

# Transfusion Transmitted Injuries Surveillance System (TTISS)

2020 - 2024

Summary Report

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## **Système de surveillance des incidents transfusionnels: Rapport 2020-2024**

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## Foreword

The Centre for Communicable Diseases and Infection Control (CCDIC) of the Public Health Agency of Canada (PHAC) is pleased to release the *Transfusion Transmitted Injuries Surveillance System (TTISS) Summary Report, 2020-2024*. This summary report presents TTISS data submitted by Canadian hospitals participating in the TTISS network.

PHAC established TTISS to collect non-nominal data on adverse reactions to blood transfusions. Canadian hospitals providing transfusion services across the country participate in this surveillance system.

CCDIC, in partnership with participating provinces and territories (P/Ts), is responsible for the collection, management, and analysis of data, and the production of reports to support evidence-based public health decisions. The overarching goal of TTISS is to improve blood transfusion safety and patient safety in Canadian hospitals.

## Abbreviations

AHR	Acute Haemolytic Reaction
ASPT	Aseptic Meningitis
ATR	Adverse Transfusion Reaction
BACT	Bacterial Infection
DHR	Delayed Haemolytic Reaction
DSR	Delayed Serological Reaction
FNHR	Febrile Non-Hemolytic Reaction
HYPT	Hypotensive Reaction
INCMP	Incompatible Transfusion
IVIG-HD	Intravenous Immune Globulin Head-ache
SAAR	Severe Anaphylactic/Anaphylactoid Reaction
TACO	Transfusion Associated Circulatory Overload
TAD	Transfusion Associated Dyspnea
TRALI	Transfusion Related Acute Lung Injury
TTISS	Transfusion Transmitted Injuries Surveillance System
BCs	Blood Components
PDs	Plasma Derivatives

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## Executive Summary

Since 2001, the Transfusion Transmitted Injuries Surveillance System (TTISS) has been collecting data on reported adverse transfusion reactions (ATRs) that are due to the transfusion of blood products i.e., blood components and plasma derivatives in Canada. As of 2007, all provinces and territories (P/Ts), with the exception of Nunavut, provide data to TTISS. Currently, the TTISS network includes over 95% of total blood transfusion activities in Canada.

This report presents the number of ATRs related to the transfusion of blood components and plasma derivatives in all P/Ts over five years (2020-2024) with the exception of Quebec, which did not provide 2023 and 2024 data.

ATR rates are calculated for the transfusion of blood components (BCs) only. Rates for the transfusion of plasma derivatives (PDs) are not shown due to the non-availability of denominator data, i.e. number of transfusions.

The range of ATRs reported include transfusion-associated circulatory overload (TACO), severe anaphylactic/anaphylactoid reaction (SAAR), hypotensive reaction (HYPT), acute and delayed haemolytic reaction (AHR and DHR), transfusion-related acute lung injury (TRALI), transfusion-associated dyspnea (TAD), intravenous immune globulin headache/hemolysis (IVIG-HD), aseptic meningitis (ASPT), bacterial infections (BACT), incompatible transfusion (INCMP), and unusual reactions of clinical significance (Others).

A total of 4,073 ATRs were reported to TTISS during the five-year period (2020-2024): 66.2% (2,695) due to transfusion of blood components and 33.8% (1,378) due to transfusion of plasma derivatives. TACO, among transfusions of blood components, and IVIG-HD, among transfusions of plasma derivatives, were commonly reported ATRs, representing 44.7% (1,204) and 35.8% (492) respectively.

In terms of imputability (definite, probably, possible), 10.2% of ATRs were definitely imputable to transfusions and 89.8% were probably/possibly imputable to transfusions.

ATRs, categorized by severity in terms of the level of medical care/intervention required for the patients, consisted of 70.5% that were non-severe, nearly one quarter (23.1%) that were severe, and 5.2% that resulted in life-threatening injuries.

Of the total ATRs (n=4,073) with reported outcomes, 91.6% resulted in minimal or no harm to recipients, whereas major or long-term sequelae and deaths accounted for 3.0% and 1.6% respectively. TACO, TAD and TRALI were the leading causes of transfusion-related deaths.

Most of ATRs deaths occurred in older recipients (median age=73.0 years), suggesting that these deaths may be attributable to other causes (comorbidities) and actual number of ATR-related deaths may be lower than the reported deaths. Further research is required to clarify the relationship between transfusions and death.

## Introduction

Established as a pilot system in 2001, the Transfusion Transmitted Injuries Surveillance System (TTISS) has since been reporting adverse transfusion reactions (ATRs), which are defined as undesirable and unintentional incidents that occur during and/or after the administration of blood, blood components or plasma derivatives. TTISS collects non-nominal data on ATRs after the transfusion of blood components (e.g., red blood cells (RBCs), granulocytes, platelets, plasma, and cryoprecipitate) and plasma derivatives (e.g., albumin, immune globulin (IG), coagulation factors, etc.). ATRs are voluntarily reportable to TTISS by a national network of hospitals providing transfusion services across all P/Ts except Nunavut.

The TTISS National Working Group (NWG-TTISS) is comprised of representatives from each P/T, two blood manufacturers (Canadian Blood Services and Héma-Québec), and ex-officio representation from Health Canada's Marketed Health Products Directorate (MHPD) and Biologics and Genetic Therapies Directorate (BGTD). The NWG-TTISS, advises TTISS on its operation and direction as a national surveillance system. The objective of TTISS is to identify and estimate risks and trends of ATRs following transfusions to help improve patient safety in Canadian hospitals. This report summarizes the findings of TTISS 2020-2024 of all P/Ts with the exception of Quebec which did not provide 2023 and 2024 data.

