How is the Diagnosis Made? The Observation of Paramedics Performance in Simulated Competition Task[1]

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ABSTRACT

Introduction: We examined the process of decision making related to diagnosis in paramedic teams in an international competition. **Method**: Observation of 28 paramedic teams in selected task was compared with objective medical evaluation of their performance in the whole competition. **Results and discussion:** The real process of examining the patient and establishing the diagnosis by the paramedics is not in accordance with the prescribed procedures. Paramedics show a tendency to make assumptions about the case from early steps of dealing with it, which has a strong influence on the subsequent process of examination of the patient and establishing diagnosis.

KEYWORDS

Problem solving; health; simulation; paramedics; making the diagnosis.

INTRODUCTION

In this paper we examined the process of making the diagnosis in paramedic teams. Situations which paramedics usually have to deal with can be classified as a complex problem solving, as they are dynamic, time-dependent and complex (Quesada, Kintsch & Gomez, 2005).

As stated by Dekker (2005), doctors are 7 500 times more likely to kill somebody by mistake then gun owners are. The problem of human error is even more important in the field of emergency medicine. In the study of Najaf-Zadeh, Dubos, Pruvost, Bons-Letouzey, Amalberti and Martinot (2011) the most common alleged misadventures were the diagnosis-related error (47%). Moreover, Rittenberger, Beck and Paris (2005) found frequently occurring deviations from the prescribed protocol.

However, in complex real world situations it is very complicated to objectively evaluate the performance of paramedics. One possibility how to overcome this difficulty is to observe the performance of paramedic teams at a competition consisting of a wide range of tasks with different level of complexity. This form of data collection enables also to compare different teams in the same situation and to gain access to objective assessment of quality of team performance from the point of view of different independent judges – experts in the field of emergency medicine. Understanding how the rescue teams deal with real time problems can provide us with useful insights into how the trainings or medic tools should be designed to support the successful resolving of the situations.

Aim

Aim of this study was to assess the frequency and nature of deviations from a standardized treatment protocol of paramedic teams in the selected competition task.

METHOD

The paramedic teams were observed and videotaped at one selected task at the international competition „Rallye Rejvíz 2010“. The competition had a strict time schedule where the teams had to solve 13 tasks of different level of difficulty in the course of 24 hours. The task we have selected for the analysis was part of the first 12-hours day period. The competition tasks were modelled as close to the real problems that paramedics can encounter as possible. The competitors were not just under time pressure, they also had to cope with unclear instructions, lack of feedback and physical fatigue. Contrary to real life situations they had to deal with the subjectively perceived pressure of public assessment by the judges and occasional onlookers.

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Participants

We observed all 28 teams in the competition (46 men, 10 women). The teams consisted of two paramedics without physician. 20 teams were from the Czech Republic and 8 teams came from Slovakia. We obtained additional information from 24 participants from the total number of 56 participants (42.86%). Anyway, we found neither statistically significant difference among these participants and the rest of group in their level of performance, nor significant relationship between their performance, age, years of practice or number of participations at previous competitions.

Procedure

In the selected task the team had to execute simple basic examination of a healthy, communicating man. After arriving at the position, they received the following instruction: „*Emergency dispatch centre received an emergency call and sent you to: Call from wife: husband at home after night shift, sounds "strange" on the phone, unusual speech, reluctant. Confirmation phone call home – no response. Your goals are: assess situation and patient, examine patient and recommend care and treatment.*" The instruction was followed by detailed description of possibilities of the next transport of the patient into three hospitals with different facilities and different distance from the spot. The timer started after handing the instruction back to the judge; the limit was 15 minutes.

Analysis

The quantitative analysis of videotaped materials of all 28 paramedic teams was conducted in order to determine the chronology and selection of employed diagnostic procedures. On the basis of the assessment of judges in the course of the whole competition we selected 10 teams for the transcription and a detailed qualitative analysis. The selected teams represented specific cases of solving the task.
We divided all teams according to the total score they achieved in the competition into three performance groups and compared them in the variables related to the performance of the team.

