

KNOWLEDGE OF AND ATTITUDES TO EMERGENCY TACHYARRHYTHMIA TREATMENT AMONG PARAMEDICS AND NURSES

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Abstract

INTRODUCTION: Supraventricular tachycardia (SVT) is a wide term used to describe tachycardia with atrial and/or ventricular rates exceeding 100 bpm at rest. The underlying mechanism involves His bundle or tissue lying above. As the diagnosis of SVT is often made in the prehospital settings or in an emergency department, the relevant knowledge of all medical personnel, including paramedics, on the diagnosis and treatment procedures is crucial for the patient's outcome. It is essential to quickly assess the patient's clinical condition and make decisions based on both electrocardiographic records and the occurrence of adverse symptoms. Some procedures and pharmacological treatments can be implemented by the paramedic on their own, some require a physician's supervision. The aim of the study was to assess paramedics' and nurses' knowledge concerning emergency management in tachycardia.

METHODS: The study was conducted in January 2019 in south-western Poland among paramedics and nurses working in the Polish National Emergency Medical System (EMS). All participants received information on the study objectives and voluntarily took part in the questionnaire survey. The questionnaire was developed by the authors and included 22 questions referring to gender, age, work experience, type of work in EMS, number of inhabitants in the workplace area, latest training in advanced life support, adverse events in hemodynamically unstable patients, vagal manoeuvres, European Resuscitation Council 2015 guidelines for narrow and broad complex tachycardia in stable and unstable patients with regular and irregular rhythms, indications for synchronized electrical cardioversion, performing synchronized electrical cardioversion in the past, concerns about cardioversion and self-assessed level of experience in tachyarrhythmia treatment.

RESULTS: Overall, 200 paramedics and 50 nurses were asked to participate in the study. The final questionnaire return rate was 84.5%. The mean age of the participants equalled as 37.90 ± 11.44 years; 50 (29.59%) were female; the mean work experience was 12.07 ± 10.39 years. The correct treatment in a stable patient with narrow QRS tachyarrhythmia (including vassal manoeuvres and adenosine administration) was proposed by 88.17% of the participants. The correct treatment in an unstable patient with broad QRS tachyarrhythmia was proposed by 84.60% of the participants. Overall, 56.80% indicated correct treatment with a beta-blocker in a stable patient with irregular narrow complex tachyarrhythmia with a duration of over 48 hours; 87.57% knew the role of magnesium sulphate in torsade de pointes treatment. Only 34.91% had conducted electrical cardioversion in the past. According to the subjects, the main problems associated with the procedure of electrical cardioversion were: analgosedation and airway management (52.66%), the risk for sudden cardiac arrest as a result of electrical cardioversion (53.25%), and the risk of a stroke (38.46%).

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The proper number of electrical cardioversions in unstable patients was proposed by 73.37% of the participants; 66.86% knew the correct dose of amiodarone when the correct electrical cardioversion sequence does not restore the sinus rhythm and the patient remains unstable. Only 43.79% knew the correct initial biphasic energy for electrical cardioversion in unstable broad complex tachyarrhythmia (120–150 J), while most responders indicated energy up to 120 J. The mean self-assessed level of experience in tachyarrhythmia treatment was 6.00 ± 1.76 in a scale of 0–10, where 0 meant lack of experience and 10 stood for experience ensuring proper performance of the procedure.

CONCLUSIONS: The knowledge of Polish paramedics and nurses concerning the emergency treatment of tachyarrhythmia is unsatisfactory in many aspects. Better undergraduate and postgraduate training on advanced life support guidelines should be recommended.

KEY WORDS: tachyarrhythmia, peri-arrest arrhythmias, emergency medicine, paramedic, nurse, medical emergency

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INTRODUCTION

Supraventricular tachycardia (SVT) is a wide term used to describe tachycardia with atrial and/or ventricular rates exceeding 100 bpm at rest. The underlying mechanism involves His bundle or tissue lying above. As the diagnosis of SVT is often made in the prehospital settings or in an emergency department, the relevant knowledge of all medical personnel, including paramedics, on the diagnosis and treatment procedures is crucial for the patient's outcome [1, 2]. In the event of SVT, a paramedic has to implement correct procedures, although in some cases specialist consultation is necessary. It is essential to quickly assess the patient's clinical condition and make decisions based on both electrocardiographic records and the occurrence of adverse symptoms. Some procedures and pharmacological treatments can be implemented by the paramedic on their own, some require a physician's supervision. If symptoms suggest SVT, performing the 12-lead electrocardiogram (ECG) is necessary to identify the arrhythmia. The tachycardia should first be classified according to whether there is a regular or irregular ventricular rate. If the SVT is regular, it most likely involves the atrioventricular (AV) node, being AV reentrant tachycardia (AVRT) or AV nodal reentrant tachycardia (AVNRT). An irregular ventricular rate implies atrial fibrillation (AF), which is not included in the present report. The European Resuscitation Council (ERC) guidelines suggest to evaluate the rhythm with a 12-lead ECG and to measure the QRS duration. If the QRS duration exceeds 120 ms, the tachycardia is classified as broad complex tachycardia. Otherwise, it is referred to as

