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Haemovigilance Annual Report 2021

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Haemovigilance Annual Report 2021

Evaluation of haemovigilance reports in 2021

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1 Editorial

As in 2020, last year was again dominated by the COVID-19 pandemic that it triggered throughout the world. At the same time, slightly more transfusions were performed in Switzerland in 2021, with figures comparable to those in 2019. One reason for this could be a backlog of elective surgical procedures from the previous year.

The reporting rate decreased slightly during the same period. Closer inspection shows a slight increase in near miss reports and a slight decline in reports of transfusion reactions. One possible cause of the slightly lower number of transfusion reactions could be the extra burden placed on healthcare professionals by the pandemic. Large regional differences in reporting rates are another striking feature.

In this Annual Report, Swissmedic has spotlighted IBCT and near miss reports. There was a distinct increase in the proportion of total reports accounted for by these two categories, which we believe to be due to greater awareness and improved implementation of haemovigilance in some centres. Reports of transfusion errors and near misses are important for quality assurance and indicate good awareness of the significance of haemovigilance. The reporting haemovigilance officers and their institutions are accordingly not simply complying with their legal obligations but are also demonstrating an established and progressive approach to dealing with errors. Swissmedic would specifically like to thank all reporters for their dedication to the improvement of transfusion safety.

Swissmedic thanks you for your interest and hopes you find this Annual Report to be a stimulating read.

Christoph Küng, Head of Safety of Medicines Department

2 Introduction

The Haemovigilance Annual Report provides a regular update on facts and developments relating to transfusion safety in Switzerland. The main focus of the report is vigilance reporting from the different parts of the transfusion process. Separate sections are dedicated to the definitions and classifications of each type of incident, e.g. transfusion reactions and adverse effects, transfusion errors (known as IBCT, incorrect blood component transfused) and near misses.

2.1 Haemovigilance

Haemovigilance is a surveillance system which covers the entire transfusion chain. It records and analyses unexpected and adverse events such as donor reactions, quality defects, transfusion reactions, transfusion errors and near misses before, during and after the administration of labile blood products.

The objective of haemovigilance is to prevent the occurrence or repetition of these events and to improve the safety of transfusion therapy. Analysis and evaluation of reported data provide an up-to-date overall picture of safety in the transfusion chain and of the nature and dimension of the expected risks. Investigation of events can provide additional information about the causes of avoidable transfusion incidents and show where improvements are necessary and possible.

2.2 Legal basis and responsibilities

According to Art. 58 of the Therapeutic Products Act (TPA, SR 812.21), Swissmedic is responsible for monitoring the safety of therapeutic products, including blood and blood products as defined in Art. 4 para. 1 TPA. To this end, it collects and evaluates reports as stipulated in Art. 59 TPA in particular and institutes the necessary administrative actions.

The holder of a licence for activities with blood or labile blood products must appoint a person who is responsible for haemovigilance in accordance with Art. 28 para. 1 of the Medicinal Products Licensing Ordinance (MPLO, SR 812.212.1). This obligation applies particularly to manufacturers of labile blood products, i.e. specifically the blood transfusion services.

Art. 65 para. 4 of the Therapeutic Products Ordinance (TPO, SR 812.212.21) requires institutions which use labile blood products to set up a quality assurance system for the use of labile blood products in keeping with the current state of medical science and technology. According to this definition, this applies to all institutions which perform transfusions of labile blood products, and hospitals and doctors' practices in particular. These institutions designate a person who is responsible for fulfilling the reporting duty.

Where relevant, further specific legal obligations are described in the respective chapter.

2.3 National haemovigilance system

The national haemovigilance system covers the whole of Switzerland. Under the Therapeutic Products Act, all institutions which transfuse (users), store and manufacture blood products have an obligation to report transfusion reactions, transfusion errors, near misses and quality defects. It is also mandatory for both users and manufacturers to set up a quality assurance system and to appoint a responsible person for haemovigilance (RPHv, haemovigilance officer) (cf. 2.2.).

Swissmedic enters reports in the haemovigilance database and assigns a case-specific reference number. The notified data and measures are evaluated by a vigilance assessor and additional information is requested if necessary. The report assessment included in the statistics is the same as the final evaluation by the vigilance assessor. If this deviates to a relevant degree from the assessment by the reporting healthcare professional, the haemovigilance officer is consulted. If an analysis of individual cases identifies a need for action in the form of improved measures, corresponding proposals are requested from the affected institutions and reviewed.

The Swiss haemovigilance system is based on spontaneous reporting; it is what is known as a passive monitoring system. Active monitoring by the national system, such as in cohort studies for example, does not take place. Information about the number of blood components supplied for transfusion is provided by the manufacturers, enabling a relative risk assessment and international comparisons to be made.

As with all passive monitoring systems, it can be assumed that the figures are under-reported. The risks described in this report should therefore be understood as minimum figures.

3 Number of transfusions and reporting rates

3.1 Number of transfusions

In 2021, a total of 283,712 blood products were supplied for transfusion in Switzerland, representing a 3% increase compared with 2020 and roughly the same level as in 2019 (Table 1). The figures are based on the number of blood components supplied as shown in the annual statistics of the Blood Transfusion Service of the Swiss Red Cross (1) and will be referred to below as transfusions or transfused products.

Table 1

Transfusions in Switzerland over the past five years					
Blood product	**2017**	**2018**	**2019**	**2020**	**2021**
pRBC	226,276	221,100	220,481	212,947	217,049
PC	37,490	38,947	36,317	35,715	38,898
FFP	29,303	30,552	28,405	26,681	27,765
Total	**293,069**	**290,599**	**285,203**	**275,343**	**283,712**

Data source: Blood products supplied, Blood Transfusion Service of the Swiss Red Cross (1).

pRBC: packed red blood cells
PC: platelet concentrate
FFP: fresh frozen plasma (FFPq or FFPpi)

3.2 Reporting numbers and rates

In 2021, Swissmedic received a total of 4,507 haemovigilance reports relating to transfusion reactions, IBCT and near miss and a further 3,394 reports of donor reactions, quality defects and protective measures (Table 2). The statistics include reports received by the end of January 2022 at least; later reports will be included in the statistics for 2022. Since the publication of donor reactions was modified in 2021, these reported figures are not comparable with previous years; please refer to section 6 for further explanations.

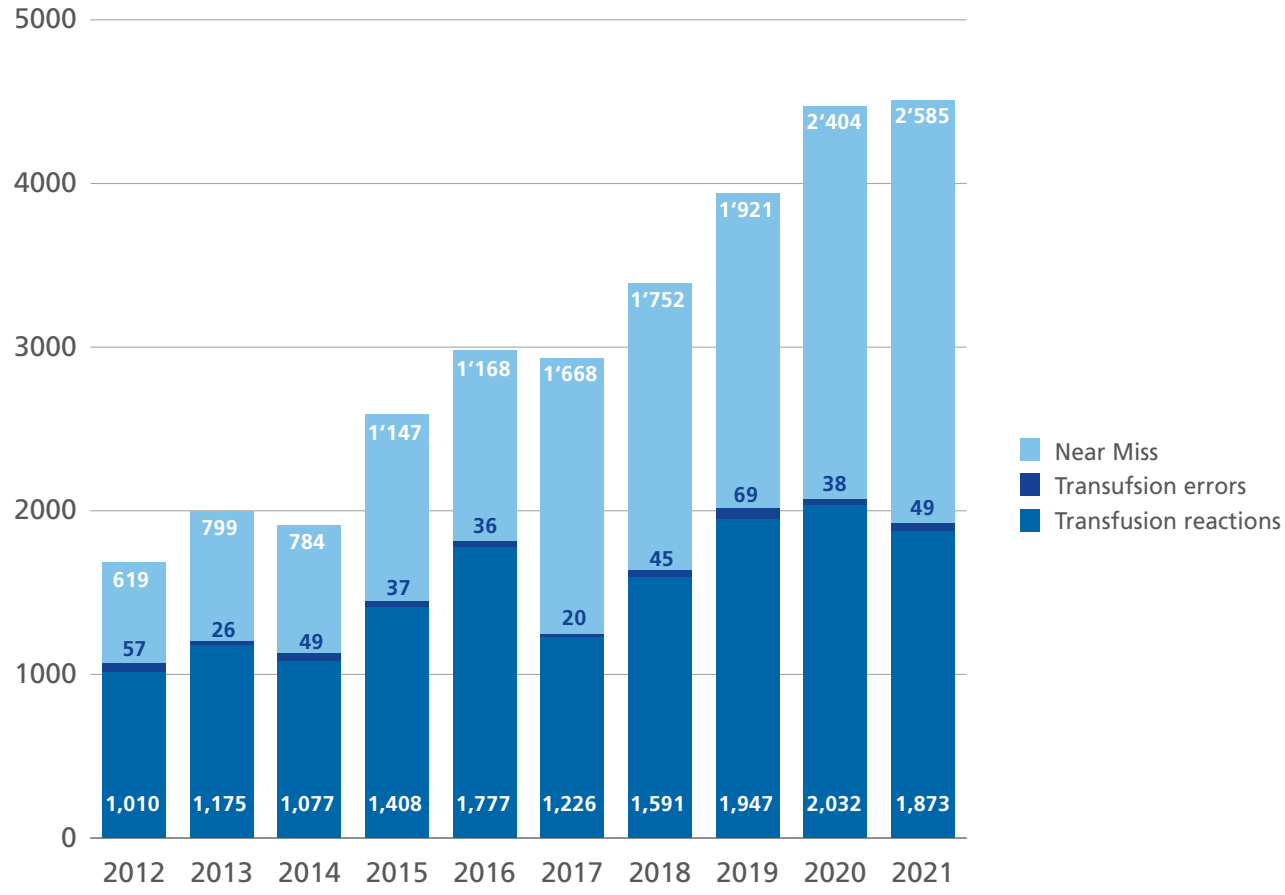
Table 2

Reports received in 2021	
Type	Number of reports
Transfusion reactions (TR)	1,873
Near miss (NM)	2,585
Transfusion errors / incorrect blood component transfused (IBCT)	49
Quality defects and protective measures	149
Donor reactions*	3,245

**Publication of data reported for donor reactions modified from 2021.*

In 2021, 7.8% fewer TR were reported than in 2020, while the number of NM increased by about 7.5% during the same period.

Figure 1
Haemovigilance reports by year (2012-2021)

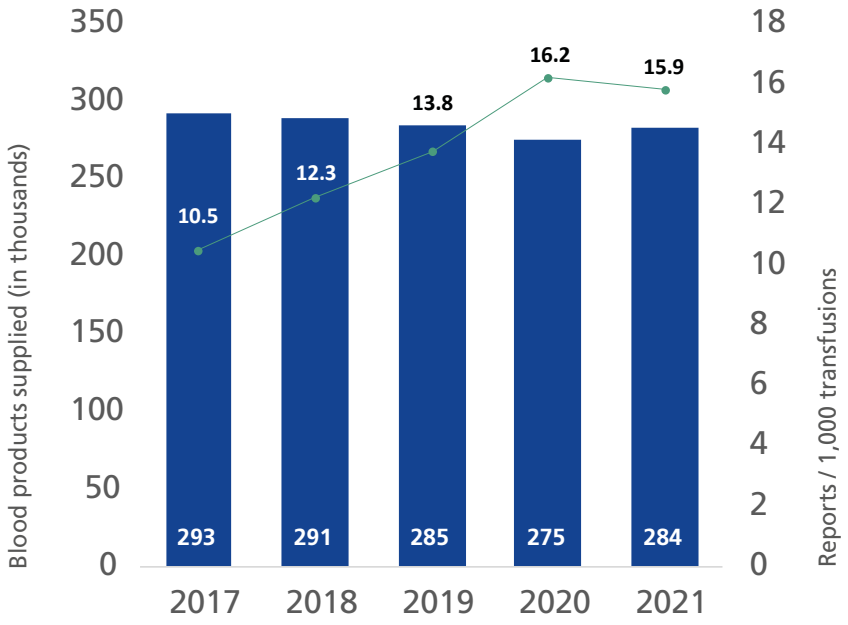


NM remain the most frequent haemovigilance reports.

Swissmedic calculates the reporting rate per 1,000 transfusions (Tf) on the basis of the total number of reports. The total reporting rate declined slightly in 2021 compared with 2020 (15.9/1,000 in 2021 compared with 16.2/1,000 in 2020), with an increase in near miss reports and a decline in TR reports (Figure 2). The heavier burden imposed by the COVID-19 pandemic is one possible cause of the lower TR reporting rate. The average reporting rate for TR over the previous five years (2016-2020) was 5.9/1,000 Tf (1:169); in 2021 it was 6.6/1,000 Tf (1:151).

The reporting rate for transfusion errors (IBCT) over the previous five years (2016-2020) was 0.14/1,000 Tf (1:7,143 Tf); in 2021 it was 0.18/1,000 Tf (1:5,674). Near miss and IBCT are discussed in detail in section 5.

