ORIGINAL ARTICLE

Pediatric Interhospital Transport: Who and How We Transport in the South of Portugal

Margarida Cunha[1], João Falcão Estrada[2], Francisco Abecasis[3]

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Abstract

Introduction: Pediatric interhospital transport allows critically ill patients to be transported to an intensive care unit by a qualified team. Since 2012, Portugal has a national pediatric interhospital transport system.

Methods: Observational study using prospectively collected data on patient and transport characteristics from south pediatric interhospital transport retrievals for two years. Patient management suggestions were analyzed during the last year.

Results: From the 1,243 retrievals performed, 93% were urgent, 53% neonatal, 61% male, median age was 23 months (minimum 0 days, maximum 18 years), and median weight 3.21 kg (minimum 0.49 kg, maximum 101 kg). In 66%, the referral hospital was in group I, II, or similar. The median total transport duration was 100 minutes, with a median time until arrival and on-site stabilization of 30 minutes. Planned transports lasted on average 30 minutes more (p = 0.015) than urgent. The most frequent indication for transport was respiratory insufficiency (25%). Before transport, 593 (48%) patients were unstable. During transport, there was a 7% improvement in clinical stability (p = 0.008). Clinical deterioration and complications occurred only in 49 (4%) and 74 (6%) transports. Two patients died (0.2%). Procedures and/or therapies were required in 99% and 76% of transports and were of advanced life support in up to half. Patient management suggestions were made by the pediatric interhospital transport doctor in 40% of transports. The 92% compliance was independent of clinical stability (p = 0.622).

Discussion: The south pediatric interhospital transport transports highly complex and severe patients with a high-quality level of care. The large volume of transports, patient stability, and the rather few adverse events reported sustain a specialized pediatric transport system.

Keywords: Adolescent; Child; Preschool; Critical Illness; Infant; Newborn; Patient Care Team; Patient Transfer/organization & administration; Patient Transfer/standards; Patient Transfer/statistics & numerical data; Portugal; Transportation of Patients

Introduction

The transport of patients has been used since ancient times.[1] Systems for interhospital transfer were first used by the military in a war context.[2-4] Currently, the transport of patients can be divided into prehospital, inhospital, and interhospital.[1]

Interhospital transport is needed whenever the required services and/or level of care are not available at the referring hospital, either for diagnostic or therapeutic interventions.[2,3] According to the nature of illness, urgency of transport and availability of means,[2] interhospital transport can be done either by a team of the referring hospital or by a specialized transport team. Considering the transport of critically ill patients, several studies show that a specialized team reduces adverse events, patient morbidity, and mortality,[1,3-8] and is cost-beneficial.[9]

In some countries, like the United States of America, United Kingdom, and Australia, the transport of seriously ill children has been fully organized for more than three decades.[1] In Portugal, adult and pediatric prehospital transport is provided by the Instituto Nacional de Emergência Médica (INEM).[1] The neonatal interhospital transport was first created in 1987 in Lisbon. It was a sub-system of INEM, with national coverage, responsible for the transport of high-risk newborns to neonatology units.[1] In 2005, the team responsible for the neonatal transport in the center region of Portugal expanded its scope to include children up to the age of 14 years old, thereby creating the first pediatric transport

1. Pediatrics Department, Hospital de Santa Maria, Lisboa, Portugal
2. Pediatric Interhospital Transport, Centro Hospitalar Lisboa Central, Lisboa, Portugal
3. Pediatric Interhospital Transport, Centro Hospitalar Lisboa Norte, Lisboa, Portugal
Corresponding Author
Margarida Cunha
https://orcid.org/0000-0002-0090-2464
cunhapmargarida@gmail.com
Hospital de Santa Maria, Avenida Professor Egas Moniz, 1649-035 Lisboa, Portugal
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system in the country.[10] In 2010, an exclusively pediatric transport system (SAV Pediátrico) started to operate in Lisbon, transporting seriously ill children aged 28 days to younger than 18 years old. In 2012, the two transport systems in the south of Portugal were merged, ensuring the transport of newborns and children up to 18 years old who needed neonatal or pediatric intensive care.[11] At the same time, the pediatric interhospital transport (PIT) system was also extended to the north of Portugal guaranteeing the national (mainland) coverage of a specialized neonatal and pediatric transport system and its characteristics were defined by specific legislation.[12]