## Methods

### Data Collection and Processing

All participating P/Ts hospitals in the TTISS network provide data to the Public Health Agency of Canada (PHAC), covering more than 95% of yearly transfusions in Canadian hospitals responding in TTISS network. The TTISS data for the years 2023 and 2024 was not made available for QC province, therefore, overall coverage rate was around 75% for these years.

A set of standardized case definitions and a standardized reporting form<sup>1</sup> are used to record data and are transferred electronically to a centralized web-based system - *Canadian Network for Public Health Intelligence (CNPHI)*<sup>2</sup>. Currently, ten of the eleven participating sites enter their data into CNPHI, and one site submit their data by email in excel format with password protected directly to PHAC. Each of the P/Ts represent participating site. The Nunavut territory has never been in the TTISS network. Generally, PHAC receives annual data with a time lag of 6 months (e.g., 2020 data were received by July 2021). Data are reviewed for quality assurance and requests for verifications if any discrepancies are addressed with each site separately. After validations, some ATRs may be reclassified or excluded to comply with standardized case definitions. Data from all P/Ts are then combined to form a national TTISS database for analysis.

ATRs are categorized based on imputability (likelihood of being related to transfusion). The transfusion-related nature of ATRs is defined as 'definite, probable or possible'. Where imputability of ATRs is 'ruled out, doubtful or not determined', events are referred to as 'non-transfusion-related'. Only 'transfusion-related' ATRs are considered for analysis. The 'severity' (the level of intervention required to respond to the adverse event and/or disability sustained) and 'outcome' (whether the recipient sustained any physiological and/or physical consequence, i.e., damage/impairment of a bodily function) are also recorded. The outcome varies from minor to major/long-term sequelae, including death. In cases of death, further investigation is conducted to determine the ATR's imputability and to establish whether the event is definitely, probably, possibly, or doubtfully related to the transfusion, or whether it is not determined or remains to be ruled out (Annex A).

ATRs collected in TTISS include severe anaphylactic/anaphylactoid reactions (SAARs), transfusion-associated circulatory overload (TACO), transfusion-related acute lung injury (TRALI) and possible TRALI, transfusion-associated dyspnea (TAD), hypotensive reactions (HYPT), intravenous immunoglobulin headache (IVIG-HD), acute and delayed haemolytic reactions (AHR and DHR), aseptic meningitis (ASPT), bacterial infections (BACT), and incompatible transfusion (INCMP). In addition to the above ATRs, when the recipient experienced any other type of adverse reaction e.g., severe electrolyte imbalance,

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<sup>1</sup> *Transfusion Transmitted Injuries Surveillance System, User's Manual, ver. 3.0, 2007. Public Health Agency of Canada.*

<sup>2</sup> CNPHI <https://www.cnphi-rcrsp.ca/cnphi/DownloadUserAgreement?lang=en>

atypical pain syndrome, etc., these are classified as “Other”. Minor allergic reactions, febrile non-haemolytic reactions (FNHR), and delayed serological reactions (DSR) are not considered in the TTISS analysis. When adverse reactions are associated with both blood components and plasma derivatives, only data from the first transfusion is included in the analysis.

## Denominator Data

The number of units of blood components transfused annually in hospitals within the TTISS network are used as the denominator to calculate rates per million units of blood components transfused.

## Statistical Analysis

Descriptive analyses were performed using the SAS EG 5.1 software. Counts and proportions of specific ATRs were calculated for all transfusions, transfusions of blood components, and transfusions of plasma derivatives, during the reporting period 2020-2024. Rates of specific ATRs and death are calculated per million units of blood components transfused.

## Results

The TTISS (2020-2024) results are presented in five sections, each including the overall results, and where feasible, the separate results for blood components and plasma derivatives:

- i. Section 1: Counts and proportions of ATRs, excluding those with imputability that is deemed doubtful, ruled out, or not determined, or where this information is missing.
- ii. Section 2: ATR rates associated with the transfusion of blood components.
- iii. Section 3: Counts and proportions of ATRs based on the imputability of the adverse reaction.
- iv. Section 4: Counts and proportions of ATRs by severity (degree of intervention required and/or disability resulting).
- v. Section 5: Counts and proportions of ATRs by outcome (nature of the sequelae).

## 1. Adverse Transfusion Reactions (ATRs)

Annual numbers of ATRs are provided for the five-year period (2020-2024) in Annex B. The yearly proportions (%) of ATRs by transfusions of blood components and plasma derivatives are presented in Figure 1A.

Of the total ATRs reported (n=4,073), two-thirds (66.2%, n=2,695/4,073) are due to transfusion of blood components and one-third (33.8%, n=1,378/4,073) are due to transfusion of plasma derivatives. The yearly proportion of ATRs, by blood components and plasma derivatives, showed a fairly constant trend with small variations in the range of (66.2±3.7%) due to blood components and (33.8±3.7%) for plasma derivatives, respectively. The lower proportion of ATRs due to transfusion of blood components in 2020 followed by some upward trend in the subsequent years may be related to COVID19, where blood transfusions activities may have affected.

Figure 1B presents the ATRs due to blood components and plasma derivatives during the five years (2020-2024). Among the ATRs due to blood components, TACO is the most commonly reported ATR (44.7%, n=1,204/2,695), followed by HYPT (11.5%, n=311/2,695) and SAAR (10.4%, n=279/2,695). Among the ATRs due to plasma derivatives, IVIG Headache is the most commonly reported (35.8%, n=494/1,378), followed by TACO (9.4%, n=130/1378) and SAAR (8.1%, n=111/1,378).

