of best health outcomes in the special care of heart diseases. This certainly means that the connected primary care provider in Kronstadt must be able to take proper care of the open care part, to supply proper data together with the right patients to special care, and afterwards take good care of the rehabilitated patients coming back to open care. In order to create a seamless service chain without any unnecessary interruption to both directions will be a demanding task to organize properly. This cannot be achieved without continuous close collaboration between all parties. This pilot actions should also include proper management of emergencies as part of the pilot activity plan.

3.2 Rethinking the health care paradigm and the role of IT

The need to provide good quality health care services equally to all citizen always remains a major challenge for the modern societies. Despite the better understanding of diseases and ailments as well as their potential prevention and cure, the need of care together with its cost seem to outgrow the limited resources available for the purpose. Therefore, in order to achieve optimum use of resources and the best possible outcomes a certain paradigm changes will be necessary. Several key principles are of utmost importance, and they will be further discussed as potential enabling elements to improve the care process in a cost efficient way; they include patient empowerment, implementation of best practices at all levels of care, complete transparency of the care process outcomes, cost optimization guided by the improvement of health, continuous feedback to the service providers (and patients), rewarding for meeting the targets.

Self-evidently, modern medical practice is based on reliable data retrieved from various sources. Today both patients and health care providers have access to good and reliable purpose dedicated databases to build on. In Finland, the Medical Association Duodecim has developed at least three important versions utilizing Cochrane with complementary reliable sources. The

publicly available Health Library is maintained in the Internet, and is available for all Finnish speaking people free of charge. Today it is the core source of reliable information concerning health and disease including principles of prevention and care. The Evidence Based Medicine Data Base has been similarly developed as the decision support tool for the practicing doctors. It is continuously open and easily accessible for their daily practice with the patients. The third version is utilized by the nurses who take care of the call center services as the entry point for patients with need of care and advice to take care of their health problems.

Still probably, the most important contribution by IT is a well-structured electronic patient record (EPR) where all relevant information and data concerning the patient is compiled in an easily accessible and clear way. It includes the whole history from anamnesis, diagnosis, treatment planning, lab data, images, treatment history as well as outcomes. In addition, a section concerning prescriptions and use of pharmaceuticals is included. Based on this element a paper free transparent drug utilization database may be developed.

In case there are different versions of EPR:s being utilized concomitantly an archive may be needed where all the patient data is collected from various sources for comprehensive review. In Finland this archive is already available with strongly restricted access.

Obviously, the most underutilized source for improving health and preventing disease is the patient him/herself. By involving and motivating the patients as the member of the care-team is centrally important. Besides achieving the anamnestic data reliably, also evaluating the patients' skills and capabilities together with the motivation of the patients to look after him/herself are essential for successful outcome. As part of the care plan sufficient follow up and continued personified training by the nursing personnel is often necessary particularly in case of chronic disease. According to Finnish experience, this will significantly reduce complications and this way the progress of the disease.

Equally important is the easy accessibility of the correct key data. The Finnish Health Library has significantly reduced the need to contact health care because the immediate needs are well covered by the library advice. In addition, the call center services give an excellent support for the potential patient to find his/her way properly to make the right use of the system.

Based on the above, it may be considered further that the concept of giving proper care is moving away from dependent patient orientation towards health care customer who as a well-informed layman also wants be involved in decision making of his/her care process options actively.

It is certain that the strong experience of the care personnel makes the backbone of all good therapeutic measures. Many times, it still is difficult to make the right decisions how to proceed. To support the daily practice the Evidence Based Medicine Data Base with its easily

accessible recommendations has turned out very helpful. Also teaming up with the specialists, as part of the care planning meetings, has turned out valuable and helpful. Time and resources will be saved. All the plans with the decisions will be included in the EPR as part of the documentation as part for later outcome evaluation.

As a result, the complete treatment history with all its features becomes visible and accessible for later evaluation. For the first time, it will be rather easy to start to actively evaluate the quality and effectiveness of the care processes. How well they really improve health? What changes and improvements should be made to achieve better results?

In health care services, one key element is the cost. How to provide good services with the minimum cost. We need to know quite precisely where the always limited money is spent and what is the outcome achieved. The payer's interest is certainly focused to this. Therefore, also financial accountability and transparency must be developed. Again, this is an IT issue although not easy in health care. Anyway, sufficiently precise systems are already available for help.

By combining the transparent care outcome data with the sufficiently focused financial data the value-based care process is in place. By utilizing this process, it will become possible to finally start the continuous evaluation and optimization of the care processes to improve the health care to benefit the patients/customers. As part of the motivation of the care personnel, the payer might also consider rewarding for excellent outcome history which can be implemented even on monthly basis if considered necessary.

Finally, with the accumulation of massive amounts of health data to the health archive for all the treatment histories this data combined to tissue bank material collected form patients voluntarily or as part of their treatment processes we are at the door of quite interesting research opportunities to learn how e.g. various genetic and or behavioral profiles influence human health and how to develop new and better, follow ups and cures for the future.

3.3 Organization of transfer towards value-based medicine

It is expected that some profound changes will start taking place in the not too distant future as part of the planned process. Therefore, a Steering Committee will be needed to direct and authorize the step-by-step processes needed to be implemented in the service chain designs in the whole system.

It is suggested that those parties already mentioned above will take the steering responsibility of the pilot.

Besides this, several specialized working groups will be nominated to first profoundly understand and analyze the present situation and openly take up the problems and bottlenecks

preventing the best practice care processes. Relevant representatives will needed from both primary and specialized care as well as preventive care, nursing, support services, central administration, and some specific patient groups among others.

It should be understood that the tasks of the working groups are not limited only to the functional element of the specialists but it will be important to realize and plan the service chain seamlessly for both ends, how the patient enters to the service how he/she will be served as well as how the patient will be taken care and supported after the treatment.

It is obvious that the patients in need of care should have easy access to make the first contact. According to previous experience, it will be important to organize the entry according to the principle “first time right”. Therefore, access to relevant information for the patient before making the contact, as well as, training of the care personnel to help the patient the best possible way are of crucial importance. The good experience based on the utilization of Health Library as well as Best Practice Data Base guidance should be explored. The Finnish experience on the Front Office utilization is recommended to be studied and possible adopted. The same office may also be utilized for maintaining chronically ill and rehabilitation patients at home and visit only in real need. Those patients not needing immediate care may be appointed to the right service after a reasonable delay if necessary.

It is obvious that both primary care, specialized care as well as ambulatory care specialists will be needed to evaluate and plane these processes. The opinion of the patient community should also get attention.

As strongly emphasized in the IT-paragraph above, a well working sufficiently structured Electronic Patient Record is the key to transparent and outcome oriented health care service system. The task to implement it properly will be a formidable endeavor. It may be advisable to first try to figure out the precise status of the present IT-systems now supporting the care processes both in Almazov Centre and Kronstadt. The best way may be to try to develop the present systems more structured and compatible with each other step by step that try to import a completely new system from outside and try to make it work in our pilot properly. At least the cost may easily soar uncontrollably.

Therefore, it is suggested that the designer of the present systems will be interviewed first to learn more about the challenges ahead. There certainly are international players keen to help. The cost optimisation will then be a challenge.

Besides IT experts also care professionals´ role will be very important to finally make this project successful.

When the patient needs to move form primary care to specialized care or vice versa this easily creates a cutoff point when both the patient service chain as well as the care data

availability will be broken and considerable delays and extra costs will start occurring. Yet, the principles to make this work are quite simple and rather easy to solve if there is a common interest. Despite there is a large variety of specialties that the patients may need the working principles are still the same. Besides applying these principles sufficient training for all the service providers must be supplied.

Helping and maintaining patients with chronic disease or injury is sometimes neglected unnecessarily. This will not only compromise the patients´ quality of life badly or even shorten it considerably. Recent data clearly suggests that proper training of both the care personnel and the patient population together with personalized follow up will make a significant difference and save cost. Implementation of modern rehabilitation services may also increase the motivation properly.

When planning each service chain for various preventive or curative processes many support service provisions will be needed at the right place at the right time. Such things as Imaging tools, laboratory analysis services, histopathology services, rehabilitation aids, pharmacy etc. should be planned as integral part of the care processes.

Finally, the physical size and form of the new clinic building will be planned as guided by the needs of the value based medical treatment process.

Certainly, separate and quite flexible working group will be needed to put together this part of the service structure.

It should be understood that the material above is not a comprehensive presentation but examples are given how to get moving to open to planning and implementation process to get started with. It may well turn out that the situation in Kronstadt and Almazov Centre is so different from the one in Finland that major modifications will be needed, or some absolutely different approach will be necessary. This remains to be seen when the project will start moving forward to concrete measures when implementing the further development of the toolkit in mapping of the existing practices of organizing seamless services at the Almazov Centre and Polyclinic 74 in the provision of medical care on the value-based principles.

3.4 Webinar plan for value-based health care and medical ecosystem development in Saint-Petersburg

In accordance with the analysis of Russian and international practice, and external experts recommendations, the plan for value based medicine development in Saint-Petersburg was developed (Table 20).

Table 20 – Webinar plan for value-based health care and medical ecosystem development in Saint-Petersburg

№	Webinar	Proposed date	Speaker	Target audience
1	Value-based medicine: principles and approach: - Finland experience in implementing value-based medicine - value-based medicine management	January 18th, 2021	European [illegible] University of Tampere	MIAC [illegible] Polyclinic 74 (Kronshtadt)
2	IT technologies in value-based medicine: - Open health libraries - Evidence Based Medicine Data Base - data centers for nursing - health archive and biobank	January 19th, 2021	European expert, University of Tampere	MIAC Almazov Center Polyclinic 74
3	Front-office organization in health care: - the “first time right” principle implementation - seamless service chain in health care - integrated IT platform for seamless health care	January 20th, 2021	European expert, University of Tampere	MIAC Almazov Center Polyclinic 74 (Kronshtadt)
4	Electronic patient record: - integration of patient's electronic record and medical databases - implementation of electronic patient records system	January 21st, 2021	European expert, University of Tampere	MIAC Almazov Center Polyclinic 74 (Kronshtadt)
5	Wholistic patient treatment plan (post-clinical): - chronic disease management - support services for health care and nursing - patient involvement and empowerment	January 22nd, 2021	European expert, University of Tampere	MIAC Almazov Center Polyclinic 74 (Kronshtadt)

Продолжение таблицы 16

Продолжение таблицы 15

4 Recommendations on seamless health care system improvement within interaction of primary health care organization and specialized cardiological center

4.1 Prepositions for processes improvement development in applying medical treatment based on audit and mapping results

The mapping of the processes of interaction of clinical and diagnostic center with agencies of primary care, which was carried out on the basis of the methodology of the audit/mapping using tools of lean manufacturing, adapted to the conditions of medical care have identified the following groups of problems hampering the effective interaction of outpatient clinics and diagnostic centres in the direction of "cardiology»:

1. Defects in the recording organization, including overloading the recording center with requests on the one hand and defects in filling out the standard form 057/u-04 on the other hand.

2. Lack of criteria for interaction in the implementation of information collaboration of medical institutions, including insufficient volume of preliminary examination (for example, failure to perform an ECG) and the appearance of unjustified directions for receiving medical care.