narrow complex tachycardia. This differentiation is essential for the choice of further treatment.

Simultaneously with ECG interpretation, the patient's hemodynamic condition must be assessed. Vagal manoeuvres and adenosine are recommended for acute treatment in hemodynamically stable patients with regular SVT. They have been shown in nonrandomized trials in an emergency department or prehospital care to effectively terminate SVT that is due to either AVNRT or AVRT, with success rates up to 90% [3]. Sinus rhythm must be promptly restored in patients with SVT who are hemodynamically unstable. Synchronized cardioversion is recommended for acute treatment in patients with hemodynamically unstable SVT. The safety and effectiveness of cardioversion in the prehospital setting was analysed in a cohort of patients with hemodynamically unstable SVT; cardioversion successfully restored sinus rhythm in all patients [4]. The guidelines advise synchronized cardioversion for any patient presenting with hypotension, acutely altered mental status, signs of shock, chest pain, or acute heart failure symptoms [5].

The ERC guidelines, defining the management of tachycardia, are directed to all medical personnel, as the assistance of an expert cardiologist is not always available.

The aim of the study was to assess the knowledge concerning emergency management in tachycardia among paramedics and nurses.

MATERIAL AND METHODS

The study protocol was approved by the institutional review board of the Polish Society of Disaster Medi-

cine (approval No.: 12.12.2018.IRB). The study was conducted in January 2019 in south-western Poland among paramedics and nurses working in the Polish National Emergency Medical System (EMS). All participants received information on the study objectives and voluntarily took part in the questionnaire survey.

The study questionnaire was developed by the authors on the basis of their observations of paramedics training, including post-graduate training. It included 22 questions referring to gender, age, work experience, type of work in EMS, number of inhabitants in the workplace area, latest training in advanced life support, adverse events in hemodynamically unstable patients, vagal manoeuvres, ERC 2015 guidelines for narrow and broad complex tachycardia in stable and unstable patients with regular and irregular rhythms, indications for synchronized electrical cardioversion, performing synchronized electrical cardioversion in the past, concerns about cardioversion and self-assessed level of experience in tachycardia treatment.

Data were analysed with the statistical package of Statistica 13.3 (TIBCO Software Inc., Tulsa, OK, USA). Descriptive statistics were used to analyse the demographic variables. Variability was measured with the standard deviation. The normality of variable distributions was tested with the Kolmogorov-Smirnov test and the homogeneity of variance with the Fisher-Snedecor F-test and the Levene test. A conventional significance level (α) equal to 0.05 was applied.

RESULTS

A total of 200 paramedics and 50 nurses were asked to participate in the study. Finally, 169 questionnaires were returned (132 paramedics and 37 nurses), which means the overall return rate of 84.5%. The proportion of paramedics and nurses represents the general proportions of medical personnel working in emergency departments and in medical rescue teams.

The mean age of the participants was 37.90 ± 11.44 years; 50 (29.59%) were female; the mean work experience equalled 12.07 ± 10.39 years. Overall, 7.10% of the respondents worked in the countryside, 15.98% in a city of 20,000 inhabitants or less, 45.56% in a city of 20,000–100,000 inhabitants, 31.36% in a city of more than 100,000 inhabitants. Among the subjects, 31.36% had participated in advanced life support training within 12 months prior to the study, 30.18%

within the previous 1–3 years, 24.85% within the previous 3–10 years, 11.24% 10 or more years earlier, and 2.37% had never taken part in such a training.

The participants were surveyed for the knowledge of adverse signs in the tachycardia treatment protocol; 81.07% knew the adverse signs. The correct treatment in a stable patient with narrow QRS tachycardia (including vassal manoeuvres and adenosine administration) was proposed by 88.17% of the participants. The correct treatment in an unstable patient with broad QRS tachycardia was proposed by 84.60% of the participants. Overall, 56.80% indicated correct treatment with a beta-blocker in a stable patient with irregular narrow complex tachycardia with a duration of over 48 hours; 87.57% knew the role of magnesium sulphate in *torsade de pointes* treatment.

