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FACULTAT DE MEDICINA

DEPARTAMENT DE PEDIATRIA, OBSTETRÍCIA, GINECOLOGIA I DE MEDICINA PREVENTIVA I SALUT PÚBLICA

Doctorat en Pediatria, Obstetrícia i Ginecologia

DESIGN AND EVALUATION OF A NEW PAEDIATRIC PRETRANSPORT RISK SCORE

Tesi per optar al grau de Doctor en Medicina

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2018

ACKNOWLEDGEMENTS

To Dr. Antonio Moreno Galdó and Dr. Cèsar W. Ruiz Campillo who have been extremely supportive since the very beginning of this research project and gave me all their knowledge and experience to make it happen.

To Dr Pedro Dominguez Sampedro, who allowed me to discover the field of paediatric emergency transport, and without whom I would not be who I am today.

To my daughter Abril and my wife Elisabet, the love of my life, who have been next to me during the countless hours I have dedicated to accomplish this project.

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INTRODUCTION

1. INTRODUCTION

Standards of medical care given to critically ill paediatric patients have changed dramatically over the last decades since the first establishment of paediatric intensive care units (PICU). With the advance in technology and development of new medical therapies, intensive care physicians are now able to offer more sophisticated critical care that has reduced significantly the morbidity and mortality of critically ill paediatric patients (1–4). This highly specialised health care system is costly and therefore most countries have decided to reduce the number of tertiary PICUs in order to concentrate medical expertise, technology and resources (5). As a consequence of this reorganization, and in order to offer the same care to all the population independently of where they live, the role of the interhospital transport system has become essential in order to guarantee the same clinical outcomes. Many tertiary paediatric centres in northern Europe and USA have their own specialised transport teams that are specifically equipped to manage critically ill children during interhospital transport, as it has shown to improve clinical outcomes. These teams have become extensions of tertiary centre PICUs to provide stabilization and highly specialised paediatric critical care at the referring hospital and while on route.

Patients are frequently transferred because of either a lack of locally available paediatric expertise or a need for more advanced on-going paediatric care. Previous transport studies have found that children are often undertreated by the referring facility (6). Only a minimal percentage of the patients transported by adult providers are paediatric and often are not acutely ill (7). Because of the often-misconceived

notion of the golden hour and its extrapolation to critical patients in general, adult emergency medical services providers tend to operate with a ''scoop and go'' mentality, focusing on speed of transport rather than goal-directed care (7). However, there is an increasing body of literature that supports the premise that early goal-directed therapy improves outcomes in many adult as well as paediatric illnesses, such as septic shock, head injury, and trauma (7,8). Nevertheless, accumulating evidence supports the premise that speed of transport is not as important as stabilization before transport, knowledge of hemodynamic physiologic changes during transport, and early use of critical care monitoring systems (9).

To improve outcomes among paediatric transported patients, recent evidence-based recommendations and guidelines have been proposed to aid policymaking and medical control decision making (10–12).

Many studies have shown that specialised paediatric retrieval teams are associated with better clinical outcome and less complication during interhospital transportation (13–17). Britto et al, also demonstrated that patients that were transported by specialised retrievals teams had a significant reduction of severity during transport before their arrival to the referring hospital and this tendency was still present on arrival at their destination. In addition, patients that were transported by specialised paediatric retrieval teams were associated with rapid initiation of therapeutic interventions both by the referring team and also by the specialised paediatric retrieval team to help stabilise the patient before the transfer (14).

Ramnarayan and colleagues (16) published in 2010 a very interesting study where out of the nearly 60000 paediatric patients admitted in a PICU, the risk adjusted mortality

rate was lower in patients transferred from other hospitals than those admitted from other internal facilities (OR: 0.65, 0.53–0.80). When they looked at possible explanations justifying such observation, they suggested it was due to those transports from other hospitals were done by specialist retrieval teams. In fact, those patients transported by specialised teams had higher survival rate compared with those transferred by non-specialist teams (13729 vs 3146, (OR: 0.58, 0.39–0.87)). Other studies have reported similar findings (18) (19).

1.1.   The Catalan paediatric interhospital transport model

In Catalonia, there is a specialised paediatric interhospital service since 1995. The model was based in 3 paediatric interhospital transport teams, based at three tertiary centres in Barcelona, that could provide specific paediatric and neonatal care during stabilization and transport to other units around an extension of 31.932 Km^2 and around 1.2 million paediatric population (<16 years old). The transport health care model included two ground units, based at Vall d'Hebron University Hospital and Sant Joan de Déu Hospital, and one air team based in Sant Pau Hospital. Each ground Unit usually covers about 45% of all patients, whereas the Air team only covers the left 10%. An Emergency Coordinator Call Centre, that centralised all the calls from referring units, coordinated the three teams. The Emergency Coordinator Call Centre was also the designated body that coordinated the adult emergency transport service and other non-medicalised transport services. Therefore, once a call is received from any referring hospital, the Emergency Coordinator call centre evaluates which resource is needed depending on the clinical needs and geographical data for each case (20).

The composition of the specialist paediatric retrieval team varies in different health care systems (10). The specialist paediatric retrieval team in our health care system consists of one paediatric emergency medical technician, one nurse with several years of paediatric critical care experience and skill training in transport medicine, and a paediatric consultant specialist in paediatric critical care or emergency medicine. This setting assures not only the chance of stabilising the critically ill child on site before transfer similarly as any standard ICU, but also helping the referring team before transport providing guidance to caregivers from the local hospital.

1.2. Paediatric emergency and transport scoring systems

Determining the most appropriate destination and equipment for the referred paediatric patients is difficult, since it relies on the clinical information obtained during the first telephone conversation with the coordinator centre. Sometimes, the referring centre's physicians are not necessarily paediatricians, or maybe if they are, they might not be accustomed to assessing the severity of paediatric illness and therefore, this can complicate transport decisions. All of these factors might have an impact on the patient's clinical outcome.

For that reason, the use of a standardised scoring system might be useful to stream the decision making process, starting from a more accurate and focused clinical assessment at the referring centre, which might lead to better selection of which transport resource needs to be used, and also could help choosing the most adequate final destination for each patient.

A useful severity of illness index for a given setting should have several properties, including relative simplicity, data availability, clinical credibility, and validity (21).

The use of standardised scoring systems using clinical variables is widely spread in paediatric Accident and Emergency (22, 23), in paediatric wards (24, 25), neonatal intensive care (26–31) and Paediatric Intensive Care (32–42), and over the last decades many have been designed and validated in these settings. There are also some standardised score systems designed to predict clinical outcomes in interhospital transport (37, 43–49). (See Table 1a and Table 1b).

Table 1a. Summary of Scoring systems used in Accident and Emergency and Intrahospital transfers.

Score	Setting	Group Age	Moment of Assessment	Endpoints
PEAT(22)	Emergency	Paediatric	Emergency Department: the time of patient triage	Level of care provided in the emergency department
RePEAT(23)	Emergency	Paediatric	Emergency Department: the time of patient triage	Length of stay (LOS) and Emergency Department costs
PEWS(24)	Intra-Hospital	<18 years	Admitted to a hospital ward	Probability of Cardiopulmonary arrest
Brighton PEWS(25)	Intra-Hospital	<18 years	Admitted to a hospital ward	Probability of Cardiopulmonary arrest

Table 1b. Summary of Scoring systems used in intensive care units.

Score	Setting	Group Age	Moment of Assessment	Endpoints
PIM(30)	PICU	Paediatric	At the time of admission	Mortality
PIM 2(31)	PICU	Paediatric	At the time of admission	Mortality
PRISM(27)	PICU	Paediatric	At the time of admission	Mortality
PELOD(28)	PICU	Paediatric	PICU Admission	Number of organ failures
PELOD-2(29)	PICU	Paediatric	PICU Admission	Number of organ failures
TISS(26)	PICU	Paediatric	PICU admission	Number and sophistication of therapies as a surrogate for severity of illness.
Neonatal Stabilisation Score (34)	NICU	Preterm <1Kg	NICU Admission	Mortality
"Transport Score" (23, 35)	NICU	Preterm	After stabilization by the hospital-of-origin	Mortality
SNAP(41)	NICU	Neonates	NICU first 24 h	Mortality, morbidity, and resource use
SNAP II and SNAPPE-II(42)	NICU	Neonates	NICU first 12 h	Mortality
CRIB(32)	NICU	Preterm Neonates	NICU first 12 h	Mortality and Morbidity

CRIB II(40)	NICU	Preterm Neonates	NICU first 12 h	Mortality
Child Health and Human Development network mortality(36)	NICU	Preterm Neonates 501 to 1500 grams	NICU Admission	Mortality
TRIPS II(38)	NICU	Neonate	NICU Admission	Mortality
Berlin Score(39)	NICU	Preterm Neonate below 1500 g	NICU Admission	Mortality

For neonatal transport there are 3 scores, MINT (43) , TRIPS(37) and MCRIB (33) that have been validated to predict risk of mortality after transport. TRIPS uses a score based on information obtained on arrival at the referring hospital and immediately after arrival at the destination whereas MINT uses information collected on the first referral call. MCRIB uses variables measured in different times during the first contact, on arrival at the referring hospital, before leaving the referring centre and at arrival destination to predict mortality. These three scores are only validated on new-borns and therefore might not be applicable to infants or older children.

The clinical complications during intrahospital transport scores (49) are only validated to predict complications during intrahospital transportations.

Three other scores have been described for paediatric age group patients. The PRISA Score (44), the TRAP Score(45) and the TPEWS score (47) have been validated in children to predict tertiary hospital disposition, but not mortality. PRISA Score and

TPEWS Score are based on information obtained before transport but TRAP uses information collected by the transport team on arrival at the referring hospital.

Similarly, the RSTP Score (46) is the only score that has been described to predict major complications during transport based on information during transport in all group ages (neonates, children and adults).

One of the most used in the adult patients is the Rapid Acute Physiology Score (RAPS) (48) that has shown to be accurate to predict patient's severity of illness and patient's stability before and after transport, but has not been validated in paediatric patients. (See Table 1c.)

Table 1c. Summary of Scoring systems used in transport.

Score	Setting	Group Age	Moment of Assessment	Endpoints
TRIPS(37)	Transport	Neonate	On arrival at the referring hospital and immediately after arrival at the destination hospital	Mortality
MCRIB(33)	Transport	Preterm Neonates	At time of first contact, arrival referring hospital, before leaving referring hospital, arrival destination	Mortality
MINT(43)	Transport	Neonate	First referral call	Mortality
Clinical complications during intra-hospital transports Score(49)	Intra-Hospital Transport	Neonates	Before Transport	Probability of complications during transport
PRISA(44)	Transport	Paediatric	Before Transport	Probability of PICU admission
TRAP(45)	Transport	Paediatric	Transport Team at local hospital	Tertiary hospital disposition

TPEWS(47)	Transport	Paediatric	First referral call	Tertiary hospital disposition
RSTP(46)	Transport	Children, Neonates and Adults	During Transfer	Major complications during transport
RAPS(48)	Transport	Adults	Transport team before and after transfer	Stability during transport

As far as we know there is no standardised score system specifically designed to use pre transport clinical data to predict mortality and tertiary centre disposition. With this study we seek to design and validate a novel Paediatric PreTransport Risk Score (PPTRS) that can be used to predict mortality 48 h after transport, the need for intensive care on admission on the destination hospital that can be used in all paediatric patients, from preterm to children < 16 years.

HYPOTHESIS

2. HYPOTHESIS

Primary Hypothesis:

1. Using a novel PPTRS is a useful tool to predict mortality after 48 h after transport for all group ages in paediatric patients.

Secondary Hypothesis:

2. Paediatric patients with higher values of PPTRS will have higher mortality rate 48 h after the transport.

3. Paediatric patients with higher values of the PPTRS will have higher proportion of intensive care admission.

4. Patients with higher PPTRS will require higher medical interventions both by the referring hospital team and by the transport team.

2. HYPOTHESIS

AIMS

3. AIMS

1. Design and validate a new PPTRS that can be used to predict the clinical risk of patients transported by Paediatric emergency transport teams.

2. Create a predictive model based on the PPTRS that predicts the mortality 48 h after the transport.

3. Create a predictive model based on the PPTRS that can predict the need for PICU or NICU admission on arrival at the tertiary centre.

4. Study with multivariate analysis if the PPTRS has a significant relationship with the number of medical interventions during transport, both by the referring hospital team and by the retrieval team. The medical interventions included in this study were administration of bronchodilators, intubation and mechanical respiratory support, pleural drain placement, use of surfactant and inhaled nitric oxide, peripheral, umbilical, central venous and arterial line access, use of volume expanders, infusion of inotropic or vasoactive drugs, intraosseous access, cardiopulmonary resuscitation (CPR) and defibrillation, administration of antiepileptic drugs and use of cervical collar.

PATIENTS AND METHODS

4. PATIENTS AND METHODS

4.1. Study Design

We designed a prospective observational study of paediatric patients transported by the paediatric transport retrieval team of Vall d'Hebron Hospital (SEM-P VH)) since to 1st of October 2010 until 30th July 2017

4.1.1. Target Population

The study population included all paediatric patients, from 0 days of life to 16 y old that were transported by our SEM-P VH. The areas that were covered by our unit included patients from Catalonia, Andorra and Balearic Islands.

4.1.2. Inclusion and Exclusion Criteria

4.1.2.1. Inclusion Criteria

We included in this study all paediatric transfers that were assigned to our SEM-P VH unit during the time of our study. That included patients that were never transported because they died before our team could arrive to the referring centre.

4.1.2.2. Exclusion Criteria

We excluded activations that were done to escort the mother with high risk of delivery during transport.

We also excluded those patients that was not possible to completely calculate the PPTRS or that it was not possible to know relevant outcome variables.

4.1.3. Sample size determination

For this study we used the following formula for the sample size n:

$$n = Z_{\alpha/2}^2 *p*(1-p) / \varepsilon^2,$$

where $Z_{\alpha/2}$ is the critical value of the Normal distribution at α/2. We accepted a confidence level of 95%, with an α error of 0,05, therefore the critical value is 1.96.

For this study we hypothesized, from previous studies and a pilot study done in our population that the mortality rate for transported paediatric patients around 2% (p= 0.02).

We decided a level of precision of 1%; therefore our ε was set at 0,01.

Applying the previous formula our expected sample population was 753 patients.

4.1.4. Data collection

Since 2008, SEMP-VH implemented a specifically designed database in order to collect all demographic and clinically relevant variables during all transport phases. The retrieval team routinely records information since the activation call, during clinical evaluation at the moment of arrival of our Paediatric Transport Team, before leaving the referring hospital, on route and at the tertiary centre. (See SEMP-VH Clinical database in Annexes). The clinical database also included all the medical interventions that were performed during the transport service and by whom, either the local team or the transport team, and the clinical diagnosis. Finally, 48 h after the transport, the same physician was responsible to document the clinical follow-up of the patients (dead or alive) and also their clinical situation.

4.2.   Score development

The PPTRS was designed to include all clinically relevant variables that had been reported in other published studies, like systolic blood pressure, respiratory rate, oxygen requirement, and neurological status. Other potentially useful variables were added based on expert opinion at our institution. The selected variables were chosen to evaluate the clinical situation of the patient similarly to the ABCDE approach. The score evaluates the breathing pattern and respiratory status, the cardiocirculatory system, neurological status, renal function and general metabolic situation and finally the body temperature. We decided to adjust the final value for the score depending on the group age. The agreed upon tool contained ten components, each worth 0 to 2 points. The final pretransport paediatric transport-scoring tool with all combined clinical fields ranged from a score of 0 to 20, with 20 representing the most abnormal physiologic variables (See Table 2). We decided to use a non-risk adjusted score.

The proposed score variables were obtained from the first activation phone call before leaving our centre. Any missing information was asked for and obtained from the patient's clinical notes at arrival to the referring centre.

Table 2. Paediatric pretransport risk score.

Variable	Age Subgroup	Value of the score		
		0	**1**	**2**
Respiration	All ages	Normal	Respiratory distress or Apnoea	Invasive Ventilation or CPAP or High Flow Nasal Oxygen
Pulse Oximetry	Child and Term neonate	≥ 95% with FiO_2 = 0.21	≥ 95% with FiO_2 > 0.21	< 95% with FiO_2 > 0.21
	Preterm neonate	≥ 88% with FiO_2 0.21	≥ 88% with FiO_2 > 0.21	< 88% with FiO_2 > 0.21
Peak Inspiratory Pressure	Child and Term neonate	< 25 cm H_2O	≥ 25 - < 35 cm H_2O	≥ 35 cm H_2O
	Preterm neonate	< 20 cm H_2O	≥ 20 - < 25 cm H_2O	≥ 25 cm H_2O
Systolic Blood Pressure	Child and Term neonate	Normal[1]	Normal with volume and/or inotropic drugs	Hypotension (with or without volume or drugs)
	Preterm neonate	Normal (≥ 40 mmHg)		
Consciousness	Child	Glasgow ≥ 14	Glasgow 9-13	Glasgow ≤ 8
	Term or Preterm neonate	Normal	Depressed or Irritable	No response or Abnormal movements
Pupils	All ages	Normal	Anisocoria	Fixed mydriasis
Diuresis	All ages	Spontaneous	Present with diuretics	Absent (with or without diuretics)
Standard Base Excess	Child	≥ -5 mEq/L	(≥-15)- (<-5) mEq/L	< -15 mEq/L
	Term or Preterm neonate	≥ -8 mEq/L	(≥-15) – (<-8) mEq/L	< -15 mEq/L
Glucose	All ages	≥ 60 - < 250 mg/dL	≥ 40 - < 60 mg/dL or ≥ 250 - < 400 mg/dL	< 40 mg/dL or ≥ 400 mg/dL
Temperature[2]	Child	≥ 36 - < 38 ºC	≥ 35 - < 36 ºC or ≥ 38 - < 39 ºC	< 35 ºC or ≥ 39ºC
	Term or Preterm neonate	≥ 36 - < 37.5 ºC	≥ 32 - < 36 ºC or ≥ 37.5 - < 38 ºC	< 32 ºC or ≥ 38ºC

1. Definitions of normal blood pressure are age dependent (See Definition of dependent and independent variables); 2. Temperature was measured in the axilla.

4.3. Definitions of dependent and independent variables

4.3.1. Independent Variables

Continuous independent variables were age (years), weight (Kg), number of total medical interventions as the sum of all interventions performed either by referring hospital team or by retrieval team, number of physiologic compromises detected on arrival at the referring hospital, Paediatric Pretransport Risk Score (0-20).

In order to facilitate the score calculation, some continuous variables were transformed into categorical variables:

Group Age:

Preterm: < 37 GW and <= 30 days.

Term neonates: More than 37 GW and <=30 days old.

Child: >30 days old.

Systolic Blood Pressure:

Systolic Blood pressure was transformed into a new variable called Hypotension depending on the proposed criteria: (50)

Preterm Neonates <1 day: Systolic Blood Pressure <40 mmHg.

Preterm Neonates 1-30 days: Systolic Blood Pressure <60 mmHg.

Neonates <30 days: Systolic Blood Pressure <60 mmHg.

Infants from 30-365 days: Systolic Blood Pressure <70 mmHg.

Children from 1 -10 years: Systolic Blood pressure < 70+(2+AgeYears))).

Children > 10 years: Systolic Blood Pressure <90).

Other variables included in the analysis were:

Need for immediate surgical intervention: Yes/No

Main pathological group:

Group 1: Preterm

Group 2: Respiratory

Group 3: Cardiac

Group 4: Central Nervous System

Group 5: Traumatic

Group 6: Renal-Metabolic

Group 7: Others.

The PPTRS was transformed into a categorical variable to help understanding the clinical relevance of the logistic regression results and also to simply constructing the table with predicted probabilities and relative risks:

Group 0: 0-3 Points

Group 1: 4-6 Points

Group 2: 7-9 Points

Group 3: 10-12 Points

Group 4: >12 Points.

Transport intervals were based on standard Emergency Medicine Society definitions (51), including:

Response interval: time from first call activation to arrival to the referring hospital.

Stabilization time: time from arrival to referring hospital to leaving the referring hospital.

Transport interval: time leaving the referring hospital to arrival at the receiving hospital.

Total transport interval: time from activation call received to arrival at the receiving hospital.

The transport team at arrival evaluated the severity of patients by identifying the total number of physiological compromises (airway, respiratory, cardiocirculatory, neurological, metabolic and others) and also with a subjective description of clinical situation of the patient (stable, mild compromise, severe compromise, dead) that was re-evaluated at arrival, before leaving and at arrival of destination hospital.

4.3.2. Dependant Variables

Primary dependant variables were studied into different categories.

Clinical Status 48 h after transport

0. Alive and discharged

1. Alive and admitted

2. Dead.

Binary clinical status 48 hours after transport

0. Alive

1. Dead

Secondary endpoint dependant variables also included were:

Intensive Care Unit admission (0.No / 1.Yes)

Administration of Nebulisers (0.No / 1.Yes)

Tracheal intubation (0.No / 1.Yes)

Insertion of pleural drain (0.No / 1.Yes)

Administration of surfactant (0.No / 1.Yes)

Use of inhaled Nitric Oxide (0.No / 1.Yes)

Insertion of peripheral cannula (0.No / 1.Yes)

Insertion of umbilical vein catheter (0.No / 1.Yes)

Insertion of central vein catheter (0.No / 1.Yes)

Insertion of an arterial catheter (0.No / 1.Yes)

Use of volume expanders (0.No / 1.Yes)

Use of inotropic drugs (0.No / 1.Yes)

Insertion of Intraosseous catheter (0.No / 1.Yes)

Cardiopulmonary massage for cardiac arrest (0.No / 1.Yes)

Defibrillation shock (0.No / 1.Yes)

Administration of antiepileptic drugs (0.No / 1.Yes)

Use of cervical collar (0.No / 1.Yes)

4.4.   Statistical Analysis

4.4.1. Data analysis and data cleansing

All the clinical data was extracted from the clinical database and analysed in order to identify possible impurities of relevant clinical data and also detect missing cases.

4.4.2. Statistical Analyses

Descriptive statistics were performed in order to study their distribution and detect any possible outliers and expressed in total number and percentage for categorical variables and in median (range) or mean ± standard deviation (SD) when appropriate. The univariate analysis was performed using either Chi-square and Fisher's Exact Test for categorical data and Student's T Test or ANOVA for continuous variables. In all analyses, statistical significance was set up at $p < 0.05$. Subsequently, in order to evaluate the primary endpoint of this thesis, a univariate logistic regression analysis was performed to evaluate the relationship between all predictor variables (group age, main pathological group, need for urgent surgical intervention, Paediatric PreTransport Risk Score) and the clinical status at 48 h. All variables with a $p<0.2$ and those that were deemed clinically relevant despite higher p values were then entered into a multivariate analysis with logistic regression.

Also, the same analysis was performed to study our second endpoint, in order to analyse the relationship with the Paediatric Pre Transport Risk Score and the hospital disposition at arrival.

Finally, we used the selected models to predict the estimated prevalence of death and admission in ICU for all the possible relevant variable combinations. We also

estimated the Relative Risk of each combination of variables compared with the group that had the lowest estimated prevalence of death and admission in ICU.