Figure 2
Reporting rate (transfusion reactions, near misses and transfusion errors)



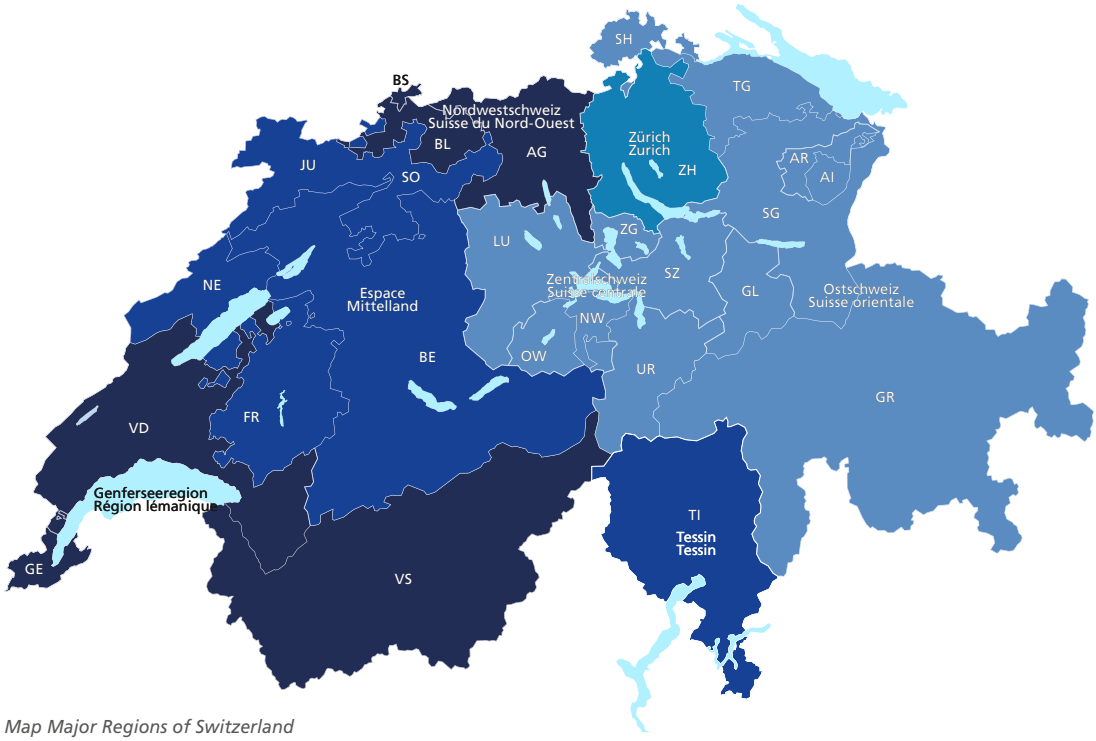
3.3 Reporting rates: Major regions

The Swiss hospitals have well-established haemovigilance systems. However, the regional reporting rates based on the number of inhabitants (TR reported per 100,000 inhabitants) vary widely. Allo-immunisations after transfusion are always detected as a laboratory finding and without direct clinical symptoms, and they therefore differ fundamentally from other TR. The TR reporting rate is therefore shown as the total reporting rate and as the reporting rate excluding allo-AB. The highest reporting rates for TR (excluding allo-immunisations) were registered in Northwest Switzerland, in the Lake Geneva region and in Ticino (Table 3, Figure 3). Zurich, the Lake Geneva region and Espace Mittelland had the highest reporting rate for NM (Table 4, Figure 4). Central and Eastern Switzerland and Zurich had the lowest reporting rate for TR (excluding allo-immunisations), Ticino and Central and Eastern Switzerland the lowest reporting rate for NM. Shifts due to care provided outside a region are not illustrated since the reporting rates are calculated on the basis of the number of inhabitants. This must be taken into account when interpreting the data.

Table 3

Distribution of transfusion reactions by major region					
		Reports		Reports per 100,000 inhabitants	
Major region	Canton	Total	excluding allo-AB	Total	excluding allo-AB
Lake Geneva region	GE, VD, VS	492	247	29.5	14.8
Espace Mittelland	BE, FR, SO, NE, JU	555	155	29.3	8.2
Northwest Switzerland	BS, BL, AG	600	169	50.8	14.3
Zurich	ZH	93	79	6.0	5.1
Eastern Switzerland	SG, TG, AI, AR, GL, SH, GR	54	45	4.5	3.8
Central Switzerland	UR, SZ, OW, NW, LU, ZG	32	24	3.9	2.9
Ticino	TI	47	38	13.4	10.8

Figure 3
Distribution of TR reports per 100,000 inhabitants (excluding allo-AB) by major region



Map Major Regions of Switzerland
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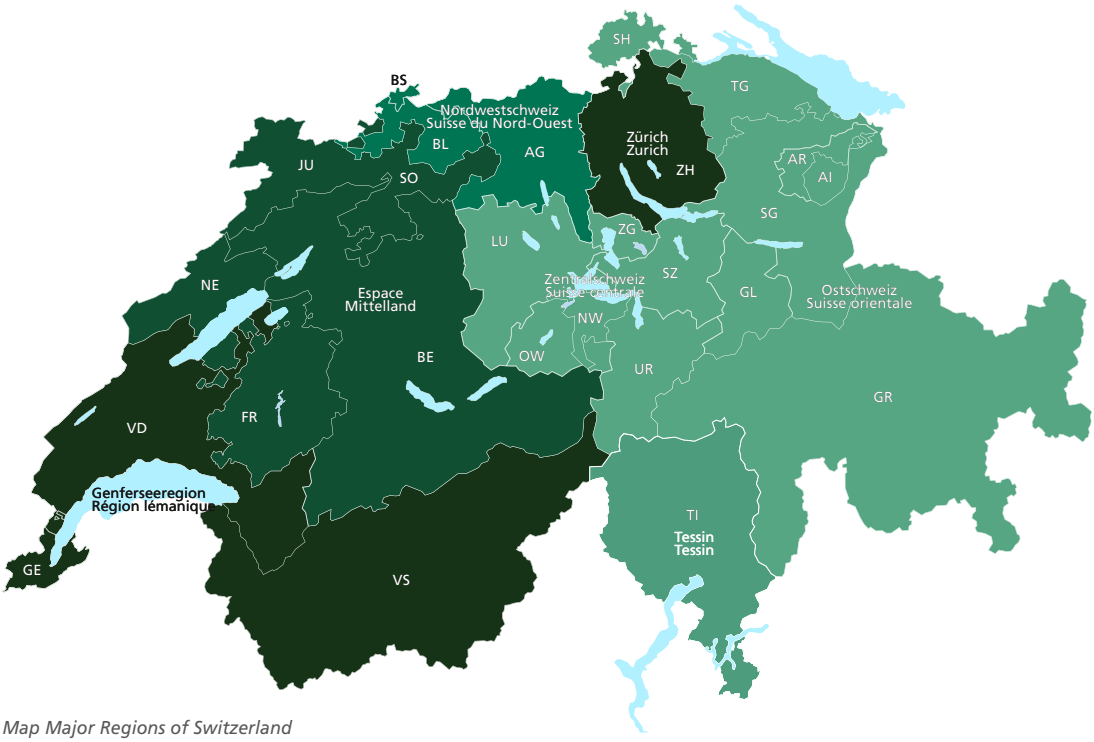
- > 12
- 8 – 11.9
- 4 – 7.9
- 0 – 3.9

Table 4

Distribution of near miss reports by major region			
Major region	**Canton**	**Reports**	**Reports per 100,000 inhabitants**
Lake Geneva region	GE, VD, VS	782	46.8
Espace Mittelland	BE, FR, SO, NE, JU	626	33.0
Northwest Switzerland	BS, BL, AG	139	11.8
Zurich	ZH	932	60.0
Eastern Switzerland	SG, TG, AI, AR, GL, SH, GR	78	6.5
Central Switzerland	UR, SZ, OW, NW, LU, ZG	20	2.4
Ticino	TI	8	2.3

Figure 4
Distribution of near miss reports per 100,000 inhabitants by major region



Map Major Regions of Switzerland
© BFS, ThemaKart, Neuchâtel 2020

> 40
20 – 39.9
10 – 19.9
0 – 9.9

4 Transfusion reactions

4.1 Definitions

Transfusion reactions (TR) are undesirable or unexpected events related to the administration of labile blood products. Art. 63 para. 2 TPO requires these events to be reported to Swissmedic. TR are classified in a similar way to the ISBT criteria on the basis of the available information Table 5 (2). Reactions which do not meet the criteria for a defined TR are summarised as «Other».

Table 5

Transfusion reactions		
Immunologically-related TR	Cardiovascular and metabolic problems	Infections
• Transfusion-related acute lung injury (TRALI)* • Allergic TR • Febrile, non-haemolytic TR (FNHTR)* • Allo-immunisations • Haemolytic TR (HTR), acute and delayed • Post-transfusion purpura (PTP) • Transfusion-associated graft-versus-host disease (Ta-GvHD)	• Circulatory overload (TACO) • Hypotensive TR • Transfusion-associated dyspnoea (TAD) • Haemosiderosis • Hyperkalaemia, hypocalcaemia • Other	• Bacterial • Parasitic • Viral • Prions • Fungal

**non-immunological mechanisms for these transfusion reactions are also under consideration.*

4.2 Severity and imputability

Table 6

Severity of transfusion reactions	
Grade 1	**Non-severe** no treatment necessary / no permanent damage without therapy
Grade 2	**Severe** relevant or lasting damage (including allo-immunisation); hospitalisation required or prolonged; therapy necessary to prevent permanent damage If the following symptoms or findings are present, a transfusion reaction should be classified at least as severe: • Allo-immunisations • Fever > 39°C and > 2°C increase • Dyspnoea / hypoxia (other than a very mild form), pulmonary oedema • Loss of consciousness, drop in blood pressure (other than a very mild form) • Suspected haemolytic transfusion reaction • Suspected bacterial contamination / infection as a result of the transfusion • Positive blood cultures in patient or blood product • Timely intervention is necessary to avoid permanent damage or a life-threatening course
Grade 3	**Life-threatening** patient may die without relevant medical intervention e.g. intubation, vasopressors, transfer to intensive care unit
Grade 4	**Death** Grade 4 should only be used if imputability with the transfusion is at least «possible», i.e. not if the relationship is purely temporal; otherwise: graded according to the type of TR)

The severity of a transfusion reaction is evaluated independently of its possible connection with the transfusion (imputability). For example, suspected cases of bacterial contamination or other infections should be classified as severe – and should remain so – even if the imputability is classified as 'unlikely' in the final evaluation.

Causality, i.e. the causal connection between transfusion and reaction, is evaluated by Swissmedic according to its probability in a similar way to the ISBT criteria. Cases for which the information is not available or is insufficient are classified as "not evaluable" (Table 7).

Table 7

Imputability (causal connection between transfusion and reaction)		
0	not evaluable	There is insufficient or contradictory information and it is impossible to obtain supplementary information or check
1	unlikely	The reaction is definitely/more likely to be due to other causes
2	possible	The reaction can be explained both by the transfusion and by other causes
3	probable	The reaction does not appear to be due to another cause
4	definite	In all probability the reaction was caused by the transfusion

4.3 Reported data

4.3.1 Transfusion reactions: Reporting rate

Compared with the previous year, the reporting rate for TR in 2021 was 7.8% lower (6.6/1,000 Tf) (Figure 5). However, the figure is within the average of the previous five years (5.9/1,000 Tf). As in previous years, allo-immunisations, FNHTR and allergic TR were the most frequently reported reactions, with allo-immunisations accounting for 60% of all TR. The proportion of FNHTR reports remained stable in 2021; the proportion of the total reports accounted for by potentially avoidable transfusion reactions, such as TACO and TTI, declined (Figure 6).

Figure 5
Reporting rate for transfusion reactions

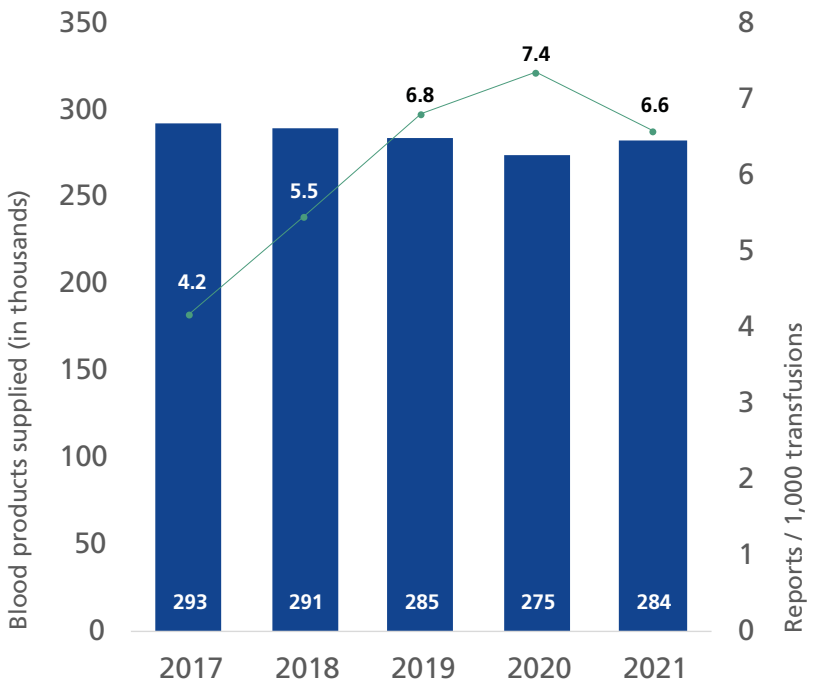
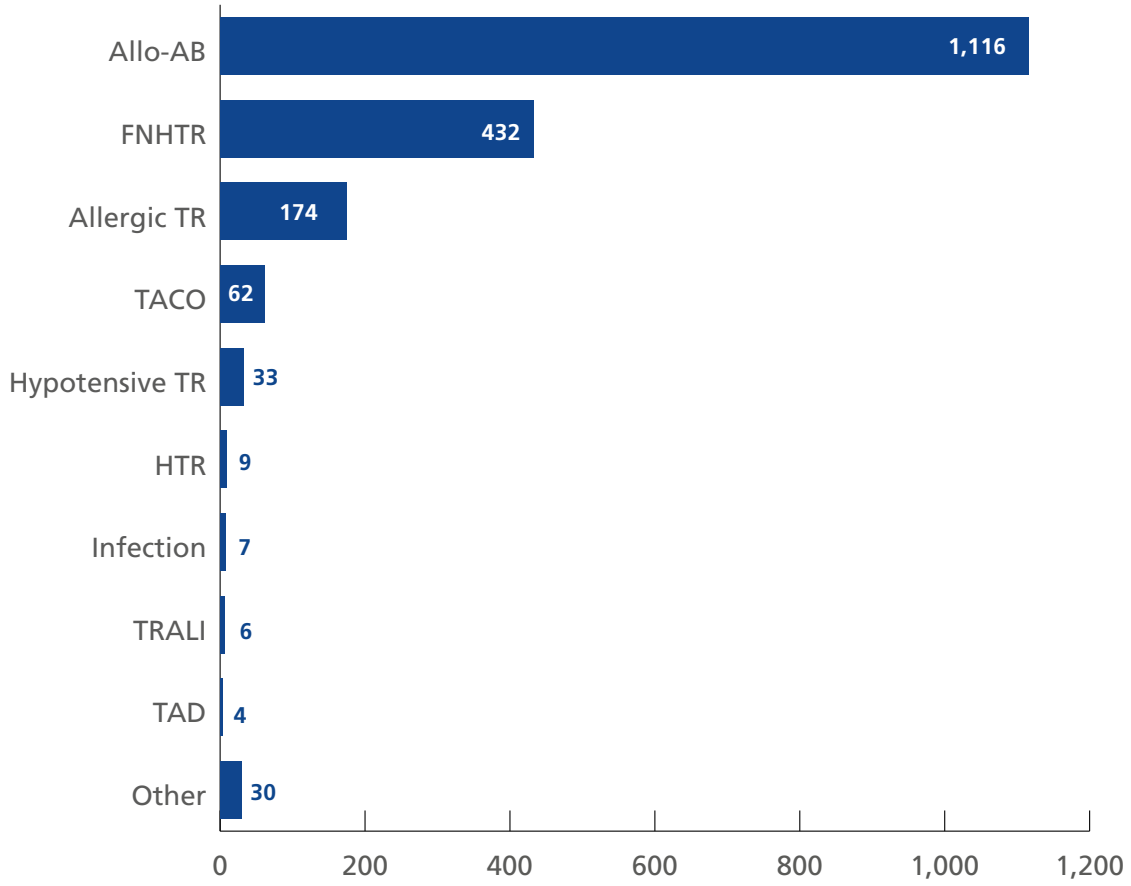
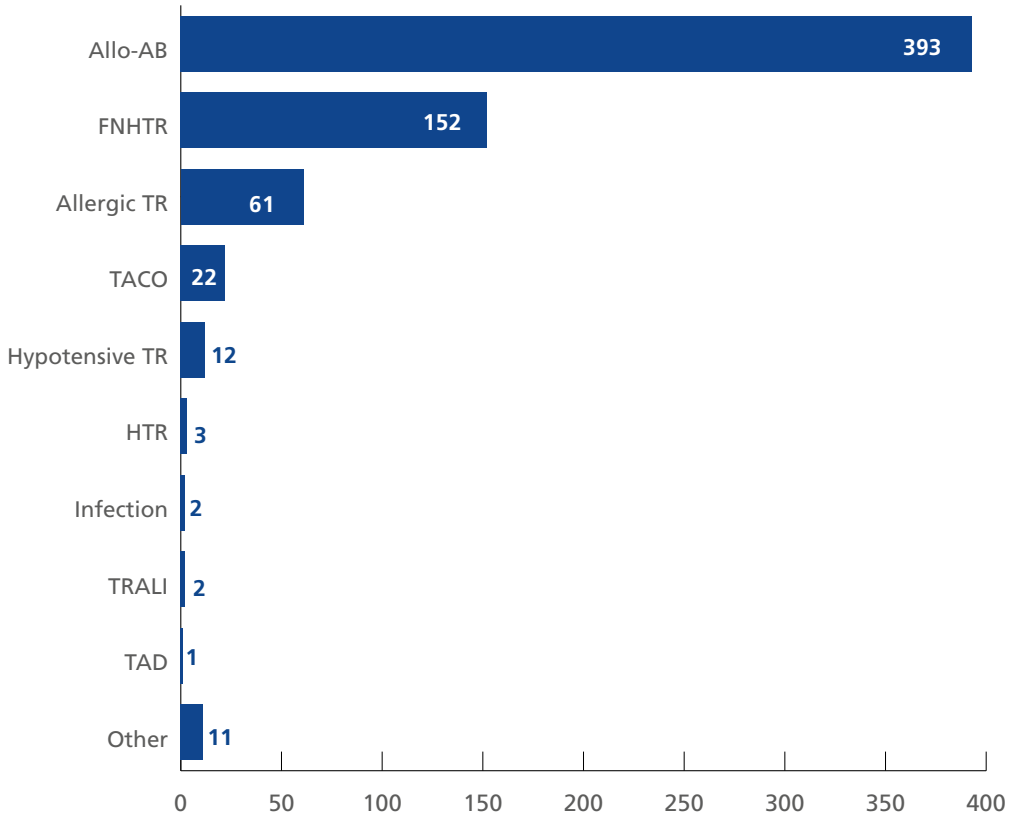