Only 34.91% of the study subjects had conducted electrical cardioversion in the past.

According to the subjects, the main problems associated with the procedure of electrical cardioversion were: analgosedation and airway management (52.66%), the risk for sudden cardiac arrest as a result of electrical cardioversion (53.25%), and the risk of a stroke (38.46%).

The proper number of electrical cardioversions in unstable patients was proposed by 73.37% of the participants; 66.86% knew the correct dose of amiodarone when the correct electrical cardioversion sequence does not restore the sinus rhythm and the patient remains unstable.

Only 43.79% of the participants knew the correct initial biphasic energy for electrical cardioversion in unstable broad complex tachycardia (120–150 J), while most responders indicated energy up to 120 J.

In the opinion of 20.70% of the study participants, the overall rate of ambulance calls for cases of tachyarrhythmia was below 1 per week, while 1–3 calls per week were indicated by 26.63%, 4–10 calls per week by 49.71%, and above 10 emergency calls per week by 2.96%.

The mean self-assessed level of experience in tachycardia treatment was 6.00 ± 1.76 in a scale of 0–10, where 0 meant lack of experience and 10 stood for experience ensuring proper performance of the procedure.

DISCUSSION

The current ERC guidelines [6] recommend the treatment in narrow and broad complex tachycardia in

stable and unstable patients. SVT is a common cause of acute hospital presentations [7].

Park et al. [8] showed that a considerable part of EMS personnel does not have appropriate knowledge on treating critical illness, including tachycardia in sepsis care.

Smith et al. [9] analysed the effectiveness of current prehospital SVT management by ambulance paramedics in Australia. They revealed that paramedics correctly identified SVT in 96.7% of cases. Valsalva manoeuvre was undertaken in 24.0% patients and reverted the SVT in 27.7% of attempts. Finally, 49.7% of patients remained in SVT on arrival at the hospital. Many paramedics and nurses are concerned about the emergency treatment of tachycardia. In our study, the mean self-assessed level of experience in tachycardia treatment was only 6.00 in a 0–10 scale.

From a practical point of view, the procedure of electric cardioversion is particularly important. The authors' observations show that many paramedics and nurses are concerned about the necessity of patient sedation and the risk of complications associated with electrical cardioversion if it is not possible for a physician to supervise the procedure directly. In our study, only 43.79% of participants knew the correct initial biphasic energy for electrical cardioversion. Approximately half of the responders were concerned about analgosedation and airway management and the risk of sudden cardiac arrest as a result of electrical cardioversion.

Honarbaksh et al. [7] compared paramedic with the hospital-delivered treatment of acute SVT with adenosine. They revealed that patients with SVT could be effectively and safely treated by paramedics with the use of adenosine. In our study, most participants knew the indication and dosage of adenosine.

Clementy et al. [10] studied ECG monitoring in outpatient cardiac unit patients presenting with palpitations and revealed that the cause of palpitations was found in 81% of cases (77% of them were atrial arrhythmias).

Goebel et al. [11] observed that the inappropriate use of adenosine occurred in 20% of cases and concluded that the errors in rhythm interpretation were lower among paramedics participating in targeted education programs on tachydysrhythmias.

Vagal manoeuvres are frequently applied as the first-line management tool in SVT in both emergency medicine and prehospital emergency-care settings

[12]. Smith and Boyle [13] analysed the knowledge of Melbourne's paramedics concerning the vagal manoeuvres and concluded that they would benefit from the introduction of an evidence-based model of vagal manoeuvres performance.

In our study, only 34.91% of the participants had conducted electrical cardioversion in the past. Even in the United States, some of the critical procedures including electrical cardioversion may be infrequently performed [14]. We noticed that the participants' knowledge on the energy level for cardioversion and a proper number of electrical cardioversions in unstable patients was incorrect in 1/2–1/3 of cases.

Minhas et al. [15] analysed cases of paroxysmal SVT treated in a prehospital setting. They revealed that EMS agencies typically required patients treated for SVT to be transported to a hospital; however, in some uncomplicated cases, the treat-and-release protocol could be instituted. The treat-and-release events were analysed and the conclusion was that only 13% of patients required EMS re-presentation and only 5.3% required emergency department admission.

CONCLUSIONS

The knowledge of Polish paramedics and nurses concerning the emergency treatment of tachycardia is unsatisfactory in many aspects. Better undergraduate and postgraduate training on advanced life support guidelines should be recommended.

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