QUALITY ASSESSMENT OF A SECOND OPINION TELEMEDICINE SERVICE

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Abstract

The use of technology advancements and telemedicine has definitely contributed to reducing the communication gap between patients and doctors. Lately, a telemedicine program is applied in Greece aiming at the improvement of primary health services offered to Greek citizens, especially of remote and rural areas. The program is supported by the Greek National Health Service, while it is fully funded and run by Vodafone Greece. Vodafone offers doctors of 100 remote areas of continental Greece and Greek islands, portable medical equipment, supplies, electronic equipment and internet access to enable them to monitor their patients. It also offers them potential advisory support from doctors of the Athens Medical Center.

The differentiation of this program from the vast majority of others lies in the fact that the end-user of the program is not the patients themselves.

In accordance with the will of Vodafone to evaluate and improve, if necessary, the telemedicine services provided, we carried out a field research, the results of which are presented in what follows. Our objective was not only to find out the overall degree of satisfaction of both the participating doctors and patients, but also to compare their views. Overall, participants admitted that Vodafone Telemedicine Program results in more efficient primary healthcare services and improves the patients' quality of life. The degree of satisfaction of both the involved doctors and patients is very high and everyone wishes the continuation or, even better, the extension of the program through the inclusion of additional tests-examinations and its application to more remote areas of Greece.

Keywords: Telemedicine; Teleconsulting; Health; Questionnaire; Greece

1. Introduction

The term Telemedicine that was introduced in the '70s literally means "healing at a distance" [1] and signifies the use of Information and Communication Technologies (ICT) to improve patient outcomes by increasing access to care and medical information. As technology advanced new terms were introduced, including eHealth, mHealth, Digital Health and TeleHealth. The World Health Organization (WHO) definition of eHealth, "The use of information and communication technologies for health", clearly places mHealth and telemedicine as subsets of eHealth. However, terms are used interchangeably and signify different context among countries and health systems. For instance, Sood et al. [2] found 104 peer-reviewed definitions of Telemedicine.

Recent advancements and increasing availability of ICT have created new possibilities for telemedicine, healthcare service and delivery. The replacement of traditional forms of communication with digital methods combined with a rapid drop in the cost of ICT, have created opportunities of new ways of delivering care. Particularly, the introduction and popularization of the Internet has further accelerated the pace of these advancements.

Overall, the last decade has seen an explosion of new telecommunication technologies worldwide, which in aggregate has propelled eHealth/telemedicine into a more widespread appearance both in and out of the hospital, spanning almost all specialties (e.g. neurology, trauma surgery, behavioral health etc.) and extending beyond clinical care services into other usage areas like remote patient monitoring and provider education and training, quality improvement and clinical trial execution as well as clinical research [3].

As far as telemedicine in Greece is concerned, a lot of information and milestones of its evolution can be found in Tsirintani [4]. Greece is a country with many isolated islands and mountainous regions, where residents do not always have easy access to hospitals and other medical units. Moreover, there is insufficiency of suitable infrastructures and lack of specialized medical personnel. Thus, telemedicine can offer crucial services in these regions. Though, despite the ambitious scientific interest, the practice in Greece has not shown the expected results until now.

One of the most challenging areas in improving healthcare globally is chronic disease management. Associated premature mortality and reduced physical functioning, along with higher use of health services and related costs, are among the key concerns faced by policy-makers and practitioners [5]. Given the growing burden of chronic diseases coupled with the increasing popularity of mobile technologies, the application of mHealth in disease management has proven to be beneficial: mHealth improves monitoring of health parameters (e.g. weight, blood pressure) and information (e.g. smoking), as well as communication between patients and doctors and facilitates adherence to chronic diseases management [6], [7]. Vodafone Greece, through their Corporate Social Responsibility (CSR) program, has started to fund a project called **Vodafone Telemedicine Program** (VTP)[1] since 2005. In this effort Vodafone cooperates with the Greek National Health Service (NHS), while NHS doctors participate voluntarily. Moreover, Vodafone offers local doctors portable medical equipment, namely

- Electrocardiograph
- Spirometer
- Blood pressure meter
- Oximeter
- Glucose meter
- Cholesterol and triglycerides meter,

as well as training and advisory support on their use, supplies, internet access, electronic equipment to record the exams and potential advisory support from doctors of the Athens Medical Center (AMC).

The objective of VTP is to support remote and rural, mainly, communities to improve management of their chronic disease population by providing expert-primary care doctor consultation and support. VTP, co-funded by the Vodafone Foundation, was launched on a pilot basis in 2006 covering 5 areas of Central Macedonia. In 2008, the Program was extended to 17

[1] http://www.vodafone.gr/portal/client/cms/viewCmsPage.action?pageId=11280&request_locale=en

areas and in 2011 to 30 areas across Greece. Since 2013, it has been implemented into 100 remote areas of continental Greece or the Greek islands.

Residents in remote areas visit the local medical center[2], where they take medical tests relative to their health condition, such as electrocardiogram or spirometry. Their medical files are made available through an mhealth app[3] to specialists at the AMC. Consultations to local primary healthcare doctors are made to help them assist their patients to better manage their health.

Evaluating telemedicine programs is not a straightforward exercise. Along the years it has become evident that methods used in other sectors cannot be directly applied into a telemedicine evaluation case. Vodafone constantly evaluates its Social Responsibility programs, but especially for this one they decided to ask for an independent research evaluation to ensure its objectivity. The authors and ISEB lab undertook the evaluation project and set a number of partial goals for the survey that was going to be realized. More specifically, we wanted to find out:

- The contribution of VTP to the primary healthcare improvement.
- The overall evaluation of VTP not only by benefiting patients, but also by involved doctors.
- The particular sectors where VTP contributes, such as patients' quality of life and their health improvement, the facilitation of the work of doctors, the NHS cost reduction etc.
- Sectors where VTP could be improved and suggestions from all participants.
- The extent to which a telemedicine program like VTP should run on a permanent basis in various areas of Greece.

In what follows we present the results of our work. We first briefly review the literature on telemedicine issues. Then, (in Section 3), we refer to our survey's research tool and to the data collection process, while in the extensive Section 4 we present, in detail, our findings after analyzing statistically the collected data. We conclude our research in Section 5, indicating the most important benefits of VTP for doctors, patients and the NHS.

[2] VTP supports home and community center visits too.
[3] http://vidavo.eu/index.php/en/component/k2/item/27-vida24

2. Literature Review

Since bibliography on telemedicine is extensive, in the brief literature review that follows we underline a few, but worth mentioning manuscripts; we certainly do not conduct an exhaustive literature mapping on telemedicine issues.

In his broadly sited book, Norris [8] explains the main features of telemedicine and its development and use. He provides a good working knowledge of the subject matter along with an in-depth survey of the literature up to that time. A few years later Heinzelmann et al. [9] follow up trying to predict the future of telemedicine: who the future users of telemedicine will be where and on what applications of telemedicine they will work etc. However, according to Klaassen et al. [10] the number of publications about telemedicine systems increases significantly after 2008; that is why they review literature in order to find telemedicine systems that have been evaluated for their usefulness or ease of use. Wang et al. [11] recognize that the increasing medical needs and insufficient medical resources have become a worldwide problem. To address this, governments have already used (e.g. in China) or are going to adopt and utilize telemedicine services. Thus, Wang et al. [11] focus on hospitals and study whether they should adopt telemedicine services and in which form (the gatekeeper system or dual-channel service system).

Regarding teleconsulting which constitutes the type of telemedicine we focus on, examples of early applications include the use of television to facilitate consultations between specialists at a psychiatric institute and general practitioners (GPs) at a state mental hospital [12] as well as the provision of expert medical advice from a major teaching hospital to an airport medical center [13]. Several years later, many references about teleconsulting can be found in WHO [14], as well as in the literature review of Klaassen et al. [10] who study 38 publications focusing on this variation of telemedicine system. Shi et al. [15] conduct a review of 12 famous consultation systems, while Schettini et al. [16] implement a nephrology e-consulting pilot program within a large, academic primary care practice to facilitate timely communication between nephrologists and primary care providers.

The evaluation of telemedicine, regarding its context and status, has been examined in depth

by Bashshur et al. [17], who propose appropriate strategies and methodologies that can be used in evaluation studies and in interpreting the empirical evidence. Moreover, they search for the origin and goals of healthcare programs' evaluation, deal with the typology of evaluation objectives and identify the difficulties in evaluating telemedicine programs. Goodman [18] distinguishes two main types of health technology evaluation methods: primary data collection methods and secondary or integrative methods. The first methods involve collection of original data, such as clinical trials and observational studies, while the second ones involve combining data or information from existing sources, including from primary data studies. Economic analysis methods - a third type of methods - can involve one or both of primary data methods and integrative methods. Lately, AlDossary et al. [19] provide a detailed review of telemedicine studies and find out that telemedicine is assessed in three different perspectives: the clinical outcome, the economics and the satisfaction. Finally, Scott Kruse et al. [20] provide a different telemedicine assessment on an international level, evaluating in their review the barriers to adopting telemedicine worldwide.

The satisfaction of patients on various issues regarding telemedicine has been measured in numerous publications such as the broadly cited [21-24]. The last publication deals also with the doctors' satisfaction, which has been measured in quite a few other cases by Branger at al. [25], Suresh et al. [26], Rashid at al. [27] and Nasser [28]. A part of these researchers uses questionnaire(s) as a tool to conduct the satisfaction measurement, e.g. [21, 24, 26, 27] and lately [28].

As per publications that compare the beliefs of doctors and patients on a medical issue, the following are the most significant: [27, 29-33]. However, this is still an important research gap, which we attempt to bridge in this paper.

3. The Statistical Analysis Framework

The questionnaires that were used in our field research were designed based mainly on the information and principles of

1. the Model for Assessment of Telemedicine (MAST) – [34] and, more specifically, the MAST toolkit, which among the various Health Technology Assessment methodologies proposed in literature, have been extensively used lately, especially to evaluate European Commission funded large scale pilot projects;

but also

2. the Knowledge gathering Questionnaire[4] that was developed by the Momentum Thematic Network, and
3. the framework methodology to assess the effectiveness of telemedicine applications in Europe, MethoTelemed[5].

However, it should be underlined that our questionnaires had to be differentiated in quite a few points regarding their forerunners as the latter refer mainly to the typical telemedicine practices, namely RT. In our survey the questionnaires were aimed at doctors who constitute the final users of the telemedicine equipment. Thus, they had to be differentiated in comparison with the three base questionnaires that we mention earlier, which are connected with patients, as final users of telemedicine programs and devices. Moreover, MAST suggests that in similar researches data may be collected with various methods, such as systematic literature review, interviews, surveys, questionnaires, focus group interviews, telephone interviews, etc. Our choice was to lean on questionnaires exclusively, which could offer us the necessary quantitative data that we were looking for.

As per the questionnaires' validation, there are certainly several methods: in fact, there are different views in the research community on the suitability of the various methods that may be used for this purpose. In our case, a first step to the questionnaires' validation was that they were analogous to similar tests already in use. The next phase included a pilot test/trial completion during which both questionnaires were sent to an indicative number of doctors in an attempt to find out that participants would understand the questions and the latter capture the topics under

[4] http://www.telemedicine-momentum.eu/wp-content/uploads/2012/09/MOMENTUM-WP3-Questionnaire-2_v2-Summary.pdf
[5] http://www.mast-model.info/Downloads/MethoTelemed_final_report_v2_11.pdf

investigation. In this phase, we paid special attention to some questions measuring the same construct, the responses to which we did not want to be divergent.

