

# The patient with acute coronary syndrome with ST segment elevation and an on-call doctor (rendez-vous system): a case report

Pacjent w ACS STEMI i lekarz w systemie na telefon – opis przypadku

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## Abstract

The Emergency Medical Services in Poland was constituted to save human health and life. Regardless of applied system solutions, all countries are guided by this assumption. In Poland, the law, which was enforced in 2007, has developed two types of emergency ambulances: one including the doctor (the "S" team), and one with paramedics only (the "P" team). The "S" team should be sent to all life-threatening conditions, and the "P" team to the remaining conditions. It is noteworthy that in some countries there are only basic teams, and their ability of action and pharmacotherapy is imposed by legal regulations operating in the country. In other systems in Europe, the basic team may rely on the support of a doctor that arrives at the emergency site.

In the case described, a patient with myocardial infarction (STEMI, ST-elevation myocardial infarction) with complicated pulmonary edema was initially supplied by the basic team. Due to the serious condition of the patient and the limited ability of action, the doctor was asked to support the team. The reported case presents a solution to abandon the permanent specialist teams that is feasible to apply (not only in Poland), and it suggests other solutions increasing efficiency of activities of the rescue teams.

Key words: STEMI, emergency medical services, prehospital care, a doctor in "rendez-vous" system

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## Introduction

In 2007 in Poland, there was enforced a law on Emergency Medical Services (Polish: PRM, *Państwowe Ratownictwo Medyczne*) [1]. On that basis, two types of emergency ambulances were created. The "P" team – the basic one, in which there are at least two paramedics (one of the team members may be an emergency nurse), and the "S" team – the specialist one with a doctor [2]. In general assumption, the "S" team should be given an order to all immediate life-threatening conditions, while the "P" team to the remaining ones. This situation is caused by varying range of medical rescue operations and the ability of phar-

macological treatment of the teams. In the situation when the "P" team ascertain at the site that they need support, and/or the range of performed medical operations exceeds the competence of the team, they should call the specialist team through the dispatcher. In this case, it is not about an additional team, but about a medical specialist that extends the ability of pharmacotherapy, and medical procedures performed at the bedside. At present, such a model of action operates throughout the country, and it may cause that teams "double" each other during one intervention.

In some countries (e.g. England, Germany), they resigned from the permanent "S" teams with a doctor. The doctors were "moved" to hospital emergency departments

(Polish: SOR, *szpitalny oddział ratunkowy*) or admission halls (Polish: IP, *izba przyjęć*) in hospitals. The doctors, however, are still at disposal of the emergency medical system. When a paramedic at the emergency site ascertains that he or she needs medical support, he or she notifies the dispatcher who sends the doctor by separate transportation (a car marked as an emergency vehicle), with a driver (usually another paramedic working in SOR or IP). The doctor, after arriving at the emergency site, starts to manage the rescue action. After the operations are completed, or appropriate instructions are given, the doctor returns to the ward, either with the rescue team, or by his/her transportation, with the paramedic or the driver. It can be concluded that the doctor is on duty in two places at once (in the SOR and, if necessary, in emergency medical services). This solution was used in many countries, mainly due to the following aspects:

- analyses revealed that a doctor in emergency ambulances is needed in a small number of cases, in relation to the total number of interventions;
- the costs of maintaining the “S” teams at the ready were reduced;
- it was faster for a doctor to arrive at the emergency site to support the basic teams;
- personal staff in hospital wards was increased [3–5].

The solution of this type is thus a tried model, and its operation has been implemented in many countries in Europe (e.g. in Germany, Great Britain).

## Case report

On 2 January 2015, at 3:30, the basic team was called to a town, approx. 15 kilometres away from the station. The reason for the call was: a man suffering from hypertension, diabetes and asthma, had had a mild dyspnea for approximately 3 days. That day, for a half an hour, an increase in severity of symptoms (persisting despite taking medication) and a slight pain in the chest. The “P” team was sent to this incident.

The team arrived at the site within 30 minutes, due to the bad weather (it was sleeting).