Figure 6
Transfusion reactions reported in 2021 by category



1,873 transfusion reactions were reported in 2021 (including all degrees of severity and imputability*)*

Figure 7
TR reported in 2021 by category per 100,000 transfusions



Incidence of TR by category per 100,000 transfusions.

If we look at the frequency of the different TR per 100,000 transfusions, the incidence is 152/100,000 (1:658) for FNHTR and 61.3/100,000 (1:1,631) for allergic TR. TACO were reported with a frequency of 22/100,000 (1:4,545), TRALI with a frequency of 2/100,000 (1:50,000) (Figure 7). The incidence of TACO declined in comparison with the previous year to the level of earlier years. There was a slight increase in the incidence of TRALI compared with previous years (Table 8). All these figures include all degrees of severity and imputability.

Table 8

Incidence of TACO/TRALI per 100,000 blood products supplied				
	TACO		TRALI	
Year	Reports	Incidence	Reports	Incidence
2017	48	15	4	1.4
2018	66	23	3	1.0
2019	48	17	8	2.8
2020	88	32	3	1.1
2021	62	22	6	2.1

The vast majority of the FNHTR had a mild course (grade 1, 96%; n=413); 93% of the allergic TR were also classified as grade 1 and 2 (n=161). 77% of the TACO were grade 1 and 2 (n=48), 21% were grade 3 (n=13). One TACO had a fatal outcome (grade 4); this case is described in section 4.3.5.

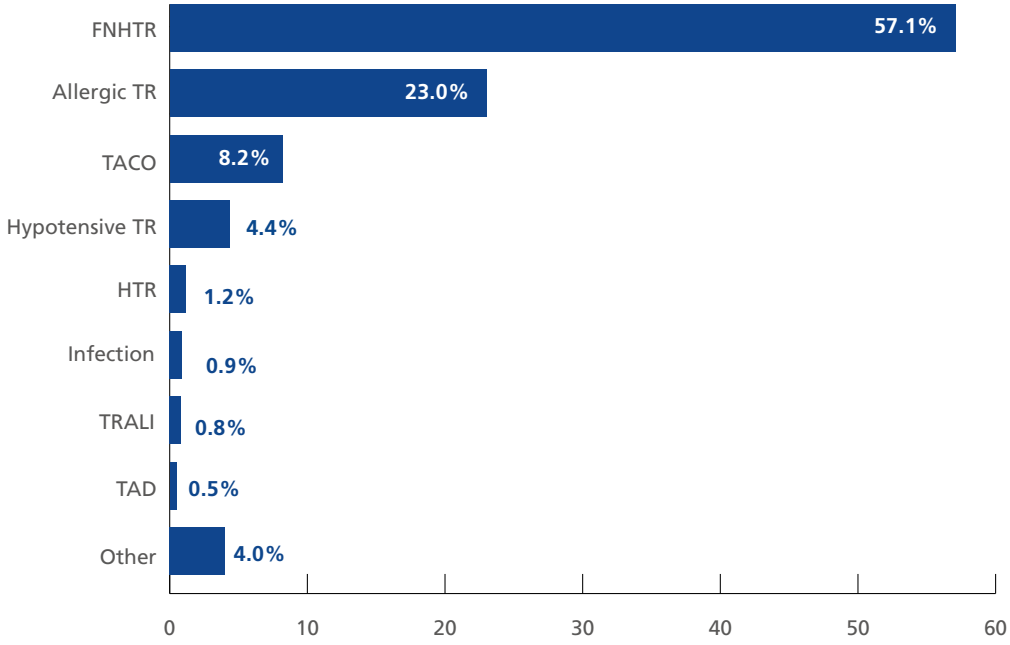
Table 9

Transfusion reactions by severity					
	1	2	3	4	Total
Allo-immunisation	0	1,116	0	0	1,116
FNHTR	413	17	2	0	432
Allergic TR	131	30	13	0	174
TACO	15	33	13	1	62
Hypotensive TR	13	18	2	0	33
HTR	2	7	0	0	9
Infection	6	0	1	0	7
TRALI	0	2	4	0	6
TAD	2	0	2	0	4
Other	29	0	0	1	30
Total	**611**	**1,223**	**37**	**2**	**1,873**

Severity 1: non-severe, 2: severe/permanent damage, 3: life-threatening, 4: death.

If allo-immunisations are not taken into account, the majority of the 757 TR were accounted for by FNHTR (57%), allergic TR (23%), TACO (8%) and hypotensive TR (4%) (Figure 8).

Figure 8
Distribution of transfusion reactions after exclusion of allo-AB



4.3.2 Transfusion reactions: Age group and gender

TR were observed more frequently in men than in women, a distribution that was already evident in previous years (Table 10). The number of reported transfusion reactions increases after the age of 50, a finding which applies to all types of transfusion reaction (Figure 9). However, the distribution patterns are different for each type of TR: TACO occurred predominantly in older patients (>70 years, 69% of TACO), 77% of allergic reactions were experienced by patients <70 years of age (<50 years, 47%). These data describe the absolute occurrence of transfusion reactions. Since there are no data on the transfusions performed by age group and gender, it is not possible to infer the incidence by age group and gender.

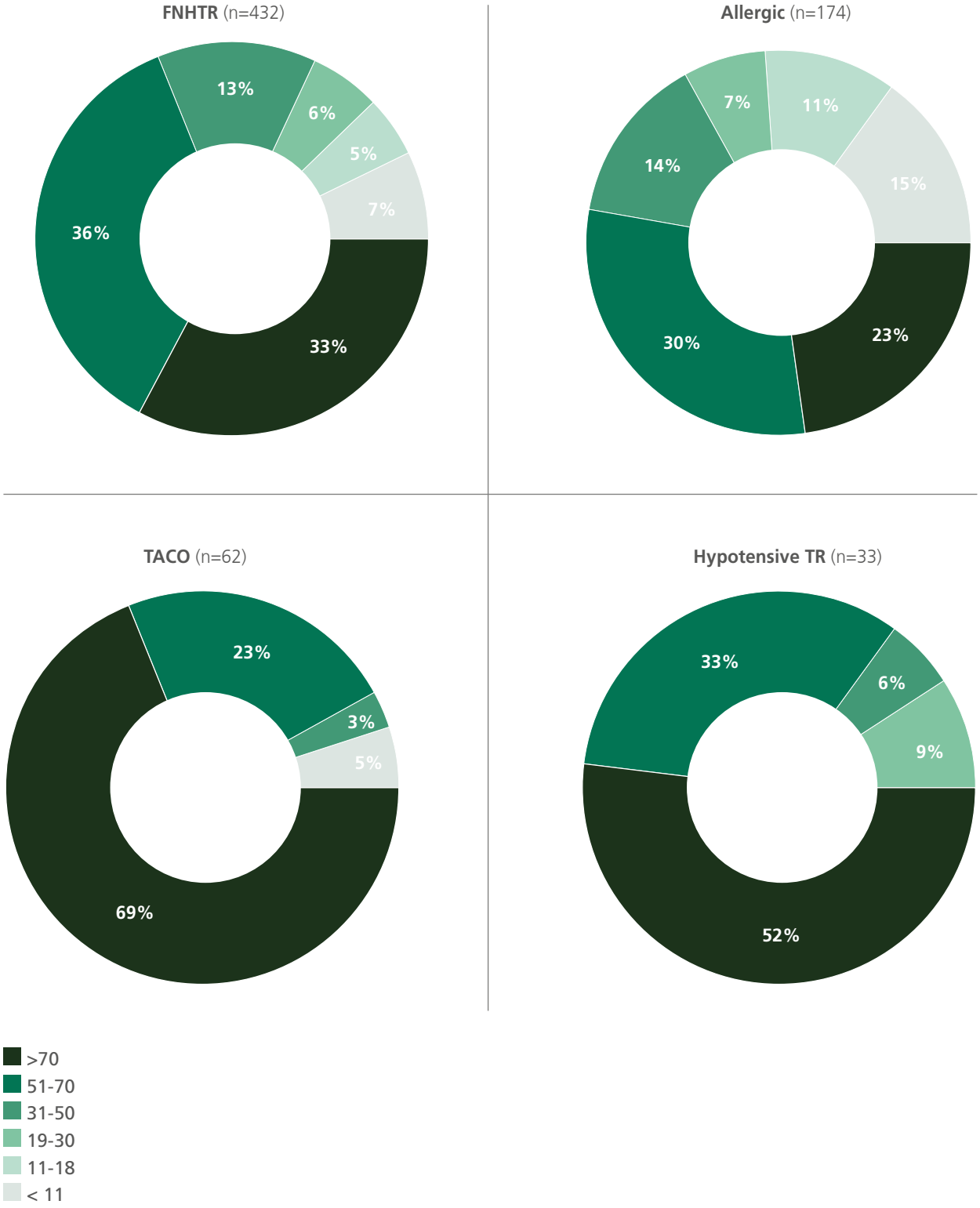
Table 10

Transfusion reactions by age group and gender				
Age groups	**Number of reports**	**Male**	**Female**	**Unknown**
0-10	65	29	32	4
11-18	49	29	18	2
19-30	40	27	12	1
31-50	88	43	45	0
51-70	247	144	102	1
>70	268	136	130	2
Total	**757**	**408**	**339**	**10**

757 transfusion reactions reported in 2021 by age group and gender (excluding allo-AB).

Figure 9
Transfusion reactions reported in 2021 by age group

The four transfusion reactions with the highest incidence in 2021.