The first questionnaire was filled out by 41 doctors (i.e. response rate 41% as the size of doctors' population was only N = 100) mostly from rural sites, while the second one was filled out by 329 patients (who had experienced VTP), during a four-month period, i.e. November 2015 – February 2016. It should, however, be noted that in various questions of both questionnaires there were some doctors / patients (depending on the questionnaire) who did not respond, so the sum of percentages in these questions is not always 100%. Moreover, a part of questionnaires aimed at doctors was filled out electronically (namely through a specially designed form in Google forms) and another part through printed questionnaires. The questionnaires aimed at patients were distributed exclusively in printed form.

Finally, regarding the type of questions asked in our survey, a part of them was a 5 point Likert scale questions, another was yes-no questions and for some other questions a number of specific responses were offered. At the beginning of both questionnaires[6] there were demographic questions.

4. Findings

4.1. Focus group: Doctors

4.1.1. Sample Demographics

The vast majority of sampled doctors (39 out of 41) were specialized, general doctors[7]. Their average work experience is 11.9 years, while the rather large standard deviation (SD) is 7.65

[6] The questionnaire aimed at participating doctor can be found in http://iseb.gr/blog/evaluation-vodafone-telemedicine-program-questionnaire-aimed-participating-doctors while the one aimed at patients in http://iseb.gr/blog/evaluation-vodafone-telemedicine-program-questionnaire-aimed-patients.

[7] Internal Medicine (practiced by GPs) is a clinical specialty of medicine that deals with the prevention, diagnosis and non-surgical treatment of diseases in adult patients, with particular emphasis in the internal organs of the human body. Internal Medicine is practiced both in hospital settings (e.g. clinics, emergency departments etc.) and at primary healthcare infirmaries (e.g. health centers, private infirmaries). In Greece, given the relatively recent recognition of General Medicine as an autonomous medical specialty, GPs have been called upon for decades to support primary healthcare structures, taking on much of the role of "family doctor", still continuing to this day.

years. Figure 1 shows that almost 75% of doctors have work experience varying from 5 to 20 years.

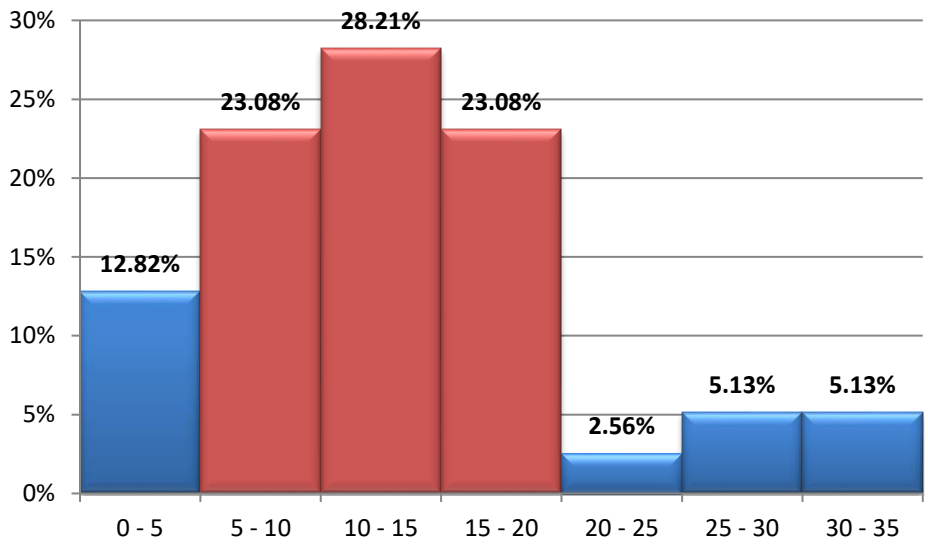


Figure 1: Percentage distribution of doctors' work experience (in years)

Studying the duration of sampled doctors' involvement in VTP (Figure 2), we find out that it ranges from 2 months to 7 years (average: 1.99 years, SD: 1.14 years). However, half the sampled doctors participated in VTP for 2 to 3 years.

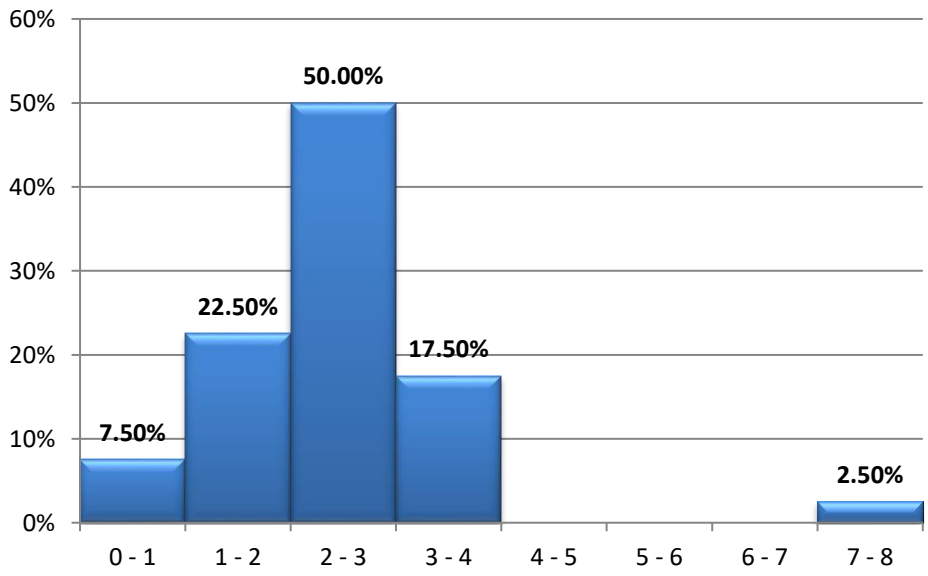


Figure 2: Percentage distribution of the duration of sampled doctors' involvement in VTP (in years)

4.1.2. Information Regarding the Areas of Responsibility of VTP Doctors

The average population of sampled doctors' areas of responsibility is 6,900 residents (SD:

8,925 residents). Though, a more accurate picture arises noticing that 80.49% of areas have less than 10,000 residents and 14.63% 10 to 20 thousand residents. Looking in more detail in the former class of population (Figure 3) we find out that almost 70% of the specific areas do not have more than 5,000 residents.

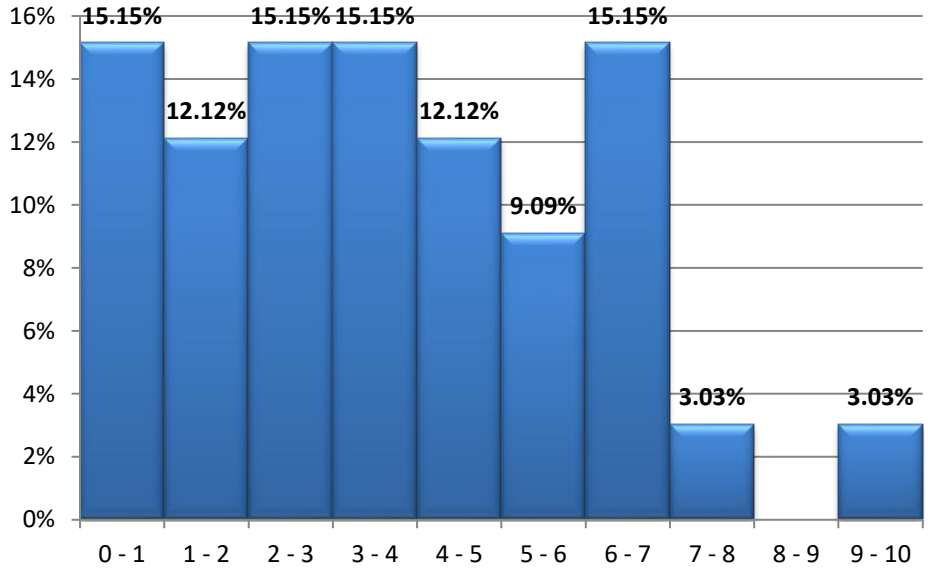


Figure 3: Percentage distribution of the population of areas with fewer than 10,000 residents

Due to shortages of NHS staff especially in the last decade, VTP doctors[8], providing their medical services, "replace" a considerable number of local NHS infirmaries, which are the ones supposed to offer these services. Most sampled doctors (i.e. 70%) address the needs of 3 to even 6 infirmaries (Figure 4). Thus, the average number of NHS infirmaries "replaced" by VTP doctors is 4.73 (SD: 3.42).

[8] which are actually NHS doctors who cooperate with Vodafone at VTP

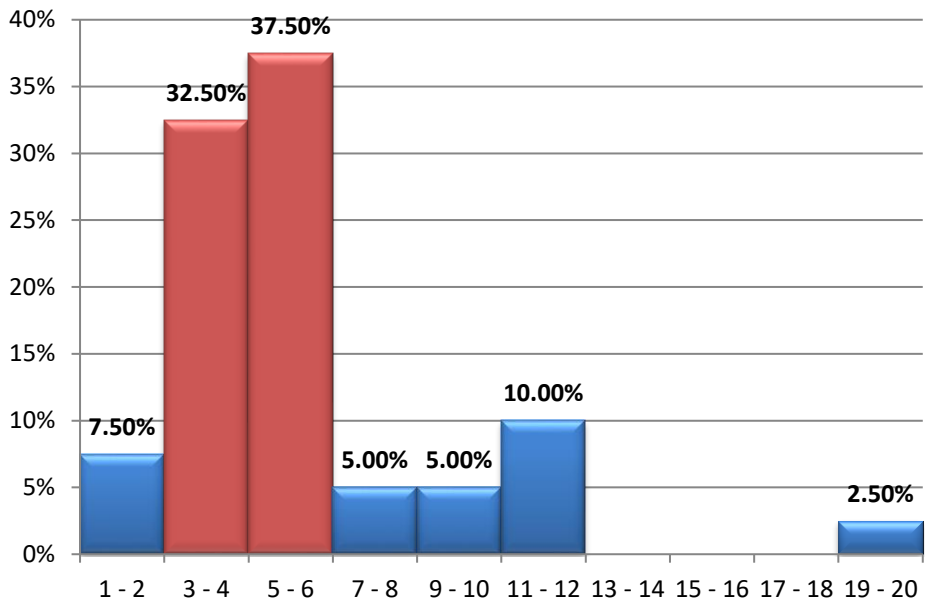


Figure 4: Percentage distribution of the number of local NHS infirmaries "replaced" by VTP doctors

A significant contribution of VTP to the primary care improvement arises from the medical devices VTP doctors are equipped with. Several of these devices cannot be found to corresponding local NHS infirmaries, according to VTP doctors' responses (Table 1). More specifically, in local infirmaries we frequently find electrocardiograph machines (87.80%) and blood pressure meters (82.93%). The percentages of glucose meters (75.61%) and oximeters (60.98%) follow. On the contrary, very rarely (i.e. in only 12.2% of cases) NHS infirmaries are equipped with cholesterol and triglycerides meters, as well as spirometers.

The long distances that patients in Greece have to travel to reach the nearest NHS hospital, constitute a deterrent for the systematic monitoring of their health, according to the doctors questioned. For example, in order to have an **electrocardiogram**, a patient has to travel up to 127 km (Figure 5), while the average distance is 43.9 km and the quite large SD is 24.53 km. Moreover, most of these transfers require the use of a car (Figure 6), while the percentage of patients transferred to NHS hospitals in an ambulance is certainly surprising.

