

## NOCTURNAL BLOOD PRODUCTS ISSUING

## DELIVRANCE DES PRODUITS SANGUINS LABILES DE NUIT

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**Abstract**

**Aim:** To describe nocturnal blood products (BP) issuing and to evaluate BP prescription (BPP) compliance to guidelines.

This was a cross-sectional study of BPP delivered by night (19pm - 7am) over eight months. The compliance of BPP was evaluated according to the most recent guidelines and the pertinence of emergency according to clinical/biological data.

Two thousand six hundred and fifteen (21.8%) BPP, or 9357 BP, were delivered by night in a total of 12014 BPP, or 38406 BP, delivered a day. BP, were 3979 (42.5%) Red blood Cell Units (RBCU), 3130 (33.5%) Fresh Frozen Plasma (FFP) and 2248 (24%) Platelet Concentrate (PC). Emergency was relevant in 64%, 25% and 56% of issued RBCU, FFP and PC. Relevance was higher in public hospitals, obstetrical, circulatory and haematological diseases.

Nocturnal issuing of BP was higher than reported and its relevance lower. RBCU, a more limited resource, had higher relevance. Continuous training and up-to-date regulatory framework are required.

**Key words:** Transfusion; Nocturnal; Blood products.

**Résumé**

**But :** Décrire la livraison nocturne de Produits Sanguins Labiles (PSL) et évaluer la conformité des indications et de l'urgence transfusionnelles.

Une étude transversale des demandes de PSL livrées de 19 à 7 heures a été menée sur 8 mois. La conformité des indications et de l'urgence ont été évaluées par rapport aux guidelines les plus récentes.

Deux mille six cent quinze (21,8%) demandes et 9357 PSL (24,4%) ont été livrées de nuits parmi 12014 demandes et 38406 PSL livrées sur le nyctémère soit 3979 (42,5%) Concentrés de Globules Rouges (CGR), 3130 (33,5%) Plasma Frais Congelés (PFC) et 2248 (24%) Concentrés Plaquettaires (CP). La pertinence de l'urgence a été de 64%, 25% et 56% pour les CGR, PFC et CP. La pertinence de l'urgence des CGR était supérieure au secteur public, pour les maladies obstétricales, circulatoires et hématologiques.

L'activité était supérieure à ce qui est rapporté et la pertinence moindre. La pertinence était supérieure pour les CGR, ressource plus limitée. Des formations et des textes réglementaires spécifiques sont requis.

**Mots clés:** Transfusion; Nocturne; Produits sanguins labiles.

**ملخص**

**الهدف:** لوصف التسليم الليلي من منتجات الدم وتقييم مدى الامتثال لمؤشرات نقل الدم و دلائل نقل الدم في الحالات الاستعجالية. أجريت دراسة مستعرضة لطلبات PSL سلمت من الساعة 19 إلى 7 صباحا على مدار 8 أشهر. تم تقييم الامتثال وإلحاحية بالاعتماد على أحدث المبادئ التوجيهية.

2615 (21.8%) من الطلبات و(24.4%) 9357 PSL تم تسليمها ليلا من 12014 مطلبا و من 38406 طلبات البولندي تم تسليمها و هو ما يوافق 3979 (42.5%) خلايا الدم الحمراء المركزة ((RBC، 33.5%) (3130) رسوم المجمدة البلازما بالفلور و2248 (24%) الصفائح الدموية (PC). كانت الحاجة الملحة للطوارئ هي 64% و 25% و 56% بالنسبة لمراكز إدارة المخاطر للمواد CGR و PFC و CP. كانت الضرورة الملحة لأطر إدارة المخاطر تتفوق في القطاع العام فيما يتعلق بأمراض التوليد والدورة الدموية وأمراض الدم.

كان النشاط أعلى مما تم الإبلاغ عنه و لكن أقل ملاءمة. كانت الأهمية أعلى بالنسبة إلى أطروحات إدارة الموارد الكروية الحمراء فيما كانت محدودة المورد. من المطلوب المزيد من التدريب في هذا المجال و إيجاد النصوص التنظيمية للقطاع.

**الكلمات المفاتيح:** نقل الدم ; الليل ; منتجات الدم .

## INTRODUCTION

During nocturnal shifts, availability of doctors and nurses is restrained, their vigilance is reduced. These non-optimal conditions compromise blood transfusion safety. Work conditions during nocturnal shifts had already been evaluated and had showed increased nocturnal blood transfusions hazards [1]. Thereby, it is currently recommended to limit nocturnal transfusions to emergency only.

