

The use of a new automatic device for patients' assessment at Triage in Emergency Department

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SINTESI

Obiettivo: Valutare in Pronto Soccorso il risparmio di tempo ottenuto grazie all'impiego di un dispositivo automatico (Carescape™ V100) per misurare i parametri vitali rispetto agli attuali dispositivi manuali.

Metodi: Abbiamo condotto uno studio prospettico osservazionale su pazienti eleggibili afferenti al Pronto Soccorso dell'Ospedale Sant'Andrea durante tutto il mese di ottobre 2009, suddivisi in modo casuale in due gruppi. Nel primo gruppo, di 476 pazienti, la rilevazione dei parametri vitali è stata effettuata con dispositivi manuali, mentre nel secondo gruppo, di 477 pazienti, con dispositivo automatico Carescape™ V100.

Risultati: I dati hanno evidenziato che la differenza dei tempi totali tra i due gruppi è risultata statisticamente significativa (1993 vs 1518 min, $p < 0,001$). I due gruppi di studio erano omogenei per età, sesso e numerosità del

campione nell'ambito dello stesso codice-colore. Differenze significative sono state invece riscontrate confrontando i tempi nei sottogruppi divisi per codice di priorità: codici bianchi 4,33 vs 2,27 (min), $p < 0,05$; codici verdi 4,28 vs 3,37 (min), $p < 0,001$; codici gialli 3,92 vs 2,72 (min), $p < 0,001$.

Conclusioni: I risultati di questo studio hanno dimostrato tra i due gruppi una differenza statisticamente significativa di 475 minuti totali impiegati nelle procedure di triage, compresa la misurazione dei parametri vitali. In conclusione, il tempo risparmiato nella rilevazione di tali parametri mediante un dispositivo automatico potrebbe consentire ai medici d'emergenza-urgenza di avere un approccio qualificato con una diagnosi precoce e una terapia più rapida ed efficace, migliorando possibilmente l'outcome dei pazienti.

Introduction

In Emergency Department (ED) the continuous flow of patients requires a considerable commitment of both medical and nursing staff. Patients referring to ED are first seen during the triage process by a nurse for a brief clinical assessment, vital signs measurement and the assignment of a priority code for care¹. In this setting vital signs measurement is essential to detect any deterioration in patient's condition, to assess illness severity and the urgency of medical treatment². Body temperature, heart rate, respiratory rate, blood pressure and ox-

xygen saturation are the five vital signs which can be measured through manual and electronic devices. Among these the only parameter which can not be measured using an electronic device at triage is the respiratory rate. Currently there are no agreed published protocols to measure vital signs at triage. This study was performed at Sant'Andrea Hospital Emergency Department in the northern urban area of Rome. The affluence of arriving patients to ED during 2009 was 54,101 divided in four triage categories according to the Manchester Triage System: 2.13% red codes, 17.11% yellow codes, 76.53% green codes and 4.23% white codes³.

The aim of this study was to assess the benefits in terms of time arising out of the introduction of automatic devices to measure vital signs (blood pressure, heart rate, body temperature and oxygen saturation) in an Emergency Department compared to the manual devices.

Methods

We performed in Sant'Andrea Hospital a prospective, observational study of patients referring to ED during the entire month of October 2009.

Before starting patients enrollment medical doctors, residents and triage nurses filled a questionnaire indicating own age, sex, work experiences and the personal opinion about the importance of a safe, accurate and prompt record of vital signs in ED.

In Sant'Andrea Emergency Department Triage area consists of two rooms. In this study one of these was equipped with manual devices and the other one with an electronic device (Carescape™ V100, DINAMAP technology).

During the study time a total of 4798 patients referred to ED; among these we enrolled about 30 eligible patients a day for a total of 953, randomly assigned into two groups with a ratio 1:1. The exclusion criteria were red triage acuity patients with cardiac or respiratory arrest, near fatal dyspnoea or coma who bypassed Triage area because of the need for immediate care; people under 18 years old and those with incomplete vital signs records.

All eligible patients were asked for a verbal consent to participate the study, so each patient was randomly assigned in one of the triage rooms and assessed by triage nurse.

In the first group of 476 patients vital signs measurements were detected with manual devices such as tympanic thermometer, manual sphygmomanometer and portable pulse oximeter for oxygen saturation and heart rate. Among these the only parameter which can not be measured using an electronic device at triage is the respiratory rate. Inaccuracies in respiratory measurement have been reported in literature. One study compared respiratory rate counted using a 15 seconds count period, to a full minute and found significant differences in the rates. It has also been reported that factors such as crying, sleeping and anxiety may affect respiratory rate measurement as an indicator of serious conditions⁴.