Table 1: Percentage distribution – per device – regarding the existence of medical devices in NHS infirmaries

Device	YES	NO	N/A	Total
Electrocardiograph	**87.80%**	9.76%	2.44%	100%
Spirometer	12.20%	**78.05%**	9.76%	

Blood pressure meter	**82.93%**	14.63%	2.44%
Oximeter	**60.98%**	34.15%	4.88%
Glucose meters	**75.61%**	19.51%	4.88%
Cholesterol and triglycerides meter	12.20%	**75.61%**	12.20%

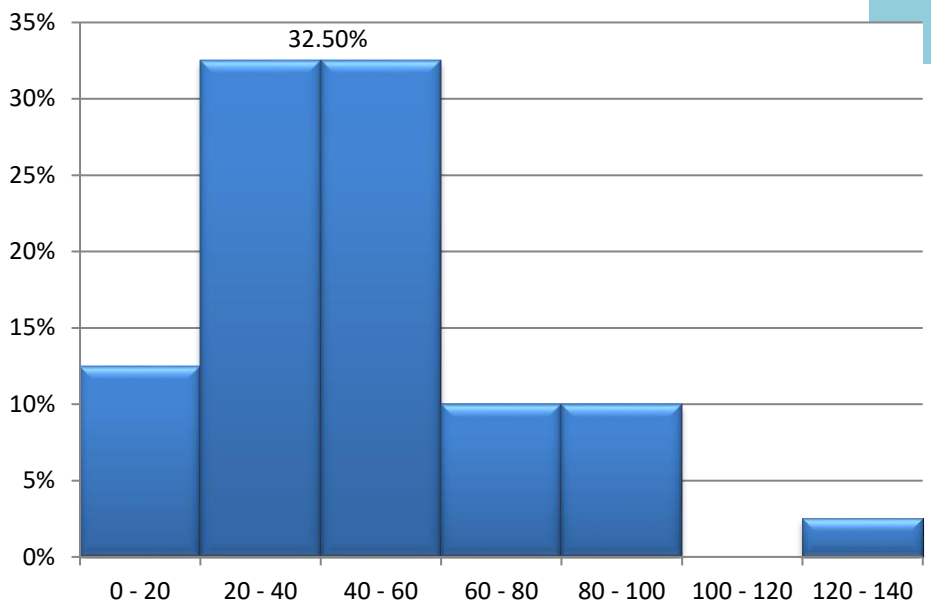


Figure 5: Percentage distribution of the distance between areas covered by VTP and hospitals, for electrocardiograms (in km)

Overall, distances that patients in Greece have to travel to reach the nearest NHS hospital are almost similar (Figure 7), regardless of the type of examination they are going to have, namely electrocardiogram, pulmonary test (average 47.7 km, SD 27.14 km) or glucose monitoring (average 42.72 km, SD 25.25 km).

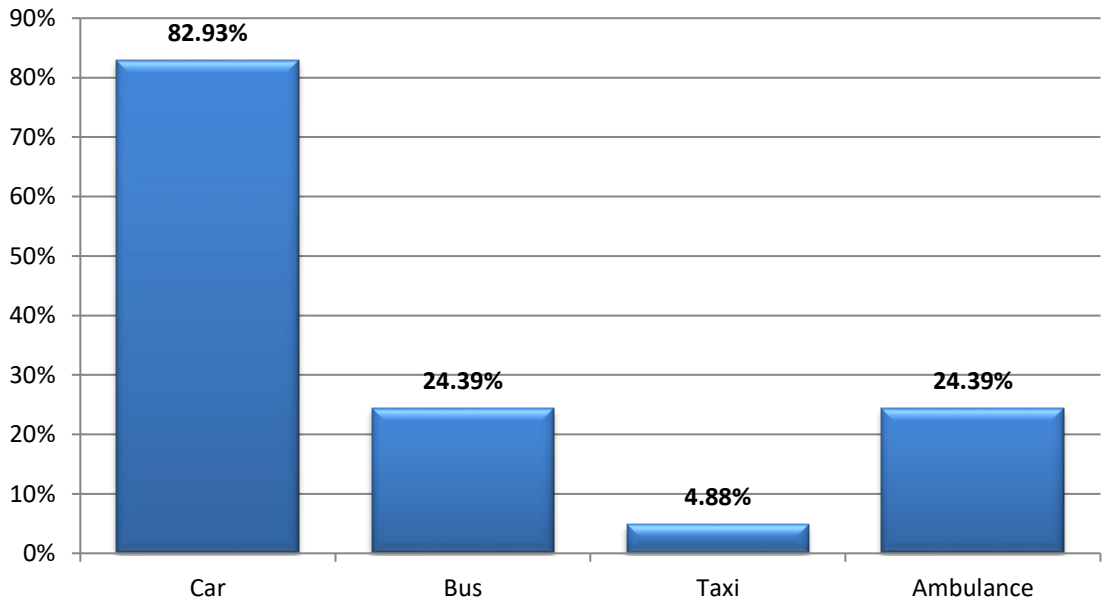


Figure 6[9]**:** Bar chart of various transportation options to hospitals for electrocardiogram

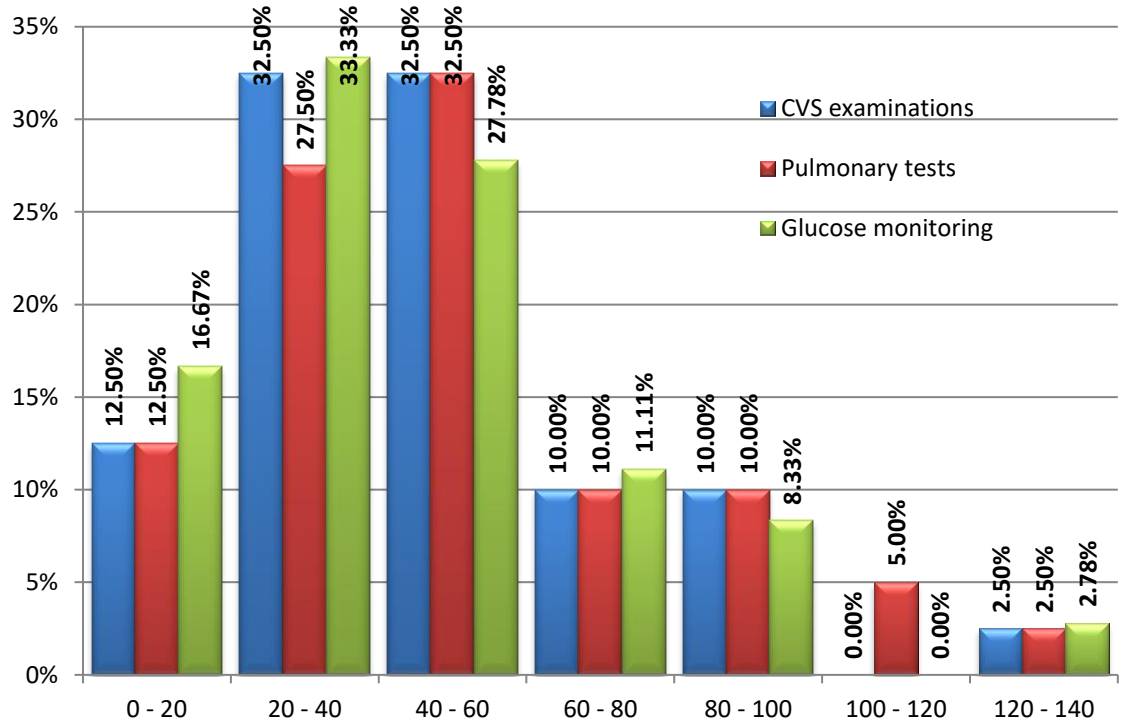


Figure 7: Percentage distribution of the distance between areas covered by VTP and hospitals, for three types of examination (in km)

Once again, most patient transfers to NHS hospitals are done by car (Figure 8), while the percentage of patients transferred to hospitals by ambulance is again significant.

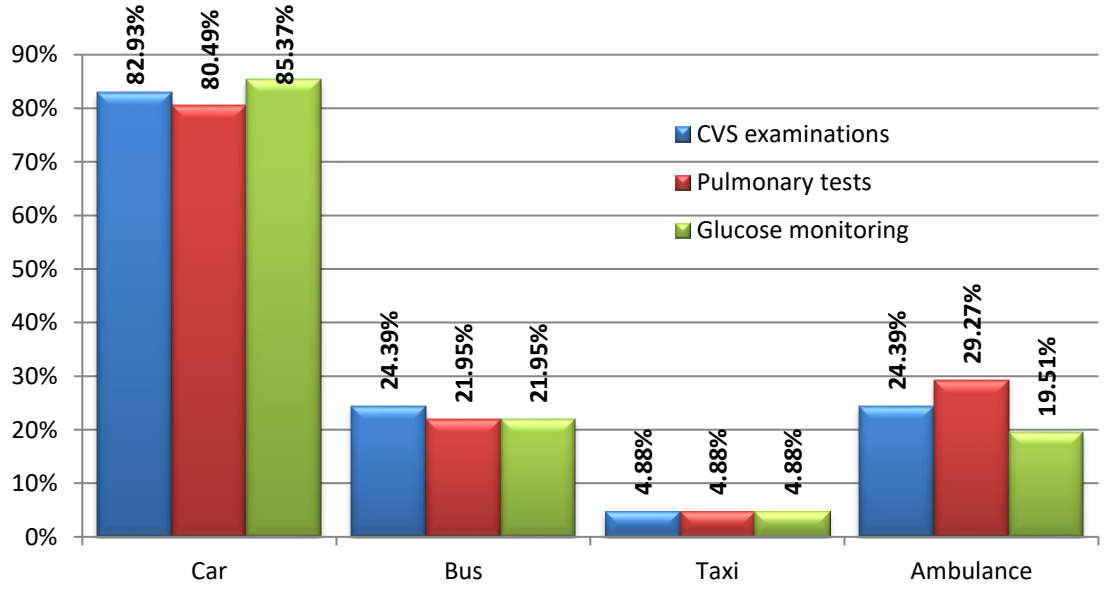


Figure 8: Bar chart of various transportation options to hospitals for three types of examination

[9] As questioned doctors could give more than one responses percentages do not add up to 100%.

4.1.3. Technical Equipment and Training

The majority of sampled VTP doctors (i.e. more than 70%) declare that they feel very comfortable with new technologies and consider the degree of familiarization with them as satisfactory or very good. However, a noteworthy 10% of doctors admit that they have only basic knowledge on this issue. At the same time, sampled doctors are very satisfied with the training they take on the use of VTP equipment: 90% of them describe this training as very good or excellent, while none of them (even those that consider their knowledge on modern technologies basic or moderate) consider the level of provided training as low.

The satisfaction of VTP doctors regarding the support they receive at the end of their initial training on issues related to the everyday use of their devices, as well as the confrontation of any technical problems during their use, is rather high: 87% evaluates the support as good or very good.

When asked about the level of ease in using the equipment, as part of their everyday work, most participating doctors mention that they rarely meet any problems (46.34%) and that the devices are easy to use and make their work easier (34.15%). However, the most important drawback in the use of the VTP equipment is the delay added in carrying out each examination: 70.73% of sampled doctors choose this response from the given list of potential disadvantages included in the questionnaire (Figure 9). Doctors state that the examination time increases mainly because they do not receive any help from nurses/assistants, while, subconsciously, they are affected by the fact that in the past (namely, before the beginning of VTP) patients' examination was simpler and limited to simple and not time consuming processes, i.e. auscultation (using just a stethoscope), blood pressure monitoring or, in general, examinations without the use of complex medical devices.

The second most frequent reported drawback, with a much smaller percentage though (39%), was the equipment's functional problems. Functional problems reported should be mostly attributed to incomplete or non-existing training for the use of particular medical devices such as

the spirometers: it was found that most of the doctors had not been properly trained to use the latter and were lacking knowledge to guide the patient through the spirometry examination to produce quality results. This correlates directly to the 78% of medical centers that were lacking spirometry devices prior to VTP engagement (Table 1). Special sessions with the pneumologists were carried out to cover this gap and training videos were made available for them. In the beginning, this was an unforeseen contribution of the VTP to rural doctors.

