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Quality of care indicators for a resuscitation unit

A descriptive study and proposal

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Abstract

There are lack of indicators of quality of care in resuscitation units of emergency departments. With the aim of proposing a series of indicators to evaluate the quality of care delivered in hospital resuscitation areas, we conducted a descriptive study of 7579 admissions to the resuscitation unit of an emergency department at a Spanish hospital between 2012 and 2016. The proposed indicators were the percentage of patients attending to the emergency department admitted to the resuscitation area by level of triage, the length of stay, the percentage of patients moved to intensive care and surgery at disposition, the mortality in the area or in the emergency department within 24 hours of disposition, and the data completeness. A majority of the patients (62.6%) were men and the median age was 68 years. Over 99% of the required data were recorded. Median length of stay in the resuscitation unit was 0.87 hours (interquartile range, 0.5–1.5). Approximately 80% of patients categorized as an emergency on admission to the emergency department were admitted to the resuscitation unit, although the proportion of urgency patients was higher. The main disposition destination was a trauma cubicle (82.3% of cases). Mortality was 0.41%.

Specific indicators are needed to assess the quality of care delivery in resuscitation units. We believe that our findings will provide new insights into the work done to date in this field.

Abbreviations: ED = Emergency Department, IQR = interquartile range, SEMES = Spanish Society of Emergency Medicine, UHAV = University Hospital Arnau de Vilanova.

Keywords: emergency, management, quality, resuscitation

1. Introduction

Resuscitation units deal with the most critically ill or unstable patients presenting to a hospital's emergency department (ED). In a level-2 hospital, a resuscitation unit may typically receive between 1500 and 2000 patients a year, according with the type hospitals of our country.[1] In Spain, we have hospitals of basic attention, called level-1 hospital, hospitals with all the medical and surgical departments and the highest technology called level-3 hospital, and a group of medium hospitals with some of the departments and with more technology than the basic hospitals.

Quality of care is an increasingly critical issue across the health care sector and quality assessment outcomes are now a key consideration in many decision-making processes.[2] A system for measuring the quality of care delivered in its resuscitation unit should be part of any hospital's health and safety toolbox. Since 2001, quality of care as perceived by patients presenting to EDs in Catalonia has been assessed through a satisfaction survey program known as PLAENSA.[3] This program, however, does not specifically collect data for evaluating care delivery in resuscitation areas.

Many indicators are used to assess quality of care in EDs.[4–7] These are typically linked to factors such as chief presenting complaints, length of stay, provision of critical care, admission and early return rates, medical record keeping, and mortality/survival rates for all patients presenting to the ED and those requiring cardiopulmonary resuscitation. The quality of care indicators recommended by the Spanish Society of Emergency Medicine (SEMES), however, are based on characteristics such as care and maintenance of resuscitation equipment, resuscitation skills, and circumstances surrounding the performance of resuscitation.[4] They do not take into account time spent in the unit, severity of the patient's condition, or mortality. In this paper, we propose a series of indicators for assessing quality of care delivery in resuscitation areas in Spanish hospitals and apply these indicators to assess the performance of the unit at our hospital. We hope that our proposals will stimulate debate in the field and pave the way for the construction of standardized indicators that can be used across hospitals in our setting.

2. Material and methods

Descriptive study of admissions to the ED resuscitation unit at the University Hospital Arnau de Vilanova (UHAV) in Lleida, Spain. The UHAV is a referral hospital for 400,000 inhabitants in the city and province of Lleida. It is the only hospital that offers

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emergency care in the area. We analyzed all admissions to the resuscitation unit between January 1, 2012 and December 31, 2016. Admissions corresponding to patients aged <1 year were excluded. Triage level was evaluated using the Spanish Triage System, which is based on the Andorran Triage Model and is recommended by the SEMES. It contains 5 levels, ranging from resuscitation required (level 1) to nonurgent (level 5).

We performed a descriptive study based on the following quality indicators: the percentage of patients directed to the resuscitation unit from the ED by triage level; the length of stay in the unit (in hours); the distribution of triage levels; the percentage of transfers to intensive care and surgery; the mortality in the resuscitation unit or in the ED within 24 hours of disposition; and the completeness of data recorded. We also collected sex, age, chief presenting complaint, and destination at disposition.

