Opinion of members of Medical Rescue Teams on the functioning of the ECG teletransmission system

(Opinia członków ZRM dotycząca funkcjonowania systemu teletransmisji EKG)

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Abstract Introduction. Filling in the electronic medical documentation (which the electronic patient record is comprising of) and sharing data (which are included in documents) are important elements of Medical Rescue Team (MRT) staff's work. That's possible due to implementation telemedicine solutions like ECG teletransmission. The personnel's opinions can affect the use of systems. That is the reason, the staff's opinion on usefulness and benefits of systems is very important.

The purpose of the study. The aim of the study is to establish the MRT (Basic: BMRT and Specialist: SMRT) staff's opinion on the subject of functioning of ECG teletransmission system in Emergency Medical Service (EMS) in Cracow.

Material and method. The survey questionnaire (which contains 18 questions) was prepared for the needs of the study (carried out by a method of diagnostic survey). 115 MRT employees of EMS in Cracow (82 paramedics, 21 nurses and 12 doctors) took part in the research.

Results. 93,91% respondents declared making an ECG teletransmission. 99,13% participants definitely or rather agree with the statement that direct patient transport to the interventional cardiology unit significantly shortens the time of invasive treatment. 87,83% MRT members are definitely or rather satisfied with the possibility of using ECG teletransmission system. 93,91% MRT employees evaluate the implemented system as definitely or rather useful. 91,30% respondents are definitely or rather positive about the implementing and developing the telemedicine in EMS in Poland.

Conclusions.

Medical rescuers and nurses significantly more often declare *Electrocardiograpfy* teletransmissions during their professional work than doctors. Medical rescuers and nurses significantly more often perceive the ECG teletransmission system as useful in the care of a patient with suspected Acute Coronary Syndrome compared to doctors. Medical rescuers are statistically significantly more likely to believe that the implementation of the ECG teletransmission system improves the quality of work of the Medical Rescue Team as compared to physicians. Medical rescuers are statistically significantly more often satisfied with the possibility of ECG teletransmission in comparison to physicians.

Key words - acute coronary syndrome, ECG teletransmission system, Medical Rescue Team.

Streszczenie – Wstęp. Do istotnych elementów pracy personelu ZRM należy zarówno sporządzanie elektronicznej dokumentacji medycznej (składającej się na elektroniczny rekord pacjenta), jak i udostępnianie zawartych w niej danych, co możliwe jest dzięki wdrożeniu rozwiązań telemedycznych, takich jak system teletransmisji EKG. Ponieważ opinia pracowników może warunkować wykorzystywanie wdrożonych systemów, duże znaczenie mają poglądy personelu nt. przydatności opracowanych rozwiązań oraz wynikających z nich korzyści.

Cel pracy. Celem pracy było ustalenie opinii członków ZRM (P oraz S) dotyczącej funkcjonowania systemu teletransmisji EKG.

Materiał i metoda. Na potrzeby badania (przeprowadzonego metodą sondażu diagnostycznego) przygotowano kwestionariusz ankiety składający się z 18 pytań. W badaniu udział wzięło 115 członków ZRM pracujących w KPR (w tym 82 ratowników medycznych, 21 pielęgniarek oraz 12 lekarzy).

Wyniki. Wykonywanie teletransmisji EKG zadeklarowało 93,91% (n=108) respondentów. Ze stwierdzeniem, że bezpośredni transport pacjenta do OKI znacznie skraca czas rozpoczęcia inwazyjnego leczenia w porównaniu do przewiezienia chorego do najbliższego SOR zdecydowanie lub raczej zgadza się 99,13% ankietowanych. 87,83% (n=101) respondentów jest zdecydowanie lub raczej zadowolonych z możliwości wykonywania teletransmisji EKG. Wdrożony system oceniony został jako zdecydowanie lub raczej przydatny przez 93,91% członków ZRM. Wśród respondentów 91,30% osób jest zdecydowanie lub raczej pozytywnie nastawionych wobec wdrażania oraz rozwijania w systemie PRM rozwiązań telemedycznych.