The predictive performance of these 2 models was evaluated in several ways. The R^2 of the model provides a measure of the percentage of the variability in the outcome that is accounted for by the predictors. Calibration, or fit, was evaluated by comparing observed vs expected numbers of each outcome using the Hosmer-Lemeshow goodness-of-fit test and discrimination was measured by the area under the curve using receiver operating characteristic (ROC) curve.

Similarly, logistic regression analysis was performed to study the relationship between the proposed risk score and the medical interventions performed by the retrieval transport team either on arrival at the referring hospital or during transport. The medical interventions included in this study were administration of bronchodilators, intubation and mechanical respiratory support, pleural drain placement, use of surfactant and inhaled Nitric Oxide, peripheral, umbilical, central venous and arterial access, use of volume expanders, infusion of inotropic drugs, intraosseous access, cardiopulmonary resuscitation and defibrillation, administration of antiepileptic drugs and cervical collar.

In all analyses, statistical significance was established using an alpha of 0.05. Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 20.0, Armonk. NY: IBM Corp.

RESULTS

5. RESULTS

5.1. Data Availability and Reliability

Out of a total of 4292 patients initially entered into our database, 854 (19.8%) cases were excluded leaving a total of 3439 patients for the final analysis.

The main reason for exclusion was missing data in the variables necessary to calculate the score or in the outcome variables. The number of missing data was different depending on the variables. Table 3 shows the missing data for each independent variable on the score and also on the main outcome variables.

Table 3. Missing Data. Results are presented for each variable, with total number of valid cases and also the total number of missing for each variable.

	Valid	Missing
Age Group	4277	15
Pathological Group	4290	2
Urgent Need for Surgery	3776	516
Breathing Pattern Score	3758	534
Pulse Oximetry Score	3674	618
Peak Inspiration Pressure Score	3693	599
Systolic Blood Pressure Score	3671	621
Consciousness Level Score	3710	582
Pupil Score	3690	602
Diuresis Score	3689	603
Standard Base Excess Score	3673	619
Glucose Score	3667	625
Temperature Score	3674	618
Referring Department	4092	200
Clinical Outcome 48 h post Transport	3900	392

5.2. Demographic characteristics of the population

A summary of the demographic characteristics of our study population is represented in Table 4. The age distribution demonstrated that 1597 (46.4%) of our patients were neonates, with 503 (14.6%) of them that were preterm neonates. The rest of the cohort, 1842 (53.6%), were children.

Table 4. Demographic characteristics with total and percentage for each variable.

Variable name		Frequency	Percent	Cumulative Percent
Age Group	Preterm neonate	503	14.6	14.6
	Term neonate	1094	31.8	46.4
	Paediatric	1842	53.6	100.0
	Total	3439	100.0	
Pathological Group	Preterm	311	9.0	9.0
	Respiratory	1402	40.8	49.8
	Cardiac	378	11.0	60.8
	CNS	716	20.8	81.6
	Trauma	164	4.8	86.4
	Renal-Metabolic	163	4.7	91.1
	Others	305	8.9	100.0
	Total	3439	100.0	

CNS: Central nervous system.

The main pathological group of our cohort was respiratory with 1402 patients (40.8%), followed by neurological causes with 716 patients (20.8%) and cardiac, with 378 patients (11.0%).

Median weight was 4.0 kg (0.5-97). The weight distribution demonstrated a strong skewness (2.7) and kurtosis (9.6). The distribution of weight was light-tailed relative to a normal distribution.

Figure 1. Boxplot of weight distribution in kg.

Referring and destination hospital and the total number of transports for each hospital are represented in Table 5a and Table 5b respectively.

Table 5a. List of Referring Hospital by region showing the total number of patients and percentage for each hospital.

Region	Hospital	Count	%
Andorra	H. Andorra	12	0.3
	Total	12	0.3
Barcelona Ciutat	C. Del Remei	11	0.3
	C. CIMA	15	0.4
	C. Corachan	36	1.0
	C. Diagonal	17	0.5
	C. Sagrada Família	46	1.3
	C. Sant Jordi	6	0.2
	CAP Besòs	1	0.0
	CAP Ciutat Meridiana	2	0.1
	CAP Maragall	2	0.1
	CAP Numància	2	0.1
	CAP Ripollet	1	0.0
	CAP Xafarines	1	0.0
	C. Pilar	44	1.3
	C. Delfos	12	0.3
	H. Dexeus	18	0.5
	Home	10	0.3
	School	1	0.0
	Fundación Puigvert	2	0.1
	H. Quirón	79	2.3
	H. Barcelona	4	0.1
	H. Clínic	19	0.6
	H. Mar	56	1.6
	H. Sagrat Cor	4	0.1
	H. Sant Pau	35	1.0
	HUVH	145	4.2
	H. Sant Joan de Déu	2	0.1
	H. Casa Maternitat	138	4.0
	H. de Nens Barcelona	48	1.4
	RACC	4	0.1
	C. Teknon	22	0.6
	Total	783	22.8
Barcelonès Nord i Maresme	H. Badalona	3	0.1
	H. Calella	126	3.7
	H. Germans Trias i Pujol	100	2.9
	H. Mataró	126	3.7
	H. de l'Esperit Sant	52	1.5
	Total	407	11.8

Centre	C Sant Josep Manresa	7	0.2
	H. Manresa	76	2.2
	H. Berga	14	0.4
	H. Mollet	56	1.6
	H. Parc Taulí	34	1.0
	H. Sant Celoni	4	0.1
	H. Granollers	81	2.4
	H. Terrassa	84	2.4
	H. Vic	104	3.0
	H. General de Catalunya	37	1.1
	Mútua Terrassa	83	2.4
	Total	580	16.9
Costa de Ponent	Aeroport	45	1.3
	Bellvitge	5	0.1
	H. Viladecans	7	0.2
	H. Vilafranca	55	1.6
	H. General de l'Hospitalet	41	1.2
	H. Igualada	82	2.4
	H. Sant Boi	173	5.0
	H. Sant Camil	86	2.5
	H. Sant Joan de Déu (HSJD)	115	3.3
	HSJD Martorell	50	1.5
	Total	659	19.2
Girona	C. Girona	2	0.1
	Clínica St. Caterina	10	0.3
	H. Figueres	64	1.9
	H. Josep Trueta	63	1.8
	H. Palamós	94	2.7
	H. Campdevànol	24	0.7
	H. Olot	26	0.8
	H. Comarcal de la Selva	24	0.7
	Total	307	8.9
Illes Balears	H. Eivissa	1	0.0
	H. Son Dureta	4	0.1
	Total	5	0.1
Lleida	Clínica Aliança Lleida	1	0.0
	H. La Seu	8	0.2
	H. Puigcerdà	13	0.4
	H. Lleida	128	3.7
	H. Tremp	18	0.5
	Total	168	4.9
Tarragona	H. Joan XXIII	167	4.9

	H. Vendrell	73	2.1
	H. Sant Joan de Reus	119	3.5
	H. Pius de Valls	46	1.3
	St. Pau Tarragona	24	0.7
	Total	429	12.5
Tortosa	H. Móra d'Ebre	21	0.6
	H.Tortosa	55	1.6
	Total	76	2.2
Others	Others	13	0.4
	Total	13	0.4
Total	**Total**	**3439**	**100**

The distribution of referring regions demonstrated that the majority of the patients were transferred from Barcelona metropolitan area followed by the region of Catalonia Centre and Tarragona. This distribution is consistent with the density of population.

Table 5b. List of receiving hospitals with the number of patients and percentage.

Receiving Hospital	Count	%
Aeroport	4	0.1
Bellvitge	1	0.0
C. Girona	1	0.0
C. Corachan	4	0.1
C. Guttmann	6	0.2
Creu Roja	1	0.0
Dexeus	25	0.7
H. Manresa	24	0.7
H. Figueres	4	0.1
H. Joan XXIII	78	2.3
H. Josep Trueta	162	4.7
H. Palamós	1	0.0
H. Parc Taulí	386	11.2
H. Quirón	3	0.1
H. Barcelona	6	0.2

H. Clínic	16	0.5
H. Germans Trias i Pujol	75	2.2
H. Granollers	28	0.8
H. Igualada	6	0.2
H. Lleida	33	1.0
H. Mar	4	0.1
H. Mataró	14	0.4
H. Sagrat Cor	1	0.0
H. Sant Pau	249	7.2
H. Tarragona	18	0.5
H. Terrassa	7	0.2
H. Tortosa	9	0.3
H. Vic	8	0.2
H. General de Catalunya	21	0.6
H. Sant Joan de Déu (HSJD)	1014	29.5
HSJD Martorell	1	0.0
HUVH	983	28.6
H. Casa Maternitat	223	6.5
Mútua Terrassa	12	0.3
C. Teknon	2	0.1
Others	9	0.3
Total	**3439**	**100**

Destination hospitals were mainly tertiary hospitals in Barcelona with 1997 patients (58.1%) transferred to either Vall d'Hebron University Hospital (983 (28.6%)) or Hospital Sant Joan de Déu (1014(29.5%)). A total of 386 patients (11%) were transferred to Hospital Parc Taulí followed by Hospital de Sant Pau and Hospital Maternitat that received 249 (7.2%) and 223 (6.55) respectively. Only a small number of patients were transferred to tertiary centres outside Barcelona Metropolitan area with 162 patients (4.7%) transferred to Hospital Dr. Josep Trueta at Girona and 72 (2.3%) to Hospital Joan XXIII at Tarragona. For hospitals where ground transport was not possible, air transport was arranged and patients were transported to the airport.

The predominant clinical diagnosis in our cohort of patients was acute bronchiolitis with 562 patients (16.3%), followed by acute respiratory distress at birth with 159 patients (4.6%) and seizures with 193 patients (5.6%). The complete list of main diagnosis is presented in the Annexes - **Table 1**.

5.3.   Evaluation of the severity of the patients

The median number of physiological compromises detected by the transport team at arrival was 1 (0-6) per patient, 260 (7.6%) patients were diagnosed with airway compromise, 1717 (49.9%) respiratory, 584 (17.0%) cardio circulatory, 878 (22.9%) neurological, 324 (9.4%) metabolic and 301 (8.8%) had other compromises.

The overall clinical situation of the patient during the transport improved in 644 (18.7%) patients, remained stable in 2724 (79.2%), deteriorated in 55 (1.6%) and 16 (0.5%) died before arriving at the receiving centre. Table 7 shows the distribution of patients depending on the number of physiological compromises.

Table 7. Distribution of number of physiological compromises

Number of physiological compromises	Frequency	Percent	Cumulative Percent
0	590	17.2	17.2
1	2092	60.8	78.0
2	505	14.7	92.7
3	169	4.9	97.6
4	56	1.6	99.2
5	22	.6	99.9
6	5	.1	100.0
Total	**3439**	**100.0**	

Table 8 shows a summary of admission to intensive care unit, urgent need for surgery and mortality evaluated in different moments at the end of transport and also 48 h after transport.

Table 8. Description of the severity of patients.

Description of severity		Count	%
Admission to Intensive Care at the Receiving hospital	No ICU	1012	29.4%
	ICU	2344	68.2%
	Total	3356	100.0%
Department at the Receiving Hospital	NICU	1303	37.9%
	PICU	1041	30.3%
	Emergency	822	23.9%
	Paediatric Ward	56	1.6%
	Neonatal Ward	132	3.8%
	Burns Unit	2	.1%
	Total	3356	100.0%
Urgent Need for Surgery?	No	3274	95.2%
	Yes	165	4.8%
	Total	3439	100.0%
Clinical Outcome at End of Transport	Alive	3417	99.4%
	Dead	22	.6%
	Total	3439	100.0%
Clinical Outcome 48 h post Transport	Alive	3374	98.1%
	Dead	65	1.9%
	Total	3439	100.0%

ICU: Intensive care unit

In our population, the majority of patients, 2344 (68.2%), were admitted into intensive care units at their receiving hospitals.

Only 165 (4.8%) patients were felt to need urgent surgery before transport at the receiving hospital.

Table 9 summarises the patients that died in our cohort.

The overall mortality at the end of transport was 0.5%. with 16 patients that died at the time of arrival at the destination hospital. A total of 65 (1.9%) of the patients died after 48 hours of the transport.

The mortality rate for neonates was 2.8% (44/1553) and 1.1% in for the children (21/1821) and this difference in crude mortality was statistically significant (Chi-Square: 12.033; p=0.001)

Out of the 65 patients. 6 were preterm neonates. 38 were term new-borns and 21 were infants. Only 8 patients required urgent surgery before transport. All patient that arrived at the receiving centre were admitted in the intensive care unite except 2 patients. The main pathological group was for cardiac causes in 20(30.7%) patients. 20 (30.7%) for central nervous system causes and 12(18.5%) patients were for respiratory causes. Table 9 summarizes the demographic characteristics and the main clinical diagnosis of the patients that died.

Table 9. Clinical details of deceased patients

Case Number	Age Group	Age	Weight(kg)	Pathological Group	Urgent Need for Surgery?	Paediatric PreTransport Risk Score	Number of Physiologic Compromises	Number of Medical Interventions by Referring Hospital	Number of Medical Interventions by Transport Team	Total Number of Medical Interventions	Clinical Progress during Transport	Clinical Outcome Endo of Transport	Receiving Hospital Department	Clinical Outcome 48 h post Transport	Clinical Primary Diagnosis
1	PreTerm NB	9d	1.46	Preterm	Yes	14	3	5	2	7	Stable	Alive	ICU	Deceased	Neonatal asphyxia
2	Paediatric	2m	1.70	Preterm	Yes	14	6	6	0	6	Deceased	Deceased	.	Deceased	Acute bronchitis
3	PreTerm NB	21d	0.94	Preterm	No	10	5	5	2	7	Worse	Alive	ICU	Deceased	Congenital heart disease
4	PreTerm NB	2h	0.90	Preterm	No	17	2	3	2	5	Better	Alive	ICU	Deceased	Pulmonary valve stenosis
5	PreTerm NB	1h	1.00	Preterm	No	11	3	3	2	7	Better	Alive	ICU	Deceased	Respiratory syncytial virus bronchiolitis
6	PreTerm NB	8h	1.23	Preterm	No	13	3	4	3	7	Stable	Alive	ICU	Deceased	Neonate apnea
7	Term NB	4d	2.50	Respiratory	No	9	4	8	2	11	Stable	Alive	ICU	Deceased	Metabolic acidosis
8	PreTerm NB	10h	1.46	Respiratory	No	6	2	5	1	6	Better	Alive	ICU	Deceased	Neonate apnea
9	Paediatric	1m	2.70	Respiratory	No	7	4	3	3	6	Stable	Alive	ICU	Deceased	Tubercular meningitis
10	Term NB	1d	3.50	Respiratory	No	10	2	5	3	8	Better	Alive	ICU	Deceased	Diabetic ketoacidosis
11	Term NB	1h	3.00	Respiratory	No	17	5	6	4	10	Deceased	Deceased	.	Deceased	Trauma
12	Term NB	1d	2.52	Respiratory	No	4	1	1	0	1	Stable	Alive	ICU	Deceased	Acute bronchitis
13	Term NB	19h	3.45	Respiratory	No	9	2	6	4	10	Deceased	Deceased	.	Deceased	Preterm neonate 750-999 g
14	Term NB	9h	2.80	Respiratory	No	8	2	8	3	11	Deceased	Deceased	.	Deceased	Intestinal obstruction
15	Paediatric	5y	25.00	Respiratory	No	3	2	1	0	1	Better	Alive	No ICU	Deceased	Acute bronchitis
16	Paediatric	2y	12.00	Respiratory	No	13	3	3	3	6	Stable	Alive	ICU	Deceased	Respiratory syncytial virus bronchiolitis
17	PreTerm NB	6h	0.80	Respiratory	No	12	4	1	3	5	Worse	Alive	ICU	Deceased	Meningitis
18	Paediatric	1y	10.00	Respiratory	No	15	4	1	4	1	Better	Alive	ICU	Deceased	Respiratory syncytial virus bronchiolitis
19	Term NB	2d	2.88	Cardiac	No	4	1	3	0	9	Stable	Alive	ICU	Deceased	Acute bronchitis
20	Term NB	1,30h	3.10	Cardiac	No	11	3	3	6	8	Stable	Alive	ICU	Deceased	Acute bronchiolitis
21	Term NB	9d	2.50	Cardiac	No	14	4	1	4	1	Worse	Alive	ICU	Deceased	Hemolytic Disease of the Newborn
22	Term NB	9h	2.60	Cardiac	No	7	0	5	0	8	Stable	Alive	ICU	Deceased	Haemochromatosis
23	Paediatric	1.5m	3.60	Cardiac	No	15	3	1	3	5	Deceased	Deceased	.	Deceased	Neonatal respiratory distress syndrome
24	Term NB	5h	2.60	Cardiac	No	11	2	0	4	3	Deceased	Deceased	.	Deceased	Head trauma
25	Paediatric	5y	15.00	Cardiac	No	9	2	3	0	5	Stable	Alive	ICU	Deceased	Acute bronchiolitis
26	Paediatric	22m	20.00	Cardiac	No	7	0	0	0	0	Deceased	Deceased	.	Deceased	Hypoglycemia
27	PreTerm NB	0h	2.00	Cardiac	No	13	2	5	5	9	Deceased	Deceased	.	Deceased	Preterm neonate 1250-1499 g
28	Paediatric	3m	6.00	Cardiac	No	10	3	5	4	9	Deceased	Deceased	.	Deceased	Sepsis
29	Term NB	28h	3.00	Cardiac	No	14	3	5	4	3	Better	Alive	ICU	Deceased	Febrile convulsions
30	Paediatric	4y	18.00	Cardiac	No	7	1	2	1	6	Stable	Alive	ICU	Deceased	Acute bronchitis
31	Paediatric	0d	5.50	Cardiac	No	15	2	3	3	6	Deceased	Deceased	.	Deceased	Anaphylactic reaction
32	Paediatric	2m	5.50	Cardiac	No	12	1	0	5	0	Deceased	Deceased	.	Deceased	Neonatal respiratory distress syndrome
33	Paediatric	6m	6.00	Cardiac	No	17	5	4	1	9	Deceased	Deceased	.	Deceased	Diabetic ketoacidosis
34	Paediatric	8y	30.00	Cardiac	No	6	1	4	3	6	Deceased	Deceased	.	Deceased	Anaphylactic reaction
35	PreTerm NB	0h	3.05	Cardiac	No	13	4	4	2	6	Deceased	Deceased	.	Deceased	Sepsis
36	Paediatric	9y	24.00	Cardiac	No	9	4	3	5	9	Deceased	Deceased	ICU	Deceased	Pneumonia
37	Term NB	<1h	3.50	Cardiac	No	15	1	1	2	8	Better	Alive	ICU	Deceased	Hypoglycemia
38	Paediatric	2y	12.00	Cardiac	No	17	3	1	6	7	Stable	Alive	ICU	Deceased	Preterm neonat 1000-1249 g
39	Paediatric	2y	10.00	CNS	Yes	10	1	5	0	5	Stable	Alive	ICU	Deceased	Neonatal respiratory distress syndrome
40	Term NB	3d	2.70	CNS	No	6	3	4	0	4	Stable	Alive	ICU	Deceased	Neonatal respiratory distress syndrome
41	Term NB	6d	4.00	CNS	No	7	2	4	0	4	Stable	Alive	ICU	Deceased	Febrile convulsions
42	Paediatric	5y	.	CNS	Yes	10	3	3	2	5	Stable	Alive	ICU	Deceased	Convulsions
43	Term NB	2h	2.50	CNS	No	13	3	6	2	6	Worse	Alive	ICU	Deceased	Sepsis
44	Term NB	2,5h	3.00	CNS	No	14	4	5	1	8	Stable	Alive	ICU	Deceased	Preterm neonate 2500 g
45	Term NB	2h	4.27	CNS	No	9	3	7	2	9	Stable	Alive	ICU	Deceased	Pulmonary hypertension
46	Term NB	4d	2.40	CNS	No	10	4	5	3	8	Stable	Alive	ICU	Deceased	Sepsis
47	PreTerm NB	3d	2.00	CNS	No	13	4	4	2	7	Better	Alive	ICU	Deceased	Status epilepticus
48	PreTerm NB	1h	2.50	CNS	No	12	5	4	1	5	Stable	Alive	ICU	Deceased	Double outlet right ventricle
49	PreTerm NB	38h	2.15	CNS	No	15	3	3	0	4	Better	Alive	ICU	Deceased	Acute myocarditis
50	Term NB	2h	3.50	CNS	No	9	2	3	2	3	Stable	Alive	ICU	Deceased	Acute bronchitis
51	Term NB	0d	5.00	CNS	No	12	2	1	1	2	Better	Alive	ICU	Deceased	Hyperbilirubinemia
52	Term NB	2h	3.00	CNS	No	3	2	1	0	2	Stable	Alive	ICU	Deceased	Acute bronchitis
53	Term NB	5d	3.20	CNS	No	2	1	2	0	4	Stable	Alive	ICU	Deceased	Acute bronchiolitis
54	Paediatric	6y	22.00	CNS	Yes	13	1	4	3	5	Worse	Deceased	.	Deceased	Preterm neonate 2000-2499 g
55	Paediatric	2y	10.00	CNS	No	8	1	4	3	8	Deceased	Alive	No ICU	Deceased	Meconium aspiration syndrome
56	Term NB	1h	3.00	CNS	No	14	1	4	2	5	Stable	Alive	ICU	Deceased	Preterm neonate 2500 g
57	Term NB	2h	3.50	CNS	No	15	2	3	2	6	Better	Alive	ICU	Deceased	Cardiac arrest
58	PreTerm NB	1,5h	1.50	CNS	No	11	0	3	2	5	Stable	Alive	ICU	Deceased	Status epilepticus
59	Paediatric	16m	14.00	Trauma	No	13	6	8	2	10	Worse	Alive	ICU	Deceased	Drug intoxication
60	PreTerm NB	10d	1.90	Renal-Metabolic	No	12	4	4	4	8	Worse	Alive	ICU	Deceased	Acute laryngitis
61	Term NB	1d	3.00	Renal-Metabolic	No	8	3	3	1	3	Stable	Alive	ICU	Deceased	Hypoglycemia
62	PreTerm NB	11d	2.00	Renal-Metabolic	No	12	4	3	2	4	Stable	Alive	ICU	Deceased	Convulsions
63	PreTerm NB	18d	0.85	Others	Yes	13	4	2	1	4	Better	Alive	ICU	Deceased	Sepsis
64	PreTerm NB	14d	1.30	Others	Yes	13	3	3	2	4	Worse	Alive	ICU	Deceased	Sepsis
65	Paediatric	3y	17.00	Others	Yes	5	3	5	2	7	Stable	Alive	ICU	Deceased	Preterm neonate 1500-1749 g

Table 9. Clinical details of deceased patients. Preterm NB: Preterm neonate ;Term NB: Term neonate ;Preterm: Preterm neonate; h: hours; d: days; m: months; y: years; CNS: central nervous system; ICU: Intensive Care Unit

5.4. Description of the paediatric pretransport risk score

Mean PPTRS was 4.55 ± 2.77 with a median of 4.0 (0-17). The risk score distribution also demonstrated skewness (1.14) and kurtosis (1.64) with a light-tailed distribution relative to a normal distribution. Normality test confirmed absence of normal distribution with a Shapiro-Wilk statistic of 0.91 (p < 0.000) and a Kolmogorov-Smirnov statistic of 0.154 (p < 0.000).