2.1. Statistical analysis

Qualitative variables were expressed as numbers and percentages. Median and interquartile range (IQR) were calculated for the quantitative variables age and length of stay because of the strong asymmetry in their distribution. The number of patients with available data is shown for each of the variables. Additionally, we explored the association between the study variables and quality indicators with 30-day readmission and length of hospital stay by means of bivariate and multivariable analyses. Patients who died during hospitalization were excluded from these analyses.

2.2. Ethical aspects

The study was approved by the ethics committee of UHAV Lleida. The data collected were used exclusively for the purpose of the study and complied with the Spanish Data Protection Organic Law 15/1999. The patients' rights were respected at all times.

3. Results

The UHAV resuscitation unit received 7579 patients who met the inclusion criteria, and there was a progressive increase in admissions between 2012 and 2016 (Table 1). The median age of the patients was 68 years (IQR, 52–80) and 62.6% were men.

Completeness of data was good or very good, with 99% of records containing information on sex, age, triage level, time of entry, and destination at disposition from the unit. Nevertheless,

Table 1

Quality of care indicators for the emergency department resuscitation unit.

	Overall	2012	2013	2014	2015	2016
Total admissions to unit, no (%)	7579 (100%)	1169 (15.4%)	1344 (17.7%)	1573 (20.8%)	1681 (22.2%)	1812 (23.9%)
Patient characteristics						
Female sex	7575	1169	1341	1573	1680	1812
	2834 (37.4%)	438 (37.5%)	495 (36.9%)	580 (36.9%)	659 (39.2%)	662 (36.5%)
Age (y)	7529	1162	1337	1561	1657	1812
	68.0 (52.0–80.0)	66.0 (49.0–78.0)	67.0 (51.0–79.0)	67.0 (51.0–79.0)	69.0 (53.0–80.0)	68.0 (53.0–81.0)
Quality indicators						
Patients admissions (unit/total emergency department) by triage level	442,766	84,880	83,772	88,769	91,239	94,106
1 (resuscitation)	928/1276	114/193	163/233	190/253	219/304	242/293
	(72.7%)	(59.1%)	(71.2%)	(75.1%)	(72.0%)	(82.6%)
2 (emergent)	3698/53,888	567/10,495	637/9760	787/10,292	892/12,306	815/11,035
	(6.9%)	(5.4%)	(6.5%)	(7.6%)	(7.2%)	(7.4%)
3 (urgent)	1923/15,8045	317/27,109	348/28,139	333/32,212	392/35,599	533/34,986
	(1.2%)	(1.2%)	(1.2%)	(1.0%)	(1.1%)	(1.5%)
4 (less urgent)	224/119,398	42/22,204	40/19,964	30/19,703	48/26,785	64/30,742
	(0.19%)	(0.18%)	(0.20%)	(0.15%)	(0.17%)	(0.20%)
5 (nonurgent)	134/45,016	10/6761	39/7767	20/7382	24/10,570	41/12,536
	(0.30%)	(0.14%)	(0.50%)	(0.27%)	(0.22%)	(0.32%)
Not rated	666/65,144	119/18,118	117/17,909	213/18,927	104/5675	113/4514
	(1.0%)	(0.65%)	(0.65%)	(1.1%)	(1.8%)	(2.5%)
Time in resuscitation unit (hr)	5513	563	1071	1160	1288	1431
	0.87 (0.50–1.50)	0.83 (0.50–1.58)	0.87 (0.50–1.50)	0.88 (0.50–1.50)	0.83 (0.50–1.54)	0.92 (0.50–1.58)
Admissions to unit by level of triage	7573	1169	1344	1573	1679	1808
1 (resuscitation)	928 (12.3%)	114 (9.8%)	163 (12.1%)	190 (12.1%)	219 (13.0%)	242 (13.4%)
2 (emergent)	3698 (48.8%)	567 (48.5%)	637 (47.4%)	787 (50.0%)	892 (53.1%)	815 (45.1%)
3 (urgent)	1923 (25.4%)	317 (27.1%)	348 (25.9%)	333 (21.2%)	392 (23.3%)	533 (29.5%)
4 (less urgent)	224 (3.0%)	42 (3.6%)	40 (3.0%)	30 (1.9%)	48 (2.9%)	64 (3.5%)
5 (nonurgent)	134 (1.8%)	10 (0.9%)	39 (2.9%)	20 (1.3%)	24 (1.4%)	41 (2.3%)
Not rated	666 (8.8%)	119 (10.2%)	117 (8.7%)	213 (13.5%)	104 (6.2%)	113 (6.2%)
Moved to intensive care	7577	1168	1343	1573	1681	1812
	93 (1.2%)	26 (2.2%)	18 (1.3%)	18 (1.1%)	15 (0.89%)	16 (0.88%)
Moved to surgery	7577	1168	1343	1573	1681	1812
	29 (0.38%)	11 (0.94%)	5 (0.37%)	5 (0.32%)	4 (0.24%)	4 (0.22%)
Mortality	7577	1168	1343	1573	1681	1812
	31 (0.41%)	11 (0.94%)	7 (0.52%)	7 (0.45%)	1 (0.06%)	5 (0.28%)