Wnioski. Ratownicy medyczni i pielęgniarki znamiennie statystycznie częściej deklarują wykonywanie teletransmisji ECG podczas pracy zawodowej w porównaniu do lekarzy.–Ratownicy medyczni i pielęgniarki istotnie statystycznie częściej postrzega-

ją system teletransmisji ECG jako przydatny w opiece nad pacjentem z podejrzeniem *Ostrego Zespołu Wieńcowego* w porównaniu do lekarzy.–Ratownicy medyczni istotnie statystycznie częściej uważają, że wdrożenie systemu teletransmisji ECG wpływa na poprawę jakości pracy *ZRM* w porównaniu do lekarzy.–Ratownicy medyczni znamiennie statystycznie częściej są zadowoleni z możliwości wykonywania teletransmisji ECG w porównaniu do lekarz.

Słowa kluczowe – Ostry Zespół Wieńcowy, system teletransmisji ECG, ZRM.

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I. INTRODUCTION

TToday, it is emphasized that telemedical systems in Emergency Medical Services have been implemented to support medical treatment, mainly in life-threatening cardiological conditions, including *Acute Coronary Syndrome* [1,2]. One of the elements that may limit the possibility of implementing telemedicine systems is the reluctance of medical staff to use new technical and technological solutions in their work. [3,4] Seeking answers to these doubts, the authors will decide to examine the opinion of members of *the Medical Rescue Team (Basic Medical Rescue Team or Specialist Medical Rescue Team)* on the functioning and benefits of implementing the ECG teletransmission system in their professional work.

II. MATERIALS AND METHODS

Materials

115 respondents (71,30% males i 28,70% females) in the age of 30- 58 were subjected to prospective survey, that is the members of *Medical Rescue Team (Basic Medical Rescue Team or Specialist Medical Rescue Team)* working in *Emergency Medical Service in Cracow*. 71,30% of the respondents were medical personnel 18,26% nurses and 10,44%- doctors. The survey was run in the time period between April 11th and May 4th in the year 2018.

Methodology

The research was carried out using the diagnostic survey method and the questionnaire technique. Author's questionnaire 18 questions (including 1 semi-open question and 7 closed questions). In 10 questions, a 5-point Likert scale was used, in which the numbers indicated: 1 - "*strongly disagree*", 2 - "*rather disagree*", 3 - "*hard to say*", 4 - "*rather agree"* and 5 - *"I definetly agree"*.
Participation in the study was voluntary and anonymous.

Statistical analysis

The statistical analysis was carried out using the *STATISTICA v.12 Pl StatSoft* program using the :2, Fisher tests (two-sided). For the purposes of the analysis, the significance level $\alpha = 0.05$ was assumed.

III. RESULTS

Question: Do I conduct ECG teletransmission during my professional work?
ECG teletransmission during the professional activities was declared by 93.91% of respondents ($p = 0.0001$) (including 96.4% of paramedics, 100.00% of nurses and 66.67% of doctors).
Paramedics significantly significantly more often perform ECG teletransmission while working in a professional setting compared to doctors ($p = 0.0045$), similarly statistically significantly more often they do nurses compared to doctors ($p = 0.0121$).

Question: After getting remote transmission ECG can every member of the Medical Rescue Team (not only the leader of MRT) consult with cardiologist?
With the above statement, 43.90% of all interviewees agree, or rather agree, 50% of paramedics, 39.1% of nurses and 33.33% of doctors.

Question: Execution of ECG teletransmission and e-consultation with the cardiologist on duty allow the patient to be transported with the suspicion of Acute Coronary Syndrome directly to the Interventional Cardiology Unit?
With the statement that direct patient's transport to the Interventional Cardiology Unit significantly reduces the time of commencement of invasive treatment compared to the patient's transport to the nearest Emergency Department definitely or rather agree 99.13% of interviewees (p = 0.00001). In the group of paramedics, 98.78% of respondents strongly agree or tend to agree with this statement. In the group of nurses and doctors with this statement, 100% of interviewees strongly agree or agree.

Question: Does a direct transport of a patient to the *International Cardiology Unit* provide an essential condition that can influence (may influence on) getting a reperfusion by a patient with suspicion of infarction STEMI (*ST Elevation Myocardial Infarction)?*
In a (the) research group 97,39% of respondents *absolutely or rather agree* with the statement that the direct transport of a patient to the *Interventional Cardiology Unit* is an essential condition for getting a reperfusion by a patient with a suspicion of infarction STEMI (p=0,00001). Among paramedics 98,78% absolutely or rather agree with the aforementioned statement.