3. Insufficient level of implementation of information technologies, expressed, as a rule, either in the lack of integration of information systems of various institutions, or in the imperfection of an automated feedback system.

1. Other problems identified in the audit / mapping process are of a non-systemic nature and cannot be considered as objects whose improvement will allow a systematic change in the quality of interaction between the clinical and diagnostic center and primary care institutions. On the contrary, the elimination of the problems described above will allow for a qualitative improvement in the seamless interaction of medical and preventive institutions in the field of "cardiology".

Problems in the organization of processes in Polyclinic No. 74, associated with the KDC of the Almazov National Medical Research Center, creating a loss of time for patients and reducing the value that need to be solved, are:

- for additional examination (including consultations) - determination of the agreed list of indications for consultation with a cardiologist, diagnostic tests performed on an outpatient basis in the Almazov NMIC CDC or in other organizations to provide consultations in the Almazov NMIC CDC, decision on payment for these studies performed by the Almazov NMIC CDC from the funds of the CHI, the procedure for registering for studies using electronic services;

- for planned hospitalization, including for receiving high-tech medical care-determination of an agreed list of indications for diagnostic tests required for hospitalization in

the Almazov NMIC CDC, performed on an outpatient basis in the Almazov NMIC CDC or in other organizations.

It is necessary to resolve the issue of organizing a full-fledged department of medical rehabilitation in outpatient and day hospital conditions in Polyclinic No. 74, including in the building planned for construction.

The problem of the shortage of beds in St. Petersburg hospitals for inpatient rehabilitation of patients who have undergone AMI and ONMC, vascular interventions, cardio-and neurosurgical interventions in vascular catastrophes needs to be solved.

Other problems identified in the audit / mapping process are non-systemic in nature and cannot be considered as objects, the improvement of which will allow to systematically change the quality of interaction between the clinical and diagnostic center and primary care institutions. On the contrary, the elimination of the problems described above will allow for a qualitative improvement in the seamless interaction of medical and preventive institutions in the field of "cardiology".

4.2 Cardiological health care improvement in the field of inter-organizational interaction

Areas of activity, the improvement of which will improve the organization of interaction in the "cardiology" profile of the KDC of the Almazov National Medical Research Center with outpatient clinics of primary health care providing specialized medical care in the "cardiology" profile»:

- monitoring of production processes based on updated requirements;

- assessment and registration in the medical documentation of indicators of the state and dynamics of indicators of the state of health of the patient, the attached population or the corresponding sample of patients, as indicators that characterize production processes and their results;

- assessment (forecasting) of the need for health resources at the appropriate stage of medical care, based on the indicators of the state and dynamics of the indicators of the state of health of the patient, the attached population or the corresponding sample of patients.

The most important task is the effective interaction and continuity between inpatient and outpatient health care facilities at the third stage of rehabilitation. For this purpose, it is possible to use the resources of a single medical card of a resident of St. Petersburg (to transfer recommendations from an inpatient to an outpatient health care facility), as well as to use the means of REGIZ to actively record a patient for an outpatient appointment already at discharge from the hospital.

Based on the analysis of the prerequisites, three key areas for improving the organization of seamless interaction of medical and preventive institutions in the field of "cardiology" were identified as part of the implementation of the principles of value-oriented medicine, the comparison of which in the dichotomy "factors-directions for improving efficiency" is presented below in Table 21.

Table 21 – Directions for improving the efficiency of interaction between medical institutions in the field of “cardiology”

№	Problem revealed by mapping	The reason for problem occurance	Dimensions for efficiency improvement
1	Defects in the organization of patient records	Congestion of recording centers Incorrect filling in of documentation Lack of implementation of a feedback system Defects in communication with patients	Reduction of fluctuations in the load of recording centers Training in correct filling of forms of documents Training in the use of feedback systems within the framework of AIS REG Improving the quality of staff training in social and psychological communication skills with patients
2	Lack of interaction criteria in information collaboration	Unjustified referral of patients for consultation in the clinical and diagnostic center Under-examination of patients when they are referred to a clinical diagnostic center Lack of feedback from the doctor who referred the patient to the clinical diagnostic center	Creating route maps for first aid institutions Training of personnel of first aid institutions in the use of route maps and the implementation of elements of route maps Formation of a feedback mechanism of the clinical and diagnostic center with doctors of first aid institutions
3	Insufficient level of information technology implementation	Lack of integration of IIA qMS with regional information systems Insufficient completion of electronic medical records Low number of requests for the use of telemedicine technologies Insufficient information for the application of telemedicine technologies Lack of telemedicine communication "doctor-patient»	Identification and elimination of the reasons for the non-integration of existing information systems with regional ones Professional development of personnel in terms of filling out electronic medical records Increasing the level of requests for the use of telemedicine consultations Formation of systems for effective collection of information in electronic form Creating a doctor-patient feedback platform

As indicated in the table above, at present, the typology of systemic errors that cause a violation of the seamless interaction of medical and preventive institutions in the field of

"cardiology" within the framework of the introduction of the principles of value-oriented medicine is quite diverse, which dictates the need to develop a set of measures to improve its effectiveness. At the same time, the measures developed should include: corrective actions to eliminate the causes of detected non-compliance of processes with the established requirements within the framework of the specified interaction;preventive actions to eliminate the causes and eliminate (reduce) the risks of potential non-compliance to prevent their occurrence; as well as other actions to improve activities (including improving identified processes) aimed at meeting the needs and expectations of all stakeholders.

Further on, we consider the key areas of efficiency improvement, grouped into the three mentioned categories.

4.3 Measures to improve medical organizations interaction efficiency in the field of cardiology

In accordance with the lean production methodology chosen as the basis, measures aimed at improving the efficiency of seamless interaction of medical and preventive institutions in the field of "cardiology" within the framework of implementing the principles of value-oriented medicine are implemented at the control stages from the position of dividing it into three components: proactive, current and control using feedback. Proactive control refers to control aimed at preventing possible problems. Current control is understood as control in the process of work execution, and feedback-based control is assumed to be control aimed at correcting problems when they occur. As can be seen from Table 17, the directions of improving the interaction of medical institutions are formed in the context of these three types of control.

The General plan of measures to improve the effectiveness of interaction between PHC and CDC institutions in the context of types of corrective actions is shown in Table 22.

The identified shortcomings confirm that one of the options for a comprehensive solution to the identified problems is the creation of an innovative platform "Smart healthcare", the action plan for the development of which is presented in the next section.

Table 22 – Measures to improve medical organizations interaction efficiency in cardiology (by type of corrections)

Interaction process	The reason for problem occurance	Measures to improve the quality of action		
		Corrective actions to eliminate the causes of detected non-compliance of processes with the established requirements	Preventive actions in order to eliminate the causes and eliminate (reduce) the risks of potential nonconformities	Other actions to improve performance (including improving identified processes) to meet needs and expectations
Pre-registration	Incorrect completion of documentation (non-compliance with form 057/u-04) The congestion of the center of the record The lack of practical implementation of the feedback system (for recording via AIS/REGAS)	Working with primary health care organizations on creating recommendations and regulations for filling out form 057/u-04 (staff training, automation of filling out the form)	Expansion of the call center staff; improvement of the technical infrastructure, preparation and implementation of scripts for working with patients, partial automation according to the developed script	Improvement of interaction with AIS/REGOSS systems, including integration of MIS qms, elimination of the reasons which do not allow to carry out full integration of the used information systems
Communication with patients	Non-compliance with the psychological nuances of medical	Creation of regulations for the administration of the electronic schedule of medical	Creation of methodological manuals and recommendations for working with patients	Development and implementation of a training and professional development

	institution-specific production processes	appointments, training in the use of regulations	("Service standards for the work of administrators of the CDC clinic"), training in working with the proposed methods	program for employees in the field of service standards and patient care
Medical information systems use	Lack of integration of MIS qMS with regional information systems Insufficient filling of the EPC	Implementation of the regulations for maintaining the patient's outpatient card in clinical and diagnostic centers, training of employees of medical institutions in the use of the regulations	Implementation of a common template for filling out the cardiologist's admission status, training of medical institutions ' personnel in the use of a common template	Development of interaction between local and regional MIS
Patient’s routing	Unreasonable referral of patients for consultation at CDC Insufficient examination of patients when referred to the CDC Lack of feedback with the doctor who referred the patient to the CDC	Creation of methodological recommendations for the primary health care facilities, training of the staff of the primary care facility in the use of the developed methodological recommendations	Implementation of a common template for examination of patients upon referral to CDC, training of medical personnel in the use of a common template	Increasing the number of telemedicine conferences "doctor-doctor" to eliminate the shortcomings of the current feedback system
Use of telemedical tehcnology	Low number of requests for TMC from the PHC Insufficient amount of	Implementation of a unified template for providing information when submitting a request to TMC, training personnel to use this template	Improvement of platforms for TMC, training of all stakeholders in the use of the full functionality of such platforms	Working with MO facilities to increase interest in TMC, popularizing TMC among stakeholders

	information provided for the implementation of TMC Absence of TMC "doctor-patient"			

4.4 Detailed plan on Smart Health innovation platform development manual

In accordance to Forey et al. research, the compex support of smart systems is supposed to be based upon:

- focusing political support and investment on identified key national / regional priorities, problems and needs for knowledge-based development;
- focus on the strengths of each country / region / industry, competitive advantages and potential for excellence;
- supporting technological as well as practical innovations and stimulating private investment;
- involve stakeholders in the process and encourage innovation and experimentation;
- use of evidence, their monitoring and an effective evaluation system.

Based on these prerequisites, the following sequence of steps is needed to develop the Smart Health Platform guideline.

1. Defining the goals and objectives of creating the Smart Healthcare platform.
2. Choosing a methodology for the Smart Healthcare platform.
3. Development of a method for collecting information from individuals and legal entities - parties interested in the work of the Smart Healthcare platform.
4. Collecting data from stakeholders on the priorities and structure of the Smart Health platform.
5. Systematization of stakeholders' data on the priorities and structure of the Smart Health platform.
6. Formation of the first draft of the architecture of the Smart Healthcare platform.
7. Conducting focus groups with stakeholders to discuss the architecture of the Smart Healthcare platform.
8. Identification of shortcomings of the first draft architecture of the Smart Healthcare platform.
9. Formation of the revised project of the architecture of the Smart Healthcare platform.
10. Conducting focus groups with stakeholders to discuss the revised architecture of the Smart Health platform.
11. Systematization of feedback on the adjusted architecture of the Smart Healthcare platform.
12. Development of guidelines for the creation of the Smart Healthcare platform using the results of mapping.

The proposed sequence of actions will allow at the stage of preliminary control to eliminate the most significant errors through the active involvement of stakeholders in the proactive assessment, including both individuals and legal entities.