Figure 1A: ATRs (%) by Year - Transfusions of Blood Components (BCs) and Plasma Derivatives (PDs), TTISS 2020-2024

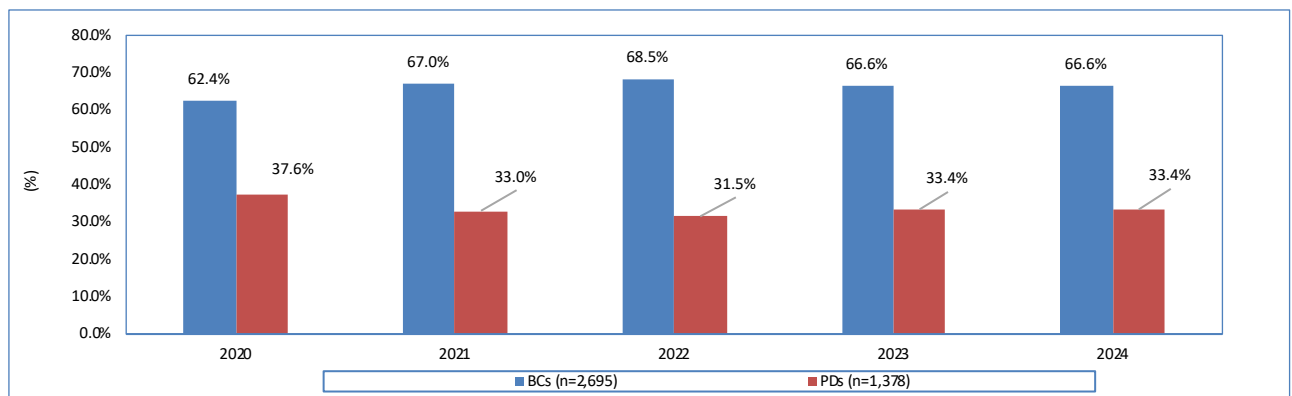
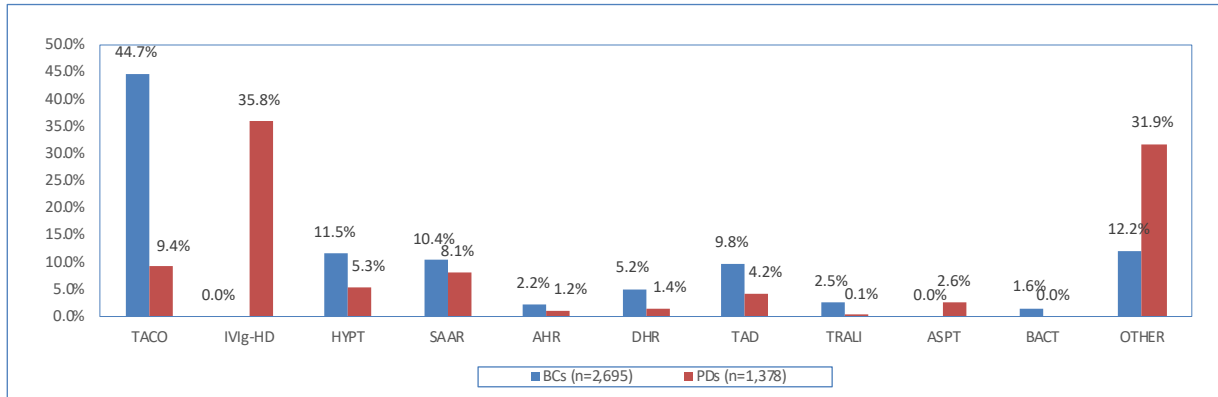


Figure 1B: ATRs (%) by Type - Transfusions of Blood Components (BCs) and Plasma Derivatives (PDs), TTISS 2020-2024



## 2. ATR Rates

ATR rates are calculated by considering the number of ATRs reported due to blood components as the numerator (Annex B) and the number of units of blood components transfused as denominator (Annex C), represented per million units of blood components transfused (Table 2). TACO consistently showed the higher rates around (229±14) with smaller yearly variation. The ATRs rates including SAAR, HYPT, TAD, and TRALI showed lower rates around 60 per million units transfusions, whereas BACT infection rate is around 8 per million units transfusions.

Table 2: ATR Rates by Year/Million Units of Blood Components Transfusion, TTISS 2020-2024

ATRs	2020	2021	2022	2023	2024	Total
TACO	228	215	238	228	236	229
SAAR	53	60	47	57	46	53
HYPT	61	49	59	45	84	59
AHR	9	3	20	10	14	11
DHR	38	16	25	22	33	26
TAD	37	44	50	62	65	50
TRALI	20	18	9	11	3	13
BACT	9	7	7	9	9	8
OTHER	39	64	47	78	96	62
Total	493	476	502	523	586	512

## 3. ATRs by Transfusion Imputability-Relationship

The detailed definitions of imputability are provided in Annex A and the number of ATRs by the transfusion-related nature (imputability) of ATRs are provided in Annex D. The relationships between ATRs for all transfusions and by transfusion of blood components and plasma derivatives are provided in Table 3. Overall, one in ten (10.3%, n=418/4,073) ATRs are considered to be definitely linked to transfusion, and nine in ten (89.7%, n=3,655/4,073) are determined to be possibly or probably linked to transfusion. The transfusion-related nature of ATRs (all transfusions) were similar over time with smaller

annual variations (Figure 3A). Similarly, the transfusion-related nature of ATRs due to blood components and plasma derivatives were also consistent over time (Figure 3A).