Organized pediatric interhospital transport allows the intensive care unit team to rapidly deliver skilled pediatric critical care to the patients at a general referring hospital and to maintain that level of care during transport.[1,13] The unstable patient should be transported to a neonatal or pediatric intensive care unit (NICU/PICU) in equal or better clinical conditions than before transport and never worse.[1]

It is a general principle of transport that the critically ill patients should be stabilized prior to transfer and that the benefits of the transfer outweigh its risks.[1,7] A stable patient will improve the outcome and quicken turnaround time.[7] Patient stabilization should start in the referring hospital and should be accessed in the initial call with the pediatric interhospital transport team.[7] Basic interventions as airway maintenance, ventilation, and vascular access should be available at all facilities that provide care to children.[7] Other interventions such as drug therapy (for example, antibiotics, anticonvulsants, sedation) and tube placement (for example, urinary catheter, nasogastric tubes) could be advised.[7] Consulting the pediatric interhospital transport team, before transport, can play a role in patient stabilization. A systematic evaluation will help on problem identification and management before the arrival of the pediatric interhospital transport team. The opposite concept, called 'scoop and run', maintains that the patients should be transferred as quickly as possible to a specialized center.[1,7] In this time-critical conditions, a judgment must always be made considering the risk of transport against the risk of denying the patient specialized treatment.[1,7] The transport decision must be made by the responsible consultant, regarding the information provided by the referring hospital and other specialties, when relevant. Ideally, the most appropriate destination hospital should be chosen, and the patient or relatives should agree with the transfer.[14]

Interhospital transport tends to be time-critical and a difficult managing situation, but has to provide high-quality care.[15] It is done in a high risk environment with limited resources and few monitoring capabilities.[15] Careful planning, monitoring, and resource allocation, including personnel, are extremely important to ensure patients safety during transport.[3] Pediatric and neonatal transport teams are an extension of the intensive care unit[3] and that is why most pediatric critical patient transport systems are based in hospitals with pediatric intensive care units.[1] Nevertheless, the transport team must be completely autonomous, not depending on the referring hospital in terms of material, drugs, energy, oxygen, or others.

Patient responsibility, when inter-hospital transport is needed, is of the referring and the pediatric interhospital transport team.[7] This joint care is facilitated by communication that should include a direct line, continuous contact for reevaluation on patients clinical status and essential information transmission between medical teams, ambulance crew and patients family.[7] Patient management suggestions can be provided to the referring physician in order to help stabilize the child for transport.[4]

The Portuguese south pediatric interhospital transport team, created in 2012, is the one with more transports per year (over 600 transports per year). The coordination is shared between Centro Hospitalar Universitário Lisboa Central and Centro Hospitalar Universitário Lisboa Norte and each institution provides human resources, equipment, and consumables.[11] The team always includes an intensive care physician (pediatrician, neonatologist, or anesthesiologist), intensive care nurse and prehospital emergency technician. The team elements work daily at an intensive care unit but are exclusively dedicated to pediatric interhospital transport in rotating shifts. In addition to qualified human resources, it possesses means of transport, a communication system, and specific material for carrying out advanced life support techniques and well-defined protocols. Patient clinical information is recorded in a specific form which, since 2017, is available online. The south pediatric interhospital transport team is responsible for urgent and planned transport. Urgent transports are those in which the patient's clinical condition determines their admission to an intensive care unit. Planned transports occur when the required diagnostic/therapeutic interventions are not available at the referring hospital and are performed by the pediatric interhospital transport team under the following conditions: ventilated patient, need for hemodynamic support, clinical instability, and prematurity weighing less than 1,500 g.

The aim of this study was twofold:

- To perform a comprehensive analysis of the south pediatric interhospital transport concerning its objectives, results, and potential improvement;

- To analyze diagnostic/therapeutic interventions suggested by the pediatric interhospital transport doctor before transport.

Methods

We performed an observational study of the prospectively collected data of all the transports carried out by south pediatric interhospital transport for two years from August 16, 2017 to August 15, 2019. For one year (April 2019-2020), we also accessed diagnostic and therapeutic interventions suggested by the pediatric interhospital transport doctor before the transport, analyzing their accomplishment.