Continuous assessment is part of quality systems. Evaluative studies had also been useful as a baseline for corrective actions. This led to improve transfusion practice as shown in previous reports [2, 3]. In Tunisia, a regulatory framework for transfusions in emergency setting is available since 2010 [4]. However, there are no regulations for nocturnal transfusions. Assessment of transfusion practice and compliance to the regulations are limited. The identification of deviations will be a scientific baseline for future improvement and an argument to convince authorities of the need of specific regulations.

**AIM:** To describe nocturnal blood products (BP) issuing and to evaluate BP prescription (BPP) compliance to regulations and pertinence of the emergency in the Sfax Blood Center, Tunisia.

## MATERIEL AND METHODS

A cross-sectional, descriptive evaluative and exhaustive study was conducted over a period of eight months (from March to October 2013) in the Blood Transfusion Center of Sfax (2<sup>nd</sup> Tunisian town, 1 million inhabitants) which is the only provider of BP in the town.

We included BPP delivered between 19 pm and 7 am to university hospitals and private clinics of Sfax. These health care institutions serve patients from the town of Sfax, complicated patients from the south and centre of Tunisia and from Libya. Gathered data from BBP were: general data (age, sex, department and prescribing physician), medical (diagnosis and transfusion motivation according to the 10<sup>th</sup> International Statistical Classification of Diseases and Related Health Problems 10 (ICD-10) [5] and transfusion data [number of delivered BP, delivery time, transfusion history, and if applicable, the delay between the last and the nocturnal transfusion, patient pre-transfusion testing: ABO and RH grouping, cross-match (mandatory) (4), erythrocyte phenotype, alloantibody detection (if indicated according to Tunisian regulation) (4), haemoglobin, prothrombin time and platelet count]. The rate of

BP delivered by night was calculated using data from the monthly reports of blood issuing during the same period. Compliance of transfusion indications was evaluated according to the ANSM recommendations and learned societies [6-12] on BP and their indications in different fields (haematology, neonatology, obstetrics, surgery...). Among compliant BPP, relevance of transfusion emergency was assessed case by case according to patient testing and transfusion context. The assessment of emergency in the case of Red Blood Cell Units (RBCUs) was based on: context, signs of poor tolerance and/or abnormally low rates of haemoglobin. In the case of Fresh Frozen Plasmas (FFP) and platelet concentrates (PC) transfusion, a relevant indication was considered as an emergency.

### Statistics:

Data were entered and analysed using SPSS.20. The qualitative variables were reported as percentages and numbers. The quantitative variables were reported as averages in case of Gaussian distribution otherwise as medians. Frequencies were compared by the mean of the Chi 2 and the Fisher tests (theoretical numbers < 5). A *p* value < 0.05 was considered as significant.

## RESULTS

### Nocturnal BPP and delivery:

The number of nocturnal delivered BPP was 2 615 (21.8 %) among 12 014 blood prescriptions delivered during the study period. The number of nocturnal delivered BP was of 9 357 or 24.4 % of the 38 406 delivered BP along the nycthemeron. An average of 11 BPP was delivered per night (extremes from 2 to 26) with an average of 39 BP per night (extremes from 26 to 52). Nocturnal delivered BP were: 3 979 (42.5%) RBCUs, 3130 (33.5%) FFP and 2248 (24%) PC or respectively 20%, 33.4% et 24.9% of all delivered BP during the study period. The nocturnal delivery of BP according to department, age, sex, transfusion history, erythrocyte phenotype and time delivery are listed in Table I. The nocturnal delivery of BP according to transfusion pattern (ICD-10) is listed in Tables 2 and 3.

In the public hospital, the top four delivered departments were the Intensive care unit (ICU), haematology, emergency room and paediatrics (respectively 21.8%; 11.2%; 10.1% and 8.8% of prescriptions). They counted for 51.9% of the nocturnal BP issuing. BPP received from ICU and

emergency room counted for 43.2%. BPP delivered to medical, surgical and gynaeco-obstetrics departments counted respectively for 30.9%, 17.3 % and 8.6% (Table IV).

### Completeness of BPP:

A lack of accuracy in the filling of the box "transfusion motivation indication" was encountered in 12.4% of the BPP (anaemia being mentioned without further details -acute or chronic, aetiology, clinical context and/or the type of surgery-).

