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Research Article

Pre-Hospital Management of Shock and its Outcome in Children

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Abstract

Background: *This study examines children with shock at territory care hospital ER, focusing on the difference in outcomes between pre-hospital management and direct tertiary care without prior interventions.*

Methods: *Study compared IV fluids and boluses in children with shock to those without, analyzing outcomes in ER, ICU, and outside settings.*
Objective: Study examines mortality and hospital stay outcomes in patients receiving fluid boluses before tertiary care, shock duration, and morbidities. Predictive factors include early recognition and management in the ER or ICU.

Results: *Out of 52 children enrolled, 6 died. Children who presented within 6 hours of shock had a 100% survival rate. Most patients were under 1 year or more than 5 years old. Distributive shock was the most common, with septic shock being the most common in the age group < 1 year. Hypovolemic shock was the most common between 1-3 years. The study found no statistical significance between the two groups receiving boluses outside the hospital and the number of days in the ICU. Out of 13 who received boluses outside the hospital, 5 died, suggesting that more fluid boluses before reaching the hospital may improve survival chances.*

Conclusion: *Early intervention in pre-hospital settings improves survival rates for patients with shock, an acute dramatic syndrome characterized by inadequate oxygen supply and lactic acidosis. Early therapy, including fluid boluses, crystalloids, colloids, and inotropic therapy, can improve survival rates. Steroids, increased oxygen delivery, and fluid resuscitation are recommended for shock-presenting children.*

Keywords: *Fluid Boluses, Survival, Tertiary care, patients, Hospital.*

Aim

The aim of this thesis is to see the difference in outcome in terms of mortality and duration of hospital stay in children with shock who have received fluid boluses before coming to this hospital and those who have not received any intervention before coming here.

Objectives

To study the difference in outcome in terms of mortality and duration of hospital stay in patients who have received fluid boluses before coming to tertiary care.

To study the duration of shock and it's outcome.

To study the morbidities during hospital stay.

To study the various types of show

Inclusion Criteria

Children between 1 month to 16 years

Systolic blood pressure <100 mmHg at presentation

Children admitted in this hospital with shock

Children requiring fluid resuscitation.

Exclusion criteria:

Age group < 1 month

Arrival systolic BP of more than >100 mmHg

Introduction

With a significant mortality risk, shock is described as a relative or absolute decrease in circulation volume that results in decreased tissue perfusion, oxygen delivery, and waste disposal [1, 2]. Shock, however, has a universally accepted clinical definition and can have a variety of underlying conditions, including cardiac,

sepsis, hypovolemia, and allergy [3–7]. Although sepsis is regarded to be the most frequent cause of shock in high-income nations, low-income nations (LICs) are expected to be more likely to have hypovolaemia related to diarrhea/dehydration. The World Health Organisation (WHO) does not formally recognise shock in its emergency triage, assessment, and treatment (ETAT) recommendations for diarrhoea/dehydration case management [8,9]. The occurrence of shock (hypovolemic or septic) in LICs, however, is not well understood [10, 11]. Only 2% of patients in the FEAST study, a sizable trial of fluid bolus resuscitation, met the ETAT criteria for shock, despite the fact that up to 57% of acutely unwell, febrile hospitalised infants displayed symptoms associated with decreased perfusion [12]. The FEAST experiment and the discussion that ensued after its release revealed that little is known about the frequency with which doctors make the diagnosis of shock in everyday settings, what they correlate the diagnosis with, and how frequently they begin treating shock with a fluid bolus. The latter is particularly important because the FEAST experiment demonstrated that bolus fluids can be detrimental when administered to kids who are not dehydrated or experiencing diarrhoea [13]. A liberal approach to use of fluid bolus might therefore be causing considerable harm in hospitalised children in LICs where intensive care cannot be provided.

Material and Methods

Study Design

Cross-sectional study was done with 52 subjects who presented to Manipal hospital, Emergency Room, Banglore with shock to study the pre-hospital management of shock and its outcome in children.

Study Population

Children in paediatric age group from 1 month - 16 years presenting to Manipal Hospital, Bangalore, Emergency Room with shock.

Study Place

Manipal Hospital, Bangalore

Sample Size

55 children who were admitted with shock in Manipal Hospital, Bangalore were studied out of which 3 were excluded.

Statistical Analysis

Descriptive statistical analysis has been carried out in this study. Two tailed t-test has been used to find the significance of study parameters on continuous scale between two groups on metric parameters.

