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A glimpse at the current practice of blood transfusion in the pediatric emergency room, Medical City, Baghdad

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Abstract:

BACKGROUND: The onus of red blood cell transfusions in the pediatric emergency rooms (ERs) is paramount, with no specified guidelines, and almost all current policies are based on the obtainable adult facts.

OBJECTIVES: The aims were to study the current practice and indications of blood transfusion in pediatric ER.

PATIENTS AND METHODS: This is a cross-sectional study that included 50 pediatric patients who were admitted to the ER of Children Welfare Teaching Hospital, Medical City, Baghdad, from February to May 2017. The patients were admitted to the ER for different complaints and during their admission, they received a blood transfusion. The decision of blood transfusion was made by the most senior physician at different times. Patient data were tabulated and processed using Statistical Package for the Social Sciences (SPSS) for Windows.

RESULTS: The age ranged from 15 days to 13 years, with a mean of 4.9 years. The main complaint was pallor in 26%, followed by bleeding (14%). Hemolysis due to presumptive glucose-6-phosphate dehydrogenase was the major diagnosis in 16 (32%) patients. The hemoglobin ranged from 2 to 11 g/dl, and the mean was 5.6 g/dl. The majority of decisions (28 cases, 56.0%) were made by the third-year resident, who is the second call on duties. Seven patients were below 4 months of age (14%), one of them received transfusion without logical indication. Forty-three (86%) patients were older than 4 months of age, of whom 13 (26%) patients received transfusion without logical scientific bases. The stay in ER ranged from 5 h to 5 days, and the mean was 26.5 h. The duration of transfusion was ranging from 60 min to about 6 h, with a mean of 3 h.

CONCLUSIONS: The study showed major pitfalls in the management of patients with anemia. The main obstacles to implementation are the lack of trained staff.

Keywords:

Anemia, children, pallor, red blood cells, transfusion duration

Introduction

A nemia is a well-known medical presentation and consequence reported among seriously and nonseriously ill children who visited pediatric emergency rooms (ERs). Recently, the intention of establishing guidelines for transfusion strategies globally has become literally more reticent. The physician should use the evidence available in his region to decide about transfusion. Pros and cons of transfusion should be placed in mind during making a transfusion decision.^[1] Many factors place children attending pediatric intensive care units at risk of anemia. These are multifactorial and include bleeding tendency, repeated phlebotomy for laboratory tests, the

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underlying disease itself, chronic anemia, and any medical therapy leading to bone marrow suppression.^[2] Itself, the erythropoietin was found to have a poor response to the event of anemia in those ill children.^[3] Still, there is a debate about what should be the exact level of hemoglobin (Hb) that calls for the need of transfusion of red blood cells (RBCs). The same applies for the target concentration of Hb a pediatrician is aiming to achieve. The physiology and pathology of pediatric patients differs from that of adults, especially during the periods of growth and development.^[4] The aim of this analysis was to study the clinical and demographic variables of patients receiving blood transfusions in pediatric ER and to study current practice and indications of blood transfusion in pediatric ER.

Patients and Methods

This is a cross-sectional study included 50 patients who were admitted to the ER of Children Welfare Teaching Hospital (CWTH)/Medical city, Baghdad, for the period from February to May 2017 and whose age is below 14 years. patients consent for participation in this study were taken from parents and the study was approved by scientific ethical committee of medical city complex. The patients were admitted to the ER for different complaints and during their admission, they received a blood transfusion. For these patients, all available notes regarding the current complaint, past medical history, physical examination, and laboratory data were recorded. A chart review was performed to determine age, gender, residence, duration of onset, clinical presentation, and date of diagnosis and results of investigations. All patients were observed in the ER till their destiny. The time of admission and discharge was recorded in addition to the fate of the patients. For all of the patients, complete blood count and other seasonable investigations were ordered.