The ABO and RH grouping were not mentioned in 62 (2.45%) BPP. Erythrocyte phenotype was mentioned in 466 (22.6%) BPP out of the 2 065 BPP where it was indicated (79%).

Alloantibody screening was mentioned in 12 (1.3%) among 903 RBCUs prescriptions where it was indicated. In obstetric patients, the alloantibody screening was mentioned in 2 prescriptions out of 109 (1.8%). Haemoglobin was mentioned in 1 385 (70%) of RBCU prescriptions. The prothrombin time was mentioned in 288 (38%) of FFP prescriptions. Of the 416 CP prescriptions, 265 (64%) showed the platelet count.

### Compliance of BPP and relevance of transfusion emergency:

In none of the nocturnal BPP, the emergency was mentioned. Relevance of transfusion emergency was of 63.6; 25.3 and 55.5 % respectively for the RBCU, FFP and CP prescriptions. Relevance of transfusion emergency was significantly higher in RBCU ( $p < 0.001$ ) and significantly lower in FFP ( $p < 0.001$ ).

- **RBCUs:** Because of the lack of medical and biological data on the BPP, 192 (13.9%) of RBCU prescriptions were not evaluable. There was no indication to transfusion in 292 (21.1%) prescriptions. Transfusion were indicated but out of emergency in 20 prescriptions (1.4%). When 4 RBCU or more were delivered at the same time ( $N=118$  prescriptions), the rate of relevant prescriptions was 93.1% (67 prescriptions). Indications and departments where emergency relevance was significantly higher ( $p < 0.001$ ) are listed in Table IV. Delivery time, delay between the latest and the nocturnal transfusion did not significantly influence emergency relevance. In the public hospitals, relevance of emergency was significantly higher ( $p < 0.001$ ) (Table V) and did not vary according to the prescribing doctor's degree (post or pre-graduate). In the private clinics,

haematologists had significantly higher rates of emergency relevance than other doctors (specialists or general practitioners) (71.9% among 23 prescriptions vs. 52.5% among 227 prescriptions,  $p=0.03$ )

- **FFP:** Among 758 FFP prescriptions, 288 (38%) were evaluable. Emergency was relevant in 73 prescriptions (25.3 %) among the evaluable ones. The emergency relevance was higher in medical and surgical departments (table VI).

- **CP:** Emergency was relevant in 147 prescriptions (55.5%) among 265 evaluable ones. Emergency relevance was significantly higher in haematologists (Table VI).

## DISCUSSION

### Nocturnal transfusions, emergency and methodology of assessment:

International transfusion bodies recommend nocturnal transfusion in an emergency setting only. In Tunisia, as in France, regulation in an emergency setting considers delays assessed by prescribing doctors [4, 13-16]. Appreciation of the transfusion emergency degree is subjective, and entrusted to the prescribing doctor [17]. The rare reports on nocturnal transfusion were based on transfusion delays to assess the transfusion emergency. In our context, neither the transfusion delay nor the actual transfusion time was mentioned. Hence, our choice to assess emergency setting according to transfusion thresholds, pathology and setting of emergency (haemorrhage, massive transfusion, poor tolerance, pathology...) was based on the ANSM recommendations and the most recent learned societies' recommendations during the study period [6-12].

In this study, quantities of BP and BPP were gathered prospectively, thus minimizing the risk of underestimation of prescriptions. However, clinical, biological and transfusion data was missing on numerous BPP. Such deficiency would be explained by the emergency setting, restricted medical staff, absence of transfusion advising doctor (on call only) and blood prescription software. This deficiency not only limited the estimates of emergency relevance, but also, compromised transfusion safety. Missing data was also reported in a study conducted in the University Hospital of la Marsa (Suburb of Tunis) [18], which reflects the lack of coordinated national awareness-raising action in the transfusion field.

### **Emergency relevance according to the delivered BP:**

The estimated nocturnal BP issuing was of 21.8% of BPP and 24.4% of BP delivered on the nycthemeron or 33.4%; 24.9% and 24.9% of the delivered RBCU, FFP and PC. The emergency relevance was respectively 63.3%, 25.3% and 55.5%.

