

INFORMATION COMMUNICATION TECHNOLOGIES IN SUPPORT TO PRE-HOSPITAL HEALTHCARE

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Abstract: Throughout the COVID-19 pandemic many countries in line with the imposed restrictive and isolation measures had recommended and issued directives regarding significant changes into pre-hospital healthcare. General practitioners were directed to limit face-to face consultations and to shift into remote visits implementing into their daily practice the Information-Communications technologies capabilities. Telephone triage and telemedicine consultations became routine to the majority of the general practitioners and the specialists providing consultations and treatment into the pre-hospital domain of the medical support to the population. These changes were forced by the imperative of restricting the SARS-CoV-2 spread. Decreasing the density of the patients into the pre-hospital healthcare facilities was effectively mitigating the risk of becoming infected. These imposed by the COVID-19 pandemic changes into the pre-hospital healthcare led to significant increase into the medical specialists awareness about the capabilities of the novel Information-Communication technologies and the Artificial Intelligence for supporting the diagnostic process.

The aim of this study is to assess the pre-hospital medical specialists knowledge and acceptance of the capabilities of the Information-Communication technologies and the Artificial Intelligence into primary medical support.

Materials and Methods A 5-question-Likert-scale survey was conducted at the end of the COVID-19 pandemic (December 2022 - February 2023) among the general practitioners and pre-hospital medical specialist in Plovdiv region. Eighty questionnaires were distributed and 57 of the medics responded. Questions were related both to the capabilities of telemedicine and the Artificial Intelligence.

Results and Discussion Majority of the medical specialists responded prevalently positive with regards to their knowledge about the possibilities of the telemedicine and Information-Communication technologies to be implemented into their practice. Less percentage of the medical specialist were responding with great degree of acceptance regarding the capacities of the Artificial Intelligence to provide risk-prediction and diagnostic and preventive programs.

As conclusion the authors would like to note that, based on the results of the performed survey, Information-Communication technologies and Artificial Intelligence are becoming more recognizable as supportive and valuable tools for pre-hospital medical specialists.

Keywords: General Practitioners, Pre-hospital healthcare, Information-communication technologies, Artificial Intelligence
Field: Medical Sciences and Health

Introduction

Throughout COVID-19 pandemics healthcare systems had faced significant challenges. These challenges were related mainly to the overwhelming number of infected citizens looking for rapid, adequate and efficient medical support. The number of the patients was growing every day, while the number of the available healthcare professionals was remaining constant. Moreover, the real number of operational medics was decreasing because of the infected medical professionals.

Another significant challenge was related to the proven capability of the virus for human to human transmission. This had demanded governments to impose strict restrictions on the population freedom of movement, in order to limit the viral spread. An isolation regulations requiring social distance of at least 1,5 meter were also imposed. In line with the overall restrictive and isolations measures the healthcare authorities in many countries had recommended and issued directives regarding significant changes into pre-hospital healthcare. These directives were focused on limiting as much as possible the possibility of virus transmission during the medical support to the infected and non infected population. The recommended and imposed measures were affecting both the pre-hospital and hospital healthcare. As core element of the pre-hospital healthcare the General practitioners had to implement a lot of changes into their routine activities.

General practitioners were directed to limit face-to face consultations and to shift into remote visits implementing into their daily practice the Information-Communications technologies capabilities. Telephone triage and telemedicine consultations (10, 16, 23) became routine to the majority of the general practitioners and the specialists providing consultations and treatment (2), into the pre-hospital domain of the medical support to the population. These changes were forced by the imperative of restricting the SARS-CoV-2 spread. A lot of researches and articles have been published recently concerning the capabilities (12), advantages (25), challenges (9) and the impact of the application of the telemedicine. (11, 21, 24) Several studies are assessing the factors influencing the readiness and willingness of the General practitioners and medical specialists of the pre-hospital care to apply the telemedicine (15, 17), other studies were focusing on the patients perceptions of the telemedicine implementation. (22) The findings of these studies is highlighting the pivotal role of the given to the medics capabilities for

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adequate response to the health threat. (7) The role of the remote consultations and tele-examination led to decreasing the density of the patients into the pre-hospital healthcare facilities. This was assessed as effectively mitigation of the patients' risk of becoming infected. Therefore, a lot of studies have analyzed the required rules and frameworks of implementation of the telemedicine during the health emergencies (1, 26), some of these publications were dedicate to the primary medical care and General practitioners, in particular. (8, 19)

Apart of research on telemedicine, during the COVID-19 pandemic, several studies have been analyzing the digitalization of the primary healthcare. (18, 29, 30, 31) The role of ICT and AI have been revealed into the medical communication and communications skills. (20, 27) These imposed by the COVID-19 pandemic changes into the pre-hospital healthcare led to significant increase into the medical specialists awareness about the capabilities of the novel Information-Communication technologies and the Artificial Intelligence for supporting the diagnostic process. A lot of studies have proven that there are several factors taht have to be further analyzed and assessed, because of their significant impact on the willingness of the General practitioners and primary healthcare medical specialists to apply the ICT na AI into their practice. (3, 4, 5, 28)

In summary it could be clearly stated that the COVID-19 pandemic challenges to the healthcare systems have resulted into digital revolution into pre-hospital medical support. (14)

The aim of this study is to assess the pre-hospital medical specialists knowledge and acceptance of the capabilities of the Information-Communication technologies (ICT) and the Artificial Intelligence (AI) into primary medical support.

