ISSN: 2474-3674

Alejandre et al. Int J Crit Care Emerg Med 2019, 5:072
DOI: 10.23937/2474-3674/1510072
Volume 5 | Issue 2
Open Access

International Journal of
Critical Care and Emergency Medicine

ORIGINAL RESEARCH

Assessment of the Degree of Stress during Pediatric Ground Transport

Carme Alejandre, MD[1,2*], David Vila, PhD[1,2], Ana Olego[1], M José Tovar[1], Angels Llorens[1], Marta Hernández[1], M Paz Larrosa[1] and Elisabeth Esteban, PhD[1,2]

[1]*Pediatric Transport Unit, Hospital Sant Joan de Déu, Spain*

[2]*Pediatric Intensive Care Unit (PICU), Hospital Sant Joan de Déu, Institut de Recerca H Sant Joan de Déu, Esplugues de Llobregat, Spain*

***Corresponding author:** *Dr. Carme Alejandre, Pediatric Transport Unit; Pediatric Intensive Care Unit (PICU), Hospital Sant Joan de Déu, Institut de Recerca H Sant Joan de Déu, Pg Sant Joan de Déu, 2, 08950, Esplugues de Llobregat, Barcelona, Spain, Tel: 93-280-55-69, Fax: 93-280-36-26*

Abstract

Objective: To describe the stress of children during medical transport.

Design and setting: Prospective observational study of a cohort of patients transferred by the Pediatric Transport Unit of a tertiary-care Pediatric Hospital in Catalonia (Spain) from January 2014 to January 2015.

Main outcome measures: The degree of stress was assessed by a modified Comfort score just before climbing into the ambulance to the referring hospital and just before arriving at the referral hospital.

Results: A total of 220 patients were included, of whom 135 were male (61.4%) with a median age of 2.5 months (IQR 3 days-21 months). Median transfer time was 29 minutes (IQR 13-52 minutes). Sixty-three patients needed non-invasive ventilation (28.6%). The median score before the transfer was 16 (IQR 15-19) and after it 16 (IQR 14-18). In 23 cases (10.5%) patients were accompanied by their parents in the ambulance; no statistically significant differences were observed in the value of the score (p 0.959). Sucrose was used in 45 patients (20.5%) and some type of sedation in 31 cases (14.1%). Statistically significant differences were observed in the assessment attributable to sedation (p 0.032). Verbal accompaniment was performed in 94 patients (42.7%) and physical in 95 patients (43.2%), responding favorably to it 64 and 62 patients, respectively (68.1% and 65.3%).

Conclusions: During pediatric transport, increased stress level of patients was not observed. The use of sedation during transport was infrequent. The verbal and physical accompaniment can be useful for stress reduction.

Keywords

Stress, Transport, Pediatric

Clinical Implications

This study assesses the degree of stress in the patients during interhospital transport and observes which actions that were performed during transport (sedation, verbal and physical accompaniment) influences in the degree of stress.

Introduction

Anxiety is very common in critically ill pediatric patients and, therefore, in their families. High levels of stress are associated with negative consequences at both the medical, psychological and social levels [1]. Medical ground transport implies an added stress to these ill children and their family. The main causes of stress are fear of intense stimuli, such as pain or noise, fear of unknown stimuli in a new physical space (ambulance) and in the presence of strange items (transport team and medical equipment). Other important facts are fear of invasive medical procedures and the kind of illness that caused the transport [2]. During that, it needs to be noted the separation of the parent-child bond, the loss of autonomy, and the control and personal competence as major etiologies of anxiety [3,4].

Citation: Alejandre C, Vila D, Olego A, Tovar MJ, Llorens A, et al. (2019) Assessment of the Degree of Stress during Pediatric Ground Transport. Int J Crit Care Emerg Med 5:072. doi.org/10.23937/2474-3674/1510072

Accepted: April 09, 2019: **Published:** April 11, 2019

There are no previous studies on the quantification of stress during pediatric transport. The objectives of this study were to assess the degree of stress in the patients during the interhospital transport and to observe if the actions that were performed during transport (sedation, verbal and physical accompaniment) influenced the degree of stress.