Figure 2 shows the distribution of the paediatric pre transport risk score in our population.
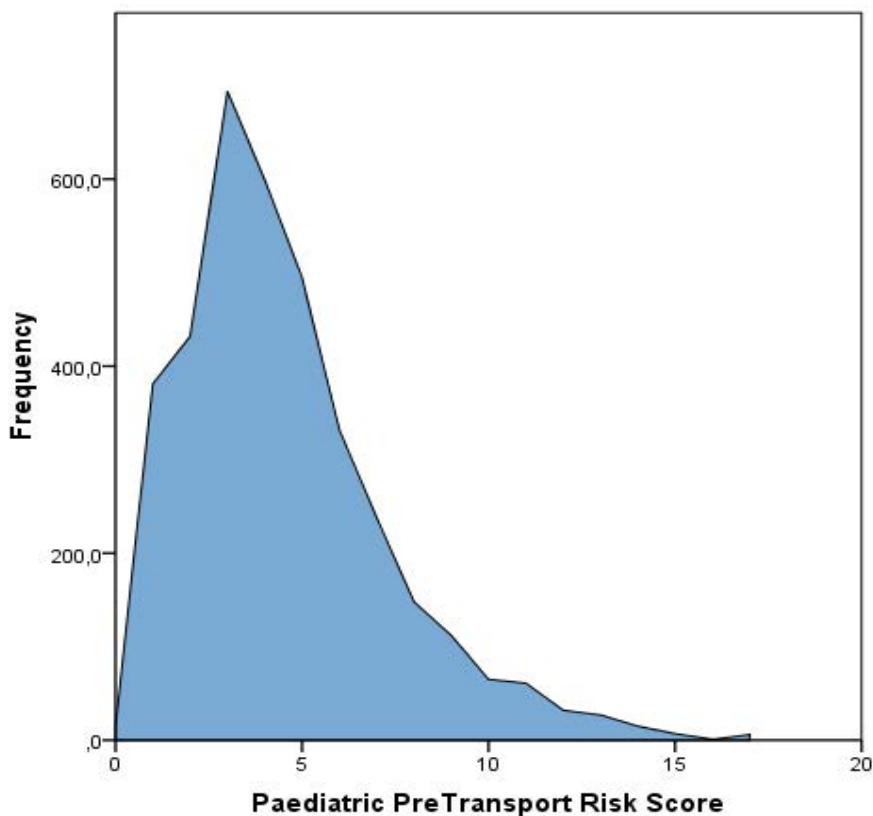
Figure 2. Paediatric pretransport risk score distribution.

The paediatric risk score distribution showed that the majority of our patients (80.3%) had scores below 7 points, and only 6% of the patients had more than 10 points. See Table 10.

Table 10. Paediatric PreTransport Risk Score distribution.

		Frequency	Percent	Cumulative Percent
Paediatric PreTransport Risk Score Category	0-3 Points	1413	41.1	41.1
	4-6 Points	1350	39.3	80.3
	7-9 Points	471	13.7	94.0
	10-12 Points	149	4.3	98.4
	>12 Points	56	1.6	100.0
	Total	3439	100.0	

5.5.   Description of medical interventions performed during transport

Table 11 reflects in detail all the medical interventions performed during transport. The most common medical intervention was insertion of an intravenous peripheral cannula in 2769 (80.5%) patients, followed by endotracheal intubation in 632 (18.4%) patients, use of volume expanders in 594 (17.3%) and administration of nebulisers in 351 (10.2%) patients.

Table 11. Description of the overall medical interventions performed during transport.

Medical interventions		Count	Total N %
Nebulisers	No	3088	89,8%
	Yes	351	10,2%
Intubation	No	2807	81,6%
	Yes	632	18,4%
Pleural Drain	No	3401	98,9%
	Yes	38	1,1%
Surfactant	No	3330	96,8%
	Yes	109	3,2%
Nitric Oxide	No	3357	97,6%
	Yes	82	2,4%
Intravenous Cannula	No	670	19,5%
	Yes	2769	80,5%
Umbilical catheter	No	3026	88,0%
	Yes	413	12,0%
Central venous line	No	3217	93,5%
	Yes	222	6,5%
Arterial Line	No	3419	99,4%
	Yes	20	,6%
Volume expanders	No	2845	82,7%
	Yes	594	17,3%
Inotropic Drugs	No	3132	91,1%
	Yes	307	8,9%
Intraosseous line	No	3395	98,7%
	Yes	44	1,3%
Cardiopulmonary resuscitation	No	3345	97,3%
	Yes	94	2,7%
Defibrillation	No	3436	99,9%
	Yes	3	,1%
Antiepileptic Drugs	No	3197	93,0%
	Yes	242	7,0%
Collar	No	3390	98,6%
	Yes	49	1,4%

On the other hand, the use of an arterial line for continuous monitoring of arterial pressure was only used in 20 (0.6%) patients and defibrillation was only performed in 3 (0.1%) cases.

Medical interventions were initiated more frequently by the referring hospital team than by the retrieval team on arrival. Specifically this happened in the following medical interventions: administration of nebulisers, endotracheal intubation, insertion of a pleural drain, administration of surfactant, insertion of a peripheral intravenous cannula, umbilical catheter, central venous line, arterial line, intraosseous line, use of volume expanders, use of antiepileptic drugs and CPR. Only the initiation of nitric oxide, initiation of inotropic drugs, use of collar for cervical immobilization and defibrillation were performed more frequently by the retrieval team. A detailed summary of all medical interventions and who performed them is described in Table 12.

Table 12. Description of who performed the medical interventions

		Count	%
Nebulisers	Referring Hospital Team	214	61.0%
	Retrieval Team	23	6.6%
	Both	114	32.5%
	Total	351	100.0%
Intubation	Referring Hospital Team	418	66.1%
	Retrieval Team	180	28.5%
	Both	34	5.4%
	Total	632	100.0%
Pleural Drain	Referring Hospital Team	22	57.9%
	Retrieval Team	12	31.6%
	Both	4	10.5%
	Total	38	100.0%
Surfactant	Referring Hospital Team	69	63.3%
	Retrieval Team	34	31.2%
	Both	6	5.5%
	Total	109	100.0%
Nitric Oxide	Referring Hospital Team	8	9.8%
	Retrieval Team	58	70.7%
	Both	16	19.5%
	Total	82	100.0%
IV Cannula	Referring Hospital Team	2490	89.9%
	Retrieval Team	120	4.3%
	Both	159	5.7%
	Total	2769	100.0%
Umbilical catheter	Referring Hospital Team	336	81.4%
	Retrieval Team	63	15.3%
	Both	14	3.4%
	Total	413	100.0%
Central Venous Catheter	Referring Hospital Team	205	92.3%
	Retrieval Team	16	7.2%
	Both	1	.5%
	Total	222	100.0%
Arterial Line	Referring Hospital Team	11	55.0%
	Retrieval Team	3	15.0%
	Both	6	30.0%
	Total	20	100.0%
Volume Expansors	Referring Hospital Team	253	42.6%
	Retrieval Team	190	32.0%
	Both	151	25.4%

	Total	594	100.0%
Inotropic Drugs	Referring Hospital Team	32	10.4%
	Retrieval Team	122	39.7%
	Both	153	49.8%
	Total	307	100.0%
Intraosseous Line	Referring Hospital Team	23	52.3%
	Retrieval Team	16	36.4%
	Both	5	11.4%
	Total	44	100.0%
Cardiopulmonary resuscitation	Referring Hospital Team	67	71.3%
	Retrieval Team	18	19.1%
	Both	9	9.6%
	Total	94	100.0%
Defibrillation	Referring Hospital Team	1	33.3%
	Retrieval Team	2	66.7%
	Both	0	.0%
	Total	3	100.0%
Antiepileptic Drugs	Referring Hospital Team	169	69.8%
	Retrieval Team	21	8.7%
	Both	52	21.5%
	Total	242	100.0%
Collar	Referring Hospital Team	10	20.4%
	Retrieval Team	27	55.1%
	Both	12	24.5%
	Total	49	100.0%

5.6. Description of the relationship between the paediatric pretransport risk score and the mortality after 48 h of transport.

5.6.1. Univariate Analysis

The univariate analysis of the relationship between the clinical outcome at 48 h after transport and the paediatric pre transport risk score demonstrated that those patients who died had a significantly higher paediatric pre transport risk score compared with those patient that were alive 48 h after transport (10.95 ± 3.59 vs 4.42 ± 2.57 p <0.001).

Figure 3 represents the boxplots of the paediatric pre transport risk score depending on the clinical situation of the patient after 48 h of transport.

Figures 4a and 4b the histogram distribution of the score for the subgroup of patients that were alive or death separately.
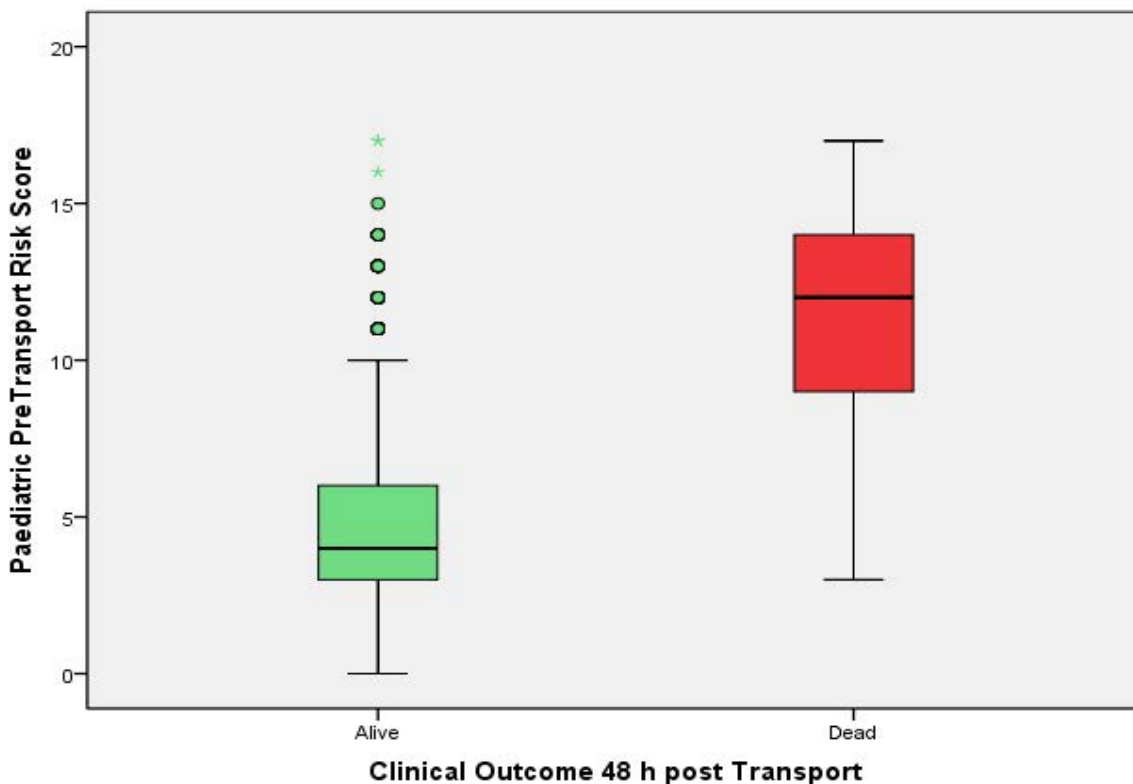

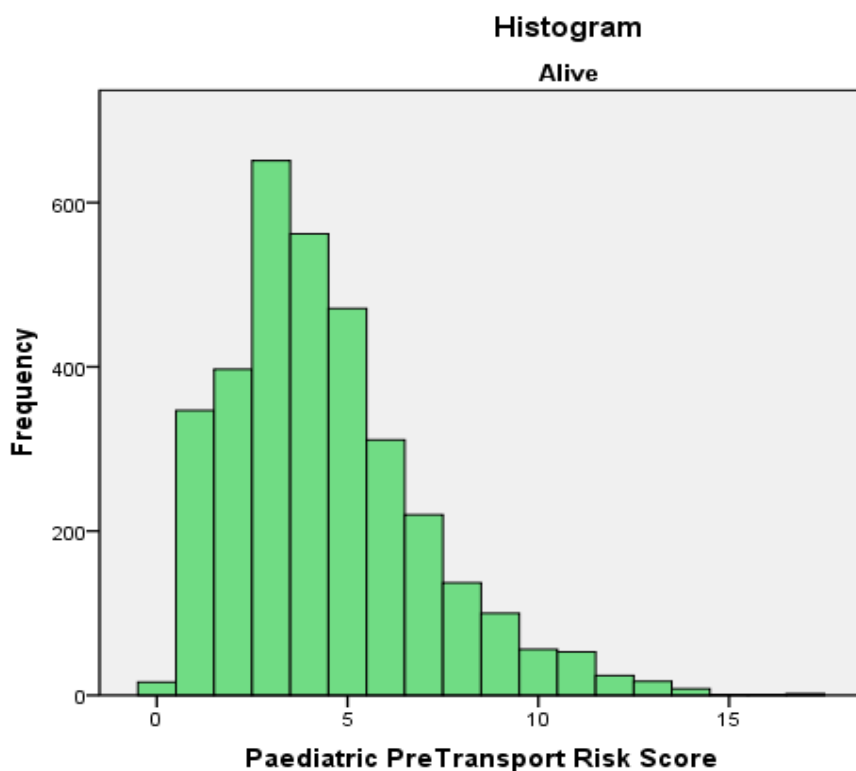**Figure 3. Paediatric pretransport risk score by clinical outcome 48 h post trasnport.**

Figure 4a. Histogram showing distribution of the score on the subgrup of alive patients.
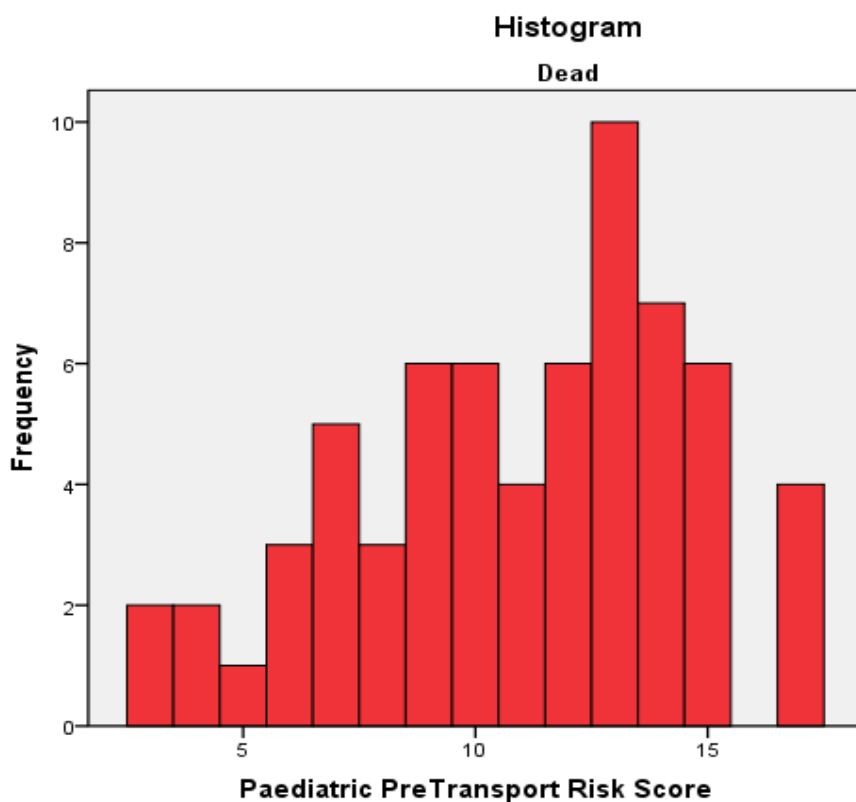

Figure 4b. Histogram showing distribution of the score on the subgrup of dead patients.

5.6.2. Logistic multivariate model development and evaluation

In order to evaluate other confounding factors on the relationship between the paediatric pre transport risk score and the clinical outcome at 48 h after transport, a multivariate model of logistic regression with all other possible clinical variables was created and evaluated to assess the difference in odds ratio for each possible model compared with the odds ratio for the reference model that included the paediatric risk score, group age, and urgent need for surgery. Unimportant changes for each possible resulting model were considered unimportant if the total percentage difference between the odds ratio of the reference model was <10% compared with the reference model. The results of this analysis are summarized in Table 13.

Table 13. Confounding Evaluation of 3 different models compared with the reference model including all variables.

Model	Numb of Variables	Variables Included	Category Label	Exp(B)	Change(%)	95% CI Lower	95% CI Upper	95% CI Range	Range Diff	Unimportant Change (<10%)
0	3	PPTRSCat. Age Group. Urgent Need for Surgey	PPTRSCat_10	3.209	0.0%	.646	15.932	15.286	.000	Reference
			PPTRSCat_20	20.690	0.0%	4.672	91.633	86.961	.000	
			PPTRSCat_30	79.714	0.0%	17.950	353.999	336.049	.000	
			PPTRSCat_40	616.586	0.0%	138.344	2.748.061	2.609.716	.000	
1	1	PPTRSCat	PPTRSCat_10	3.150	1.8%	.635	15.632	14.997	-.289	Yes
			PPTRSCat_20	21.613	4.5%	4.894	95.451	90.558	3.596	
			PPTRSCat_30	84.872	6.5%	19.307	373.091	353.784	17.735	
			PPTRSCat_40	656.845	6.5%	149.131	2.893.056	2.743.925	134.209	
2	2	PPTRSCat. Age Group	PPTRSCat_10	3.194	0.5%	.643	15.859	15.216	-.070	Yes
			PPTRSCat_20	20.977	1.4%	4.738	92.877	88.139	1.178	
			PPTRSCat_30	81.139	1.8%	18.288	359.991	341.703	5.654	
			PPTRSCat_40	643.991	4.4%	144.779	2.864.536	2.719.757	110.040	
3	2	PPTRSCat. Urgent Need for Surgey	PPTRSCat_10	3.171	1.2%	.639	15.739	15.100	-.186	Yes
			PPTRSCat_20	21.330	3.1%	4.828	94.231	89.403	2.442	
			PPTRSCat_30	83.885	5.2%	19.075	368.891	349.816	13.767	
			PPTRSCat_40	633.961	2.8%	143.746	2.795.945	2.652.199	42.482	

Exp(B): Odds Ratio. CI: Confidence Interval. PPTRSCat: Paediatric Risk Score Categorical.

The analysis showed that the three different models compared with the reference model that included the three clinically relevant variables had an unimportant change on the odds ratio that was < 10% in all models. With these results we could have chosen to use the most simple model including only the Paediatric Risk Score to predict the mortality after 48 h of transport although we believed that using the model with all variables was clinically useful and therefore we selected the model with the paediatric pre transport risk score, age group and need for urgent surgery our final model.

5.6.3. Logistic multivariate analysis

The logistic regression model for mortality after 48 h of transport demonstrated a significant independent association with only higher pre transport paediatric risk score (p < 0.001), whereas Age Group (p = 0.660) and Need for urgent surgery (p = 0.220) were not statistically significant. The overall analysis of the model showed a statistically significant change of -2Log Likehood (Chi-Square: 234.444; df:7; p <0.001). The Cox & Snell R Square was 0.066 and the Hosmer and Lemeshow test for goodness-of-fit was non significant (p = 0.654). Table 14a summarises the observed and expected contingency table of the Hosmer and Lemeshow test.

Table 14a. Contingency Table for Hosmer and Lemeshow Test for clinical outcome after 48 h of transport using the final logistic regression model.

Paediatric Risk Score Category	Clinical Outcome 48 h post Transport Binary = Alive		Clinical Outcome 48 h post Transport Binary = Dead		Total
	Observed	Expected	Observed	Expected	
1	747	747.042	1	.958	748
2	398	398.463	1	.537	399
3	266	265.495	0	.505	266
4	742	739.955	1	3.045	743
5	414	415.204	3	1.796	417
6	367	368.086	7	5.914	374
7	440	439.756	52	52.244	492

Classification Table

Observed		Predicted Clinical Outcome 48 h post Transport Binary		
		Alive	Dead	Percentage Correct
Clinical Outcome 48 h post Transport Binary	Alive	3367	7	99.8
	Death	56	9	13.8
Overall Percentage				98.2

After the multivariate analysis our results showed that the Paediatric Risk Score was the only variable that showed a statistically significant relationship with the mortality after 48 h of transport with a Exp(B): 1.744 (95% CI: 1.599-1.902; $p < 0.001$). The Age group and the Urgent Need for Surgery were not statistically significant. See Table 14b.

Table 14b. Multivariate Logistic Regression analysis for mortality including the Paediatric Risk Score. Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1ª	NNP			.883	2	.643			
	NNP(1)	.293	.377	.605	1	.437	1.341	.640	2.808
	NNP(2)	-.023	.346	.004	1	.947	.977	.496	1.924
	PrevIQI(1)	.660	.467	2.000	1	.157	1.936	.775	4.835
	PPTRS	.556	.044	158.048	1	.000	1.744	1.599	1.902
	Constant	-8.128	.465	305.922	1	.000	.000		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRS. NNP: Age Group paediatric group (Reference category); NNP(1): Age Group perm neonates; NNP(2): Age Group preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRS: Paediatric Pre-Transport Risk Score analysed as a continuous numeric variable. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

We also performed the same analysis using the categorical Paediatric Risk Score variable in order to be able to better appreciate the difference in odds ratio of mortality after 48 h of transport between different categories of the score. Table 14c displays the results with the Paediatric Risk Score entered in the model as a categorical variable where the reference group was 0-3 points.