Results

Age group	Number	Percentage
< 1 year	15	28.8%
1-3 year	6	11.5%
3-5 year	1	1.9%
5-10 year	15	28.8%
>10 years	15	28.8%
Total	52	100%

Age Dependent Distribution of Shock: **Table 1**

In this hospital, it was observed that most patients who were presented with shock were either under 1 year old or older than 5 years old. 15 of the 52 total children, or 28.8%, were younger than 1 year old. Children aged 1-3 made up 6.1% of the population. Between 3-5 years old made up 1.9% (1). 15 kids, or 28.8%, ranged in age from 50 to 10 years. 15 youngsters, or 28.8%, were older than 10 years old. (Table 1)

Age Group	Hypovolemic Shock	Cardiogenic Shock	Septic Shock	Distributive Shock	Total
< 1 yr	1	0	5	9	15
1-3 yr	3	0	1	2	6
3-5 yr	0	0	1	0	1
5-10 yr	1	0	2	12	15
> 10 yr	0	1	1	13	15
Total	5	1	10	36	52

Age Dependent Distribution and Types of Shock: **Table 2**

Our data revealed that out of 15 children under the age of one, 1 had hypovolemic shock, 5 had septic shock, and 9 had distributive shock. Three of the six children, aged 1-3, were in hypovolemic shock, one was in septic shock, and two were in distributive shock. Only 1 kid between the ages of 3-5 had septic shock when they were seen. Out of 15 kids aged 5 to 10, hypovolemic shock affected 1, septic shock affected 2, and at most 12 kids showed signs of distributive shock. One child suffered cardiogenic shock, one had septic shock, and 13 of the 15 kids that showed up after 10 years had distributive shock.

With the exception of children aged 3 to 5, distributive shock was discovered to be the most prevalent among all age groups. The age group under 1 year olds had septic shock the most frequently. Between 1-3 years old, hypovolemic shock was most frequently observed.(Table 2)

Types of Shocks

Type of Shock	Number	Percentage (%)
Septic Shock	10	19.2%
Hypovolemic Shock	5	9.6%
Cardiogenic Shock	1	1.9%
Distributive Shock	36	69.2%

Table 3

The majority of patients, or 36 out of 52, were determined to be in the distributive shock group (69.2%), which was most likely caused by dengue fever. Septic shock had the second-highest incidence, with 10 patients out of 52, or 19.2%, followed by hypovolemic shock, with 5 patients out of 52, or 9.6%, and cardiogenic shock, with 1 patient out of 52, or 1.9%. (Table 3)

Mean Systolic BP at Presentation and Type of Shock:

Table 4

Mean systolic BP	Hypovolemic shock	Cardiogenic shock	Septic shock	Distributive shock	Total
<50	1	0	3	1	5
51-70	3	1	6	20	30
71-90	1	0	1	14	16
>90	0	0	0	1	1
Total	5	1	10	36	52

Most patients, out of 52 who were studied, 30(57.6%) of them who presented to ER with shock had presented with mean systolic BP between 50-70 mmHg. Out of them 20 belonged to distributive shock, 6 to septic shock, 1 to cardiogenic shock and 3 to hypovolemic shock.

Out of 52 children in the study, only 5 (9.6%) of them presented with mean systolic BP of less than 50 mmHg, out of which, 3 were septic shock, 1 hypovolemic and 1 distributive shock.

Among the children studied, 16(30.7%) out of the 52 presented to ER with mean systolic BP of 71-90 mmHg, out of which 14 belonged to distributive shock group, 1 belonged to hypovolemic and 1 to septic shock. 1 child in the study group presented with mean systolic BP of more than 90 mmHg which had belonged to distributive shock group.(Table 4)

Table 5

Pre Hospital Bolus (ml/kg)	Outcome- Discharged	Outcome - Death	Total
10	1	2	3
20	1	3	4
' 25	1	0	1
30	1	0	1
40	3	0	3
60	1	0	1
Total	8	5	13

Table 6

	Pre-hospital bolus	ICU stay(days)
Yes	13	52
No	82	43
Mean	26.5385	2.9231
Std. Deviation	14.91429	1.90815

Out of 52 patients who presented to Manipal Hospital ER with shock, 13 (25%) of them had received pre-hospital fluid boluses. Out of the 13 patients, 3(23%) of them received lOml/kg among which 1 survived and 2 died. 4 (30%) of them out of 13 received 20ml/kg bolus, among whom, 1 survived and 3 died. 1 (7.6%) child receiving 25ml/kg and 1 (7.6%) receiving 30mI/kg bolus survived. 3 (23%) of them had received 40ml/kg among whom all 3 survived. One child had also received upto 60ml/kg of pre-hospital bolus and survived. All 5 of patient who died had received less than 20 ml/kg pre-hospital boluseswhich means more fluid boluses before reaching the hospital may have a better survival chance. Hence proving that pre-hospital fluid resuscitation (golden period) has betteroutcome. Table 5.

