ORIGINAL ARTICLE

Quality in Emergency Departments: a study on 3,285,440 admissions

M. SARTINI, P. CREMONESI*, R. TAMAGNO, M.L. CRISTINA, P. ORLANDO AND SIMEU GROUP**

Dept. Health Sciences, University of Genoa; Genova, Italy; * DEA I livello, E.O. Ospedali "Galliera", Genova, Italy;
** Members of SIMEU Group are: A. Vandelli, A. Carinci, A. Caruso, A. Grotti, A. Iacovella, A. La Brocca, A. Mangioncalda,
A.M. Longanesi, B. Susi, C. Barletta, D. Braglia, D. Coen, D. Tazza, E. Gottardi, E. Palego, E. Urbano, F. Bar, F. Bussani,
F. De Giorgi, F. Esposito, F. Fabi, F. Lotti, F. Miglio, F. Moscariello, F. Pertoldi, F. Sardella, F. Tosato, G. Abregal, G. Baldi,
G. Carbone, G. Cerqua, G. Giagnorio, G. Pia, G. Piazza, G. Tedesco, G.F. Sallustio, I. Morana, L. Beringheli, L. Jannotti, L. Spinsi,
L. Zulli, M. Cavazza, M. De Simone, M. Galletti, M. Gioffrè Florio, M. Greco, M. Longoni, M. Luppi, M. Magnani, M. Mazzone,
M. Pastorello, M. Pazzaglia, M. Ravaglia, M. Zammataro, M. Zanna, M.A. Bressan, M.P. Saggese, N. Gentiloni Silveri, N. Scopetta,
O. De Mitri, O. Fantin, P. Boscolo, P. Cancemi, P. De Angelis, P. Di Pietro, P. Mosca, P. Pacelli, P. Torboli, R. Copetti, R. Fazio,
R. Losordo, R. Melandri, R. Papitto, S. Chiaravalle, S. Orlando, U. Sturlese, A. Di Grande, G. Narbone, H. Zimmermann,
L. Martinelli, V. Clanchini, D. Paternosto, M. Fiorilli, C. Del Prato, M. Becheri, M. Lanigra, G. Guerra, C. Sinno, A.Soragna,
M.P. Ferranio, V. Bua, R. Capra, E. Lualdi

Key words

Quality • Triage • Questionnaire

Summary

Introduction. *A multi-centre study has been conducted, during 2005, by means of a questionnaire posted on the Italian Society of Emergency Medicine (SIMEU) web page. Our intention was to carry out an organisational and functional analysis of Italian Emergency Departments (ED) in order to pick out some macro-indicators of the activities performed. Participation was good, in that 69 ED (3,285,440 admissions to emergency services) responded to the questionnaire.*
Methods. *The study was based on 18 questions: 3 regarding the personnel of the ED, 2 regarding organisational and functional aspects, 5 on the activity of the ED, 7 on triage and 1 on the assessment of the quality perceived by the users of the ED.*
Results and conclusion. *The replies revealed that 91.30% of the ED were equipped with data-processing software, which, in*

96.83% of cases, tracked the entire itinerary of the patient. About 48,000 patients/year used the ED: 76.72% were discharged and 18.31% were hospitalised. Observation Units were active in 81.16% of the ED examined.
Triage programmes were in place in 92.75% of ED: in 75.81% of these, triage was performed throughout the entire itinerary of the patient; in 16.13% it was performed only symptom-based, and in 8.06% only on-call. Of the patients arriving at the ED, 24.19% were assigned a non-urgent triage code, 60.01% a urgent code, 14.30% a emergent code and 1.49% a life-threatening code.
Waiting times were: 52.39 min for non-urgent patients, 40.26 min for urgent, 12.08 for emergent, and 1.19 for life-threatening patients.