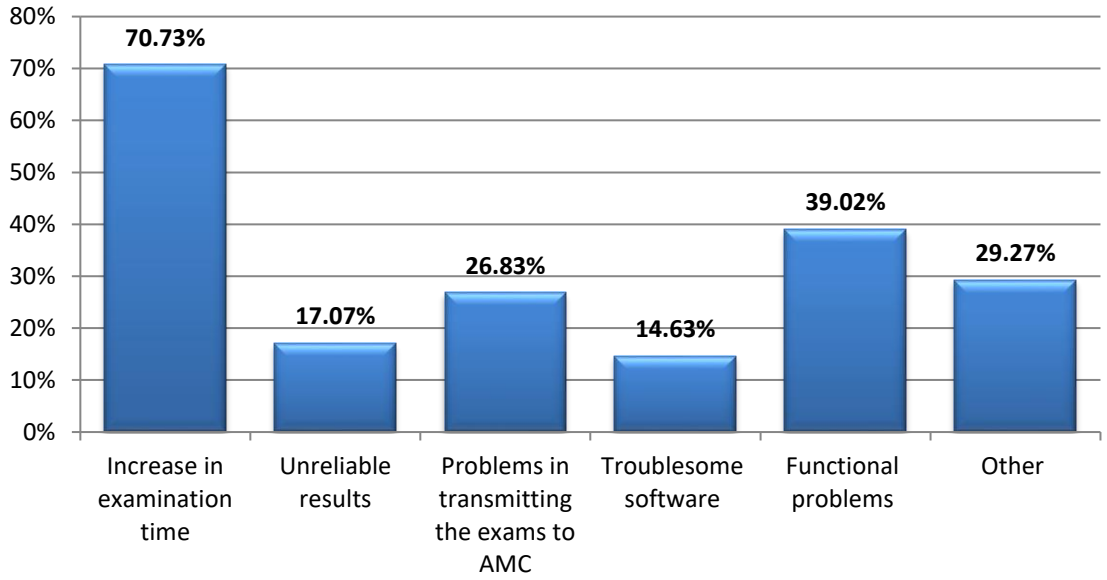


Figure 9: Bar chart of drawbacks arising from the use of VTP equipment

According to the questioned VTP doctors the number of medical examinations they carry out per month is 18.17, with a surprising large SD though (28.65) which should be attributed to the large range of doctors' responses. Despite this range, the majority of doctors (almost 83%) carry out less than 20 examinations per month, using the VTP medical devices. At this point we should clarify that as i) VTP doctors travel a lot to replace the understaffed NHS infirmaries (Figure 4) in several places, ii) are occupied mostly with writing prescriptions to their patients and not actually with their examination and iii) they do not receive even the slightest sometimes help from nurses, it seems normal to find out that they conduct an unsatisfactory number of examinations per month.

4.1.4. Cooperation between VTP Doctors and Athens Medical Center

Most doctors who participated in our research (77.78%) admit that they ask for advisory support from doctors of the Athens Medical Center (AMC) for no more than 10 examinations per month, while the monthly average number of requests for advisory support is 7.44.

According to VTP doctors the response time of the AMC doctors fluctuates between 2 to 72 hours since the moment the former send electronically the examination results to the latter. Almost half the sampled doctors (Figure 10) said that they receive the advisory support they ask for from the AMC doctors within 24 hours.

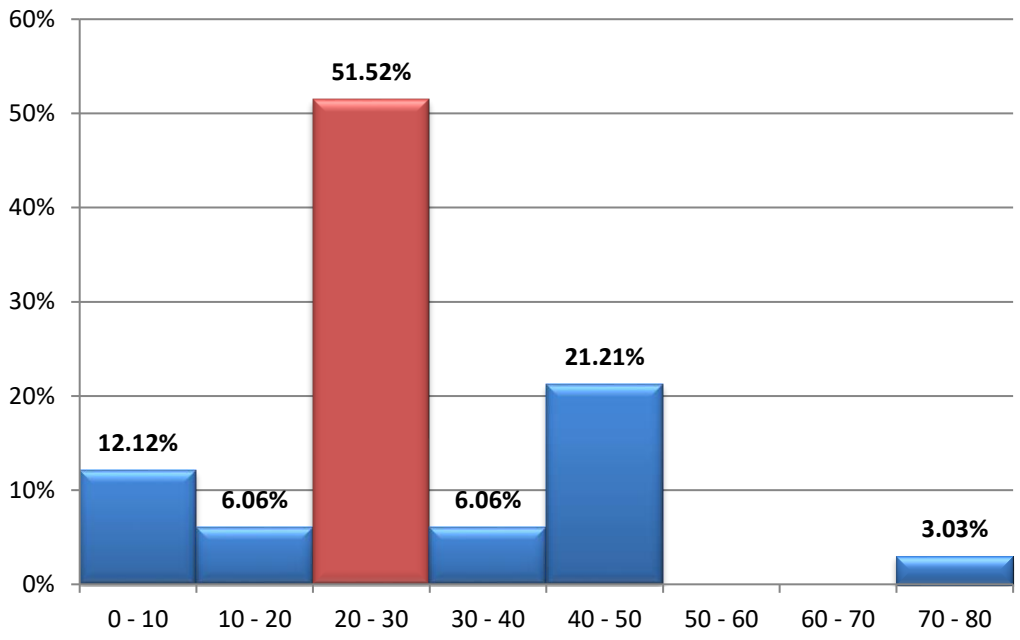


Figure 10: Percentage distribution of response times of the AMC doctors (in hours)

Only 26.83% of the doctors declare that they adopt and follow "almost always" the advisory support and the recommended treatment of the AMC doctors, either in cardiovascular or pulmonary cases (Figure 11). Overall, sampled doctors embrace to a greater percentage the advice of the AMC related to pulmonary cases than to cardiovascular ones.

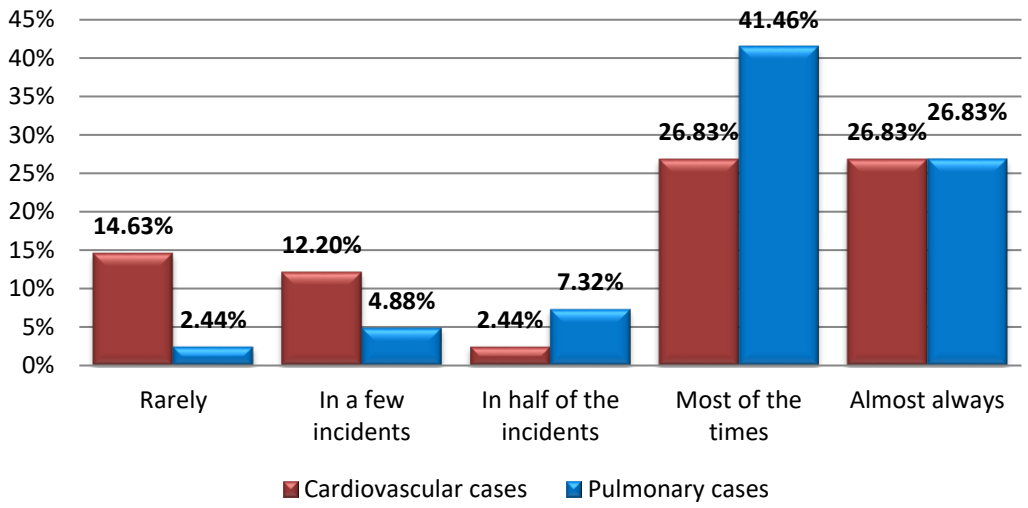


Figure 11: Percentage distribution of times that doctors adopt the advisory support of the AMC doctors

Sampled VTP doctors consider as the most important domain of their cooperation with the AMC their opportunity to have advisory support from the AMC experts in cardiovascular and pulmonary cases (68.29%). What follows next is the help they get in more specialized diagnostic problems (53.66%) and the suggestions of the AMC doctors regarding the patients' treatment (41.46%). As per the points of cooperation with the AMC that need to be improved and established in the future (Figure 12), 43.90% of VTP doctors choose the necessity for more complete and more accurate answers – instructions from the AMC doctors, while high percentages of doctors choose i) faster response of the AMC doctors regarding the advisory support they provide, ii) the ability to print exams and the AMC doctors' opinions, iii) the ability to send the whole medical file of a patient to the AMC doctors and iv) the option of doctors to discuss selected, at least, cases, especially in the event of disagreement.

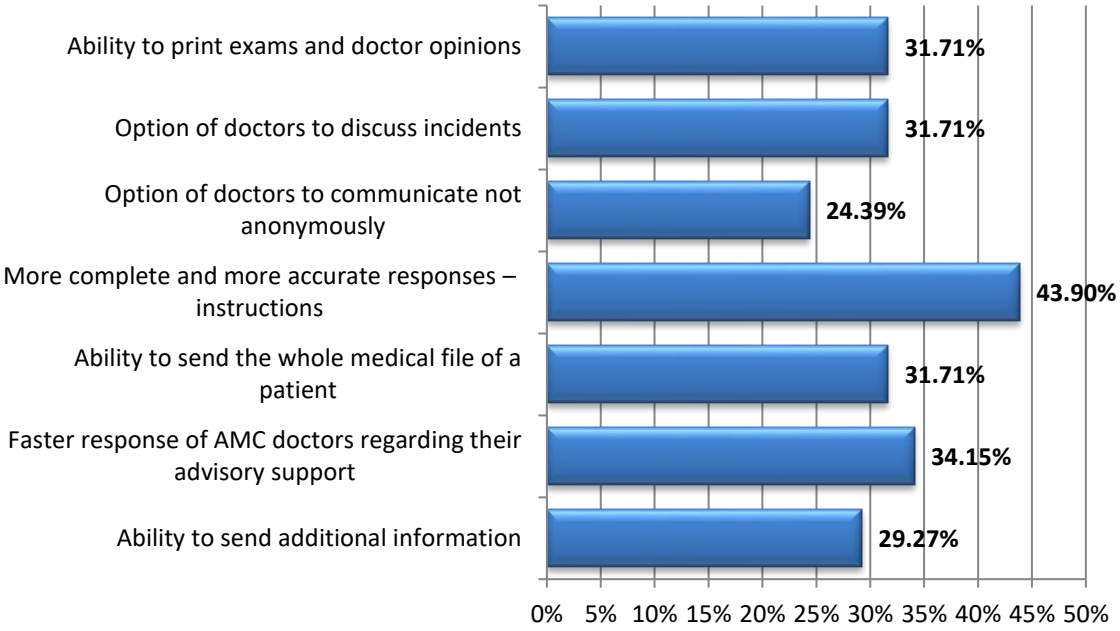


Figure 12: Bar chart of the points of cooperation of VTP with the AMC that need to be improved

Finally, sampled doctors mention that an extended, future cooperation of VTP with the AMC should also include the consideration of some medical cases as urgent so that immediate advisory support is offered by the AMC about them, inclusion of additional tests-examinations, as well as the ability of doctors to exchange their opinions on selected cases (Figure 13).