Table 3A: ATRs (%) by Year and by Transfusion Imputability- All Transfusions, Transfusions of Blood Components, and Plasma Derivatives, TTISS 2020-2024

Year	All Transfusions				Blood Components				Plasma Derivatives			
	Definite	Possible	Probable	(N)	Definite	Possible	Probable	(N)	Definite	Possible	Probable	(N)
2020	9.5%	44.4%	46.1%	897	10.9%	48.7%	40.4%	560	7.1%	37.1%	55.8%	337
2021	7.3%	44.8%	47.9%	848	6.5%	48.2%	45.3%	568	8.9%	37.9%	53.2%	280
2022	9.5%	44.9%	45.6%	866	9.4%	47.9%	42.7%	593	9.5%	38.5%	52.0%	273
2023	12.6%	46.9%	40.5%	683	11.2%	53.8%	35.0%	455	15.4%	32.9%	51.7%	228
2024	13.2%	47.4%	39.4%	779	13.5%	52.0%	34.5%	519	12.7%	38.1%	49.2%	260
Total	10.2%	45.6%	44.2%	4073	10.2%	49.9%	39.9%	2695	10.4%	37.0%	52.6%	1378

Note: Because of rounding's sum of the entries of imputability levels may not be 100%.

Figure 3A: ATRs (%) by Year and by Transfusion Imputability - All Transfusions, Transfusions of Blood Components, and Plasma Derivatives, TTISS 2020-2024

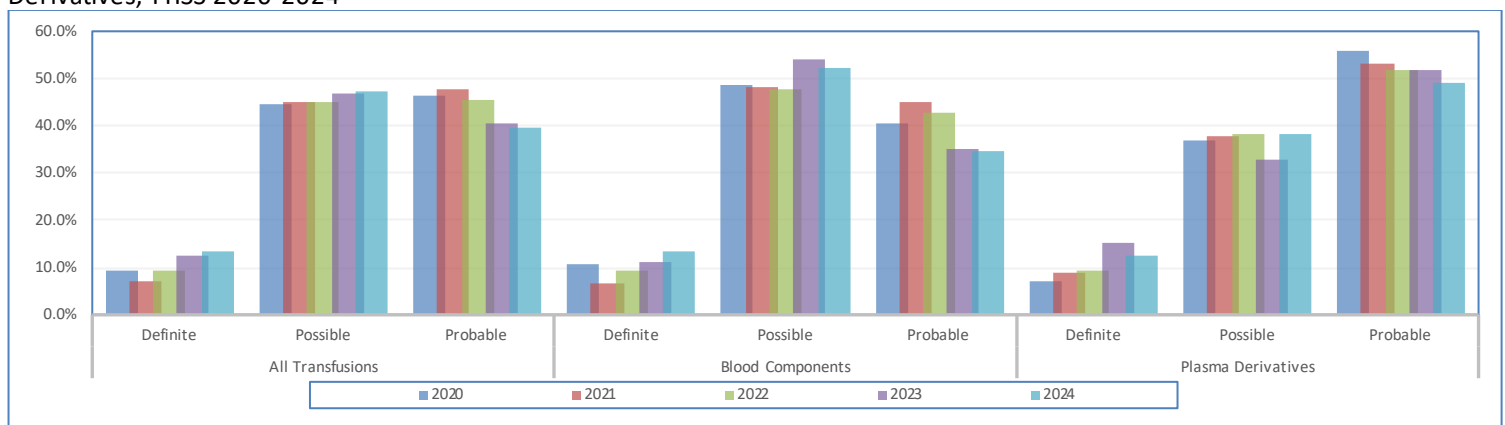


Table 3B presents the transfusion-related assessment of ATRs for all transfusions, blood components and plasma derivatives for combined five-year period (2020-2024). It is observed that among frequently reported ATRs such as TACO and IVIG-HD, which represent 32.8% (n=1,334/4,073) and 12.1% (n=494/4,073), respectively, a definite link to transfusion makes up the smallest numbers: 9.9% (n=132/1,334) and 10.3% (n=51/494), respectively. Among the least reported ATRs of AHR and DHR representing only 1.8% (n=74/4,037) and 3.9% (n=158/4,037), showed the majority of these cases definitely related to transfusion: 40.5% (n=30/74) and 48.1% (n=76/158), respectively. The ASPT and SAAR cases show almost the same relationships with definite cases making up 16.7% (n=6/36) and 14.9% (n=58/390) respectively. Transfusion of blood components and plasma derivatives show a similar pattern with smaller variations.

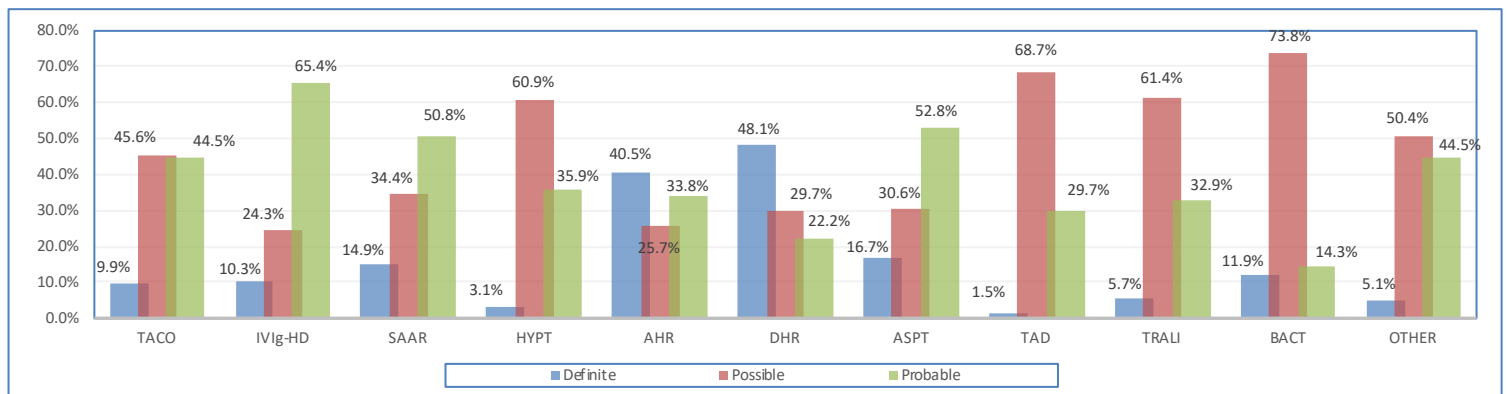
Table 3B: ATRs (%) by Imputability - All Transfusions, Transfusion of Blood Components and Plasma Derivatives, TTISS 2020–2024