Few papers addressed the issue of the nocturnal transfusions. A French retrospective study, reported that the transfusion nocturnal issuing was of 21.3% of the overall transfusion issuing, with 40.5% of non-urgent transfusions, if one excludes emergency room, intensive care units, FFP and PC [19]. This rate seems to be similar to ours, although comparison is difficult because of differences in methodology, context, regulations and type of health care structures. A prospective English study reported a rate of 25.2% of cross-matches done outside working hours from whom 23.1% were done in a lesser urgent context [20]. It is also difficult to compare because of methodology differences. These rates valued as high were explained by the lack of training and information of doctors and nurses [19]. There were no reports on nocturnal issuing of FFP and PC because of their scarcity, which was not the case of this study where FFP and PC issuing accounted for 33.2% and 23.8% of the issued BP by night.

A prospective study conducted within 11 health care structures in France has concluded that 80% of FFP prescriptions were in accordance with the ANSM recommendations [21]. A similar rate was found in the Tunisian hospital of La Rabta [22] (18% of inappropriate FFP prescriptions). In the current study, the usage of FFP was high with a low relevance (25.3%). The lack of a national program of plasma fractionation results in accumulation of FFP in transfusion structures but also in shortage of stable plasma derivatives as albumin and clotting factors. In our daily practice, the FFP are an available and cheap resource, which results in the lack of compliance to the few FFP indications. Regarding PC, those issued in Tunisia are mainly standard, while in France, aphaeresis PC and pooled PC are issued. The latter contain much more platelets [23-25]. This could explain overestimation of issued PC compared to other BP and to a French study (10%) [26]. Relevance of PC transfusion is lower than reported (55.5% vs. 71%) [27]. Being a haematologist was the only factor related to a better relevance of PC prescription. Haematologists, due to their specialty, have better knowledge of PC indications than the other specialties. Herein,

The transfusion advising doctor intervenes to straighten the indications. In the transfusion structure where this study was conducted, PC are an available resource (non-issued prescription over 5 years =4%) [28]. The transfusion advising doctor is called only when PC stocks are critical. Yet, PC are among the most expensive products in transfusion medicine [29] and are the most involved in transfusion adverse events [30].

### **Activity and relevance of emergency according to the issuing time:**

In the current study, the peak of BP issuing was later than that reported [19]. Delays are explained by cumulated delays in different steps of the health care system from the blood count request to its recovery [19], the lack of an information system for the laboratory analysis and the lack of an alert procedure in case of low blood counts. A higher relevance of emergency is expected during late hours, but this was not true in the current study, probably because of the lack of clinical information during late hours where vigilance is decreased.

### **Relevance of emergency according to the department :**

Studies reporting nocturnal transfusion were conducted in public hospital, while the current study also concerned private clinics where the relevance was significantly lower. In the private clinics, the lack of continuous trainings, and regular controlling, the immediate comfort of the patient who is paying for health care (contrary to the hospitals where majority of health services are free), could explain this lack of relevance.

### **Relevance according to transfusion indications:**

In the current study, indications for emergency transfusion were consistent with those reported (polytraumatism, upper digestive bleeding and onco-haematology [31]). Differences in the top three [32] indications were reported and could be explained by different specialization of the health care structures. The town of Sfax has a multidisciplinary hospital and clinics with various medical, surgical and gynaeco-obstetric departments. However, bone marrow transplantation and liver transplantation are not practised. In the current study, relevance was higher in the case of obstetrical, circulatory and haematological indications, which are most likely to be real emergencies. Another explanation of the retrieved difference in relevance could also be the organization of the transfusion activity with the prescribers. In fact, in case of obstetric and circulatory indications, prescription of blood transfusion is centralized at the level of

anaesthetists and ICU doctors who are the privileged actors of the transfusion structure. Like haematologist, they do have better knowledge of transfusion indications. In other specialities, the relevance was less and the transfusion was directly indicated by the corresponding specialist. Paradoxically, a lesser pertinence was noted in ICU of the public hospital. It could be explained by their preference to tranquil transfusion, i.e. once the unit has recovered its calm as reported by E. Bianco [33].

#### Relevance of emergency according to age:

In the literature, [5, 49, 50], higher ages (> 70 years) were reported in transfused patients contrary to our patients. This could be explained by the age pyramid in Tunisia with younger ages of the general population [34], but also by the pattern of the specialties predominantly requiring BP (traumatology, obstetrics, paediatrics and neonatology) where ages are lower.