CONCLUSION

As a result of developing a methodology and conducting an audit / mapping of the existing practice of interaction in the provision of medical care in medical institutions of St. Petersburg, using the models of leading European clinics (Finland), the following basic documents were developed.:

1. The methodology of auditing and value development flow in case of primary health care, which defines the sequence of process assessment in the field of cardiology, and aiming to define unstable processes.
2. Auditing of seamless interaction of cardiological medical organizations based on implementation of value-based medicine principles, which was performed in accordance with the developed methodology by Almazov centre.
3. Auditing of seamless interaction of cardiological medical organizations based on implementation of value-based medicine principles, which was performed in accordance with the developed methodology by Policlinic 74.
4. European expert commentary on the development of a toolkit, for the mapping of existing practices of organizing seamless services at the Almazov Centre and Polyclinic 74 in the provision of medical care based on the value-based principles and applying the experience of Finland / Mapping value chains of the existing collaboration practices.
5. Recommendations on improvement of seamless interation in primary health care between ambulance-policlinic organization and specialized care medical organization in the field of cardiology. These recommendations were based upon the systemic mistakes revealed via auditing and the experience of leading Finnish clinics on primary health care and interrelations between primary and specialized medical organization. The peculiarities of medical care organizing in Saint-Petersburg were taken into account.

The development of the named documents allowed to fulfill the aim of the research and supplementing tasks. Thus, within the research it was possible to acquire a set of conclusions, which are necessary to proceed with the Interreg project of the Baltic Sea region, SDR S3 Ecosystem, and allows to develop a basement for innovative platform development (th one aiming to manage Saint-Petersburg value-based medical services in cardiology, a platform to build up a Living Lab/Hub, and to promote the achived results for the increasing quality of medical treatment and population well-being.

The results obtained make it possible to determine the directions of work at the next stages of the Interreg Baltic Sea Region BSR S3 Ecosystem project, within the framework of which these works were carried out.

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APPENDIX A

An example of a questionnaire for auditing

Survey objective: identifying key directions for improvement.

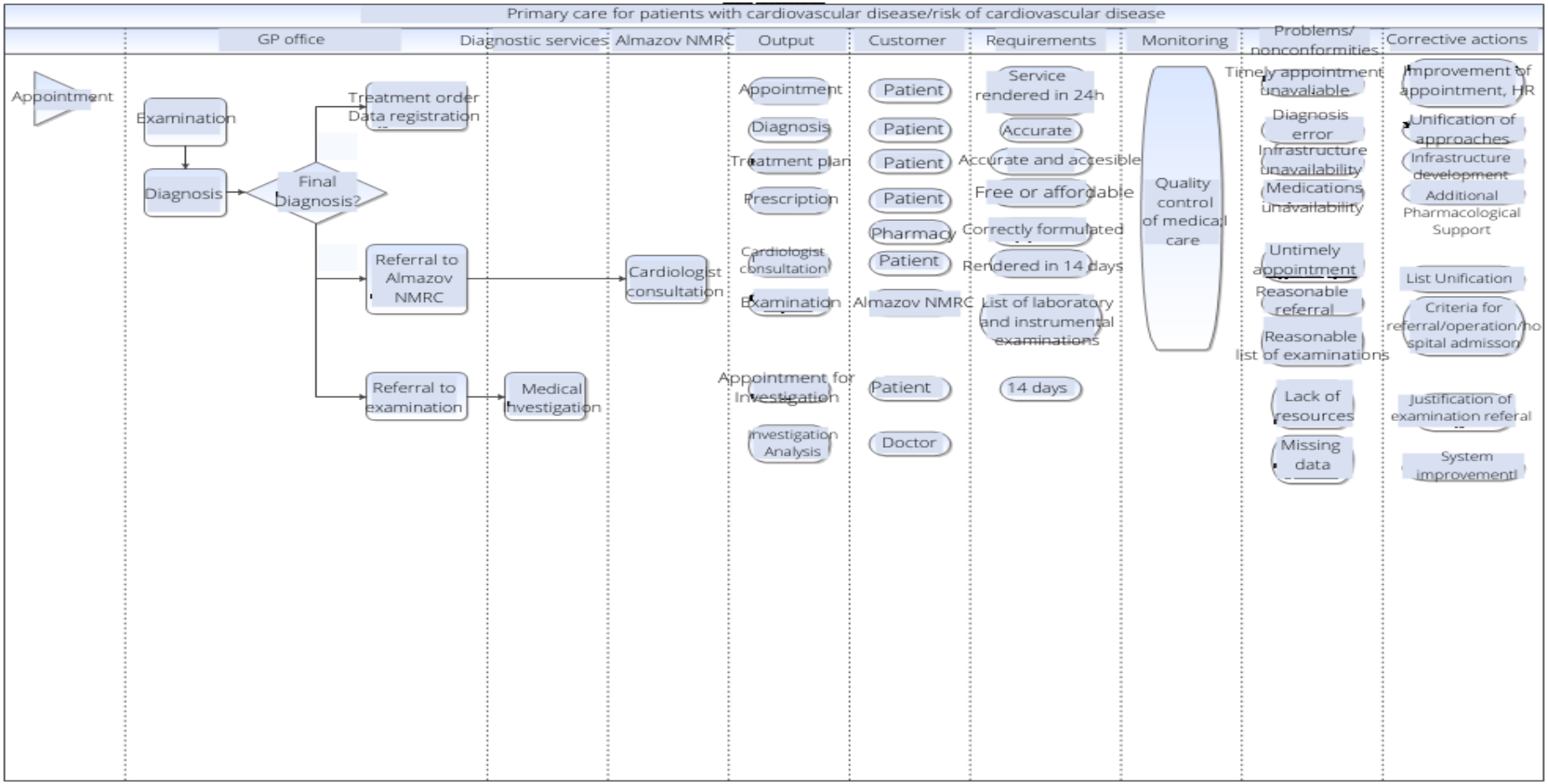
List of possible questions:

1) Describe three (five) most relevant directions that require improvement.
2) What three (five) aspects of your department's activity require improvement the most?
3) What three (five) most significant problems do you face when interacting with other departments?
4) What three (five) aspects of workplace organization require improvement?
5) What three (five) outside factors impact the general work of your clinic the most?
6) Identify three (five) most problematic processes in your structural units. Specify the number of workers engaged.
7) Identify three (five) most lengthy processes in your structural units. Specify approximate process time.
8) Identify three (five) processes that take up the best part of your working time.
9) Identify three (five) processes in documentation of which you most frequently come across errors of other actors or other problems.
10) Identify three (five) processes where the most sharp disputes, collision of interests and conflicts occur.
11) Identify three (five) processes where you mot frequently face late performance or necessity to intervene into the process for its acceleration.
12) Identify three (five) difficulties that were most significant to you. Specify the processes where they occured.
13) Identify three (five) grave errors in documentation. Specify the processes where they occured.
14) Identify three (five) processes where you face workers' reluctance (make propositions about tasks reformulation, changing time limits, etc.).
15) Identify three (five) processes that are out of your responsibility and for completion of which you have to wait the longest to start or continue your work (three (five) processes that hinder your work or significantly postpone process completion).
16) Identify three (five) areas (directions, processes) where employee turnover rate is most significant. Specify the number of employees that left the organization in the area/department in the last two years.
17) Identify three (five) processes where employees work overtime. Specify approximate numbers per month.

18) Interaction with which government health agencies is marked by low efficiency, low quality of service and documentation, low level of corporate ethics, etc.
19) Identify three (five) most cost-intensive processes. Specify approximate expenses.
20) Please provide additional comments on increasing effectiveness of performance and interaction with outside contractors.