The data was collected from the transport information form, filled out online during the transport, and automatically transferred to a data base fully anonymized. The form has 41 entries and includes yes/no questions, nominal and ordinal questions and open fields for detailed information. It is organized in:

- Transport and team identification;
- Referring and destination hospital;
- Transport duration;
- Patient demographic information;
- Patient clinical status (on the referring hospital, after stabilization by the pediatric interhospital transport team and during transport);
- Patient diagnosis and diagnostic group;
- Procedures and therapeutics performed;
- Suggestions made by pediatric interhospital transport team and complications. A comprehensive analysis of this data was performed, concerning the type of transport (neonatal/pediatric and urgent/planned), referral and reception hospital, duration, patient characteristics (gender, age, and weight), diagnosis, clinical stability before and during the transport, procedures, therapeutics, and complications during transport.

Referral and destination hospitals were categorized in groups according to the established by the ordinance 82/2014 of April 10, 2014 of Diário da República.[16]

Transport duration was evaluated considering three criteria: total duration (TT), time until arrival (TUA) to the referring hospital, and on-site stabilization time (OST). Patient clinical stability during transport was assessed in two ways:

- Subjectively, through a nominal form question;
- Objectively, analyzing vital signs for age (oxygen saturation, blood pressure, and pulse) and conscience level assessed by the Glasgow coma score (GCS) before and during transport.

Clinical instability was defined as the deterioration in one or more vital signs (oxygen saturation < 93%, hypo or hypertension, tachycardia, or bradycardia) and/or GCS < 15. Procedures and therapeutics used during pediatric interhospital transport were analyzed, regardless of whether they were performed by the pediatric interhospital transport team or at the referral hospital, in order to analyze the complexity of the patients.

Statistical analysis was performed using IBM® SPSS® software version 24. Categorical variables were described as frequencies and percentages, and continuous variables as means and standard deviation (SD). The median value was reported whenever considered relevant. An Independent sample t-test was used to study the continuous variables and the chi-square test to study the association between the categorical variables. To access the agreement between subjectively and objectively evaluated patient clinical stability, we used Cohen kappa coefficient. All the tests performed were two-tailed, and a *p* value of 0.05 or less was considered as statistically significant.

Results

In the two-year period analyzed, we performed 1,243 retrievals: 660 (53%) were neonatal and 583 (47%) pediatric. Urgent transports were the majority at 1,148 (92%) and 95 (8%) were planned. Eleven (0.9%) patients were not transported because of clinical instability and there were two (0.2%) deaths. Clinical and/or technical complications were reported in 74 (6%) transports, 54 (73%) clinical and 20 (27%) technical. Table 1 describes the general patient and transport characteristics.

Transport duration

The median duration of all the transports is presented in Table 1. When we compared urgent and planned transports, we found a smaller median total duration in urgent transports (TT 1 h 33 min. *vs.* 2 h 07 min.), although the median time until arrival and on-site stabilization was longer than in the planned transports (TUA 0 h 30 min. *vs.* 0 h 20 min., OST 0 h 30 min. *vs.* 0 h 15 min.). Planned transports lasted on average 30 more minutes ($p = 0.015$) than urgent.

Indications for transport

The main indications for transport are described in Fig 1. The most frequent were respiratory insufficiency in 308 (25%), neurologic conditions in 219 (18%), heart disease in 179 (14%), and surgery or postoperative status in 159 (13%). Conditions under other causes

(13%) include diabetic ketoacidosis, hypovolemic shock, severe hemorrhage/anemia, prematurity retinopathy for treatment, tachyarrhythmias, and tumors.

Clinical stability

The evaluation of clinical stability during transport was performed in two ways. Considering the subjective evaluation of the transport doctor, clinical stability was found in 1,200 (97%) patients and only 43 (3%) were identified as being unstable. The objective assessment, as described in methods, identified clinical stability in 650 (52%) and instability in 593 (48%). This shows a poor agreement between the subjective and objective assessment (kappa 0.086, $p < 0.001$).

Table 1. Pediatric interhospital transport characterization (n = 1243)

Patient characteristics	
Gender (n, %)	
Male	759 (61%)
Female	484 (39%)
Age	
Median (min., max.)	23 (0 days, 18 years)
Weight (kg)	
Median (min., max.)	3.21 (0.49, 101)
Transport characteristics	
Referral hospital	**n (%)**
Group I, II, equivalent	817 (66%)
Destination hospital	**n (%)**
Group III	841 (67%)
Transport duration (hours)	**Median (min, max)**
Total	1h40min (0h15min - 11h00min)
Time until arrival	0h30min (0h00min - 5h40min)
On-site stabilization time	0h30min (0h01min - 4h50min)

max - maximum, min - minimum.