The total number of patients for whom information was available is shown for all variables.

Table 2

Chief presenting complaint in patients with triage level 1.

Chief presenting complaint	Overall N = 928	2012 N = 114	2013 N = 163	2014 N = 190	2015 N = 219	2016 N = 242
Stroke	227 (24.5%)	61 (53.5%)	87 (53.4%)	52 (27.4%)	15 (6.8%)	12 (5.0%)
Performance of electrical cardioversion	143 (15.4%)	0 (0%)	30 (18.4%)	48 (25.3%)	55 (25.1%)	10 (4.1%)
Multiple trauma	114 (12.3%)	18 (15.8%)	13 (8.0%)	6 (3.2%)	19 (8.7%)	58 (24.0%)
Atrial fibrillation and other arrhythmias	107 (11.5%)	3 (2.6%)	2 (1.2%)	9 (4.7%)	3 (1.4%)	90 (37.2%)
Digestive/abdominal disorder	70 (7.5%)	2 (1.8%)	2 (1.2%)	3 (1.6%)	25 (11.4%)	38 (15.7%)
Another neurological disease	69 (7.4%)	5 (4.4%)	8 (4.9%)	3 (1.6%)	48 (21.9%)	5 (2.1%)
Infarction	43 (4.6%)	0 (0%)	0 (0%)	42 (22.1%)	1 (0.46%)	0 (0%)
Cardiorespiratory arrest	39 (4.2%)	13 (11.4%)	6 (3.7%)	0 (0%)	11 (5.0%)	9 (3.7%)
Respiratory disease	29 (3.1%)	4 (3.5%)	1 (0.61%)	7 (3.7%)	10 (4.6%)	7 (2.9%)
Head trauma	21 (2.3%)	4 (3.5%)	1 (0.61%)	3 (1.6%)	7 (3.2%)	6 (2.5%)
Sepsis	19 (2.0%)	0 (0%)	5 (3.1%)	4 (2.1%)	9 (4.1%)	1 (0.41%)
Intoxication	13 (1.4%)	3 (2.6%)	3 (1.8%)	3 (1.6%)	2 (0.91%)	2 (0.83%)
CHF/APE	6 (0.65%)	0 (0%)	0 (0%)	3 (1.6%)	3 (1.4%)	0 (0%)
Vascular disease	3 (0.32%)	0 (0%)	0 (0%)	2 (1.1%)	0 (0%)	1 (0.41%)
Other	20 (2.2%)	1 (0.88%)	4 (2.5%)	4 (2.1%)	10 (4.6%)	1 (0.41%)
No Diagnosis	5 (0.54%)	0 (0%)	1 (0.61%)	1 (0.53%)	1 (0.46%)	2 (0.83%)

APE = acute pulmonary edema, CHF = congestive heart failure.

27.2% of records did not contain information on time of disposition, although performance in this area improved in the later study period. Median length of stay in the Resuscitation Unit was 0.87 hours (0.5–1.5), and there were very few variations in this indicator over the years.

Overall, 72.7% of patients categorized as triage level 1 on admission to the ED were directed to the Resuscitation Unit. This proportion increased from 59.1% in 2012 to 82.6% in 2016. Level 1 admission accounted for 12.3% of all admissions to the unit. The largest group, accounting for 48.8% of admissions, was formed by level-2 patients, followed by level-3 patients (25.4%).