The decision of blood transfusion was made by the senior resident at different times during the day. The timing of admission and order of transfusion were recorded precisely. The indication of transfusion was labeled by the person who requested the transfusion. The complications of transfusion were (if happened) recorded and the treatment of any complication was issued accordingly by the responsible staff. Other therapies including intravenous fluids, antibiotics, and other medications were given as per the patient status. Some of the patients required more than one transfusion and the subsequent transfusions were excluded from the analysis of the data. The transfusion planned for all patients is packed RBC transfusion, while the whole blood transfusion was given only for patients with nonavailable matched packed RBCs.

The data collected were distributed through a questionnaire filled by the ER resident and the researcher. They included history, physical examination, investigations, and blood transfusion procedure logistics. The working hours in CWTH are divided like other hospitals according to the regulations of the Iraqi Ministry of Health into the morning (daytime, 8 am–3 pm) and the afternoon/night shifts (3 pm–8 am next day). Patient data were tabulated and processed using Statistical Package for the Social Sciences SPSS version 20.0 (SPSS, Chicago, IL, USA) for Windows. Qualitative data were expressed as frequency and percentage and quantitative data as mean. $P \leq 0.05$ was considered significant.^[5]

Results

Forty-three (86%) patients were >4 months of age, while only 7 (14%) were <4 months. The minimum recorded age was 15 days who died in the ER for a presumptive diagnosis of inborn error of metabolism, while the maximum was 13 years, with a mean of 4.9 years [Table 1].

Thirteen (26%) patients presented with a complaint of pallor. Other complaints in order of frequency were bleeding in 7 patients (14%), jaundice in 6 (12%), poor oral intake in 5 (10%), and dark-colored urine in 4 (8%) [Table 2].

Table 1: Distribution of the 50 patients visitingthe emergency room of Children Welfare TeachingHospital according to age

Age group	Frequency (%)
Less 4 months	7 (14.0)
More or equal 4 months	43 (86.0)
Total	50 (100.0)
Minimum (days)	15
Maximum (years)	13
Mean (years)	4.9
SD (years)	3.9
SD-Standard doviation	

SD=Standard deviation

Table 2: Distribution of the main complaint of 50 patients

Item	Frequency (%)
Pallor	13 (26.0)
Bleeding	7 (14.0)
Jaundice	6 (12.0)
Poor intake	5 (10.0)
Dark color urine	4 (8.0)
Lethargy	3 (6.0)
Palpitation	3 (6.0)
LAP	2 (4.0)
Others	7 (14.0)
Total	50 (100.0)
A D-1 umphadapapathu	

LAP=Lymphadenopathy

Glucose 6-phosphate dehydrogenase (G6PD) deficiency was the most frequent diagnosis in 16 (32%) patients, all of them were diagnosed previously with G6PD deficiency. Thirteen patients (26%) received blood transfusion in the pediatric ER were undiagnosed and the decision was mainly dependent on the clinical condition prior to diagnosis. Three (6%) patients were diagnosed with acute hemolysis and three (6%) with sepsis. The diagnosis was established in pediatric ER according to the available investigations [Table 3].

Among the study groups, Hb ranged from 2 to 11 g/dl, with a mean of 5.6 g/dl. The mean WBC count is 14.200/mm³ and the mean platelets were 243.000/mm³ [Table 4].

The majority of transfusion decisions (56.0%) were made by the third-year resident who is the second call on duties. Twelve cases (24.0%) were decided by the specialist on duty [Table 5].

