

Medical care at long duration mass gatherings: is the Seville 92 Expo a useful model for Saragossa '08?

EMILIO MORENO MILLÁN^{1,4}, MARÍA FERNANDA RAPOSO TRIANO^{2,4}, CARLOS ÁLVAREZ LEIVA³

¹Head of Special Care, SAS (Andalusian Health Service) Management Dep., Seville, Spain. ²Head of Medical Care Service for EXPO'92, Seville, Spain. ³Head of SAMU (Emergency Services), Technical Head of the CAP (Main Health Centre) of EXPO'92, Seville, Spain. ⁴Commission for Health, Safety and Civil Defence, General Office of Operations, EXPO'92, Seville, Spain.

CORRESPONDENCE:

E. Moreno Millán
Urb. Aljamar II, 6
41940 Tomares
Sevilla, Spain
E-mail: emorenomillan@terra.es

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Introduction: Long duration mass gatherings involve possible risks. To avoid negative consequences to the local health care system an inclusive medical attention model should be established in this setting. We present the planning, management and results obtained from the emergency medical system developed for the coverage of the Universal Exhibition of Seville (EXPO'92).

Methodology: after analyzing the data of previous exhibitions we forecasted that the complexity of the demand for health care would be low. The prediction was for a young and healthy crowd of spectators, a frequentation ratio between 1.8-2.4 consultations per 1,000 visitors with a 97% problem solving capacity, and a 2% hospital re-mission rate. Considering those circumstances a primary care center (PCC), including stabilization and observation areas, and five peripheral units located strategically near the pavilions or more dangerous areas were built.

Results: During the 176 days of the EXPO'92 82,748 people received medical attention (470 people/day [range 211-760]) and the frequentation ratio was 1.98/1,000. Among the cases assisted 92.5% were mild, 82.1% of patients were 10-49 years old, only 6.8% were > 60 years old, and 56.9% were women. The cause of seeking attention was significant disease in 64.7%, and accidental injury in 30.4%. Among all cases 68.5% were visitors, 30.7% workers, and 82% Spaniards. Saturdays were the days with the highest level of work intensity and the most frequent pathology was mild trauma (32.7%). 1,726 patients were assisted at the PCC (9.8 per day, 2.08% of all the people who needed assistance); mean length of stay was 91 minutes and 30.8% were older than 50 years. Among the 552 patients evacuated 222 were hospitalized and 61 admitted to the ICU. Two patients died in the EXPO'92 area and 6 more at the hospital.

Discussion and conclusions: The specific location of the emergency care system made immediate attention of patients possible. Different management of the most seriously ill at the different PPC areas facilitated specific treatment. The number of consultations, their low complexity, the solving capacity and the amount of people remitted to hospitals met our expectations, in conjunction with a very low frequentation (0.2%). The existence of critical pathology, however, required constant presence of Emergency Medicine experts. This model is perfectly exportable to other events, such as the next Saragossa EXPO'08. [Emergencias 2008;20:125-130]

Key words: Mass casualties. Emergency care. Health facility planning.

Introduction

Mass gatherings involve situations of possible risk (SPR) that require full safety and protection: individual medical care, community care coverage and mass medical emergencies that may arise¹⁻⁹. There are many types of mass gatherings, such as

sports and musical events, political demonstrations and rallies, religious and cultural gatherings, pilgrimages, trade fairs (shows, exhibitions), refugee camps and mass migrations¹⁰⁻¹⁹.

The needs posed by such gatherings depend on factors such as the type and capacity of the venue, duration (short: 1-24 hours, medium: 1-3

days, long: 4-15 days, very long: over 15 days), geographical area, scope, type of audience, area infrastructures, access and means of transport, telecommunications, weather, time and day^{20,21}. In Spain, the possibility of terrorist attacks must also be added^{22,23}.

Medical care at these events poses an important planning and management challenge for the organisers, who must ensure capability for on site emergency care and mass care in the surrounding area, while maintaining the usual level of care for the rest of the population. The literature indicates that the rate of medical care is proportional to the number of spectators, the duration of the event and the outdoor temperature^{3,4,6,8,21}.