In the second group of 477 patients vital signs measurements were detected with automatic device Carescape™ V100 enabling Triage nurse to

capture vital signs using a single, mobile vital signs monitor excluding respiratory rate.

In the two Triage rooms nurses filled out a list of enrolled patients for each group, which allowed us to extrapolate data concerning not only vital signs but also demographic, anamnestic data and any other nursing procedures such as wound dressing, clinical scores evaluation, pupil diameter and the Triage priority codes according to the Manchester Triage System³. Time needed to vital signs measurement was derived from each patient's Triage card using its opening and closing time recorded in minutes. In Lazio Region GIPSE is the informatic software used to support all ED medical and nursing activities. It is a patient-centered tool which provides reception management, selection and prioritization of access (triage), medical and surgical treatment and patient's outcome.

Data analysis

Data were analysed using the software Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois USA). Data were expressed in terms of means \pm standard deviation. The differences between two independent groups of continuous variables have been compared using the T-test and the Mann-Whitney U test. Statistical significance was expressed as $p < 0.05$.

Results

The study was performed on 953 eligible patients referring to ED and assessed at triage. Of these 476 were assigned to manual vital signs measurement group, mean age 55.65 ± 20.61 years, M:F = 234:242. Mean time of triage assessment, recorded in minutes (min), was 4.19 ± 2.28 (Table 1). Patients belonging to this group were further divided into their respective acuity categories: 6 white codes (1.3%), mean time 4.33 ± 1.97 (min); 348 green codes (73.1%) mean time 4.28 ± 2.29 (min); 122 yellow codes (25.6%) mean time 3.92 ± 2.27 (min). Total time spent for triage evaluation of 476 patients in this first group was equal to 1993 minutes.

The second group, assigned to Carescape™ V100 vital signs measurement, consisted of 477 patients, mean age 54.21 ± 20.20 years, M:F = 238:239. Mean time of triage assessment, recorded in minutes, was 3.18 ± 1.92 . Also these patients were divided into their respective acuity categories: 11 white codes (2.3%), mean time 2.27 ± 1.01 (min); 349 green codes (73.2%) mean time 3.37 ± 2.00

TAB. 1

Comparison of demographic variables and total time/group (minutes) spent for Triage evaluation of the 2 groups.

	Carescape V100 (n = 477)	Manual devices (n = 476)
M/F	238/239	234/242
Age (years)	54.21 ± 20.20	55.65 ± 20.61
Total time/group (minutes)	1518	1993
Mean time/patient (minutes) ± SD	3.18 ± 1.92	4.19 ± 2.28

(min); 117 yellow codes (24.5%) mean time 2.72 ± 1.63 (min). Total time spent for triage evaluation of 477 patients in this second group was equal to 1518 minutes.

The comparison of the total time between the two groups gave a significant difference (1993 vs 1518 min, $p < 0.001$, Figura 1). No differences were found with respect to age, sex and total amount of patients in the two groups. Significant differences were also found when comparing the subgroups of the same acuity categories: white codes 4.33 vs 2.27 (min), $p < 0.05$; green codes 4.28 vs 3.37 (min), $p < 0.001$, yellow codes 3.92 vs 2.72 (min), $p < 0.001$ (Figura 2).

Discussion

Emergency Department provides initial treatment to patients with a broad spectrum of illnesses and injuries, some of which may be life-threatening and requiring immediate attention. Early detection

of vital signs deterioration is of tremendous impact especially for those who might be at risk of cardiorespiratory arrest and organ failure. Delays may also occur in the diagnosis and treatment of serious medical conditions. One of the most important and recurrent problem in ED is overcrowding which is often due to complex and multifactorial causes such as shortage of inpatients hospital beds, inappropriate visits for minor medical reasons, nurses shortage, increasing numbers of non EU citizens, translation language problems, delays in diagnostic studies and consultations. Long waiting times cause frustration and may prolong pain and suffering^{5,6,7}.

The affluence of arriving patients to Sant'Andrea Hospital ED during 2009 was 54,101 divided in four triage categories according to the Manchester Triage System: 2.13% red codes, 17.11% yellow codes, 76.53% green codes and 4.23% white codes³.