ATRs	All Transfusions				Blood Components				Plasma Derivatives			
	Definite	Possible	Probable	(N)	Definite	Possible	Probable	(N)	Definite	Possible	Probable	(N)
TACO	9.9%	45.6%	44.5%	1334	9.6%	45.9%	44.4%	1204	12.3%	42.3%	45.4%	130
IVig-HD	10.3%	24.3%	65.4%	494	-	-	-	-	10.3%	24.3%	65.4%	494
SAAR	14.9%	34.4%	50.8%	390	11.1%	35.1%	53.8%	279	24.3%	32.4%	43.2%	111
HYPT	3.1%	60.9%	35.9%	384	2.9%	62.7%	34.4%	311	4.1%	53.4%	42.5%	73
AHR	40.5%	25.7%	33.8%	74	36.2%	25.9%	37.9%	58	56.3%	25.0%	18.8%	16
DHR	48.1%	29.7%	22.2%	158	50.4%	28.1%	21.6%	139	31.6%	42.1%	26.3%	19

ASPT	16.7%	30.6%	52.8%	36	-	-	-	-	16.7%	30.6%	52.8%	36
TAD	1.5%	68.7%	29.7%	323	1.9%	69.1%	29.1%	265	0.0%	67.2%	32.8%	58
TRALI	5.7%	61.4%	32.9%	70	5.9%	61.8%	32.4%	68	0.0%	50.0%	50.0%	2
BACT	11.9%	73.8%	14.3%	42	11.9%	73.8%	14.3%	42	-	-	-	-
OTHER	5.1%	50.4%	44.5%	768	4.3%	57.8%	38.0%	329	5.7%	44.9%	49.4%	439
Total	10.3%	45.6%	44.2%	4073	10.2%	49.9%	39.9%	2695	10.4%	37.0%	52.6%	1378

Note: Because of rounding, sum of the entries of imputability levels may not be 100%.

Figure 3B: ATRs (%) by Imputability for All Transfusions, TTISS 2020–2024



#### 4. ATRs Severity

The definitions of severity level and the number of ATRs by severity level are provided in Annex A and Annex E respectively. The annual proportions (%) of ATRs by severity are detailed in Table 4A, and exhibited in Figure 4A for all transfusions, and in Figure 4B for transfusions of blood components and plasma derivatives. Overall, majority ATRs were reported ‘non-severe’ (70.5%, n=2873/4,073), about one-quarter (23.1%, n=940/4,073) ‘severe’, and 5.2% (n=210/4,073) recorded as having ‘life-threatening injuries’. The ATRs by severity level exhibit a uniform yearly trend with small variations during the reporting period (Figure 4A).

ATRs (%) by severity levels due to transfusions of blood components and plasma derivatives also exhibit a uniform trend with smaller annual variations (Figure 4B). The number of ATRs deemed to be grade 1 (non-severe) are consistently lower for blood components than for plasma derivatives, whereas the number of ATRs deemed to be grade 2 (severe) and grade 3 (life-threatening injuries) are consistently higher for blood components than for plasma derivatives.

Table 4A: ATRs (%) by Severity Levels and Year - All Transfusions, Transfusions of Blood Components and Plasma Derivatives, TTISS 2020-2024

Year	All Transfusions					Blood Components					Plasma Derivatives				
	Non-severe	Severe	Life-threat	Not determined	(N)	Non-severe	Severe	Life-threat	Not determined	(N)	Non-severe	Severe	Life-threat	Not determined	(N)
2020	67.8%	26.9%	4.1%	1.2%	897	58.4%	34.3%	5.5%	1.8%	560	83.4%	14.5%	1.8%	0.3%	337
2021	69.0%	24.1%	5.4%	1.5%	848	63.4%	27.5%	7.4%	1.8%	568	80.4%	17.1%	1.4%	1.1%	280
2022	71.1%	20.1%	7.2%	1.6%	866	69.1%	20.9%	8.1%	1.9%	593	75.5%	18.3%	5.1%	1.1%	273

2023	70.0%	23.7%	5.0%	1.3%	683	65.3%	26.2%	6.8%	1.8%	455	79.4%	18.9%	1.3%	0.4%	228
2024	75.2%	20.4%	4.0%	0.4%	779	70.5%	24.7%	4.4%	0.4%	519	84.6%	11.9%	3.1%	0.4%	260
Total	70.5%	23.1%	5.2%	1.2%	4073	65.3%	26.7%	6.5%	1.5%	2695	80.8%	16.0%	2.5%	0.7%	1378

Note: Because of rounding, sum of the entries of severity levels may not be 100%.

Figure 4A: ATRs (%) by Severity Levels and Year- All Transfusions, TTISS 2020-2024