Comparing clinical instability at the referral hospital (544 patients, 44%) and during transport (462 patients, 37%), we found a 7% improve during transport (p = 0.008), shown in Fig. 2. Only 49 patients (4%) became unstable during transport. When comparing urgent and planned transports, we found a higher percentage of clinical instability in urgent transports than in planned ones (49% *vs.* 22%, $p < 0.001$).

Procedures and therapeutics

Procedures and therapeutics were necessary in 1,230 (99%) and 925 (76.2%) transports, either before or during transport (the most frequent are shown in Table 2). There was a total of 6,138 techniques, being 3,957 (64%) procedures and 2,181 (36%) therapeutics. The most frequent procedure was peripheral venous access placement in 735 (59%). Advanced life support interventions were used in up to half of the patients. Central venous and arterial access were placed in 648 (52%) and 126 (10%) patients, invasive ventilation was used in 381 (31%), vasoactive/inotropic drugs in 138 (11%), passive hypothermia in 53 (4%), and 12 (1%) patients were transported in extra corporeal membrane oxygenation (ECMO). We found no difference in the number of procedures (p = 0,580) or therapeutics (p = 0.108) between urgent and planned transports.

Planned transports

Regarding the 95 planned, the referral was made from a level III hospital in 53 (70.7%) and the main reason was to perform imaging examinations. The average transport duration was on average 30 minutes longer than urgent transports (p = 0.015). Clinical instability was identified in 13 (16%) and one patient's condition worsened during transport.

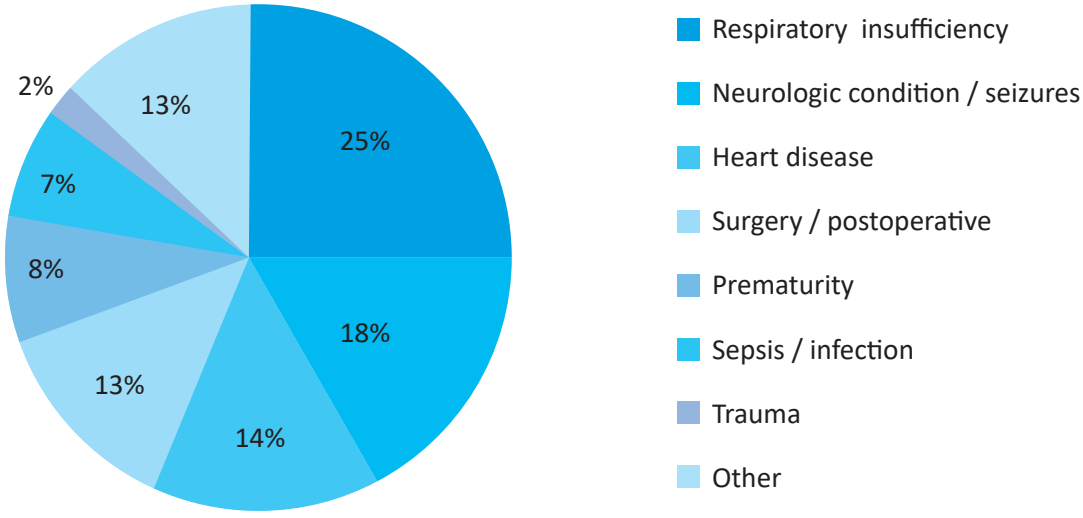
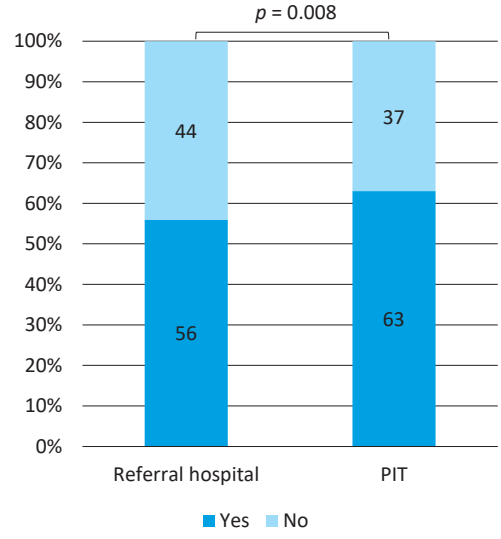


Figure 1. Main indications for transport.