4.3.3 Transfusion reactions: Imputability

Table 11

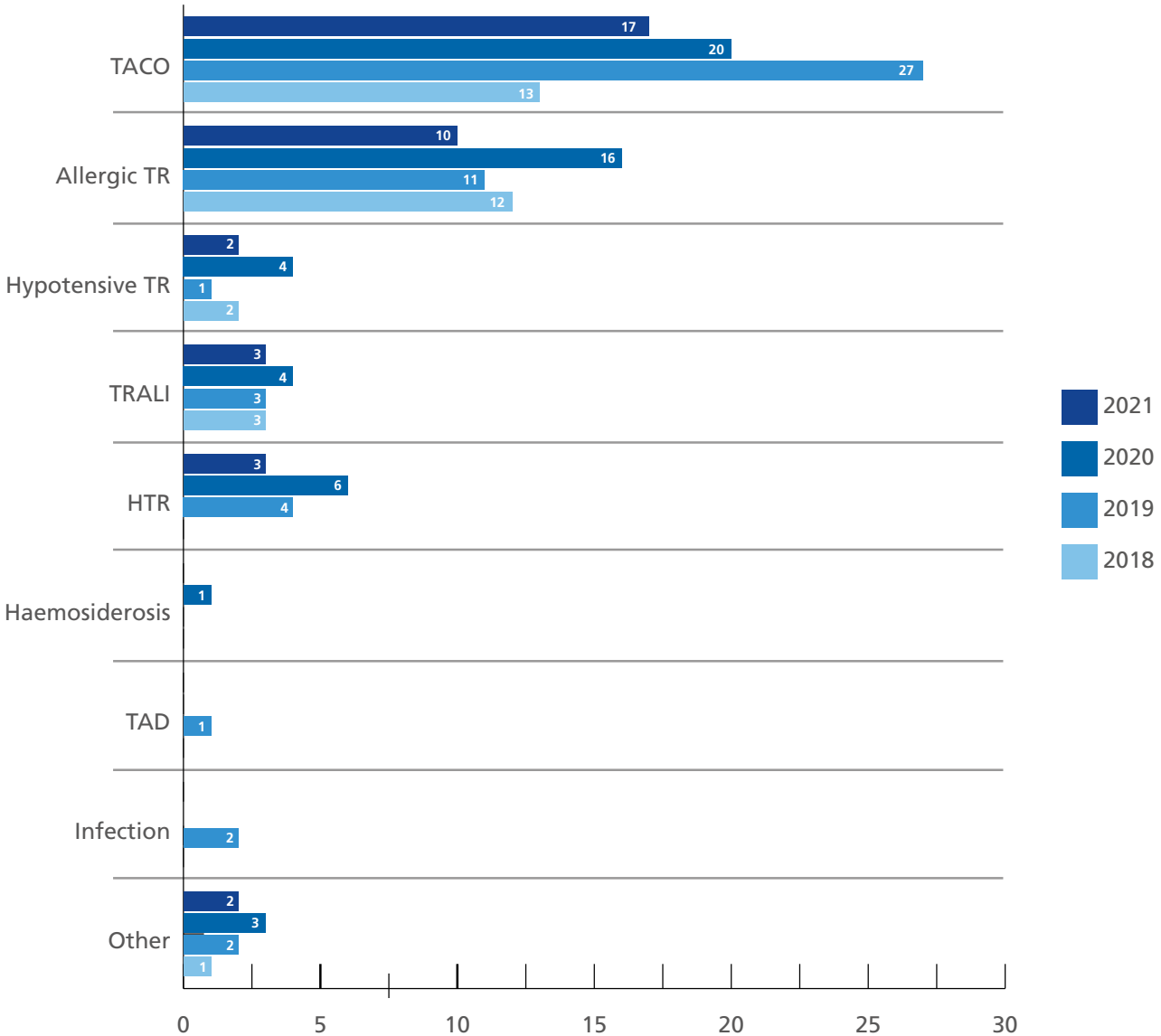
Transfusion reactions by imputability					
	1	2	3	4	Total
Allo-immunisation	2	69	402	643	1,116
FNHTR	70	289	65	8	432
Allergic TR	1	51	98	24	174
TACO	2	25	26	9	62
Hypotensive TR	6	18	8	1	33
HTR	2	2	3	2	9
TTI	6	1	0	0	7
TRALI	2	2	1	1	6
TAD	3	1	0	0	4
Other	8	16	5	1	30
Total	102	474	608	689	1,873

Number of transfusion reactions in 2021 by classification and imputability. The imputability of the allo-AB was classified as certain in the majority of cases (n=643). Excluding the allo-AB, the imputability of just 46 TR was classified as certain. (Imputability 1: unlikely, 2: possible, 3: probable, 4: certain).

4.3.4 Transfusion reactions: Life-threatening and fatal events

In 2021, a total of 29 life-threatening TR and two deaths with a imputability of at least possible were reported (Table 12). TACO (n=13) and allergic TR (n=12) remain the most frequent causes of life-threatening or fatal transfusion reactions (Figure 10). The incidence of fatal transfusion reactions (imputability at least possible) was therefore 0.70/100,000 transfusions (1:142,857) in 2021.

Figure 10
Life-threatening and fatal transfusion reactions (severity 3-4) with imputability ≥2



Grade 3-4 transfusion reactions with causality ≥2 in the last four years.
Platelet refractoriness (one case in 2019) is included in "Other".

Table 12

Life-threatening and fatal transfusion reactions (severity 3 and 4) with imputability ≥2				
	Possible	Probable	Certain	Total
TACO	5	6	2	13
Allergic TR	5	5	2	12
TRALI	2	0	1	3
Hypotensive TR	0	1	1	2
Other	1	0	0	1
Total	13	12	6	31

4.3.5 Deaths

A total of two fatal transfusion reactions were reported in 2021. Similarly to ISBT, transfusion reactions are only classified as deaths (grade 4) if imputability is evaluated as at least possible (3). The two cases are described below.

Table 13

Deaths	
TACO	**Imputability: certain**
Male patient, age group > 80 years, with known myelodysplastic syndrome, chronic kidney failure, chronic heart failure with reduced LVEF and further medical and oncological comorbidities. Elective admission to hospital. Anaemia (Hb < 70 g/l) and elevated BNP were present on admission. Cardiological examination failed to identify an acute cardiac pathology; the known heart failure was confirmed. Following consultation with a haematologist, pRBC was transfused in accordance with the recommendation (over a period of approx. two hours, transfusion rate > 2.5 ml/kg/h). Approx. two hours after the end of the transfusion, the patient developed fever (≥ 39.0°C), impaired vigilance, dyspnoea and crackles over the lungs, accompanied by hypertension and tachycardia. In spite of the therapy that was initiated (including diuretics), the patient's clinical condition deteriorated rapidly, culminating in cardiac arrest and death. The patient's blood cultures remained negative, immunohaematological testing showed nothing abnormal. The death was assessed as «unclear», following forensic examination the cause of death was stated as acute heart failure with signs of pulmonary oedema and pleural effusion in the context of pre-existing chronic heart damage. The cause of death must be considered to be acute volume overload as a result of the transfusion (constituting a TACO). The imputability between death and transfusion is evaluated as «certain».	

Deaths	
Other	**Imputability: possible**

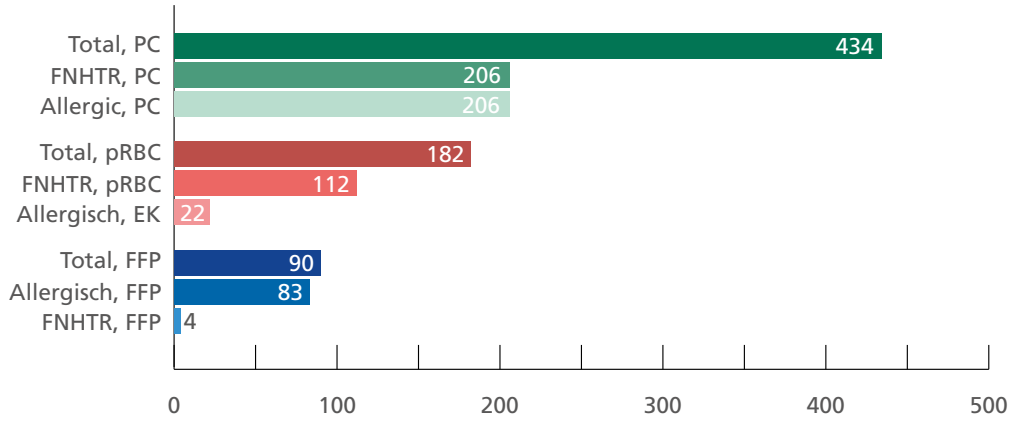
Female patient, age group 65-70 years, with known type 1 diabetes and chronic alcohol consumption, among others; found at home with impaired vigilance, admitted as an emergency after arrival by ambulance.

When the paramedics arrived, the patient's consciousness was moderately impaired and she had severe hypothermia, hypotension, tachypnoea, cyanosis and clinical signs of centralisation of circulation. Further investigations after admission to the emergency department showed severe diabetic ketoacidosis and massive hyperglycaemia. Hyperkalaemia, elevated LDH and CRP levels, signs of liver and kidney failure and severe anaemia (Hb ≤ 60 g/l) were also present. Treatment was started for the medical conditions described here, and pRBC was transfused. During the transfusion (approx. 100 ml had been given) hypotension occurred again, accompanied by neurological deterioration; the transfusion was therefore stopped. The patient subsequently went into cardiac arrest and, despite attempts to resuscitate her, died. The patient's blood cultures and those set up with the transfused pRBC continued to show no growth and immunohaematological testing produced no abnormal findings.

In this case the pattern associated with a TR following ISBT is not evident – the criteria for a hypotensive TR are not fulfilled in view of the pre-existing hypotension and clear other causes of this. The TR is therefore classified as "Other". The cause of death was assessed as «unclear», although an autopsy was not requested. There is a temporal connection between clinical deterioration and transfusion, but in view of the complex and life-threatening clinical situation there are clear other reasons for the patient's death. Imputability is therefore classified as «possible».

4.3.6 Product-specific risks

Figure 11
Reporting rate per 100,000 transfusions by reaction and blood product



Comparison of product-specific TR rates; excluding allo-AB (see text);
only TR unequivocally assignable to a product type were included.
pRBC: packed red blood cells, PC: platelet concentrate, FFP: fresh frozen plasma (FFPq / FFPpi).

The frequency and type of transfusion reactions vary according to the type of product. The evaluation included reports in which it was possible to assign the reaction unequivocally to a specific product type. Reactions which occurred after various types of product had been transfused were excluded. The current evaluation also does not include allo-immunisations: the majority of reports of allo-immunisation do not mention a triggering blood product, or the imputability with a transfusion is not certain (e.g. in women). Allo-immunisations are therefore considered separately (cf. 4.3.7).

Transfusion of PC is associated with a high incidence of febrile and anaphylactoid reactions in the literature (4). This picture was confirmed again in Switzerland in 2021: the transfusion of PC was associated with the highest rate of TR overall (434/100,000 transfusions); FNHTR (206/100,000) and allergic reactions (206/100,000) are the most common types of reaction.

The TR rate for pRBC (182/100,000) was lower than in previous years. Here the exclusion of allo-immunisations mentioned above must be taken into account. FNHTR (112/100,000) and allergic TR (22/100,000) are the most common types of reaction associated with pRBC too, although the incidences are lower than for PC.

The TR rate for FFP (90/100,000) was lower overall than those for pRBC and PC; most of the reactions were allergic (83/100,000).

4.3.7 Allo-immunisations

Allo-immunisations accounted for the bulk of the transfusion reactions with severity 2. Allo-antibody formation signifies a permanent disadvantage for the affected patients since, for example, a limited choice of compatible blood components will be available for any future transfusions, or complications could occur during pregnancy. As mentioned before, many of these reports do not state the causative blood product, or the imputability with a transfusion is not certain (e.g. allo-AB in women, which may also have been triggered by pregnancy). In view of the clinical relevance of allo-AB, we consider the totality of the reports (even if imputability was not definite). The rate of allo-AB / Tf (based on transfused pRBC and PC) was 436/100,000 in 2021.

45% of the reported antibodies belong to the Rhesus/Rh system, followed by Kell antibodies, which accounted for 17% (Figure 12, Table 14). Anti-E antibodies (anti-RH3) are the most common antibodies within the Rh system, accounting for 45% (Figure 13, Table 15).

Figure 12
Allo-AB by BG system in %

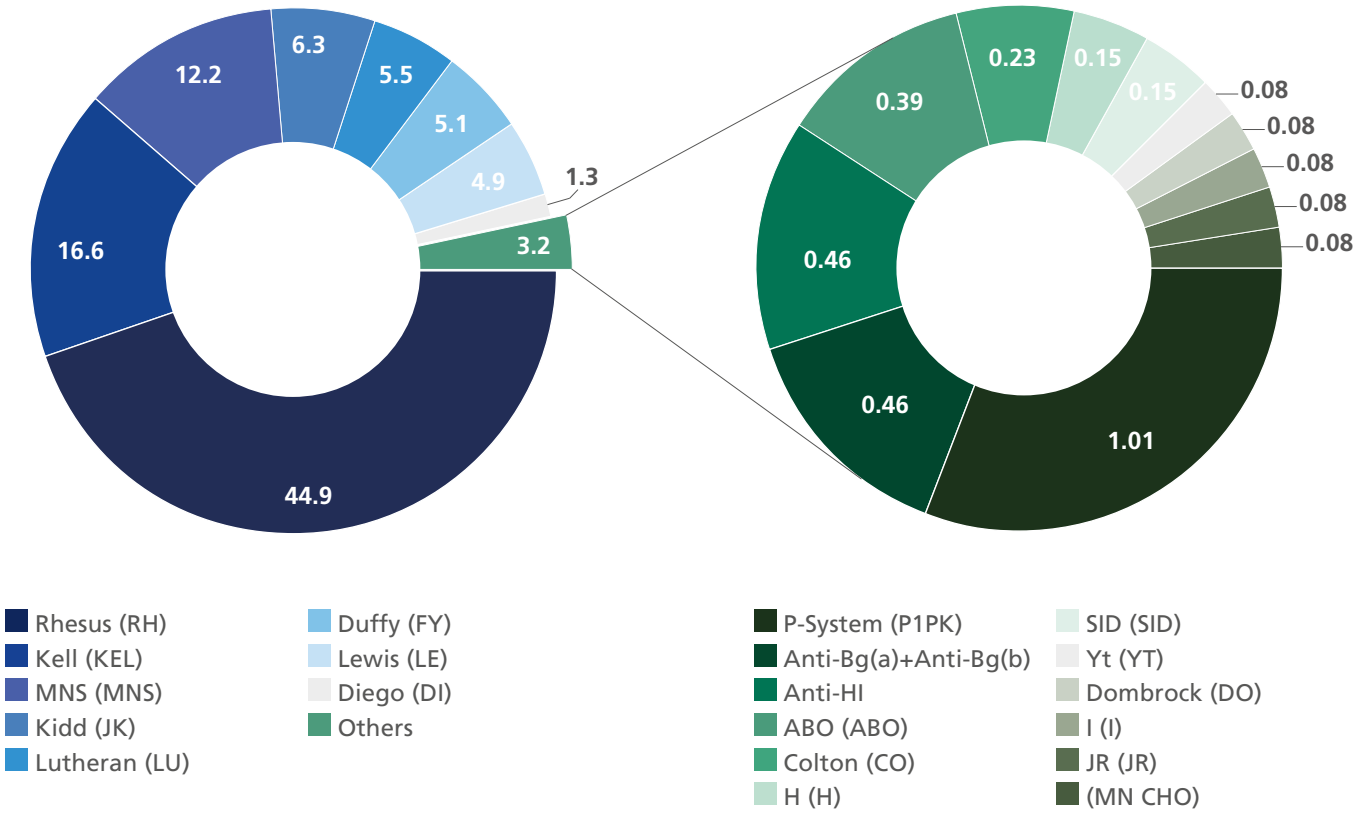


Table 14
Allo-AB reports by BG system (%)

Name (symbol)	ISBT	%
Rhesus (RH)	004	44.9
Kell (KEL)	006	16.6
MNS (MNS)	002	12.2
Kidd (JK)	009	6.3
Lutheran (LU)	005	5.5
Duffy (FY)	008	5.1
Lewis (LE)	007	4.9
Diego (DI)	010	1.3
Others		3.2
Total		100