Study also shows that there is no statistical significance between the two groups who received pre-hospital bolus and the ones who didnot, withnumber of days spent in ICU. (Table 6)

Fluid Boluses in ER and Outcome:

ER Bolus (ml/kg)	Discharged	Death	Total
10 .	6	0	6
20	7	2	9
30	4	0	4
40	8	2	10
50	5	1	6
60	4	0	4
70	1	0	1
80	2	0	2
Total	37	5	42

Table 7

It was found in the study that out of 52 patients studied, 42 (80.7%) of them had received fluid boluses in Manipal hospital ER. Out of those 42 children who received boluses in ER, 37(88%) of them survived and 5(11.9%) of them died. Among the 5 who died, 2 had received 20 ml /kg bolus, another 2 had received 40ml/kg bolus and 1 had received 50ml/kg of fluid bolus. It was seen that out of the 37 survivors more than 20 of them had received fluid boluses more than 40ml /kg in ER. Hence suggesting that children who had survivedhadreceived more fluid boluses in ER than the ones who died.(Table 7)

ER boluses		**ICU stay in days**								**Total**
ml/kg		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	
	10.00	3	2	0	1	0	0	0	0	6
	20.00	3	1	2	1	1	0	0	1	9
	30.00	1	0	1	0	0	1	1	0	4
	40.00	2	6	0	1	1	0	0	0	10
	50.00	1	2	0	2	1	0	0	0	6
	60.00	0	0	3	1	0	0	0	0	4
	70.00	0	0	0	1	0	0	0	0	1
	80.00	0	1	0	1	0	0	.0	0	2
Total		10	12	6	8	3	1	1	1	43

Table 8

This (table 8) suggests that the patients who received more boluses in ER had shorter stay in ICU. Out of the 43 patients who received ER fluid boluses, 10 of them stayed in ICU for 1 day out of which 6 of them had received less than 20 ml/kg and 5 of them had received more than 30ml/kg of fluid boluses. Out of 12 patients who stayed in ICU for 2 days, 9 of them had received more than 40ml/kg bolus in ER. Out of 6 who stayed in ICU for 3 days, 3 of them received more than 50ml/kg boluses. Out of 8 who had ICU stay of 4 days, 6 of them received more than 40ml/kg boluses. Out of 6 who had ICU stay of more than 5 days, most of them had received less than 40ml/kg fluid boluses.

But statistically there is no significance between the number of boluses given in ER and duration of ICU stay. (Table 9)

ER Boluses and ICU Stay:

	ICU Stay	**Boluses in ER**
Valid	52	42
Missing	43	53
Mean	2.9231	36.4286
Std. Deviation	1.90815	19.23176

Table 9

ER Boluses	**Number**	**Percentage**
10.00	6	6.3%
20.00	9	9.5%
30.00	4	4.2%
40.00	10	10.5%
50.00	6	6.3%
60.00	4	4.2%
70.00	1	1.1%
80.00	2	2.1%
Total	42	44.2% .

Table 10

In the study it was found that out of 42 (44.2%) patients who received fluid boluses in ER, 6 of them (6.3%) received lOml/kg, 9 of them (9.5%) received 20ml/kg, 4 of them (4.2%) received 30ml/kg, 10 of them (10.5%) received 40ml/kg, 6 of them(6.3%) received 50ml/kg, 4 of them (4.2%) received 60ml/kg, 1 (1.1%) received 70ml/kg and 2 of them (2.1%) received 80ml/kg . It was seen that most of them ie 10.5% received 40 ml/kg of fluid boluses in ER.(Table 10)ICU

Boluses and Outcome:

ICU boluses (ml/kg)	Discharged	Death	Total
10	0	0	0
20	7	0	7
30	4	0	4
40	8	0	8
50	5	0	5
60	5	1	6
70	4	1	5
80	3	0	3
90	2	1	3
120	0	1	1
Total	33	4	37

Table 11

It was seen that children who have survived, received lesser boluses in ICU compared to the ones who succumbed. Out of 52 patients, 37 (71.1%) of them received fluid boluses in ICU , out of which 33 survived and 4 died. The 4 (10.8%) children who died, all of them had received fluid bolus more than 60ml/kg in ICU. Out of the 33(89%) who survived, 29 of them received fluid bolus of less than 60ml/kg in ICU. (Table 11)

Pre - hospital boluses(ml/kg)		Time taken to recover from shock(days)					Total
		<1 day	1 day	2 days	3 days	5 days	
	10.00	0	1	1	0	0	2
	20.00	2	1	0	0	0	3
	30.00	0	0	1	0	0	1
	40.00	0	0	1	2	0	3
	60.00	0	0	0	0	1	1
Total		2	2	3	2	1	10

Table 12

This shows that children who took longer time to recover, received more pre-hospital fluid boluses,most likely depicting the severity of shock. Out of the 10 patients who received pre-hospital boluses, the 2 patient who received lOml/kg had ICU stay of 1-2 days. 3 patients who had received 20ml/kg bolus had ICU stay of upto 1 day. 3 patients who received boluses of 40ml/kg, had ICU stay of 2-3 days. One patient who received bolus of 60 ml/kg had ICU stay of 5 days. (Table 12)

ER boluses(ml/kg)		**Time taken to recover in days**						Total
		<1 day	1 day	2 days	3 days	4 days	5 days	
	10.00	0	4	1	1	0	0	6
	20.00	1	2	1	3	0	1	8
	30.00	0	1	0	1	0	2	4
	40.00	1	1	6	1	0	1	10
	50.00	0	1	2	2	1	0	6
	60.00	0	1	1	1	1	0	4
	70.00	0	0	1	0	0	0	1
	80.00	0	0	1	0	1	0	2
Total		2	10	13	9	3	4	41

Table 13

It shows that there is no statistical significance between ER boluses and time taken to recover. Out of 41 patients who received ER boluses , 10 (24.3%) of them had time taken to recover of 1 day and 8 out of 10 had received bolus less than 40ml/kg. Out of 13 (31.7%) patients who had taken 2 days to recover, 11 of them received bolus more than 40 ml/kg. Out of 9 (21.9%) patients who had taken 3 days to recover, 6 of them received bolus less than 40 ml/kg. out of 3 (7.35) patients who had taken 4 days to recover , all of them received bolus more than 40ml/kg. Out of 4 (9.7%) patients who had taken 5 days to recover, all of them received bolus more than 40ml/kg.Hence proving that there is no statistical co-relation between the number of fluid boluses received in ER and duration of time taken to recover. (Table 13)

ICU Boluses and Time Taken to Recover

ICU boluses(ml/kg)		**Time Taken to Recover**							
		<1 day	1 day	2 days	3 days	4days	5 days	lOdays	**Total**
	10.00	0	0	1	1	0	0	0	2
	20.00	0	2	4	0	0	0	0	6
	30.00	0	1	1	1	0	1	0	4
	40.00	0	0	2	3	0	2	0	7
	45.00	0	0	0	1	0	0	0	1
	50.00	0	2	0	2	1	0	0	5
	60.00	0	1	2	2	0	0	0	5
	70.00	1	1	0	2	0	0	0	4
	75.00	0	0	0	1	0	0	0	1
	80.00	0	0	1	0	2	0	0	3
	90.00	0	0	1	0	0	1	1	3
	120.00	1	0	0	0	0	0	0	1
Total		2	7	12	13	3	4	1	42

Table 14

This study shows that there is statistical significance between the ICU boluses and time taken to recover. Patient receiving more boluses in ICU took shorter time to recover. Out of 42 patients who received fluid boluses in ICU, 2 (4.7%) patients who took less than 1 day to recover had received more than 70ml/kg of fluid bolus. Out of 7 (16.6%) who took 1 day to recover 4 of them had received more than 50 ml/kg bolus in ICU and 3 had received less than 40ml/kg. Out of 12 (28.5%) who took 2 days to recover, 8 of them

received less than 40ml/kg . Out of 13 (30.9%) who took 3 days to recover, 8 of them received less than 50ml/kg and 5 received more than 50ml/kg. Out of 3(7.1%) who took 4 days to recover, 2 of them received more than 80ml/kg of fluid boluses. Out of 5 (11.9%) who took more than 5 days to recover, 2 of them received more than 90ml/kg. (Table 14)