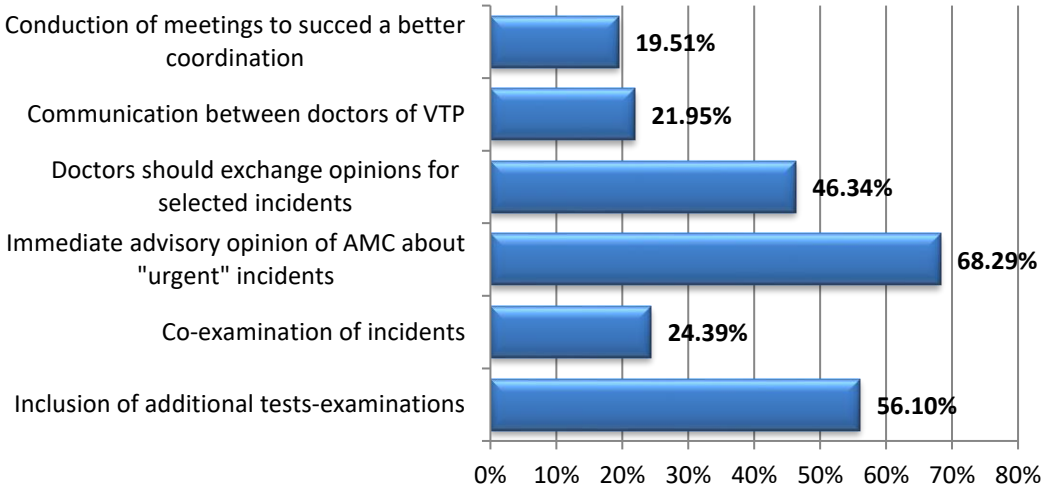


Figure 13: Bar chart of ideas regarding the improvement of cooperation of VTP with the AMC

4.1.5. VTP Contribution

VTP doctors who participated in our research were asked about the benefits of VTP for i) the

patients, ii) themselves, as well as iii) the NHS. According to their responses (Figure 14), the most important VTP benefits **for patients** is the increased ease with which they carry out their tests-examinations (80.49%), the more effective diagnosis of their state of health (51.22%) and, overall, the improvement of their life quality (51.22%).

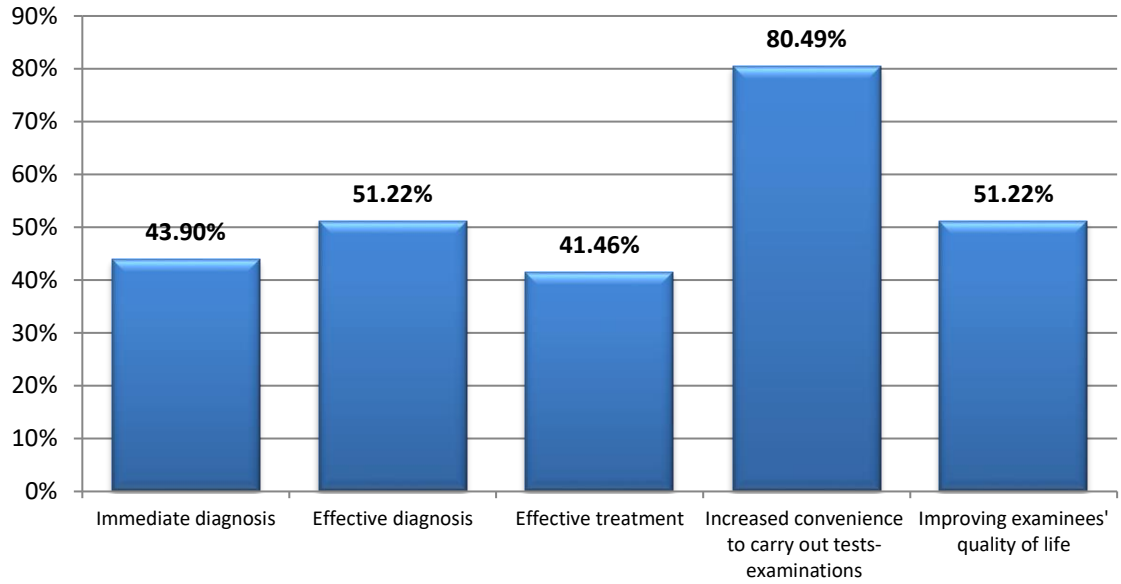


Figure 14: Bar chart of the most important benefits for patients, arising from VTP, according to VTP doctors

Sampled VTP doctors state that the most important benefits for **themselves** are in turn the chance to provide medical services of better quality (90.24%), the opportunity to get a second opinion about the cases they examine (63.41%), as well as the increased prestige they acquire because of the efficient diagnoses they make (53.66%) - Figure 15.

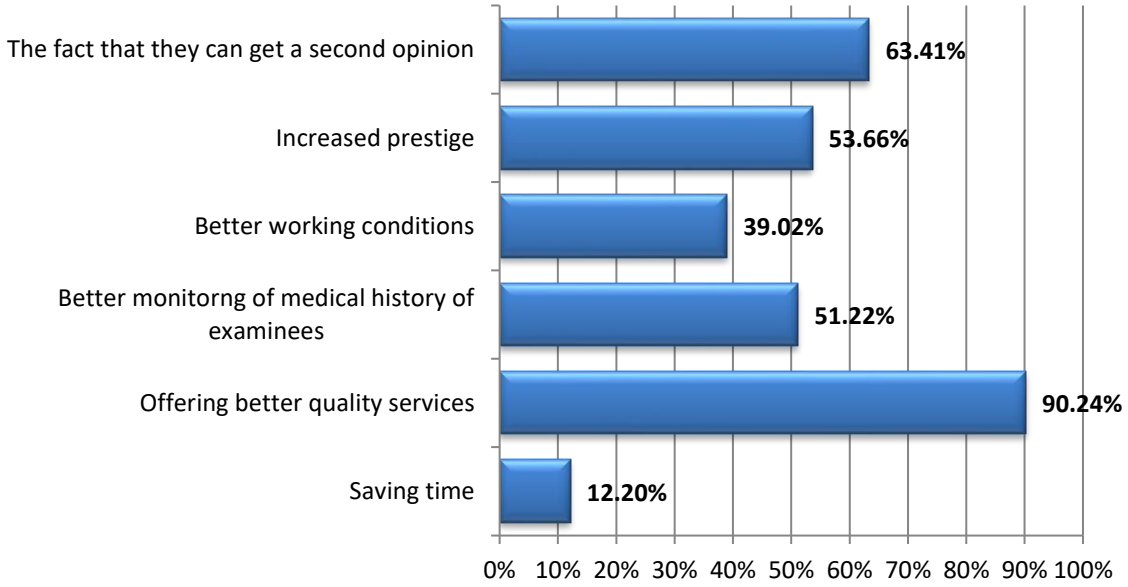


Figure 15: Bar chart of the most important benefits for VTP doctors, arising from VTP

Significant percentages of VTP doctors consider that **NHS** benefits from VTP due to the far more efficient primary healthcare services that are provided (73.17%) or because medical services are provided to many more people - patients (73.17%) or due to the decongesting of regional hospitals (68.29%).

41.46% of the doctors questioned believe that the contribution of VTP to the improvement of patients' health is very important, while 24.39% consider it important. Moreover, the people who benefit the most from VTP are those who have preventive health examinations (90.24%), chronic disease patients (85.37%) and bedridden patients (78.05%) according to VTP doctors.

4.1.6. Evaluation of VTP

When asked to evaluate the medical equipment provided to VTP doctors, 95.13% of the latter found its technological part as good or very good. Similarly, 70.73% of sampled VTP doctors evaluate positively (good or very good) their cooperation with the AMC; however, there is a significant part of them (19.51%) who found the cooperation moderate.

As per the overall evaluation of VTP, more than 85% of doctors who participated in our research find it good or very good. Only 7.32% of them find it moderate, while no one evaluates it negatively (bad or very bad). Finally, the percentage of sampled doctors considering the

acceptance of VTP from patients as positive, is quite large, namely 90.25%.

The acceptance of surveyed doctors on the extension of VTP or an equivalent project in all remote areas of Greece is overwhelming: 92.68% of the sample supports the idea. The percentage of them who state that patients are informed about the key points of VTP is at the same level, while 90.24% of respondents do not express any concern about the protection of personal data of the patients of VTP. Finally, the opinion of doctors on VTP contribution to the improvement of patients' quality of life is positive: 24.39% choose "a lot", while 29.27% choose "very much".

4.2. Focus group: Patients

4.2.1. Sample Demographics

The majority of 329 patients who filled out our questionnaire (55.8%) were women. The average age of sampled patients is 61.94 years old: more specifically 64.06 for men and 59.95 for women. The youngest patient who filled out the questionnaire is 17 years old and the oldest 90 years old. Moreover, 65% of participating patients are aged between 50 and 80 years old (Figure 16), while 90% of sample is above 40. Finally, goodness of fit test for normality reveals that for usual confidence levels (e.g. 5%, 1%) the percentage distribution of the age of sampled patients is not normal (p-value < 0.01); the reader can see the left skewed distribution in Figure 16.

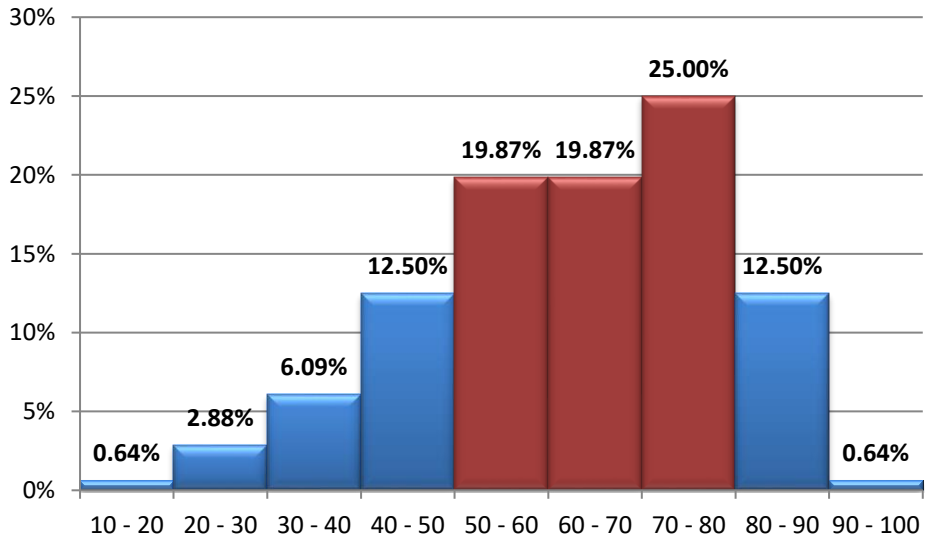


Figure 16: Percentage distribution of the age of patients (in tens of years)

When we consider the marital status of surveyed patients, the most important group 69.91% is the one of married patients, while 16% are widowed and 10.64% single. Regarding the employment status of patients, about half the respondents (49.24%) are retired, 16.41% of the sample are public servants and 10.33% farmers (other responses were private company employee, freelancer, student, unemployed and homemaker). The large percentage of retired people implies the increased need for better-quality primary healthcare services.

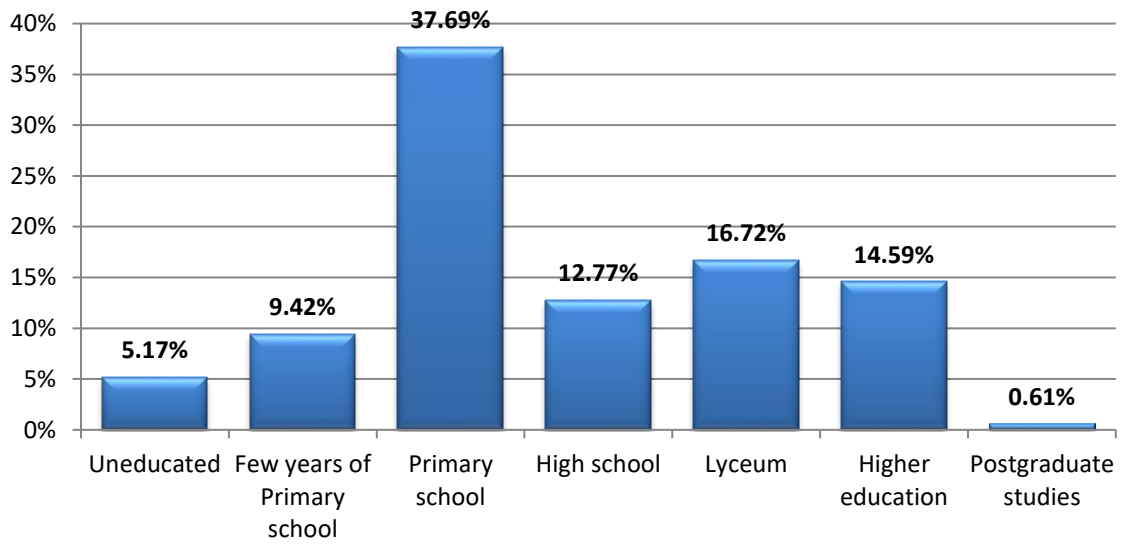


Figure 17: Bar chart of the education level of participants

The education level of participants in the survey is relatively high, taking into account that most surveyed areas are remote ones (Figure 17). Although more than half of the respondents have completed at least primary education, the proportion of those who completed high school or a higher education department reaches a 32%.