Name (symbol)	ISBT	%
P-System (P1PK)	003	1.01
Anti-Bg(a)+Anti-Bg(b)	*	0.46
Anti-HI	*	0.46
ABO (ABO)	001	0.39
Colton (CO)	015	0.23
H (H)	018	0.15
SID (SID)	038	0.15
Yt (YT)	011	0.08
Dombrock (DO)	014	0.08
I (I)	027	0.08
JR (JR)	032	0.08
(MN CHO)	213	0.08

**According to ISBT (2) (no data were found for these AB in the ISBT reference table)*

Figure 13
Allo-AB in the Rh system in %

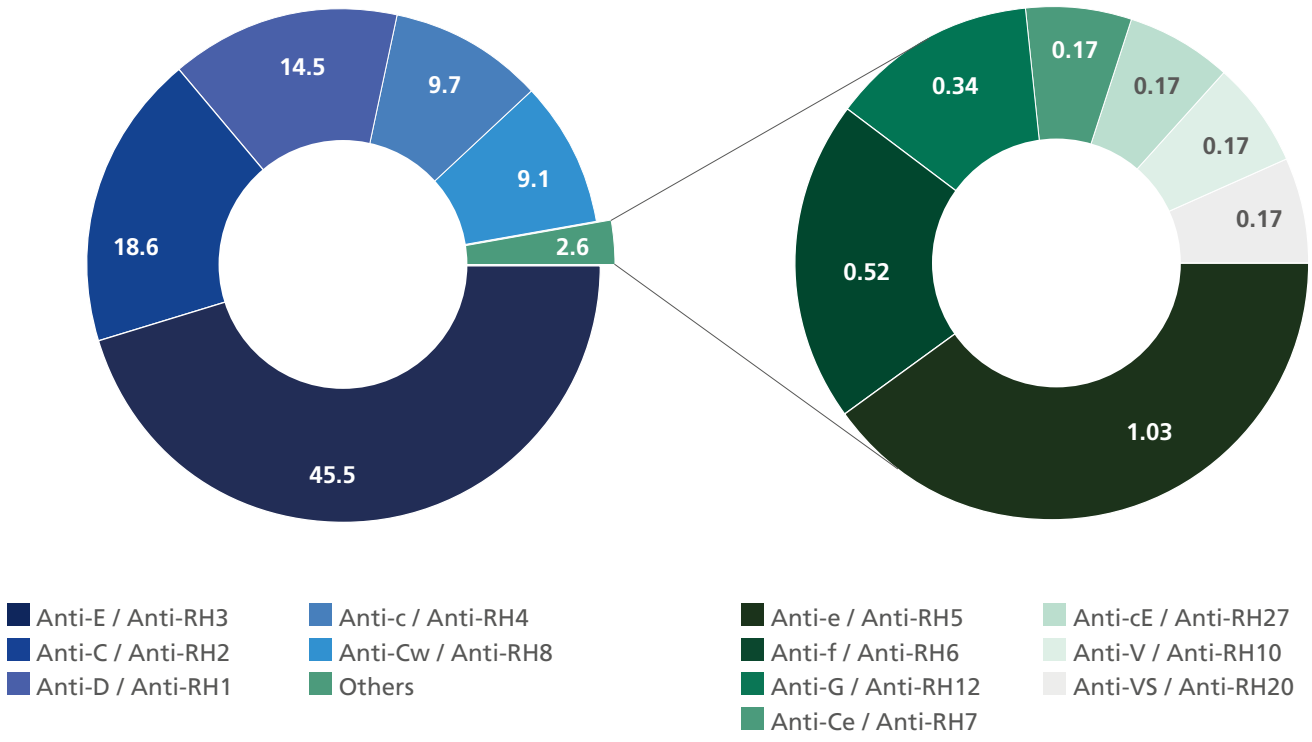


Table 15
Allo-AB in the Rh system (%)

Antibodies	ISBT	%
Anti-E	Anti-RH3	45.5
Anti-C	Anti-RH2	18.6
Anti-D	Anti-RH1	14.5
Anti-c	Anti-RH4	9.7
Anti-Cw	Anti-RH8	9.1
Others		2.6
Total		100

Antibodies	ISBT	%
Anti-e	Anti-RH5	1.03
Anti-f	Anti-RH6	0.52
Anti-G	Anti-RH12	0.34
Anti-Ce	Anti-RH7	0.17
Anti-cE	Anti-RH27	0.17
Anti-V	Anti-RH10	0.17
Anti-VS	Anti-RH20	0.17

5 Transfusion errors / IBCT and Near Miss

5.1 Definitions

Transfusion errors are defined as events in which a blood component is transfused into a patient for whom it is not intended, not suitable, compatible by chance or not necessary, or in whom transfusion is delayed to a relevant extent. The term "IBCT" (incorrect blood component transfused) has become internationally established for this event. If errors or deviations from regulations and guidelines which could have resulted in a transfusion error or a transfusion reaction are discovered before the transfusion takes place, this is known as a «near miss» event.

Analyses of IBCT and near misses help to identify sources of errors and safety gaps in the transfusion chain. If a near miss happens, this provides an opportunity to investigate which safety precautions were effective. Reports of these events are therefore an important element of quality assurance, the aim being to prevent future incidents by establishing specific measures and to improve patient safety.

5.2 Mandatory reporting

Art. 63 TPO requires anyone who uses or dispenses medicinal products professionally or is entitled to do so to report to Swissmedic observations of serious or previously unknown facts which endanger drug safety. This Article also covers transfusion errors. Equally, Art. 59 para. 3 TPA requires serious or previously unknown adverse effects and incidents, observations of other serious or previously unknown facts and quality defects that are of significance for drug safety to be reported. According to Art. 4 para. 1 let. a TPA, blood and blood products are also medicinal products. The explanatory report on the Therapeutic Products Ordinance published in September 2018 states the following: «Observations of serious facts are incorporated for the first time following the revision of Article 59 paragraph 3 TPA. This specifically addresses situations in which erroneous use of a medicinal product was avoided but which favour errors in use and could lead to substantial damage to health. […]. Where blood products are concerned, transfusion errors that are barely avoided must also be reported.» Here the Ordinance explicitly addresses near misses.

5.3 Classifications

The causes of an incorrect blood product being transfused can lie anywhere in the entire transfusion chain: during the initial prescription, while taking blood samples, in the immunohaematology laboratory, when the product is dispensed or during the actual transfusion. Safety precautions are established to prevent transfusion errors, e.g. two blood group determinations from independent samples or the four-eyes principle. If a transfusion error occurs notwithstanding the precautions, the source of the error must be identified so that the control mechanisms can be improved.

Swissmedic bases its classification of IBCT and near misses on the system developed by the British haemovigilance organisation SHOT (Serious Hazards of Transfusion) (5) so that data are recorded internationally in a comparable manner. In addition to the error category (cf. Table 16), the place in the transfusion chain at which the deviation occurred and – where possible – the cause and type of error (e.g. communication, knowledge gaps, inadequate SOP) are also recorded.

Table 16

Classification of IBCT according to SHOT	
WCT	**wrong component transfused/ falsches Produkt transfundiert**
Cases in which the wrong type of product (e.g. platelet concentrate instead of pRBC) or a blood product that was ABO/RhD incompatible was transfused (this also includes cases in which the change in ABO/RhD blood group after a stem cell transplantation was not taken into account). Equally, transfusion of a suitable product in the wrong patient (e.g. due to a prescribing error) or transfusion of an unsuitable product in a premature baby/neonate (specifications not met) are also recorded in this category. Mistakes and errors in which the transfusion was ABO/RhD compatible solely by chance are included in a similar way to ABO/RhD incompatible transfusions. • Incorrect ABO/RhD blood group • Product intended for another patient, ABO compatible by chance • Wrong patient • Wrong type of product	

Classification of IBCT according to SHOT	
SRNM	**Specific requirements not met**

If a patient needs a blood product with particular specifications (in accordance with current guidelines or a doctor's prescription) and does not receive it because of an error, this constitutes an SRNM. ***If the deviation is the result of a deliberate clinical decision (e.g. because of an emergency situation), this is not an SRNM*** (one exception here is the deliberate administration of Rhesus D-positive blood to Rhesus D-negative recipients in the context of a mass transfusion – this should be reported). Product specifications that may be affected are, for example, an extended RBC phenotype (e.g. in the context of allo-immunisation or haemoglobinopathy), irradiation or washing of a product, CMV negativity, HLA typing (for platelet concentrates) or warming of the blood product (e.g. if cold antibodies are present). An SRNM also exists if (e.g. in the immunohaematology laboratory) SOPs have not been followed and products are released before the necessary diagnostic procedures (including internal quality controls) have been completed.

- Not allo-AB compatible
- Where an indication exists: failure to observe
  - Irradiation/washing of a blood product
  - CMV negativity
  - HLA compatibility (platelet concentrate)
  - Extended RBC phenotype (e.g. haemoglobinopathies)
  - Use of blood warmers (e.g. cold antibodies)
- Product released in spite of incomplete / inadequate diagnostics (e.g. transfused after the T&S has expired, internal quality control not available)
- Deliberate Rhesus D conversion in the context of mass transfusion

HSE	Handling and storage errors

If a blood product is selected and tested correctly but its quality and safety are compromised due to errors in handling or storage, this constitutes an HSE. These include, for example, interruption of the refrigeration chain, storage for too long or incorrectly after the product has been dispensed (e.g. platelet concentrate without a shaker), errors in thawing a plasma product, transfusion although the bag is damaged, use of an incorrect giving set or transfusion of a product after its shelf life has expired.

- Errors during storage (e.g. interruption of the refrigeration chain, platelet concentrate stored too long without a shaker)
- Incorrect giving set, unsuitable Infusomat
- Incorrect thawing
- Damaged product bag
- Shelf life exceeded

Classification of IBCT according to SHOT	
ADU	**Avoidable, delayed or under-/over-transfusion**

ADU is the term used to describe errors in the quantity and timing of transfusions:
Avoidable transfusions: Transfusions in which the indication was incorrect, e.g. due to incorrect laboratory results (such as false low haemoglobin or platelet values), errors in transmitting results or incorrect clinical decisions. The term also covers the avoidable use of emergency products (0 RhD neg).
Delayed transfusions: Clinically indicated transfusions which were not given or given with a relevant delay. These include, for example, the delayed provision of blood products in an emergency situation of relevant delays in patient care (e.g. postponement of a date for surgery, rescheduling an out-patient for another day).
Over-/under-transfusion: Transfusion of too large or too small a quantity of a product, e.g. due to incorrect prescription or the malfunction of an infusion pump.

- Transfusion with an incorrect indication
  (e.g. due to incorrect Hb measurement, prescribing error)
- Incorrect quantity transfused
- A relevant delay in transfusion
  (e.g. the necessary postponement of surgery, patient rescheduled for another day)

RBRP	Right blood, right patient

Incidents in which the transfusion was correct but there were relevant errors in identifying or prescribing the blood products. This includes, for example, damaged or incomplete labelling, a missing patient ID bracelet, a missing official prescription or missing signatures.

- Incorrect labelling
- Missing prescription or signatures
- Missing patient identification when there should be some (e.g. ID bracelet)

Table 17

Examples of near misses

Near misses in haemovigilance can also occur at any place in the transfusion chain. However, by definition they are ***identified prior to transfusion***. Examples from practice include, for example, rejected blood samples (because of incorrect labelling) or patient mix-ups identified prior to transfusion. In this context the term WBIT (wrong blood in tube) is used to refer to a T&S sample on which label and patient do not match and which was not discovered on receipt in the laboratory (the mix-up is not discovered until ***after*** the sample has been received by the laboratory). Errors like this (discovered, for example, because the blood group is not the same as one that is already known) are a major risk for ABO/RhD incompatible transfusion.
Product orders that are cancelled in time and products that develop a quality defect because of incorrect storage, for example, and ***have to be discarded*** are also evaluated as near misses.

- Order form not initialled
- Sample tubes not labelled correctly, order form incomplete or label missing
- Discrepancy between tube and order form
- Another patient›s date of birth
- Sample taken with incorrect sample tube
- Error in handling & storage with products discarded
- Sample taken from wrong patient and not discovered until ***after*** the sample has been received by the laboratory: Wrong blood in tube (WBIT)
- Orders for the wrong patient
- Wrong blood product ordered
- Blood products ordered on the basis of incorrectly measured haemoglobin, platelet or coagulation values

5.4 Severity

Table 18

Severity of IBCT and NM	
Grade 1	**Non-severe** Formal error with no potential for use by mistake: • Order form not initialled • Sample tubes not labelled correctly or order form incomplete • Minor discrepancy between tubes and order form • Deliberate Rhesus conversion in mass transfusions • Handling & storage with products discarded
Grade 2	**Severe** Formal error with potential for use by mistake or transfusion error involving a suboptimal product: • Labels missing from sample tubes • Another patient›s date of birth • Patient ID on sample tube differs from that on form • Transfusion error with unconfirmed allo-AB compatibility according to the SOP
Grade 3	**Life-threatening** Use by mistake occurred at some level in the transfusion chain: • Wrong blood in tube* (WBIT) • Discrepant BG determinations • Blood product orders for the wrong patient • Transfusion error ABO incompatible or ABO-compatible only by chance *Wrong blood in tube (WBIT) means that the patient identification on the tube / order form does not match the patient whose blood is in the tube.

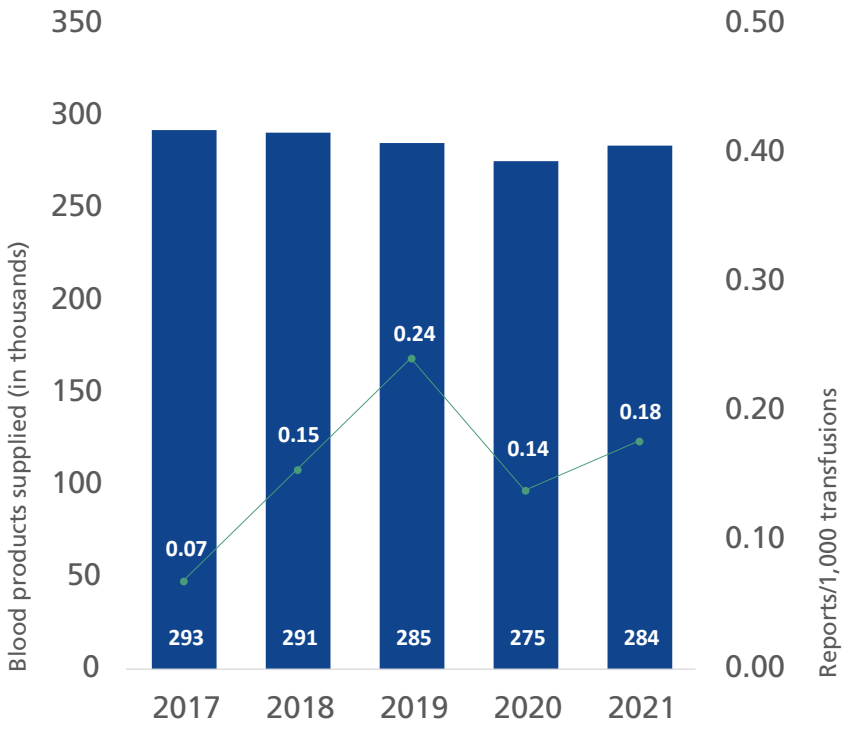
If a transfusion error is fatal, the case is recorded as grade 4 in the transfusion reaction database and as grade 3 in the transfusion error database.