APPENDIX B

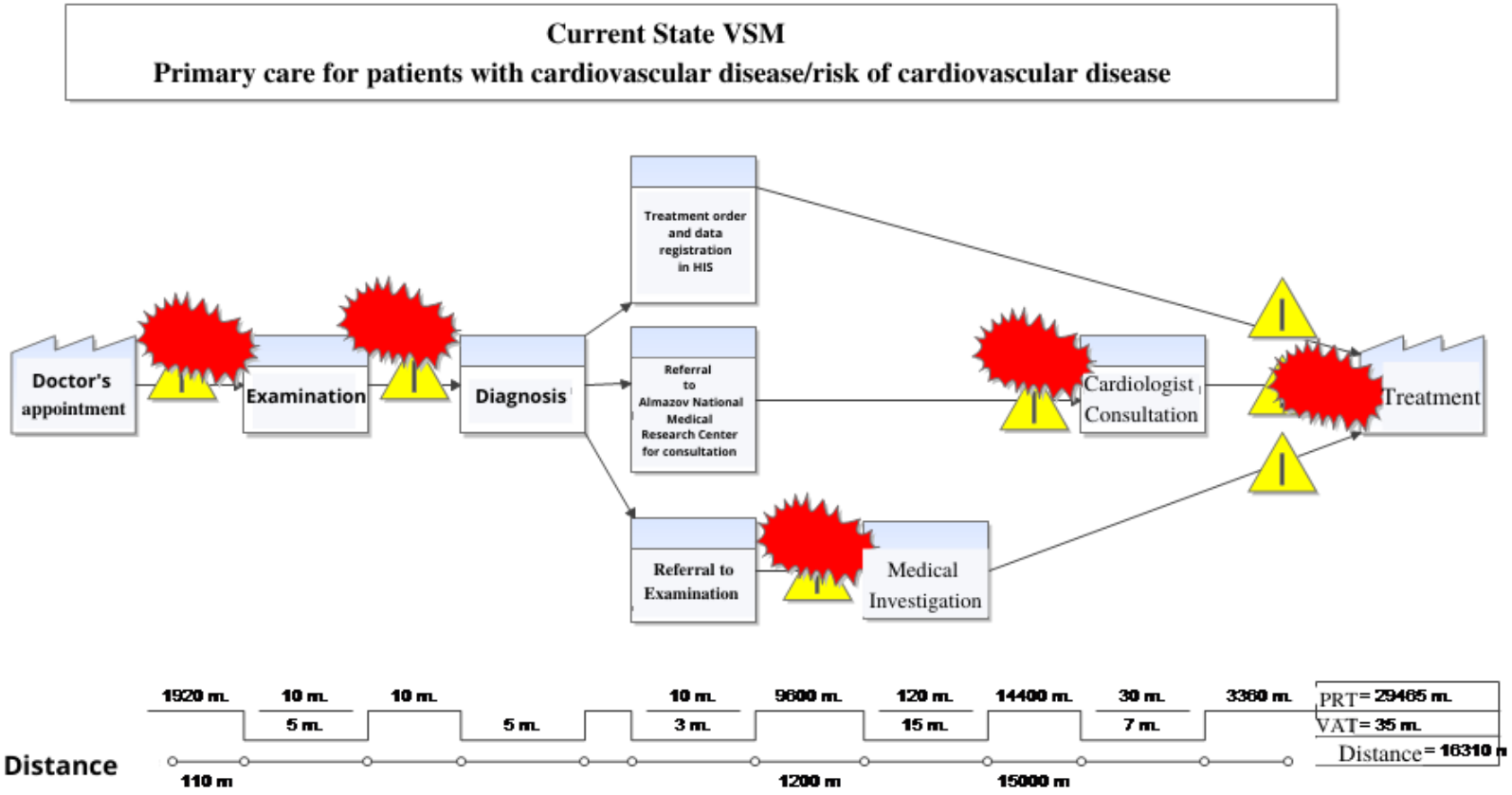
Process map model



ANNEX C

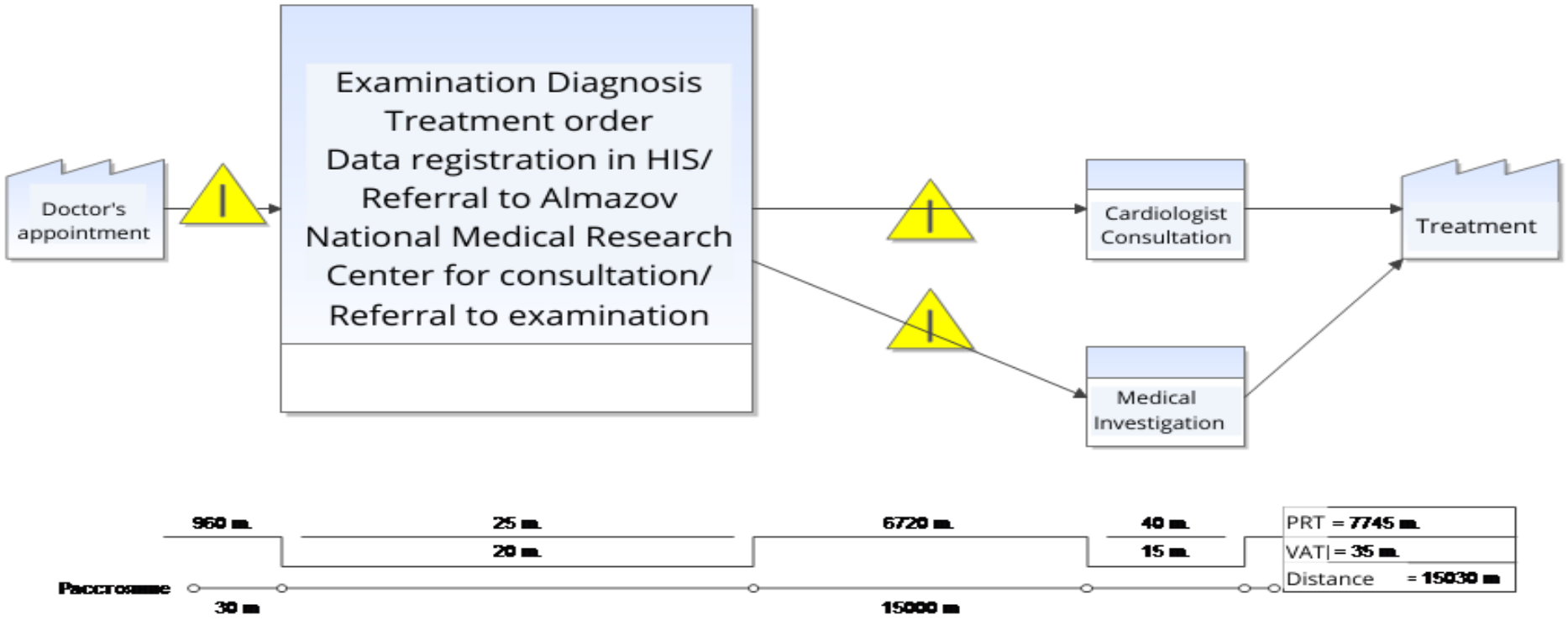
Medical sanitary support model implementation

VSM models given in this Annex serve for demonstrating general structure of current state VSM and goal state VSM. The information represented in these models has not been gathered through audit and is purely illustrative.



Future State VSM

Primary care for patients with cardiovascular disease/risk of cardiovascular disease



ANNEX D

Ambulance visits

2018

(2100) 545 code

Name	№ - ки	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor funciton
		Doctors, including preventive treatment-total	including					total	including rural inhabitants	from group 9		from group 12 Due to disease	
			rural inhabitants	children below 18	rural inhabitants	adults 18 and above	children below 18			due to disease	children below 18		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Doctors, total	1	332501	-	127276	-	123660	55396	37205	-	36216	15826	14837	9,86
Including: heads of medical organizations and their deputies	4	-	-	-	-	-	-	-	-	-	-	-	0,00
obstetricians and gynecologists	5	21337	-	2047	-	12152	566	-	-	-	-	-	11,92
Including obstetricians and gynecologists medical section	5.1	-	-	-	-	-	-	-	-	-	-	-	0,00
allergists-immunologists	6	884	-	884	-	-	869	-	-	-	-	-	7,16
anesthesiologists-resuscitators	7	-	-	-	-	-	-	-	-	-	-	-	0,00
doctors at health centers	10	-	-	-	-	-	-	-	-	-	-	-	0,00
gastroenterologists	11	829	-	829	-	-	817	-	-	-	-	-	13,43
hematologists	12	-	-	-	-	-	-	-	-	-	-	-	0,00
geneticists	13	-	-	-	-	-	-	-	-	-	-	-	0,00
geriatrics	14	-	-	-	-	-	-	-	-	-	-	-	0,00
dermatovenerologists	16	24076	-	8007	-	11087	3371	-	-	-	-	-	24,37
diabetologists	17	-	-	-	-	-	-	-	-	-	-	-	0,00

nutritionists	18	-	-	-	-	-	-	-	-	-	-	-	0,00
infectiologists	19	5361	-	986	-	2756	10	-	-	-	-	-	17,36
cardiologists	20	4560	-	-	-	3648	-	-	-	-	-	-	6,71
child cardiologists	21	-	-	-	-	-	-	-	-	-	-	-	0,00
clinical mycologists	23	-	-	-	-	-	-	-	-	-	-	-	0,00
coloproctology	24	-	-	-	-	-	-	-	-	-	-	-	0,00
cosmetologists	25	-	-	-	-	-	-	-	-	-	-	-	0,00
manual therapists	29	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	29.1	-	-	-	-	-	-	-	-	-	-	-	0,00
neurologists	31	11738	-	6377	-	3699	2317	-	-	-	-	-	13,58
neurosurgeons	32	-	-	-	-	-	-	-	-	-	-	-	0,00
neonatologists	33	-	-	-	-	-	-	-	-	-	-	-	0,00
nephrologists	34	-	-	-	-	-	-	-	-	-	-	-	0,00
general practice (family)	35	71512	-	-	-	34355	-	18711	-	18711	-	-	22,83

continued (2100)

Name	№ - ки	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor funciton
		Doctors, including preventive treatment-total	including					total	including rural inhabitants	from group 9		from group 12 Due to disease	
			rural inhabitants	children below 18	rural inhabitants	adults 18 and above	children below 18			due to disease	children below 18		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
oncologists	36	6136	-	-	-	5522	-	-	-	-	-	-	16,56
child oncologists	37	-	-	-	-	-	-	-	-	-	-	-	0,00
orthodontists	38	-	-	-	-	-	-	-	-	-	-	-	0,00
osteopaths	39	-	-	-	-	-	-	-	-	-	-	-	0,00
otorhinolaryngologists	40	15435	-	12424	-	2077	8026	-	-	-	-	-	20,83
ophthalmologists	41	14768	-	8176	-	4548	3487	-	-	-	-	-	19,93
ophthalmologists-prosthetists	42	-	-	-	-	-	-	-	-	-	-	-	0,00
pediatrists - total	45	52823	-	52823	-	-	20600	15826	-	14837	15826	14837	9,84
indluding: pediatrists distict (including prediatrists on each local district)	46	40326	-	40326	-	-	18850	15826	-	14837	15826	14837	23,32
pediatrists cities (by district)	47	-	-	-	-	-	-	-	-	-	-	-	0,00
aviation and space medicine	48	-	-	-	-	-	-	-	-	-	-	-	0,00
diving medicine	49	-	-	-	-	-	-	-	-	-	-	-	0,00
in physical therapy	55	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	55.1	-	-	-	-	-	-	-	-	-	-	-	

medical and social expertise	56	-	-	-	-	-	-	-	-	-	-	-	0,00
medical prevention	57	-	-	-	-	-	-	-	-	-	-	-	0,00
medical rehabilitation	58	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	58.1	-	-	-	-	-	-	-	-	-	-	-	
palliative care	60	-	-	-	-	-	-	-	-	-	-	-	0,00
x-ray endovascular diagnostics and treatment	62	-	-	-	-	-	-	-	-	-	-	-	0,00
sports medicine	64	-	-	-	-	-	-	-	-	-	-	-	0,00
reception	65	-	-	-	-	-	-	-	-	-	-	-	0,00
occupational pathology	66	-	-	-	-	-	-	-	-	-	-	-	0,00
psychiatrists	67	9366	-	-	-	6462	-	318	-	318	-	-	26,14
including: district	68	9366	-	-	-	6462	-	318	-	318	-	-	39,21
children psychiatrists	69	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists district	70	-	-	-	-	-	-	-	-	-	-	-	0,00

continued (2100)

Name	№ - ки	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor funciton
		Doctors, including preventive treatment-total	including					total	including rural inhabitants	from group 9		from group 12	
			rural inhabitants	children below 18	rural inhabitants	adults 18 and above	children below 18			due to disease	children below 18	Due to disease	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
teenage psychiatrists	71	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists teenage distict	72	-	-	-	-	-	-	-	-	-	-	-	0,00
psychiatrists-narcologists	73	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists-narcologistsи district	74	-	-	-	-	-	-	-	-	-	-	-	0,00
psychotherapists	75	3556	-	-	-	1768	-	-	-	-	-	-	11,52
including: visits by disabled	75.1	1691	-	-	-	1691	-	-	-	-	-	-	
pulmonologists	76	-	-	-	-	-	-	-	-	-	-	-	0,00
radiologists	77	-	-	-	-	-	-	-	-	-	-	-	0,00
radiotherapists	78	-	-	-	-	-	-	-	-	-	-	-	0,00
rheumatologists	79	-	-	-	-	-	-	-	-	-	-	-	0,00
radiologists	80	-	-	-	-	-	-	-	-	-	-	-	0,00
reflexologists	81	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	81.1	-	-	-	-	-	-	-	-	-	-	-	
sexologists	82	-	-	-	-	-	-	-	-	-	-	-	0,00
interns	84	-	-	-	-	-	-	-	-	-	-	-	0,00

dentists	86	3722	-	-	-	3349	-	-	-	-	-	-	2,08
childrens dentists	87	18162	-	18162	-	-	6119	-	-	-	-	-	36,77
orthopedic dentists	88	-	-	-	-	-	-	-	-	-	-	-	0,00
dental therapists	89	14936	-	-	-	10305	-	-	-	-	-	-	8,06
dental surgeons	90	544	-	544	-	-	544	-	-	-	-	-	1,10
forensic experts	91	-	-	-	-	-	-	-	-	-	-	-	0,00
forensic psychiatric experts	92	-	-	-	-	-	-	-	-	-	-	-	0,00
maritime doctors	93	-	-	-	-	-	-	-	-	-	-	-	0,00
audiologists-otorhinolaryngologists	94	-	-	-	-	-	-	-	-	-	-	-	0,00
audiologists-prothesits	95	-	-	-	-	-	-	-	-	-	-	-	0,00

continued (2100)