Question: Does a direct transport of a patient to the *Interventional Cardiology Unit* increase chances of avoiding complications by a patient with *Acute Coronary Syndrome* as opposed/in comparison to the transport to the nearest *Emergency Department?*
With the aforementioned statement *absolutely or rather agree* 99,13% of respondents (p=0,00001). With the statement absolutely or rather agree 98,78% of paramedics, 100% of nurses and 100% of doctors.

Question: Is it possible that the direct transport of the patient to *Interventional Cardiology Unit* may lower the costs of patient's treatment?
In view of the above (with the aforementioned statement) definitely agree or rather agree 83,48% of the respondents (p=0,001). Among the EMS medics (paramedics) the interest is 84,15%. In a group of the nurses 71,43% definitely agree or rather agree with this statement when (and) among the doctors 100% agree.

Question: Has the implementation of the ECG broadcasting an influence on the job quality of Medical Rescue Team? (Does the implementation of the ECG broadcasting influence the job quality of *Medical Rescue Team)*
Among all the examined (the research group), 88,70% *definitely agree or rather agree* with the statement that the implementation of the ECG system has an influence on the correct quality of work of *Medical Resource Team* (p=0,001). In the group of the EMS medics such as statement expresses (with the statement agree) 91,46%, among the nurses - 90,48% and among doctors - 66,67%

Question: Using ECG's teletransmission system leads to declining a number of medical procedures executed by *Medical Rescue Team* on a patient with a suspected *Acute Coronary Syndrome?*
In the test group 35,36% *strongly or rather agree* with the statement that the use of ECG teletransmission system allows to reduce the number of medical procedures executed by *Medical Rescue Team* with a suspected *Acute Coronary Syndrome*. Among medical rescuers, 32,93% strongly or rather agree with the above given statement, among nurses - 57,14%, and among doctors - 16,67% of respondents.

Question: I am satisfied with the possibility of carrying out ECG teletransmission?
87.83% of respondents are *definitely or rather satisfied* with the possibility of carrying out ECG teletransmission (p = 0.001). Among the paramedics it expresses 92.68%, among nurses - 80.95%, and among doctors - 66.67% of the respondents.

Question: Should solutions that use telemedicine be implemented and developed in the *Emergency Medical Services system in Poland?*
The ECG teletransmission system was rated as definitely or rather useful by 93.91% of all respondents (p = 0.0001), including 96.34% of paramedics, 100% of nurses and 66.67% of medical doctors?
Statistically, medical rescuers (in comparison to doctors) more often perceive (p = 0.0045) the ECG teletransmission system as useful in caring for a patient with suspected *Acute Coronary Syndrome*, also significantly high utility

teletransmission is seen by nurses compared to the group of doctors (p = 0 , 0121).

Question: Please indicate what you think is necessary to introduce / develop telemedicine in *the Emergency Medical Services system in Poland?*

80% of the respondents said that *the necessary equipment* to introduce / develop telemedicine in *Emergency Medical Services in Poland* was 66.09% as the priority *the financial means*, 48.70% - *staff training*, 25.2% - *electronic medical documentation* and 24,35% - the *appropriate number of personnel in EMT*.

IV. DISCUSSION

According to experts, ECG remote transmission should be the standard procedure for all patients suspected of having *acute coronary syndrome*[2]. The results confirm the high interest of the members of the *medical rescue team* in the discussed system, 93.91% of whom explain that ECG remote transmissions are performed during their professional activities. The professional group that transmits ECG recordings most rarely are physicians. This may be due to the fact that the system in question was developed primarily to support members of the *Basic Medical Rescue Team[*5]. In addition, the decision to transport the patient directly to *Interventional Cardiology Unit* is made during a telephone consultation with a cardiologist, eliminating the need for remote transmission. This solution can also be used for problems with the network coverage used to transmit the data. The changes diagnosed in the ECG protocol and other information, such as the patient's general condition, are then presented orally during the teleconsultation.

Non-performance of ECG teletransmission by paramedics may also result from the fact that the decision on performing any medical procedures (including the use of the discussed system) is made by the *Medical Rescue Team* manager, who is a doctor in the case of the *Specialist Medical Rescue Team* [9].