The main indications of transfusion were studied; in accordance with the national guidelines for transfusion, seven patients were below 4 months of age (14%), one of them received transfusion without logical indication. The other six patients received transfusion either for Hb below 7 g/dl or for symptomatic anemia (4 and 2, respectively). Forty-three (86%) patients were older than 4 months of age; 23 (56%) received a blood transfusion for Hb below 7 g/dl with symptomatic anemia; and two (4%) received transfusion for Hb below 9 g/dl with impaired cardiopulmonary status. Unfortunately, 13 (26%) patients received transfusion without logical scientific bases. By this, the total number of patients who received a blood transfusion

Table 3: Distribution of the presumptive diagnosis forthe 50 patients

Item	Frequency (%)
Hemolysis due to G6PD deficiency	16 (32.0)
Undiagnosed	13 (26.0)
Sepsis	4 (8.0)
Acute hemolysis	3 (6.0)
Malignancy	3 (6.0)
Spherocytosis	3 (6.0)
Aplastic anemia	2 (4.0)
Others	6 (12.0)
Total	50 (100.0)

Table	4:	Hematological	parameters	of	the	study	group

Item	Minimum	Maximum	Mean	SD
Hb level (g/dl)	2.0	11.0	5.6	2.0
WBC count (1000/mm ³)	1.0	35.0	14.2	8.6
Platelet count	0.0	761.0	243.0	171.0
(1000/mm ³)				

Hb=Hemoglobin, WBC=White blood cell, SD=Standard deviation

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in pediatric ER of CWTH without a scientific base was 14 (28%) [Table 6].

Regarding the time of admission, 29 (58%) patients of the children presented in the daytime shift, while 21 patients (42%) were admitted during the afternoon/night shifts. Thirty patients (60%) stayed for 24 h or less in the ER of CWTH, while 40% (20) of patients stayed >24 h. The delay in admission was attributed to nonavailability of the beds inside the hospital or the critical status of the patients. The range of stay in the ER was from 5 h to 5 days, with a mean of 26.5 h. The patients with 5-h stay were discharged on family responsibility after received a blood transfusion for an urgent acute pallor. The patient who stayed 5 days was a case of acute hemolytic G6PD who received three transfusions in ER and clinically was unstable, so he was kept in the ER. A longer stay was noticed to be statistically related to those presented in the afternoon/night shift (P = 0.01) [Table 7].

The majority of orders of blood transfusion (56%) were taken during the afternoon/night shift, while in 22 patients (44%), the orders of blood transfusion were taken in the morning shift. The duration of transfusion was ranging from 60 min to about 6 h, with a mean of 3 h. Seventeen (34%) patients received a blood transfusion in a duration of more than 4 h or less than 2 h which was beyond the acceptable duration [Table 8].

Among all blood transfusions given in pediatric ER of CWTH, five patients (10%) reported febrile reaction during or shortly after blood transfusion and three

Table 5:	Distribution of	transfusion	decisions	among
children	presented to t	he emergend	cy room	

Item	Frequency (%)
Third-year residents	28 (56.0)
Pediatric specialists	12 (24.0)
First-year residents	6 (12.0)
Orthopedic surgery division	3 (6.0)
Pediatric surgery division	1 (2.0)
Total	50 (100.0)

Table 6: Indications of transfusion of children in the emergency room of Children Welfare Teaching Hospital

Indication	Frequency (%)
<4 months	7 (14)
Hb <7 g/dl	4 (8)
Hb <8 g/dl with symptomatic anemia	2 (4)
No indication for transfusion	1 (2)
Older children	43 (86)
Hb <7 g/dl with symptomatic anemia	28 (56)
Hb <9 g/dl with cardiopulmonary disease	2 (4)
No indication for transfusion	13 (26)
Total	50 (100.0)

Hb=Hemoglobin

Table 7:	Distribution of the 50 patients according to	C
the time	of admission and duration of stay	

Time	Frequency (%)
Time of admission	
8 am-3 pm	29 (58.0)
After 3 pm	21 (42.0)
Duration of stay in the ER (h)	
≤24	30 (60.0)
>24	20 (40.0)
Minimum	5
Maximum	119
Mean	26.5
SD	20.5

*P value= 0.01. ER=Emergency room, SD=Standard deviation

 Table 8: Distribution of the 50 patients according to the time and duration of transfusion