Table 14c. Multivariate Logistic Regression analysis for mortality including the Pretransport Paediatric Risk Score (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	NNP			.828	2	.661			
	NNP(1)	.325	.379	.735	1	.391	1.384	.658	2.912
	NNP(2)	.050	.339	.022	1	.882	1.051	.541	2.043
	PrevIQI(1)	.549	.477	1.327	1	.249	1.732	.680	4.411
	PPTRSCat			167.273	4	.000			
	PPTRSCat(1)	1.166	.818	2.034	1	.154	3.209	.646	15.932
	PPTRSCat(2)	3.030	.759	15.922	1	.000	20.690	4.672	91.634
	PPTRSCat(3)	4.378	.761	33.133	1	.000	79.714	17.950	354.002
	PPTRSCat(4)	6.424	.762	70.985	1	.000	616.586	138.343	2748.086
	Constant	-6.659	.723	84.753	1	.000	.001		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

As expected and similarly to the previous analysis, Age group and Need for urgent surgery did not reach statistical significance. The only variable that showed a statistically significance relationship with the mortality after 48 h of transport was the Paediatric Risk Score. With this analysis, it was possible to compare the odds ratio of mortality for each category compared with the reference group (0-3 points). Patients with 3-6 points in the Paediatric Risk Score had approximately 3 times higher odds ratio of mortality after 48 h of transport compared with the reference group (Exp(B): 3.209 (95% CI: 0.646-15.932; p= 0.154)).   Patients with 7-9 points in the Paediatric Risk Score had approximately 20 times higher odds ratio of mortality after 48 h of transport compared with the reference group (Exp(B): 20.690 (95% CI: 4.672-91.634;

p= 0.000)). Patients with 10-12 points in the Paediatric Risk Score had approximately 80 times higher odds ratio of mortality after 48 h of transport compared with the reference group (Exp(B): 79.714 (95% CI: 17.950-354.002; p= 0.000)). Finally. patients with >12 points in the Paediatric Risk Score had approximately 600 times higher odds ratio of mortality after 48 h of transport compared with the reference group (Exp(B): 616.586 (95% CI: 138.343-2748.086; p= 0.000)).

Our analysis revealed that even though the association between the pre transport paediatric risk score did not reach statistical significance when comparing the first group of 3-6 points and the reference group, the other categories showed a very strong association where the odds ratio of mortality increased exponentially as patients had a higher pre transport paediatric risk scores.

5.6.4. ROC Analysis of mortality and paediatric pretransport risk score

In order to illustrate the diagnostic ability of the paediatric pre transport risk score system as its discrimination threshold varied a ROC curve was performed by plotting the true positive rate against the false positive rate at various threshold settings.

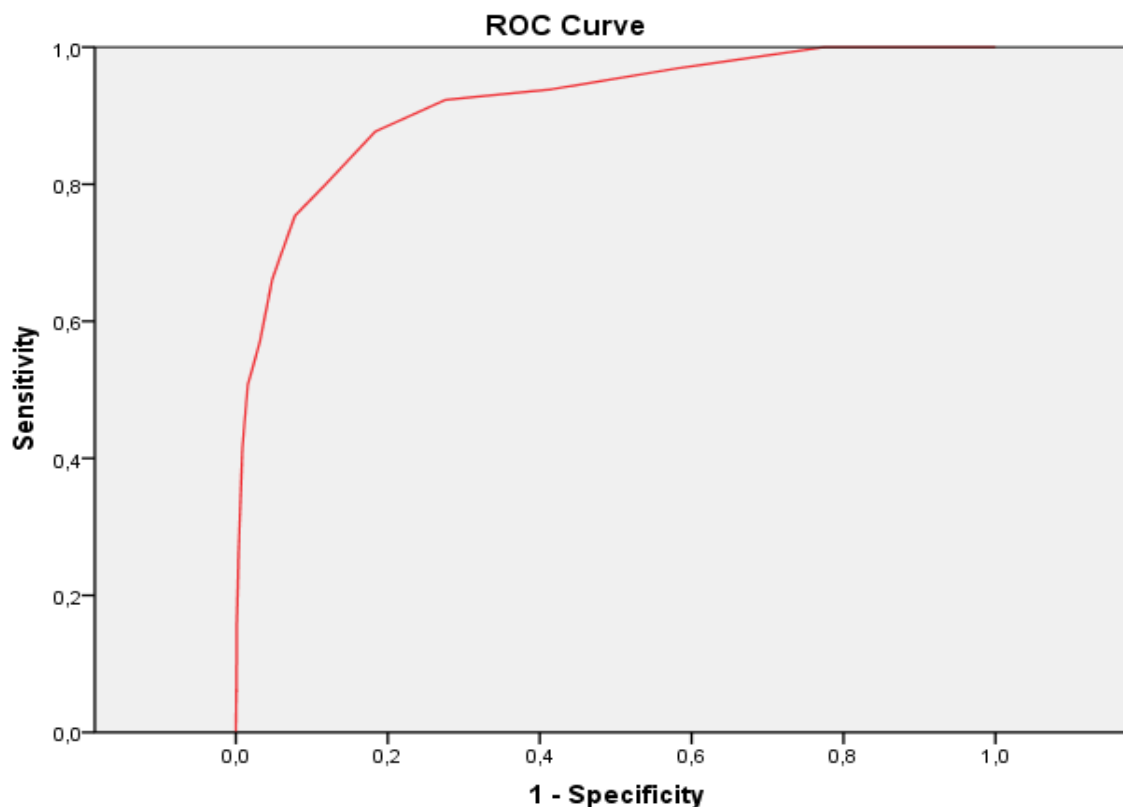The ROC curve for mortality showed an area under the curve AUC= 0.918 (95% CI: 0.909 to 0.927). See Figure 6.

Figure 6. ROC Curve of paediatric pre transport risk score for mortality after 48 h or transport. AUC= 0.918 (95% CI: 0.909 to 0.927).

Table 15 summarises the relationship in sensitivity and 1-specificiy for different paediatric risk score values. For example, whereas a cut point of 5.5 showed a high sensitivity of 92.3% and a relatively low specificity of 72.4%. A cut-off point of 11.5 had a lower sensitivity of 50.8% with a much higher specificity of 98.4%.

Table 15. Values of Sensitivity and 1-Specificity for different cut off points of the paediatric pretransport risk score for mortality.

Value of Paediatric PreTransport Risk Score	Sensitivity	1 - Specificity
.50	1.000	.995
1.50	1.000	.892
2.50	1.000	.775
3.50	.969	.582
4.50	.938	.415
5.50	.923	.276
6.50	.877	.183
7.50	.800	.118
8.50	.754	.078
9.50	.662	.048
10.50	.569	.031
11.50	.508	.016
12.50	.415	.009
13.50	.262	.004
14.50	.154	.001
15.50	.062	.001
16.50	.062	.001
18.00	.000	.000

5.6.5. Predicted risk of mortality and relative risk of mortality using our final model

To obtain a useful tool that could be used to give the clinician the estimated predicted risk of mortality depending on the paediatric pre transport risk score, we decided to use our logistic regression model to build up a predicted risk table (Table 16a) that could summarise the estimated risk of mortality for each of the depending values for all the variables included in our final regression model. For example, the risk of mortality after 48 h of transport of a preterm neonate that did not need urgent surgery with a paediatric pre transport risk score of 2 had an absolute risk of death after 48 h of transport of 0.2%, whereas a term neonate with urgent need for surgery and a score of 10 had an absolute risk of mortality of 15.7%.

Taking into account only the result in PPTRS, in our study the group of patients that had the highest risk of mortality were the preterm neonates with >12 points in our score, that showed > 50% of mortality.

Table 16a. Predicted absolute risk (in percentage) of mortality after 48 h of transport depending on age group, urgent need for surgery and paediatric pretransport risk score category

Age Group	Urgent Need for Surgery?	Paediatric Pretransport Risk Score Category				
		0-3 Points	4-6 Points	7-9 Points	10-12 Points	>12 Points
		%	%	%	%	%
Preterm Neonate	No	0.2	0.6	3.5	12.4	52.3
	Yes	0.3	1.0	6.0	19.7	65.5
Term Neonate	No	0.1	0.4	2.7	9.7	45.4
	Yes	0.2	0.7	4.6	15.7	59.0
Paediatric	No	0.1	0.4	2.6	9.3	44.2
	Yes	0.2	0.7	4.4	15.0	57.8

We also calculated the relative risk of mortality after 48 h of transport for each combination of variables compared with the group of patients with lowest estimated mortality risk, the paediatric group with no need for surgery and with 0-3 points in the paediatric pre transport risk score. These results are shown in Table 16b.

For example, with this table we could predict that a term neonate with a need for urgent surgery and a paediatric risk score of 10 had 122 times more risk of mortality after 48 h of transport than a paediatric patient with no need for urgent surgery and a paediatric pre transport risk score of 3 (reference group).

The highest relative risk of mortality in our group corresponded to preterm neonates with > 12 points with need for urgent surgery (Relative Risk 511.2 compared with the reference group).

Table 16b. Relative risk of mortality after 48 h of transport depending on age group. urgent need for surgery and paediatric pre transport risk score category compared with reference group (Paediatric, No need for urgent surgery, 0-3 Points)

Age Group	Urgent Need for Surgery?	Paediatric PreTransport Risk Score Category				
		0-3 Points	4-6 Points	7-9 Points	10-12 Points	>12 Points
		RR	RR	RR	RR	RR
Preterm Neonate	No	1.4	4.4	27.7	96.8	408.1
	Yes	2.4	7.6	46.7	153.7	511.2
Term Neonate	No	1.1	3.4	21.2	75.8	354.4
	Yes	1.8	5.8	36.0	122.5	460.8
Paediatric	No	**1.0**	3.2	20.2	72.4	344.8
	Yes	1.7	5.5	34.3	117.5	451.3

5.7. Description of the relationship between the paediatric pretransport risk score and the need for intensive care

5.7.1. Univariate Analysis

The findings of the univariate analysis of the relationship between the paediatric pre transport risk score and the department of admission at the destination centre established that those patients that were admitted in the intensive care unit, either the neonatal or paediatric, had a significantly higher PPTRS compared with those patients who did not require admission in intensive care (3.32 ± 1.77 vs 5.07 ± 2.88 ; p <0.001). See Table 17.

Table 17. Statistics for destination hospital department of admission by paediatric pre transport risk score

	Destination Hospital Department	N	Mean	Std. Deviation
Paediatric Pretransport Risk Score	No ICU	1012	3.32	1.77
	ICU	2344	5.07	2.88

ICU: Intensive care unit

Figure 6 displays the boxplots of the paediatric pre transport risk score depending on the department of admission at the destination centre.
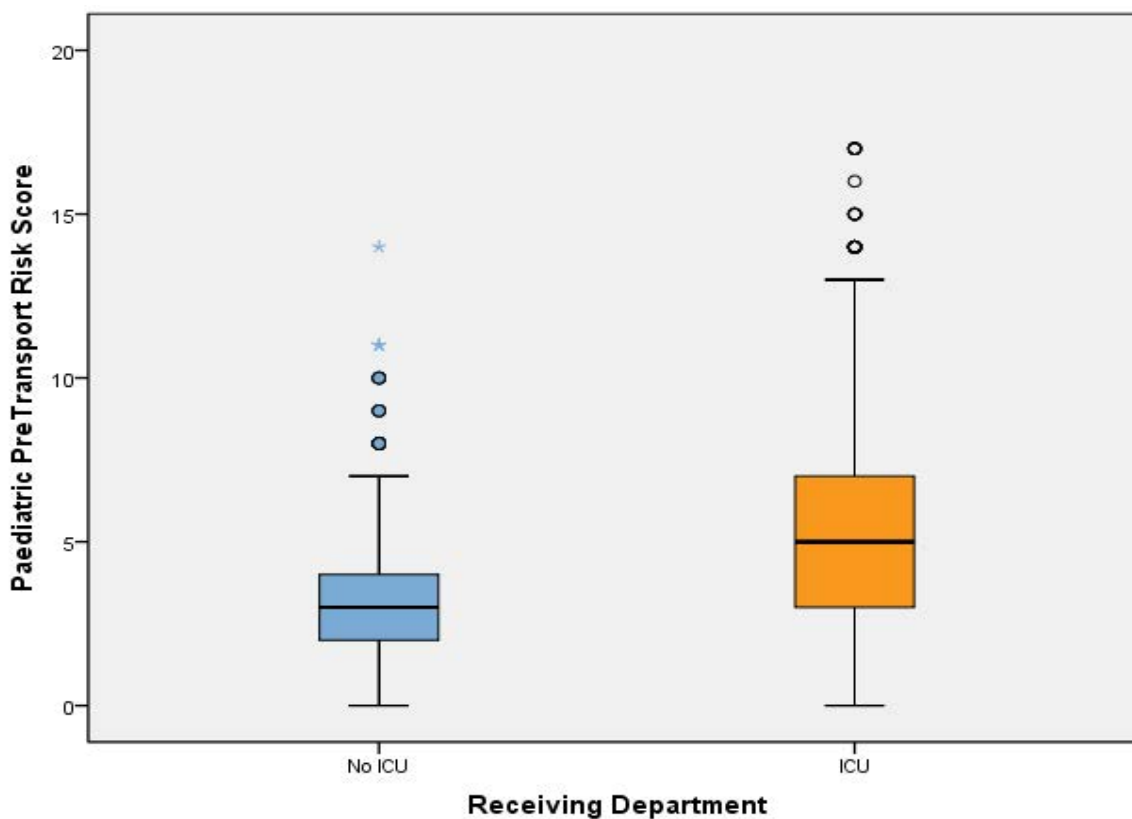

Figure 6. Department of admission at the destination hospital.

Figures 7a and 7b reveal the histogram distribution of the score for the subgroup of patients that were admitted in ICU or not separately.
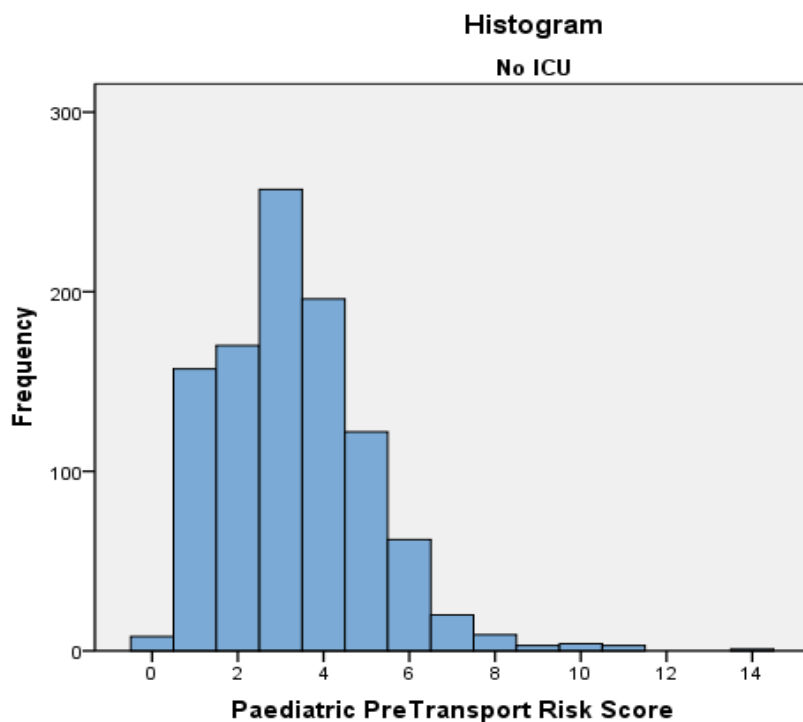
Histogram

No ICU

Figure 7a. Histogram of the paediatric pretransport risk score in the subgroup of patients who were not admitted in the intensive care unit

In our cohort the majority of patients, 2344 (69.5%), were admitted in intensive care at
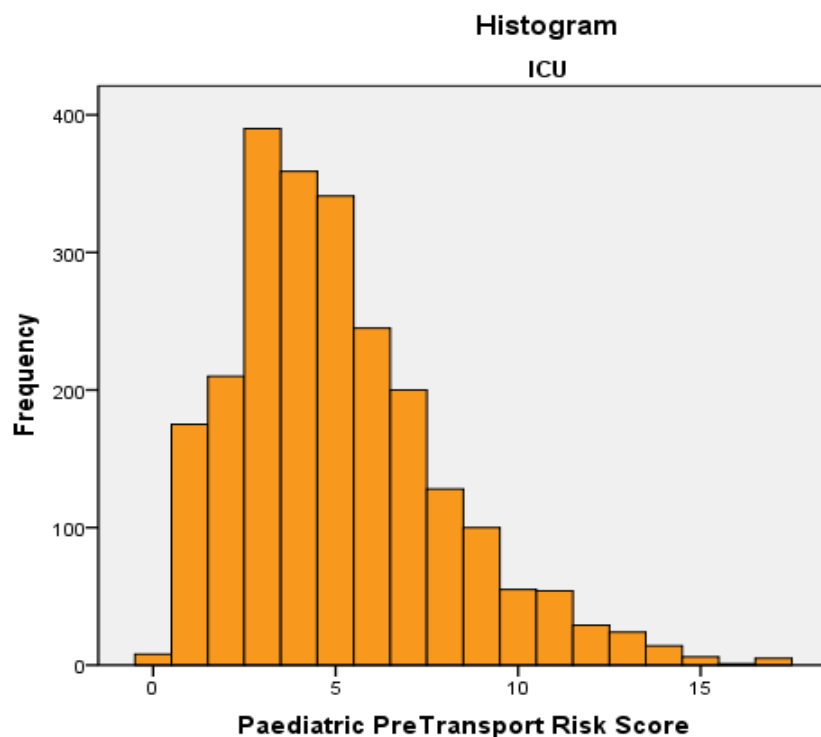
Histogram

ICU

Figure 7b. Histogram of the paediatric pretransport risk score in the subgroup of patients who were admitted in the intensive care unit

the receiving hospital. The distribution of these patients differed significantly depending on the paediatric pre transport risk score category as it is shown in the Table 18. 56.9% of the patients with a score between 0-3 points were admitted in intensive care, whereas nearly 100% of patients with scores higher than 9 points were admitted in the intensive care units. See table 18.

Table 18. Description of admission in intensive care depending on the paediatric pre transport group category. Count and percentage for each category are represented

		Receiving Hospital Department			
		No ICU		ICU	
		Count	%	Count	%
	0-3 Points	592	43.1%	783	56.9%
	4-6 Points	380	28.7%	945	71.3%
Paediatric PreTransport Risk Score Category	7-9 Points	32	7.0%	428	93.0%
	10-12 Points	7	4.8%	138	95.2%
	>12 Points	1	2.0%	50	98.0%
Total		1012	30.2%	2344	69.8%

5.7.2. Multivariate Analysis

The logistic regression model for intensive care admission demonstrated a significant independent association with higher pre transport paediatric risk score (p= 0.000), Age Group (p= 0.000) and also Need for urgent surgery (p= 0.038). The overall analysis of the model showed a statistically significant change of -2Log Likelihood (Chi-Square: 774.255; df:4; p= 0.000). The Cox & Snell R Square was 0.206 and the Hosmer and Lemeshow test for goodness-of-fit was non-significant (p= 0.087). Table 19a summarises the observed and expected contingency table of the Hosmer and Lemeshow test.

Table 19a. Contingency Table for Hosmer and Lemeshow Test for intensive care admission's logistic regression model

	Receiving Hospital Department = No ICU		Receiving Hospital Department = ICU		
	Observed	Expected	Observed	Expected	Total
1	229	239.963	131	120.037	360
2	207	212.580	179	173.420	386
3	168	162.473	181	186.527	349
4	121	114.333	178	184.667	299
5	105	94.227	215	225.773	320
6	64	71.997	265	257.003	329
7	57	52.945	276	280.055	333
8	49	40.356	337	345.644	386
9	9	17.916	308	299.084	317
10	3	5.212	274	271.788	277

Classification Table

		Predicted		
		Receiving Hospital Department		
Observed		No ICU	ICU	Percentage Correct
Receiving Hospital Department	No ICU	446	566	44.1
	ICU	315	2029	86.6
Overall Percentage				73.7

a. The cut value is .500; ICU: Intensive care unit

The findings revealed that the PPTRS showed a statistically significant relationship with the need for admission in intensive care with an OR: 1.413 (95% CI: 1.353-1.476; p= 0.000) .

Also the results showed that those patients that required urgent need for surgery had an odds ratio 1.5 times higher for being admitted in intensive care compared with those who did not require urgent surgery. This association was statistically significant (Exp(B): 1.515 (95% CI: 1.017-2.256; p= 0.041).

Age group was also a statistically significant risk factor for admission in intensive care. Preterm neonates were approximately 6 times more likely to be admitted in intensive care compared with the paediatric group (Exp(B): 6.216 (95% CI: 5.007-7.717; p=

0.000)). This results were also similar for term neonates that showed an odds ratio of 5.6 compared with the paediatric group (Exp(B): 5.676 (95% CI: 4.245-7.591; p= 0.000)). See Table 19b.

Table 19b. Multivariate Logistic Regression analysis for intensive care admission including the Paediatric Pre-transport Risk Score (Continuous numeric variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	PPTRS	,346	,022	240,188	1	,000	1,413	1,353	1,476
	PrevIQI(1)	,415	,203	4,167	1	,041	1,515	1,017	2,256
	NNP			355,377	2	,000			
	NNP(1)	1,736	,148	137,085	1	,000	5,676	4,245	7,591
	NNP(2)	1,827	,110	274,186	1	,000	6,216	5,007	7,717
	Constant	-1,233	,101	149,946	1	,000	,291		

a. Variable(s) entered on step 1: PPTRS, PrevIQI, NNP. NNP: Age Group paediatric group (Reference category); NNP(1): Age Group perm neonates; NNP(2): Age Group preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRS: Paediatric Risk Score analysed as a continuous numeric variable. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

Similarly to what we performed in the mortality analysis, we also examined the relationship between the admissions in intensive care using the categorical PPTRS variable in order to be able to better appreciate the difference in odds ratio of intensive care admission between different categories of the score. Table 19c displays the results with the PPTRS entered in the model as a categorical variable where the reference group was 0-3 points.

Table 19c. Multivariate Logistic Regression analysis for intensive care admission including the Paediatric Pretransport Risk Score (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	PrevIQ(1)	.397	.203	3.834	1	.050	1.487	1.000	2.213
	NNP			343.450	2	.000			
	NNP(1)	1.644	.147	125.686	1	.000	5.175	3.883	6.898
	NNP(2)	1.797	.109	270.307	1	.000	6.033	4.869	7.474
	PPTRSCat			208.610	4	.000			
	PPTRSCat(1)	.749	.088	71.913	1	.000	2.115	1.779	2.514
	PPTRSCat(2)	2.306	.197	137.613	1	.000	10.029	6.823	14.742
	PPTRSCat(3)	2.420	.400	36.676	1	.000	11.247	5.139	24.614
	PPTRSCat(4)	3.308	1.021	10.507	1	.001	27.334	3.698	202.026
	Constant	-.422	.069	37.798	1	.000	.656		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

As expected and similarly to the previous analysis, Age group and Need for urgent surgery showed similar results. Patients with 3-6 points in the PPTRS had approximately 2 times higher odds ratio of intensive care admission compared with the reference group (Exp(B): 2.115 (95% CI: 1.779-2.514; p= 0.000)). Patients with 7-9 points in the score had approximately 10 times higher odds ratio of intensive care admission compared with the reference group (Exp(B): 10.029 (95% CI: 6.823-14.742; p= 0.000)). Patients with 10-12 points had approximately 11 times higher odds ratio of intensive care admission compared with the reference group (Exp(B): 11.247 (95% CI: 5.139-24.614; p= 0.000)).

Finally, patients with >12 points in the PPTRS had approximately 27 times higher odds ratio of intensive care admission in the destination hospital compared with the reference group (Exp(B): 27.334 (95% CI: 3.698-202.026; p= 0.000)).