Numbers of Pre-Hospital Inotropes Used and ICU Stay:

No of inotropes		**ICU stay(days)**				
		1.00	2.00	4.00	10.00	Total
	1.00	0	0	2	1	3
	2.00	1	1	0	0	2
Total		1	1	2	1	5

Table 15

In the study 5 children out of 52 had received pre-hospital inotropes. Out of the 5 children, 3(60%) of then received 1 inotrope and 2 (40%) received 2 inotropes. The children who were started on 2 inotropes in pre-hospital setting had less than 2 days of ICU stay and the ones who were started on only one inotropes had more than 4 days of ICU stay.Early use of inotropes in pre- hospital setting has better outcome in terms of duration of ICU stay. (Table 15)

Pre -Hospital Inotropes and Outcome

Inotropes	Outcome- Discharged	Outcome-Death	Total
1	3	0	3
2	1	1	2
Total	4	1	5

Table 16

It was found that there is no co-relation between number of pre-hospital inotropes and the outcome in terms of mortality. Out of 5 who received pre-hospital inotropes 3 (60%) received 1 inotrope and all of them survived and 2 (40%) received 2 inotropes out of which 1 died and 1 survived. (Table 16)

Numbers of Inotropes Used in ER And ICU Stay and Outcome

ER inotropes		ICU stay(days)					Total
		1.00	2.00	3.00	4.00	5.00	
	1.00	1	2	1	1	1	6
	2.00	0	1	0	1	0	2
Total		1	3	1	2	1	8

Table 17

ER Inotropes	Discharged	Death	Total
1	5	1	6
2	1	1	2
Total	6	2	8

Table 18

Out of 52 children in the study, 8 (15.3%) of them were started on inotropes in ER, out of which 6 received 1 inotrope and 2 received 2 inotropes. Out of 6 of them who received 1 inotrope, 5(83%) survived and 1(16.6%) died. Out of the 2 who received 2 inotropes, 1 survived and 1 died. (Table 18) Hence it shows that there is no co-relation between no of inotropes used in ER and outcome.

Out of 8 (15.3%) who received inotropes in ER, 1 who stayed in ICU for a day received 1 inotrope. Out of 3 of them who had 2 days ICU stay, 2 of them received 1 and 1 received 2 inotropes. 1 who had 3 days ICU stay received 1 inotrope. Out of 2 who had 4 ICU days, 1 received SI inotrope and another received 2 inotrope. 1 child who had 5 ICU days had received 1 inotrope in ER. Hence there is no co-relation between the number of inotropes used in ER and duration of ICU stay.

Numbers of Inotropes Used in ICU to ICU Stay and Outcome:

Inotropes in icu		ICU stay									Total
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	
	1.00	3	3	5	r	2	1	0	1	0	18
	2.00	0	4	2	4	1	0	0	0	0	11
	3.00	2	2	0	2	0	0	1	0	1	8
	4.00	1	0	0	1	0	0	0	0	0	2
	5.00	0	0	1	0	0	0	0	0	0	1
Total		6	9	8	10	3	1	1	1	1	40

Table 19

It was seen that number of inotropes used in ICU and duration of ICU stay have no co¬relation. Out of 40 children who received inotropes in ICU, 18 of them received 1 inotrope, 11 received 2, 8 received 3, 2 of them received 4 and 1 received 5 inotropes. Most of the children had ICU stay of less than 5 days irrespective of the number of inotropes used. Table 19

ICU Inotropes	Discharged	Death	Total
1	17	1	18
2	11	0	11
3	5	3	8
4	1	1	2
5	0	1	1
Total	34	6	40

Table 20

It was seen that children who required more number of inotropes in ICU had poorer outcome compared to those who received lesser number of inotropes. Out of 40 (76.9%) children who received inotropes in ICU, 18 (45%) ofthem received 1 inotropes, out of which 1 died, out of 11(27.5%) who received 2 inotropes, all survived. Out of 8(20%) who received 3 inotropes, 3 died and 5 survived. Out of the 2(5%) who received 4 inotropes, 1 died and 1 survived. One child(2.5%) who received 5 inotropes in ICU had succumbed. Table 20

Its seen that children who survived, required lesser number of inotropes compared to the ones who died and there is no co relation between the number of inotropes used and duration of ICU stay.