Pediatric transport in Catalonia

Each country organizes its transport system according to the needs of the population and geography. The layout of the hospital network in Catalonia, with the third level centers concentrated in the city of Barcelona and its metropolitan area, forced the implementation of an interhospital medical transport service. The objective is to be able to transfer critical patients in the best conditions from secondary hospitals in Catalonia. For this, the Medical Emergency System was created in 1985, with the advent of specifically pediatric equipment in 1995. The transport team is a pediatric team specialized in critically ill children and neonates which covers all pediatric and neonatal transportations in an area of more than 31.000 square kilometers, with more than three and a half million population. The health care staff of these teams consists of a pediatrician, an expert nurse in pediatric and neonatal intensive care and a health transport technician. The vehicles used are two advanced life support ambulances and a medicalized helicopter. Pediatric Medical Emergency System mostly involves patient transfers between hospitals (secondary transport), with occasional assistance at the site of the incident (primary transport). During the period of this study, the parents rarely accompanied the patients inside the ambulance, traveling next to the driver or by their own means to the receiving hospital.

Patients and Methods

It was a prospective, unicenter and observational study. All patients transported by the pediatric transport team of the Sant Joan de Déu Hospital (base BP62) who did not meet any exclusion criteria from January 1 until December 31, of 2014 were included. The study was done according to the Helsinki declaration, approved by the Ethics Review Board of the hospital Sant Joan de Déu and written informed consent was obtained from all the parents or legal guardians.

Exclusion criteria

- Preterm newborns with gestational age less than 32 weeks.
- Patients with severe neurological disease (cerebral palsy, seizures or post-critical state, neonate with hypoxic-ischemic encephalopathy…).
- Unconscious patient (Glasgow Coma Scale less than 12 points).
- Intubated patients.

In order to assess the degree of stress, we carried out a review of the literature. Specific scales for this purpose that can be applied to all ages or non-collaborating children were very scarce. The Comfort scale was appropriate, with excellent results in the validation studies [5]. We also saw that making a small change in the Comfort scale, this could serve us for the objectives of our work.

For this reason the Comfort scale and two physiological data such as heart rate and respiratory frequency were used. This modification is shown in Table 1.

Table 1: Modified comfort scale.

	Deeply asleep	1
	Lightly asleep	2
	Drowsy	3
	Fully awake and alert	4
Alertness	Hyper alert	5
	No muscle tone	1
	Reduced	2
	Normal	3
	Increased	4
Muscle tone	Extreme muscle rigidity	5
	Calm, quite breathing (no crying)	1
	Slightly anxious, easily distracted by touch or voice (sobbing)	2
	Anxious, difficult to distract (moaning)	3
	Very anxious, impossible to distract (crying)	4
Calmness	Panicky (screaming)	5

Physical movement	No movement	1				
	Occasional slight movements	2				
	Frequent slight movements	3				
	Vigorous movements of the extremities	4				
	Vigorous movements, including head and torso	5				
Facial tension	Facial muscles totally relaxed (smile)	1				
	No facial muscle tension evident (serious)	2				
	Tension evident in some facial muscles (frown)	3				
	Tension evident throughout facial muscles (clenched teeth)	4				
	Facial muscles contorted and grimacing	5				
Respiratory rate (bpm)	Age\Points	1	2	3	4	5
	< 1 year	< 30	30-40	41-50	51-60	> 60
	1-5 years	< 25	25-35	36-50	51-60	> 60
	5-12 years	< 20	20-25	25-35	36-50	> 50
	>12 years	< 15	15-20	21-35	36-50	> 50
Heart rate (bpm)	Age\Points	1	2	3	4	5
	< 1 year	< 110	110-160	161-180	181-200	> 200
	1-5 years	< 95	95-140	141-160	161-180	> 180
	5-12 years	< 80	80-120	121-140	141-160	> 160
	> 12 years	< 60	60-100	101-120	121-140	> 140

In order to determine whether the modified Comfort scale correctly assessed the variation of stress in this context, a preliminary phase was carried out to validate its usefulness. Cronbach's alpha was performed, and showed a value of 0.806, and Lin's concordance correlation coefficient (CCC) showed values of 0.823 (CI 95% 0.779-0.867).

In the present study, we recorded epidemiological and clinical variables: Age, sex, gestational age (in neonates), patient pathology, need for non-invasive ventilation, and duration of transport. The modified Comfort scale registered: Waking state, muscle tone, psychic state, mobility, facial expression and respiratory and cardiac rate.

A stress determination was performed using the modified Comfort score at the emissary hospital (after stabilization) and another determination in the ambulance (before arrival at the receptor hospital). In case of requiring sedation or performing verbal accompaniment (telling stories, songs, etc) or physical (caresses, shaking hands, etc), these were recorded on the data sheet. The stress determination was performed separately by the nurse and the physician.