5.7.3. ROC Analysis of admission in intensive care admission and paediatric pre transport risk score

The ROC curve studying the relationship of admission in intensive care and the PPTRS showed an area under the curve AUC= 0.687 (95% CI: 0.671 to 0.703). See figure 8.
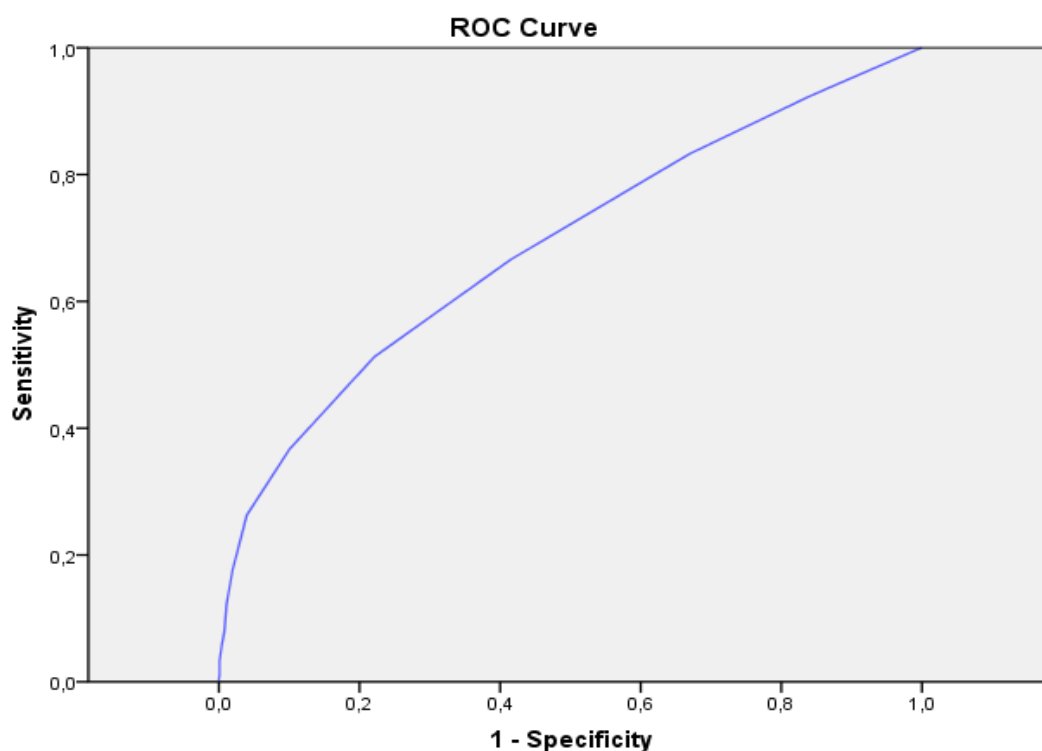

Figure 8. ROC Curve of paediatric pretransport risk score for intensive care admission AUC= 0.687 (95% CI: 0.671 to 0.703).

Table 20 represents the relationship in Sensitivity and 1-Specificiy for different PPTRS values. For example, whereas a cut point of 2.5 showed a high sensitivity of 83.2%

and a relatively low specificity of 66.9%, a cut-off point of 8.5 had a lower sensitivity of 12.3% with a much higher specificity of 98.9%.

Table 20. Values of Sensitivity and 1-Specificity for different cut off points of the paediatric pre transport risk score (PPTRS)for admission in intensive care

Value of PPTRS	Sensitivity	1 - Specificity
.50	1.00	.99
1.50	.92	.84
2.50	.83	.67
3.50	.67	.42
4.50	.51	.22
5.50	.37	.10
6.50	.26	.04
7.50	.18	.02
8.50	.12	.01
9.50	.08	.01
10.50	.06	.00
11.50	.03	.00
12.50	.02	.00
13.50	.01	.00
14.50	.01	.00
15.50	.00	.00
16.50	.00	.00
18.00	.00	.00

5.7.4. Predicted risk of intensive care admission and Relative Risk of intensive care admission using our final model

Similarly to what we did in the mortality study, we created a table (Table 21a) with the estimated predicted risk of admission in intensive care using our logistic regression model based on the PPTRS variable, age group and the need for urgent surgery.

Table 21a. Predicted absolute risk (in percentage) of intensive care admission depending on age group, urgent need for surgery and paediatric pre transport risk score (PPTRS) category

Age Group	Urgent Need for Surgery?	PPTRS Category				
		0-3 Points	4-6 Points	7-9 Points	10-12 Points	>12 Points
		%	%	%	%	%
Preterm Neonate	No	77.2	87.8	97.1	97.4	98.9
	Yes	83.5	91.4	98.1	98.3	99.3
Term Neonate	No	79.8	89.3	97.5	97.8	99.1
	Yes	85.5	92.6	98.3	98.5	99.4
Paediatric	No	39.6	58.1	86.8	88.1	94.7
	Yes	49.4	67.4	90.7	91.6	96.4

For example, the risk admission in intensive care of a preterm neonate that did not need urgent surgery with a PPTRS of 2 was 77.2%, whereas an infant without urgent need for surgery and a score of 3 had an absolute risk of intensive care admission of 39.6%.

As we did for the mortality study we also calculated the relative risk of intensive care admission for each combination of variables compared with the group of patients with the lowest estimated risk of intensive care admission, the paediatric group with no need for surgery and with 0-3 points in the PPTRS. These results are shown in Table 21b.

Table 21b. Relative risk of intensive care admission after 48 h of transport depending on age group, urgent need for surgery and paediatric pretransport risk score (PPTRS) category compared with reference group (Paediatric, No need for urgent surgery, 0-3 Points)

Age Group	Urgent Need for Surgery?	PPTRS Category				
		0-3 Points	4-6 Points	7-9 Points	10-12 Points	>12 Points
		RR	RR	RR	RR	RR
Preterm Neonate	No	1.9	2.2	2.5	2.5	2.5
	Yes	2.1	2.3	2.5	2.5	2.5
Term Neonate	No	2.0	2.3	2.5	2.5	2.5
	Yes	2.2	2.3	2.5	2.5	2.5
Paediatric	No	**1.0**	1.5	2.2	2.2	2.4
	Yes	1.2	1.7	2.3	2.3	2.4

The results of this analysis revealed that a term neonate without need for urgent surgery and a PPTRS of 10 had 2.5 times more risk of intensive care admission than a paediatric patient with no need for urgent surgery and a PPTRS of 3 (reference group).

The maximum relative risk was very similar for all the patients that had a score above 7 points, being only around 2.5 times higher compared with the reference group.

The reason for that finding corresponded to the fact that our reference group had already a risk of admission in intensive care of nearly 40%.

5.8. Description of the relationship between paediatric pretransport risk score and the medical interventions

5.8.1. Description of relationship between the Paediatric Pretransport Risk Score and the total medical interventions and by which team the medical interventions were performed

Our study showed that those patients that required a higher total number of medical interventions had higher PPTRS as it shown in Table 22a. This trend was also present when we looked at the medical interventions performed by the referring hospital team and the transport team. See Tables 22b and 22c respectively.

Table 22a. Mean and standard deviation of the paediatric pretransport risk score by total number of medical interventions performed.

Total Number of Medical Interventions	Mean	Std. Deviation
0	3.05	2.12
1	3.61	1.86
2	4.32	2.13
3	5.46	2.30
4	6.55	2.66
5	7.83	2.94
6	8.66	2.59
7	9.95	2.98
8	11.28	2.82
9	11.48	2.14
10	13.25	3.30
11	9.50	1.29
12	12.00	.
13	11.00	.

Table 22b. Mean and standard deviation of the paediatric pre transport risk score by number of medical interventions performed by referring hospital team.

Number of Medical Interventions Referring Hospital Team	Mean	Std. Deviation
0	3.43	2.29
1	3.80	2.01
2	4.66	2.29
3	7.12	2.83
4	8.82	2.72
5	9.91	2.85
6	10.74	2.88
7	10.50	1.61
8	10.60	2.07

Table 22c. Mean and standard deviation of the paediatric pre transport risk score by number of medical interventions performed by transport team.

Number of Medical Interventions by Transport Team	Mean	Std. Deviation
0	3.85	2.19
1	5.30	2.66
2	7.37	3.20
3	7.93	3.03
4	8.82	3.62
5	9.50	3.81
6	10.09	3.51
7	6.00	.

In order to study the relationship between the number of medical interventions and the PPTRS, we performed an ANOVA study that demonstrated that there was a statistically significant linear trend association (F: 508.973; p= 0.000) between the number of medical interventions and the PPTRS category. See table 23a and 23b. In summary, patients that had scores below 6 points required a mean of less than 2 medical interventions in total. In the other hand, patients with scores above 6 points,

required between 3 and 6 total medical interventions. Overall total of medical interventions was relatively low with a mean of 1.95 medical interventions per patient.

Table 23a. Descriptive Statistics of total number of medical interventions by Paediatric Pretransport Risk Score (PPTRS) category

PPTRS category	N	Mean	Std. Deviation	Minimum	Maximum
0-3 Points	1413.00	1.17	0.87	0.00	5.00
4-6 Points	1350.00	1.82	1.31	0.00	8.00
7-9 Points	471.00	3.22	2.08	0.00	11.00
10-12 Points	149.00	4.93	2.63	0.00	13.00
>12 Points	56.00	6.23	2.26	0.00	10.00
Total	3439.00	1.95	1.77	0.00	13.00

Table 23b. ANOVA Test for Total number of interventions by Paediatric Pretransport Risk Score (PPTRS) category

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3992.32	4.00	998.08	508.97	0.00
Within Groups	6733.97	3434.00	1.96		
Total	10726.30	3438.00			

df: degrees of freedom; F: F-statistic; Sig.: Signification

When we looked at the differences between the medical interventions performed by the referring team and the transport team, we observed that the referring team performed more medical interventions in all the different score risk categories than the transport team. For example, in patients with score risk category of 0-3 points, the median number or interventions by the referring hospital team was 1 medical intervention and by the transport team was 0 medical interventions. These results suggested that patients were already stable when the paediatric transport team

arrived at the referring hospital and no more medical interventions were deemed necessary. For those patients with higher PPTRS categories, the transport team performed more medical interventions but never more than the referring hospital teams. See Table 24.

Table 24. Descriptive Statistics of total number of medical interventions. interventions by referring hospital team and transport team by Paediatric Pretransport Risk Score (PPTRS) category.

PPTRS Category		Total Number of Medical interventions	Number of Medical Interventions Referring Hospital	Number of Medical Interventions by Transport Team
0-3 Points	Median	1.00	1.00	.00
	Minimum	.00	.00	.00
	Maximum	5.00	3.00	4.00
	Mean	1.17	1.01	.16
	Std. Deviation	.87	.68	.45
4-6 Points	Median	1.00	1.00	.00
	Minimum	.00	.00	.00
	Maximum	8.00	5.00	7.00
	Mean	1.82	1.38	.44
	Std. Deviation	1.31	.88	.85
7-9 Points	Median	3.00	2.00	1.00
	Minimum	.00	.00	.00
	Maximum	11.00	8.00	6.00
	Mean	3.22	2.26	.96
	Std. Deviation	2.08	1.52	1.24
10-12 Points	Median	5.00	3.00	1.00
	Minimum	.00	.00	.00
	Maximum	13.00	8.00	6.00
	Mean	4.93	3.34	1.58
	Std. Deviation	2.63	1.89	1.37
>12 Points	Median	6.00	4.00	2.00
	Minimum	.00	.00	.00
	Maximum	10.00	8.00	6.00
	Mean	6.23	3.89	2.34
	Std. Deviation	2.26	1.65	1.73

This trend association was also represented graphically in boxplots where the trend associations are more easily visible. Figure 9 shows the total number of interventions for each PPTRS category. Figures 10 and 11 represent the medical interventions performed by the referring hospital team and the transport team by the different PPTRS categories.
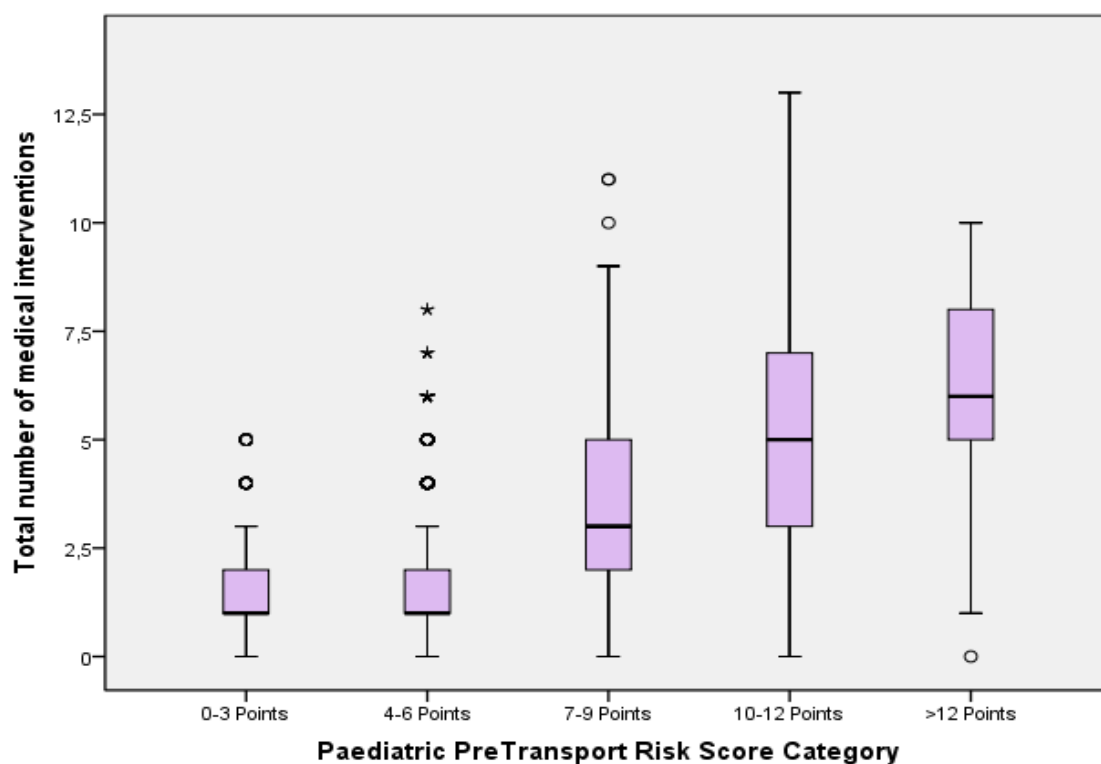

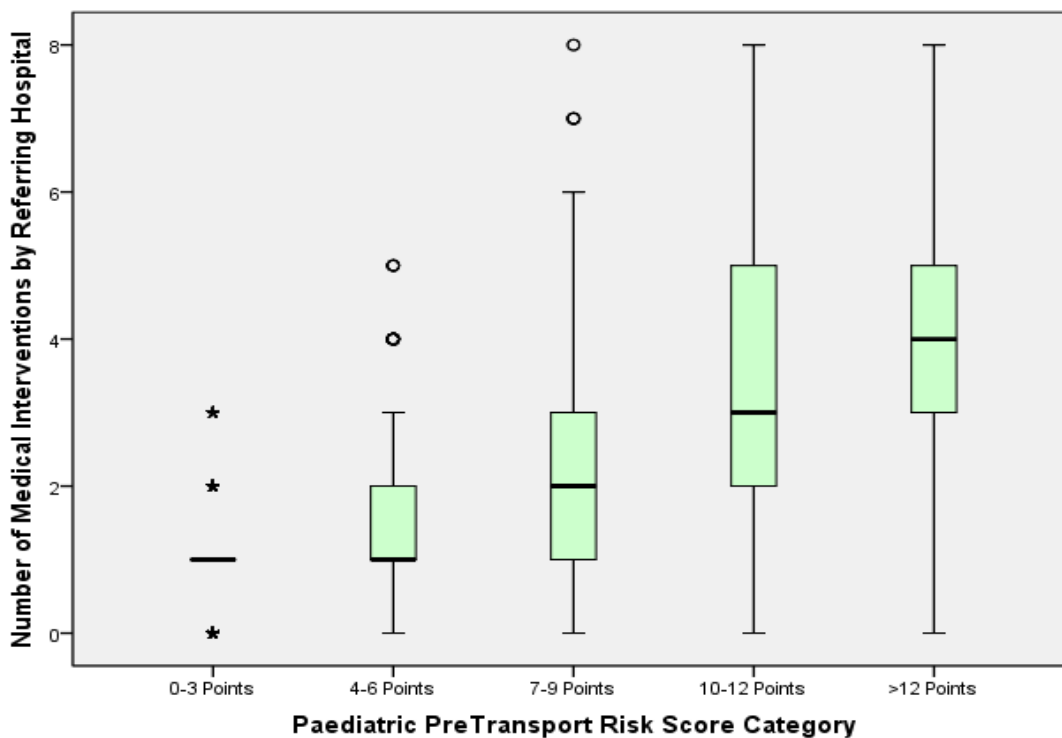Figure 9. Total number of medical interventions performed by paediatric pretransport risk score category.

Figure 10. Number of medical interventions performed by referring hospital team by paediatric pretransport risk score category.
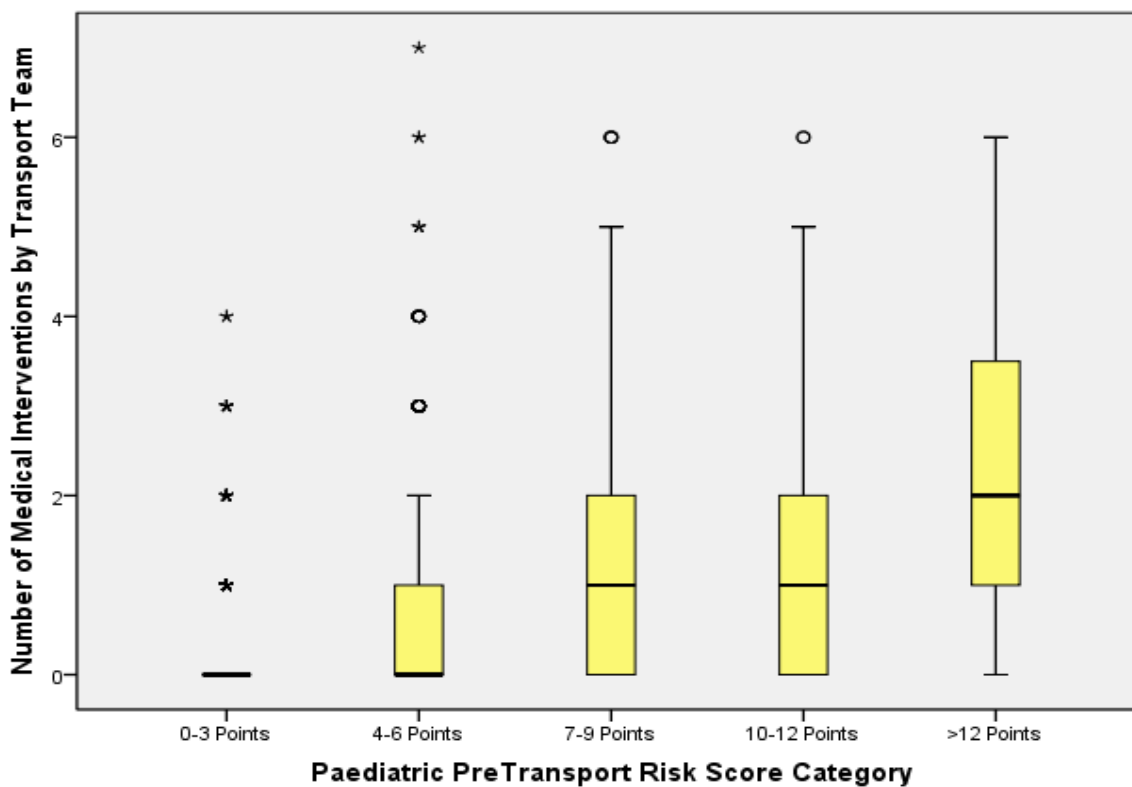
Figure 11. Number of medical interventions performed by the transport team by paediatric pretransport risk score category.

5.8.2. Relationship of the paediatric pretransport risk score and administration of bronchodilators

When we studied the univariate relationship between the administration of bronchodilators compared with different categories of the PPTRS, we observed a statistically significant association demonstrating that higher scores were associated with higher proportions of treatment with bronchodilators but without a significant linear trend. See Table 25a.

Table 25a. Crosstab of Paediatric Pretransport Risk Score Category (PPTRS) by Bronchodilators

		Nebulisers		
		No	Yes	Total
	0-3 Points	1299	114	1413
	4-6 Points	1144	206	1350
PPTRS Category	7-9 Points	447	24	471
	10-12 Points	146	3	149
	>12 Points	52	4	56
Total		3088	351	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	69.570[a]	4	.000
Likelihood Ratio	73.258	4	.000
Linear-by-Linear Association	2.050	1	.152
N of Valid Cases	3439		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.72; df: degrees of freedom

The multivariate analysis for bronchodilators showed that only the patients with scores from 3 to 6 had an odds ratio 2 times higher than the reference group. Those patients with higher scores did not have a higher proportion of administration of bronchodilators. This could be explained by the fact that bronchodilators are used as a first line of therapy and therefore patients who received bronchodilators had lowers scores.

In our model the need for urgent surgery and being a neonate were protector factors against administration of bronchodilators. See table 25b.

Table 25b. Multivariate Logistic Regression analysis for bronchodilators including the Pretransport Paediatric Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
PPTRSCat			46.366	4	.000			
PPTRSCat(1)	.708	.127	31.112	1	.000	2.030	1.583	2.604
PPTRSCat(2)	-.261	.236	1.217	1	.270	.771	.485	1.224
PPTRSCat(3)	-.988	.599	2.725	1	.099	.372	.115	1.203
PPTRSCat(4)	.430	.549	.613	1	.434	1.537	.524	4.505
PrevIQI(1)	-2.068	.589	12.338	1	.000	.126	.040	.401
NNP			96.377	2	.000			
NNP(1)	-4.490	1.003	20.018	1	.000	.011	.002	.080
NNP(2)	-1.415	.160	78.431	1	.000	.243	.178	.332
Constant	-1.886	.102	339.448	1	.000	.152		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.3. Relationship of the paediatric pretransport risk score and tracheal intubation and mechanical ventilation

There was a statistically significant association between the PPTRS and tracheal intubation, with also a significant linear trend. See table 26a.

Table 26a. Crosstab of Paediatric PreTransport Risk Score (PPTRS) Category by Intubation

		Intubation		Total
		No	**Yes**	
	0-3 Points	1393	20	1413
	4-6 Points	1156	194	1350
PPTRS Category	7-9 Points	217	254	471
	10-12 Points	35	114	149
	>12 Points	6	50	56
Total		2807	632	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1205.704[a]	4	.000
Likelihood Ratio	1109.233	4	.000
Linear-by-Linear Association	1117.435	1	.000
N of Valid Cases	3439		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.29; df: degrees of freedom

The multivariate logistic regression analysis using our model showed that patients with higher scores had higher odds ratio for intubation. The odds ratio was approximately 12 times higher for patients with a score from 3 to 6 compared with the reference group and 564 times higher for those patients with > 12 points in the score.