4.2.2. Information regarding the Realization of Examinations

The vast majority of patients (94.8%) mention that there is an operating, local infirmary / medical center in their area, while the average distance from the nearest NHS hospital is about 39 km, which they travel, when it is necessary, by car (82.4% of surveyed patients mention car as a first or second choice in the relevant question) or by bus (17% of surveyed patients mention it). Regarding the average waiting times for patients between the moment they decide to arrange to

visit a doctor at the hospital or a contracted doctor, and the actual day of the visit, the answers are the following: about 29 days for a visit to a cardiologist (SD = 30.43 days) and around 30 days for a visit to a pulmonologist (SD = 34.12 days). Things are better when they consider a visit to a GP: the waiting time in this case is around 17 days (SD = 16.68 days). SDs of these times denote better accuracy of responses as per GPS, while the much larger SD values for the other two doctor specialties denote larger differentiation, and consequently imprecision of patients' responses. Note that goodness of fit tests for normality show that the distribution of the aforementioned waiting times is not normal (p-value ≈ 0); this fact can be ascertained easily in Figure 18 from the positive skewness of all three distributions.

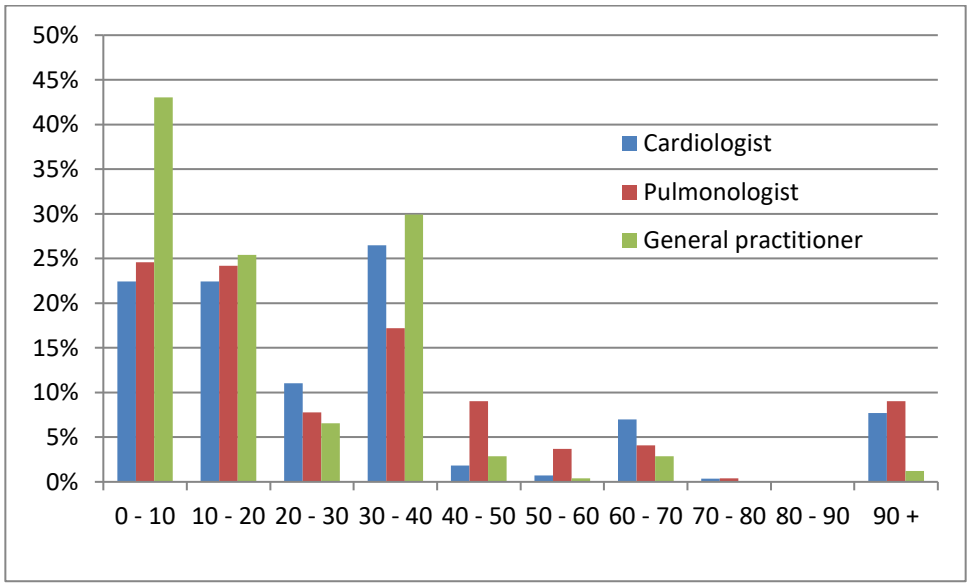


Figure 18: Percentage distribution of waiting times for an appointment with a cardiologist, a pulmonologist and a GP (tens of days)

Almost half of surveyed patients (48.94%) mention that they are examined by the local doctor at the local infirmary and 40.3% of questioned patients at the medical center. A significant 7.9% of patients are examined at home.

4.2.3. Frequency of Exams Realization

Regarding the frequency with which patients had exams / checkups in hospitals or contracted doctors **before the beginning of VTP**, we figure out from Table 2 that the percentage of those

who reply "never" is quite large mainly for spirometry (62.61%), blood oxygen saturation monitoring (40.73%) and electrocardiogram (21.88%). The majority of surveyed patients have electrocardiogram (33.74%), cholesterol and triglycerides test (28.88%) and blood oxygen saturation monitoring (22.8%) once per year, while they have more frequent checkups only for blood glucose monitoring (once per semester - 20.97% of respondents) and blood pressure monitoring (once per month - 28.88% of respondents). On the contrary, spirometry is conducted by 13.07% of patients more rarely than once a year.

Table 2: Percentage distribution of the frequency of exams **before** and **after** the beginning of VTP

		Once per month	Once per semester	Once per year	More rarely	Never	N/A
Electrocardiogram	Before	0.91%	11.55%	33.74%	31.91%	21.88%	0.00%
	After	3.04%	31.00%	46.50%	14.29%	4.56%	0.61%
Spirometry	Before	0.30%	2.74%	5.17%	13.07%	62.61%	16.11%
	After	1.82%	19.45%	34.65%	16.72%	25.84%	1.52%
Blood oxygen saturation monitoring	Before	4.86%	8.81%	22.80%	18.24%	40.73%	4.56%
	After	18.84%	31.00%	21.28%	10.33%	17.33%	1.22%
Blood glucose monitoring	Before	11.25%	20.97%	20.36%	14.89%	7.90%	24.62%
	After	22.19%	24.32%	16.41%	6.69%	2.74%	27.66%
Blood pressure monitoring	Before	28.88%	13.37%	16.41%	11.25%	5.17%	24.92%
	After	37.39%	14.89%	13.37%	4.26%	1.52%	28.57%
Cholesterol and triglycerides test	Before	0.91%	21.88%	28.88%	14.29%	6.08%	27.96%
	After	2.74%	37.08%	17.33%	7.29%	2.13%	33.43%

Based on the patients' responses we then compare the percentage differentiation regarding the frequency of exams before and after the beginning of VTP. More specifically, two questions were addressed to them: one about the frequency of their exams through VTP and the other about the frequency of their exams in hospitals (irrespectively from VTP, but after its beginning). During statistical analysis, responses were merged as follows: for every patient (and every type of examination) we considered its response corresponding to the larger frequency, as we cared more about the degree of patients' sensitization after the beginning of VTP and not so much about the exact way of exam realization. For example, if a patient chose regarding spirometry "once per month" through VTP and "once per semester" in a hospital, then we considered "once per month" as his response.

The analysis of responses revealed some very interesting findings: in all types of exams

offered by VTP we notice an increase of the realization frequency after the beginning of VTP, which is a fact that proves the vital VTP contribution into the patients' awareness, as far as the need for frequent checkups is concerned. In all types of examination, an increase of responses (and, thus, of respective percentages) "once per month" and "once per semester" can be identified. The most remarkable changes are noticed in electrocardiogram where the percentage is almost tripled (12.46% becomes 34.04%), in spirometry where 3.04% arises to 21.27% and in blood oxygen saturation monitoring where 13.67% increases to 49.84%. Not unexpectedly, in these particular exams we notice an impressive decrease of those replying "never". The increased patients' awareness is attributed mainly to three factors (a) availability and easiness of use of medical devices, (b) value of the AMC consultations and (c) training of GPs in correctly executing examinations and in particular spirometry, a byproduct of the VTP introduction in rural areas as explained above. These are major findings of our research, which are further discussed in the relevant section.

The frequent exams / checkups through VTP result in a certainly welcome decrease of patients' visits to public hospitals. More specifically, almost 75% of surveyed patients say that they have reduced the number of their visits to hospitals (responding "enough" to "very much" to the relevant question). The ability that VTP offers to specific groups of patients (such as the elderly, chronic disease patients, in bed patients etc.) to have periodical preventive exams/checkups certainly contributes to the aforementioned decrease of visits to hospitals.

4.2.4. Evaluation of VTP from Patients

More than half of the patients believe that the provided primary healthcare services have significantly improved, in the area where they live, since the beginning of VTP: 52.88% of the surveyed patients have replied "a lot" and "very much" in the relevant question, while almost 37% considers the improvement of healthcare services "enough". However, a lot more people consider the exams conducted with the VTP equipment reliable: 70.51% of surveyed patients reply "a lot" and "very much" in the relevant question, while less than 3% of the respondents consider the

exams “not at all” or “a little bit” reliable. Moreover, almost all questioned patients not only know that VTP doctors have the option to ask for advisory support from the AMC doctors in cardiovascular and pulmonary cases (92.4% of total), but they are also informed about it from VTP doctors (94.2% of total). Finally, 65.35% of them say that they consider the AMC doctors’ opinions very reliable and only 1.5% unreliable.

Patients have also been asked if VTP has improved their health (in any way). Their responses are particularly zealous: more than 89% of them believe that VTP contributes from “enough” to “very much” to their health improvement. Generally, the overall assessment of VTP is overwhelmingly positive, since the percentage of those who answer “good” and “very good” is approximately 91%. Finally, patients believe at a percentage of 67.48% that VTP contributes “a lot” or even “very much” to the improvement of their life quality.

In consistency with the picture emerging from previous questions, 97.6% of questioned patients consider that a telemedicine program like the particular one of Vodafone should run on a permanent basis in the area where they live. Regarding the protection of their personal data in the framework of VTP, the degree of confidence shown by respondents is significant: almost all patients (i.e. 94.2% of them) state that they have no concern over this issue. Although the VTP platform has all the required security and privacy certifications, this finding is mostly attributed to cultural characteristics rather than knowledge of the patients on the specificities of such regulations. For the record, we note that the VTP platform is certified as a Class IIa medical device, ISO 13485 and operates under a GDPR compliance certification.

Overall, taking into account all presented information, especially in this section, it is certainly a future research issue why “only” 53% of the respondents accept that the provided healthcare services have significantly improved since the beginning of VTP.

4.3. Comparisons between Subgroups of Doctors and/or Patients

4.3.1. Subgroups of Doctors

We have made a number of statistical comparisons after having divided doctors in subgroups

using various criteria. However, due to the small size not only of the doctors' sample (i.e. 41), but also of the doctors' subgroups, findings should be interpreted with caution. We recommend that the survey be repeated in the future, taking larger samples if possible, in order to verify the conclusions of our study.

Regarding the population in the areas of the doctors' responsibility we use 5,000 residents as threshold. The most important finding using this separation criterion concerns the reliability of exams: (23) doctors in less densely populated areas (namely 56.1% of the total) consider exams more reliable (Fisher's exact test p-value = 0.010 < 0.05) in comparison to their (18) counterparts in areas with more than 5,000 residents. This can be attributed to the fact that less densely populated areas are usually the most remote ones, so doctors and people there count more on VTP and its equipment. In several other aspects, our comparisons do not reveal any statistically significant differentiation.

Moreover, regarding the number of local NHS infirmaries that are replaced by VTP doctors, we use three infirmaries as threshold and we do not come to the identification of any statistically significant differentiation.

4.3.2. Subgroups of Patients

Similar statistical comparisons have been made after having divided the sample of patients in subgroups using various criteria. The first criterion is the Regional Health Directorate (RHD) the patients belong (the 7 RHDs of Greece are presented in Figure 19), while the findings are presented hereafter.