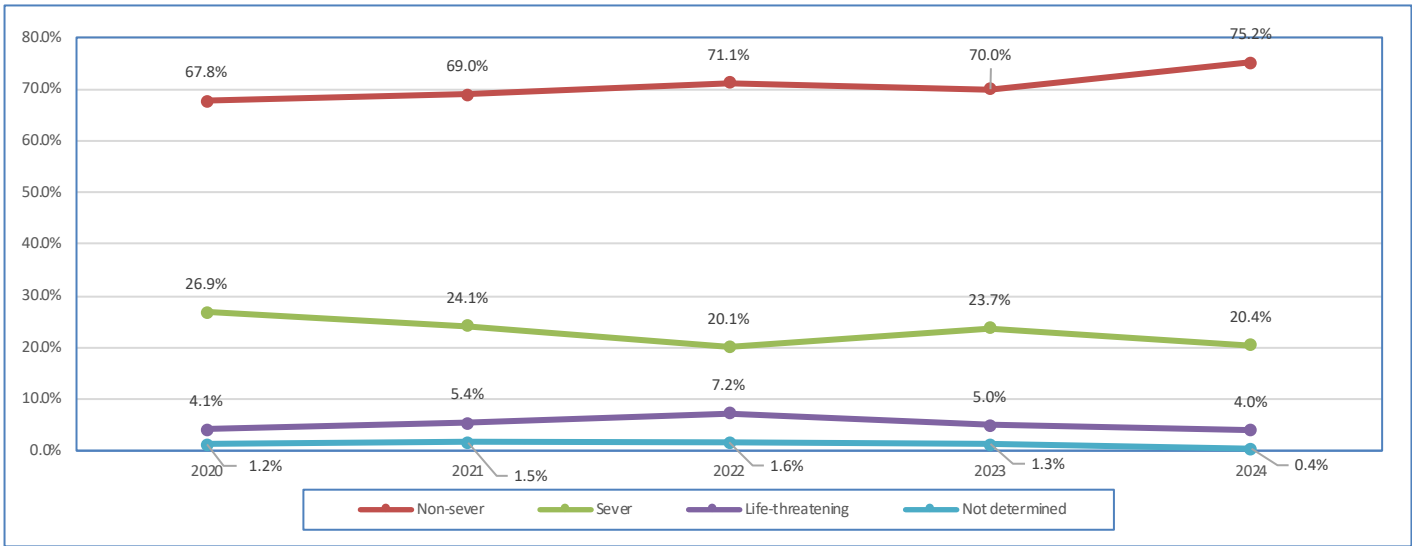
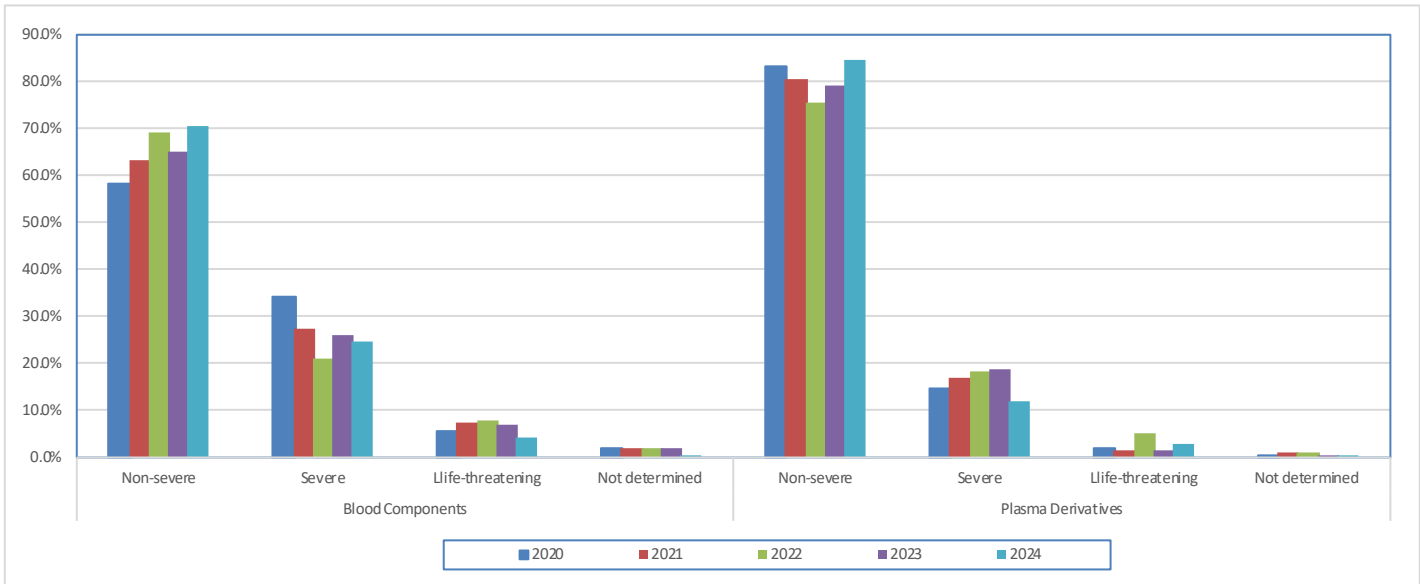


Figure 4B: ATRs (%) by Severity Levels and Year - Transfusions of Blood Components (BCs) and Plasma Derivatives (PDs), TTISS, 2020-2024



ATRs (%) by severity level for the five-year combined period (2020-2024) are detailed in Table 4B and exhibited in Figure 4C. Among the ATRs related to blood components TACO, SAAR, and HYPT make up a larger portion of total cases, but fewer