Patient management suggestions

During the period analyzed (one year), there were 586 pediatric interhospital transport, the majority pediatric (51%), and urgent (90%). In 234/586 (40%) transports, patient management suggestions were made by the pediatric interhospital transport doctor. They were implemented in 216/234 (92%) transports. The most frequent diagnostic and therapeutic suggestions are shown in Table 3.

Patient management suggestions were similar in pediatric and in neonatal transport (51.3% *vs.* 48.7%, $p = 0.308$), but were more frequent in urgent *versus* planned transports (98.3% *vs.* 1.7%, $p < 0.001$) and whenever the referral hospital was level I and II rather than in level III (80.3% *vs.* 19.7%, $p < 0.001$). Suggestions were more frequently made when the patient was unstable in the referral hospital (51% *vs.* 32%, $p < 0.001$), but the compliance was independent of clinical stability/instability (91.5% *vs.* 93.3%, $p = 0.622$).



PIT - pediatric interhospital transport.

Figure 2. Clinical stability of patients at the referral hospital and during pediatric interhospital transport.

Discussion

In this retrospective cohort study of prospectively collected data, we performed a comprehensive analysis of transports made by south pediatric interhospital transport for two years. The online transport information form, filled out during transport, decreases filling errors and facilitates data analysis. No signed consent is requested before transport, but detailed information is given to the patient either by the referring hospital team or the pediatric interhospital transport team. Because of the nature of the transport, where the patient is in a critical situation, we believe that it is inappropriate to ask for consent.

During the studied period, we performed 1,243 transports. This represents about 620 per year, which is a number that has been stable in recent years and accounts for about half of all the transports done in Portugal. Most were emergency transports (92%), a higher percentage than in other studies.[6] More than half of the pediatric interhospital transports were neonatal (53%) but there is a wide range of ages and weights of transported patients.

Table 2. Most frequent procedures and therapeutics (n = 1243)

Procedures	n (%)	**Therapeutics**	n (%)
Peripheral venous access	735 (59%)	Sedative/analgesic	517 (42%)
Central venous access	648 (52%)	Antibiotic	445 (36%)
Central arterial access	126 (10%)	Parenteral nutrition	253 (20%)
Assisted ventilation	596 (48%)	Anticonvulsant	82 (7%)
- Invasive/high frequency	373 (30%) / 4 (0.3%)		
- Non-invasive	223 (18%)		
Oxygen therapy	466 (37%)	Prostaglandin	77 (6%)
High flow	53 (4%)		
Gastric tube	724 (58%)	Blood products	75 (6%)
Urinary catheter	182 (15%)	Surfactant	61 (5%)
Passive hypothermia	53 (4%)	Hyperosmolar therapy	30 (2%)
Thoracic drainage	26 (2%)	Resuscitation	
		Drugs	29 (2%)
		Volume bolus	140 (11%)
		Vasoactive/inotropic drugs	138 (11%)
ECMO	12 (1%)		

ECMO - extra-corporal membrane oxygenation.

Table 3. Most frequent patient management suggestions (n = 234)

Procedures	n (%)	Therapeutics	n (%)
Blood gas analysis	89 (38%)	Start/optimize antibiotic	41 (18%)
Optimize ventilation parameters	41 (18%)	Start/optimize intravenous fluid therapy	33 (14%)
Peripheral venous access	38 (16%)	Volume bolus	21 (9%)
Non-invasive assisted ventilation	36 (15%)	Vasoactive/inotropic drugs	19 (8%)
Gastric tube	35 (15%)	Sedation/analgesia	19 (8%)
Central venous access	28 (12%)	Diuretic	14 (6%)
Diagnostic imaging exams	25 (11%)	Blood products	13 (6%)
Nil by mouth	15 (6%)	Anticonvulsant	10 (4%)
Urinary tube	10 (4%)	Hyperosmolar therapy	5 (2%)
Others Laboratory analysis, passive hypothermia, central arterial access, surgery	20 (9%)	Others Prostaglandin, surfactant, caffeine citrate, inhaled therapy	37 (16%)