The results of our own research are consistent with the observations of Burdzy et al., In which it was found that 80% of respondents declare very frequent or frequent ECG teletransmission [10]. In turn, Rekosz et al. They pointed out that in the analyzed region, in the period from September 2009 to August 2013, the number of ECG teletransmission procedures performed by the *Basic Medical Rescue Team* nearly 4 times increased [11]. Obłoja et al. emphasize that *Basic Medical Rescue Team* employees more often use the teletransmission system [1]. These observations are also confirmed by other authors [12,13].

The results of our own research show that only 46.90% of respondents agree with the statement that after performing ECG teletransmission each member of the Medical Rescue Team (not only the team leader) can consult a cardiologist. The belief that only the *Medical Rescue Team* manager can participate in a telephone call may be explained by the fact that he is the only one who is in charge of any procedure (including remote transmission ECG) and making phone calls. Skill sharing, being an effect of use the telemedic system, contributing to increase of competences of the *Medical Rescue Team* membrs is probable only in case of transporting a patient to *Interventional Cardiology Unit* [10,14]. By patients being diagnosed with the heartattack STEMI (*ST Elevation Myocardial Infarction*) and NSTEMI (*No ST Elevation Myocordial Inflarction*) (in case of a high risk), the invasive therapy is more succesful. This includes making the treatment *Percutaneous Coronary Intervention*, which is a preferred method or *Coronary Atery Bypass Surgery* [15,16]. The period between the initial contact of a patient with *Medical Rescue Team* and making the treatment PCI should last to 90 minutes (maximally 120 minutes) and in a case of early diagnose of massive heartattack: to 60 minutes. The period between a first contact of a patient with *Medical Rescue staff* and conducting the fibrynolytic therapy should maximally last to 30 minutes.

The larger the area of myocardial infarction, the shorter the delay time should be [1,17].The results of our own research indicate that as many as 99. 13% of respondents agree with the statement that direct transport to the *Interventional Cardiology Unit* significantly reduces the time to start invasive therapy compared to transporting the patient to the nearest *Emergency Department*. In addition, 97. 39% of respondents agreed that direct transport of the patient to the *Interventional Cardiology Unit* is an important condition for achieving reperfusion in a patient with suspected STEMI infarction. The opinion of the respondents is consistent with the results of Kleinrok et al. , in which it was stated that the use of ECG teletransmission system significantly reduces the delays that may occur in the process of care of patients with *Acute Coronary Syndrome* (by 8. 3%). In addition, the use of this solution has made it possible to increase the percentage of patients in whom the invasive procedure was performed at the time recommended in the guidelines. In 2006, the percentage of patients who received treatment within 90 minutes of initial contact with staff was only 14%, while in 2010 it reached 30. 6%. The percentage of patients treated within 120 minutes was 55. 0% in 2006 and 62. 2% in 2010 [18].

From case descriptions characterized by Janicka et al. It transpires that the transport of the patient who has *Acute Coronary Syndrome* symptoms to the nearest SOR, and then to the *Interventional Cardiology Unit (indirect transport*), significantly contributed to the delay in the implementation of effective therapy, which resulted in reperfusion. The average period from the patient's initial contact with the PCI procedure (balloon dilatation) was 160 minutes (in the case of patients directly transported to the *Interventional Cardiology Unit*) and as many as 315 minutes (in the case of patients transported to the *Interventional Cardiology Unit* indirectly). In addition, it has been proven that only direct transport of patients to the *Interventional Cardiology Unit* (possible through the use of the discussed system) enables the implementation of effective therapy in a recommended time or close to the time recommended by the guidelines [17].

In turn, in the studies of Obłoja et al. It has been proven that due to the implementation of the implemented system, the average period from the acceptance of a medical report by the dispatcher to handing over the patient to the Interventional Cardiology Unit staff was only 63 minutes [1].

Studies by Mężyński et al. showed that in the Podlasie region direct transport of a patient with suspected *Acute Coronary Syndrome* to the *Interventional Cardiology Unit* significantly shortened the period from the initial contact with the *Medical Rescue Team* to the implementation of intervention therapy up to 71.6 minutes [7].