The main destination at disposition from the resuscitation unit was a cubicle in the ED (82.3% of cases); 0.38% of patients were transferred to surgery and 1.2% to intensive care. Overall mortality was 0.41%. This rate varied over the years with a peak of 0.94% in 2012 and a low of 0.06% in 2015.

The most common diagnosis in level-1 patients was stroke. It accounted for over 50% of all diagnoses at this level in 2012 and 2013, 27.4% in 2014 and just 6.8% and 5.0% in 2015 and 2016 (Table 2).

We found that the length of hospital stay was the most statistically significant variable with 30-day readmission (supplementary Table S1, http://links.lww.com/MD/C666) and it was the only variable included into the selected logistic regression model (supplementary Table S2, http://links.lww.com/MD/C666). Regarding the length of hospital stay, we found that diagnostic and destination at the unit discharge were significantly associated (supplementary Table S3, http://links.lww.com/MD/C666). Multivariable analysis found age and destination at discharge significantly associated with length of hospital stay, when adjusted by sex, triage level and time in the resuscitation unit (supplementary Table S4, http://links.lww.com/MD/C666).

4. Discussion

We have described the performance of a resuscitation unit at a level-2 hospital in Spain using a set of indicators recommended by the Spanish Society of Emergency Medicine and the Spanish Health Ministry.[8] Although the indicators are designed to assess quality of care in EDs, we successfully applied them to a resuscitation unit. Although the results reflect good-quality practice, we recognize the need for more studies and discussion on the suitability of different indicators to evaluate quality of care delivery in Spanish resuscitation units.

Data used to measure quality of resuscitation care should be obtained from purpose-designed systems supported by data collection protocols that ensure completeness, integrity, and objectivity. The ED at our hospital maintains a registry of all patients directed to the Resuscitation Unit. This registry is part of the UHAV's quality system, explaining the extremely high level of data completeness observed (>99%).

Time spent in an ED or resuscitation area is an important indicator. Most emergency care plans prioritize rapid assessment and treatment, as these are associated with improved survival and functional outcomes. Time to stabilization should thus be as short as possible, with prompt performance of all tests deemed necessary to ensure rapid delivery of the best possible treatment. Fast delivery of care requires fast decisions, particularly in terms of where to direct a patient (specialized unit, surgery, intensive care . . .).[9] Obviously this time will vary with the complexity of each case and the occurrence of complications. Early out-of-hospital activation codes can help reduce turnaround times for certain conditions. One such example in our setting is the stroke code. The relatively short length of stay observed for the resuscitation unit at the UHAV may be partly explained by easy access to Radiology Services and prioritization of pathology results for patients in the unit.

Mortality is a key quality of care indicator in resuscitation areas. In our case, it was consistently lower than 1%, which is a positive finding considering the high risk of death associated with the majority of cases dealt with. It should, however, be noted that while resuscitation procedures usually require intensive care and monitoring, they are not generally associated with high mortality, although some patients die within a period of 24 to 48 hours. In most cases, however, these deaths are probably the results of an acute presenting condition. ED length of stay has been identified as a key predictor of mortality in trauma patients.[10] Where possible, all attempts should be made to move patients who are expected to die within the next few hours or days to a destination where they can be accompanied (e.g., a trauma bay or ward). This is a key quality of care issue.

Emergency severity levels assigned by triage nurses determine the destination of patients presenting to the ED. Patients assigned level 1, for example, require immediate attention from both physicians and nurses, and accordingly should be moved straight to the resuscitation area. The proportion of level-1 patients moved to the resuscitation unit in our series was surprisingly low in 2012 (59.1%), although by 2016, it had risen to 82.6%. This rate of above 80% is close to what would be expected and in our opinion reflects high-quality emergency and resuscitation care, as well as a good relationship with other departments in the hospital, as it indicates that the hospital's emergency resources are being used adequately and not simply as a front door service. The majority of level-1 patients not admitted to the resuscitation unit had been directly transferred from another hospital for an intervention. Level-2 patients accounted for the largest proportion of patients received by the resuscitation unit at the UHAV. These patients must receive care within a maximum of 7 minutes and are therefore often assessed and treated by the resuscitation team. There are, however, circumstances where they may be directed to a trauma cubicle.[11] Resuscitation areas may also receive patients assigned higher triage scores in the case of complications or accidents following initial admission. Triage errors are also a possibility. We reviewed the 134 level-5 (nonurgent) admissions to the resuscitation unit in our series. Eighty-one patients had been wrongly suspected to have a heart condition and 53 had been admitted for an emergency procedure.