Name	№ - ки	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor funciton
		Doctors, including preventive treatment- total	including rural inhabitants	including children below 18	rural inhabitants	adults 18 and above	children below 18	including rural inhabitants	due to disease	from group 9 children below 18	from group 9 Due to disease	from group 12 из гр.12: по	
therapists - total	96	16464	-	-	-	6750	-	2227	-	2227	-	-	7,21
including: district	97	16464	-	-	-	6750	-	2227	-	2227	-	-	13,76
therapitss: disttict manufacturing	98	-	-	-	-	-	-	-	-	-	-	-	0,00
therapists ambulance	99	-	-	-	-	-	-	-	-	-	-	-	0,00
therapists teenage	100	-	-	-	-	-	-	-	-	-	-	-	0,00
toxicologists	101	-	-	-	-	-	-	-	-	-	-	-	0,00
traumatologists-orthopedists	102	6422	-	3666	-	2480	2517	-	-	-	-	-	11,56
transfusiologists	103	-	-	-	-	-	-	-	-	-	-	-	0,00
urologists	105	5782	-	-	-	3579	-	-	-	-	-	-	15,61
children’s urologists-andrologists	106	2523	-	2523	-	-	1313	-	-	-	-	-	40,86
pharmacologists clinical	107	-	-	-	-	-	-	-	-	-	-	-	0,00
physical therapists	108	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	108.1	-	-	-	-	-	-	-	-	-	-	-	
phthisiologists	109	-	-	-	-	-	-	-	-	-	-	-	0,00
including: phthisiologists district	110	-	-	-	-	-	-	-	-	-	-	-	0,00
surgeons	112	6610	-	-	-	4560	-	-	-	-	-	-	9,73

children’s surgeons	113	8026	-	8026	-	-	4004	-	-	-	-	-	32,49
plastic surgeons	114	-	-	-	-	-	-	-	-	-	-	-	0,00
cardiovascular surgeons	115	-	-	-	-	-	-	-	-	-	-	-	0,00
thoracic surgeons	116	-	-	-	-	-	-	-	-	-	-	-	0,00
maxillofacial surgeons	117	-	-	-	-	-	-	-	-	-	-	-	0,00
endocrinologists	118	5127	-	-	-	4563	-	123	-	123	-	-	14,17
children’s endocrinologists	119	1802	-	1802	-	-	836	-	-	-	-	-	9,73
endoscopists	120	-	-	-	-	-	-	-	-	-	-	-	0,00
other	122	-	-	-	-	-	-	-	-	-	-	-	0,00
including emergency visits	122.1	-	-	-	-	-	-	-	-	-	-	-	X
Total number of visits (line.1): emergency care points	123	8425	-	2610	-	5815	2610	-	-	-	-	-	X
palliative care	124	-	-	-	-	-	-	-	-	-	-	-	X
other, psychologists	125	4047	-	205	-	-	-	-	-	-	-	-	X
including: visits by disabled	125.1	3738	-	79	-	-	-	-	-	-	-	-	X

(2100) 545 code

Name	№	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor
		Doctors, including preventive treatment-	including						including	From group 9 funciton		From group 12	
		total	rural inhabitants	children Below 18	rural inhabitants	adults 18 and above	children Below 18	total	rural	Due to disease		Due to disease	function
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Doctors, total	1	332501	-	127276	-	123660	55396	37205	-	36216	15826	14837	9,86
Including: heads of medical organizations and their deputies	4	-	-	-	-	-	-	-	-	-	-	-	0,00
obstetricians and gynecologists	5	21337	-	2047	-	12152	566	-	-	-	-	-	11,92
Including obstetricians and gynecologists medical section	5.1	-	-	-	-	-	-	-	-	-	-	-	0,00
allergists-immunologists	6	884	-	884	-	-	869	-	-	-	-	-	7,16
anesthesiologists-resuscitators	7	-	-	-	-	-	-	-	-	-	-	-	0,00
doctors at health centers	10	-	-	-	-	-	-	-	-	-	-	-	0,00
gastroenterologists	11	829	-	829	-	-	817	-	-	-	-	-	13,43
hematologists	12	-	-	-	-	-	-	-	-	-	-	-	0,00
geneticists	13	-	-	-	-	-	-	-	-	-	-	-	0,00
geriatrics	14	-	-	-	-	-	-	-	-	-	-	-	0,00
dermatovenerologists	16	24076	-	8007	-	11087	3371	-	-	-	-	-	24,37
diabetologists	17	-	-	-	-	-	-	-	-	-	-	-	0,00
	18	-	-	-	-	-	-	-	-	-	-	-	0,00
infectiologists	19	5361	-	986	-	2756	10	-	-	-	-	-	17,36
cardiologists	20	4560	-	-	-	3648	-	-	-	-	-	-	6,71

child cardiologists	21	-	-	-	-	-	-	-	-	-	-	-	0,00
clinical mycologists	23	-	-	-	-	-	-	-	-	-	-	-	0,00
coloproctology	24	-	-	-	-	-	-	-	-	-	-	-	0,00
cosmetologists	25	-	-	-	-	-	-	-	-	-	-	-	0,00
manual therapists	29	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	29.1	-	-	-	-	-	-	-	-	-	-	-	0,00
neurologists	31	11738	-	6377	-	3699	2317	-	-	-	-	-	13,58
neurosurgeons	32	-	-	-	-	-	-	-	-	-	-	-	0,00
neonatologists	33	-	-	-	-	-	-	-	-	-	-	-	0,00
nephrologists	34	-	-	-	-	-	-	-	-	-	-	-	0,00
general practice (family)	35	71512	-	-	-	34355	-	18711	-	18711	-	-	22,83

continued (2100)

Name	№	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor function
		Doctors, including preventive treatment- total	including					total	including rural	From group 9 funciton		From group 12	
			rural inhabitants	children Below 18	rural inhabitants	adults 18 and above	children Below 18			Due to disease		Due to disease	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
oncologists	36	6136	-	-	-	5522	-	-	-	-	-	-	16,56
child oncologists	37	-	-	-	-	-	-	-	-	-	-	-	0,00
orthodontists	38	-	-	-	-	-	-	-	-	-	-	-	0,00
osteopaths	39	-	-	-	-	-	-	-	-	-	-	-	0,00
otorhinolaryngologists	40	15435	-	12424	-	2077	8026	-	-	-	-	-	20,83
ophthalmologists	41	14768	-	8176	-	4548	3487	-	-	-	-	-	19,93
ophthalmologists-prosthetists	42	-	-	-	-	-	-	-	-	-	-	-	0,00
pediatrists - total	45	52823	-	52823	-	-	20600	15826	-	14837	15826	14837	9,84
indluding: pediatrists distict (including prediatrists on each local district)	46	40326	-	40326	-	-	18850	15826	-	14837	15826	14837	23,32
pediatrists cities (by district)	47	-	-	-	-	-	-	-	-	-	-	-	0,00
aviation and space medicine	48	-	-	-	-	-	-	-	-	-	-	-	0,00
diving medicine	49	-	-	-	-	-	-	-	-	-	-	-	0,00
in physical therapy	55	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	55.1	-	-	-	-	-	-	-	-	-	-	-	

medical and social expertise	56	-	-	-	-	-	-	-	-	-	-	-	0,00
medical prevention	57	-	-	-	-	-	-	-	-	-	-	-	0,00
medical rehabilitation	58	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	58.1	-	-	-	-	-	-	-	-	-	-	-	
palliative care	60	-	-	-	-	-	-	-	-	-	-	-	0,00
x-ray endovascular diagnostics and treatment	62	-	-	-	-	-	-	-	-	-	-	-	0,00
sports medicine	64	-	-	-	-	-	-	-	-	-	-	-	0,00
reception	65	-	-	-	-	-	-	-	-	-	-	-	0,00
occupational pathology	66	-	-	-	-	-	-	-	-	-	-	-	0,00
psychiatrists	67	9366	-	-	-	6462	-	318	-	318	-	-	26,14
including: district	68	9366	-	-	-	6462	-	318	-	318	-	-	39,21
children psychiatrists	69	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists	70	-	-	-	-	-	-	-	-	-	-	-	0,00

continued (2100)

Name	№	Number of visits			From total visits (p.3) due to disease			Number of vistis at home					doctor function
		Doctors, including preventive treatment- total	including rural inhabitants	including children Below 18	rural inhabitants	adults 18 and above	children Below 18	total	including rural	From group 9 funciton Due to disease		From group 12 Due to disease	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
teenage psychiatrists	71	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists teenage distict	72	-	-	-	-	-	-	-	-	-	-	-	0,00
psychiatrists-narcologists	73	-	-	-	-	-	-	-	-	-	-	-	0,00
including psychiatrists-narcologistsи district	74	-	-	-	-	-	-	-	-	-	-	-	0,00
psychotherapists	75	3556	-	-	-	1768	-	-	-	-	-	-	11,52
including: visits by disabled	75.1	1691	-	-	-	1691	-	-	-	-	-	-	
pulmonologists	76	-	-	-	-	-	-	-	-	-	-	-	0,00
radiologists	77	-	-	-	-	-	-	-	-	-	-	-	0,00
radiotherapists	78	-	-	-	-	-	-	-	-	-	-	-	0,00
rheumatologists	79	-	-	-	-	-	-	-	-	-	-	-	0,00
radiologists	80	-	-	-	-	-	-	-	-	-	-	-	0,00
reflexologists	81	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	81.1	-	-	-	-	-	-	-	-	-	-	-	
sexologists	82	-	-	-	-	-	-	-	-	-	-	-	0,00

interns	84	-	-	-	-	-	-	-	-	-	-	-	0,00
dentists	86	3722	-	-	-	3349	-	-	-	-	-	-	2,08
childrens dentists	87	18162	-	18162	-	-	6119	-	-	-	-	-	36,77
orthopedic dentists	88	-	-	-	-	-	-	-	-	-	-	-	0,00
dental therapists	89	14936	-	-	-	10305	-	-	-	-	-	-	8,06
dental surgeons	90	544	-	544	-	-	544	-	-	-	-	-	1,10
forensic experts	91	-	-	-	-	-	-	-	-	-	-	-	0,00
forensic psychiatric experts	92	-	-	-	-	-	-	-	-	-	-	-	0,00
maritime doctors	93	-	-	-	-	-	-	-	-	-	-	-	0,00
audiologists-otorhinolaryngologists	94	-	-	-	-	-	-	-	-	-	-	-	0,00
Audiologists-prothesists	95	-	-	-	-	-	-	-	-	-	-	-	0,00

continued (2100)