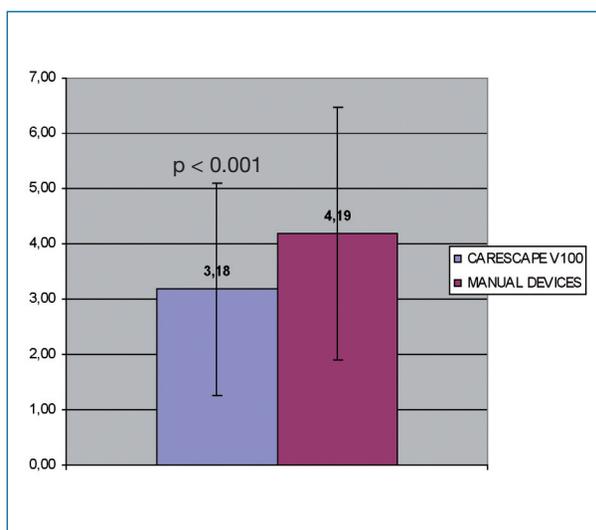


Fig. 1 - Mean of total time/group (minutes) spent for Triage evaluation in the 2 groups.

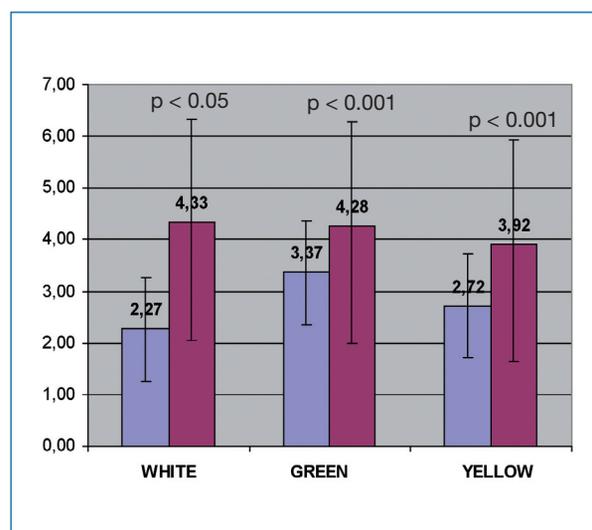


Fig. 2 - Mean time/patient (minutes) spent for the evaluation of each Triage priority code.

In this study we prospectively assessed time saving arising out of the introduction of automatic devices (Carescape™ V100) to measure vital signs in an Emergency Department compared to the manual devices. Our data demonstrated a statistical significance between the two groups with a total difference of 475 minutes spent in one month in Triage procedures including vital signs measurements. Statistical significances obtained in all acuity categories subgroups could be very important not only to reduce waiting times at Triage especially in most critical patients, but also to recognize any clinical deterioration in those waiting to be visited by a prompt and immediate vital signs measurement. Our results demonstrated the possibility to reduce time needed for vital signs measurement allowing nurses to assess more patients in the same Triage room in a single day with a favourable impact on waiting time especially for those with more severe diseases and patients' satisfaction. Moreover the use of an automatic device can have a positive impact on nurses' workload thus using a single instrument to assess at the same time blood pressure, heart rate, body temperature and oxygen saturation instead of three different devices with a possible reduction of mistakes due to manual measurements. The limit of our study is the lack

of data concerning vital signs quality assessment, because we did not compare the two methods in the same patient and we did not correlate Triage priority evaluation with patients' outcomes. In the future further studies should be specifically aimed to address this issue.

In conclusion time saved by vital signs automatic device could allow ED physicians to make a qualified approach to patient with an earlier diagnosis and a more rapid and effective therapy, possibly improving patients' outcomes.

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ABSTRACT

Objectives: To assess time saving in an Emergency Department arising out of the introduction of automatic devices (Carescape™ V100) to measure vital signs compared to the manual devices.

Methods: We performed a prospective, observational study of eligible patients referring to Sant'Andrea Hospital Emergency Department during the entire month of October 2009, randomly assigned into two groups. In the first group of 476 patients vital signs measurements were detected with manual devices, while in the second group of 477 patients with automatic device Carescape™ V100.

Results: Data indicated that the comparison of the total time between the two groups gave a significant difference (1993 vs 1518 min, $p < 0.001$).

No differences were found with respect to age, sex and priority codes. Significant differences were also found when comparing the subgroups of the same acuity categories: white codes 4.33 vs 2.27 (min), $p < 0.05$; green codes 4.28 vs 3.37 (min), $p < 0.001$; yellow codes 3.92 vs 2.72 (min), $p < 0.001$.

Conclusions: Our data demonstrated a statistical significance between the two groups with a difference of 475 minutes spent in Triage procedures including vital signs measurements. In conclusion time saved by vital signs automatic device could allow ED physicians to make a qualified approach with an earlier diagnosis and a more rapid and effective therapy, possibly improving patients' outcomes.