We also explored the association of the study variables and quality indicators with 30-day readmission and length of hospital stay, outcomes usually considered to assess hospitals quality of care. We have observed that very few patients (25) return to the emergency service within 30 days of their passage through the resuscitation unit. We believe that it is indicative of good quality of care that the most serious patients treated in the resuscitation room do not return to the ED within a month. As expected, we found no significant association of the quality indicators that we suggest with 30-day readmission and length of stay. Actually, the simple fact of there being a resuscitation unit in ED is already an improvement in quality of care compared to EDs without a resuscitation unit. This is so because of the early and more appropriate assistance to the most severe cases admitted to an ED. Those patients would probably deteriorate rapidly or even die, if there was not a resuscitation unit. Once the case is attended, the time of hospital stay and the risk of early readmission are outcomes that most likely depend on other factors external to the resuscitation unit, and even external to the ED.

This is the first study of quality indicators applied to an ED resuscitation unit in Spain and, as such, constitutes an important step towards building knowledge for the scientific community, for resuscitation specialists, and for health care managers. The establishment of indicators for objectively assessing quality of care delivery in resuscitation units should be a priority.

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Author contributions

OY, MJA, and AV conceived the study and designed the trial. CL, MJA and JL, supervised the conduct of the trial and data collection. AV managed the data, including quality control. CF provided statistical advice on study design and analyzed the data. OY and CF drafted the manuscript, and all authors contributed substantially to its revision. OY takes responsibility for the paper as a whole.

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References

[1] Health Region Memorandum of Lleida 2017. Departament de Salut. Available at: http://www.gencat.cat/salut. Accessed January 19, 2018.
[2] Tomás Vecina S, Chanovas Borràs M, Roqueta F, et al. La seguridad del paciente en urgencias y emergencias: balance de cuatro años del Programa SEMES-Seguridad Paciente. Emergencias 2012;24:225–33.
[3] Servei Català de la Salut [Catalan Health Service]. Pla d'enquestes de satisfacció (PLAENSA) [Satisfaction Survey Plan]. Updated 2016. Available at: http://catsalut.gencat.cat/web/.content/minisite/catsalut/ciutadania/serveis_atencio_salut/valoracio_serveis_atencio_salut/enquestes_satisfaccio/atencio_urgent_hospitalaria/2016/informe_resultats_globals_atencio_urgent_hospitalaria_2016_es.pdf. Accessed September 10, 2017.
[4] Crowea C, Bobrowb B, Vadeboncoeur T, et al. Measuring and improving cardiopulmonary resuscitation quality inside the emergency department. Resuscitation 2015;93:8–13.
[5] López-Andújar AL, Tejedor FM, Fernández VBJ, et al. Estándares de acreditación para servicios de urgencias de hospitales. SEMES. Grupo Saned. Madrid 2008.
[6] Felisart J, Requena J, Roqueta F, et al. Servicios de urgencias: indicadores para medir los criterios de calidad de la atención sanitaria. Agència d'Avaluació de Tecnologia i Recerca Mèdiques y el Servei Català de la Salut. Breus 2001;16:698–767.
[7] The College of Emergency Medicine. Clinical Standards for Emergency Departments. 2014. Available at: www.collemergencymed.ac.uk. Accessed January 23, 2018.
[8] Ministry of Health. Hospital Emergencies Unit. Standards and Recommendations. Available at: http://www.msssi.gob.es/organizacion/sns/planCalidadSNS/ec02-2.htm. Accessed October 17, 2017.
[9] Serviá L, Badia M, Baeza I, et al. Time spent in the emergency department and mortality rates in severely injured patients admitted to the intensive care unit: an observational study. J Crit Care 2012;27:58–65.
[10] Mowery N, Dougherty S, Hildreth A, et al. Emergency department length of stay is an independent predictor of hospital mortality in trauma activation patients. J Trauma 2011;70:1317–25.
[11] Sánchez R, Cortés C, Rincón B, et al. El triaje en urgencias en los hospitales españoles. Emergencias 2013;25:66–70.