RESULTS

Processing of initial information from emergency dispatch centre

We created two catergories of dealing with written instructions representing a usual call from emergency dispatch centre. The first represented the way of reading the instruction, the second was related to further information processing (e.g., selection of the key information, sense making about the situation on the spot). Further information processing slightly correlated with higher evaluation of approach towards the patient from the patient himself ($r_s = 0.342$; $p = 0.041$). Moreover, despite no significant differences, there was some tendency of more successful teams to study and process information in the instruction more thoroughly.
Qualitative analysis of special cases showed that some of the most successful teams, by reading aloud, were simultaneously selecting key information about the patient, formed an appropriate image of the situation on the spot and also selected the best possibilities for further most probable treatment of the patient. Interaction with team colleague regarding the instruction enabled them to correct the primary misunderstandings. In some teams from the first and second group according to performance at least one of the members read carefully the possibilities of next transport of the patient.
On the contrary, the least successful strategy was not paying full attention to the instructions – reading it on the go, ignoring the possibilities of patient treatment, inadequate understanding of situation or fixation on the anamnestic detail – "he was speaking strangely". Inefficient was to create hypotheses in advance about the patient if they negatively influence the approach to the patient (bias, suspicion of mental disorder from which disrespect for the patient resulted).

Anamnesis and examination

An ideal solution of the task was careful and systematic taking of the anamnesis, thorough examination: physical examination, measuring non-invasive values, establishing glycaemia, 12-lead ECG and complete basic neurological examination. Even the most successful teams did not perform the task without mistakes. The procedures differed in how many times they were used, some of the procedures were rare or totally absent (Table 1.).

Table 1. Examinations used according to their frequency

% of teams	Number of teams	
75-100%	21-28	examination – blood pressure, oxygen saturation, pulse, glycaemia, pupils, ECG (11correct /11 incorrect), neurological examination – squeeze of the hand anamnesis – medicaments, treatment
50-74%	14-20	anamnesis – actual problem, actual state, previous examination, allergies, pain, occupation, what happened, alcohol, injury, accident
25 – 49%	6-13	examination – breathing, neurological examination – tongue, sticking out the tongue, arms stretched forward, finger-to-nose test; temperature, stiffness of the neck, hearth, stomach, head, legs anamnesis – pain in a chest, food, fluids, workload, diabetes, previous illnesses, breathing, medicaments

The teams with a narrow focus just on the application of their examination procedure often overlooked the important anamnestic information spontaneously provided by the patient. These teams were also forgetting to ask about possible connections with actual state of patient's health. A complete opposite were teams that, although listening actively to the patient, relied completely on his information and did not verify his state by examination. According to our observation nobody did a complete examination. Three categories of teams according to their performance in the whole competition showed significant differences in the number of examination procedures (K-W = 9.435; p = 0.009; Table 2), but despite some descending tendency not in the number of anamnestic data obtained in selected task (Table 2.).

Table 2. Number of examination procedures and anamnestic data according to performance group

	N	Mdn	M	SD	Mdn	M	SD
		number of examination procedures			number of anamnestic data		
1. performance group	9	15	14.44	5.83	15	12.67	4.42
2. performance group	10	12	10.90	2.56	11	12.10	4.31
3. performance group	9	8	7.89	2.47	11	11.22	1.92

Linear regression analysis validated that, how teams approached this task represented to a certain extent how they worked in the whole competition. The relation between the number of gained anamnestic information in the selected task and the ranking in the whole competition was not significant. But the amount of examinations executed in the selected task explains 26% of variance in overall ranking of the team (adjusted R square; F = 10.49; p = 0.004). After adding the variable "assessment of the approach to the patient from judges" the value of explained variance rose to 36% (adjusted R square; F = 8.46; p= 0.002) which is more than what explains the total score of the teams in the selected task (23%, F = 9.09; p = 0.006).

The correlation of the number of gained anamnestic information and the number of examinations conducted was on the border of statistical significance (r_s = 0.316; p = 0.051).