At the emergency site, at 4:00, the team found a man about 120 kg of weight, in a sitting position, with a strong dyspnea, drenched with sweat. During the subjective examination, he was not able to answer questions freely. While being interviewed, the family confirmed information that were received from the dispatcher.

During the examination, the following were determined:

- 15 points in Glasgow Coma Scale;
- respiratory rate: 45 bpm;
- peripheral blood oxygen saturation 90%;
- 180/80 blood pressure, and heart rate of 120 bpm, palpable on radial artery;
- on auscultation, several crackles over lung fields;

- level of capillary blood glucose 180 mg/dL;
- wet skin, the patient drenched with sweat;
- the patient rated the pain in chest as 10, in a scale from 1 to 10.

On the basis of the information gathered, a preliminary diagnosis was determined: a suspicion of heart attack, accompanied by pulmonary edema.

After presumptive diagnosis, it was decided to transport the patient urgently to the hospital. Before transporting, 2 intravenous (i.v.) injections were made. The patient was given 5 mg of morphine and 20 mg of furosemide i.v. A 12-lead ECG was also conducted, in which the ST segment elevation was confirmed, which was responsible for e.g. myocardial infarction of inferior wall (possible infarction of the right ventricle [RV]). A right-sided ECG was not conducted, so as not to prolong the proceedings at the emergency site.

About 15 minutes later, after putting the patient on the stretcher, he lost consciousness on the way to the ambulance (house → ambulance). The following symptom of respiratory and circulatory failure arose: BP 60/undetectable (the parameter marked in the ambulance around 4:25). The medical dispatcher was asked for the support of a doctor. Transportation to the hospital was temporarily not continued. During waiting and transportation, the following were performed:

- the protection of airway patency (LMA), and active oxygen therapy (it was not decided to perform an endotracheal intubation – a legal limit for paramedics);
- saturation was monitored (before obtaining airway patency, it decreased from 93% at home to 80% in the ambulance);
- sterofundin 500 ml was applied i.v.;
- 12-lead ECG was conducted again, with a teletransmission to the invasive cardiology center.

## The obtained ECG record and its preliminary interpretation (Fig. 1, 2)

The preliminary interpretation of ECG:

- sinus rhythm of approx. 100 bpm;
- first-degree atrioventricular block;
- dextrogram;
- undefined intraventricular conduction disturbances;
- features of acute myocardial infarctions of lateral and inferior walls;

After about 20 minutes (around 4:50), the doctor was driven (in a car) to the basic team. Endotracheal intubation was then performed, and it was commissioned to expand pharmacotherapy on dobutamine. After above steps were conducted, transportation of the patient to the SOR (emergency department) was initiated, and the dispatcher was informed about the condition of the patient. During transportation, systolic blood pressure 90 was achieved (diastolic blood pressure was undetectable).



Figure 1. ECG 1

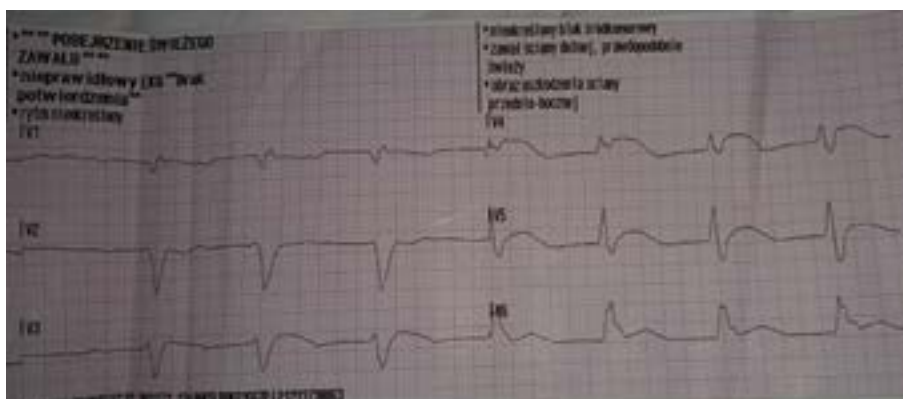


Figure 2. ECG 2

In the SOR, an anesthesiologist and a cardiologist were waiting. There occurred an acute circulatory arrest in ventricular fibrillation. The ALS scheme was implemented and defibrillation was performed (twice). The return of spontaneous circulation was achieved, and the patient was transported to the invasive cardiology ward for the purpose of reperfusion of the coronary artery.