Given the experience amassed during the Universal Exposition of 1992 (EXPO'92) – very long duration: 176 days – we believe it appropriate to present the model and results achieved – despite the time lapsed – to support the organisation of medical care services at Saragossa 2008.

Method

The Medical Care Service for EXPO'92 was created in July 1991 as part of the Logistics Support Division of the Organisation's General Office of Operations – with public health pertaining to another area – and included in the Health, Safety and Civil Defence Commission²⁴. The EXPO'92 National Corporation in collaboration with the Provincial Office of the Andalusian Health Service (SAS), in light of the high demand on public resources and the upcoming event, established the following goals: to ensure maximum resolution by the internal resources of the Organisation; to ensure that evacuees were sent to appropriate centres according to the severity and complexity of the situation; to prevent saturation of the closest public hospitals; and draft a plan for mass emergency in conjunction with other public bodies (Civil protection, na-

tional and Local Police Forces, Civil Guard, Fire Department).

Agreements were reached with hospitals outside the SAS (Military and FREMAP), transfer protocols were set up according to pathology and severity (seeking to prevent under- and over-availability), a plan and list of resources were drawn up for mass emergencies and an information and monitoring system was developed and hospital emergency units were remodelled.

Phase I (analysis of requirements) involved the study of the results of previous exhibitions (Table 1), healthcare and infrastructure data on Seville and medical care service for the workers during the construction phase (14,598 consultations, 93% mild, 3% hospital evacuations). The study estimated a demand with a frequentation of 1.8-2.4 care intervention/1000 visits, 80-90% of no importance, 97% resolved on site and 2% evacuations (Table 2). Adverse weather conditions (high temperatures), size of the venue (215 Ha), high audience density at shows, traffic and long opening hours (9 AM to 4 AM), added to services being free of charge, made planning even harder²⁴.

During Phase 2 (Facilities), a main health care centre (MHC) and five peripheral units (PUs) were set up. The MHC was fitted with reception, observation and stabilisation areas, 4-6 physician, 4-7 nurses, 2-4 auxiliary nurses, 4-6 technicians, 1 social worker and 2 administrative personnel during the opening hours of the venue and the PUs had 2 physicians, 2 nurses and 2 technicians. Eight training courses were held for medical personnel, who had to have worked for at least 2 years in an Intensive Care Unit (ICU) or Emergency Service²⁴.

Results

EXPO'92 was visited by 41,814,571 people of which 66.5% were Spanish, with a daily average of 237,583, a maximum of 629,845 (3rd of Octo-

Table 1. Healthcare results in three previous World Expositions

	Osaka 1970	Vancouver 1986	Brisbane 1988
Visits to Expo (thousands)	64,000	22,111	18,500
Medical care demands	90,435	86,898	25,768
Rate per 1000	1.4	3.9	1.4
Cases/day	494	524	143
Total referrals	764	2,537	1,000
Referrals/day	4.2	14.1	12.4
Admissions/day	0.6	2.1	1.9
Cardiopulmonary resuscitation (CPR)	N/D	6	14
Deaths	17	4	3

ND: No data.

Table 2. EXPO'92 estimated healthcare demand

	Forecast	Actual	% of total demands
Medical care demands	86,409	82,748	–
Demands/day	491	470	–
Frequentation (%)	2.00	1.98	–
Mild (%)	80.00	92.56	–
Referrals	432-604	552	0.66
Admissions	195-272	222	0.26
ICU Admissions	64	61	0.07

ICU: Intensive Care Unit.

ber) and a minimum of 110,482 visitors (1st of June). Medical attention was given to a total of 82,748 cases. The frequentation was 1.98/100 visits. 92.5% of cases were classified as mild. 82.1% ranged between the ages of 10 and 49, with only 8.8% over the age of 60 (Figure 1) with more women (56.9%) than men (43.1%). Reason for consultation was disease in 64.7% of cases, 30.4% unfortunate accident, 4.0% industrial accident, traffic accident in 0.5% and assault in 0.3% of cases. Medical care was distributed as follows: 68.5% to visitors, 30.7% to workers and 0.7% to participants/organisers, with Spain as the highest user (82%). The highest rate of medical care demand was on Saturdays, with maximum incidence between 12 and 14 hours and 17 and 20 hours. Table 3 shows the conditions treated, with a prevalence of mild trauma (32.7%). The ratio of visitors and consultations was statistically significant ($p < 0.005$).