Duration of Shock at Presentation and its Outcome:

Duration of Shock	Number	Percentage
<6 hrs	6	6.3%
7-12 hrs	28	29.5%
12-24 hrs	18	18.9%
Total	52	54.7%

Table 21

It was seen that 28 children who presented to ER with shock had presented within 7-12 hours (29.5%).

18.9% of them ie 18 children had presented between 12-24 hours of shock. 6.3% of the children ie 6 of them presented before 6 hours of shock. Table 21

Duration of Shock and ICU Stay

Duration of shock		**ICU stay**									
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	Total
	<6hrs	3	0	3	0	0	0	0	0	0	6
	7-12 hrs	5	10	4	7	1	1	0	0	0	28
	12-24 hrs	5	3	2	3	2	0	1	1	1	18
Total		13	13	9	10	3	1	1	1	1	52

Table 22

It was found that children who presented with shock within 6 hours had shorter duration of ICU stay. Out of 6 children who had presented within 6 hours of shock, 3 had 1 day and other 3 had 3 days of ICU stay. Out of 28 children who presented within 7-12 hours of shock, 26 of them had less than 4 days of ICU stay and 2 of them had more than 5 days ICU stay. It was seen that those who had presented between 12-24 hours had longer duration of ICU stay. Out of 18 patients 3 of them had more than 7 days of ICU stay,2 had 5 days of ICU stay, 3 had 4 days ICU stay and 10 of them had less than 3 days of ICU stay. Hence we can say that children who earlier with shock has shorter duration of ICU stay. Table 22

Duration of Shock and Outcome:

Duration of Shock	**Outcome-Discharged**	**Outcome-Death**	**Total**
< 6 hrs	6	0	6
7-12 hrs	26	2	28
12-24 hrs	14	4	18
Total	46	6	52

Table 23

It was found that children who presented within 6 hours of shock had 100% survival chances. Out of 6(11.5%) who presented within 6 hours, all six(100%) survived. Out of 28 who presented between 7-12 hours, 26 (92%) survived and 2 (7.1%) died and out of 18 (34.6%)who presented between 12-24 hours , 14(77.7%) survived and 4(22.2%) died , again stressing on better survival chances with early presentation. Table 23.

Mental Status at Presentation and ICU Stay;

Mental status		**ICU stay**									Total
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	
	Conscious	11	7	8	5	1	1	0	1	0	34
	Drowsy	2	6	1	5	2	0	1	0	1	18
Total		13	13	9	10	3	1	1	1	1	52

Table 24

It was seen that children who presented with conscious mental status had shorter duration of ICU stay. Out of 34(65.3%) children who presented with conscious mental status, 11 of them stayed in ICU for 1 day and majority stayed below 5days. Out of 18(34.6%) children who presented with drowsy mental status 2 of them stayed in ICU for more than a week. Table 24

Mental Status at Presentation and Outcome:

Mental Status	Outcome- Discharged	Outcome- Death	Total
Conscious	29	5	34
Drowsy	17	1	18
Total	46	6	52

Table 25

It was seen that there is no statistical co-relation between mental status and mortality. Out of 52 children, 34(65.3%) were conscious on arrival out of which, 29(85.2%) survived and 5 (14.7%) died. Out of 18(34.6%) children who were drowsy on arrival, 17(94.4%) survived and 1(5.5%) died. Table 25

Commonly Seen Morbidities:

Morbidity	Number	Percentage (%)
Pleural effusion	11	21%
Hepatitis	1	1.9%
Bleeding	2	3.8%
Central lines	17	32.6%
ICD	3	5.7%
Ventilation	14	26.9%
Prolonged ICU Stay (>1 week)	3	5.7%

Table 26

It was found that most common morbidity seen was requirement of central lines which was present in 17 of them (32.6%) followed by ventilation which was seen in 14 children (26.9%) and pleural effusion was present in 11 of them (21%). It was also found that the children who were ventilated had higher mortality than others. Table 26.