Statistical analysis

Categorical variables were expressed as percentages and frequencies and continuous variables as means and standard deviation or medians and interquartile range (IQR), depending on the variable distribution. Unpaired quantitative continuous variables were compared among the groups using the unpaired Student's t-test or the Mann-Whitney U-test accordingly. Paired quantitative continuous variables were compared among the groups using the paired Student's t-test or the Wilcoxon Signed Ranks Test accordingly. χ^2 tests were used to compare qualitative variables. Statistical significance was set at $p < 0.05$. Statistical analysis was performed using SPSS v17 (SPSS Inc, Chicago, IL).

Table 2: Patient pathologies.

Patient pathologies	n	%
Bronchiolitis	31	14.1
Respiratory insufficiency	29	13.2
Asthma	25	11.4
Infection	21	9.5
Trauma patients	20	9.1
Neurological disease	18	8.2
Prematurity	18	8.2
Cardiac disease	16	7.3
Metabolic disease	14	6.4
Surgical disease	10	4.5
Neonatal disease	9	4.1
Other	9	4.1

Results

A total of 220 patients were included, of whom 135 were men (61.4%) with a median age of 2.5 months (IQR 3 days - 21 months). In newborns, the median gestational age was 39 weeks (IQR 35-40 weeks).

The patients' pathologies are shown in Table 2, the main cause of transport were respiratory problems as bronchiolitis, asthma and other respiratory problems.

Table 3: Different values before and after transportation (Median and IQR).

Item evaluated	Before transportation	After transportation	p
Modified comfort score	16 (15-19)	16 (14-18)	0.005
Heart rate	137 (120-155)	133 (118-150)	< 0.001
Respiratory rate	42 (35-52)	44 (32-51)	0.554

Table 4: Score before and after transportation according to different characteristics (Median and IQR).

Item assessed		Before transportation	After transportation	p
Use of sedation	No	16 (14-18)	16 (14-17)	0.032
	Yes	17 (15-21)	17 (16-21)	
Use of sucrose	No	16 (14-19)	16 (14-18)	0.056
	Yes	17 (14-20)	17 (14-20)	
Presence of parents	No	16 (15-19)	16 (14-18)	0.896
	Yes	16 (14-18)	17 (14-18)	
Verbal accompaniment	No	16 (14-18)	16 (14-18)	0.063
	Yes	17 (15-20)	16 (14-18)	
Physical accompaniment	No	16 (14-18)	16 (14-17)	0.111
	Yes	17 (15-21)	16 (14-18)	

The median of the transfer time was 29 minutes (IQR 13-52 minutes). Non-invasive ventilation was required in 63 cases (28.6%).

The values of the modified Comfort scale at the arrival of the receiving hospital were lower (median 16; IQR 15-19) than at the time of the exit of the emitter center (median 16; IQR 14-18), whether valued by a doctor or a nurse, establishing a statistically significant difference ($p < 0.005$ and < 0.001 respectively), as shown in Table 3.

The values of heart rate at the time of arrival at the receiving hospital were also significantly lower than at the time of the exit of the emitter center ($p < 0.001$). Respiratory frequency values were not statistically significant.

Table 4 shows the values of the modified Comfort score in different situations before and after transportation. In 23 cases (10.5%) the patients were accompanied by their parents in the ambulance, with no statistically significant difference in the value of the score (p 0.896).

Sucrose was used in 45 patients (20.5%) and some type of superficial sedation in 31 cases (14.1%). There were no statistically significant differences in score assessment attributable to sucrose but there is some difference attributable to sedation (p 0.032).

Verbal accompaniment was performed in 94 patients (42.7%) and physical in 95 patients (43.2%), with a favorable answer in 64 and 62 patients respectively (68.1% and 65.3%), and with no statistically significant difference in the score.

Discussion

Reviewing the literature, this is the first study of quantification of stress during medical transport between hospitals of pediatric patients. In the last decades, it has been an increasing awareness, among physicians and nurses, that both physical and psychical pain in neonates and children should be prevented and treated. As a result, there is a growing need for reliable and valid pain instruments that can easily be incorporated into daily care [6-9].

Interest in sedation is also increasing, especially in critically ill patients. Adequate sedation facilitates diagnostic and therapeutic processes, reduces stress and, therefore, improves the comfort of both the patient and his/her relatives [8,9]. In order to quantify the degree of stress of critically ill children, it was reviewed in the literature. There are a variety of scores designed to be used by physicians, parents, teachers, or children themselves, but many are not appropriate for stress assessment in infants or neonates [10]. For this reason, we made minor modifications to the Comfort scale, which has been used for the evaluation of our patients being previously validated in our environment.