5.5 Reported data: IBCT

5.5.1 IBCT: Reporting rate

There was a slight increase in the number of bags supplied for transfusions in 2021 compared with 2020. The reporting rate for IBCT in Switzerland in 2021 also increased in comparison with the five-year average (from 0.16/100,000 to 0.18/100,000) (Figure 14).

Figure 14
IBCT reporting rate by year



5.5.2 IBCT: Subclassification

As in the previous year, SRNM account for the lion's share of reported IBCT (n=31; 63%) (Table 19). Most of them involved planned Rhesus D conversions (n=11; 35% of SRNM) and errors in taking into account the extended RBC phenotype (n=9; 29% of SRNM). There was a slight reduction in the number of WCT compared with 2020 (n=5; 10% of all IBCT); the figure is largely stable compared with previous years. There were no ABO-incompatible transfusions in 2021; three transfusions were ABO-compatible by chance. The WCT reported in 2021 are described in Table 20.

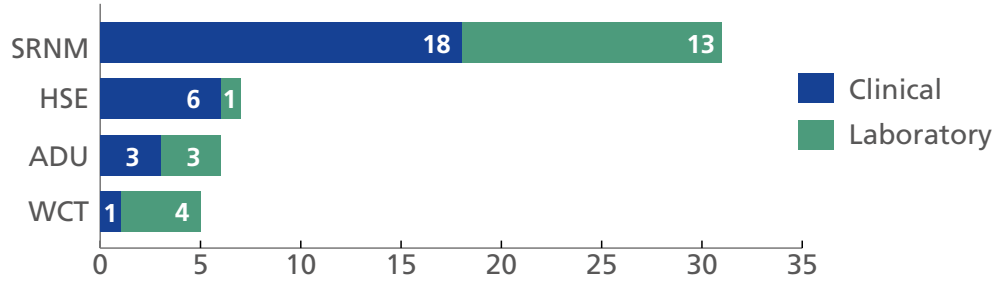
Table 19

Subclassification of transfusion errors / IBCT		
WCT	**Wrong component transfused**	**5**
	ABO-compatible by chance	3
	Wrong patient	1
	Wrong product	1
SRNM	**Specific reuirements not met**	**31**
	Rhesus D conversion	11
	Error during use / selection of RBC phenotype	9
	Not irradiated	6
	SOP not followed	5
HSE	**Handling and storage errors**	**7**
	Shelf life exceeded	2
	Product damaged	2
	Incorrect giving set	1
	Incorrect storage in laboratory	1
	Incorrect storage in clinical area	1
ADU	**Avoidable, delayed or under-/over-transfusion**	**6**
	Delayed	3
	Avoidable	2
	Incorrect transfusion rate	1
RBRP	**Right blood, right patient**	**0**
Total		**49**

Transfusion errors were classified according to SHOT definitions (6).

5.5.3 IBCT: Localisation of error

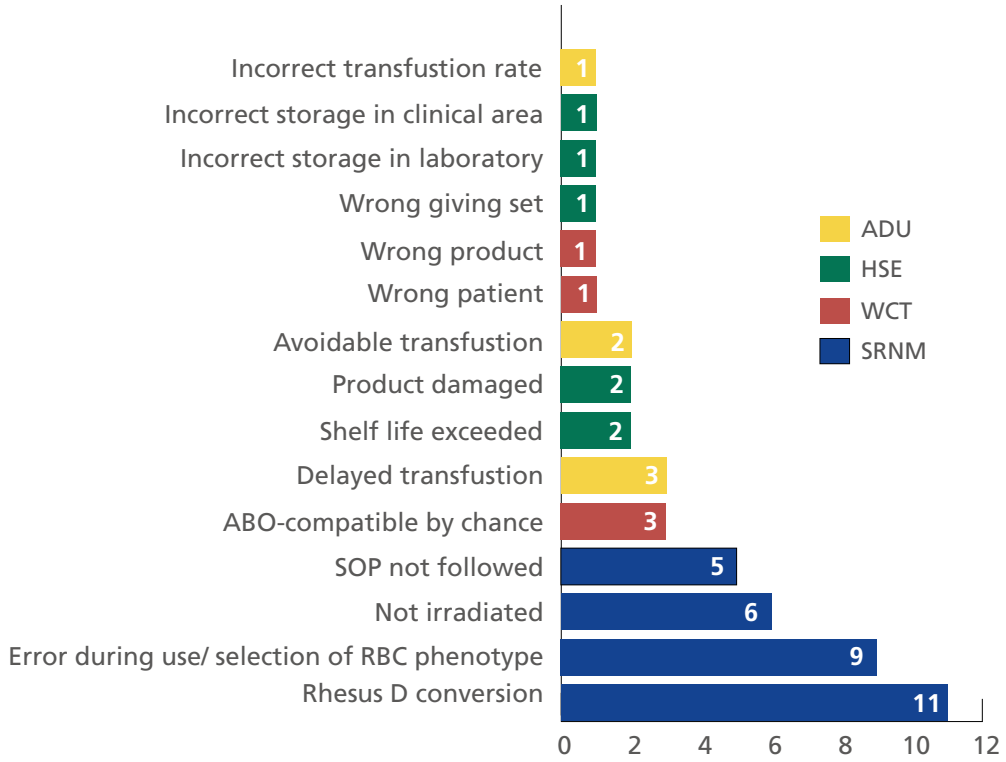
Figure 15
IBCT: Localisation by subclass



	SRNM	HSE	ADU	WCT
Clinical	18	6	3	1
Laboratory	13	1	3	4

Viewed as a whole, the cause of IBCT was slightly more often in the clinical area (approx. 56%). There was an almost balanced distribution of SRNM and ADU; incorrect storage (HSE) occurred most commonly in the clinical area. The cause of the WCT can usually be found in the laboratory (Table 15) – the initial error is recorded in the statistics, any further errors in the process (e.g. when checking an incorrect product) are not shown here.

Figure 16
IBCT: Subclassification



Among the SNRM, an error was most likely to occur in selecting the product («component selection», n=26 / 84%). Analysis of the process shows some errors in the communication between the clinical area and the laboratory (e.g. missing information about a relevant underlying disease such as haemoglobinopathy, failure to communicate allo-antibodies determined elsewhere); in four reports, known and currently no longer detectable allo-antibodies were not taken into account when selecting pRBC.

5.5.4 IBCT-WCT: Case studies

Table 20
IBCT-WCT case studies

Transfusion errors	
ABO-compatible by chance	**Number: 3**
Localisation of the deviation in the transfusion chain	**Laboratory**
Severity	**3**

An unidentified male patient (Patient X) was admitted with resuscitation measures in place and the hospital's internal protocol for massive haemorrhage was initiated. The patient's number (numerical code) was reported orally to the laboratory, it was not possible to obtain a blood tube for immunohaematological testing (T&S). Patient X was initially given untested, RhD-negative pRBC from group 0 in accordance with the emergency protocol. At the same time another – rapidly identified – male patient (Patient Y) was admitted to the emergency department and was also assigned a patient number (numerical code which differed from the number assigned to Patient X by a single digit). Two samples were taken from Patient Y for T&S and sent to the laboratory without an order for blood but with the comment «resuscitation». In the laboratory the blood samples for Patient Y were correctly entered and analysed. The laboratory did not notice that this was a different patient and not Patient X, for whom the «massive haemorrhage» protocol was ongoing. Analysis of the blood samples showed that Patient Y had the confirmed blood group A RhD pos. No blood tubes from Patient X had arrived at the laboratory in the meantime.

Patient X required further transfusions, which were also ordered orally. After 6 units of pRBC O RhD had been transfused, the laboratory supplied blood from group A RhD pos since it was convinced that it was Patient Y for whom the «massive haemorrhage» protocol had been initiated. The individuals performing the transfusion, who believed that Patient X had been identified, did not notice the difference between the two patient numbers and it was not possible to compare the number with the patient's ID bracelet (not accessible). Patient X was given the A RhD pos pRBC. He died shortly afterwards as a result of the haemorrhage. Determination of Patient X's blood group (by molecular genetics), which was performed after the error had been discovered, showed that he had blood group A RhD pos.

Localisation of the deviation in the transfusion chain	**Laboratory**
Severity	**3**

pRBC were ordered for two patients: 4 units of pRBC for Patient X (male), 2 units of pRBC for patient Y (male). The pRBC were selected and assigned in the LIS in the transfusion laboratory. When the products were labelled, the pRBC for both patients were handled at the same time, and the labels for Patient X were attached to the pRBC intended for Patient Y. The product number on the product and on the adhesive label accordingly did not match. The products were all dispensed and transfused using the labelling for Patient X. The discrepancy between label and product number was not noticed when the products were dispensed in the laboratory and transfused in the clinical area. The error was noticed the next day when the pRBC pre-ordered for Patient Y were dispensed. Both patients had blood group A RhD pos, no transfusion reactions occurred.

Transfusion errors	
ABO-compatible by chance	Number: 3
Localisation of the deviation in the transfusion chain	Laboratory
Severity	3

Im Transfusionslabor wird ein FGP bestellt; im Laborinformationssystem wird FGP X ausgewählt und der entsprechende Lieferschein ausgestellt. Ausgegeben wird FGP Y, welches eine geringfügig andere Produktnummer aufweist (zwei Ziffern betroffen, Anfangs- und Endziffern identisch). Die Ausgabe erfolgt im Nachtdienst, die Arbeitsbelastung ist zum Zeitpunkt hoch. Die Verwechslung fällt nicht auf, das Produkt wird transfundiert. Der Fehler fällt im Folgejahr auf, als Produkt Y ausgegeben werden soll, jedoch nicht auffindbar ist. Beide FGP haben die Blutgruppe AB, eine Transfusionsreaktion tritt nicht auf.

Wrong product	Number: 1
Localisation of the deviation in the transfusion chain	Laboratory
Severity	3

FFP was prescribed in writing in the electronic patient chart. The product was ordered from the transfusion laboratory using a paper form (no electronic interface). The transfusion laboratory dispensed a platelet concentrate (PC) by mistake, the employee mixed up the order (FFP and PC are close together on the form). There was no four-eyes check in the transfusion laboratory before the product was dispensed. The PC was labelled correctly (correct patient data, correct product code). The responsible nurse in the clinical area did not notice that the product was a platelet concentrate and not an FFP (visual check, product code). When a four-eyes check is performed in the clinical area before transfusion, the labelling and patient assignment are checked but not the actual prescription. The patient was given the PC (at the transfusion rate of an FFP). The discrepancy between prescription and transfused product was noticed by the staff on the next shift. No transfusion reaction occurred.

Wrong patient	Number: 1
Localisation of the deviation in the transfusion chain	Clinical
Severity	3

Transfusion of a packed red blood cell product (pRBC) for Patient X (male) following oral prescription. The responsible nurse's shift ended after the transfusion. The new responsible nurse asked the responsible doctor whether a further transfusion was necessary. An oral prescription for a further pRBC was issued, and this was ordered and administered. When the written prescription was obtained subsequently, it was noticed that a misunderstanding had occurred and that the second pRBC was intended for Patient Y (male). No transfusion reaction occurred.

The discovery, processing and reporting of transfusion errors is a sign of a functioning quality management system – we would expressly like to thank all reporters for their commitment to improving transfusion safety. A structured incident analysis should be performed, taking all the process factors into account. 51% of the IBCT reports in 2021 identified "human error" (failure to follow an existing SOP, human error, individual error) as the main cause of the incident. However, in most incidents there are other factors in the process which increase the likelihood of an error being made, and these present an opportunity to improve safety. We would like to mention some of the factors which were involved in the above examples of IBCT-WCT for illustrative purposes.

Factors which increase the likelihood of errors

Temporary patient identification

Emergency situations in which it is not possible to identify the patient completely are always a risk. The use solely of numerical codes and consecutive numerical codes – which differ only slightly from each other – has an increased potential for causing mix-ups. Possible safety precautions could include the assignment of random names (using a pre-defined system), temporary patient identification consisting of numbers and letters (where technically possible) or the use of non-consecutive numerical codes. A combination of a number with additional information (e.g. room number, invented first names) can also increase safety.

Oral prescriptions

Oral prescriptions are part of clinical life. They must be seen as a contributing factor in two of the IBCT-WCT. Written prescriptions should be used wherever possible – options for issuing written prescriptions should be easily and rapidly available.

Interfaces

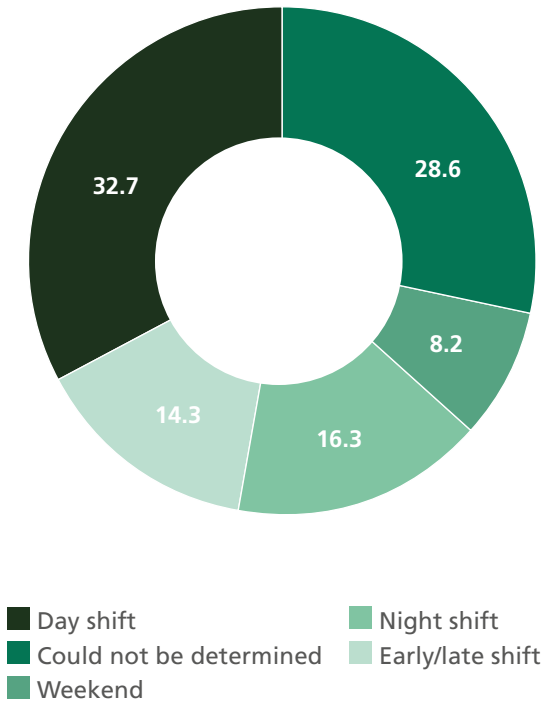
There is a risk of a transmission error occurring every time prescriptions and information are transferred. In an IBCT-WCT the transfer of an electronic prescription from the clinical information system to a paper form and subsequently into another electronic system (laboratory information system) must be viewed as the source of the error. Direct information transfer can improve transfusion safety and should therefore be the goal.