Successful procedure in this phase of dealing with the task was systematic examination from head to toe, with simultaneous taking of the anamnesis, perceiving the relevant information spontaneously obtained from the patient and their verification by examinations. It was also helpful to summarize the gained information after some intervals and their verification, an effort to understand the situation – why the wife called, how the patient reacted and why. An alternative was also a combination of the mostly systematic procedure of anamnesis taking with a parallel examination, while at the same time verifying the preliminary hypotheses, perceiving information from the patient and deriving new plausible hypotheses, however, if the paramedic was still able to return to the systematic procedure.

Diagnosis

Although 23 teams came to the right conclusion that the patient is healthy, this conclusion was not well supported by the conducted examinations. Some teams showed nervousness, uncertainty or helplessness, as the number of examinations with good results increased. Two teams had a tendency to stick to any kind of minor discrepancy in the examination results and use it as an argument for the next examination by the doctor. One team did not arrive to the final conclusion in the limited time. Two teams refused to accept the idea, that the patient was healthy despite all good results and they concluded that the patient has to be intoxicated or a psychiatric case. They presented this as a reason for forced transport. Their way of thinking is illustrated by the statement: "We did not find anything, but there has to be something wrong with you when your wife said that you were weird." Apart from that, there were also incorrect conclusions, e.g., suspicion of ventricular fibrillation or mental disorder.

The task should have ended with the attempt to call the doctor on the spot (doctor could not come) and then use consultation by phone for the purpose of signing the against medical advice form. The correct solution to this task was to conclude that the patient had no medical problems, that he was healthy, just tired. He reacted irritated to his wife's phone calls because she repeatedly woke him up after the night shift and so he switched the phone off.

DISCUSSION

Results both from quantitative as well as qualitative analysis together with other resources support the following findings: Misunderstanding of initial information lead to more frequent conflicts with the patient, which resulted in errors in the further process. Similarly Balla, Heneghan, Goyder and Thompson (2012) claim that the cognitive biases developed at the initial framing of the problem relate to errors at the end of the process. In our case there were false conclusions about the patient's state (e.g., mental health, intoxication). This can be explained by the fixation errors, which occur when the practitioner concentrates solely upon a single aspect of a case to the detriment of other more relevant aspects (Fioratou, Flin & Glavin, 2009). Fixation errors or cognitive lockups have been reported as a unique type of performance failure in dynamic work environments (Xian & MacKenzie, 1995).

Creating an assumption about a forthcoming event can be the natural part of mental preparation for the action (Xiao, Milgram & Doyle, 1997; Dominiguez, 2001). Although this preparation can be useful, it is not immune to mistakes. We suppose that paramedics incline to create a small number of successively arising hypotheses about the condition of the patient. Less successful teams consider their plausibility just on the basis of a minimal number of examinations and sometimes even against a direct evidence of results. Narrow focus of attention to their own goals resulted, in less successful teams, in indifference towards important anamnestic information spontaneously provided by the patient. Keyser and Woods (1990) see the failure to revise situation assessment as new evidence comes in as a major source of human error in dynamic domains. According to Balla et al. (2012) deliberate practice of looking for warning signs may be a potential method of professional development to reduce error through reflection in action.

CONCLUSION

The real process of examining the patient and determining the diagnosis by the paramedics in the selected simulated situation was not in accordance with the prescribed procedures. The tendency of paramedics to create preliminary hypotheses about the state of the patient and situation can be helpful just in the case when the team is able to stay open towards the alternative development of the situation. They can flexibly adapt to new conditions, they are able to maintain a systematic procedure, they do not refuse contradictory evidence, and do not stop to look for information after gathering the minimum evidence of the validity of their preliminary assumptions. In the opposite case the team risks misunderstandings, conflicts and mistakes not just in contact with the patient but also in establishing the diagnosis or deciding about the next process.

The next research should broaden the range of observed real and simulated situations and compare it to the subjective statements of the participants. Our study replicated the results according to which paramedics do not adhere to the prescribed procedures and that they commit mistakes in the diagnosis process. We also brought description of the most and the less often used procedures of investigation of Slovak and Czech paramedics.

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