Introduction

Triage was perfected in the 1960s in the United States. At the time, a large portion of the population had no health insurance cover and turned to hospital emergency departments for treatment, as these were the only facilities to provide health care free of charge. Predictably, this resulted in increased waiting times, which averaged 6 hours and showed peaks of 16-18 hours [1, 2].
A similar situation has gradually developed in all industrialised countries, including Italy, where it is estimated that one citizen out of every 2-3 currently makes use of emergency department facilities [3, 4]. Many of these cases are not genuine emergencies and the overcrowding that results may lead to delays in treating those who do need urgent medical attention [5-7]. In view of the large, and constantly increasing, numbers of admissions to emergency departments, and the limited numbers of doctors and nurses available, criteria are needed in order to establish the priority of access to medical treatment. In this regard, some ED have been applying their own

triage scales for years, while others have waited for specific guidelines to be issued in order to organise their services adequately.
In Italy, the first experiments in hospital triage, based on the experiences of other countries [8-12] were undertaken in the early 1990s in high-volume ED. The process was given a boost in May 1996 by the publication of the Guidelines for the Emergency System [13], drawn up in accordance with the provisions of DPR 27/3/92 of the Ministry of Health [14]. For the first time in Italy, within the framework of indications for the reorganisation of the entire health service, explicit provision was made for the function of triage and how and by whom this activity was to be implemented.
On 7th December 2001, the guidelines endorsing the institutional establishment of triage assigned to nurses [15], with the objectives of:
– reducing to a minimum the possible delay in treating emergent cases by assigning a 4-level priority code to all patients;
– grading access to medical treatment on the basis of the potential gravity and urgency of the case;

– regulating the flow of patients in order to improve the overall efficiency of the facility [2, 16, 17].

A multi-centre study was conducted by administering a questionnaire through the computer network, with a view to analysing the activity of ED and identifying certain macro-indicators of the processes undertaken. The aim of the study was to collect data on triage nationwide in order to glean preliminary information on the waiting time and on the activities performed, with a view to constructing a national benchmark because one real barrier to quality improvement is the lack of adequate benchmarking data [18].

Each ED will be able to compare its own waiting times with those indicated by the benchmark data, and consequently modify or integrate its own organisational processes.

The present study deliberately refrained from evaluating the appropriateness of the pathways and the triage undertaken, which is to be the subject of a further study.

Materials and methods

Data were gathered by means of an *ad hoc* questionnaire made up of 18 closed questions with multiple-choice answers (see Appendices). The questionnaire was designed for the collection of general data on the facility and specific data on triage:
– 3 questions identify the ED;
– 2 questions on its organisational and functional aspects;
– 5 questions on its activities;
– 7 questions on triage;
– 1 question on the existence of assessments of perceived quality.

The questionnaire was posted on the web-site of the Italian Society of Emergency Medicine (SIMEU) so that it could be downloaded by the facilities wishing to participate in the study, compiled and sent back to the group co-ordinator. If any answers were incomplete or unclear, those who had filled in the questionnaire were contacted and asked for clarification.
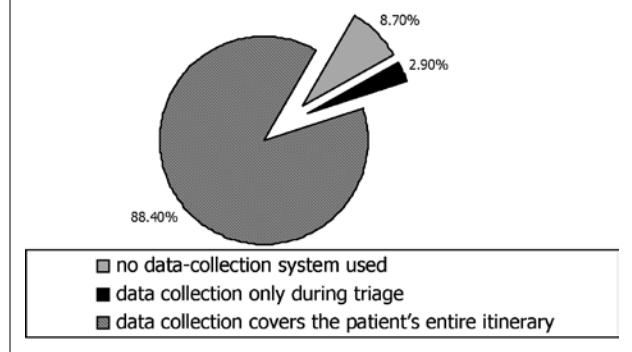
The activity of 69 hospital facilities was analysed in this way, for a total of 3,285,440 admissions (triage data were reported for 2,509,537 of these).

The results of the questionnaire were evaluated by means of the Stata 8™ statistical software.