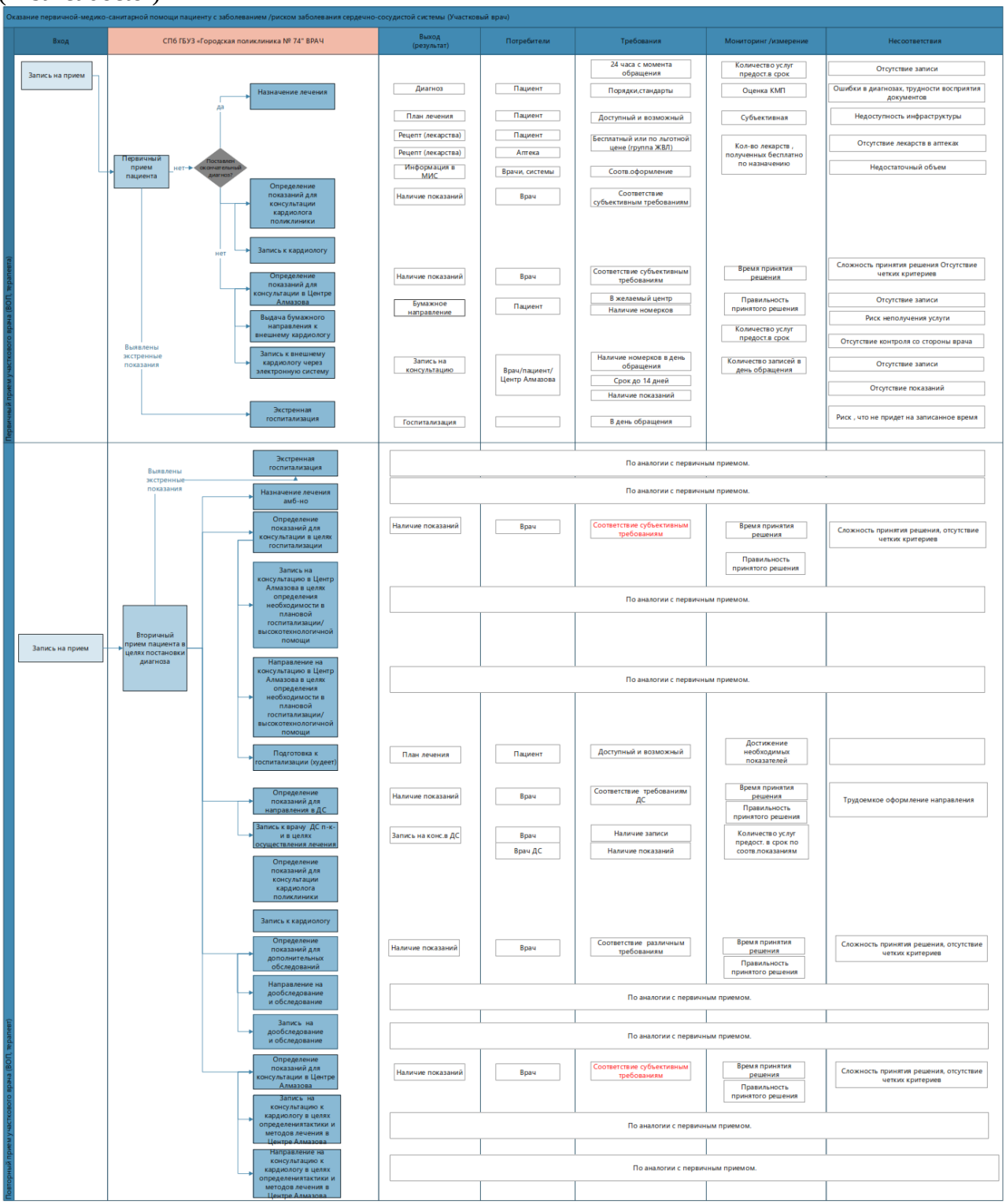
Name	№	Number of visits			Out of total			Number of visits at home					Doctor's function
		Doctors, including preventive treatment- total	including		Due to disease			total	incldуing	From group 9		From group Due to disease	
			rural inhabitants	children Below 18	rural inhabitants	adults 18 and above	children Below 18		rural inhabitants	Due to disease	children Below 18		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
therapists - total	96	16464	-	-	-	6750	-	2227	-	2227	-	-	7,21
including: district	97	16464	-	-	-	6750	-	2227	-	2227	-	-	13,76
therapitss: disttict manufacturing	98	-	-	-	-	-	-	-	-	-	-	-	0,00
therapists ambulance	99	-	-	-	-	-	-	-	-	-	-	-	0,00
therapists teenage	100	-	-	-	-	-	-	-	-	-	-	-	0,00
toxicologists	101	-	-	-	-	-	-	-	-	-	-	-	0,00
traumatologists-orthopedists	102	6422	-	3666	-	2480	2517	-	-	-	-	-	11,56
transfusiologists	103	-	-	-	-	-	-	-	-	-	-	-	0,00
urologists	105	5782	-	-	-	3579	-	-	-	-	-	-	15,61
children's urologists-andrologists	106	2523	-	2523	-	-	1313	-	-	-	-	-	40,86
pharmacologists clinical	107	-	-	-	-	-	-	-	-	-	-	-	0,00
physical therapists	108	-	-	-	-	-	-	-	-	-	-	-	0,00
including: visits by disabled	108.1	-	-	-	-	-	-	-	-	-	-	-	
phthisiologists	109	-	-	-	-	-	-	-	-	-	-	-	0,00
including: phthisiologists district	110	-	-	-	-	-	-	-	-	-	-	-	0,00

surgeons children’s surgeons	112	6610	-	-	-	4560	-	-	-	-	-	-	9,73
plastic surgeons	113	8026	-	8026	-	-	4004	-	-	-	-	-	32,49
cardiovascular surgeons	114	-	-	-	-	-	-	-	-	-	-	-	0,00
thoracic surgeons	115	-	-	-	-	-	-	-	-	-	-	-	0,00
maxillofacial surgeons	116	-	-	-	-	-	-	-	-	-	-	-	0,00
endocrinologists	117	-	-	-	-	-	-	-	-	-	-	-	0,00
children’s endocrinologists	118	5127	-	-	-	4563	-	123	-	123	-	-	14,17
endoscopists	119	1802	-	1802	-	-	836	-	-	-	-	-	9,73
other	120	-	-	-	-	-	-	-	-	-	-	-	0,00
including emergency visits	122	-	-	-	-	-	-	-	-	-	-	-	0,00
помощи отделения неотложной помощи Total number of visits (line.1):	122.1	-	-	-	-	-	-	-	-	-	-	-	X
emergency care points	123	8425	-	2610	-	5815	2610	-	-	-	-	-	X
palliative care	124	-	-	-	-	-	-	-	-	-	-	-	X
other, psychologists	125	4047	-	205	-	-	-	-	-	-	-	-	X
including: visits by disabled													
Inducing disabled	125.1	3738	-	79	-	-	-	-	-	-	-	-	X

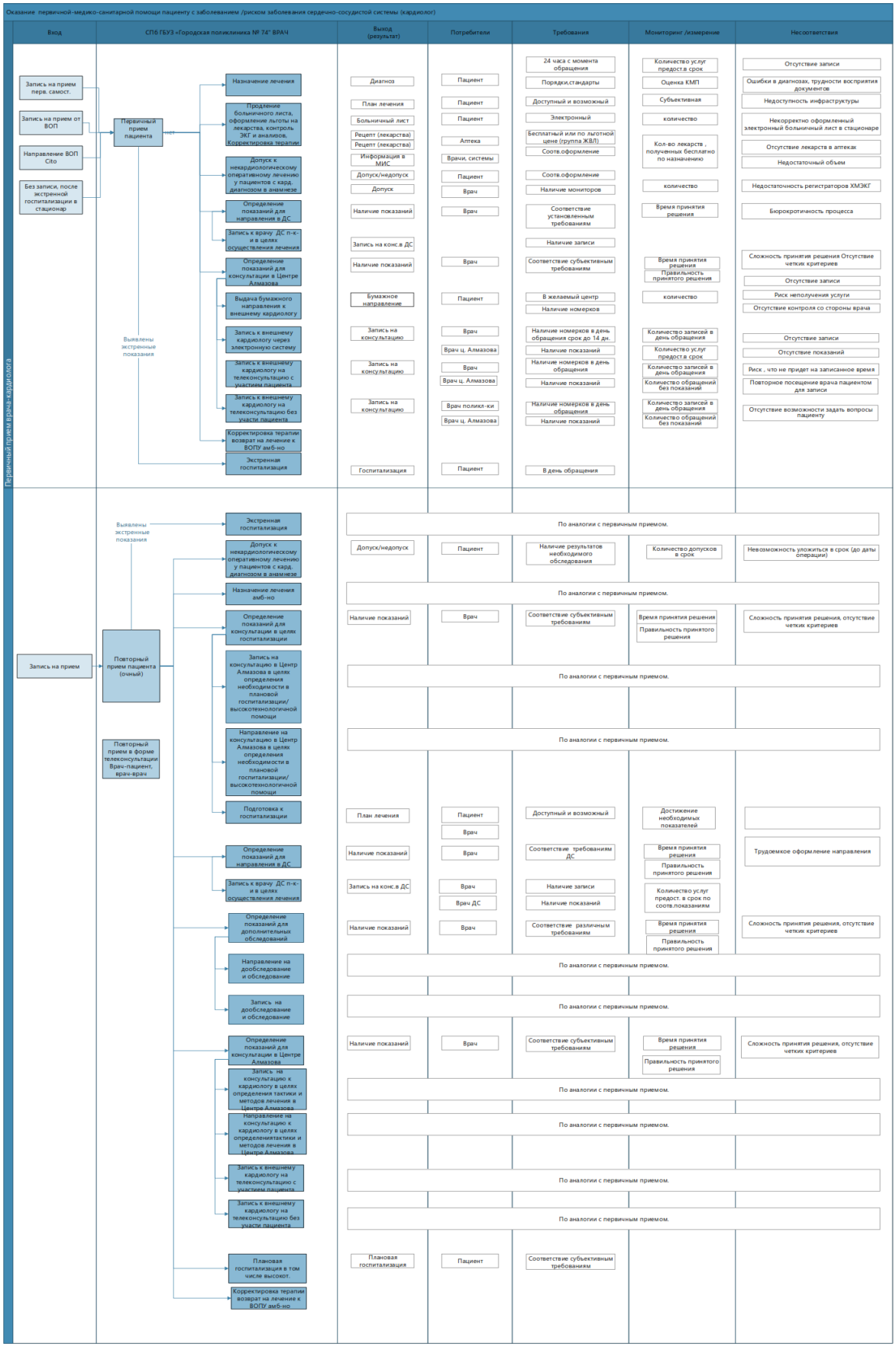
APPENDIX D

The practice of interaction in the provision of medical care in the "cardiology" profile in the surveyed institutions of St. Petersburg in terms of outpatient care

Providing primary health care to a patient with a disease/risk of cardiovascular disease (District doctor)



Providing primary health care to a patient with a disease/risk of cardiovascular disease (cardiologist)



APPENDIX E

Sample Template for Cardiologist Appointment Summary

- Patient's complaints

Mandatory Fields			
There are no complaints on the pathology of the cardiovascular system.	*(specify the reason for consultation)*		
Thoracodynia	Yes/no		
Localization	*(to specify)*		
	at rest		
	on activity	walking distance to	100 meters without stopping
			up to 300 meters without stopping
		during a slight/domestic physical activity	
		When climbing stairs	up to the ___ floor
		When climbing stairs	up to the ___ floor
		others	
	Without a clear link to physical activity		
	Affected by psychoemotional stress		
	duration	Up to 5 minutes	
		5-30 minutes	
		More than 30 minutes	
	character	pressing	
		burning	
		stabbing	
		others	
	Without radiation		
	Irradiate		
		In the left hand	