#### Fulfilment of transfusion security:

In this study, we assumed that relevant emergency would be better able to be retrieved in patients having their first transfusion by night. But this was not ascertained in this study probably because of

the lack of clinical and biological data. An English study (haemovigilance) showed that serious hazards of transfusion occur in 40 % of the cases by night and at weekends [1]. It was then, recommended to restrict nocturnal transfusions to the emergency only. Thus, mentioning the emergency and having full clinical data are crucial. The additional lack of immune-haematology data compromises transfusion security and obstetrical future of women of childbearing age. The ABO Rh D group is mandatory. The lack of such data on the BPP is explained by the emergency context. According to the Tunisian regulatory framework, erythrocyte phenotype and antibody screening are not systematic; they are rather done according to specific indications. On the BPP where they were indicated, few mentioned their results. Furthermore, in a study performed at the National Blood Centre of Tunis about 16 064 BP prescriptions, more than 50% of the girls and women of childbearing age did not have erythrocyte phenotype [35]. This evidences the ignorance of indications but also of the lack of continuous training and information in the transfusion field.

**Table I :** Nocturnal delivered prescription according to department, sex, age, transfusion history, group and time of delivery.

	Delivered BPP*	
	N=	%
<b>Health care structure</b>		
Public	1 548	59,2
Private	1 067	40,8
<b>Sex</b>		
Men	1 542	59,0
Women	1 073	41,0
<b>Age (years)</b>		
< 1	181	6,9
1-15	221	8,5
15-49	1 035	39,6
≥ 50	1 178	45,0
<b>Transfusion history</b>		
Not mentioned	74	2,8
No	1 410	53,9
Yes	1 131	43,3
<b>Transfusion delays</b>		
Not mentioned	225	20
Same day	260	23
> 1 day	646	57
<b>Previous transfusion adverse event</b>		
Not mentioned	447	39,5
No	677	59,9
yes	7	0,6
<b>Group (ABO Rh-D)</b>		
Rh-D positive	2 191	83,8
Rh-D Negative	362	13,8
ABO Rh-D Not mentioned	62	2,4
<b>Delivery time</b>		
19H-00H	1 743	66,7
00H-4H	649	24,8
4H-7H	223	8,5
<b>Total</b>	<b>2 615</b>	<b>100</b>

\*BPP: blood product prescription

**Table II : Nocturnal delivered prescriptions according to transfusion motivation (ICD-10).**

Transfusion motivation	Nocturnal delivered transfusions			Corresponding blood products		
	N=	%	Cumulative %	RBCU <sup>[a]</sup>	FFP <sup>[b]</sup>	PC <sup>[c]</sup>
Diseases of the blood	730	27,9		1111	335	87
Injury and poisoning	409	15,6		683	694	216
Tumours	270	10,3	<b>53,8</b>	327	129	501
Diseases of the circulatory system	262	10,0		407	364	16
Pregnancy, childbirth and puerperium	109	4,2		249	149	146
Diseases of the digestive system	102	3,9		99	222	83
Perinatal period	100	3,8	<b>75,7</b>	74	79	49
Diseases of the genitourinary system	89	3,4		72	218	83
External causes of morbidity and mortality	64	2,4		84	142	8
Endocrine diseases	35	1,3		59	53	17
Diseases of the respiratory system	35	1,3		71	11	5
Infection diseases	29	1,1		35	52	11
Diseases of the nervous system	23	0,9		26	36	4
Diseases of the skin	20	0,8		29	32	12
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	6	0,2		11	4	10
Congenital malformation	3	0,1		3	0	0
Factors influencing health status	3	0,1		5	0	0
Diseases of the ear	2	0,1		3	0	0
Diseases of the musculoskeletal period	1	0,0		1	0	0
Not mentioned	323	12,4		558	392	917
<b>Total</b>	<b>2615</b>	<b>100</b>	<b>100</b>	<b>3 979</b>	<b>3130</b>	<b>2 248</b>

<sup>[a]</sup>RBCU: Red Blood Cell Unit, <sup>[b]</sup>FFP: Fresh Frozen Plasma, <sup>[c]</sup>PC : Platelet Concentrates.