In our study, clinical and/or technical adverse events were reported in a low percentage (6%) of transports and only less than one third were because of technical issues. The reported incidence of adverse events varies 3%-75%, partly because of the definitions used.[14] If only adverse events requiring intervention are taken into account, the percentage is lower (4.2%-8.9%).[17] Equipment failure or technical problems are common and may vary 9%-36%.[14] In another study, 75% of the patients experienced important complications that were life-threatening in 20%.[3] A lower prevalence (4.5%) of adverse events has been reported in a study for the United Kingdom and Ireland[18], but technical problems account for 80% of adverse events. Factors associated with fewer incidents are good personnel skills/teamwork, checking equipment and the patient, patient monitoring, and good interpersonal communication.[14] In fact, up to 91% of incidents seem to be preventable.[14,17]

As for transport duration, the median time until arrival (from activation to patient bedside) and on-site stabilization was 30 minutes. Both operational times were inferior to the ones reported by one study[18] comparing high and low volume pediatric interhospital transport teams (median of 76 minutes for a high-volume team). This study and others[15] focus on the mobilization time (interval between receiving the referral telephone call and the departure of the specialist team) and ranged from 25 to 65 minutes. One reason pointed out for a longer mobilization time was the need to advise referral hospital physicians on patient management, appropriate treatment, and communication with the families, particularly when the referral radius was over 50 km.[15] With our pediatric interhospital transport team, this is not a concern because there is an independent means of communication available at all times that allows us to assess the patient's clinical condition and make patient management suggestions without impairing team mobilization. The on-site median stabilization time (30 minutes) was also inferior to the one reported by a high-volume team pediatric interhospital transport (101 minutes).[18]

Planned transports lasted on average 30 minutes longer than urgent. This delay is due to the exam or procedure duration and, although it does not depend on the pediatric interhospital transport team, it might be a point to improve because it prevents the team from being available for emergent transports.

Regarding the most frequent indications - respiratory insufficiency (25%) and heart disease (14%) - they were similar to other studies.[6,15,18,19] Reference centers for the treatment of congenital heart disease do not have maternity. Neurologic conditions were also very frequent (18%) because they include newborns with hypoxic-ischemic encephalopathy. These newborns must be transported to a therapeutic hypothermia center and one of the centers in Lisbon does not have the magnetic resonance imaging required after rewarming. This means that these patients are transported at least twice. The surgery or post postoperative status (13%) is frequent because one of the reference neonatal surgery departments is located at a hospital without maternity.

In our study, clinical stability increased during transport, that is, after the care of the specialized transport team and was maintained in the majority of pediatric interhospital transport. Only a small minority (4%) suffered clinical deterioration during transport. We, as well as other authors,[20] believe that pretransport stabilization and the use of a specialized and trained pediatric interhospital transport were crucial to achieving these good results. Pretransport stabilization time does not worsen the patient outcome[14] and although it has no effect on risk-adjusted mortality[14,18] it has been

associated with a shorter length of hospital stay.[14] The subjective and objective assessment of clinical stability showed a discrepancy between the two, demonstrating the importance of parameterized clinical assessment.

The analysis of procedures and therapeutics used during pediatric interhospital transport denotes patient complexity. In our study, advanced life support interventions were required in most of the transports. In a review of pediatric interhospital transport in Hong Kong,[6] 11% patients were not escorted by a doctor, support during transport was necessary in fewer transports (70%) and patient monitoring was only used in 9%. Even so, the percentage of invasive ventilation (56%), inotropic support (14.5%), and arterial line (51.2%) was slightly higher but with more reported complications (44%).[6]

Our highly specialized team allows an effective performance in view of the diversity of clinical situations, patient complexity, and age range (from extremely premature infants to patients aged 18). It can also justify the low percentage of adverse events. A 1996 study of Portuguese pediatric interhospital transport revealed the lack of transport quality and pointed to the absence of an organized transport system as the cause. It also stressed the need to form teams and encourage the creation of pediatric transport ambulances with the capacity to transport critically ill patients in the best clinical conditions.[21] Much has been done since then.

Planned transports were a minority, revealing each hospital capacity to treat their own patients. Even so, the majority of planned pediatric interhospital transport was in the neonatal age, to perform clinical exams, and the referral was made from a level III hospital. The reason for this apparent paradox has to do with the organization of health care facilities in Lisbon with a large dispersion of means by different hospitals. Transports are, on average, longer although patients have similar complexity and less clinical instability. This is something we aim to improve.