5.5.5 IBCT: Shift work

The workload and human resources differ from one shift to another. The "Guidelines for quality assurance in transfusion practice" issued by the Swiss "Quality Assurance in the Use of Blood Products" working group recommend that transfusions should not be performed at night if possible.

It was possible to assign 71% of the IBCT reports in 2021 to a specific shift. 33% of the IBCT occurred during the day shift, 39% during other shifts or at the weekend (Figure 17). Since no figures for the frequency with which transfusions are performed in the respective shifts are available, it is not possible to derive an error rate from this information. Considering that most activities are focused on the day shift (surgery, out-patient clinics, doctors' rounds), it is likely that more transfusions are performed during the day shift and that the frequency of transfusion errors outside the day shift is increased to a relevant degree.

Figure 17
Occurrence of IBCT by shift (%)

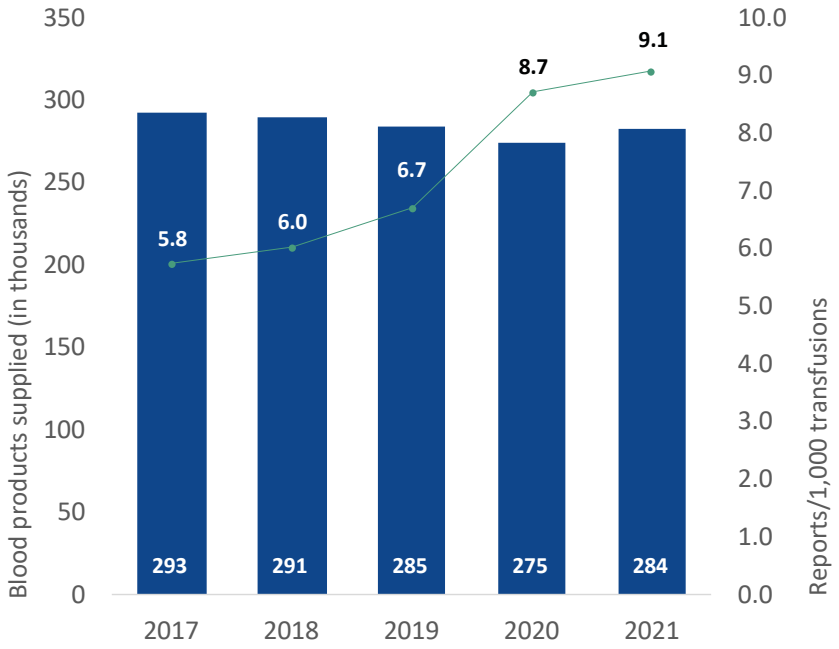


5.6 Reported data: Near Miss

5.6.1 Near miss: Reporting rates

The proportion of all reports received accounted for by near misses increased again and, at 57%, is higher than in previous years. At the same time, the number of reporting centres was lower in 2020 and 2021 than in 2019 (2021: 47, 2020: 44, 2019: 54), possibly due in part to the additional workload created by the COVID-19 pandemic. The reporting rate at the active centres has increased accordingly. However, in this context we do not assume that the number of near misses has increased per se, rather that awareness is now greater and vigilance processes are being implemented more effectively at the centres.

Figure 18
Near Miss reporting rate by year



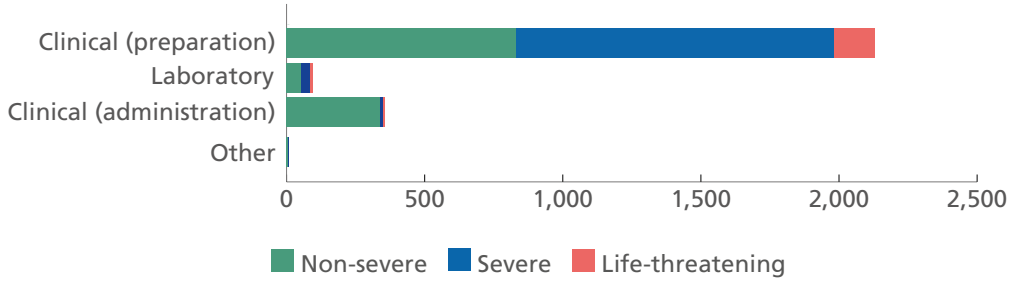
NM reporting rate. The reporting rate is calculated from the total number of reports per 1,000 transfusions (products supplied). The reporting rate rose again in 2021 (9.1 reports per 1,000 transfusions in 2021 versus 8.7 in 2020).

5.6.2 Near Miss: Severity and localisation

Table 21

Near misses by severity	
Severity	**n**
Non-severe	1,222
Severe	1,195
Life-threatening	168
Total	**2,585**

Figure 19
Near Miss by severity and localisation



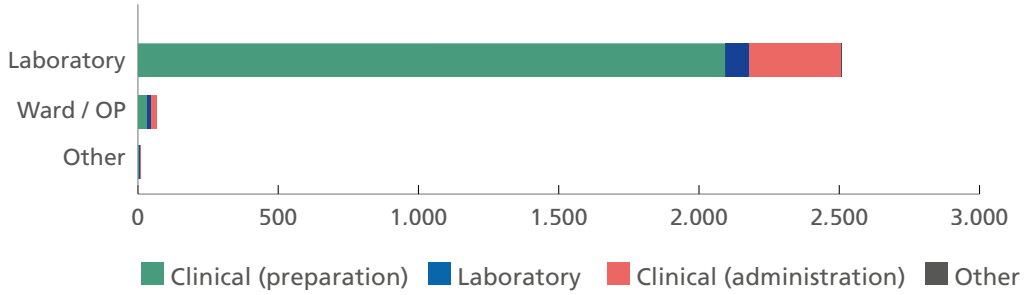
	Localisation of the error			
Severity	**Clinical (preparation)**	**Laboratory**	**Clinical (administration)**	**Other**
1 Non-severe	830	49	339	4
2 Severe	1,149	33	10	3
3 Life-threatening	149	12	5	2

Classification of the deviation (rows) and the localisation of the discovery of the deviation (columns).

Half of the near-miss reports (53%) were severity grade 2 or 3 (Table 21, Figure 19); this figure is slightly lower than the year before (2020: 56%). The majority of near misses occurred in the clinical area (preparation and administration, 96% in total). 89% of the grade 3 errors were localised in clinical preparation; this is a slightly higher proportion than in previous years.

5.6.3 Near Miss: Discovery

Figure 20
Near Miss: Discovery of error



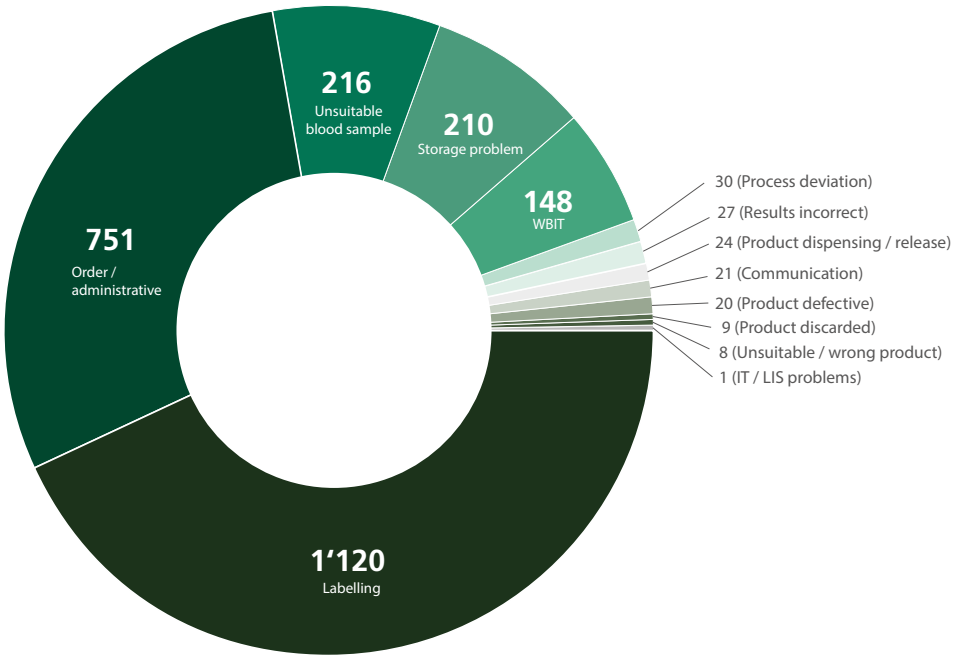
	Discovery of error		
Localisation of the error	**Laboratory**	**Ward / OP**	**Other**
Clinical (preparation	2,093	32	3
Laboratory	82	11	1
Clinical (administration)	329	22	3
Other	7	0	2

Localisation of the deviation (rows) and the localisation of the discovery of the deviation (columns). The majority of deviations are discovered in the laboratory.

Near misses were discovered in the laboratory in 81% of the reports. This includes both cases which were discovered when a blood sample was received (e.g. incorrect labelling, discrepancy between label and delivery note) and cases which were not noticed until the blood sample had been analysed (e.g. discrepancy between the blood group and previous findings in the context of WBIT). Here the difference between the most common localisation of the error (clinical preparation) and discovery (laboratory) illustrates the principle of sequential control (and the possibility of discovering an error) at each step of the process – and confirms its value. A large proportion of the near misses that occurred in the «clinical: administration» area involved products which were not transfused and which had to be discarded because of incorrect storage in the laboratory. These incidents are recorded as «Discovery: laboratory».

5.6.4 Near Miss: Cause

Figure 21
Near misses by cause



As in previous years, incorrectly labelled blood samples account for the largest proportion of near miss reports at 43%. The majority (> 99%) of these reports are severity 2, e.g. blood samples with a discrepancy between the labelling of the blood tube and the delivery note, or no labelling at all, which was discovered at the latest on receipt by the laboratory.

The number of WBIT reports (wrong blood in tube) is largely the same as last year (2020: n=151; 2021: n=147). 86% of the WBIT were discovered in the laboratory, 81% (n=103) because of a discrepancy between the newly determined and a previously determined blood group (in the laboratory or on the blood group card). In the absence of previous determinations in the same laboratory or a blood group card, these cases can result in an ABO-incompatible transfusion and must be viewed especially critically. They underpin the need for the blood group to be determined twice from different blood samples and strict checking of the patient's full data when the sample is taken.

Storage problems (n=210) included numerous interruptions of the refrigeration chain for pRBC, which led to the products being discarded. They also included reports in which platelet concentrates were stored cold (refrigerator, cold box) or without a shaker for a long time and therefore had to be discarded. Undetected, both storage errors place the patient at risk if the product is transfused. However, it is also vital to prevent them in view of the scarcity of resources and the ethical responsibility towards donors. Regular training, information leaflets and standardisation of transportation could be helpful here.

5.6.5 Near Miss: Case studies

In the same way as reporting transfusion errors, reporting near misses is useful in analysing errors and should help to make the transfusion process safer. Errors are part of any real-life work situation, and the fact that they are discovered and followed-up is indicative of a functioning quality assurance process. The following case studies have been chosen by way of example and describe situations in which near misses occurred at very different places in the transfusion chain.

Table 22

Near Miss case studies	
Wrong product dispensed	
Localisation of the deviation in the transfusion chain	**Laboratory, Product dispensing**
Severity	**3**
pRBC were ordered by two different wards for two male patients with the same surname. When the pRBC for Patient X was dispensed, the transfusion laboratory issued the pRBC for Patient Y with the delivery note for Patient X. The product was checked using only the surname. The product was dispensed during the break handover in the laboratory and the workload was heavy. Staff on ward X noticed the discrepancy between the delivery note and the pRBC and the pRBC was returned (the refrigeration chain remained intact).	
Discovery of the discrepancy	**Ward: check before transfusion**

WBIT	
Localisation of the deviation in the transfusion chain	**Clinical, preparation (prob. patient admission)**
Severity	**3**
Patient X (male) presented for a scheduled outpatient consultation involving a blood sample and T&S determination (a blood product was not requested). In the clinical information system (CIS), the case was recorded as Patient Y (male), who has the same date of birth. The labels for the blood tubes were accordingly issued for Patient Y. The names of Patient X and Y are rare in Switzerland, and the correct pronunciation may not have been clear. The name mix-up was not noticed during blood sampling and the sample was accordingly analysed in the transfusion laboratory as Patient Y. Patient Y subsequently contacted the hospital because he had been sent an invoice but had not received a consultation at the time stated on the invoice. A work-up of the case showed that the outpatient clinic had noticed that the name in the CIS was incorrect, but the matter was not pursued and the (transfusion) laboratory was not informed. The T&S determination was deleted after the incident was discovered; the initial mix-up is very likely to have occurred while the patient was being admitted.	
Discovery of the discrepancy	**Patient**

Near Miss case studies	
WBIT	
Localisation of the deviation in the transfusion chain	Clinical
Severity	3

A newborn and its mother were transferred for further care. A blood tube was transferred and described orally as umbilical cord blood. Blood group determination and AHG testing were requested for this blood tube. On checking the blood tube again, staff on the ward noticed that it was labelled with the mother's name and presumably did not contain umbilical cord blood. A blood sample was taken from the child for blood group determination, but this information was not passed on to the transfusion laboratory.

Discovery of the discrepancy	Clinical area: re-checking of label

Error in merging data	
Localisation of the deviation in the transfusion chain	Laboratory
Severity	3

Patient X (female) was hospitalised for an obstetric indication. Blood group determination showed O RhD pos. The transfusion laboratory had a record of her having blood group A RhD pos (tested on several occasions) and a new blood sample was requested. This also showed blood group O RhD pos. When asked, the patient said she had never been in the hospital before. Further analysis of the process showed the cause of the discrepant findings to be an error in merging her data with those of another female patient in the transfusion laboratory's information system.

Discovery of the discrepancy	Discrepancy with previous findings, communication with patient

6 Donor reactions

6.1 Mandatory reporting

In accordance with Art. 58 para. 1 TPA, Swissmedic and the other authorities responsible for enforcing the Therapeutic Products Act monitor the legitimate manufacture, distribution, dispensing and promotion of therapeutic products within the scope of their responsibilities. They perform periodic inspections to establish whether the conditions for licensing are still being met. Swissmedic's responsibility for inspections relating to blood and blood products is set out in Art. 60 para. 2 let. b TPA.

The regional blood transfusion services (RBTS) report all grade 1-4 donor reactions cumulatively to Swissmedic and to Swiss Transfusion SRC once a year. Severe grade 3 and 4 donor reactions must be also reported individually to Swissmedic (on a separate form) within 15 days, as stipulated in Art. 62 TPO and Art. 63 para. 3 TPO.

