

Implementacija Hrvatskog hitnog prijamnog indeksa prema modificiranom Norveškom indeksu za hitnu medicinsku pomoć

Implementation of Croatian Emergency Call Reception Index modified according to Norwegian Index of Medical emergencies

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Abstract:

Introduction: The medical dispatching call service made by Croatian nurses is crucial in its significance and responsibility in taking and receiving calls, setting priorities and allocating resources. The best indicators of the quality of its effect are the changes in call response time, reception time, delay time - which is defined as time between receiving a call and intervention emergency team arrival to the patient, and protocol compliance. The introduction of the new Croatian Emergency Call Reception Index protocol, which is modified from the Norwegian Index of medical Emergencies, resulted in a new model of aiding criteria-based decisions. We examined the efficiency of the dispatching service which is based on Croatian Emergency Call Reception Index protocol.

Methods: We performed retrospective analysis of one year period and compared results according to criteria given by the Norwegian index, between index and control group. All the included participants had NACA Severity of Injury or Illness Index score 5-7. There were no significant differences between the participants in both groups based on the subjects' age and gender. We included 40 participants [20 indexes and 20 control group].

Results: Average call reception and reaction time as well as elapsed time, defined as a time between receiving a call and intervention emergency team arrival to the patient, were significantly shorter in the index group, where the call reception and reaction time were 111 seconds, compared to 180 seconds in the control group. Average elapsed time between receiving a call and the intervention team's arrival to the patient was 11.3 minutes for the index group, and it was 15.5 minutes for the control group. Average time elapsed between receiving a call and the patient's admission to the emergency department was 32 minutes for the index group and 52 minutes for the control group.

Discussion: Seeing as the dispatching service is dynamic, demanding and highly responsible, it is subject to constant monitoring of quality indicators. The implementation of the Croatian Emergency Call Reception Index significantly improved the management of Emergency Medical service.

Key words: Emergency dispatch centre • service quality • outcomes • Croatian Emergency Call Reception Index

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Background

The Norwegian emergency medical service [EMS] system intends to provide help, regardless of time and place by a uniform alert and response system. It is internationally recognized that criteria based dispatch [CBD] are useful tool in this effort, [1 2] and have therefore been adopted and implemented in many countries [3–5].

The Norwegian Index of Emergency Medical Dispatching [NIEMD] is a further development of CBD first developed in Seattle and King county. [6] The Index is a decision tool to secure an appropriate response to a medical emergency. It is based on clinical signs, symptoms or events, not diagnosis, presented in 40 categories such as unconsciousness, fever and chest pain, with subgroups of criteria for various responses. According to the Index, each call is classified either as: "acute", with the highest priority; "urgent", with

a high, but lower priority; or "not urgent", with the lowest priority. With "acute" calls, both ambulances and the general practitioner [GP] on call should be alerted. In addition, the emergency practitioner [EP] manned EMS is alerted if the emergency medical dispatch centre [EMDC] operator believes there is a chance for an improved outcome based on the expertise of the EP, or on the time element for longer transports.

In Croatia, patients which have needs of emergency medical assistance are recommended to come in contact with the emergency health care system by calling the health specific national three digits emergency numbers to an emergency medical dispatch centre. Considering the complexity of the working processes of medical dispatching services, it is essential to determine how certain changes influence the

services' quality level. The best indicators of level of quality are significant changes in response time, call reception time, reaction time, access time and protocol compliance. Protocol compliance is an indicator of quality used to determine a dispatching service's consistency in following the regulations of a particular protocol. The Croatian Emergency Call Reception Index [CECRI] for Medical Reporting Units [MRU] is a novelty in this regard. The guidelines of this CECRI include numerous dispatching events and offer a model of criteria-based decision-making. Dispatchers are enabled to assign priorities to each incoming emergency medical call [2-4], as well as in Norwegian model [7, 8].

Due to the policy of free access and the openness of the NI-EMD we created modification called CECRI and implemented it in practice.

To investigate the efficiency of CECRI, we created the so-called "Start Algorithm", which is the initial questionnaire which represents the guideline for medical service's dispatcher for and is a tool for the assessing the presence of dispatching criteria [5].

The CECRI could be the useful tool as a basis for establishing common terminology and the general service qualities of medical dispatch units and medical emergency services in Croatia. The CECRI includes the following basic quality indicators: Response Time; Call Reception Time; Reaction Time; Access Time, and Protocol Compliance. The CECRI itself contains systemized questions which aid the assessment of priority and support to be given to each incoming emergency medical call and aids dispatchers the opportunities in achieving higher standards of quality. This paper compares the quality levels of medical dispatch services when managing unconscious patients according to NACA scale levels 5-7, with and without implementation of CECRI [9, 10].