Results

The 69 facilities that took part in the study were subdivided into three categories on the basis of lists provided by the Ministry of Health [19]: i) First-aid Units; ii) Level-I Emergency Department (Level-I ED), which provide emergency treatment and diagnostic services and some specialised operations, short-term observation, cardiological assistance and intensive care; iii) Level-II Emergency Department (Level-II ED) which, in addition to the functions of Level-I ED, also provide a complete

Fig. 1. Type of computerised data-collection system used.

8.70%
2.90%
88.40%

□ no data-collection system used
■ data collection only during triage
▣ data collection covers the patient's entire itinerary

range of specialist care and normally have a catchment area of about 500,000 residents [9].

On the basis of this subdivision, 27 facilities (31.13%) were classified as First-Aid Units, 25 (36.23%) as Level-I ED, and 17 (24.64%) as Level-II ED.

Of the First-aid Units that took part in the study, 44.44% were located in northern Italy, 29.63% in central Italy and 25.93% in southern Italy. With regard to the Level-I ED facilities, 80% were in northern Italy, 20% in central Italy and none were in the south, while 52.82% of the Level-II ED facilities were in the north, 35.29% in the centre and 5.88% in the south of the country.

The hospitals that participated in the study had a mean of 522 ordinary beds (range 80-1,925). Of the 69 participating facilities, 91.30% were equipped with a computerised data-collection system (Fig. 1) and in 96.83% of these the system recorded the entire treatment pathway of the patient.

According to Italian, "The system of triage … is to be implemented in every case and continually in those facilities with over 25,000 admissions per year" [8]. On the basis of this recommendation, the sample examined was subdivided according to the volume of activity. In terms of the volume of activity, the sample varied considerably, though the majority of facilities handled more than 25,000 admissions/year. Of the facilities examined, 17.39% had a volume of activity below 25,000 admissions/year; 66.67% of these were First-aid Units and 33.33% were Level-I ED facilities (Tab. I).

The overall mean volume of activity calculated on the sample was 47,615 admissions/year (range 11,182-132,051).

With regard to the distribution of hospitalisations, discharges and transfers, it emerged that in the Level-II ED facilities 78.59% of patients were discharged, 20.67% were hospitalised and 0.74% were transferred. In the Level-I ED facilities, 82.69% were discharged, 16.39% were hospitalised and 0.92% were transferred, while the corresponding figures for the First-aid Units were 79.69%, 18.75% and 1.56%, respectively.

Among the facilities handling fewer than 25,000 admission/year, only 8.33% had no system of triage; 16.67% had an on-call system of triage, 25% had a symptom-based triage system, and 50% implemented a triage pro-

Tab. I. Facilities responding to the questionnaire, subdivided according to activity volume.

	Less than 25,000 admissions/year		More than 25,000 admissions/year		Total	
Level-II ED	-	-	17	100%	17	100%
Level-I ED	4	16.00%	21	84.00%	25	100%
First-aid Units	8	29.63%	19	70.37%	27	100%
Total	12	17.39%	57	82.61%	69	100%

cedure throughout the patient's therapeutic or diagnostic pathway. With regard to facilities handling more than 25,000 admissions/year, 7.27% had no system of triage; 5.45% had an on-call system, 12.73% had a symptom-based system, and 74.55% implemented triage throughout the patient's therapeutic or diagnostic pathway. We also noted the types of facilities that did not yet have any system of triage in place: 2 were Level-II ED facilities, 1 was an Level-I ED facility and one was an First-aid Units.

Observation Unit, defined as hospitalisation in an emergency unit for no more than 24 hours, was available in 81.16% of the facilities examined, with a mean of 5 beds being allocated for this purpose; 40.58% of the facilities were equipped with beds for longer hospitalisation (more than 24 hours), while 59.42% were not.