A total of 4,998 ambulance transfers took place, with 1,060 on site interventions, a response time of 5.2 minutes for conventional interventions and 3.5 minutes for mobile ICUs. A total of 1,583 patients (2.8%) were referred from the PUs to the MHC, 85% of which by ambulance. Referrals from the MHC to hospitals are shown in Table 3; 6.7% required previous stabilisation and 59.6% required observation. Up to 68.3% were transferred by mobile ICU, 26.8% by medicalized ambulance and 4.9% by support vehicle with mean times ranging between 7 and 13 minutes. At the hospitals, 33.7% of patients were discharged after treatment, 15% remained under observation in A&E, 40.2% were admitted in wards and 11% in ICU (73.7 per 100,000 consultations). Table 3 also shows the distribution by department, with a prevalence of trauma (37.8%) and internal medicine (17.3%).

Admissions to the observation area of the MHC totalled 1,726 patients (9.8 per day, 2.08% of tho-

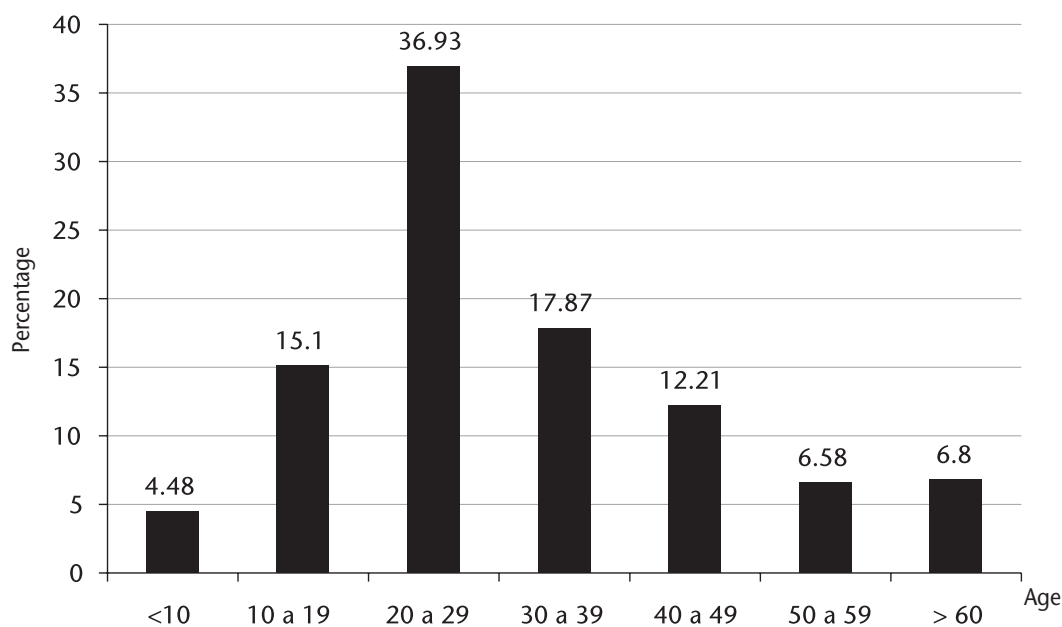
**Figure 1.** Percentage distribution of cases according to age.