These data suggest that this scale correctly assesses changes in the state of anxiety in children: More anxiety, higher score. The score provides a reasonably measure of the anxiety of the patient which is easily recordable as well as permits to notice its evolution and its response to treatments. Furthermore, facilitates objective communication between professionals. The modified Comfort scale seems an easy and useful tool for the evaluation of stress in infants and children.

The environments where there is more anxiety are the emergency department and prior to surgery, where studies are carried out to identify and reduce stressors [2,11-14]. Ill or injured children receiving emergency services often experience psychological distress with

potentially serious consequences for their physical and mental health. Nearly a third of patients report clinical levels of state anxiety and anticipatory stressors, according to Nager's, et al. study [12]. The identifiable stressors in all settings including fear of separation from parents, fear of physical pain or death, fear of the strange environment and procedures, fear of loss of control, autonomy and competence, and fear due to uncertainty about expected acceptable behavior. These are the same stressors we have detected in our environment.

The main objective of the study is to show that the transfer does not affect the anxiety of children, and according to our data, the level of stress of children is not increased by transporting them to another hospital and temporarily separating them from their parents. This may be explained because our team of professionals is able to create a family environment for our patients, even in particularly difficult situations. Given the influence of cognitive and behavioral factors on pain perception, such as fear or worry, nonpharmacological interventions are important in managing pain perception and behavior. Evidence-based techniques include reading, blowing balloons, singing, use of mobiles or other distractions, storytelling or use of films adjusted to age [15-17]. A recent review of virtual reality for pain control has demonstrated that virtual reality has promising effects in decreasing pain and distress associated with painful medical procedures [18].

In our study, almost half of our patients received physical or verbal support, with a high percentage responding favorably to it. Those who did not receive it were mostly neonates, where sucrose was used. Therefore, only 14% of the cases required some type of sedative, mainly levomepromazine. According to our data, we can say that non-pharmacological measures applied to transport were important stress-reducing factors, in a statistically significant way. During the study period, the presence of parents inside the ambulance cabin during the transport of critical children was not usual. They were informed of their situation before departure at the referring hospital and an informed consent was signed in order to be able to carry out the transport. These went next to the driver or on their own way to the referral hospital, where definitive cures would be performed.

In the last decade, a recurrent theme that emerged was the level of parental distress as a consequence of separation from their child during the transfer period and the convenience of being transferred [19-24]. It has been seen that the adverse effects are minimal and the benefits outweigh the disadvantages, when this is done by trained professionals. In view of the published data, our pediatric transport service has adopted this policy, bringing parents in the ambulance in a high percentage of cases. We hope to show the results in future work.

The main limitation of this study is the subjectivity in the evaluation of some of the variables of the score used, which require specific knowledge and training. Sample size is the other limitation when we extrapolate results in the general population. More extensive studies are needed to detect patients' level of anxiety during their previous stay at the hospital, in order to reduce or make them disappear.

Conclusions

During the pediatric transport an increase in the level of stress of children was not observed, despite being separated from their parents. The use of sedation during transport was infrequent. The verbal and physical accompaniment can be useful for stress reduction unless it has not seen significative difference.

Acknowledgment

The authors gratefully acknowledge the efforts of all nursing and medical staff of the Transport Unit of Sant Joan de Déu Hospital in this project. Thanks also to the Hospital Sant Joan de Déu for their trust in us.

Funding Source

No external funding was secured for this study.

Financial Disclosure

The remaining authors have no financial relationships relevant to this article to disclose.

Conflict of Interest

Authors disclose any potential financial or ethical conflicts of interest regarding the contents of this submission.

The study was done according to the Helsinky declaration and approved by the Sant Joan de Déu Ethical Assistant Committee.

Authors Contribution

Dr. C Alejandre: Conceptualized and designed the study, carried out the data collection and the initial analyses, drafted the initial manuscript, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Dr. D Vila: Carried out the data collection and the initial analyses, applied the statistical analysis, drafted the initial manuscript, reviewed and revised the manuscript, and approved the final manuscript as submitted.

A Olego: Carried out the data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted.

MJ Tovar: Carried out the data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted.

A LLorens: Carried out the data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted.

M Hernández: Carried out the data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted.

MP Larrosa: Carried out the data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Dr. E Esteban: Reviewed and revised the manuscript, and approved the final manuscript as submitted.