We also documented that there was a statistically significant relationship between intubation and the age group with an odds ratio of 2.6 and 1.3 for term and preterm neonates respectively, compared with the reference group.

Similarly, those that needed urgent surgical treatment had 3 times higher odds ratio of intubation compared with those that did not. See table 26b.

Table 26b. Multivariate Logistic Regression analysis for intubation including Paediatric PreTransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	PPTRSCat			595.085	4	.000			
	PPTRSCat(1)	2.546	.240	112.740	1	.000	12.750	7.970	20.397
	PPTRSCat(2)	4.397	.246	320.731	1	.000	81.203	50.187	131.389
	PPTRSCat(3)	5.393	.301	322.017	1	.000	219.889	122.007	396.300
	PPTRSCat(4)	6.337	.492	165.932	1	.000	564.919	215.407	1481.536
	PrevIQI(1)	1.242	.235	27.934	1	.000	3.463	2.185	5.489
	NNP			38.454	2	.000			
	NNP(1)	.956	.154	38.453	1	.000	2.600	1.922	3.517
	NNP(2)	.276	.126	4.796	1	.029	1.317	1.029	1.686
	Constant	-4.613	.237	378.744	1	.000	.010		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.4. Relationship of the paediatric pretransport risk score and insertion of pleural drain

Only 38 patients in hour cohort required a placement of a pleural drain and therefore the statistical analysis performed should be interpreted with caution. Nevertheless, there was an association between the severity of patients and the need for a plural drainage that was statistically significant. See table 27a.

Table 27a. Crosstab of Paediatric PreTransport Risk Score (PPTRS) Category by Pleural Drain

		Pleural Drain		Total
		No	**Yes**	
	0-3 Points	1411	2	1413
	4-6 Points	1340	10	1350
PPTRS Category	7-9 Points	457	14	471
	10-12 Points	140	9	149
	>12 Points	53	3	56
Total		3401	38	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	71.149[a]	4	.000
Likelihood Ratio	52.330	4	.000
Linear-by-Linear Association	61.413	1	.000
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .62.; df; degrees of freedom

The multivariate logistic regression analysis showed also a statistically significant association between placement of a pleural drain and higher values on the PPTRS. For example, patients with a score value of 10-12 had 38 times higher odds ratio of requiring a pleural drainage than those with 0 to 3 points in the score. These results are shown in the Table 27b.

Table 27b. Multivariate Logistic Regression analysis for pleural drainage including the Paediatric PreTransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	95% C.I.for EXP(B) Upper
Step 1[a]	PPTRSCat			34.371	4	.000			
	PPTRSCat(1)	1.682	.776	4.701	1	.030	5.379	1.175	24.617
	PPTRSCat(2)	2.991	.760	15.509	1	.000	19.915	4.494	88.260
	PPTRSCat(3)	3.659	.792	21.352	1	.000	38.811	8.222	183.202
	PPTRSCat(4)	3.585	.930	14.842	1	.000	36.038	5.818	223.232
	PrevIQI(1)	-.881	1.029	.733	1	.392	.414	.055	3.114
	NNP			3.676	2	.159			
	NNP(1)	.837	.444	3.556	1	.059	2.310	.968	5.513
	NNP(2)	.536	.404	1.761	1	.185	1.709	.774	3.771
	Constant	-6.868	.742	85.596	1	.000	.001		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.5. Relationship of the paediatric pretransport risk score and administration of surfactant

Treatment with surfactant was only performed in neonates and its administration was clearly associated with higher scores in our cohort with also a clear direct linear trend. Those results also should be taken carefully as the statistical test had at least 2 cells with expected count being less than 5. See table 28a.

Table 28a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Surfactant.

		Surfactant		Total
		No	**Yes**	
	0-3 Points	1411	2	1413
	4-6 Points	1329	21	1350
PPTRS Category	7-9 Points	418	53	471
	10-12 Points	119	30	149
	>12 Points	53	3	56
Total		3330	109	3439

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	294.539[a]	4	.000
Likelihood Ratio	215.752	4	.000
Linear-by-Linear Association	203.700	1	.000
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.77.; df: degrees of freedom

The multivariate analysis with logistic regression showed that the odds ratio was a thousands times higher in preterm neonates and term neonates compared with infants. There was not a clear relationship with the need for urgent surgery.

The PPTRS was also an independent factor with patients that had scores between 9-12 had 146 times higher odds ratio than the reference group. See table 28b.

Table 28b. Multivariate Logistic Regression analysis for administration of surfactant including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1ª	PPTRSCat			89.790	4	.000			
	PPTRSCat(1)	2.666	.745	12.811	1	.000	14.386	3.341	61.947
	PPTRSCat(2)	4.387	.728	36.274	1	.000	80.385	19.283	335.093
	PPTRSCat(3)	4.988	.749	44.317	1	.000	146.672	33.770	637.031
	PPTRSCat(4)	3.451	.944	13.378	1	.000	31.539	4.962	200.465
	PrevIQI(1)	-1.023	.656	2.427	1	.119	.360	.099	1.302
	NNP			60.389	2	.000			
	NNP(1)	19.037	858.398	.000	1	.982	185121447.564	.000	.
	NNP(2)	17.224	858.398	.000	1	.984	30223789.880	.000	.
	Constant	-23.925	858.398	.001	1	.978	.000		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.6. Relationship of the paediatric pretransport risk score and administration of inhaled nitric oxide

Table 29a displays the relationship between the administration of inhaled nitric oxide and the PPTRS. The results showed that there was a significant association but results should be interpreted carefully as 2 cells form the crosstab analysis had expected counts less than 5. See table 29a.

Table 29a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Nitric Oxide.

		Nitric Oxide		Total
		No	Yes	
	0-3 Points	1413	0	1413
	4-6 Points	1331	19	1350
PPTRS Category	7-9 Points	447	24	471
	10-12 Points	120	29	149
	>12 Points	46	10	56
Total		3357	82	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	299.246[a]	4	.000
Likelihood Ratio	185.957	4	.000
Linear-by-Linear Association	223.948	1	.000
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.34.; df: degrees of freedom

The multivariate analysis is represented in the Table 29b. The results showed that there was significant association with the PPTRS and the age group. In fact, administration of inhaled nitric oxide was nearly 15 times more likely in preterm neonates compared with patients form the paediatric age group. This trend was also true for term neonates even though the odds ratio was slightly lower, around 8 times higher.

Table 29b. Multivariate Logistic Regression analysis for Nitric Oxide administration including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	PPTRSCat			67.436	4	.000			
	PPTRSCat(1)	16.850	1007.649	.000	1	.987	20793853.381	.000	.
	PPTRSCat(2)	18.002	1007.649	.000	1	.986	65820098.560	.000	.
	PPTRSCat(3)	19.339	1007.649	.000	1	.985	250562254.944	.000	.
	PPTRSCat(4)	19.150	1007.649	.000	1	.985	207287176.686	.000	.
	PrevIQI(1)	.217	.521	.172	1	.678	1.242	.447	3.450
	NNP			33.240	2	.000			
	NNP(1)	2.116	.516	16.820	1	.000	8.299	3.019	22.815
	NNP(2)	2.684	.474	31.998	1	.000	14.642	5.777	37.108
	Constant	-22.890	1007.649	.001	1	.982	.000		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.7. Relationship of the paediatric pretransport risk score and peripheral vein access

Placement of a peripheral vein cannula was by far the most common medical intervention in our cohort as it was present in 2769 out of 3439 patients.

Its placement was already present in the majority of patients with lower scores but still our analysis showed that there was a statistically significant association between obtaining peripheral intravenous access and the PPTRS in spite of the fact that this relationship did not have a significant linear trend. See table 30a.

Table 30a. Crosstab of Paediatric PreTransport Risk Score (PPTRS) Category by Peripheral Vein access

		IV Cannula		Total
		No	Yes	
	0-3 Points	312	1101	1413
	4-6 Points	206	1144	1350
PPTRS Category	7-9 Points	86	385	471
	10-12 Points	41	108	149
	>12 Points	25	31	56
Total		670	2769	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.610[a]	4	.000
Likelihood Ratio	46.486	4	.000
Linear-by-Linear Association	1.230	1	.267
N of Valid Cases	3439		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.91.; df: degrees of freedom

The multivariate analysis for peripheral vein access showed a very different trend compared with the other medical interventions. Those patients with scores from 3 to 6 and 6 to 9 had an odds ratio that was only 1.5 times higher compared with those who only had 0-3 points in the score. In the other hand, the patients with higher scores

from 10 to 12 points were less likely to get an intravenous cannula compared with those with lower scores, although this association did not reach statistical significance. Interestingly, the analysis revealed that having > 12 points in the score was a protective factor for peripheral vein access compared with the less severe group category with an odds ratio of 0.392, and this was statistically significant. See table 30b.

Table 30b. Multivariate Logistic Regression analysis for peripheral vein access including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	PPTRSCat			37.549	4	.000			
	PPTRSCat(1)	.416	.103	16.363	1	.000	1.516	1.239	1.855
	PPTRSCat(2)	.445	.143	9.723	1	.002	1.560	1.180	2.064
	PPTRSCat(3)	-.010	.205	.003	1	.960	.990	.662	1.480
	PPTRSCat(4)	-.937	.290	10.436	1	.001	.392	.222	.692
	PrevIQI(1)	.625	.261	5.716	1	.017	1.868	1.119	3.116
	NNP			215.908	2	.000			
	NNP(1)	-1.714	.117	214.454	1	.000	.180	.143	.227
	NNP(2)	-.548	.105	27.141	1	.000	.578	.470	.710
	Constant	1.733	.085	414.019	1	.000	5.659		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.8. Relationship of the paediatric pretransport risk score and umbilical vein access

Obtaining an umbilical vein access during transport was the second intravenous access after peripheral cannula insertion and was present in 413 patients. Our results showed that there was a statistically significant association and linear with the PPTRS. See table 31a.

Table 31a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Umbilical vein access

		Umbilical catheter		Total
		No	Yes	
PPTRS Category	0-3 Points	1377	36	1413
	4-6 Points	1224	126	1350
	7-9 Points	337	134	471
	10-12 Points	67	82	149
	>12 Points	21	35	56
Total		3026	413	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	645.443[a]	4	.000
Likelihood Ratio	510.520	4	.000
Linear-by-Linear Association	583.290	1	.000
N of Valid Cases	3439		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.73; df: degrees of freedom.

Table 31b displays the results of the multivariate analysis for umbilical vein access and it showed that higher scores had a significantly higher odds ratio of umbilical vein access. For example, patients with scores >12 had an odds ratio 115 times higher compared with our reference category.

Table 31b. Multivariate Logistic Regression analysis for umbilical vein access including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

| | | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
								Lower	Upper
Step 1ª	PPTRSCat			302.959	4	.000			
	PPTRSCat(1)	1.591	.201	62.580	1	.000	4.911	3.311	7.284
	PPTRSCat(2)	2.808	.213	174.129	1	.000	16.575	10.923	25.152
	PPTRSCat(3)	4.060	.290	195.541	1	.000	58.001	32.830	102.470
	PPTRSCat(4)	4.751	.478	98.726	1	.000	115.720	45.330	295.414
	PrevIQI(1)	-1.103	.425	6.736	1	.009	.332	.144	.763
	NNP			60.796	2	.000			
	NNP(1)	6.959	1.010	47.469	1	.000	1052.791	145.401	7622.845
	NNP(2)	6.347	1.007	39.760	1	.000	570.782	79.372	4104.606
	Constant	-9.351	1.018	84.319	1	.000	.000		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.9. Relationship of the paediatric pretransport risk score and central venous access

The univariate analysis between the PPTRS and central venous access was statistically significant and had also a linear trend. See table 32a.

Table 32a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Central venous line

		Central venous line		
		No	**Yes**	**Total**
	0-3 Points	1352	61	1413
	4-6 Points	1280	70	1350
PPTRS Category	7-9 Points	406	65	471
	10-12 Points	130	19	149
	>12 Points	49	7	56
Total		3217	222	3439

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	69.556[a]	4	.000
Likelihood Ratio	58.710	4	.000
Linear-by-Linear Association	49.839	1	.000
N of Valid Cases	3439		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.62.;df: degrees of freedom

When analysing the multivariate results shown in the table 32b, it was clear that there was a statistically significant relationship with central vein access and the paediatric pre- transport risk score, age group and need for urgent surgical treatment.

All categories from the score except for those with 3-6 points had around 3 times higher odds ratio of ventral vein access compared with the reference category.

Age group analysis revealed that the term neonate group had a higher risk of requiring a central line compared with the paediatric group whereas the preterm neonatal

group age was a very strong protective risk factor for central vein access. These results probably reflect the fact that umbilical vein access was the preferred central vein access for preterm neonates. See table 32b.

Table 32b. Multivariate Logistic Regression analysis for central vein access including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	PPTRSCat			51.043	4	.000			
	PPTRSCat(1)	.244	.181	1.831	1	.176	1.277	.896	1.819
	PPTRSCat(2)	1.205	.190	40.154	1	.000	3.337	2.299	4.845
	PPTRSCat(3)	1.101	.286	14.768	1	.000	3.007	1.715	5.271
	PPTRSCat(4)	1.040	.440	5.586	1	.018	2.830	1.194	6.706
	PrevIQI(1)	1.083	.230	22.178	1	.000	2.953	1.882	4.634
	NNP			25.484	2	.000			
	NNP(1)	.647	.176	13.573	1	.000	1.910	1.354	2.694
	NNP(2)	-.347	.180	3.728	1	.054	.707	.497	1.005
	Constant	-3.214	.150	461.458	1	.000	.040		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.10. Relationship of the paediatric pretransport risk score and arterial access

Arterial access was extremely infrequent in our cohort and only occurred in 20 patients. Despite the statistical analysis shown in Table 33 demonstrated a significant relationship with the PPTRS, those results should be interpreted cautiously as there were at least 3 cells in the crosstab analysis that had expected counts less than 5.

We did not perform a multivariate logistic analysis, as the sample was too small.

Table 33. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Arterial Line

		Arterial Line		Total
		No	Yes	
	0-3 Points	1413	0	1413
	4-6 Points	1346	4	1350
	7-9 Points	461	10	471
PPTRS Category	10-12 Points	144	5	149
	>12 Points	55	1	56
Total		3419	20	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.762[a]	4	.000
Likelihood Ratio	40.571	4	.000
Linear-by-Linear Association	39.344	1	.000
N of Valid Cases	3439		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .33.; df: degrees of freedom

5.8.11. Relationship of the paediatric pretransport risk score and administration of volume expanders

Administration of volume expanders was relatively frequent as 17.3% of patients received it during the transport. The analysis showed that there was a statistically significant association and linear trend with the PPTRS. See table 34a.

Table 34a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Volume Expanders

		Volume Expansors		Total
		No	Yes	
	0-3 Points	1336	77	1413
	4-6 Points	1135	215	1350
PPTRS Category	7-9 Points	303	168	471
	10-12 Points	60	89	149
	>12 Points	11	45	56
Total		2845	594	3439

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	595.446[a]	4	.000
Likelihood Ratio	513.453	4	.000
Linear-by-Linear Association	566.796	1	.000
N of Valid Cases	3439		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.67.;df:degrees of freedom.

The multivariate analysis showed that those patient with higher scores categories had higher odds ratio for volume expanders. That risk was already 3.3 times higher for patients with 3-6 points in the score, but increased up to 90 times higher in those with > 12 points.

The results also showed that urgent need for surgery was a risk factor with an odds ratio 2.2 times higher compared with those that did not required surgery.

Not surprisingly, both preterm and term neonates were protective factors for volume administration. See table 34b.

Table 34b. Multivariate Logistic Regression analysis for volume expanders including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1ª	PPTRSCat			432.900	4	.000			
	PPTRSCat(1)	1.205	.140	74.297	1	.000	3.337	2.537	4.389
	PPTRSCat(2)	2.379	.155	234.861	1	.000	10.797	7.965	14.637
	PPTRSCat(3)	3.495	.212	271.654	1	.000	32.962	21.752	49.949
	PPTRSCat(4)	4.504	.364	153.514	1	.000	90.361	44.317	184.243
	PrevIQI(1)	.789	.199	15.808	1	.000	2.202	1.492	3.250
	NNP			36.730	2	.000			
	NNP(1)	-.643	.156	16.925	1	.000	.526	.387	.714
	NNP(2)	-.657	.120	29.873	1	.000	.518	.410	.656
	Constant	-2.670	.124	466.130	1	.000	.069		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.12. Relationship of the paediatric pretransport risk score and administration of inotropic drugs

Use of inotropic drugs showed similar results as the analysis with volume expanders. The association with the PPTRS was statistically significant and also showed a linear trend. See Table 35a.

Table 35a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Inotropic Drugs

		Inotropic Drugs		
		No	Yes	Total
	0-3 Points	1403	10	1413
	4-6 Points	1284	66	1350
PPTRS Category	7-9 Points	361	110	471
	10-12 Points	71	78	149
	>12 Points	13	43	56
Total		3132	307	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	927.807[a]	4	.000
Likelihood Ratio	644.232	4	.000
Linear-by-Linear Association	770.074	1	.000
N of Valid Cases	3439		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 5.00.; df: degrees of freedom.

The multivariate analysis showed that the odds ratio for inotropic drugs increased for each PPTRS category with and odds ratio that was already 7 times higher for patients with 3-6 points, and it multiplied up to 413 times higher in those with > 12 points.

Urgent need for surgery did not show a statistically significance with inotropic drugs.

The relationship in the age group analysis showed that in the contrary of what we found in the volume expanders analysis, both preterm and term neonates had around 1.5 times more odds ratio for inotropic drugs compared with the paediatric reference group. See Table 35b.

Table 35b. Multivariate Logistic Regression analysis for inotropic drugs including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

| | | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
								Lower	Upper
Step 1[a]	PPTRSCat			390.206	4	.000			
	PPTRSCat(1)	1.991	.342	33.942	1	.000	7.324	3.748	14.310
	PPTRSCat(2)	3.701	.336	121.270	1	.000	40.482	20.951	78.220
	PPTRSCat(3)	4.932	.359	189.017	1	.000	138.613	68.623	279.988
	PPTRSCat(4)	6.024	.450	179.085	1	.000	413.258	171.021	998.602
	PrevIQI(1)	.343	.289	1.416	1	.234	1.410	.801	2.481
	NNP			8.996	2	.011			
	NNP(1)	.474	.192	6.098	1	.014	1.606	1.103	2.340
	NNP(2)	.416	.160	6.723	1	.010	1.515	1.107	2.074
	Constant	-5.174	.328	249.015	1	.000	.006		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.13. Relationship of the paediatric pretransport risk score and intraosseous access

Only 44 (1.3%) patients on our cohort required an intraosseous access and there was an statistically significant association with the PPTRS that also showed a linear trend. Still results should be interpreted with caution as some expected counts were below 5. Table 36a.

Table 36a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Intraosseous access

		Intraosseous line		Total
		No	Yes	
	0-3 Points	1408	5	1413
	4-6 Points	1338	12	1350
PPTRS Category	7-9 Points	463	8	471
	10-12 Points	141	8	149
	>12 Points	45	11	56
Total		3395	44	3439

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	181.109[a]	4	.000
Likelihood Ratio	68.427	4	.000
Linear-by-Linear Association	91.527	1	.000
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .72.; df: degrees of freedom.

Table 36b revealed that higher scores were statistically associated with higher odds ratio for intraosseous access in all categories. The relationship with urgency of surgical treatment was not significant.

The analyses for group age showed that both preterm and term neonates had very low risk of intraosseous access compared with paediatric group age.

Table 36b. Multivariate Logistic Regression analysis for intraosseous access including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	PPTRSCat			100.083	4	.000			
	PPTRSCat(1)	.905	.535	2.864	1	.091	2.471	.867	7.047
	PPTRSCat(2)	1.820	.576	9.994	1	.002	6.175	1.997	19.089
	PPTRSCat(3)	3.482	.593	34.492	1	.000	32.510	10.172	103.902
	PPTRSCat(4)	5.298	.633	69.993	1	.000	199.925	57.788	691.662
	PrevIQI(1)	.509	.541	.886	1	.347	1.664	.576	4.810
	NNP			21.493	2	.000			
	NNP(1)	-18.186	1583.290	.000	1	.991	.000	.000	.
	NNP(2)	-2.472	.533	21.493	1	.000	.084	.030	.240
	Constant	-5.148	.452	129.594	1	.000	.006		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.14. Relationship of the paediatric pretransport risk score and cardiopulmonary resuscitation

94 (2.7%) of patients in our study received cardiopulmonary resuscitation during their transport and there was a significant association with the PPTRS that also showed a linear trend. It should be taken into account that those results were form a sample with low numbers.

Table 37a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Cardiopulmonary resuscitation

		CPR		
		No	**Yes**	**Total**
	0-3 Points	1411	2	1413
	4-6 Points	1339	11	1350
PPTRS Category	7-9 Points	449	22	471
	10-12 Points	121	28	149
	>12 Points	25	31	56
Total		3345	94	3439

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	788.868[a]	4	.000
Likelihood Ratio	305.428	4	.000
Linear-by-Linear Association	426.880	1	.000
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.53.; df: degrees of freedom

The only variable that showed a statistically significant association with cardiopulmonary resuscitation was the PPTRS. Changing from 0-3 points category to 4-6 points category increased the odds ratio for cardiopulmonary resuscitation 5.7 times, but it was much higher in patient with > 12 points reaching 879 times higher odds ratio compared with lowest risk group category. See Table 37b.

Table 37b. Multivariate Logistic Regression analysis for cardiopulmonary resuscitation including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	PPTRSCat			203.014	4	.000			
	PPTRSCat(1)	1.742	.770	5.118	1	.024	5.707	1.262	25.807
	PPTRSCat(2)	3.510	.741	22.409	1	.000	33.446	7.820	143.046
	PPTRSCat(3)	5.005	.741	45.636	1	.000	149.164	34.915	637.252
	PPTRSCat(4)	6.780	.764	78.758	1	.000	879.816	196.843	3932.461
	PrevIQI(1)	-1.276	.667	3.660	1	.056	.279	.076	1.032
	NNP			6.096	2	.047			
	NNP(1)	.219	.353	.387	1	.534	1.245	.624	2.487
	NNP(2)	.667	.281	5.634	1	.018	1.948	1.123	3.379
	Constant	-6.799	.724	88.135	1	.000	.001		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.15. Relationship of the paediatric pretransport risk score and defibrillation

Only 3 patients had a cardiac arrest with ventricular fibrillation. 2 were from the group of 7-9 points and 1 from > 12 points in the score. See table 38. With such small sample no statistical analysis was performed.

Table 38. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Defibrillation

		Defibrillation		Total
		No	Yes	
	0-3 Points	1413	0	1413
	4-6 Points	1350	0	1350
PPTRS Category	7-9 Points	469	2	471
	10-12 Points	149	0	149
	>12 Points	55	1	56
Total		3436	3	3439

5.8.16. Relationship of the paediatric pretransport risk score and administration of antiepileptic drugs

The univariate analysis of the relationship between the administration of antiepileptic drugs and the PPTRS showed a weak association that did not reach significance.