On triage, codes were assigned as follows: in Level-II ED facilities, 24.23% of patients received a non-urgent code, 55.15% a urgent code, 19.09% a emergent code, and 1.53% a life-threatening code. In Level-I ED facilities, the codes assigned were 24.18% non-urgent,

61.02% urgent, 13.48% emergent and 1.32% life-threatening, while in the First-aid Units the percentages were 24.16% non-urgent, 63.81% urgent, 10.32% emergent, and 1.71% life-threatening.

Mean waiting times were recorded in 75.81% of the facilities. These were: 52.39 min for non-urgent coded cases, 40.25 min for urgent codes, 12.51 for emergent codes and 1.16 for life-threatening codes (Tab. II).

In order to assess the possible impact of the volume of activity on waiting times, these data were analysed as a function of both triage code and the type of department (First-aid Units, Level-I ED, Level-II ED). With regard to First-aid Units, the results showed no correlation between these factors. In Level-I ED facilities, however, an increase in the volume of activity was accompanied by an increase in waiting times for both non-urgent coded and urgent coded patients; in the former case, the correlation was at the limit of significance ($R^2 = 0.20$; $p = 0.0457$), while in the latter case, it was not statistically significant ($R^2 = 0.21$; $p = 0.077$) (Fig. 2). By contrast, in Level-II ED facilities waiting times tended to shorten

Tab. II. Waiting times (min) from triage to examination according to triage code and type of facility (total activity = 2,509,537 admissions).

	Median	Q_l-Q_u	Mean ± SD	Min-Max
Non-urgent (n. admissions = 607,101)				
Level-II ED	64.6	33-85	73.22 ± 54.31	10-200
Level-I ED	45	26-55	47.16 ± 28.72	8-120
First-aid Units	36.5	20-56	43.48 ± 29.27	15-120
All	45.5	26.5-66	52.39 ± 37.87	8-120
Urgent (n. admissions = 1,505,934)				
Level-II ED	49	28-65	56.15 ± 40.83	9-150
Level-I ED	28	17-34.5	32.81 ± 23.22	8-100
First-aid Units	30	20.42-46	37.61 ± 27.22	12-120
All	31	22-55.9	40.25 ± 30.40	8-120
Emergent (n. admissions = 358,981)				
Level-II ED	16.5	13-23	16.96 ± 7.97	3-30
Level-I ED	11	7.5-14.5	10.75 ± 4.06	4-15
First-aid Units	10	7-15	10.25 ± 4.46	2-17
All	12	9-15	12.51 ± 5.95	2-30
Life-threatening (n. admissions = 37,521)				
Level-II ED	0	0-2.5	1.12 ± 1.53	0-4
Level-I ED	0	0-1.6	0.86 ± 1.64	0-5
First-aid Units	0	0-3.5	1.50 ± 2.37	0-6
All	0	0-2	1.16 ± 1.86	0-6

Q_l = Low Quarterly rates; Q_u = Upper Quarterly rates; SD = Standard deviation; Min = minimum value; Max = maximum value