		In the interscapular region	
		Lower jaw bone	
	are delimited	After cessation of activity	
		After taking nitrates in	
			1 minute
			1-5 minutes
			More than 10 minutes
	Others		
Dyspnea	Yes/no		
	On activity /at rest		
	On activity	walking distance to	100 meters without stopping
			up to 300 meters without stopping
		during a slight/domestic physical activity	
		When climbing stairs	up to the ___ floor
		When climbing stairs	up to the ___ floor
Choking attack at rest	Yes/no		
Orthopnea	Yes/no	others	
Episodes of emptysis	Yes/no		
Tussis	Yes/no		
Feeling of heart failure	Yes/no		
	(describe)		
Syncopal and lipothymic condition	Yes/no		
	(describe)		
Dizziness	Yes/no		
Episodes of increase in BP	Yes/no		
	Maximum		
	Frequency of increase		

	What is followed by:	
Swelling in legs	Yes/no	
	Describe if "yes"	
Free text		

2. Medical History

The patient denies any history of cardiovascular pathology. Previously, was not observed by cardiologist.			
Collecting the history is problematic due to a severe cognitive-mnestic deficit.			
Collection of the history from the words of relatives, based on the provided medical documentations.			
History of arterial hypertension	The patient denies the increase in BP in the history		
	The patient did not control BP		
	Increase in BP during	_____ years	
		Several months	
	Maximum of BP	_____ mm Hg	
	Normal BP range	_____ mm Hg	
	On treatment		
	Continuous antihypertensive therapy	Yes	No
	CVA in the medical history	denies	
		others	
	Present deterioration	(describe)	
Medical history of arteriosclerotic heart disease	The patient denies arteriosclerotic heart disease in the history		
	The onset of arteriosclerotic heart disease in	the year _____	
	The onset of arteriosclerotic heart disease	from the clinic of effort angina	
		with unstable angina	
		MI	
	Previously conducted	conservative therapy	
		PTCA with stenting	AIVA Basilar Artery SCA

	In	the year _____	
		Coronary artery bypass grafting	
	In	the year _____	
	Recent hospitalization for arteriosclerotic heart disease	(describe)	
	Currently there are clinical findings of		
		Unstable angina	
		Stable angina, Class I	
		Stable angina, Class II	
		Stable angina, Class III	
		Stable angina, Class IV	
	Present deterioration	(describe)	
According to the stress echocardiography data from	(date)		
	Completed load	_____ MET / W	
	Negative sample		
	Positive sample	- according to clinical criteria	
		- according to ECG criteria	(describe)
	At the height of the load there appeared zones of cardiac rhythm disturbances (ZCRD) in the area of	(describe)	
	Additionally		
According to Holter ECG monitoring data	(date)		
	No ischemic changes were detected		
	St segment ischemic depression was registered	(describe)	
	Rhythm disorders were registered	(describe)	
	Additionally		
History of rhythm disorders	(free text)		
Anticoagulant therapy	Receive/doesn't receive		
	As anticoagulant therapy were prescribed:	Warfarin	Target INR values were

		achieved
		Target INR values were not achieved
		Pradaxa
		Xarelto
		Eliquis
	Hospitalizations for this reason	
	Presence of implantable devices	(describe)
Additionally		
History of CRHD	CRHD was first diagnosed in	the year _____
	According to echocardiography data	(describe)
	Bicillin preventive treatment	Taken/not taken
	Follow-up according to echocardiography data	(describe)
	Clinically	(describe)
	Surgical service	Not conducted/describe
	Additionally:	
The history of the valve pathology	For the first time the pathology	Aortic valve
		Mitral valve
		Tricuspid valve
	Detected in	the year _____
	Diagnosed	(describe)
	There were complaints on	(describe)
	Currently according to the echocardiography data	(describe)
	Clinically	(describe)
	Surgical service	Not conducted/describe
	Additionally:	
History of CHF	Decrease in EF for the first time detected in	the year _____
	A workup was done	(describe)
	Therapy was conducted	(describe)
	Follow-up during conducted treatment	(describe)

	Additionally	
	Present deterioration	(describe)
Pathology of the aorta	Aortic dilatation detected for the first time	the year _____
	According to echocardiography data	(describe)
	According to MSCT of the aorta data	(describe)
	Consulted by a surgeon	(describe)
	Currently	(describe)
ASD	For the first time diagnosed in	the year _____
	According to echocardiography data	(describe)
	According to TEE data	(describe)
	Consulted by a surgeon	(conclusion)
	Follow-up	(describe)
HCM	For the first time diagnosed in	the year _____
	According to echocardiography data	(describe)
	According to MRI data	(describe)
	According to Holter ECG monitoring data	(describe)
	Clinically	
	Additionally	
Free text		
Results of clinical blood analysis	From	Describe
Lipid profile	From	Describe
Results of biochemical blood analysis	From	Describe
INR	From	Describe
Results of common urine analysis	From	Describe
Other laboratory assessment	describe	
ECG	From	Describe
Echocardiography	From	Describe
	EF	___%
	ZRCD	_____

	AV	_____
	MV	_____
	TV	_____
	LAT	_____
	aorta	____
Holter ECG monitoring	From	Describe
Ultrasonic Doppler examination of the brachio-cephalic arteries	From	Describe
Stress echocardiography	From	Describe
According to cardioangiography	From the year _____	LMCA
		AIVA
		Basilar Artery
		SCA
		PIV
		MB
		_____
Other investigations	Describe	
At the moment of examination the patient constantly takes	(describe)	

Currently, the patient does not receive medical therapy for the pathology of the cardiovascular system.		
The patient is consulted by a cardiac surgeon of the NMRC, and operative therapy is indicated –	(date)	
	Coronary artery bypass grafting	
	PCI	
	Replacement of	
		Aortic valve
		Mitral valve
		Tricuspid valve
	Mitral valve repair	
In short terms		
Routinely.		

History of life		
History of chronic diseases	Type 1 diabetes mellitus	
	Type 2 diabetes mellitus	

	Chronic gastritis.		
	Peptic ulcer		
	Pathology of the thyroid		
	Bronchial asthma		
	COPD		
	Obliterating atherosclerosis of lower limb arteries		
	Lower limb varicose veins disease		
	Gout		
Free text			
Gynecologic history	*(take from the existing status)*		
Heredity	*(take from the existing status)*		
Allergological history	*(take from the existing status)*		
Cacoethes	*(take from the existing status)*		
Epidemiological history			
Physical examination			
General condition	Satisfactory/relatively satisfactory/moderate/severe		
	Height		
	Weight		
	BMI	(calculated value, take from the existing status)	
Skin cover and visible mucosa	Normal color/pale / icteric/yellowish/cyanotic/lip cyanosis/acrocyanosis		
Oedemata	*(take from the existing status)*		
Respiratory system	Respiration rate	Per minute	
	Breath sounds	Harsh/vesicular/other	
	Heard	Throughout all lung fields/ not heard in___/ suppressed in ____	
	By percussion	(describe)	
	Rale	No	
		Dry rale	(describe)
		Moist	(describe)
Cardiovascular system	Pulse	_____ beats/min	

	Characteristics	*(take from the existing status)*	
	Heart rate	Beats/min	
	Heart sounds	Resonant	
		Dull	
		Arrhythmic	
	Heart murmur	*(take from the existing status)*	
	Abnormal pulsations	Not defined/describe	
	Peripheral arteries pulsation	Saved/(other)	
	BP in right arm (1)		
	BP in right arm (2)		
	BP in left arm (1)		
	BP in left arm (2)		
Digestive system	The abdomen is soft and painless in palpation/ other (describe)		
Stool	Normal/other (describe)		
Urinary system	Sufficient diuresis/other (describe)		

APPENDIX F

Draft of Guidelines On the Criteria for Patient Referral to Almazov National Medical Research Centre and examinations required for consultation

1. Arteriosclerotic heart disease

Criteria for primary care referral to the Almazov Center:

1.1. Grade II-IY angina, which persists despite the full-scale therapy provided according to the recommendations

Angina when patients suffered a myocardial infarction with a decrease in the ejection fraction below 50%.

1.2. Angina in the setting of cacoethic rhythm disorders.

1.3. Relapse of angina when patients underwent percutaneous coronary intervention or CABG surgery, up to 1 year.

1.4. Availability of data from coronary angiography performed in other institutions.

The required extent of examinations required for the consultation:

3. Complete blood count;

4. Chemistry panel (creatinine, glucose, potassium, sodium, aspartate transaminase, alanine transaminase, INR, prothrombin, uric acid);

5. Urinalysis;

6. Echocardiography;

7. Holter ECG monitoring;

8. 12-lead ECG at rest;

2. Rhythm Abnormalities

Criteria for primary care referral to the Almazov Center:

2.1. Patients with reciprocating tachycardia or with suspected reciprocating tachycardia for determining the indications for RFA or further examination - transoesophageal EP heart test.

2.2. Patients with frequent, hemodynamically relevant paroxysmal event of AF or AFL to determine indications for operative therapy.

2.3. Patients with persistent (up to 1-1.5 years) , tachysystole AF, especially at a young age - to determine the indications for operative therapy.

2.4. Patients with registered rhythm disorders and AV block conduction disorders, SSS to determine indications for pacemaker implantation.

2.5. Patients with ventricular rhythm disorders - all VT, ESV from 7 thousand /day according to the results of Holter ECG monitoring, with low subjective tolerance of tachyarrhythmia.

2.6. Patients with long QT syndrome, suspected Brugada syndrome, especially if there is a history of syncope.

2.7. Patients with a family history of SCD syndrome, cardiomyopathy to determine indications for ICD implantation, CRT-D, RFA, geneticist consultation.

The extent of examinations required for the consultation:

12-lead ECG at rest;

Echocardiography;

Holter ECG monitoring (with registered rhythm and conduction disorders);

Heart MRI in the presence of more than 10 thousand ventricular extrasystoles by Holter ECG monitoring (or the presence of refferal 64-P for the study at the Almazov Center),

Thyroid hormone;

Chemistry panel (creatinine, glucose, potassium, sodium, aspartate transaminase, alanine transaminase, INR, prothrombin, uric acid);

3. Valvular pathology

Criteria for primary care referral to the Almazov Center:

3.1. Aortic insuffiency

- Severe
- Moderate
- Aortic insufficiency with additional echocardiography data: EF less than 50%, EDD>70mm, ESD>50 mm

3.2. Aortic stenosis (AS)

According to the echocardiography data: Vmax across the aortic valve ≥ 3 m/s; mean pressure gradient across the aortic valve ≥ 30 mm Hg.

- Moderate AS
- Severe AS
- Mild AS with EF less than 50% according to echocardiography data

3.3. Mitral regurgitation (primary)

- Moderate
- Severe

- Any MI with additional echocardiography data (EF< 60%, ESD>45mm, calculated mPAP≥50 mm Hg)

  As well as all women who are planning pregnancy and have cardiac valvular pathology

The required extent of examinations required for the consultation:

- 12-lead ECG at rest;
- Clinical blood analysis;
- Chemistry panel (lipid profile, AST, ALT, creatinine, bilirubin, glucose, potassium);
- urinalysis;
- Echocardiography;
- Holter ECG monitoring

4. Thoracic aortic aneurysm

Criteria for primary care referral to the Almazov Center:

4.1. Aortic diameter ≥ 45mm;

4.2. Women planning pregnancy with aortic diameter ≥ 40 mm.

The required extent of examinations required for the consultation:

- MSCT-aortography with ECG gating or refferal 64-P to be performed in the Almazov Center;
- 12-lead ECG at rest;
- Clinical blood analysis;
- Chemistry panel (total cholesterol, AST, ALT, creatinine, bilirubin, glucose, potassium);
- Urinalysis;
- Echocardiography;
- Holter ECG monitoring.