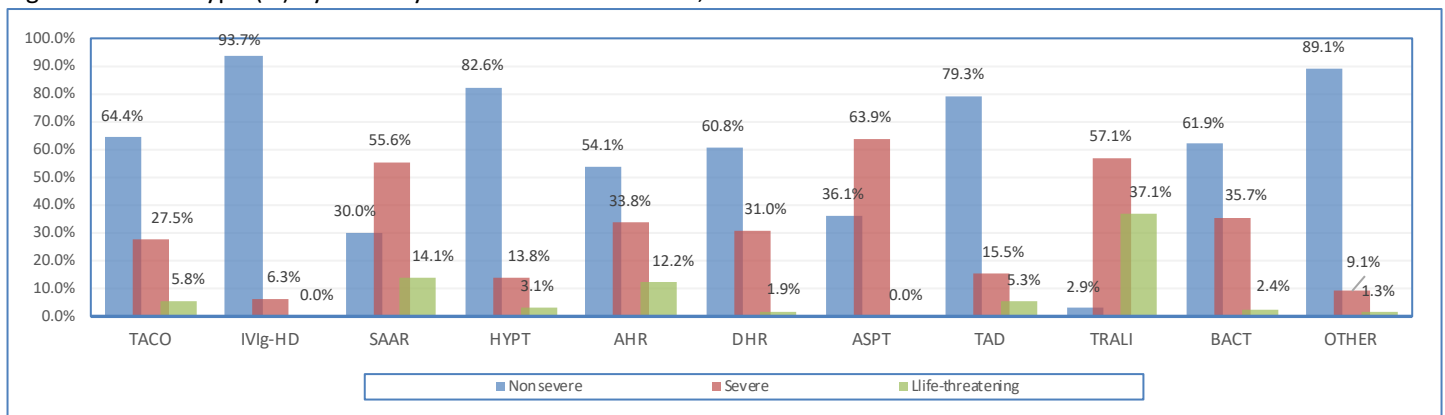
cases among these were of grade 3 (life-threatening), accounting for 5.6%, 13.3%, 3.5%, respectively. On the other hand, TRALI and AHR make up a smaller portion of total ATRs, representing higher proportions of grade 3 severity cases (36.8% and 13.8%, respectively). Among the plasma derivatives transfusions SAAR, TACO and AHR represent (16.2%, 6.9%, and 6.3%) life-threatening, respectively (Table 4B).

Table 4B: ATRs Type (%) by Severity Levels- All Transfusions, Transfusions of Blood Components and Plasma Derivatives, TTISS 2020-2024

ATRs	All Transfusions					(N)	Blood Components					(N)	Plasma Derivatives					(N)
	Grade 1	Grade 2	Grade 3	Not determined	Grade 1		Grade 2	Grade 3	Not determined	Grade 1	Grade 2		Grade 3	Not determined				
	Non severe	Severe	Life threat		Non severe		Severe	Life threat		Non severe	Severe		Life threat					
TACO	64.4%	27.5%	5.8%	2.3%	1334	64.8%	27.2%	5.7%	2.3%	1204	60.8%	30.0%	6.9%	2.3%	130			
IVIg-HD	93.7%	6.3%	0.0%	0.0%	494	-	-	-	-	-	93.7%	6.3%	0.0%	0.0%	494			
SAAR	30.0%	55.6%	14.1%	0.3%	390	30.1%	56.3%	13.2%	0.4%	279	29.7%	54.1%	16.2%	0.0%	111			
HYPT	82.6%	13.8%	3.1%	0.5%	384	82.6%	13.5%	3.5%	0.3%	311	82.2%	15.1%	1.4%	1.4%	73			
AHR	54.0%	33.8%	12.2%	0.0%	74	55.2%	31.0%	13.8%	0.0%	58	50.0%	43.8%	6.3%	0.0%	16			
DHR	60.8%	31.0%	1.9%	6.3%	158	63.3%	29.5%	2.2%	5.0%	139	42.1%	42.1%	0.0%	15.8%	19			
ASPT	36.1%	63.9%	0.0%	0.0%	36	-	-	-	-	-	36.1%	63.9%	0.0%	0.0%	36			
TAD	79.2%	15.5%	5.3%	0.0%	323	78.9%	15.8%	5.3%	0.0%	265	81.0%	13.8%	5.2%	0.0%	58			
TRALI	2.9%	57.1%	37.1%	2.9%	70	2.9%	57.4%	36.8%	2.9%	68	0.0%	50.0%	50.0%	0.0%	2			
BACT	61.9%	35.7%	2.4%	0.0%	42	61.9%	35.7%	2.4%	0.0%	42	-	-	-	-	-			
OTHER	89.1%	9.1%	1.3%	0.5%	768	85.7%	11.3%	2.4%	0.6%	329	91.6%	7.5%	0.5%	0.5%	439			
Total	70.5%	23.1%	5.2%	1.2%	4073	65.3%	26.7%	6.5%	1.5%	2695	80.8%	16.0%	2.5%	0.7%	1378			

Note: Because of rounding, sum of the entries of severity levels may not be 100%.

Figure 4C: ATRs Type (%) by Severity Levels- All Transfusions, TTISS 2020-2024



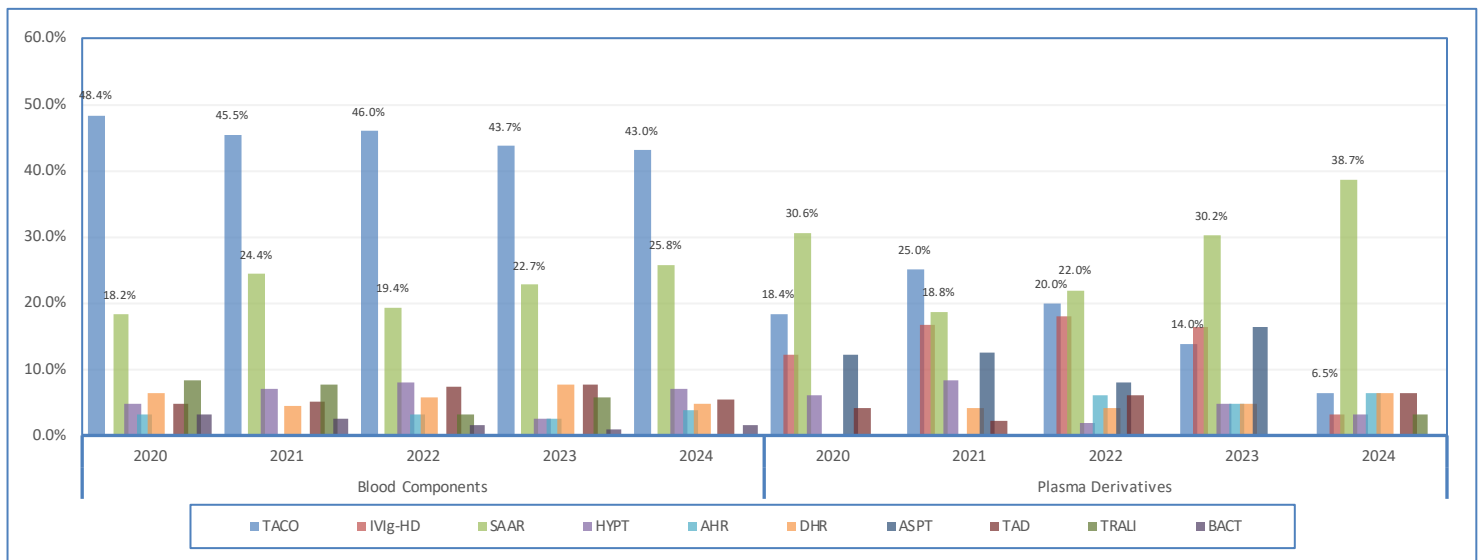
### 4.1 ATRs - Grade 2\* (Severe)