Fig. 2. Trend in waiting times of non-urgent- and urgent-coded patients as a function of the volume of activity in Level-I ED.
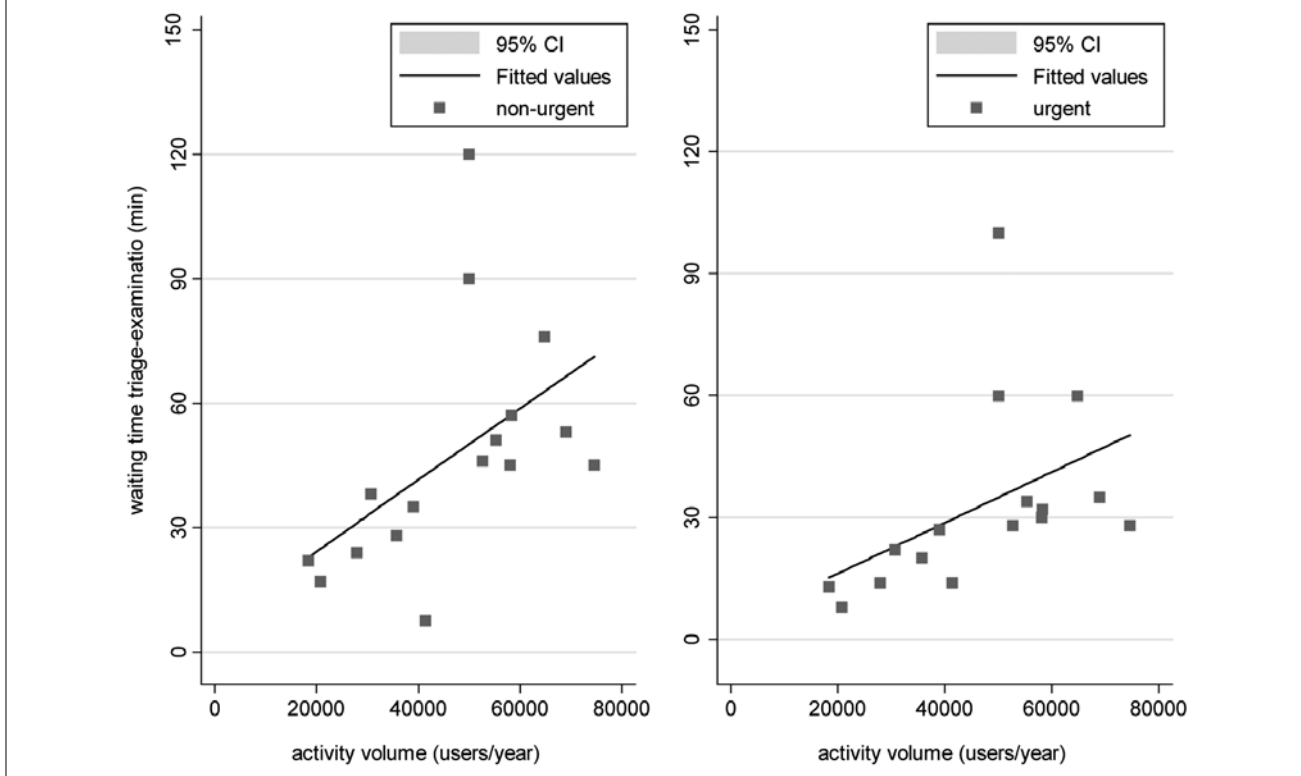
as the volume of activity increased. However, owing to the limited number of facilities taking part in the study, the association did not prove to be statistically significant.

Discussion and conclusion

The results obtained revealed that participation in the study varied according to the geographical location of the facilities, with Level-I ED and Level-II ED facilities in the north of Italy (18.02% and 18.52%) showing a distinct prevalence over those in the south (0% and 2.44%). This can probably be explained in terms of different levels of sensitivity to the issues inherent in the evaluation of the quality of services offered.

For what concerns the volume of activity, it emerged that most of the facilities sampled handled more than 25,000 admissions/year. In this regard, it may be hypothesised that the obligation to implement triage in facilities handling more than 25,000 admissions/year, which has been in force since 1996, influenced the composition of the sample, since this practice, especially if computerised, enables data on activities to be extrapolated. Nevertheless, it should be pointed out that a number of facilities that handle such activity volumes have not yet complied with the law, and were therefore unable to respond to all of the items in the questionnaire. However, the vast majority (81.16%) of facilities have implemented observation Units, with a view to reducing the number of inappropriate hospitalisations and discharges.

An interesting result is the association between the volume of activity and the reduction in the waiting times of non-urgent and urgent-coded patients in Level-II ED facilities. This is probably due to greater organisational capacity in the management of patients and in assigning codes.

