

# **Creating an Ergonomic Solution for Avoiding Errors in Blood Transfusion**

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### ABSTRACT

The Centre for Patient Safety of the Tuscany Region designs solutions for preventing adverse events in the 39 hospitals and 14 local trusts of the regional healthcare system. One of the most important risks in terms of consequences is the error in blood transfusion. The Centre for Patient Safety adopted an ergonomic approach centered on human factor in order to define the best solutions for clinicians. Thus, the definition of a patient safety practice on blood transfusion has been realized starting from: the analysis of the adverse events happened in the Tuscany healthcare system in the last year about this topic; the analysis of the main phases of the process and of the related potential risks, the analysis of the interaction among the clinicians and their working context. According to this analysis we produced some tools for supporting the promotion of a safer blood transfusion; an algorithm that visualizes the most important actions to take to avoid errors during the transfusion; a poster to remind the key controls at the bedside; a patient's identification procedure based on wristbands which layout help an active identification of the patient's. All the tools have been designed with the final users and tested.

The authors will present the tools and results about their application in one of the most complex teaching hospital of the Region.

Keywords: Safety of the blood transfusion, ergonomic check list, patient safety practice

## INTRODUCTION

The Centre for Patient Safety The Centre for Patient Safety of the Tuscany Region designs solutions for preventing adverse events in the 39 hospitals and 14 local trusts of the regional healthcare system. One of the most important risks in terms of consequences is the error in blood transfusion. The Centre for Patient Safety adopted an ergonomic approach centered on human factor in order to define the best solutions for clinicians. Thus, the definition of a patient safety practice on blood transfusion has been realized starting from: the analysis of the adverse events happened in the Tuscany healthcare system in the last year about this topic; the analysis of the main phases of the process and of the related potential risks, the analysis of the interaction among the clinicians and their working context. The patient safety practice has been promoted by the regional government body and adopted from all the hospitals which started to work on training and a blood check list transfusion in order to face a problem that was

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considered an emergency in terms of very high risk to avoid inside the system.

#### THE ERGONOMIC TOOLS FOR A SAFE BLOOD TRANSFUSION

The Centre, in accordance with its basic approach centred on human factor, has designed solutions for improving patient safety in blood transfusion in partnership with the professionals. Especially, all the tools have been designed by analyzing the current blood transfusion clinical care process, in some of the most complex and at high risk hospitals of the region. Starting from the process as it is now we considered all the possible pitfalls and criticalities that can induce in making an error and produce an adverse event. According to that we identify the strategic points and the related safety standard that need to be meet in order of avoiding never events. The blood transfusion check list represents these key moments and fix precise controls related to them. The regional model of check list has been designed taking into account the existing check lists already implemented in the wards. The evaluation of these tools helped the practical design of the new form. The layout of the check list is presented in Figure 1. The design emphasizes the double check process and its traceability by using a double box for the registering the check of both professionals. The space for registering not just a check but a piece of information (date, time, vital signs) meets the need of containing all the information about a transfusion in a single document (the checklist) that becomes part of the clinical record.

Figure 1 – The blood transfusion check list



Check-list for To be completed for ea	blood transfusion ach unit to transfuse	
Surname	and first name	Date of birth
Check Op.1	PROCEDURE	Check Op. 2
	Integrity and expiration date of blood product	
	Blood bag corresponding with SIMT document	t 📃
	Correct personal data on SIMT document	
	Sent unit corresponding with request	
	Blood group check	
	Patient identification	
_		
Signature	Start transfusion (date) Time	Signature
:	Stop transfusion (date) Time	
_	FC PA T	
	Adverse reactions	
	Signature for performed transfusion	
122 (04 (00 (04 (04 (04 (04 (04 (04 (04 (04	Sending performed transfusion form to SIMT Notes	Signature
At the end of the trasfusion	apply the assigned label of the unity to the back of this	form

The analysis of the blood transfusion process identified also the need for reminding to the clinicians on the field all the essential controls which are needed every time that you administer a blood bag. This process was represented on an algorithm that described for each phase of the process the essential things (see Figure 2) to do and for the final step related to the final patient's identification before administering the blood a specific poster was conceived (see figure 3). Both alerts were designed to be visible to operators during the process, thus while the one representing the entire blood transfusion has to be displayed in the physicians and nurses dedicated area, the one related to the final check has to be displayed at the bedside.