In the coronary arteriography, the occlusion of the artery, responsible for the infarct (RCA) was confirmed. Next, the patient underwent the percutaneous coronary angioplasty. In the following hours and days, gradual stabilization of the condition of the patient was achieved.

## Discussion

The Emergency Medical Services in Poland was established in order to “implement state tasks of ensuring help to any person in sudden emergency state...” [1]. According to the law, the profession of paramedic was created and sanc-

tioned, together with the “S” and “P” teams. The law gives the right for paramedics to apply specific medicines from the drug list (appendix 1 to the law on PRM), and to perform medical rescue operations. Although in Poland there is no official data concerning analysis and legitimacy of interventions of the “S” and “P” teams, the vast majority of them is nowadays effectively implemented by the basic teams.

Acute coronary syndrome (ACS) is a state of immediate danger to life which requires an urgent intervention. Each year in Poland, there occur more than 50,000 of instances of the treatment of myocardial infarction (STEMI and NSTEMI) [6]. Unfortunately, there is no nationwide data which would analyze the type of the team and the extent to which they perform interventions and recognize ACS or other severe conditions. Basing on author’s own research, conducted in Szczecin between 2009–2011, it was proved that nearly half of the interventions for a heart attack is performed by basic teams (45%) [7]. Differences within the competence of paramedics and

doctors in the case of ACS are significant. Paramedics cannot perform intubation in any other case than a sudden cardiac arrest, even if the patient is unconscious or in respiratory failure, and they cannot apply clopidogrel. In the case of hypotension and ACS, they cannot apply any medications to increase blood pressure (except fluid therapy). In the case of SCA, the range of operations is leveled in terms of emergency medical actions and pharmacological treatment (in ALS).

The analysis of dispatch orders in different areas of the country indicates that basic teams are sent more often than specialist teams. In many studies defining times of departure, commuting, intervention and transportation to specialist centers from the emergency site, the basic teams seem to be far more effective [8, 9]. This situation makes the assumption that the “S” teams are sent only to severe conditions incorrect. It can be said without a doubt that the basic teams operate more frequently, and as often encounter severe conditions of patients as the specialist teams. In many situations, the basic teams are able to operate as effectively as specialist teams, and being supported by specialist teams is a relatively rare situation. There arises a reasonable question: to what extent is at the moment the need to maintain the specialist teams in readiness and to defray the cost? It is worth noting that in many places of the country, as presented in the Supreme Audit Office Report concerning emergency medical services, the directors of ambulance stations reduce the number of specialist teams and increase the number of basic teams. The reasons presented in the report are various, but there are mentioned e.g. problems with the staff of the “S” teams at the weekends and public holidays, or high financial expectations of doctors [8]. The increase in the number of basic teams may indicate a growing confidence in paramedics and high professional qualifications.

In the case described, due to the loss of consciousness, hypotension, problems with obtaining airway patency and lack of possibility of drug administration, the team decided to call a doctor. After a few minutes, he was driven to the team. As a result, they could effectively take care of the patient, extend the rescue proceedings, and continue transportation. Even if the rescuer could perform above operations, the headcount would be a significant problem, because only one person would have the ability to perform medical rescue operations. The other paramedic normally serves as the driver.

### Systemic solutions

In the present case, at the site of stationing there are contracted 2 teams: one “S” and one “P”. The teams are deployed in the vicinity of one hospital. Therefore, all patients after the intervention of the teams are placed in the SOR or the appropriate ward (e.g. invasive cardiology).