The percentage of participating centres that carried out assessments of customer satisfaction was very low (27.54%). This may be explained by the fact that the users of emergency services constitute a somewhat particular population; it is therefore not easy to conduct this kind of investigation, even though it is regarded as very important in the process of Continuous Quality Improvement.

This study yielded useful information on the activity indicators of the system of emergency services and admissions within the National Health Service. The data are subdivided according to the type of facility (First-aid Units, Level-I ED, Level-II ED) in an effort to establish a national benchmark for the classification of triage codes, though this may partly be influenced by the different modalities of code assignment resulting from differences in the organisational models of the facilities involved.

Furthermore, benchmarks were established with regard to waiting times, which were analysed and expressed as the time interval in minutes between triage and medical examination. In establishing standard reference values, we considered the median time, calculated as a function of the triage codes and the types of facilities examined, since this value is influenced to a lesser degree by the

extreme values, which are often far removed from the main cluster of data. This happens because the values (times) are not always correctly recorded by the healthcare workers, or because the patient's file is not closed immediately when the patient leaves without being seen the facility.

In conclusion, the present investigation is to be regarded as a pilot study; a more detailed study is currently under way, in which, it is hoped, a greater number of facilities will participate. This is an important area of research, since proper national and international reference standards have not yet been established.

Acknowledgements

References

[1] Baker DW, Stevens CD, Brook RH. *Patients who leave a public hospital emergency department without being seen by a physician. Causes and consequences*. JAMA 1991;266:1085-90.

[2] Bindman AB, Grumbach K, Keane D, Rauch L, Luce JM. *Consequences of queuing for care at a public hospital emergency department*. JAMA 1991;266:1091-6.

[3] Howard MS, Davis BA, Anderson C, Cherry D, Koller P, Shelton D. *Patients' perspective on choosing the emergency department for nonurgent medical care: a qualitative study exploring one reason for overcrowding*. J Emerg Nurs 2005;31:429-35.

[4] Derlet R. *Triage* [Online] 2006 [cited 2006 Sept 2] Available from: URL: http://www.emedicine.com/emerg/topic670.htm

[5] GFT. *Triage infermieristico*. Milano: McGraw-Hill 2005.

[6] Fatovich DM, Jacobs IG. *NTS vs. waiting time: an indicator without definition*. Emerg Med (Fremantle) 2001;13:47-50.

[7] Lee G, Endacott R, Flett K, Bushnell R. *Characteristics of patients who did not wait for treatment in the emergency department: a follow-up survey*. Accid Emerg Nurs 2006;14:56-62.

[8] Weber E. *Triage in the USA*. Atti I convegno Internazionale "Il triage Infermieristico in P.S. I temi che scottano" Torino, 28-30/11/2002; Gruppo Formazione Triage [Online] 2002 [cited 2006 June 29] Available from: URL: http://www.triage.it/corsi/attitorino/attito2002_fr.htm

[9] Windle J. *Triage – but by any other name*. Emerg Nurse 2002;10:9.

[10] Murray MJ. *The Canadian Triage and Acuity Scale: a Canadian perspective on emergency department triage*. Emerg Med (Fremantle) 2003;15:6-10.

[11] Brillman JC, Doezema D, Tandberg D, Sklar DP, Davis KD, Simms S, et al. *Triage: limitations in predicting need for emergent care and hospital admission*. Ann Emerg Med 1996;27:493-500.

[12] Wuerz RC, Travers D, Gilboy N, Eitel DR, Rosenau A, Yazhari R. *Implementation and refinement of the emergency severity index*. Acad Emerg Med 2001;8:170-6.

[13] Ministero della Sanità. *"Atto di intesa tra Stato e regioni di approvazione delle linee guida sul sistema di emergenza sanitaria in applicazione del decreto del Presidente della Repubblica 27 marzo 1992"*. G.U. 114 del 17 maggio 1996.

[14] DPR 27 marzo 1992. *"Atto di indirizzo e coordinamento alle regioni per la determinazione dei livelli di assistenza sanitaria di emergenza"*. G.U. 76 del 31 marzo 1992.