On the other hand, studies carried out by Dudek et al. showed that the average period from initial contact with representatives of the health system (e. g. from a call for professional medical assistance) to vessel unblocking was 93 minutes in the case of direct transport (75% of people in this group were treated within the recommended 120 minutes) and 175 minutes in the case of patients transported first to the nearest *Emergency Department* (in this group only 33% of people were treated within the time recommended by the guidelines). [15]. Studies conducted abroad also confirm the significant impact of ECG teletransmission system on the reduction (in Denmark by more than 1 hour) of the time that elapses until vessel patency is achieved in patients diagnosed with STEMI myocardial infarction [19].

Many authors stress that any delay in the treatment resulting in the decongestion of the vessel causes a significant increase in mortality [17,20,21]. According to Zgliczynski et al. and Birati et al. , the implementation of telemedical systems contributes to the reduction of mortality in the group of patients diagnosed with myocardial infarction [22,23].

Since one of the main factors that may limit the implementation or development of telemedicine is the reluctance of medical personnel to apply new solutions, the medical staff's opinion on the functioning, usefulness and benefits resulting from their implementation is important to the use of systems [4.24]. According to data obtained from the National Registry of *Acute Coronary Syndrome* PL-ACS, the number of patients imported by the Medical Rescue Team to OKI increases directly from the place where the symptoms appeared [1]. For this reason, the views of the members of the *Medical Rescue Team* are of particular importance for the development of the ECG teletransmission system, as the opinion may condition the willingness to use the discussed solution. The results of the study carried out at the *Emergency Medical Service in Cracow* showed that the employees of the *Medical Rescue Team* assessing the ECG teletransmission system as useful, satisfied with its use and positively focused on the implementation or development of telemedicine in the *Emergency Medical Services in Poland* system significantly more often declare the execution of ECG teletransmission .

V.CONCLUSIONS

- Medical rescuers and nurses significantly more often declare using ECG teletransmission during their work than doctors.
- Medical rescuers and nurses significantly more often perceive the ECG teletransmission system as useful in the care of a patient with suspected *Acute Coronary Syndrome* compared to doctors.
- Medical rescuers are statically significantly more likely to believe that the implementation of the ECG teletransmission system improves the quality of work of *the Medical Rescue Team* compared to doctors.
- Medical rescuers are statically significantly more often satisfied with the possibility of using ECG teletransmission compared to doctors.

VI. REFERENCES

[1] Obłój D, Zalewski J, Wróblewska I. Działania zespołów ratownictwa medycznego u pacjentów z rozpoznanym ostrym zespołem wieńcowym. Anest Ratow 2017; 11: 273-281.

[2] Kubica J, Adamski P, Paciorek P, Ładny J, Kalarus Z, Banasiak W, *i wsp*. Leczenie antyagregacyjne u pacjentów z ostrym zespołem