Table 39a. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Antiepileptic Drugs

		Antiepileptic Drugs		
		No	**Yes**	**Total**
	0-3 Points	1323	90	1413
	4-6 Points	1263	87	1350
PPTRS Category	7-9 Points	424	47	471
	10-12 Points	137	12	149
	>12 Points	50	6	56
Total		3197	242	3439

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	9.311[a]	4	.054
Likelihood Ratio	8.535	4	.074
Linear-by-Linear Association	5.530	1	.019
N of Valid Cases	3439		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.94.;df:degrees of freedom.

The multivariate analysis showed that the PPTRS variable overall was a significant independent factor for administration of antiepileptic drugs, but not for each category. See Table 39b.

Age group was the other variable that had a strong association with antiepileptic drugs administration. Term neonate group age was an independent protective factor compared with the paediatric group age.

Table 39b. Multivariate Logistic Regression analysis for antiepileptic drugs including the Paediatric Pretransport Risk Score (PPTRS) (Categorical variable), Age Group and Urgent Need for Surgery

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	PPTRSCat			15.063	4	.005			
	PPTRSCat(1)	-.022	.156	.021	1	.885	.978	.720	1.327
	PPTRSCat(2)	.600	.191	9.911	1	.002	1.823	1.254	2.648
	PPTRSCat(3)	.439	.325	1.822	1	.177	1.550	.820	2.931
	PPTRSCat(4)	.747	.452	2.729	1	.099	2.110	.870	5.117
	PrevIQI(1)	-.689	.395	3.048	1	.081	.502	.232	1.088
	NNP			22.048	2	.000			
	NNP(1)	-1.356	.296	20.969	1	.000	.258	.144	.460
	NNP(2)	-.275	.148	3.443	1	.064	.759	.568	1.016
	Constant	-2.460	.120	423.240	1	.000	.085		

a. Variable(s) entered on step 1: NNP. PrevIQI. PPTRSCat. NNP: paediatric age group (Reference category); NNP(1): Term neonates; NNP(2): preterm neonates; PrevIQ(1): Need for Urgent Surgery; PPTRSCat: Paediatric Risk Score 0-3 points (Reference group); PPTRSCat(1): Paediatric Risk Score 4-6 points; PPTRSCat(2): Paediatric Risk Score 7-9 points; PPTRSCat(3): Paediatric Risk Score 10-12 points; PPTRSCat(4): Paediatric Risk Score >12 points. B: beta coefficient; S.E: Standard Error for B; df: degrees of freedom; Sig.: Signification; Exp(B): Odds Ratio; C.I: Confidence Interval.

5.8.17. Relationship of the paediatric pretransport risk score and use of cervical collar

Only 49 patients in our cohort needed placement of cervical collar. Out of the 149 patients on the trauma group category, only 49 were included in cervical trauma and therefore a collar was used during transport. The placement of a cervical collar did not show any significant relationship with the PPTRS and those results are shown in the Table 40.

Table 40. Crosstab of Paediatric Pretransport Risk Score (PPTRS) Category by Collar

		Collar		
		No	**Yes**	**Total**
PPTRS Category	0-3 Points	1392	21	1413
	4-6 Points	1333	17	1350
	7-9 Points	463	8	471
	10-12 Points	147	2	149
	>12 Points	55	1	56
Total		3390	49	3439

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.612[a]	4	.962
Likelihood Ratio	.604	4	.963
Linear-by-Linear Association	.015	1	.903
N of Valid Cases	3439		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .80.
;df: degrees of freedom

DISCUSSION

6. DISCUSSION

The PPTRS has been validated specifically for transport patients of all group ages with clinical information obtained at the first contact call that can predict mortality 48 h after transport, intensive care admission and the medical interventions performed during stabilization and transport.

Our study yielded several major findings. First, the PPTRS is, to our knowledge, the first interhospital transport risk score that has been validated for all paediatric group ages with clinical information obtained at the first contact call.

Secondly, the PPTRS calculated at the first contact call is the first that provides information about the risk of 48 hours after transport mortality in infants who undergo interhospital transport.

Third, the PPTRS is a tool that can predict tertiary department disposition and the need for most common medical interventions during stabilization and transport.

Our study population included a large number of patients including ages form preterm neonates to teenagers and thus makes our results more robust. There are other scores that were designed to be used in all group ages but the number of patients included was significantly less. For example, the RSTP score (46) was designed to predict the risk of major complications during transfer for all group ages, also adults, but included a total sample of 128 patients with only 32 children (16 infants and 16 neonates).

6.1.   Mortality after 48 h of transport

Our study reported an overall mortality of 0.5% at the end of the transport and of 1.9%. after 48 h of transport. There was a slightly higher mortality rate in neonates, 2.5% compared with 1.1% in paediatric group. This mortality rates are very low compared with other mortality rates from other scores' studies reported in the literature. For the neonatal subgroup, the MCRIB reported a mortality rate of 12.06% (33) and this number was similar to the 11% reported in the MINT Score (43).

Any of the specifically designed scores for paediatric group age patients, like PRISA (44), TRAP score (45), and TPEWS (47) were designed to predict mortality and therefore we could not compare our results with these scores. As a surrogate to compare our mortality rates in the paediatric group age, Kyösty et el (52) recently published a study that compared the long-term mortality and causes of death in children post admission to an ICU, with a control population of same age, and they found that the ICU mortality rate was 1.9% compared with 0.10% in the control group of healthy children.

Other large multicentre studies have reported overall observed mortality rates for paediatric intensive care units to be around 4% (4.4 % (53) and 4.25% (54)).

Our study showed an overall mortality rate and also specific age group mortality rates that were significantly lower than others reported in the literature. These findings could be explained by a selection bias. National Catalan health system has a centralised tertiary care approach with two main hospitals that centralise the care of more complex patients with higher complexity. Therefore, it is likely that the most severe patients would be admitted directly in the destination centres and therefore

would not need to be transferred.

In this study the predictive model for mortality after 48 h of transport that included the PPTRS, group age and urgent need for surgery, had acceptable discrimination value and adequate goodness-of-fit.

The ROC analysis, that illustrates the diagnostic ability of the PPTRS, is created by plotting the true positive rate (TPR) against the false positive rate (FPR) at various threshold settings. Ideally, a perfect test would have area under the curve of 1. In our study, the ROC analysis showed an area under the curve of 0.918 (95% CI: 0.909 to 0.927), which reflected the excellent accuracy of our score to predict mortality. When comparing our results with other scores, the MINT score (43) had an area under the ROC curve of 0.80 (95% CI: 0.76-0.83) for death in the perinatal period (first week after birth) and an area under the ROC curve of 0.80 (95% CI: 0.76-0.83) for death in the neonatal period (first month after birth). The TRIPS Score (37) had an area under the curve of 0.83 and 0.76. respectively for the same analysis. We could not compare our analysis with the TPEWS score as ROC analysis was not performed in their study.

The Cox & Snell R Square for our model was 0.066, indicating that approximately 6% of the variation in mortality changes were accounted by our final model indicating that the results were only mild. However, the magnitude of the correlations in our model were similar to that found in a number of other widely used risk-adjustment measures. The reported average Cox & Snell R Square of the PRISA score predicting intensive care admission in paediatric patients was only 0.044 (55). Alos, Cox & Snell R Square for predicting the cost for 11 different conditions was 0.13 for APACHE II, and 0.13 for MedisGroups Study. Similarly, the Cox & Snell R Square for length of stay for

pneumonia patients was 0.09 for MedisGroups study. (56)

The Hosmer-Lemeshow test showed good calibration with a non-significant P=0.654. When comparing our results with other scores, our model for mortality had better calibration than the TRIPS (37) (p= 0.49), SNAP-II (p= 0.29), and very similar to SNAPPE-II (p= 0.88) (42).

The results of our multivariate study showed that the PPTRS was the only independent variable to predict the risk of mortality 48 h of transport (OR: 1.744 (95% CI: 1.599-1.902; p= 0.000). We also calculated the odds ratio of mortality for each category compared with the reference group (0-3 points) and the results showed an exponentially increase in mortality risk with higher scores, with an OR of 616.586 (95% CI: 138.343-2748.086; p= 0.000) for the highest category (> 12 points).

As far as we know, this is the first study that used the final validated model to create a tool to predict the estimated mortality and the relative risk for patients based on the age group, need for urgent surgery and the PPTRS. This tool could be a valid resource for caregivers in the local hospitals and also in the control centre in order to establish the estimated risk of mortality and also anticipate the need for medical interventions. Knowing these information in advance will be a key information to chose the most appropriate hospital destination based on the expected mortality rates.

6.2. Intensive Care admission

Our study demonstrated that those patients that were admitted in the intensive care unit had higher PPTR Scores (3.32 ± 1.77 vs 5.07 ± 2.88; p <0.000) compared with those who were admitted in other units. This relationship also showed a linear trend with higher scores leading to higher percentages of intensive care admission.

Interestingly, in our study the majority of patients, 2344 (69.5%), were admitted in intensive care units. Nearly 100% of those that had scores > 9 points were admitted in intensive care. These results could have been expected as higher scores would lead undoubtedly to intensive care admission.

What was not expected in our study is that 56.9% of the patients with the lowest paediatric pre transport risk scores (from 0-3), were admitted in intensive care as well. This high proportion of intensive care admission could be for several reasons. It is possible that there was a selection bias in our cohort of patients as our unit is a specialist retrieval paediatric team and it is more likely that the coordinator centre had assigned more severe cases to our unit and less severe cases to other non-specialised teams, thus the need for ICU admission could be higher. Unfortunately we did not have access to the whole cohort of paediatric patients transferred in Catalonia and therefore this data could not be analysed. Also, it could have been explained by an overestimation of the patient's severity by the referring team, who at the time to contact the coordinator centre would request an intensive care admission in the receiving hospital, leading to higher intensive care allocations rates.

Interestingly, Kandil et all (45) also reported a high rate of intensive care admissions on the TRAP score data and, similarly to our results, they also reported that using their score was an independent factor for PICU admissions with an OR of 1.40 (1.23- 1.60), but their study did not evaluated mortality neither the medical interventions required.

Our final model for intensive care admission showed that the PPTRS, the group age and the urgent need for surgery were all three independent risk factors. The results showed that those patients that required urgent need for surgery had an odds ratio

1.5 times higher for being admitted in intensive care compared with those who did not require urgent surgery. Also it was found that preterm and term neonates were at least 5.5 times more likely to be admitted in intensive care compared with the paediatric group age. Although, the strongest association for PICU admission was with higher scores, with those who had 7-9 points had having approximately 10 times higher odds ratio of intensive care admission compared with the reference group (OR: 10.029 (95% CI: 6.823-14.742; p= 0.000)); and those with >12 points had approximately 27 times higher odds ratio of intensive care admission (OR: 27.334 (95% CI: 3.698-202.026; p= 0.000)).

The ROC analysis of our intensive care admission model showed an area under the curve of 0.687 (95% CI: 0.671 to 0.703). The Cox & Snell R Square was 0.206 and the Hosmer and Lemeshow test for goodness-of-fit was non significant (p= 0.087).

Despite that the calibration and goodness-of-fit for this model were lower compared with the mortality model, it was very similar to other published scores that are only validated to predict intensive care disposition. Moreover, our study predicted also mortality using the same score. The ROC curve for PICU admission using TRAP score as a predictor showed an area under the curve of 0.70 (95% CI 0.64 - 0.77) (45). The PRISA score, which predicted the risk of admission in intensive care among paediatric emergency department patients, showed an area under the ROC curve of 0.86 and 0.83 in their derivation and validation samples, respectively (44).

In this study, the PPTRS had acceptable discrimination value and adequate goodness-of-fit in predicting intensive care admissions. Increasing the cut-off value (from > 2.5 to > 8.5) increased significantly the specificity from 66.9% up to 98.9% with a relevant

drop in sensitivity form 83.2% down to 12.3%.

Similarly to the mortality analysis, our study is the first to use the final model of intensive care admission to create a tool that summarised the predicted risk of intensive care admission and also its relative risk compared with the group that had less intensive care admission rates.

6.3. Medical interventions

The results of our study showed that overall total of medical interventions was relatively low with only an average of 1.95 medical interventions/patient, which implies that most of the patients only required supervision and monitoring during their transfer to the receiving hospital.

Our study also revealed that the medical teams in the referring hospitals performed more medical interventions than the retrieval team in all subgroup of PPTRS categories. This data suggested that the medical team from the referring hospitals started the medical treatment before the transport team arrived at the referring hospital in all cases.

When we analysed each medical intervention individually, we demonstrated that the PPTRS had a statistically significant positive linear trend relationship with the administration of bronchodilators, tracheal intubation and mechanical respiratory support, use of surfactant, placement of an umbilical vein catheter, obtaining a central line access, administration of volume expanders and infusion of inotropic or vasoactive drugs.

Pleural drain placement, administration of inhaled nitric oxide, placement of an arterial line or obtaining intraosseous access and performing cardiopulmonary resuscitation manoeuvres and defibrillation, did show also a linear trend with the PPTRS but these relationships should be taken cautiously as the number of those procedures was relatively low in our cohort.

Obtaining a peripheral vein access was the only medical intervention that showed a significant association with the PPTRS, but in this case the relationship showed a negative linear trend. These results indicated that it was much more likely to get a peripheral line access in less severe patients compared with those with higher scores.

Lastly, the administration of antiepileptic drugs and the use of cervical collar did not have any relationship with the PPTRS.

LIMITATIONS

7. LIMITATIONS

Several limitations of this study deserve mention.

First, despite that our sample included 3439 patients, we had to exclude around 20% patients because of relevant missing information and this could have included a selection bias in our population.

Second, our sample is not nationally representative and only represented the activity of a highly specialised ground retrieval team unit and therefore these results might not be applicable for air transport units or adult transport teams, which are also present in our territory.

Third, our population showed a high rate of intensive care admission even for the lowest paediatric risk score categories. The lack of patients admitted to other wards might have an impact on the accuracy of the application of this score to populations with lower intensive care admission rates.

Finally, because the present study was carried out at a single centre, other characteristics related to patients, transports or hospital areas that were not assessed in the present model may have significant influence on risks for mortality, intensive care admission and also to medical interventions during transport. Multicentre studies are needed to generalize the obtained results. Further external validation of the PPTRS is necessary before widespread adoption can be recommended.

CONCLUSIONS

8. CONCLUSIONS

1. The paediatric pre transport risk score is a valid and useful tool to predict the mortality after 48 h of transport in all paediatric group ages. We demonstrated that patients who died had significantly higher paediatric risk scores than those who survived. The paediatric risk score was the only independent risk factor to predict mortality at 48 h post transport.

2. The expected risk tool created with the paediatric pre transport risk score model is a valid and useful information to predict the mortality 48 hours after transport.

3. The paediatric pretransport risk score is a valid and useful tool to predict intensive care admission in all paediatric group ages. We demonstrated that patients with higher paediatric pretransport risk scores had significantly higher rates of intensive care admission. The paediatric pre transport risk score, group age and need for urgent surgery were independent risks factors.

4. The expected risk tool created with the paediatric pre transport risk score model is valid and useful to predict admission in intensive care.

5. The paediatric pretransport risk score was an independent risk factor with a positive linear trend for bronchodilators, tracheal intubation and mechanical respiratory support, use of surfactant, placement of an umbilical vein catheter, obtaining a central

venous line access, administration of volume expanders and infusion of inotropic or vasoactive drugs.

The paediatric pretransport risk score was an independent risk factor with a negative linear trend for peripheral vein access.

6. We believe that the results of our study provide a useful tool to guide the decision process to determine when to use specialised retrieval team and the need of an intensive care unit admission based on estimated clinical outcomes and medical interventions. This new score proved to be useful and broadly applicable to all patients in our territory and others.

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ANNEX

10. ANNEX

Paediatric Transport Database

Annex-Figure 1. Picture of the main menu of Vall d'Hebron Hospital Paediatric Transport Database.
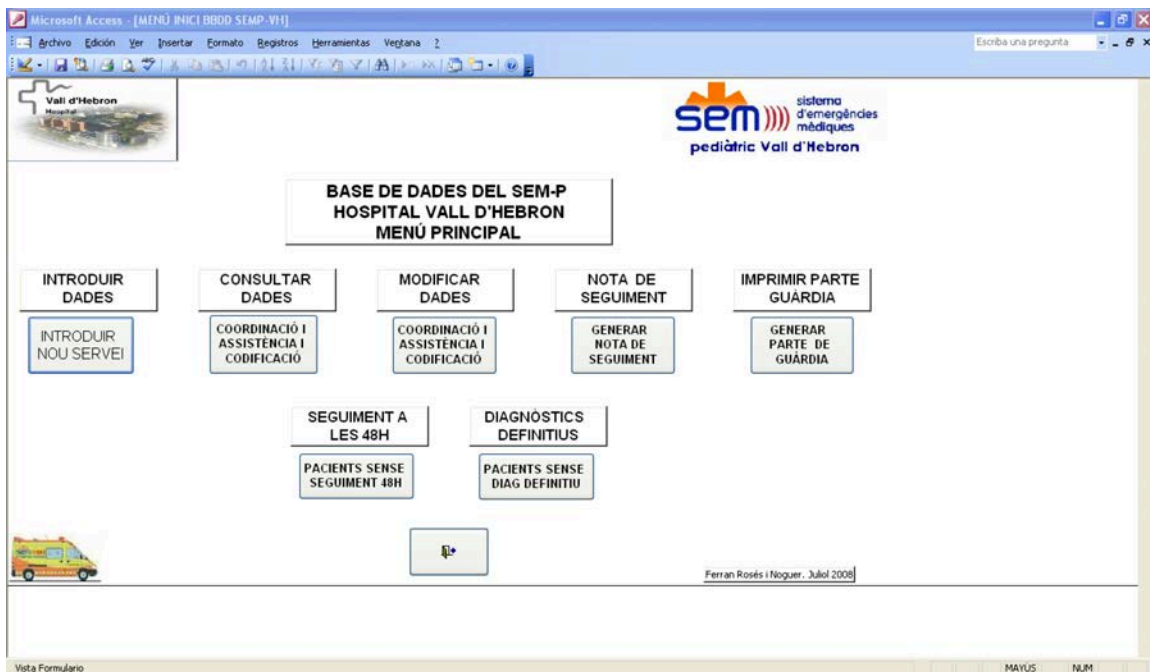
Annex-Figure 2. Picture of the main coordinator centre data and clinical data of the Vall d'Hebron Hospital Paediatric Transport Database.

Annex-Figure 3. Picture of the respiratory clinical data of the Vall d'Hebron Hospital Paediatric Transport Database.

Annex-Figure 4. Picture of the main medical interventions of the Vall d'Hebron Hospital Paediatric Transport Database.

Annex-Figure 5.   Picture of the diagnostics and procedures coding tool of the Vall d'Hebron Hospital Paediatric Transport Database.

Annex-Figure 6. Picture of the paediatric pretransport risk score tool of the Vall d'Hebron Hospital Paediatric Transport Database.

Annex-Table 1. Summary of primary clinical diagnosis.

Primary Clinical Diagnosis	Frequency	Percent	Valid Percent	Cumulative Percent
BRONQUIOLITIS VRS	219	6.4	6.4	6.4
BRONQUIOLITIS AGUDA	211	6.1	6.1	12.5
DISTRES RESPIRATORIO NEONATAL	159	4.6	4.6	17.1
BRONQUITIS AGUDA	132	3.8	3.8	21.0
CONVULSIONES	124	3.6	3.6	24.6
SEPSIS A GERMEN NO ESPECIFICADO	99	2.9	2.9	27.4
CONVULSIONES NEONATALES	69	2.0	2.0	29.5
TRAUMA CRANEOENCEFALICO CERRADO	63	1.8	1.8	31.3
RNPT 2000-2499 g	60	1.7	1.7	33.0
NEUMONIA	59	1.7	1.7	34.7
RNPT 1000-1249 g	59	1.7	1.7	36.5
RNPT 1750-1999 g	54	1.6	1.6	38.0
ASFIXIA GRAVE DURANTE EL NACIMIENTO	50	1.5	1.5	39.5
STATUS EPILEPTICO	50	1.5	1.5	40.9
RNPT 1500-1749 g	49	1.4	1.4	42.4
RNPT 750-999 g	49	1.4	1.4	43.8
APNEA	45	1.3	1.3	45.1
MEMBRANA HIALINA	38	1.1	1.1	46.2
ENCEFALOPATIA HIPOXICO-ISQUEMICA	37	1.1	1.1	47.3
RNPT =2500 g	35	1.0	1.0	48.3
LARINGITIS AGUDA	34	1.0	1.0	49.3
RNPT 1250-1499 g	34	1.0	1.0	50.3
ASFIXIA MODERADA DURANTE EL NACIMIENTO	31	.9	.9	51.2
ASMA BRONQUIAL	31	.9	.9	52.1
ASPIRACIÓN MECONIAL MASSIVA	31	.9	.9	53.0
SHOCK SEPTICO	31	.9	.9	53.9
ASFIXIA NEONATAL	30	.9	.9	54.8
CARDIOPATIA CONGÉNITA INESPECIFICADA	30	.9	.9	55.6
CETOACIDOSIS DIABETICA	30	.9	.9	56.5
COARTACION DE AORTA	28	.8	.8	57.3
HIPOGLUCEMIA	28	.8	.8	58.1
BRONCOASPIRACÓN	25	.7	.7	58.9
BRONCOESPASMO	25	.7	.7	59.6
CONVULSIONES FEBRILES	25	.7	.7	60.3
OBSTRUCCION INTESTINAL	25	.7	.7	61.0
POLITRAUMATISMO	24	.7	.7	61.7
TAQUIPNEA TRANSITORIA DEL RECIÉN NACIDO	24	.7	.7	62.4
ENCEFALITIS VIRICA	23	.7	.7	63.1
HIPERBILIRRUBINÈMIA	23	.7	.7	63.8
RNPT 500-749 g	23	.7	.7	64.4