[15] Conferenza permanente per i rapporti tra lo stato, le regioni e le province autonome di Trento e Bolzano. Accordo 25 ottobre 2001. Accordo tra il Ministro della salute, le province autonome sul documento di Linee-guida sul sistema di emergenza sanitaria concernente: *"Triage intraospedaliero (valutazione gravità all'ingresso) e chirurgia della mano e microchirurgia nel sistema dell'emergenza-urgenza sanitaria"*. G.U. 285 del 7/12/2001.

[16] Liew D. *Efficiency in emergency departments: is the wait over?* Ann Emerg Med 2006;47:294.

[17] Chan TC, Killeen JP, Kelly D, Guss DA. *Impact of rapid entry and accelerated care at triage on reducing emergency department patient wait times, lengths of stay, and rate of left without being seen*. Ann Emerg Med 2005;46:491-7.

[18] Welch SJ, Allen TL. *Data-driven quality improvement in the emergency department at a level one trauma and tertiary care hospital*. J Emerg Med 2006;30:269-76.

[19] Basili F, Boldrini R, Camera T, Ceccolini C, Di Cesare M, Montorio V. *Atlante di Geografia Sanitaria - Italia Centri di rilevanza nazionale - Anno 2004*. Ministero della Salute [Online] 2004 [cited 2006 June 29] Available from: URL: http://www.ministerosalute.it/servizio/documenti/dipartimenti_di_emergenza%20_e%20_accettazione.pdf

Correspondence: Dr Marina Sartini, Department of Health Sciences, University of Genoa, via Pastore 1, 16132 Genoa, Italy - Tel. +39 010 3538447 - Fax +39 010 3538216 - E-mail: msartini@unige.it

Survey questionnaire

1. Name of the facility

2. Director of the facility

3. Name and e-mail address of person filling in the questionnaire

4. Is your emergency department (ED) equipped with a computerised data bank?
   Yes []   No []

5. If Yes, are data gathered only at the time of triage []
   or is the patient's entire pathway documented []

6. How many admissions per year does your emergency department handle?

7. How many patients are hospitalised _____
   discharged _____
   or transferred to other healthcare facilities _____

8. Does your ED provide beds for brief or temporary observation?
   No []   Yes []   N° beds _____

9. Does your ED have beds for hospitalisation (more than 24 hours)?
   No []   Yes []   N° beds _____

10. N. of ordinary beds (excluding day hospital and rehabilitation) in the hospital
    N. beds ____

11. Number of patients in each age group (indicate the number or percentage):
    < 18 years _____ 18-65 years _____ > 65 years _____

12. Is triage performed?
    Yes []   No []
    If started in the current year, specify the starting date:
    in reporting the data requested below, exclude the first month of triage activity, if possible.

13. Triage is   total []   on call []
    interview-based (i.e. without evaluation of vital parameters) []

14. In the year considered, how many of each of the following codes were assigned?

Non urgent	Urgent	Emergent	Life-threatening

15. In the year considered, specify:

	Non urgent	Urgent	Emergent	Life-threatening
the number of hospitalisations				
the number of discharges				
the number of transfers to other				
facilities (hospital, hospice, etc.)				

16. Are the times of triage, examination and report closure recorded?
Yes []   No []
If yes:
• What is the mean time interval from triage to examination in the year considered?:

Non urgent	Urgent	Emergent	Life-threatening

•   What is the mean time interval from examination to report closure in the year considered (excluding the outcome of Temporary observation)?

Non urgent	Urgent	Emergent	Life-threatening

17. Specify the numbers of:
full-time doctors in the ED
doctors covering in shifts
nurses
ward sisters
social and technical staff
Auxiliaries/porters

18. N. of written protocols available for the ED: _____

19. Was a study of customer satisfaction conducted?
Yes []   No []