wieńcowym – zalecenia dla zespołów ratownictwa medycznego. Stanowisko ekspertów. Kardiol Pol 2017; 75(5): 47-56.
[3] Polski M, Kułak P, Gościk E, Krajewska-Kułak E. Znaczenie telemedycyny, ze szczególnym uwzględnieniem teleradiologii, w percepcji studentów elektroradiologii. Hyg Pub Health 2015; 50(4): 549-557.
[4] Kielar M, Fil K. Jak oceniać technologie telemedyczne w placówce? OPM 2014; 6: 23-27.
[5] Kasiak K, Surtel W, Maciejewski R. Telemedycyna w sytuacjach kryzysowych. OSTRY DYŻUR 2014; 7(2): 63-68.
[6] Kordasiewicz M. Telemedycyna ratunkowa w kardiologii interwencyjnej. Acta Bio-Opt Inform Med 2008; 14(3): 240.
[7] Mężyński G, Kralisz P, Nowak K, Bachórzewska-Gajewska H, Poniatowski B, Prokopczuk P. i wsp. Przedszpitalna teletransmisja 12-odprowadzeniowego EKG i bezpośrednia transmisja do ośrodka kardiologii inwazyjnej w celu zmniejszenia opóźnienia leczenia interwencyjnego (PCI) u pacjentów ze STEMI. Doniesienie wstępne. Acta Bio-Opt. Inform Med 2010; 16(3): 268-271.
[8] Podbielska H. Całodobowa Sieć Życia LIFENET. System telemedycyny ratunkowej Lifenet działa we wszystkich województwach w Polsce. Acta Bio-Opt. Inform. Med 2010; 16(3): 272-273.
[9] Ustawa z dnia 8 września 2006 r. o Państwowym Ratownictwie Medycznym (j. t. Dz. U. 2006 Nr 191 poz. 1410).
[10] Burdzy D, Ozga D, Kosydar-Bochenek J, Migut M, Burdzy K, Lewandowski B. Use of teletransmission and influence of telemedicine on enhancing healthcare quality in opinions of paramedics from the Podkarpackie Province – a pilot survey. J Educ Health Sport 2017; 7(10): 79-95.
[11] Rekosz J, Kasznicka M, Kwiatkowska D, Mączyńska-Mazuruk R, Kołak K, Mierzejewska B, et al. Standard 12-lead electrocardiogram tele-transmission: Support in diagnosing cardiovascular diseases in operations undertaken by Warsaw-area basic medical rescue teams between 2009 and 2013. Cardiol J 2015; 22(6): 675-682.
[12] Piotrowicz R, Krzesiński P, Balsam P, Kempa M, Główczyńska R, Grabowski M, i wsp. Rozwiązania telemedyczne w kardiologii – opinia ekspertów Komisji Informatyki i Telemedycyny Polskiego Towarzystwa Kardiologicznego, Sekcji Elektroradiologii Nieinwazyjnej i Telemedycyny Polskiego Towarzystwa Kardiologicznego oraz Komitetu Nauk Klinicznych Polskiej Akademii Nauk Kardiol Pol 2018; 76(3): 698-707.
[13] Piotrowicz R, Balsam P, Grabowski M, Kempa M, Kołtowski Ł, Krzesiński P, *i wsp*. Telemedycyna – zmiany w procesie świadczenia usług kardiologicznych. Możliwości i realia. NAUKA 2016; 4: 53-69.
[14] Blim M, Mikulik J. Bezpieczeństwo danych w nowoczesnej telemedycynie (cz. 1). Zabezpieczenia 2014; 1 (95): 20-24.
[15] Dudek D, Legutko J, Siudak Z, Rakowski T, Dziewierz A, Bartuś S. i wsp. Organizacja interwencyjnego leczenia pacjentów z zawałem serca STEMI i NSTEMI w Polsce. Kardiol Pol 2010; 68(5): 618-624.
[16] Pstrągowski K, Koziński M, Jabłoński M, Fabiszak T, Navarese E, Kubica J. Optymalizacja postępowania w nagłym pozaszpitalnym zatrzymaniu krążenia w przebiegu ostrego zawału serca – opis przypadku i przegląd piśmiennictwa. Folia Cardiol Excerpta 2011; 6(4): 270-276.
[17] Janicka J, Wilczyńska J. Czas to mięsień – system transportu chorego ze STEMI do ośrodka hemodynamicznego a opóźnienie reperfuzji. Kardiol Dypl 2009; 8(6): 79-85.
[18] Kleinrok A, Płaczkiewicz D, Puźniak M, Dąbrowski P, Adamczyk T. Electrocardiogram teletransmission and teleconsultation: essential elements of the organisation of medical care for patients with ST segment elevation myocardial infarction: a single centre experience. Kardiol Pol 2014; 72(4): 345-354.
[19] Ripa MS. The ECG as decision support in STEMI. Dan Med J 2012; 59(3): B4413.
[20] Moniuszko A, Tycińska A, Skolimowski K, Dobrzycki S, Kralisz P, Musiał W, *i wsp*. Cykliczność występowania świeżego zawału serca z uniesieniem odcinka ST (STEMI). Pol Prz Kardiol 2011; 13(3): 149-154.
[21] Lambert L, Brown K, Segal E, Brophy J, Rodes-Cabau J, Bogaty F. Association between timeliness of reperfusion therapy and clinical outcomes in ST-elevation myocardial infarction. JAMA 2010; 303(21): 2148-2155.
[22] Zgliczyński W, Pinkas J, Cianciara D, Sitarek M, Berdyga T, Nowicka-Wasilewska J, i wsp. Telemedycyna w Polsce – bariery rozwoju w opinii lekarzy. Med Ogólna Nauk Zdr 2013; 19(4): 496-499.
[23] Birati EY, Roth A. Telecardiology. Isr Med Assoc J 2011; 13:498-503.
[24] Januszewicz P. Telemedycyna – nowe narzędzie medycyny XXI wieku. Prz Med Uniw Rzesz Inst Leków 2012; 3: 274-276.