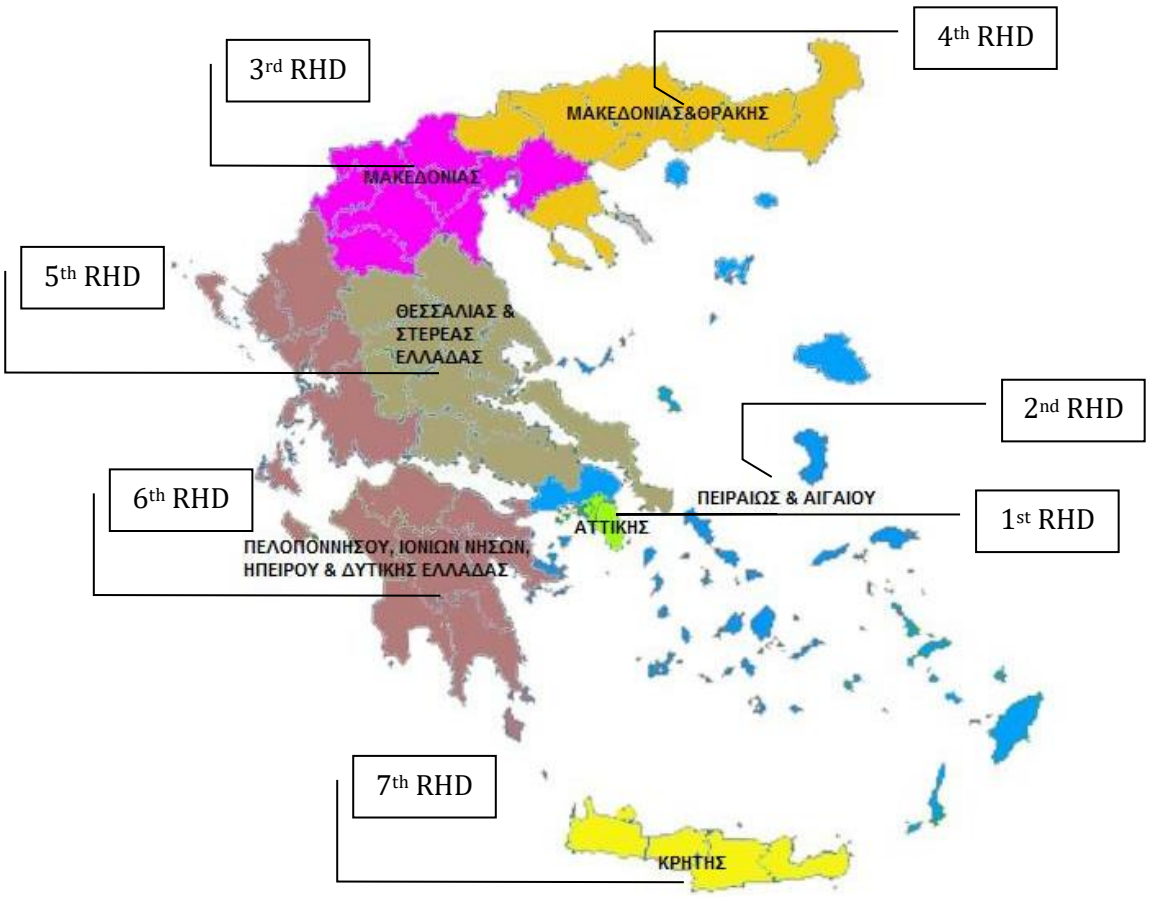


Figure 19: RHDs of Greece

We notice a statistically significant difference (Pearson's $X^2 = 49.943$, p-value $\approx 0 < 0.01$) in the responses of patients regarding the primary healthcare services improvement through VTP in the area where they live. More specifically, 15.4% of the participants belonging to the 4th RHD (i.e Macedonia and Thrace) choose "not at all" or "a little bit" in this question, which is significantly worse than the percentages of the rest of the patients (Table 3). On the contrary, the most positive view (by far) is the one of 5th RHD residents: 61% of them respond "a lot" or "very much". The reader should bear in mind that collected responses are highly related to the easiness of access of patients to the nearest NHS hospital.

We also notice a statistically significant difference between patients' subgroups regarding the decrease of their visits to public hospitals, after the beginning of VTP (Pearson's $X^2 = 92.644$, p-value $\approx 0 < 0.01$). More specifically (Table 4), more than 66% of the 3rd RHD (i.e Macedonia) choose "not at all" or "a little bit" in the relevant question, while "a lot" or "very much" choose 58% of the 2nd and 7th RHD, as well as 55% of the 5th RHD (i.e. Thessaly and Central Greece). Again, patients'

responses are influenced by the easiness of access to NHS hospitals, i.e. the easier for patients to reach the local hospital, the higher the percentage of "not at all" or "a little bit" replies becomes.

Table 3: Comparisons in patients' responses about healthcare services improvement, depending on their RHD

		Not at all or a little bit	Enough	A lot	Very much	Total
2nd and 7th RHD	Frequency	1	13	15	0	29
	Percentage of the subgroup	3.4%	44.8%	51.7%	0%	100%
3rd RHD	Frequency	3	25	35	0	63
	Percentage of the subgroup	4.8%	39.7%	55.6%	0%	100%
4th RHD	Frequency	12	28	25	13	78
	Percentage of the subgroup	**15.4%**	35.9%	32.1%	16.7%	100%
5th RHD	Frequency	5	28	25	28	86
	Percentage of the subgroup	5.8%	32.6%	**29.1%**	**32.6%**	100%
6th RHD	Frequency	9	27	25	8	69
	Percentage of the subgroup	13.0%	39.1%	36.2%	11.6%	100%
Total	Frequency	30	121	125	49	325
	Percentage of the subgroup	9.2%	37.2%	38.5%	15.1%	100%

Table 4: Comparisons in patients' responses about the decrease of visits to public hospitals, depending on their RHD

		Not at all or a little bit	Enough	A lot	Very much	Total
2nd and 7th RHD	Frequency	3	9	15	2	29
	Percentage of the subgroup	10.3%	31.0%	**51.7%**	**6.9%**	100%
3rd RHD	Frequency	42	18	3	0	63
	Percentage of the subgroup	**66.7%**	28.6%	4.8%	0%	100%
4th RHD	Frequency	14	28	21	16	79
	Percentage of the subgroup	17.7%	35.4%	26.6%	20.3%	100%
5th RHD	Frequency	9	29	28	**19	85
	Percentage of the subgroup	10.6%	34.1%	**32.9%**	**22.4%**	100%
6th RHD	Frequency	12	23	21	12	68
	Percentage of the subgroup	17.6%	33.8%	30.9%	17.6%	100%
Total	Frequency	30	121	125	49	324
	Percentage of the subgroup	24.7%	33.0%	27.2%	15.1%	100%

A similar picture emerges in the question about the improvement of the quality of life of patients, after the beginning of VTP (Pearson's $X^2 = 67.195$, p-value $\approx 0 < 0.01$). Differences have been identified (Table 5) in the 3rd RHD, where 72% replied "enough", as well as in the 5th RHD

where 74% replied “a lot” or “very much”.

Table 5: Comparisons in patients’ responses about the quality of their life, depending on their RHD

		Not at all or a little bit	Enough	A lot	Very much	Total
2nd and 7th RHD	Frequency	3	12	13	1	29
	Percentage of the subgroup	10.3%	41.4%	44.8%	3.4%	100%
3rd RHD	Frequency	7	46	9	2	64
	Percentage of the subgroup	10.9%	**71.9%**	14.1%	3.1%	100%
4th RHD	Frequency	5	33	27	14	79
	Percentage of the subgroup	6.3%	41.8%	34.2%	17.7%	100%
5th RHD	Frequency	7	15	31	33	86
	Percentage of the subgroup	8.1%	17.4%	**36.0%**	**38.4%**	100%
6th RHD	Frequency	8	28	20	10	66
	Percentage of the subgroup	12.1%	42.4%	30.3%	15.2%	100%
Total	Frequency	30	134	100	60	324
	Percentage of the subgroup	9.3%	41.4%	30.9%	18.5%	100%

Next, another separation of patients to subgroups was done according to their education level. One group included all patients that completed at least primary school, while the second one those who have higher level education. As many as 16.8% of the latter believe that the primary healthcare services have improved “a little bit” or “not at all” in the area where they live after the beginning of VTP, while the respective percentage of the other subgroup is only 5.2%. In the question about the improvement of their life quality the percentages of patients who choose “a little bit” or “not at all” are 13.4% (highly educated patients) and 7.1% (patients who completed at least primary school) respectively.

Another criterion that was used for the division of sampled patients in subgroups is the distance they have to travel to reach the nearest NHS hospital: the threshold was 30 km. Several significant findings came out. In the question regarding the improvement of the primary healthcare services in the area where they live after the beginning of VTP, “a lot” and “very much” answered 65% of those living in more remote areas of Greece, in contrast to the much lower 41% of the rest (Pearson’s $X^2 = 32.215$, p-value $\approx 0 < 0.01$). This fact demonstrates clearly the greater effectiveness of VTP in the most remote areas of its application.

The difference is more impressive in the question about the decrease of their visits to NHS hospitals after the beginning of VTP (Pearson's $X^2 = 55.571$, p-value $\approx 0 < 0.01$): "a lot" and "very much" answer 62% of those living more than 30 km away from the nearest hospital, while the respective percentage of the rest is only 22%.

In the question about the contribution of VTP to the improvement of patients health after the beginning of VTP, "a lot" and "very much" respond 61% of those living in more remote areas of Greece and only 37% of the rest (Pearson's $X^2 = 36.407$, p-value $\approx 0 < 0.01$). As far as the improvement of the patients' life quality after the beginning of VTP is concerned, a similar picture emerges (Pearson's $X^2 = 34.884$, p-value $\approx 0 < 0.01$): "a lot" and "very much" answer 10% of those living close to NHS hospitals, against 37% of the rest.

Finally, another question where we find out significant differentiation between the two subgroups (Pearson's $X^2 = 12.773$, p-value = $0.005 < 0.05$) is the one about the overall evaluation of VTP: the residents of more remote areas are more satisfied from VTP than the rest as 50% of them judge it "very good ", against 33% of the rest.

4.3.3. Comparisons between Doctors and Patients in Similar Questions

In both questionnaires, namely the one for doctors and the other for patients, we have included some common or, at least, similar questions. Obviously, our objective was to compare the responses of the two groups.

In the question about how much VTP contributes to the improvement of patients' health, we notice (Table 6 – Figure 20) that patients seem to be more cautious about VTP than doctors (Pearson's $X^2 = 14.902$, p-value = $0.002 < 0.05$): see for example the percentages of "very much" of the two sampled groups.

Similarly, patients are more cautious than doctors regarding VTP contribution to the improvement of their life quality (Pearson's $X^2 = 9.194$, p-value = $0.027 < 0.05$ – Table 7 – Figure 21).