Such a structure indicates that in the intervention of the “S” team, another team, regardless of the type of call, have to perform together with paramedics. In a situation when the “P” team reports the need to be supported, the “S” team is normally sent. However, in this area, an additional “systemic” solution was introduced. When the “S” team cannot enter the emergency site, the hospital has got a car. When there is such an urgency, one of the doctors assigned to the SOR is driven to the basic team, and there he or she provides the appropriate support.

### Financial aspect and “systemic” solution

The maintenance costs of basic and specialist teams are different, depending on the region. The Supreme Audit Office Report, conducted between 2009 and 2011, indicated that the differences in regions were significant [8]. Generally speaking, however, and averaging the rates, it can be assumed that the maintenance cost of the basic team is about 1,000 PLN (250\$) lower than the cost of the specialist team. Monthly, it means nearly 30,000 PLN (7,400\$) of difference, and over 360,000 PLN (88,760\$) per year, only in the case of one team. In the case of liquidation or reducing the number of specialist teams, the cost savings would be counted in millions in the whole country. It should be noted, however, that some of these funds, in the case of changes in the functioning of specialist teams, would be moved to the SORs or to create a rendez-vous system. This would also mean that the SORs would have a greater staff of doctors, which today is a major problem that is often reported by hospitals. However, any possible changes would require, without a doubt, an amendment of the law on emergency medical services.

A possible (suggested) proposal for an amendment:

- a liquidation of “fixed” specialist teams and replacing them with basic teams. Doctors would be on duty in emergency medical stations and, if necessary, they would be sent along with a free team, or they would commute to the team;
- a total elimination of specialist teams and replacing them with basic teams. Doctors would be on duty in wards (SOR, IP, etc.), and, if necessary (after a paramedic’s call), they would be driven to the emergency site.

### Conclusion

The example has shown that the need to maintain permanent specialist teams should be reconsidered. Solutions other than standard are possible in the current system and functioning of legal acts in Poland. A very good and proven solution, implemented in many countries, is to provide an on-call doctor (the rendez vous system). This makes it possible to increase the number of basic teams,

shift funds to the training of paramedics, increase staff, and provide emergency ambulances with newer equipment. Before introducing such a system, however, an analysis on the ratio of departures of the “S” teams and an evaluation of whether to send these teams should be implemented, and the analysis of the frequency of

departures of the “P” teams and the need to support them by a doctor.

### Conflicts of interest(s)

There are no conflicts of interest.

### Streszczenie

Państwowe Ratownictwo Medyczne powołano w celu ratowania ludzkiego zdrowia i życia. Bez względu na zastosowane rozwiązania systemowe wszystkie kraje kierują się takim założeniem. W Polsce ustawą, która weszła w życie w 2007 roku stworzono dwa rodzaje zespołów wyjazdowych – z lekarzem (zespół „S”) oraz złożony z samych ratowników medycznych (zespół „P”). Do wszystkich stanów zagrożenia życia powinien być wysłany zespół „S”, zaś do pozostałych zespołów „P”. Warto zauważyć, że w niektórych krajach istnieją tylko zespoły podstawowe, natomiast ich możliwości działania i farmakoterapii są podyktowane regulacjami prawnymi funkcjonującymi w danym kraju. W innych systemach w Europie zespół podstawowy może liczyć na wsparcie lekarza, który dojeżdża na miejsce zdarzenia.

W opisanym przypadku pacjent z zawałem serca (STEMI, zawałem serca z uniesieniem odcinka ST) powikłanym obrzękiem płuc początkowo był zaopatrywany przez zespół podstawowy. Ze względu na ciężki stan chorego oraz ograniczone możliwości działania poproszono o wsparcie lekarza. Opisany przypadek ukazuje możliwe do zastosowania (nie tylko w Polsce) rozwiązanie, by zrezygnować ze stałych zespołów specjalistycznych oraz proponuje inne rozwiązania zwiększające skuteczność w działaniach zespołów ratownictwa medycznego.

Słowa kluczowe: STEMI, ratownictwo medyczne, postępowanie przedszpitalne

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