Table 3. Percentage distribution of medical conditions attended, number of patients transferred to hospitals by department of admission and percentage distribution of such evacuations by hospital

Distribution of conditions subject to medical attention (%)	
Mild trauma	32.7
Poorly defined	20.4
Digestive	8.3
Respiratory	7.5
Wound dressing	7.0
Osteomuscular	5.8
Central Nervous System/sensorial	4.4
Circulatory	3.1
Genito-urinary	3.1
Distribution of admissions by department	
Trauma	209
Internal medicine	96
Cardiology	64
Intensive Care Unit	61
Neurology	31
Gynaecology	22
Digestive	22
Plastic surgery	20
General surgery	20
Other	17
Psychiatry	11
Pneumology	7
Distribution of admissions by hospital (%)	
FREMAP	30.8
Military	23.0
Virgen del Rocío	15.0
Virgen Macarena	13.6
Valme	10.5
Private clinics	7.1

se treated), with an average stay of 91 minutes and a patient-bed rotation rate of 192. Thirty point eight percent were over the age of 50 and illness (88.9%) prevailed over unfortunate accident (7.2%), visitors (75.9%) over workers (22.9%) and Spanish nationals (77.8%) over foreigners.

Forty-five patients with emergency conditions requiring vital supported were attended in the MHC stabilisation area, of which 75.5% were collected by the venue's mobile ICU, either due to illness (75.5%) or accident (24.5%). Of these, 51.1% were over the age of 50 and 5 cardiac arrests were treated.

Multiple casualty accidents took place in evening mass concerts – one involving 300 on site interventions and 68 transfers to MHC. At the Maestranza Theatre, one death due to crushing was reported. The Alfa'92 Plan was put into practice in 34 situations with 13 phases of approach by other security forces. Two patients died (one by drowning and one due to multiple injuries) within the Venue and six more at the hospital (dilated myocardiopathy, aortic aneurysm rupture, head trauma, trunk haemorrhage, myocardial infarction, and septic shock).

Seventy-two cases of chicken pox, 6 of malaria and one bacterial meningitis were diagnosed at the MHC, in addition to 2,639 diarrhoeic cases, with stool samples taken from 59.7% of patients. Public Health issues, however, pertained to a different service that was exclusively devoted to food, waste water and spillage, the environment and epidemiological alerts²⁴.

Discussion

The bibliography suggested emergency medical care of little complexity, probably due to being a young and healthy audience population, although it remained important to ensure assistance in the event of possible severe situations or group emergencies^{1,7,9}. Overall safety, quality and satisfaction of the visitors were paramount, in addition to preventing any adverse repercussion on public hospitals and the resident population.

A very young and healthy cohort was indeed proven (only 6.8% of attendees over the age of 60), with the main incidents being mild trauma (31.7%) similar to cases reported in other events^{18,21,25}. Trauma was also the most frequent cause for hospital referral (37.8%), which highlighted the need to establish agreements with outside centres²⁴. Only 61 patients were admitted to the ICU (73.7 per 100,000 attendees) which, over a period of 176 days, had little impact on the Seville hospitals.

Location diversification ensured immediate attention and increased level of satisfaction among the patients. The separate handling of the stabilisation and observation areas also helped towards the positive results achieved. Although the bibliography mentions units manned by paramedics²⁶⁻³², we believe that the severe cases^{33,34} attended at the MHC and their referral justified the presence of Emergency Medicine Specialist Physicians.

The number and severity of cases attended, the resolution capacity of the staff and the rate of referrals were within expected ranges, as shown in Table 4. The slight variation in terms of hospital admissions, particularly into the ICU, could be explained by the presence of the stabilisation and observation areas.

Our results agree with all previous publications and support the usefulness, effectiveness and, above all, efficiency of this model and thereby recommend their implementation by the medical services at the Saragossa Expo 2008.

Table 4. Comparison of forecast and actual healthcare consultations

Month	W/H	Visits to exhibition (n)	Freq. (medical visits/day)	Freq./visits (‰)	Mild (n)	Mild/Freq. (%)	Evac. (n)	Evac./Freq. (%)	Admis. (n)	Adm./Evac. (%)
April	W	121,606	292	2.40	233	79.79	5	1.71	2	40
	H	174,614	419	2.39	335	79.95	7	2.14	3	42
May	W	131,534	316	2.40	253	80.06	5	1.97	2	40
	H	195,670	461	2.35	376	81.56	8	2.12	3	37
June	W	157,644	378	2.39	303	80.16	6	1.98	3	50
	H	233,435	560	2.39	448	80.01	9	2.00	4	44
July	W	282,454	678	2.40	542	79.94	11	2.02	5	45
	H	348,025	835	2.39	668	80.02	13	1.94	6	46
August	W	238,704	573	2.40	458	79.93	9	1.96	4	44
	H	334,185	802	2.39	641	78.17	13	2.02	6	46
Sept.	W	156,261	375	2.39	300	80.01	6	2.00	3	50
	H	231,386	555	2.39	444	80.01	9	2.02	4	44
Oct	W	158,103	379	2.39	304	80.21	6	1.97	3	50
	H	221,344	531	2.39	425	80.03	9	2.11	4	44
Total			86,409	2.40	69,120	79.99	1,382	1.99	622	0.45