Table 6 – Figure 20: Comparisons between doctors' and patients' responses about VTP

contribution to patients' health improvement

		Group		Total
		Patients	Doctors	
Not at all or a little bit	Frequency	30	1	31
	Percentage of the group	9.3%	2.6%	8.6%
Enough	Frequency	134	10	144
	Percentage of the group	41.4%	26.3%	39.8%
A lot	Frequency	100	10	110
	Percentage of the group	30.9%	26.3%	30.4%
Very much	Frequency	60	17	77
	Percentage of the group	**18.5%**	**44.7%**	21.3%
Total	Frequency	324	38	362
	Percentage of the group	100.0%	100.0%	100.0%

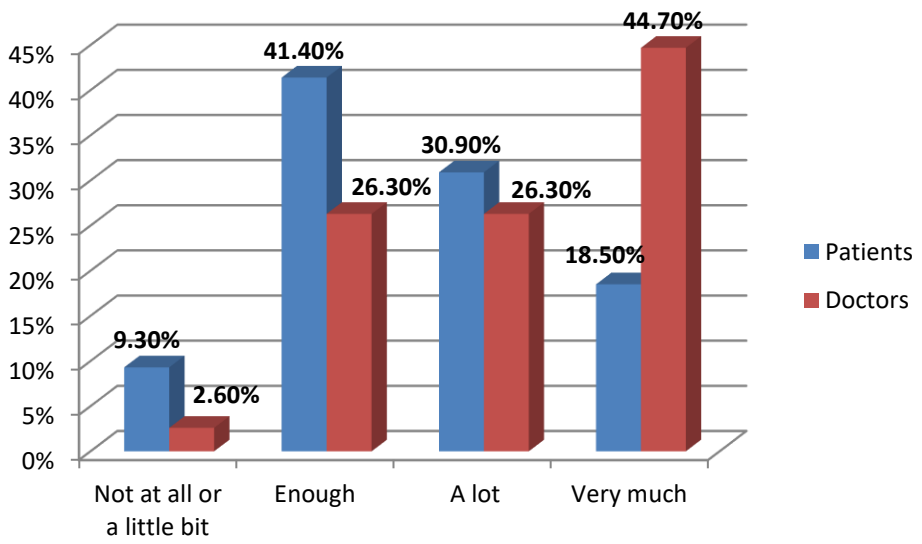
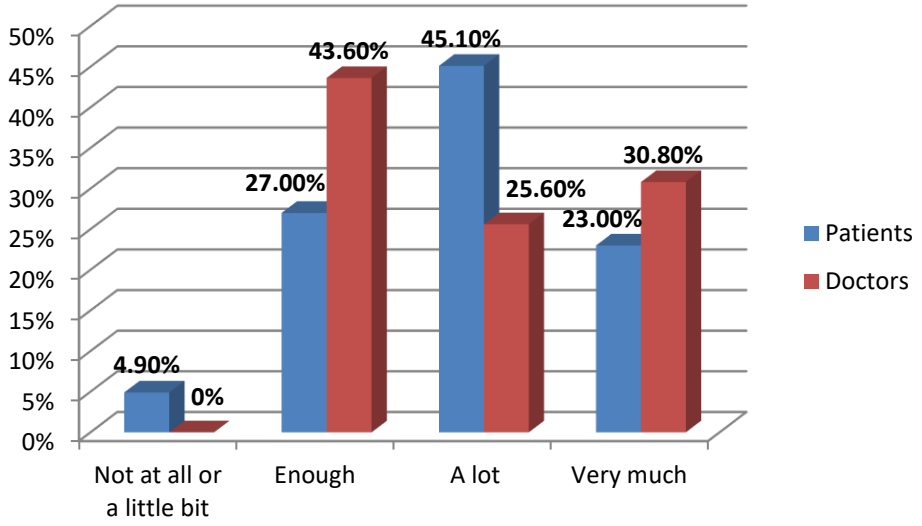


Table 7 – Figure 21: Comparisons between doctors' and patients' responses about VTP contribution to the improvement of the quality of life of the latter

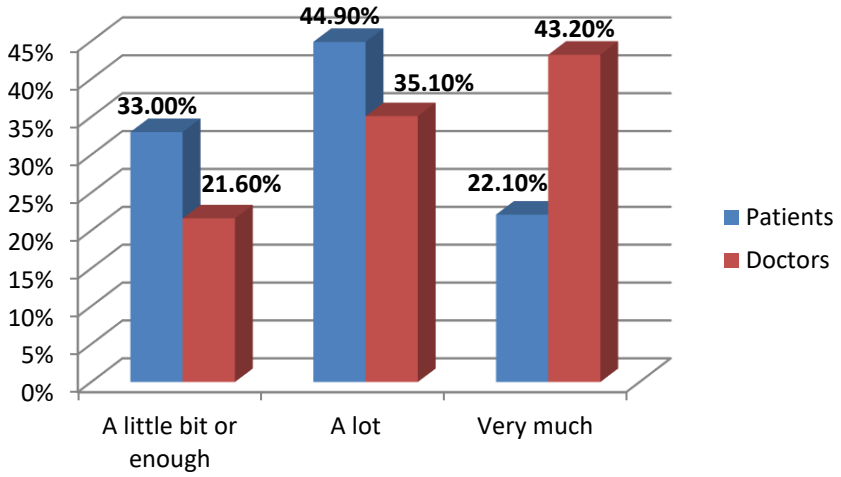
		Group		Total
		Patients	Doctors	
Not at all or a little bit	Frequency	16	0	16
	Percentage of the group	4.9%	0%	4.4%
Enough	Frequency	88	17	105
	Percentage of the group	27.0%	43.6%	28.8%
A lot	Frequency	147	10	157
	Percentage of the group	45.1%	25.6%	43.0%
Very much	Frequency	75	12	87
	Percentage of the group	23.0%	30.8%	23.8%
Total	Frequency	326	39	365
	Percentage of the group	100.0%	100.0%	100.0%



Finally as per the reliability of advisory support from the AMC experts (Table 8 - Figure 22), both teams consider it reliable to a great extent, especially doctors (Pearson's $X^2 = 8.162$, p-value $= 0.017 < 0.05$).

Table 8 - Figure 22: Comparisons between doctors' and patients' responses about the reliability of the AMC advisory support

		Group		Total
		Patients	Doctors	
A little bit or enough	Frequency	106	8	114
	Percentage of the group	33.0%	21.6%	31.8%
A lot	Frequency	144	13	157
	Percentage of the group	44.9%	35.1%	43.9%
Very much	Frequency	71	16	87
	Percentage of the group	22.1%	43.2%	24.3%
Total	Frequency	321	37	358
	Percentage of the group	100.0%	100.0%	100.0%



5. Discussion and Conclusions

As our survey has revealed, the majority of areas participating in VTP have fewer than 5,000 residents (Figure 3) who are located far from the main hospital of the respective regions. Not only long distances but often the poor quality of roads, make it difficult or impossible for residents of remote areas to reach the nearest NHS hospital. Additionally, the need for medical monitoring of the areas VTP addresses is increased, because the majority of their residents are over 50 years old (Figure 16). These obstacles are overcome with the portable equipment of VTP, which brings monitoring facilities to the particular Greek population.

A factor that makes it difficult for Greek NHS to provide better primary health services is the significant shortage of medical equipment in several local infirmaries. Unfortunately, some of them lack even blood pressure meters or cardiographs, while only a small percentage of them are equipped with spirometer(s) and cholesterol - triglycerides meter(s). To make things worse, even though some infirmaries are fully equipped with the necessary medical devices, they frequently experience considerable deficiencies in their supplies (e.g. bandages, cotton, plastic gloves etc.), which are absolutely necessary for conducting most of patients' exams.

Through VTP the needs of remote infirmaries in medical equipment and supplies are fulfilled, keeping additionally the costs of acquisition and maintenance of the (portable) equipment at much lower level than the respective costs that burden NHS to equip every local infirmary on a permanent basis. More importantly, the broad deployment of a program such as VTP throughout Greece could reduce the costs of NHS, as it would not be necessary to build (or rent) and maintain numerous local infirmaries, but it would be enough to find even limited space at any public building.

Another serious problem of primary healthcare is the shortage of NHS staff. The fact that participating VTP doctors are usually responsible for 3 to 6 areas of the country (Figure 4) is indicative of the aforementioned problem. Covering the medical needs of many remote areas, with strict time limits and in difficult, sometimes, travel conditions do not allow the full scale and effective exploitation of VTP and its medical devices. The overburden of doctors and the fact that

the VTP is not integrated in their mandatory reporting - which they still have to do regardless of the digitalization of their practice that VTP offers - explains why 70.73% of the surveyed doctors consider the duration of any examination (Figure 9), including feedback from the AMC experts, as an important drawback of VTP. As a result, the majority of doctors carry out fewer than 20 medical examinations using VTP devices per month (Section 4.1.3), the majority of which are cases that require the advisory support of the AMC colleagues. However, we strongly believe that doctors are overestimating the unfavorable effects of the duration of examination with VTP devices, which are actually faster than classical devices, at least because the results are automatically transferred to the digital platform that supports the operation of VTP. The reason they are influenced negatively is that the VTP is actually an add-on to their regular practice and has not been adopted by NHS as part of their regime.

Undoubtedly, the ideal solution for NHS would be to hire additional doctors and medical staff, but mainly establish new workflows fully exploiting the dynamicity of the VTP and its platform. The possibilities that VTP offers along with the potential support of doctors by nurses could result into a significant increase of the number of the examinations conducted through VTP. Overall, it is clear from our research findings that the Greek NHS should:

1. adopt the VTP program and incorporate it smoothly in the GP practices
2. modify the relevant workflows in the remote local infirmaries / medical centers to fully exploit the benefits the VTP brings
3. expand the VTP to all areas that can benefit from it, especially small islands and isolated mountain communities
4. streamline saved budget from cost reduction to hiring more nurses and GPs in remote areas.

More frequent examinations will showcase the importance of an electronic, medical history for each patient. The latter is made possible through the use of the VTP. Clearly, the services provided by NHS will also be enhanced accordingly. A complete, medical history for each patient can improve its health monitoring and can result in significant economic benefits for NHS, which spends huge amounts of money to maintain patients' history, in printed form.

Overall, the VTP results in more efficient primary healthcare services (Section 4.1.5) and improves patients' life-quality (Section 4.1.5 and Figure 14). The latter is a result of the reduction of waiting times before the conduction of the necessary exams: the average waiting times between the arrangement and the conduction of an appointment with a NHS cardiologist, pulmonologist or GP, can fluctuate between 2 to 4 weeks approximately (Section 4.2.2). On the other hand, VTP allows for an immediate medical examination, and if requested, advisory support can be provided by the AMC within 24 hours (Figure 10). The improvement of life quality is even more noteworthy for bedridden patients, who are not troubled with transportation, when the need of medical examination arises.

The two aforementioned benefits for patients reduce directly or indirectly the costs that NHS has to cover: strain in the system of scheduled appointments is relieved and the need of transporting bedridden patients through the National Emergency Center decreases. Moreover, timely diagnosis (which macro-economically allows NHS to avoid the costs related to far more expensive levels of care and prevention, when telemedicine does not exist), decongestion of hospitals and the ability to be consulted by specialized doctors without their physical presence being necessary contribute further to NHS's cost reduction.

VTP impacts positively participating doctors' scientific progress as the potential to take advisory support from expert AMC doctors (and, hopefully, discuss incidents with them, in the near future) improves their knowledge and the medical services they provide. More than one in four doctors considers the opinion of the AMC almost always (Figure 11). In detail, doctors take into consideration the AMC consulting on pulmonary cases more frequently, compared to the cardiovascular ones. Of course, this (phenomenon) is related to the specialty of the local doctors, since most of them are more knowledgeable on cardiovascular issues, which is part of their GP training. Another direct benefit to GPs comes from their training for the correct use of the spirometer. It was a surprise to realize that there were doctors not properly trained to conduct spirometry examinations and this only became apparent after analyzing the results reporting low quality exams and non-optimal functionality of devices (Figure 9).

Although patients are slightly more demanding regarding VTP (Table 7), both patients and participating doctors positively evaluate the program's operation. Focusing on patients, we find a more critical mood as per VTP in highly educated ones (Section 4.3.2), who are more demanding of a telemedicine program and the quality of its equipment. On the contrary, less educated patients are excited when local doctors use the telemedicine devices of VTP and get advisory support from "expert" doctors.

Furthermore, participating patients and doctors believe that the program – or any equivalent one – should run on a permanent basis, as well as expand in order to include all remote areas in Greece (Section 4.2.4).

Of course, there are certain points in which the operation of VTP could be further enhanced, as well as enriched with more possibilities. If the suggested improvements are applied, the transportation of patients who live in remote areas could be rendered unnecessary, except when a highly specialized examination is needed. Obviously, this could have an extremely positive economic impact on both NHS and the residents of remote areas.

Summarizing, the major contribution of VTP is most probably its ability to raise the awareness of people living in remote areas on the importance of frequent check-ups and medical examinations. Such a shift in perspective and philosophy differentiation will allow various diseases to be diagnosed - and hopefully be prevented - at their early stages, when they are treatable and the cost of treatment is still low.

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