Methods

The research was conducted during one year period, from January 1st to December 31st 2012, at the Emergency Medical Centre [EMC] Velika Gorica, Croatia. In research we included 40 patients [29 males; 11 females].

All the included participants had NACA Severity of Injury or Illness Index score 5-7 [patients with injuries/diseases with acute threat to life or worse]. The patients were classified into two groups. In the first group [index group; 20 patients] calls for assistance by the EP were managed by the dispatch centre who acted according to the CECRI, and each call was classified as: "acute", with highest priority included in the study. Other patients, whose calls were classified as "urgent", with high, but lower priority; or "not urgent" with lowest priority, were excluded from the study. To avoid possible bias, all the patients which were included in the control group [N 20] had the same NACA Severity of Injury or Illness Index score. In the control group of patients, dispatcher was acted without usage of CECRI. The data of patient's oin the control group were collected retrospectively and compared to the data of index group, while they were treated during the same time period in 2011, when the CECRI was not implemented. Testing was conducted on the basis of an analysis of the quality standards attained in

the medical dispatch service, namely the standards of call reception and reaction time as the most significant for the dispatch service. Medical documentation [time registering protocols] of the dispatch centre of Emergency Medical Centre served as the source data. Patients were classified according to gender. Moreover, the town population of Velika Gorica has 31,341 inhabitants, while the municipality has a population of 63,511 inhabitants and the centre of an area covering 552 square kilometers (213 square miles). For the purposes of defining the level of quality of CECRI we observed three parameters: call reception and reaction times, the time elapsed between receiving a call and the intervention team's arrival and the time elapsed between receiving a call and the patient's admission to the hospital emergency department.

We used descriptive statistics. The data represented differences between groups, which were tested with usage of a Student's *t*-test. The χ^2 test was used to compare categorical data level of significance [$p < 0.05$]. was collected and entered into a software, and analyzed by SPSS [version 20.0; SPSS Inc., IL, USA].

Results

The average age of included participants was 58, 5 [range 55 -62]. The subjects were predominantly male in both groups. There were 29 males (73%) and 11 females (27%) in both groups. There were no significant differences between the participants in both groups based on the subjects' age and gender [Table 1].

TABLE [1] Baseline characteristics of study groups

	CECRI group (n=20)	Control group (n=20)
Age (years)	62,1 ± 8,7[65;17-85]	55,2 ± 9,3[60;14-90]
Female patients	6 (30%)	5 (25%)
Male patients	14 (70%)	15 (75%)

Results are presented as n (%) or mean ±SD [median; range]

Call reception and reaction times were significantly shorter in the index group and it was 111 seconds as compared to 180 seconds in the control group. This difference was statistically significant [$p < 0.05$]. The average elapsed time in the index group was 11.3 minutes, and it was 15.5 minutes in the control group. The difference was not statistically significant [$p = 0.10$]. The average time elapsed between receiving a call and the patient's admission to the emergency department was 32 minutes for the index group and 52 minutes for the control group. A statistically significant difference [$p = 0.003$] was observed as depicted at table [Table 2].

Discussion

The included participants were predominantly male middle-aged patients with cardiovascular symptoms and without appropriate medical care, which were not prone to regular visits to their general practitioner [GP] [12].

TABLE [2] Factors of the dispatch service quality

	CECRI group (n=20)	Control group (n=20)	p-value
Call reception and reaction times	1,85 [1;1-5]	3 [3;2-5]	0,003
The time elapsed between receiving a call and the intervention team's arrival	11,3 [10;3-30]	15,5[14,5;3-37]	0,10
The time elapsed between receiving a call and the patient's admission to the Hospital emergency department	32[39,5;12-60]	52[55,5;18-90]	0,003

Results are presented (in minutes) as mean period of time [median; range]

The reason why participants were predominantly males is in accordance with the significant eg. scientific results published: females are better protected from cardiovascular events by the protective effects of sex hormones. When monitoring the time between a receiving call to the dispatch centre and setting the emergency team in motion, there was a statistically significant difference between the groups, and this period of time was 70 seconds shorter when the CECRI was used. Aforementioned time is in accordance with the applicable guidelines [12, 13] which point to the necessity of remedial and corrective measures in case that this time period is longer than 120 seconds [3, 13]. The aforementioned time surpassed the standardized framework, which justifies the use of the CECRI in managing the incoming calls to Croatian dispatch centers.

The time elapsed between receiving a call and the intervention team's arrival to the patient was not statistically significant between groups, but it was shorter in the group with the usage of CECRI. It must be pointed out that this value is influenced by the caller's destination from the centre, the weather, configuration of rural areas, e.g. state of roads.

Average value in our study was 13 minutes, which is within the values of the quality standards which allow 10 minutes for urban and 20 minutes for rural areas [5].