6.2 Classifications

Swissmedic classifies donor reactions using the classification developed by the Donor Haemovigilance working group of the ISBT, IHN and AABB in 2014 (7). This enables reactions to be recorded in a standardised manner and facilitates international comparison of donor haemovigilance data. Reactions are classified into symptom-related categories and degrees of severity (Table 23 and Table 24); in addition, imputability between donation and incident is evaluated (similarly to imputability in TR, cf. Table 7, section 4.2). A detailed classification is provided on the Swissmedic Homepage.

Table 23

Classification of donor reactions	
A	Local symptoms
B	Generalised symptoms / vasovagal circulatory reactions
C	Specific adverse effects related to apheresis
D	Allergic reactions
E	Other cardiovascular reactions
F	Other severe reactions

Table 24

Severity of donor reactions	
Grade 1	**mild** • Localised symptoms • Mild symptoms • Spontaneous / rapid recovery • No medical intervention necessary
Grade 2	**moderat** • Localised but more extensive • More severe or more persistent symptoms • Functional impairment • Recovery delayed • Possibly intervention such as infusion required • Possibly medical treatment
Grade 3	**severe/life-threatening** • Medical intervention necessary to prevent permanent damage or to save life (resuscitation) • Admission to emergency department / hospitalisation required • Duration of symptoms > 1 year after donation
Grade 4	**Death**

6.3 Reported data

In contrast to previous years, from 2021 Swissmedic is publishing not only the data for serious donor reactions and reactions notified in individual reports but also for incidents classified as non-serious (grade 1 and 2), which are notified in collective reports. This change has been made in the interest of transparency in donor vigilance and is intended to facilitate international comparison.

A total of 3,244 donor reactions (whole blood and apheresis donations) were reported (Table 25). At 60%, vasovagal and circulatory symptoms accounted for the largest proportion of all reactions (Figure 22). 92% (n=2,990) of the incidents involved mild symptoms (mainly local symptoms or low-grade vasovagal reactions without injury or need for treatment). Seven incidents were classified as serious (grade 3) (six whole blood donations, one apheresis donation), a lower number than in previous years (Table 26). Five of these incidents were vasovagal reactions leading to a fall and subsequently referral to an emergency care centre. One of these was a reaction that occurred before the donation started. One whole-blood donor experienced palpitations and felt unwell during their first donation. Here, too, the donor was referred to an emergency department but no cardiac pathology was diagnosed. A pronounced and prolonged citrate reaction with vasovagal and other symptoms occurred during an apheresis donation (this case is referred to as "C: specific adverse effects related to apheresis" in the statistics). Six of the seven severe incidents involved repeat donors who were born between 1961 and 2001; there was therefore no clustering of severe adverse events in the age group > 65 years or in first-time donors.

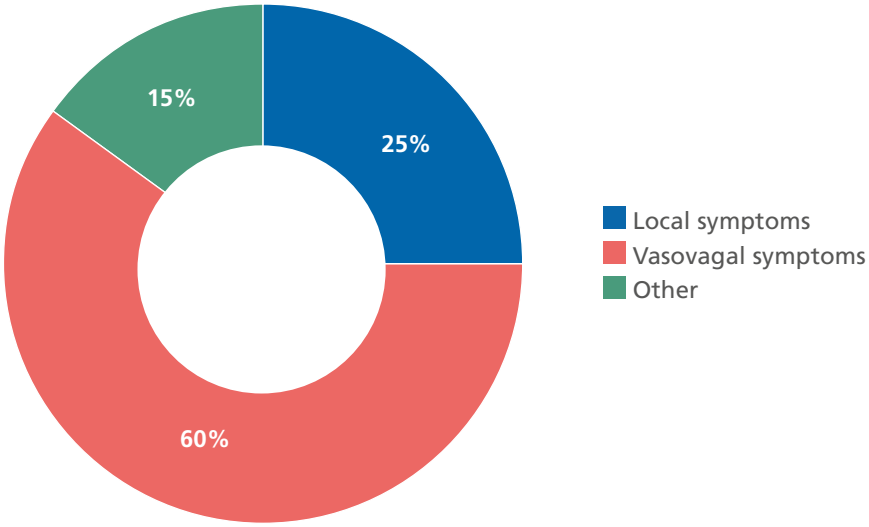
Based on the total number of donations (total: 268,202; whole blood: 251,485; apheresis: 16,717), severe donor reactions occurred with a frequency of 0.24 / 10,000 donations in whole blood donors and in 0.6 / 10,000 donations in apheresis donors. These numbers are low and at a level comparable to that recorded in international donor haemovigilance data (5; 8).

Table 25

Donor reactions (total figures)				
	Grade 1	Grade 2	Grade 3	Total
A Local symptoms	750	58	0	808
B Vasovagal circulatory reactions	1,769	178	5	1,952
C Specific adverse effects related to apheresis	240	4	1*	245
D Allergic reactions	0	0	0	0
E Other cardiovascular reactions	0	0	1	1
F Other severe reactions	231	7	0	238
Total	2,990	247	7*	3,244

**Grade 3 reaction associated with an apheresis donation with complex symptoms (see text).*

Figure 22
Donor reactions



Vasovagal circulatory reactions are the most common adverse reaction.

Table 26

Grade 3/4 donor reactions in the last five years					
	2017	2018	2019	2020	2021
Local symptoms	5	1	2	0	0
Vasovagal circulatory reactions	9	15	18	12	6
Other	2	1	2*	2	2
Total	**16**	**17**	**22**	**14**	**8**

**of which one grade 4*

7 Quality defects and protective measures

7.1 Mandatory reporting

If it is found that the donor did not fulfil the criteria for donor suitability during the donation, the tests for communicable diseases were not performed correctly or the donor has been discovered to have a blood-borne disease, Art. 37 para. 1 MPLO requires the person who holds a licence for activities involving blood and labile blood products to take the necessary protective measures without delay.

According to Art. 37 para. 4 MPLO, institutions which administer blood and labile blood products to patients (generally hospitals and doctors' practices) must, on request, provide the manufacturers with the relevant information concerning use of the labile product to facilitate investigations (involvement in the «look-back» procedure, see below). If quality defects in a product are not discovered until it is used in a patient (e.g. in hospital), the defects must be reported to Swissmedic in accordance with Art. 63 para. 1 let. c TPO.

7.2 Incidents during manufacture that must be reported

Reports of quality defects usually concern infection markers identified in donors who test positive. They also include the documentation of any further investigations triggered by this finding with respect to earlier donations by the same person and/or other blood donors in some cases (known as the "look-back" procedure).

The responsible blood transfusion service reports the infection markers, the measures implemented and the data for the donated blood products to Swissmedic. The exposure risk must also be reported for certain infection markers. For repeat donors, the data from the last-but-one donation must also be provided, and it must be stated whether a look-back procedure was initiated.

Table 27

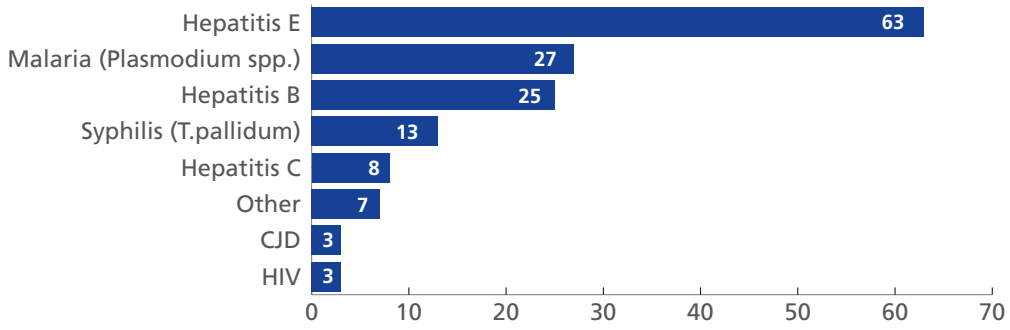
Incidents during manufacture that must be reported
• Safety risks for blood donors: Incidents that pose a threat to the health of the blood donor. • Donor and donation mix-ups • Incorrect release, incorrect labels • Release of out-of-specification blood products • Defective materials or reagents. Incorrect testing • Suspected quality defects • Detection of a blood-borne infection in a blood donor

7.3 Reported data

7.3.1 Quality defects / protective measures: total

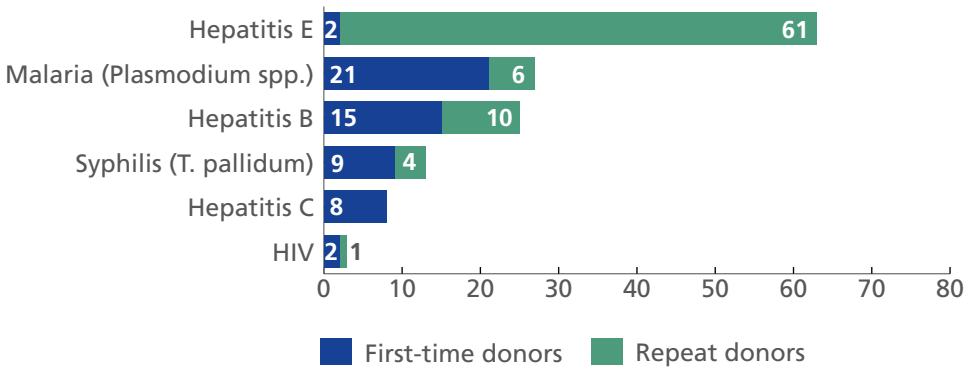
In 2021, a total of 149 reports were received concerning quality defects and protective measures (Figure 23). 139 of these reports involved infection markers which had tested positive (hepatitis E, hepatitis B, hepatitis C, HIV, Treponema pallidum, Plasmodium spp.). Three reports involved individuals who had contracted Creutzfeldt-Jakob disease and had donated blood in the past. Other quality defects (n=7) included labelling errors, mix-ups during the donation process and post-donation information.

Figure 23
Quality defects and protective measures



7.3.2 Quality defects / protective measures: Infection markers

Figure 24
Positive infection markers in first-time or repeat donors



One notable feature in 2021 was a distinct increase in the number of donors testing positive for hepatitis E (2021: n=63; 2020: n=42). Most of these were repeat donors (97%). The reports were received from a number of RBSD, i.e. from different regions in Switzerland, with most of them concerning the months January to April 2021 (01.-04.2021: n=48; 76% of reported HEV cases). The Federal Office of Public Health also observed an increase in hepatitis E infections in the Swiss population during this period – more details can be found in FOPH Bulletin 04.2022 published on 24.01.0222 (9).

7.4 Look-back procedures

Look-backs are performed to investigate the transmission of infections in blood products. The procedure may focus on the donor (confirmed diagnosis of a blood-borne infection in a repeat donor) or the patient (confirmed diagnosis of a blood-borne infection in a recipient of blood products). The investigations are coordinated by the Look Back B-CH coordinating office and performed using algorithms specific to each infection.

7.4.1 Donor-related look-backs

Table 28

Donor-related look-backs in 2021			
Infection markers	**Case reports**	**Transfusion-related infections diagnosed**	**Ongoing**
HIV	1	0	0
HBV	6	0	0
HCV	0	-	-
HEV	10	0	0

**Donor-related look-back CJD: cf. text; as at 01.05.2022*

19 donor-related look-backs were performed in 2021 (Table 28). No diseases transmitted by a blood product were identified, all procedures were concluded. In addition, three donor-related look-backs were performed in the context of Creutzfeldt-Jakob disease (CJD) (blood donated before onset of the disease). It is not possible to screen (test blood) for this prion disease, there is no indication of transmission.

7.4.2 Patient-related look-backs

Table 29

Patient-related look-backs in 2021			
Infection markers	**Case reports**	**Result: Infection excluded**	**Result: Infection not excluded**
HIV	0	-	-
HBV	1	1	-
HCV	1	1	-
HEV	0	-	-

In 2021, two patient-related look-backs were initiated

Two patient-related look-backs were initiated in 2021; in both cases a blood product was excluded as the cause of the infection.

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Attachment

Abbreviations

°C	degrees Celsius
ABO	ABO blood group system
para.	paragraph
ADU	avoidable, delayed or under/overtransfusion
Ag	antigen
AB	antibodies
Allo-AB	allo-antibodies
MPLO	Medicinal Products Licensing Ordinance
Art.	Article
BG	blood group
BD/BTS	blood donation/blood transfusion service
let.	letter
CH	Switzerland
CJD	Creutzfeldt-Jakob disease
i.e.	in other words
pRBC	packed red blood cells
F	female
FFP	fresh frozen plasma
FFPq	fresh frozen plasma, quarantined
FFPpi	fresh frozen plasma, pathogen-inactivated (Intercept®)
FNHTR	febrile non-haemolytic transfusion reaction
h	hour
HBV	hepatitis B virus
HCV	hepatitis C virus
HEV	hepatitis E virus
HIV	human immunodeficiency virus
HLA	human leukocyte antigen
TPA	Therapeutic Products Act
HSE	handling and storage errors
HTR	haemolytic transfusion reaction
HV	haemovigilance
RPHv	Responsible Person for Haemovigilance
IBCT	incorrect blood component transfused
ID	identification
ISBT	International Society of Blood Transfusion
IT	information technology
AR	Annual Report
M	male
n	Number
NM	near miss
PTP	post-transfusion purpura
RBRP	right blood right patient
Rh	rhesus
SHOT	Serious Hazards of Transfusion (United Kingdom's haemovigilance scheme)
SOP	standard operating procedure
SRC	Swiss Red Cross
SRNM	specific requirements not met
T&S	type and screen (to define blood group and detect irregular antibodies)
T. cruzi	Trypanosoma cruzi (causative agent in Chagas disease)
TACO	transfusion-associated circulatory overload
TAD	transfusion-associated dyspnoea
Ta-GvHD	transfusion-associated graft versus host disease
Tf	transfusion
PC	platelet concentrates (PCa: apheresis-derived; PCb: whole blood-derived)
TR	Transfusion reaction
TRALI	transfusion-related acute lung injury
TPO	Therapeutic Products Ordinance
WBIT	wrong blood in tube
WCT	wrong component transfused
e.g.	for example

AI	Appenzell Innerrhoden
AR	Appenzell Ausserrhoden
BE	Berne
BL	Basel-Land
BS	Basel-Stadt
FR	Fribourg
GE	Geneva
GL	Glarus
GR	Graubünden
JU	Jura
LU	Lucerne
NE	Neuchâtel
NW	Nidwalden
OW	Obwalden

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