Final Outcome:

Final outcome	Number	Percentage
Discharged	46	48.4%
Death	6	6.3%
Total	52	

Table 27

In our study it was found that out of 52 children who were studied, 46 of them were discharged which is 48.4% and mortality was 6 out of 52 which is6.3%. Table 27

Final Diagnosis

Final diagnosis	Number	Percentage	Death(Percentage)
Dengue shock	1 25	26.3%	3 (12%)
Septic shock	13	13.7%	1(7.6%)
Viral haemorrhagic shock	4	4.3%	2 (50%)
Acute gastroenteritis	3	3.2%	0
Dengue haemorrhagic shock	7	7.4 %	0
Total	52	54.7%	6

Table 28

Most cases of shock in the study wasattributed to dengue shock syndrome which is 25 children out of 52 ie (26.3%) and mortality seen was 12%, followed by septic shock which was found in 13 children out of 52 ie (13.7%) with mortality of 7.6%, 7 children were diagnosed with dengue haemorrhagic shock ie (7.4%) and mortality was 0%, viral haemorrhagic shock was seen in 4 out of 52 ie (4.3%) with mortality of 50% and 3 out of 52 children were diagnosed with acute gastroenteritis ie(3.2%) with 0% mortality.Table 28

Discussion

A study found that children with shock presented within 6 hours had 100% survival chances. More fluid boluses before reaching the hospital had a better survival chance. Out of 37 survivors, 20 received fluid boluses of more than 40ml/kg, suggesting early resuscitation is associated with better outcomes. [14] A multicentre cohort study in France found that SMUR management significantly reduced 30-day mortality, with a higher median time spent at the scene and transport. A study found that SMUR management in France significantly reduced 30-day mortality rates despite delayed hospital admission. [15]

A prospective randomized study evaluated the efficacy of goal-directed therapy before intensive care unit admission. Patients in Group A received early goal-directed therapy, while in Group B, standard therapy was used. The study found significant benefits in outcome and a higher rate of in-hospital death due to sudden cardiovascular collapse in Group A compared to Group B. [16]

A study by Rivers et al. found that aggressive early intervention, including broad spectrum antibiotics, tight glucose control, low steroids, and protective lung ventilation, was crucial for successful goal-directed therapy in septic shock and severe sepsis with hypoperfusion. Paediatric survivors received an average of 40 ml/kg of fluid over the first hour of resuscitation, preventing organ hypoperfusion and organ failure. The number of inotropes used in the ICU and duration of stay have no correlation. A single-institution clinical trial of 263 randomized patients with septic shock showed that early goal-directed therapy was more effective than traditional therapy. [17] The EGT group showed a 16% reduction in 28-day mortality, with red blood cell transfusion being the primary difference. This early approach to increasing oxygen delivery in septic shock patients differs from supranormal delivery in general ICU patients. Larger multiple-centered studies are needed to validate this approach. The study collected data on 235 children who had shock at referral to PICU. 38% reversed shock, 60% failed to reverse shock, and 29% developed shock by PICU admission. The shock group included 107 children who developed shock, failed to reverse shock, or died. [18-20]

In our study we also found that children who presented to ER, conscious rather than drowsy had shorter duration of ICU stay. But there is no statistical co-relation between mental status and mortality.

Conclusion

Early intervention in pre-hospital settings can significantly improve mortality and ICU stay outcomes. Children who present within 6 hours have a 100% chance of survival. Pre-hospital fluid boluses and inotropes use also improve survival chances. The majority of patients with shock in the hospital were distributive, septic, hypovolemic, and cardiogenic. Most patients had a mean systolic blood pressure between 50-70 mmHg.

Out of 52 patients, 42 received fluid boluses, suggesting that children who survived received more fluid boluses in the ER than those who died. This study found that patients who received more boluses in the emergency room (ER) had shorter stays in the ICU. However, there was no statistical correlation between the number of boluses given in the ER and the duration of ICU stay. Out of 52 patients, 37 received fluid boluses in the ICU, with 33 survivors and 4 dying. The study found no correlation between ICU boluses and mortality. Pre-hospital inotropes were used in 5 children out of 52, with early use resulting in better outcomes. The number of inotropes used in the ICU and the duration of ICU stay had no significant correlation. Children who required more inotropes had poorer outcomes compared to those who received lesser numbers. Children who presented with shock within 6 hours had shorter ICU stay durations.

Conscious mental status had shorter ICU stay durations compared to those who presented drowsy. There was no statistical co-relation between mental status at presentation and mortality. The study found that 46 children were discharged, with mortality being 6 out of 52. Most cases of shock were attributed to dengue shock syndrome (26.3%), septic shock (13.7%), dengue hemorrhagic shock (7.4%), viral hemorrhagic shock (4.3%), and acute gastroenteritis (3 out of 52).