Communication between the pediatric interhospital transport team and referral hospital team makes it possible to transmit recommendations that optimize the care until the arrival of the transport team without impairing their mobilization.[1] It is our belief that patient management suggestions are useful, not only to give support to the referral hospital team, but also a way to start intensive care before the pediatric interhospital transport team's arrival. From our study, we found that suggestions were given in less than half of the transports but they were implemented in almost all and independently of the patient's clinical status. In addition, they were more frequent in emergency transports when there was clinical instability and when the referral hospital was less differentiated. We found no previous studies in this matter and think this is a topic of further research.

This study shows that the south pediatric interhospital transport transports highly complex and severe patients, in need of various techniques and therapies of advanced life support. Clinical instability is present in almost half of the patients but improves during transport and there are few adverse events reported. It also demonstrates the effectiveness of the communication between the referring hospital team and the pediatric interhospital transport team, as it allows periodic patient reassessment and transmitting patient management suggestions without compromising the transport team mobilization. It is our belief that these results justify the existence of a highly specialized transport system in our country. Planned transports were a minority but take longer, meaning that resources are unavailable for a urgent response, if necessary. This should be improved. In this study, we did not assess whether children were accompanied by a relative during transport. It would be interesting to do so, and it would possibly be another point to improve.

WHAT THIS STUDY ADDS

- We report a comprehensive analysis of a neonatal and pediatric specialized transport system.
- Clinical stability improves during transport and there are rather few adverse events reported, although patients are highly complex and severe.
- Effective communication between the transport team and the referring hospital team optimizes the patient care, without impairing the transport team mobilization.
- Patient management suggestions were almost always implemented, independently of the patient's clinical status.
- This study supports the existence of a highly specialized transport system in our country.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

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Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Provenance and peer review

Not commissioned; externally peer reviewed

Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

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References

1. Abecasis F. Transporte neonatal e pediátrico: Organização e perpectivas actuais. Nascer Crescer 2008;XVII:S162-5.
2. Tobiassen CL. Outcome analysis and quality improvement for inter-hospital transfers of pediatric [thesis]. Long Beach: California State University; 2015.
3. Blakeman TC, Branson RD. Inter- and intra-hospital transport of the critically ill. Respir Care 2013;58:1008-23. doi: 10.4187/respcare.02404.
4. Ajizian SJ, Nakagawa TA. Interfacility transport of the critically ill pediatric patient. Chest 2007;132:1361-7. doi: 10.1378/chest.07-0222.
5. Bellingan G, Olivier T, Batson S, Webb A. Comparison of a specialist retrieval team with current United Kingdom practice for the transport of critically ill patients. Intensive Care Med 2000;26:740-4. doi: 10.1007/s001340051241.
6. Leung KK, Lee SL, Wong MS, Wong WH, Yung TC. Clinical outcomes of critically ill infants requiring interhospital transport to a paediatric tertiary centre in Hong Kong. Pediatr Respirol Crit Care Med 2019;3:28-35.
7. Barry P, Leslie A, Pediatric and neonatal critical care transport. London: BMJ Publishing Group; 2003.
8. Gupta P, Rettiganti M. The quest to optimize pediatric interhospital transport. Pediatr Crit Care Med 2018;19:591-2. doi: 10.1097/PCC.0000000000001539.
9. Macnab AJ, Wensley DF, Sun C. Cost-benefit of trained transport teams: Estimates for head-injured children. Prehosp Emerg Care 2001;5:1-5. doi: 10.1080/10903120190940227.
10. Carvalho L. A regionalização dos cuidados intensivos pediátricos na Região Centro de Portugal: Contributo para a melhoria dos indicadores relacionados com o trauma? Saúde Infant 2010;32:3-4.
11. Departamento de Pediatria, Centro Hospitalar Universitário Lisboa Central. Manuel de transporte inter-hospitalar neonatal e pediátrico. Lisboa: CHULC; 2017.
12. Ministério da Saúde. Despacho nº. 1393/2013. Diário da República. 2ª série, Nº. 16, 23 de janeiro de 2013.
13. American Academy of Pediatrics Committee on Hospital Care. Guidelines for air and ground transportation of pediatric patients. Pediatrics 1986;78:943-50.
14. Droogh JM, Smit M, Absalom AR, Ligtenberg JJ, Zijlstra JG. Transferring the critically ill patient: Are we there yet? Crit Care 2015;19:62. doi: 10.1186/s13054-015-0749-4.
15. Qiu J, Wu XL, Xiao ZH, Hu X, Quan XL, Zhu YM. Investigation of the status of interhospital transport of critically ill pediatric patients. World J Pediatr 2015;11:67-73. doi: 10.1007/s12519-015-0004-8.
16. Ministério da Saúde. Portaria nº. 82/2014. Diário da República. 1ª série, Nº. 71, 10 de Abril de 2014.
17. Fanara B, Manzon C, Barbot O, Desmettre T, Capellier G. Recommendations for the intra-hospital transport of critically ill patients. Crit Care 2010;14:R87. doi: 10.1186/cc9018.
18. Ramnarayan P, Dimitriades K, Freeburn L, Kashyap A, Dixon M, Barry PW, et al. Interhospital transport of critically ill children to PICUs in the United Kingdom and Republic of Ireland: Analysis of an international dataset. Pediatr Crit Care Med 2018;19:e300-1. doi: 10.1097/PCC.0000000000001506.
19. Mata S, Escobar M, Cabrerizo M, Gómez M, González R, López-Herce Cid J. Pediatric and neonatal transport in Spain, Portugal and Latin America. Med Intensiva 2017;41:143-52. doi: 10.1016/j.medin.2015.12.013.
20. Orr RA, Felmet KA, Han Y, McCloskey KA, Dragotta MA, Bills DM, et al. Pediatric specialized transport teams are associated with improved outcomes. Pediatrics 2009;124:40-8. doi: 10.1542/peds.2008-0515.
21. Almeida HN,, Rodrigues G, Correia M, Carvalho A, Sequeira JS. Transporte inter-hospitalar em pediatria. Acta Med Port 1996;9:163-6.