Time	Frequency (%)
Time of order transfusion	
8 am-3 pm	22 (44.0)
After 3 pm	28 (56.0)
Duration of transfusion (minutes)	
2-4 h	33 (66)
<2 h or > 4 h	17 (34)
Minimum	60
Maximum	350
Mean	185
SD	66

SD=Standard deviation

Table 9: Reported complications of blood transfusions in the pediatric emergency room

Complication	Frequency (%)
No complication	42 (84.0)
Fever	5 (10.0)
Rigor/chills	3 (6.0)
Total	50 (100.0)

patients (6%) reported rigor or chills during or shortly after blood transfusion. All other cases of blood transfusions reported no complication [Table 9].

Discussion

Globally, many challenges stand up to RBC transfusion. Transmission of infections had enlightened the emphasis on the safe use of transfusion policies. Guidelines for RBC transfusion in infants and children generally have been established by taking standards from adult patients and modifying them according to the clinical experience.^[6,7]

Addressing these challenges should be a central priority for most blood transfusion services, particularly in developing countries, to ensure the uninterrupted supply of safe blood and blood products. The aim of this study was to highlight the main difficulties and pitfalls associated with blood transfusion indications and environment in pediatric ER in CWTH. Developing countries face considerable obstacles to ensuring a safe blood supply and safe blood transfusions. Since developing countries tend to have inadequate available blood supplies, they depend on family blood donors.^[8]

Guidelines for the use of blood transfusion have been published by many scientific societies. Some of the recent ones are from the American Society of Anesthesiologists and other societies.^[9-13] Most recommend the use of restrictive transfusion strategy. Almost all guidelines divide the pediatric age group into those below 4 months of age and those above 4 months of age. The principles used to guide the decision to transfuse RBCs to infants older than 4 months of age and children are essentially the same as for adults because of the experience from the adult side in blood transfusion strategies. In general, young children have lower Hb concentrations than adults; the studied group had shown that 86% of children are >4 months of age.

The decision of blood transfusion in the ER is highly respectable and should be made by the one who is the most senior one. In the current study, only 24% of cases were decided by the specialist pediatrician, while most of the cases were decided by the third-year board student. This is mainly because of most of the transfusions have been ordered and started after the day time shift where the senior specialist is not available and the most senior one working is the third-year student. However, the majority of the patients were admitted in the daytime shift which means that the decisions are taken after the result of the investigations which are usually available after 2 pm.

The duration of stay in the ER for the study group was ranging from 5 h to 119 h. Although both extremes are illogical for the official logistics of the Iraqi regulations of the ER as the Ministry of Health recommended no >24 h-stay for patients, most of the patients stayed 1–2 days in the ER. Forty percent of the patients in the study group stayed >24 h in the ER which is against the regulation of the Ministry of Health.

The duration of transfusion ranges from 1 to 5.8 h. Again, both the numbers are illogical for the ideal transfusion, as most guidelines recommend 2–4 h' transfusion time. Still, those below 5 g/dl with cardiac compromise need a slower transfusion. Most transfusions in the study group lasted 2–4 h. Thirty-four percent of patients were transfused blood over an illogical duration of time. This raises the importance of following up a patient under transfusion process.

In this cohort, 28% of patients received transfusions on no scientific base, this highlights the importance of educating the medical staff about the indications of transfusion and the importance of using the restrictive strategy of transfusions. Many measures should be undertaken before issuing blood transfusion. These measures are assessing the clinical status of the patients, deciding if he/she is a candidate for blood transfusion in the ER, checking his vitals before transfusion as well as the blood group and the compatibility, ensuring the availability of compatible blood, ensuring a good and constant follow-up during transfusion, and establishing a plan to admit the patient to the ward after transfusion process.

Conclusions

The burden of anemia and RBC transfusions in the pediatric population are significant. The current guidelines for pediatric blood transfusions are mainly based on available information regarding transfusions in adults. The study showed major pitfalls in the management of patients with anemia.

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Conflicts of interest

There are no conflicts of interest.

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