Materials and Methods A 5-question-Likert-scale survey was conducted at the end of the COVID-19 pandemic (December2022 - February 2023) among the general practitioners and pre-hospital medical specialist in Plovdiv region. Eighty questionnaires were distributed and 57 of the medics responded. Questions were related both to the capabilities of telemedicine and the Artificial Intelligence. Medical specialists were asked to assessed their level of agreement to the following statements:

1. I am familiar with the possibilities of Information-Communication Technologies in the medical practice.
2. The application of Artificial Intelligence improves the diagnostic possibilities in medicine.
3. Information-Communication Technologies provide capabilities for development of Risk-predictor for identifying and sorting patients at risk.
4. Artificial intelligence could provide the medical specialist a program of tests and consultations for better and more comprehensive evaluation the risk level of developing a disease.
5. Contemporary Information-Communication Technologies are capable to develop a personalized preventive program for the patients at risk and propose it for medical specialist's approval.

The degree of agreement was proposed to be measured as follows:

Table 1

DEGREE OF AGREEMENT	STRONGLY AGREE	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	STRONGLY DISAGREE
	5	4	3	2	1

Results and Discussion: Into the survey participated 57 medical specialists form the pre-hospital healthcare. Majority of them are General practitioners n=42 (73,7%). 43 (75,4%) of the respondents are female and 14 (24,6%) males. 52,6% (n=30) of the medical specialists are at age between 21-40 years-old, 42,1% (n=24) are at age group 41-65 and 3 (5,3%) are above 65 years.

Based on the forced and wide implementation of the contemporary ICT during the COVID-19 pandemic was expected that great majority of the respondents will be fully aware of the digitalization of the medical practice. The answers measuring the level of agreement with the given statements with 2 or 3 were not really presumptive. The initial set goal of the was to differentiate those of the medical specialists that were fully confident into the implementation of the AI and ICT into their practice (Strongly agree - 5) from those that were still having some hesitation and indecisiveness into application of the digital capabilities or were facing minute challenges working with them (measuring the level of acceptance with 4, just agree).

The results of the survey was quite surprising. Figure 1 is presenting the summary of the answers received to the statement 1 of the questionnaire - I am familiar with the possibilities of ICT in the medical practice. Notwithstanding the wide use of the ICT during the COVID-19 medical management, more than half (56, 2%, n=32) of the respondents are either not familiar with the given by the technologies capabilities, or are not confident into their knowledge. Only 8,8% (n=5) strongly confirm the statement.

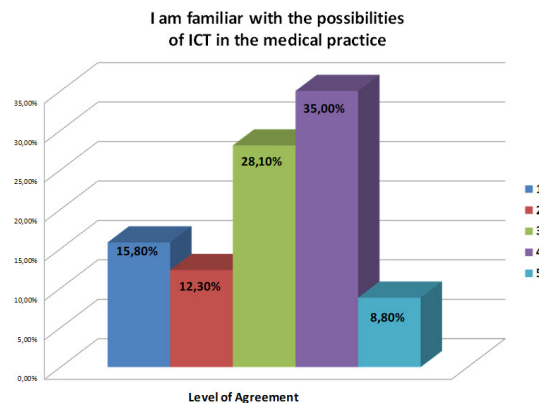


Figure 1

Based on the above presented results the answers to the other statements are a little confusing. Assuring us that are not familiar with the ICT capabilities in the medical practice the same respondents are confirming their confidence and certainty that ICT and the AI could provide a personalized program for tests and consultation, as well as for the required preventive and mitigating risk measures and procedures. (fig. 2)

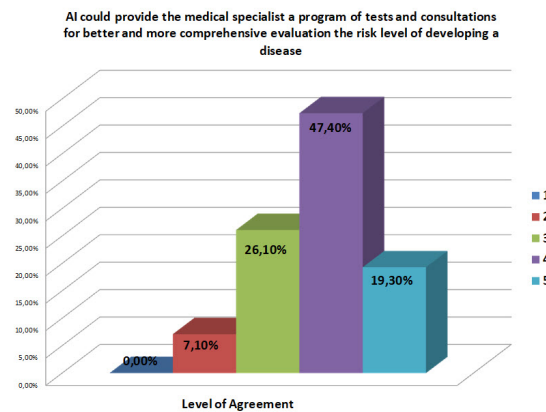


Figure 2

Almost the same are the results for the fifth statement: Contemporary Information-Communication Technologies are capable to develop a personalized preventive program for the patients at risk and propose it for medical specialist's approval.

Table 2

Level of agreement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
	17,50% n=10	45,60% n=26	29,80% n=17	7,10% n=4	0%

From the presented figures it is obvious that above 60% of the medical specialists are confident into the capabilities of the technologies to support their decision making process concerning the follow-up of the patients. The remaining 36,90% (n=21) is still an unexpected number of medical specialists that are declaring their reluctance to utilize the modern technologies capabilities into their practice.

Statements 2 and 3 are linked - the possibility to apply AI into the diagnostic process and the use of the ICT for development of Risk predictor to be used into identification and evaluation of the health risk level.

Table 3

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The application of AI improves the diagnostic possibilities in medicine.	21,10% n=12	33,30% n=19	36,80% n=21	7,10% n=4	1,7% n=1
ICT provide capabilities for development of Risk-predictor for identifying and sorting patients at risk.	17,50% n=10	47,40% n=27	35,20% n=20	5,40% n=3	3,5% n=2

Again the results without any doubt present that close to half of the pre-hospital medical specialists are not in favor of applying the modern technologies and they do not foresee how their everyday growing capabilities could be implemented for early identification of patients at risk of development serious illness.

Conclusion Based on the obtained results from the performed survey have to be noted that near 50% of the medical specialists working at the frontline of the healthcare, the pre-hospital one, are still either unaware or with significant reluctance and restrain to utilize into diagnostic process and health prevention the advantages provided by the contemporary ICT breakthrough. Our study confirms the conclusions of the mentioned researches that in order to increase the utilization of the AI and ICT in medicine a more thorough and elaborate analyses of the human-machine interaction are required.

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