W: working day; H: holiday; Freq: frequentation; Evac: evacuation; Adm: admissions.

Conclusions

A long duration mass gathering requires emergency medical care units located close by and made known to the visitors, with a high qualification standard (emergency specialists), designed for low frequentation (2%) but able to cope with potential individual or mass emergency situations needing stabilisation and observation facilities. Emergency Medicine plays a significant role in the planning, management and assessment of such events.

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Atención sanitaria en acontecimientos colectivos de larga duración: sirve el modelo de la Exposición de Sevilla'92 para la de Zaragoza'08?

Moreno Millán E, Raposo Triano MF, Álvarez Leiva C

Introducción: Los acontecimientos colectivos constituyen situaciones de riesgo previsible que precisan un modelo asistencial sanitario integral, especialmente aquéllos que por su prolongada duración requieren evitar repercusiones sobre el sistema autóctono. Presentamos la planificación, gestión y resultados del dispositivo desarrollado para la cobertura de la Exposición Universal de Sevilla (EXPO'92).

Método: Analizados los datos de exposiciones previas, se estimó una demanda de escasa complejidad –ante la previsión de una población joven y sana de espectadores– con una frecuentación entre 1,8-2,4 asistencias por 1.000 visitas, 97% de capacidad resolutive y 2% de derivaciones hospitalarias, para lo que se construyeron un centro principal (CAP) –con zonas de estabilización y observación– y cinco unidades periféricas, situadas estratégicamente en las proximidades de los pabellones o áreas más conflictivas. Se prepararon también los hospitales para las evacuaciones, especialmente los privados concertados, y distintos operativos para emergencias colectivas.

Resultados: Se asistieron 82.748 casos en los 176 días de la Muestra, con una media de 470 (rango 211-760), frecuentación 1,98/‰. El 92,5% fueron consideradas leves, el 82,1% en pacientes entre 10 y 49 años (sólo 6,8% mayor de 60 años), el 56,9% en mujeres, el 64,7% la causa principal fue enfermedad y el 30,4% accidente casual, el 68,5% fueron visitantes y el 30,7% fueron trabajadores, el 82% fueron españoles. Los sábados fueron los días de mayor intensidad y la traumatología leve la patología más frecuente (32,7%). Ingresaron en el CAP 1.726 pacientes (9,8 al día, 2,08% de los asistidos), con 91 minutos de estancia media, y el 30,8% eran mayores de 50 años. Se evacuaron 552 enfermos, e ingresaron 222 en planta convencional y 61 en intensivos. Fallecieron 2 enfermos en el recinto y 6 más en los hospitales. El plan de emergencias se activó en 47 ocasiones.

Discusión y conclusiones: La ubicación específica de los dispositivos asistenciales favoreció la atención inmediata, y la gestión diferenciada de los más graves en las distintas áreas del CAP facilitó su manejo especializado. El número de consultas y su escasa complejidad, la capacidad resolutive y la tasa de derivaciones a hospitales estuvieron acordes con las previsiones realizadas, rubricadas con una frecuentación muy baja (2‰). La existencia de patología crítica para estabilizar obliga, no obstante, a disponer de presencia continuada de facultativos especialistas en Medicina de Urgencias y Emergencias. Este modelo es perfectamente exportable a otros eventos de larga duración, como la próxima Exposición de Zaragoza 2008. [*Emergencias* 2008;20:125-130]

Palabras clave: Acontecimientos de masas. Exposiciones universales. Concentraciones. Atención urgente. Planificación.