References

1. Hagglof B (1999) Psychological reaction by children of various ages to hospital care and invasive procedures. Acta Paediatr 88: 72-78.
2. Fein JA, Zempsky WT, Cravero JP (2012) Relief of pain and anxiety in pediatric patients in emergency medical systems. Pediatrics 130: e1391-e1398.
3. Méndez FX, Ortigosa JM, Pedroche S (1996) Preparación a la hospitalización infantil (I): afrontamiento del estrés. Psicología Conductual 4: 193-209.
4. Fernández-Castillo A, López-Naranjo I (2006) Transmisión de emociones, miedo y estrés infantil por hospitalización. Int J Clin Health Psychol 6: 631-645.
5. Maaskant J, Raymakers-Janssen P, Veldhoen E, Ista E, Lucas C, et al. (2016) The clinimetric properties of the comfort scale: A systematic review. Eur J Pain 20: 1587-1611.
6. Craig KD, Whitfield MF, Grunau RVE, Linton J, Hadjistavropoulos HD (1993) Pain in the preterm neonate: Behavioural and physiological índices. Pain 52: 287-299.
7. Franck LS, Miaskowski C (1997) Measurement of neonatal responses to painful stimuli: A research review. J Pain Symptom Manage 14: 343-378.
8. Chanques G, Jaber S, Barbotte E, Violet S, Sebbane M, et al. (2006) Impact of systematic evaluation of pain and agitation in an intensive care unit. Critical care medicine 34: 1691-1699.
9. Playfor S, Jenkins I, Boyles C, Choonara I, Davies G, et al. (2006) Consensus guidelines on sedation and analgesia in critically ill children. Intensive Care Medicine 32: 1125-1136.
10. Greenhill LL, Pine D, March J (1998) Assessment issues in treatment research of pediatric anxiety disorders: what is working, what is not working, what is missing, and what needs improvement. Psychopharmacol Bull 34: 155-164.
11. Heilbrunn BR, Wittern RE, Lee JB, Pham PK, Hamilton AH, et al. (2014) Reducing anxiety in the pediatric emergency department: A comparative trial. J Emerg Med 47: 623-631.
12. Nager AL, Mahrer NE, Gold JI (2010) State trait anxiety in the emergency department: An analysis of anticipatory and life stressors. Pediatr Emerg Care 26: 897-901.
13. Maclaren JE, Thompson C, Weinber M, Fortier MA, Morrison DE, et al. (2009) Prediction of preoperative anxiety in children: Who is most accurate? Anesth Analg 6: 1777-1782.
14. Badner NH, Nielson WR, Munk S, Kwiatkowska C, Gelb AW (1990) Preoperative anxiety: Detection and contributing factors. Can J Anaesth 37: 444-447.
15. O'Donnell JJ, Maurice SC, Beattie TF (2002) Emergency analgesia in the paediatric population. Part III Non-pharmacological measures of pain relief and anxiolysis. Emerg Med J 19: 195-197.
16. Khan KA, Weisman SJ (2007) Nonpharmacologic pain management strategies in the pediatric emergency department. Clin Ped Emerg Med 8: 240-247.
17. Ahmed MI, Farrell MA, Parrish K, Karla A (2011) Preoperative anxiety in children risk factors and non-pharmacological management. MEJ Anesth 21: 153-164.
18. Mahrer NE, Gold JI (2009) The use of virtual reality for pain control: A review. Curr Pain Headache Rep 13: 100-109.
19. Lewis MM, Holditch-Davis D, Brunssen S (1997) Parents as passengers during pediatric transport. Air Med J 16: 38-42.
20. Davies J, Tibby SM, Murdoch IA (2005) Should parents accompany critically ill children during inter-hospital transport? Arch Dis Child 90: 1270-1273.
21. Woodward GA, Fleegler EW (2001) Should parents accompany pediatric interfacility ground ambulance transports? Results of a national survey of pediatric transport team managers. Pediatr Emerg Care 17: 22-27.
22. Woodward GA, Fleegler EW (2000) Should parents accompany pediatric interfacility ground ambulance transports? The parents' perspective. Pediatr Emerg Care 16: 383-390.
23. Colville G, Orr F, Gracey D (2003) "The worst journey of our lives": Parents' experiences of a specialised paediatric retrieval service. Intensive Crit Care Nurs 19: 103-108.
24. Macnab AJ (1992) Paediatric inter-facility transport: the parents' perspective. Soc Work Health Care 17: 21-29.