The Velika Gorica Emergency Medicine Department's [EMD] jurisdiction consists of a city with 31.141 inhabitants, while the municipality has a population of 63,511 inhabitants. The centre covering an area of 552 square kilometers (213 square miles). The average duration of time between incoming from call to admission to EMD was shorter in CECRI group [20 minutes] compared to control group. Although this could have been the result of head starts for the intervention teams with the aid of the Index, it would be an exaggeration to believe the Index is responsible for that kind of difference. On the aforementioned value of time influenced -medical factors such as the time needed for the team to reach the patient, the patient's condition, administering cardiopulmonary resuscitation, and non-medical factors such as traffic frequency. When the CECRI was used, the average time frameworks were not higher than gene-

rally accepted time frameworks listed in current emergency guidelines [12, 13].

[45 minutes for urban and 60 minutes for rural areas]. Mortality rate was high, but does not differ from the results presented in recent literature [11, 12, 13]. Patients who were unconscious and not breathing at the time of the dispatch unit's being alarmed did not survive, whilst the patients who were unconscious but breathing survived until their admission to the ED [95% of cases].

The represented data supports the usage of the CECRI. The factor of laymen's "callers" competence in aiding their neighbor and administering basic life support, as well as determining the gravity of their ailment, will remain out of reach of the corrective influence of the medical system and the emergency medicine departments' dispatch units for a long time to come, and represents the limitation of the study, but could be a start point for future investigations.

The intention of the reorganizing emergency medical service in Croatia was to build a service based on equity and equality, independent of the location of the emergency scene. The EMs and medical staff in emergency reception call centre are basic to implementation the new procedures at Emergency Medical Centers. This seems to be the fact for rural areas, as well as the city of Velika Gorica. There seems to be logical reason for a different organization and function of the Future organization, on which the EMC has to reflect, preventing unplanned and unwanted autonomously emerging EMS systems.

References

- [1] Burman AR, Zakariassen E, Hunskaar S. Acute chest pain - A prospective population based study of contacts to Norwegian emergency medical communication centres. *Emergency Medicine* 2011, 11:9.
- [2] Ministarstvo zdravstva i socijalne skrbi. Projekt razvoja sustava hitne medicinske pomoći i investicijskog planiranja u zdravstvu. Available at: http://www.mzss.hr/hr/programi_i_projekti/projekt_razvoja_sustava_hitne_medicinske_pomoci_i_investicijskog_planiranja_u_zdravstvu_demispp.retreivev et March 2nd 2014
- [3] Fink A. Medicinska prijavno-dojavna jedinica. Zagreb: HZHM; 2011.
- [4] Mittermayer R. Priručnik o standardima kvalitete zdravstvene zaštite i načinu njihove primjene. Zagreb, AKAZ, 2011.
- [5] Dami F, Fuchs V, Praz L, Vader JP. Introducing systematic dispatcher-assisted cardiopulmonary resuscitation (telephone-CPR) in a non-Advanced Medical Priority Dispatch System (AMPDS): implementation process and costs. *Resuscitation* 2010; 81:848-52.
- [6] Culley LL, Henwood DK, Clark JJ, et al. Increasing the efficiency of emergency medical services by using criteria based dispatch. *Ann Emerg Med* 1994;24:867-72.
- [7] Steen-Hansen J. Medical emergency service. Descriptions of a one-year activity at an emergency communication center. *Tidsskr Nor Lægeforen* 1995; 115:1063-1066.
- [8] Zachariah BS, Pepe PE. The development of emergency medical dispatch in the USA: a historical perspective. *Eur J Emerg Med* 1995;2:109-12.
- [9] Cook M, Bridge P, Wilson S. Variation in emergency ambulance dispatch in Western Europe. *Scand J Trauma Emerg Med* 2001;9:57-66.
- [10] Hrvatski zdravstveno-statistički ljetopis za 2010. godinu. HZJZ. Zagreb:2011.
- [11] Trier H, Larsen CF. Prehospital service in Denmark. *Ord Med.* 1993; 108:84-87.
- [12] Luepker RV, Raczynski JM, Osganian S, et al. Effect of a community intervention on patient delay and emergency medical service use in acute coronary heart disease: The Rapid Early Action for Coronary Treatment (REACT) Trial. *JAMA* 2000;284:60-7.
- [13] Lossius HM, Soreide E, Hotvedt R, et al. Prehospital advanced life support provided by specially trained physicians: is there a benefit in terms of life years gained? *Acta Anaesthesiol Scand* 2002;46:771-8.
- [14] Renier W, Seys B. Emergency medical dispatching by general practitioners in Brussels. *Eur J Emerg Med* 1995;2:160-71.