5. **Pulmonary hypertension, NOS**

Criteria for primary care referral to the Almazov Center: calculated pulmonary artery pressure ≥ 50 mm Hg..

The required extent of examinations required for the consultation:

- Thoracic organs MSCT contrast-enhanced (MSCT-angiography of the pulmonary artery) or lung scintigraphy at the hospitals of the city (or with the refferal 057y to perform at the Almazov Centre);
- Spirometry with a sample with a bronchodilator in the case of lung pathology.
- 12-lead ECG at rest;

- Clinical blood analysis;
- HbsAg, HCV blood test, form 50;
- Chemistry panel (total cholesterol, AST, ALT, CPK, creatinine, bilirubin, glucose, potassium; urinalysis);
- Echocardiography;
- Holter ECG monitoring

6. **Myocarditis**

Criteria for primary care referral to the Almazov Center: EF< 50%, CHF≥ FC II, ventricular, supraventricular extrasystole in abnormal amounts, ventricular tachycardia.

The required extent of examinations required for the consultation:

- ESR, CRP;
- Troponin I, or creatine phosphokinase-MB;
- 12-lead ECG at rest;
- Clinical blood analysis;
- HbsAg, HCV blood test, form 50;
- Chemistry panel (total cholesterol, AST, ALT, CPK, creatinine, bilirubin, glucose, potassium; urinalysis);
- Echocardiography;
- Holter ECG monitoring.

7. Pericarditis

Criteria for primary referral to the Almazov Center: pericardial effusion > 7 mm, agnogenic

The required extent of examinations required for the consultation:

- Phthisiologist consultation;
- ESR, CRP;
- Troponin I, creatine phosphokinase-MB;
- Thyroid hormone;
- 12-lead ECG at rest;
- Clinical blood analysis;
- Chemistry panel (total cholesterol, AST, ALT, creatinine, bilirubin, glucose, potassium);
- Urinalysis;
- Echocardiography;
- Holter ECG monitoring.

8. **Cardiomyopathies**

Criteria for primary care referral to the Almazov Center:

Dilated, hypertrophic, restrictive, and other cardiomyopathies - to determine the management tactics and follow-up frequency.

The required extent of examinations required for the consultation:

- 12-lead ECG at rest;
- Clinical blood analysis;
- ESR, C-reactive protein;
- Chemistry panel (total cholesterol, AST, ALT, creatinine, bilirubin, glucose, potassium);
- Urinalysis;
- Echocardiography;
- Holter ECG monitoring.

9. **Surgically operated congenital heart disease (CHD)**

Criteria for primary care referral to the Almazov Center:

9.1. Women planning pregnancy;

9.2. Patients transferring from the paediatric network to an outpatient clinic of the common network;

9.3. Complicated CHD.

The required extent of examinations required for the consultation:

- 12-lead ECG at rest;
- Clinical blood analysis;
- Chemistry panel (total cholesterol, AST, ALT, creatinine, bilirubin, glucose, potassium);
- Urinalysis;
- Echocardiography;
- Holter ECG monitoring.

10. **Non-operated congenital heart disease**

Criteria for primary care referral to the Almazov Center: the need to address the issue of surgical correction of the disease.

The required extent of examinations required for the consultation:

- 12-lead ECG at rest;
- Clinical blood analysis;

- Chemistry panel (fats, AST, ALT, CPK, creatinine, bilirubin, glucose, potassium; urinalysis);
- Echocardiography;
- Holter ECG monitoring;

11. **Patients with lipid storage disease**

Criteria for primary care referral to the Almazov Center:

1. Patients with suspected familial hypercholesterolemia (OH level > 8.0 mmol/l and / or LDL > 4.9 mmol/l + family history), requiring determination of optimal patient management tactics (determination of indications for high-dose rate and / or combination therapy with lipid-lowering drugs, including monoclonal antibodies);
2. Patients with an early history of cardiovascular diseases (up to 50 years), including after revascularization, due to blood stream arterial sclerotic disease, who need timely, "aggressive" secondary prevention;
3. Patients with an insufficiently effective regimen of lipid-lowering therapy due to its intolerance, the development of side effects.

The required extent of examinations required for the consultation:

- 12-lead ECG at rest;
- Clinical blood analysis;
- Chemistry panel (fats, AST, ALT, CPK, creatinine, bilirubin, glucose, sodium, potassium; urinalysis);
- Urinalysis;

12. **Anticoagulant therapy unit**

Criteria for primary care referral to the Almazov Center:

4. Patients with artificial heart valves surgically operated at the Almazov Center (mechanical/biological prosthesis), who have difficulties with selecting the dose of warfarin and achieving the target INR. Within the city network of anticoagulant therapy units - monitoring at least once a month until a stable result is achieved (the target value of INR).
5. Patients with thromboembolic or hemorrhagic complications during anticoagulant therapy. At least once a month.
6. Patients after myocardial infarction with thromboembolic complications (thrombosis of heart cavities, atrial appendage). At least once a month until complete thrombosis lysis.

7. Instable INR with differences of more than 2 units over a period of 2 weeks, or instable INR in half of the measurement cases.
8. Comorbide patients with high risk of thrombotic complications and high risk of bleeding who need antithrombotic protection

14.8.1. kidney pathology : stages 3B, 4, 5 CKD

14.8.2. after suffering a pulmonary embolism, recurrent PATE

14.8.3. taking NSAIDs, corticosteroids, and hormone therapy for a long period of time.

INR control from 1-3 times a month with dose-ranging of warfarin, achieving the target INR.

14.8.4. Patients taking NOAC (rivaroxaban, apixaban, dabigatran)- risk stratification. Monitoring 1 time in 6 months.

14.8.5. Antiphospholipid syndrome

The required extent of examinations required for the consultation:

- Clinical blood analysis+platelet count;
- Chemistry panel (ALT, AST, creatinine, GFR);
- Coagulogram, the previous value of the INR.

13. **Congestive heart failure**

Criteria for primary care referral to the Almazov Center:

13.1. Obstinate, resistant or refractory to optimal medicamentous therapy congestive heart failure to determine the indications for surgical and/or electrophysiological correction of congestive heart failure: coronary angiogram, revascularization, CRT / ICD implantation, radiofrequency ablation of arrhythmias, heart transplantation, and other operations.

13.2. Difficulties in selecting CHF therapy in polyclinic settings due to patients co-morbidity, hypotension, CKD and/or side effects of treatment.

13.3. Patients after heart transplantation.

The required extent of examinations required for the consultation:

- Clinical blood analysis;
- Urinalysis;
- Chest photofluorograph;

- Chemistry panel (creatinine, potassium, sodium, calcium, total cholesterol, lipid profile (for arteriosclerotic heart disease or CVD risk factors), fasting glucose, uric acid, prothrombin, INR, ALT, AST, bilirubin);
- 12-lead ECG at rest;
- Echocardiography;
- Holter ECG monitoring;
- In the presence of co-mordibity - the results of the examination of this pathology to assess its severity and damage to target organs (if the disease is systemic).

14. Hypertensive disease;

Criteria for primary care referral to the Almazov Center:

1.1. Difficult to control, resistant or refractory arterial hypertension, as well as difficulties in selecting antihypertensive therapy due to patients co-morbidity and/or side effects of treatment.

1.2. Isolated arterial hypertension with multiple risk factors and severe target organs damage.

1.3. Suspected secondary arterial hypertension.

The required extent of examinations required for the consultation:

1. Clinical blood test and ESR;
2. Urinalysis;
3. Chest photofluorograph;
4. Chemistry panel: creatinine, potassium, sodium, lipidogram, fasting glucose, uric acid, prothrombin, INR, ALT, AST, bilirubin;
5. 12-lead ECG at rest;
6. Echocardiography;
7. Kidney and adrenal glands ultrasound;
8. Ophthalmologist consultation - fundus of the eye assessment.

APPENDIX G

Sample Template of the TMC Application Summary

(cardiological profile)

1. **Patient complaints**

Mandatory Fields		
Thoracodynia	(describe)	
Dyspnea	(describe)	
Choking attack at rest	Yes/no	
Orthopnea	Yes/no	
Episodes of emptysis	Yes/no	
Feeling of heart failure	*(describe)*	
Syncopal and lipothymic condition	Yes/no	
	(describe)	
Episodes of increase in BP	Yes/no	
	(describe)	
Swelling in legs	Yes/no	
	Describe if "yes"	
Free text		

2. **Medical Record**
   Required fields

History of arterial hypertension		
Medical history of arteriosclerotic heart disease		
History of rhythm disorders	(free text)	
Additionally		
History of CRHD		
The history of the valve pathology		
History of CHF		
Pathology of the aorta		
ASD		
HCM	For the first time diagnosed in	the year _____
Free text		
Results of clinical blood analysis	From	Describe

Results of laboratory assessment and instrumental methods of examination (fill in if available)		
Lipid profile	From	Describe
Results of biochemical blood analysis	From	Describe
INR	From	Describe
Results of common urine analysis	From	Describe
Other laboratory assessment	describe	
ECG	From	Describe
Echocardiography	From	Describe
Holter ECG monitoring	From	Describe
Ultrasonic Doppler examination of the brachio-cephalic arteries	From	Describe
Stress echocardiography	From	Describe
Other investigations	Describe	
At the moment of examination the patient constantly takes	(describe)	
Currently, the patient does not receive medical therapy for the pathology of the cardiovascular system.		
History of life		
History of chronic diseases	Type 1 diabetes mellitus	
	Type 2 diabetes mellitus	
	Chronic gastritis.	
	Peptic ulcer	
	Pathology of the thyroid	
	Bronchial asthma	
	COPD	
	Obliterating atherosclerosis of lower limb arteries	
	Lower limb varicose veins disease	
	Gout	
Free text		
Gynecologic history		
Heredity		
Allergological history		
Cacoethes		

Physical examination			
General condition	Satisfactory/relatively satisfactory/moderate/severe		
	Height		
	Weight		
	BMI	(calculated value)	
Skin cover and visible mucosa	Normal color/pale / icteric/yellowish/cyanotic/lip cyanosis/acrocyanosis		
Oedemata			
Respiratory system	Respiration rate	Per minute	
	Breath sounds	Harsh/vesicular/other	
	Heard	Throughout all lung fields/ not heard in___/ suppressed in ____	
	Rale	No	
		Dry rale	(describe)
		Moist	(describe)
Cardiovascular system	Pulse	_____ beats/min	
	Characteristics	*(take from the existing status)*	
	Heart rate	Beats/min	
	Heart sounds	Resonant	
		Dull	
		Arrhythmic	
	Heart murmur	*(take from the existing status)*	
	Abnormal pulsations	Not defined/describe	
	Peripheral arteries pulsation	Saved/(other)	
	BP in right arm (1)		
	BP in left arm (1)		
Digestive system	The abdomen is soft and painless in palpation/ other (describe)		
Stool	Normal/other (describe)		
Urinary system	Sufficient diuresis/other (describe)		
Representation of the patient	*(required field) (it is required to specify the purpose of referral to the telemedicine consultation, it is possible to choose from the list)*		