Limitations:

- Fluid bolus is mostly used in children with hypovolemic shock secondary to dehydration and clinicians mostly prescribe the fluid and amounts recommended in current guidance.
- Further improvements can be made in identifying and treating children with shock, perhaps particularly to improve availability of simple bedside monitoring devices.

Reference

1. Nelson Text book of Pediatrics Ed.- Robert Kiegan, Richard Behrman, Hal B Jenson, Bonita Stanton. 18th Edition Saunders'an imprint of Elsevier. 2009.

2. Medical emergencies in children - Meherban singh, 4th edition

3. Davis AL, Zaritsky A. Role ofearly fluid resuscitation in paediatric septic shockJAMA 1991; 266:1242-1245

4. Carcillo JA, Fields Al; American College of Critical Care Medicine Task Force Committee Members. Clinical practice parameters for hemodynamic support of pediatric and neonatal patients in septic shock. Crit Care Med. 2002 Jun;30(6): 1365-78

5. Dellinger RP. Cardiovascular management of septic shock..Crit Care Med. 2003 Mar; 31(3):946-55

6. Michael M Krausz,World journal of emergency surgery/initial fluid resuscitation of haemorrhagic shock 2006.

7. Khilnani P. Clinical management guidelines of pediatric septic shock. Indian J Crit Care Med 2005;9:164-172

8. Aneja R, Carcillo JA. What is the rationale for hydrocortisone treatment in children with infection-related adrenal insufficiency and septic shock? .Arch Dis Child. 2007 Feb;92(2): 165-9.

9. Hebbar KB, Stockwell JA, Leong T, Fortenberry JD. Incidence of adrenal insufficiency and impact of corticosteroid supplementation in critically ill children with systemic inflammatory syndrome and vasopressor-dependent shock. Crit Care Med. 2011 May;39(5):l 145-50

10. Yeguiayan JM, Garrigue D, Binquet C, Jacquot C, Duranteau J, Martin C, Rayeh F, Riou B, Bonithon-Kopp C, Freysz M; French Intensive Care Recorded In Severe Trauma Study Group. Medical pre-hospital management reduces mortality in severe blunt trauma: a prospective epidemiological study. Crit Care.2011:15(l):R34

11. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, et al. Early goal-directedtherapy in the treatment of severe sepsis and septic shock. N Engl J Med 2001;345:1368-1377.

12. Hauser GJ. Early Goal-Directed Therapy of Pediatric Septic Shock in the Emergency Department. Israeli

Journal of Emergency Medicine - Vol. 7, No. 2 June 2007

13. Chudnofsky CR, Dronen SC, Syverud SA, Zink BJ, Hedges JR. Intravenous fluid therapy in the prehospital management of hemorrhagic shock: improved outcome with hypertonic saline/6% Dextran 70 in a swine model.Am J Emerg Med. 1989 Jul;7(4):357-63

14. Inwald DP, Tasker RC, Peters MJ, Nadel S; Paediatric Intensive Care Society Study Group (PICS-SG). Emergencymanagement of children with severesepsis in the United Kingdom: the results of the Paediatric Intensive Care Society sepsis audit. Arch Dis Child. 2009 May;94(5):348-53

15. Kanter RK, Zimmerman JJ, Strauss RH, Stoeckel KA. Pediatric emergency intravenousaccess. Evaluation of a protocol. Am J Dis Child 1986; 140:132-4.

16. Brunette DD, Fischer R. Intravascularaccess in pediatric cardiac arrest. Am J EmergMed 1988; 6:577-579.

17. Yunge M, Petros A. Angiotensin for septic shock unresponsive to noradrenaline. Arch Dis Child. 2000 May; 82(5) :3 88-9.

18. Talving P, Palstedt J, Riddez L. Prehospital management and fluid resuscitation in hypotensive trauma patients admitted to Karolinska University Hospital inStockloholm. Prehosp Disaster Med. 2005 Jul-Aug;20(4):228-34

19. Barton P, Garcia J, Kouatli A, et al: Hemodynamic effects of i.v.milrinone lactate in pediatric patients with septic shock: A prospective, double-blinded, randomized, placebo-controlled, interventional study. Chest 1996; 109:1302-1312

20. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008.