Transporte Inter-Hospitalar Pediátrico: Quem e Como Transportamos no Sul de Portugal

Introdução: O transporte inter-hospitalar pediátrico permite que uma equipa qualificada transporte um doente crítico para uma unidade de cuidados intensivos. Portugal tem, desde 2012, um sistema de transporte inter-hospitalar pediátrico com cobertura nacional.

Métodos: Estudo observacional de dados colhidos prospectivamente (características do doente e transporte) da atividade do inter-hospitalar pediátrico sul durante 2 anos. As sugestões diagnósticas / terapêuticas foram analisadas no último ano.

Resultados: Realizados 1243 transportes, 93% urgentes, 53% neonatais, 61% do sexo masculino, mediana de idade mediana 23 meses (mínimo 0 dias, máximo 18 anos), mediana de peso 3,21 kg (mínimo 0,49 kg, máximo 101 kg). Em 66% o hospital de referenciação foi do grupo I, II ou equivalente. A mediana da duração total do transporte foi 100 minutos, com mediana de tempo até à chegada e estabilização no local de 30 minutos. Os transportes planeados duraram em média mais 30 minutos (p = 0,015) do que os urgentes. A indicação mais frequente foi a insuficiência respiratória (25%). Antes do transporte, 593 (48%) doentes estavam instáveis. Durante o transporte houve melhoria clínica em 7% (p = 0,008), agravamento em 49 (4%) e complicações em 74 (6%). Dois doentes morreram (0,2%). Foram necessários procedimentos e/ou terapêuticas em 99% e 76% dos transportes, de suporte avançado de vida em cerca de metade. Foram dadas sugestões diagnósticas / terapêuticas em 40% dos transportes e cumpridas 92%, independente da estabilidade clínica do doente (p = 0,622).

Discussão: O transporte inter-hospitalar pediátrico sul transporta doentes complexos e graves, com elevada qualidade. O volume de transportes, a estabilidade clínica e os poucos eventos adversos justificam um sistema de transporte pediátrico especializado.

Palavras-chave: Adolescente; Criança; Equipe de Assistência ao Paciente; Estado Terminal; Lactente; Portugal; Pré-Escolar; Recém-Nascido; Transferência de Pacientes/estatística & dados numéricos; Transferência de Pacientes/métodos Transferência de Pacientes/organização & administração; Transporte de Doentes