Figure 2 – Poster with the algorithm to control safety in strategic phases of the blood transfusion

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	Paziente non collaborante non identificabile	Paziente collaborante / non collaborante	
	Implementare sistema identificazione univoco basato su doppio identificativo	identificabile Adottare tutti gli strumenti possibili	Ŷ
	alfanumerico standard	per la corretta identificazione del paziente	Ŷ
ONE	In ogni fase adottare tutte le strategie possibili al fine di identificare correttamente il paziente	Almeno nome, cognome e data di nascita	Ŷ
ENTIFICAZIONE	Contrassegnare la documentazione con tutti i d	dati identificativi	<b>\$</b>
	Stampa dei dati su apposito braccialetto		Ŷ
			Å
	Informare il ricevente della trasfusione sui risch Verificare che il consenso informato sia firmato		X
	La richiesta deve contenere:		X
	<ul> <li>- I dati identificativi del paziente e specificare:</li> </ul>		Х
	- I dati identificativi dei paziente e specificare:     - Il reparto di degenza		FCE Vers.1.
	- La diagnosi e il motivo della richiesta		Å G
	- L'anamnesi immunoematologica		
	- La priorità e altre indicazioni cliniche utili		Ý.
<b>Z</b> ICHIESTA	- Il volume/numero di unità da trasfondere		Ý L
RIC	- La firma del richiedente		Ŷ
	Al momento del prelievo, a letto del paziente de	we essere effettuata l'identificazione	
	Il campione di sangue deve riportare dati ident del prelievo, data, ora e la compilazione delle e contestualmente all'identificazione	ificativi del paziente, firma del responsabile	Ş⊆
38	Verificare la corrispondenza tra i dati sulla prov	etta, sui moduli e braccialetto	ψC
	Inviare la provetta con il modulo di richiesta		ф —
	Verificare la sacca al momento della consegna		ŶL
NOIZ	Tracciare l'avvenuta ricezione secondo le proce	dure definite con il Centro Trasfusionale	ŶC
CEZIONE CONSERVAZIONE	In caso di trasfusione differita conservare le sac dalle procedure aziendali	che secondo le modalità specifiche previste	ŶZ
	In caso di mancata trasfusione restituire nel più	ù breve tempo possibile al servizio trasfusionale	Ŷ
ALE			
ISION	Identificare chiaramente gli operatori addetti a	Illa trasfusione	• ¢ C
DIRASFUSIONALE DIRASFUSIONALE	Realizzare tutti i controlli con il supporto della	check list	¢ -
PROC.			

Figure 3 – Poster with the algorithm to control the final check before blood administration

	Identificare chiaramente gli operatori addetti alla trasfusione	$\diamond$
	Realizzare tutti i controlli con il supporto della check list	$\diamond$
	Controllare identità, corrispondenza e compatibilità sacca/richiesta/modulo di assegnazione	$\mathbf{\hat{\nabla}}$
	Controllare e confermare il consenso informato (dove applicabile)	$\diamond$
щ	Verificare integrità e data di scadenza della sacca	$\mathbf{\dot{\nabla}}$
D DEL PAZIENTE	Rilevare i parametri vitali e registrarli assieme all'ora di inizio della trasfusione sulla check list	$\mathbf{\hat{\nabla}}$
	Sorvegliare attentamente il paziente soprattutto nei primi 15 minuti dall'inizio della trasfusione	$\diamond$
	Rilevare i parametri vitali e registrarli assieme all'ora di fine della trasfusione sulla check list	♦
ALLE	Compilare il modulo da restituire al servizio trasfusionale	$\dot{\nabla}$
	EMOTRASFUSIONE	

The patient's identification at the bedside is realized with the support of a wristband whose layout has been conceived to guarantee an easy reading of the information even from far away. The essential information are described together with two specifications about allergies and use of oral anticoagulants, and a barcode (see figure 4).

Figure 4 - Wristband patient's identification procedure



AO Name: Francesco DO Sumame: Ranzani Gender: Date of birth: 23/11/1979 Place. Vigevano M FC: RNZFNC79S23L872E	
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## THE PATIENT SAFETY PRACTICE

These tools became part of the essential requirements of the patient safety practices on blood transfusion that have to be adopted from all the hospitals and centers where blood transfusion takes place in the Tuscany Region. The patient safety practice includes also a training program where newcomers in clinical units at high density of transfusions are involved in a structured simulation session supported by the transfusion services and a periodic retraining on how to realize controls before administering blood.

The patient safety practice has composed of some essential parts: rational – state of the art of the problem; patient safety requirements; standards to be met and related performance indicators. The practice has been formally approved by the regional government so that its application becomes a priority for each hospital and part of the accreditation program with the related plans of evaluation.