DESTRET NEONATAL	21	.6	.6	65.0
CAIDA ACCIDENTAL	19	.6	.6	65.6
HEMATOMA EPIDURAL (TRAUMATICO)	19	.6	.6	66.2
INSUFICIENCIA RESPIRATORIA AGUDA	19	.6	.6	66.7
TAQUICARDIA PAROXISTICA SUPRAVENTRICULAR	19	.6	.6	67.3
FRACTURA DE BOVEDA CRANEAL CERRADA	17	.5	.5	67.8
HIPOTONIA GENERALIZADA NEONATAL	17	.5	.5	68.2
PARO CARDIACO	17	.5	.5	68.7
SEPSIS MENINGOCOCICA	17	.5	.5	69.2
SOSPECHA INFECCIÓN TRANSMISIÓN VERTICAL	17	.5	.5	69.7
ENTEROCOLITIS DEL RECIÉN NACIDO	16	.5	.5	70.2
MENINGITIS DE CAUSA NO ESPECIFICADA	16	.5	.5	70.7
PERSISTENCIA DEL CONDUCTO ARTERIOSO	16	.5	.5	71.1
RETINOPATIA DE LOS PREMATUROS	16	.5	.5	71.6
ANEMIA	14	.4	.4	72.0
ATRESIA DE ESOFAGO	14	.4	.4	72.4
ENCEFALOPATIA	14	.4	.4	72.8
TOSFERINA (B.PERTUSSIS)	14	.4	.4	73.2
DISPLASIA BRONCOPULMONAR	13	.4	.4	73.6
EPILEPSIA CONVULSIVA GENERALIZADA	13	.4	.4	74.0
HEMORRAGIA INTRACEREBRAL NO TRAUMAT	13	.4	.4	74.4
PARO RESPIRATORIO	13	.4	.4	74.7
TRANSPOSICION DE GRANDES ARTERIAS	13	.4	.4	75.1
HIPERTENSION PULMONAR 2ª	12	.3	.3	75.5
NEUMOTORAX ESPONTANEO	12	.3	.3	75.8
STATUS ASMATICO	11	.3	.3	76.1
Sufrimiento fetal	11	.3	.3	76.4
TRAUMATISME CRANIAL	11	.3	.3	76.8
HERNIA DIAFRAGMATICA CONGENITA	10	.3	.3	77.1
HIDROCEFALIA OBSTRUCTIVA (ADQ)	10	.3	.3	77.3
ASFIXIA POR AHOGAMIENTO	9	.3	.3	77.6
ESTATUS DE GRAN MAL	9	.3	.3	77.9
ESTENOSIS PULMONAR VALVULAR (CONG)	9	.3	.3	78.1
GASTROENTERITIS AGUDA	9	.3	.3	78.4
INSUFICIENCIA HEPATICA AGUDA	9	.3	.3	78.7
INTOXICACIÓN MEDICAMENTOSA	9	.3	.3	78.9
MENINGITIS PURULENTA	9	.3	.3	79.2
METABÒLIC. DESORDRE	9	.3	.3	79.4
SINDROME HEMOLITICO UREMICO	9	.3	.3	79.7
TRAUMATISMO ABDOMINAL	9	.3	.3	80.0
ALTERACIONES DE LA CONCIENCIA	8	.2	.2	80.2
HEMORRAGIA POST-PROCEDIMIENTO	8	.2	.2	80.4

HEMORRAGIA SUBGALEAL	8	.2	.2	80.7
HERNIA INGUINAL	8	.2	.2	80.9
TETRALOGIA DE FALLOT	8	.2	.2	81.1
TRAUMATISMO DE BAZO	8	.2	.2	81.4
ACCIDENTE DE TRAFICO	7	.2	.2	81.6
ANOMALIA CONGÈNITA INESPECIFICA	7	.2	.2	81.8
APNEAS DEL RECIEN NACIDO	7	.2	.2	82.0
FIEBRE	7	.2	.2	82.2
HEMORRAGIA GASTROINTESTINAL	7	.2	.2	82.4
INTOXICACION	7	.2	.2	82.6
MENINGITIS NEUMOCOCICA	7	.2	.2	82.8
NEUMONIA CONGÉNITA	7	.2	.2	83.0
RCIU 1750-1999 g	7	.2	.2	83.2
SHOCK CARDIOGENICO	7	.2	.2	83.4
TUMOR CEREBRAL MALIGNO	7	.2	.2	83.6
ACIDOSIS METABOLICA	6	.2	.2	83.8
CANAL ATRIO-VENTRICULAR COMUN	6	.2	.2	83.9
COMA (INESPECIFICO)	6	.2	.2	84.1
CUERPO EXTRAÑO BRONQUIAL	6	.2	.2	84.3
CUERPO EXTRAÑO ESOFAGICO	6	.2	.2	84.5
INSUFICIENCIA CARDIACA	6	.2	.2	84.6
INSUFICIENCIA RENAL AGUDA	6	.2	.2	84.8
INTOXICACION ACCID MONOXIDO CARBONO	6	.2	.2	85.0
MIOCARDIOPATIA DILATADA 1ª	6	.2	.2	85.2
MIOCARDITIS AGUDA	6	.2	.2	85.3
NEUMOTORAX 2º VENTILACION MECANICA	6	.2	.2	85.5
PERFORACION INTESTINAL	6	.2	.2	85.7
RCIU 2000-2499 g	6	.2	.2	85.9
REACCION ANAFILACTICA	6	.2	.2	86.0
SINDROME DE PIERRE-ROBIN	6	.2	.2	86.2
ACCIDENTE CEREBROVASCULAR AGUDO	5	.1	.1	86.4
BRADICARDIA NEONATAL	5	.1	.1	86.5
COMUNICACION INTERVENTRICULAR	5	.1	.1	86.7
CRUP	5	.1	.1	86.8
DERRAME PERICARDICO	5	.1	.1	86.9
DESHIDRATACION HIPERTONICA	5	.1	.1	87.1
DESHIDRATACION ISOTONICA	5	.1	.1	87.2
ESTENOSIS HIPERTROFICA DE PILORO	5	.1	.1	87.4
EXTROFIA VESICAL	5	.1	.1	87.5
HIPERTENSIÓN INTRACRANEAL	5	.1	.1	87.7
INVAGINACION INTESTINAL	5	.1	.1	87.8
PURPURA TROMBOCITOPENICA IDIOPATICA	5	.1	.1	88.0
SINDROME NEFROTICO	5	.1	.1	88.1

TAQUICARDIA. SIN ESPECIFICAR	5	.1	.1	88.3
VOMITOS PERSISTENTES	5	.1	.1	88.4
ANOMALIES CONGÈNITES MÚLTIPLES	4	.1	.1	88.5
ATAXIA	4	.1	.1	88.6
ATRESIA - ESTENOSIS DE COANAS	4	.1	.1	88.7
DREPANOCITOSIS	4	.1	.1	88.9
HIDROCEFALIA CONGENITA	4	.1	.1	89.0
INTERRUPCION DEL ARCO AORTICO	4	.1	.1	89.1
LARINGOTRAQUEITIS AGUDA	4	.1	.1	89.2
LEUCEMIA LINFOBLASTICA AGUDA	4	.1	.1	89.3
MENINGITIS MENINGOCOCICA	4	.1	.1	89.4
MENINGITIS VIRICA	4	.1	.1	89.6
MIOCARDIOPATIA 2ª INESPECIFICADA	4	.1	.1	89.7
PERICARDITIS AGUDA	4	.1	.1	89.8
POLICITEMIA SECUNDARIA	4	.1	.1	89.9
REFLUJO GASTROESOFAGICO	4	.1	.1	90.0
RNPT <500 g	4	.1	.1	90.1
SINDROME DE DOWN	4	.1	.1	90.3
SINDROME DE GUILLAIN - BARRE	4	.1	.1	90.4
TRAUMA CRANEOENCEFALICO ABIERTO	4	.1	.1	90.5
ABDOMEN AGUT	3	.1	.1	90.6
ATRESIA ESOFÁGICA	3	.1	.1	90.7
BRADIARRITMIA HEMODINAMICAMENTE ESTABLE	3	.1	.1	90.8
CRISIS HIPOXICA	3	.1	.1	90.8
DRENAJE VENOSO ANOMALO TOTAL	3	.1	.1	90.9
ENCEFALITIS POSTINFECCIOSA	3	.1	.1	91.0
ESTRIDOR LARINGEO CONGENITO	3	.1	.1	91.1
FISURA PALATINA	3	.1	.1	91.2
FRACTURA DE BASE DE CRANEO CERRADA	3	.1	.1	91.3
FRACTURA DE FEMUR CERRADA	3	.1	.1	91.4
HEMATOMA SUBDURAL (NO TRAUMATICO)	3	.1	.1	91.5
HEMATOMA SUBDURAL (TRAUMATICO)	3	.1	.1	91.5
HEMORRAGIA CEREBRAL TRAUMATICA	3	.1	.1	91.6
HEMORRAGIA SUBARACNOIDEA TRAUMATICA	3	.1	.1	91.7
HIPERTENSION PULMONAR 1ª	3	.1	.1	91.8
HIPOTONÍA	3	.1	.1	91.9
LEUCEMIA AGUDA NEC	3	.1	.1	92.0
MASSA ABDOMINAL	3	.1	.1	92.1
MENINGITIS TUBERCULOSA	3	.1	.1	92.1
MIOPATIA (SIN ESPECIFICAR)	3	.1	.1	92.2
OBSTRUCCION RESPIRATORIA ALTA	3	.1	.1	92.3
RCIU 1250-1499 g	3	.1	.1	92.4
RCIU 1500-1749 g	3	.1	.1	92.5

RCIU 750-999 g	3	.1	.1	92.6
SHOCK ANAFILACTICO	3	.1	.1	92.7
SHOCK HEMORRAGICO	3	.1	.1	92.8
SINCOPE	3	.1	.1	92.8
ABCESO RETROFARÍNGEO	2	.1	.1	92.9
ABSCESO ABDOMINAL	2	.1	.1	93.0
ACCIDENTE DE BICICLETA	2	.1	.1	93.0
ACCIDENTE DE TRAFICO (ATROPELLO)	2	.1	.1	93.1
ANEMIA AGUDA POSTHEMORRAGICA	2	.1	.1	93.1
ANOMALIA DE EBSTEIN	2	.1	.1	93.2
ATRESIA ANO-RECTAL	2	.1	.1	93.3
ATRESIA DUODENAL	2	.1	.1	93.3
CEFALOHEMATOMA TRAUMÁTICO	2	.1	.1	93.4
CEL·LULITIS	2	.1	.1	93.4
Control salud.Otro bebé o niño sano que recibe cui	2	.1	.1	93.5
CRISIS DE APNEA	2	.1	.1	93.5
CUERPO EXTRAÑO TRAQUEAL	2	.1	.1	93.6
DERRAME PLEURAL	2	.1	.1	93.7
DIABETES MELLITUS NEONATAL	2	.1	.1	93.7
EDEMA AGUDO DE PULMON	2	.1	.1	93.8
ENF. HEMOL. DEL FETO Y RN DEBIDA A ISOINMUNIZACION	2	.1	.1	93.8
EPILEPSIA PARCIAL CON ALT. CONCIENC	2	.1	.1	93.9
ERROR CONGÉNITO DEL METABOLISMO	2	.1	.1	94.0
HEMORRAGIA INTRAVENTRICULAR	2	.1	.1	94.0
HEMORRAGIA PULMONAR	2	.1	.1	94.1
HEMORRAGIA SUBARACNOIDEA NO TRAUMAT	2	.1	.1	94.1
HEPATITIS AGUDA	2	.1	.1	94.2
HIDROCEFALIA CONGÉNITA	2	.1	.1	94.2
HIPERINSULINISMO	2	.1	.1	94.3
HIPERTENSION ARTERIAL 2ª (OTRAS)	2	.1	.1	94.4
HIPONATREMIA	2	.1	.1	94.4
HIPOPLASIA DE ARCO AORTICO	2	.1	.1	94.5
HIPOPLASIA DE CAVIDADES IZQUIERDAS	2	.1	.1	94.5
I.RESPIRATORIA AGUDA (OTRAS)	2	.1	.1	94.6
INMUNODEFICIENCIA SEVERA COMBINADA	2	.1	.1	94.6
INTOXICACION ACCID POR CANNABIS	2	.1	.1	94.7
LESION MEDULAR CERVICAL	2	.1	.1	94.8
MALARIA	2	.1	.1	94.8
MALFORMACIÓN VASCULAR SNC	2	.1	.1	94.9
MENINGITIS ESTREPTOCOCICA	2	.1	.1	94.9
MIOCLONIAS	2	.1	.1	95.0
NEUMOMEDIASTINO	2	.1	.1	95.1

NEUMONIA INTERSTICIAL (INESPECIFIC)	2	.1	.1	95.1
ONFALOCELE	2	.1	.1	95.2
PERSISTENCIA DE LA CIRCULACÓN FETAL	2	.1	.1	95.2
PORTADOR DE DERIVACION DE LCR	2	.1	.1	95.3
QUEMADURA DE CARA.CABEZA O CUELLO	2	.1	.1	95.3
QUEMADURA DE EXTREMIDAD INFERIOR	2	.1	.1	95.4
QUEMADURA DE LOCALIZACION MULTIPLE	2	.1	.1	95.5
QUEMADURA POR LIQUIDOS CALIENTES	2	.1	.1	95.5
QUEMADURAS 40-49% DE S.C.	2	.1	.1	95.6
SEPSIS A PSEUDOMONAS	2	.1	.1	95.6
SHOCK ENDOTOXICO	2	.1	.1	95.7
TRANSPOSICION DE G.A. CORREGIDA	2	.1	.1	95.8
TRAQUEOMALACIA	2	.1	.1	95.8
TROMBOCITOPENIA PRIMARIA	2	.1	.1	95.9
VENTRICULO DERECHO DE DOBLE SALIDA	2	.1	.1	95.9
ABCESO PERIAMIGDALINO	1	.0	.0	96.0
ABCESO SUBMANDIBULAR	1	.0	.0	96.0
ABSCESO INTRACRANEAL	1	.0	.0	96.0
ALCALOSIS RESPIRATORIA	1	.0	.0	96.0
ALTE (EPISODIO APARENTEMENTE LETAL)	1	.0	.0	96.1
ALTRES TRANSTORNS DE FETGE	1	.0	.0	96.1
AMIGDALITIS AGUDA	1	.0	.0	96.1
AMIOTROFIA ESPINAL	1	.0	.0	96.2
ANEMIA HEMOLITICA AUTOINMUNE	1	.0	.0	96.2
ANOMALÍA CONGÉNITA DE LA PIEL	1	.0	.0	96.2
ARTOGRIPOSI	1	.0	.0	96.2
ARTROGRIPOSI MÚLTIPLE CONGÈNITA	1	.0	.0	96.3
ASTROCITOMA (A.P.)	1	.0	.0	96.3
ATELECTASIA	1	.0	.0	96.3
ATRAGANTAMIENTO	1	.0	.0	96.4
ATRESIA DE ARTERIA PULMONAR	1	.0	.0	96.4
ATRESIA ILEAL	1	.0	.0	96.4
ATRESIA PULMONAR	1	.0	.0	96.5
ATRESIA TRICUSPIDEA	1	.0	.0	96.5
ATRESIA YEYUNAL	1	.0	.0	96.5
BLOQUEO A-V CONGENITO	1	.0	.0	96.5
CAUSA NO ESPECIFICADA DE ENCEFALITIS	1	.0	.0	96.6
COAGULOPATÍA	1	.0	.0	96.6
COLOSTASIS	1	.0	.0	96.6
CONMOCION CEREBRAL	1	.0	.0	96.7
DEPRESIÓN CEREBRAL. COMA Y OTROS SIGNOS CEREBRALES	1	.0	.0	96.7
DEPRESION RESPIRATORIA POR ANESTESIA MATERNA	1	.0	.0	96.7

DESHIDRATACION HIPOTONICA	1	.0	.0	96.7
DESPRENDIMIENTO DE PLACENTA	1	.0	.0	96.8
DIABETES INSIPIDA NEUROGENICA	1	.0	.0	96.8
EMPIEMA PLEURAL	1	.0	.0	96.8
ENDOCARDITIS AGUDA/SUBAGUDA	1	.0	.0	96.9
ENFERMEDAD DE HIRSCHPRUNG	1	.0	.0	96.9
ENFERMEDAD DE KAWASAKI	1	.0	.0	96.9
ENFISEMA INTERSTICIAL	1	.0	.0	96.9
ENNUEGADA	1	.0	.0	97.0
EPIGLOTITIS AGUDA	1	.0	.0	97.0
EPISODIO DE CIANOSIS	1	.0	.0	97.0
ESPINA BIFIDA	1	.0	.0	97.1
ESTENOSIS AORTICA VALVULAR (CONG)	1	.0	.0	97.1
ESTENOSIS TRAQUEAL 2ª	1	.0	.0	97.1
ESTENOSIS TRAQUEAL CONGENITA	1	.0	.0	97.2
EXTRASISTOLES VENTRICULARES	1	.0	.0	97.2
FASCITIS NECROTIZANTE	1	.0	.0	97.2
FIBROSIS QUISTICA DE PANCREAS	1	.0	.0	97.2
FISTULA TRAQUEO-ESOFAGICA	1	.0	.0	97.3
FLUTTER AURICULAR	1	.0	.0	97.3
FRACTURA COSTAL CERRADA	1	.0	.0	97.3
FRACTURA DE HUMERO CERRADA	1	.0	.0	97.4
FRACTURA ORBITARIA CERRADA	1	.0	.0	97.4
GLOMERULONEFRITIS AGUDA	1	.0	.0	97.4
GRANULOMA CUERDAS VOCALES	1	.0	.0	97.4
GRIPE A 2009 (H1N1)	1	.0	.0	97.5
HEMATEMESIS	1	.0	.0	97.5
HEMATOMA SUBGALEAL	1	.0	.0	97.5
HEMOCROMATOSIS	1	.0	.0	97.6
HEMOPTISIS	1	.0	.0	97.6
HEMORRAGIA ADRENAL FETO Y RN	1	.0	.0	97.6
HEMORRAGIA VENTRICULAR NO TRAUMAT	1	.0	.0	97.6
HEMORRAGIA VESICAL	1	.0	.0	97.7
HEMOTORAX TRAUMATICO	1	.0	.0	97.7
HIDROCELE CONGÉNITO	1	.0	.0	97.7
HIPERAMONEMIA CONGENITA	1	.0	.0	97.8
HIPOALBUMINEMIA	1	.0	.0	97.8
HIPOCALCEMIA	1	.0	.0	97.8
HIPOPLASIA PULMONAR	1	.0	.0	97.8
HIPOTIROIDISMO CONGENITO	1	.0	.0	97.9
ICTIOSI CONGÈNITA	1	.0	.0	97.9
INFARTO HEPATICO	1	.0	.0	97.9
INFEC. AGUDAS VÍAS RESPIRATORIAS NO ESPECIFIC.	1	.0	.0	98.0

INFECCION 2ª A CATETER	1	.0	.0	98.0
INFECCION CANDIDA ORINA	1	.0	.0	98.0
INMUNODEFICIENCIA INESPECIFICA	1	.0	.0	98.1
INSUFICIENCIA MITRAL (ADQUIRIDA)	1	.0	.0	98.1
INSUFICIENCIA MITRAL (R)	1	.0	.0	98.1
INSUFICIENCIA MITRAL CONGENITA	1	.0	.0	98.1
INSUFICIENCIA RENAL CRONICA	1	.0	.0	98.2
INSUFICIENCIA RESPIRATORIA CRONICA	1	.0	.0	98.2
INTOXICACION ACCID ANTIDEPRESIVOS	1	.0	.0	98.2
INTOXICACION ACCID BEBIDAS ALCOHOL.	1	.0	.0	98.3
INTOXICACION ACCID OPIACEOS	1	.0	.0	98.3
INTOXICACION ACCID ORGANOFOSFORADOS	1	.0	.0	98.3
LEUCODISTROFIA METACROMATICA	1	.0	.0	98.3
LINFANGIOMA GONGENITO	1	.0	.0	98.4
LINFOMA NO HODGKIN	1	.0	.0	98.4
LUXACION CONGENITA DE CADERA	1	.0	.0	98.4
MALALTIA HIRSCHPRUNG	1	.0	.0	98.5
MASA CERVICAL	1	.0	.0	98.5
MENINGITIS A COXACKIE	1	.0	.0	98.5
MENINGO-ENCEFALOCELE	1	.0	.0	98.5
MICROCEFALIA	1	.0	.0	98.6
MICROGNATIA	1	.0	.0	98.6
MIELITIS HOLOMEDULAR	1	.0	.0	98.6
MIELOMENINGOCELE	1	.0	.0	98.7
MIOPATIA CENTRONUCLEAR	1	.0	.0	98.7
MIOTONIA CONGENITA	1	.0	.0	98.7
MONONUCLEOSIS INFECCIOSA	1	.0	.0	98.7
MORDEDURA DE SERPIENTE	1	.0	.0	98.8
MUERTE SUBITA	1	.0	.0	98.8
NASOFARINGITIS AGUDA (RESFRIADO COMÚN)	1	.0	.0	98.8
NECROSIS CUTANEA	1	.0	.0	98.9
NEUMONIA POR CITOMEGALOVIRUS	1	.0	.0	98.9
NEUROBLASTOMA	1	.0	.0	98.9
NEUTROPENIA - AGRANULOCITOSIS	1	.0	.0	99.0
ONFALITIS	1	.0	.0	99.0
PANCREATITIS AGUDA	1	.0	.0	99.0
PANHIPOPITUITARISMO	1	.0	.0	99.0
PARALISIS MULTIPLE DE NERVIOS CRANEALES	1	.0	.0	99.1
PERFORACIÓN INTESTINAL PERITONITIS MECONIAL	1	.0	.0	99.1
QUEMADURA DE TRONCO	1	.0	.0	99.1
QUEMADURAS 10-19% DE S.C.a	1	.0	.0	99.2
QUEMADURAS 20-29% DE S.C.	1	.0	.0	99.2

QUILOTORAX	1	.0	.0	99.2
QUISTE LARÍNGEO	1	.0	.0	99.2
REACCIÓ AL·LÈRGICA	1	.0	.0	99.3
REACCION POSTVACUNAL	1	.0	.0	99.3
RN POSTERMINO NO PESO ELEVADO PARA EDAD GESTACION	1	.0	.0	99.3
ROTURA DE CATETER INTRAVASCULAR	1	.0	.0	99.4
S. DE WOLFF-PARKINSON-WHITE	1	.0	.0	99.4
SEMIAHOGAMIENTO	1	.0	.0	99.4
SEPSIS A ENTEROCOCO	1	.0	.0	99.4
SEPSIS POR ESTREPTOCOCO	1	.0	.0	99.5
SHOCK HIPOVOLEMICO	1	.0	.0	99.5
SÍNDROME DE EDWARDS	1	.0	.0	99.5
SÍNDROME DE HIPOVENTILACIÓN CENTRAL	1	.0	.0	99.6
SINDROME DE INTESTINO CORTO	1	.0	.0	99.6
SLING DE LA ARTERIA PULMONAR	1	.0	.0	99.6
SOPLO CARDÍACO	1	.0	.0	99.7
TAQUICARDIA VENTRICULAR	1	.0	.0	99.7
TIROSINEMIA	1	.0	.0	99.7
TORSIÓN TESTICULAR	1	.0	.0	99.7
TRAUMATISMO RENAL	1	.0	.0	99.8
TRAUMATISMO TORÁCICO	1	.0	.0	99.8
TROMBOSIS AORTA ABDOMINAL	1	.0	.0	99.8
TROMBOSIS ARTERIAL INESPECIFICADA	1	.0	.0	99.9
TROMBOSIS SENO VENOSO	1	.0	.0	99.9
TRUNCUS ARTERIOSO	1	.0	.0	99.9
TUMOR CARDÍACO	1	.0	.0	99.9
URETER ECTOPICO	1	.0	.0	100.0
VIRASIS	1	.0	.0	100.0
Total	**3439**	**100.0**	**100.0**	