**Table III : Nocturnal delivered prescriptions according to aetiologies (ICD-10).**

Transfusion motivation	Nocturnal delivered transfusions		
	N=	%	cumulated %
Acute post haemorrhagic anaemia	433	16,6	
Polytrauma	263	10,1	
Malignant tumours of blood and lymphoid tissue	132	5,0	31,7
Other coagulation abnormalities	129	4,9	
Other neonatal haematological diseases	64	2,4	
Fracture of the femur	59	2,3	
Shock	59	2,3	
Purpura and other haematological diseases	57	2,2	
Post-partum haemorrhage	46	1,8	
Arterial embolism and thrombosis	40	1,5	
Disseminated intravascular coagulation	35	1,3	50,4
Cerebral haemorrhage	35	1,3	
Digestive tract cancer	31	1,2	
Cranial traumatic lesion	27	1,0	
Others	1205	46,0	100
Total	2615	100	

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**Table IV : Nocturnal delivered prescriptions according to wards in the public hospital**

Transfusion ward	Nocturnal delivered transfusions		
	N=	%	% cumulé
Intensive Care Unit	337	21,8	
Haematology	174	11,2	
Emergency room	156	10,1	
Paediatrics	136	8,8	<b>51,9</b>
General surgery	111	7,2	
Neo-natology	110	7,1	
Gynaecology	86	5,6	
Cardiovascular surgery	68	4,4	
Surgery ICU	56	3,6	
Obstetrics	46	3,0	
Carcinology	43	2,8	
Orthopaedic surgery	43	2,8	
Cardiology	38	2,5	
Urology	38	2,5	<b>93,4</b>
Nephrology	26	1,7	
Neurology	17	1,1	
Gastrology	16	1,0	
Others *	47	3,0	
<b>TOTAL</b>	<b>1548</b>	<b>100</b>	<b>100%</b>

\*Others: Radiology, infectious diseases, pneumology, burned unit, plastic surgery, endocrinology, ear-nose-throat, pediatric ICU, internal medicine, dermatology, ophthalmology et rheumatology.

**Table V : Pertinence of Red Blood Cell Units prescription.**

Department		Red Blood Cell Units			
		Evaluable prescriptions	Pertinence of transfusion emergency		
			N=	N=	%
Public		918	631	68,7	
Private		467	250	53,5	<0,001
<b>Transfusion motivation</b>					
Obstetrics	Yes	47	45	95,7	
	No	1 338	836	62,5	<0,001
Circulatory diseases	Yes	151	143	94,7	
	No	1 234	738	59,8	<0,001
Haematology	Yes	327	240	73,4	
	No	1 058	641	60,5	<0,001
Tumours	Yes	126	60	47,6	
	No	1 259	821	65,2	<0,001
Traumatology	Yes	214	92	43,0	
	No	1 171	789	67,4	<0,001
Neonatology	Yes	59	23	39,0	
	No	1 326	858	64,7	<0,001
<b>Prescribing departments</b>					
Gynaeco-obstetrics	Yes	91	85	93,4	
	No	827	546	66,0	<0,001
Surgery	Yes	192	146	76,0	
	No	726	485	66,8	0,01
Intensive Care Unit	Yes	373	214	57,4	
	No	545	417	76,5	<0,001

Yes : motivation noted a line , No : other motivations.

**Table VI: Pertinence of transfusion emergency of Fresh Frozen Plasmas and platelet concentrate**

		Evaluable prescriptions		Pertinence of transfusion emergency		
		N=	N=	%	p	
<b>Fresh Frozen Plasma</b>						
Surgery department	Yes	24	13	54,2	<0,001	
	No	192	43	22,4		
Medical department	Yes	39	3	7,7	0,004	
	No	177	53	29,9		
<b>Platelet Concentrates</b>						
Haematologists	Yes	25	19	76	0,02	
	No	240	128	53,3		

Yes : motivation noted a line, No : other motivation.

## CONCLUSION

Nocturnal transfusions suffer from a lack of application of regulatory framework. We noted a lack in the clinical and biological data on the BPP. The nocturnal transfusions were more frequent than reported and the relevance lesser. Relevance was higher in case of RBCU, which is a limited resource. It was higher in case of relevant emergency and certain specialties. Transfusion and its regulations are poorly known worldwide. This seems to be even more marked in Tunisia. Continuous training is needed. As well, assessment of knowledge, application of the regulations, nocturnal transfusion risks and costs are needed. This action should be a priority for FFP and PC transfusions, private health care structures, ICU doctors, carcinologists and traumatologists. The implementation of prescription support software, a national program of plasma fractioning and nocturnal transfusion regulation are to be considered in Tunisia.

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