### THE APPLICATION IN A TEACHING HOSPITAL: RESULTS

The teaching hospital starts its training activities from the clinicians belonging to the top ten wards which have the higher number of transfusions a year inside the hospital.

The course had 5 editions with the participation of 95 clinicians (35 medical doctors, 58 nurses, 2 obstetricians). The evaluation of the course from the participants was very good: in a scale from 1 (very bad) to 5 (very good), the course was considered very useful (5), giving good practical solutions (5) and designed with and effective training methodology (5).

During the period between January and February 2014, 200 check lists were verified (see table 1) and the results are described in the following table. In general the check list was adequately used, even if there are some criticalities regarding the compilation of the final part, especially the data related to the traceability of the check list (date of compilation) and of the vital signs after the transfusion.

Concerning the performance data just few indicators have been monitored: the number of assigned blood units for each ward was of 5278; units which were sent back to the blood centre were 1610 (31% of the total), the blood units are sent back after an average period of time of 2,5 days (max time allowed for the blood unit to be out of the centre blood is 72 hours).

Furthermore, the blood transfusion check list has been included into the electronic clinical record and designed according to the ergonomic evaluation realized for its initial definition. The implementation of the electronic check list is still going on but we can show a screen shot of the interface in the following images (figures 5-6).

Once you start the process of blood administration, the blood bag barcode is requested, once the barcode number is inserted the system controls the existence of the corresponding checklist and if it not found or not completed a new one appears (see image 4).

Table 1 – compliance to the blood check list in a big teaching hospital of the Tuscany Region (sample)

Compliance to the blood check list		
	Yes	No

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Total	number of analyzed check lists: 200				
1	Is the check list inside the clinical record?	198		2	
2	Is the blood bag labeled?	198			
3	Is there one check list for each transfonded blood unit?	198		2	
		MDs Nurses		ses	
		SI	NO	SI	NO
4	Is the informed consent checked out?	188			
5	Is the integrity and the expiration date checked out?			180	
6	Is the correnspondence of the blood bag with the request from blood centre checked out?	188		188	
7	Is the correctness of the personal data on the request from the blood centre checked out?	188		176	
8	Is the correspondence of the sent units with the request checked out?	188			
9	Is the correspondence of the blood group checked out?	188			
10	Is the patient's identification checked out?	188		188	
11	Are the vital signs written down at the beggining of the blood transfusion?			185	
12	Are date and time of the starting transfusion writtend down?			188	
13	Are all the signatures there?			185	
14	Are date and time of the end of the transfusion writtend down?			170	
15	Are the vital signs written down at the end of the blood transfusion?			166	
16	Are adverse events checked out?		175		
17	Is the signature for the blood centre document checked out? E' barrata la firma del documento SIMT?	188			
18	Is the sending receipt for the blood centre checked out?			170	
19	Are the connected signatures there?	180			

Figure 5 - Request of barcode for the blood bag associated to the new check list

Dati	i salvati con succes	so!				
🛛 🔀 Venerdi	i, 28 Marzo		_			
*)	Martedi	Mercoledì (	G	Emoderivati		
Lista Farma				Inseire il barcode della s	acca	
Farmaco						
RASFUSIONE	AUTOLOGA: PREDEPOS	ІТО	(	2	Annulla	Ok
	Orario Stato ml	ml/h Data e ora	Operatore	Termine		
	15:00	28/03/2014 1	4:32			

Figure 6 - Electronic check list

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Barcode sacca 12345678	
Procedura	
Consenso informato	<b>\$</b>
Corrispondenza sacca con documento SIMT	0
Correttezza dati anagrafici su documento SIMT	0
Corrispondenza unità inviata con richiesta	0
Corrispondenza gruppo sanguigno	
Identificazione paziente	
FC Sis Dia T	

This check list is personalized according to the profile of the clinician that is logged on (medical doctor or nurse); and only after both professional have checked out the checklist, the administration process can go on.

#### CONCLUSIONS

Safety in blood transfusion has become a priority in the Tuscany healthcare Region, and ergonomic solutions have been designed in order to support clinicians in ensuring a safe blood administration. The effective application of these tools depend on many factors related to the complexity of the hospitals: an adequate training of all the involved professionals, a strong commitment of the management to indicate the use of these tools as a priority and to build an evaluation system that monitor on the real application of the solution in daily sharp end life.

For the next future some actions have been already planned: a strict monitoring of the real application of the patient safety practice, the realization of a FAD program for training newcomers about safety in blood transfusion and an annual regional seminar to share experiences and results of the monitoring of the patient safety application in the healthcare local trusts.

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