Annual trends of ATRs considered grade 2 severity during the five-year reporting period for blood components and plasma derivatives are provided in Table 4.1 and exhibited in Figure 4.1. Of the total number of grade 2 severity ATR cases (n=940), three-fourths (76.5%, n=719/940) were due to blood components and about one-fourth (23.5%, n=221/940) were due to plasma derivatives. Annual trends in grade 2 severity ATRs show relatively consistent patterns with small variations for each ATRs. TACO, followed by SAAR, make up most of the total number of grade 2 severe ATRs (Figure 4.1). The number of grade 2 severe ATRs due to plasma derivatives show consistent patterns with some annual variations. ATRs due to SAAR and IVIG Headache were more frequent compared to other ATRs over the reporting period (Figure 4.1).

Table 4.1: ATRs Type (%) of Grade 2 Severity - Transfusions of Blood Components and Plasma Derivatives, TTISS 2020-2024

ATRs	Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	48.4%	45.5%	46.0%	43.7%	43.0%	45.6%	18.4%	25.0%	20.0%	14.0%	6.5%	17.6%
IVIg-HD	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	16.7%	18.0%	16.3%	3.2%	14.0%
SAAR	18.2%	24.4%	19.4%	22.7%	25.8%	21.8%	30.6%	18.8%	22.0%	30.2%	38.7%	27.1%
HYPT	4.7%	7.1%	8.1%	2.5%	7.0%	5.8%	6.1%	8.3%	2.0%	4.7%	3.2%	5.0%
AHR	3.1%	0.0%	3.2%	2.5%	3.9%	2.5%	0.0%	0.0%	6.0%	4.7%	6.5%	3.2%
DHR	6.3%	4.5%	5.6%	7.6%	4.7%	5.7%	0.0%	4.2%	4.0%	4.7%	6.5%	3.6%
ASPT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	12.5%	8.0%	16.3%	0.0%	10.4%
TAD	4.7%	5.1%	7.3%	7.6%	5.5%	5.8%	4.1%	2.1%	6.0%	0.0%	6.5%	3.6%
TRALI	8.3%	7.7%	3.2%	5.9%	0.0%	5.4%	0.0%	0.0%	0.0%	0.0%	3.2%	0.5%
BACT	3.1%	2.6%	1.6%	0.8%	1.6%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OTHER	3.1%	3.2%	5.6%	6.7%	8.6%	5.1%	16.3%	12.5%	14.0%	9.3%	25.8%	14.9%
Total	192	156	124	119	128	719	49	48	50	43	31	221

Figure 4.1: ATRs (%) of Grade 2 Severity - Transfusions of Blood Components and Plasma Derivatives, TTISS 2020-2024



#### 4.2 ATRs - Grade 3 (Life-Threatening)

Of ATRs (n=210) considered grade 3 severe (life-threatening) reported (2020-2024), the majority (83.3%, n=175/210) were due to transfusions of blood components, while 16.7% (n=35/210) were due to plasma derivatives (Table 4.2). Among the recipients of blood components, TACO was most commonly found to be of grade 3 severity (38.9%, n=68/175), followed by SAAR (21.1%, n=37/175), TRALI (14.3%, n=25/175) and HYPT (7.4%, 14/175). Each of the remaining ATRs represents 5% or less of the total number of grade 3 severe ATRs. The annual trend shows a similar pattern with some annual variations.

Of the total grade 3 severe (life-threatening) ATRs due to the transfusion of plasma derivatives, SAAR accounted for more than half of cases (51.4%, n=18/35), followed by TACO accounting for nine cases (25.7%, n=9/35), while one each was due to HYPT and AHR and TRALI (Table 4.2). The annual numbers of grade 3 ATRs are too small to confidently report on any trends.

Table 4.2: ATRs of Grade 3 (Life-threatening) Severity by Year - Transfusions of Blood Components and Plasma Derivatives, TTISS 2020-2024

ATRs	Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	12	17	19	13	7	68	1	0	5	0	3	9
SAAR	6	7	14	7	3	37	3	2	5	3	5	18
HYPT	5	3	1	0	2	11	0	1	0	0	0	1
AHR	0	0	5	1	2	8	0	1	0	0	0	1
DHR	0	0	1	1	1	3	0	0	0	0	0	0
TAD	1	4	2	3	4	14	0	0	3	0	0	3
TRALI	6	8	6	3	2	25	0	0	1	0	0	1
BACT	1	0	0	0	0	1	0	0	0	0	0	0
OTHER	0	3	0	3	2	8	2	0	0	0	0	2
Total	31	42	48	31	23	175	6	4	14	3	8	35

### 5. ATRs by Outcome

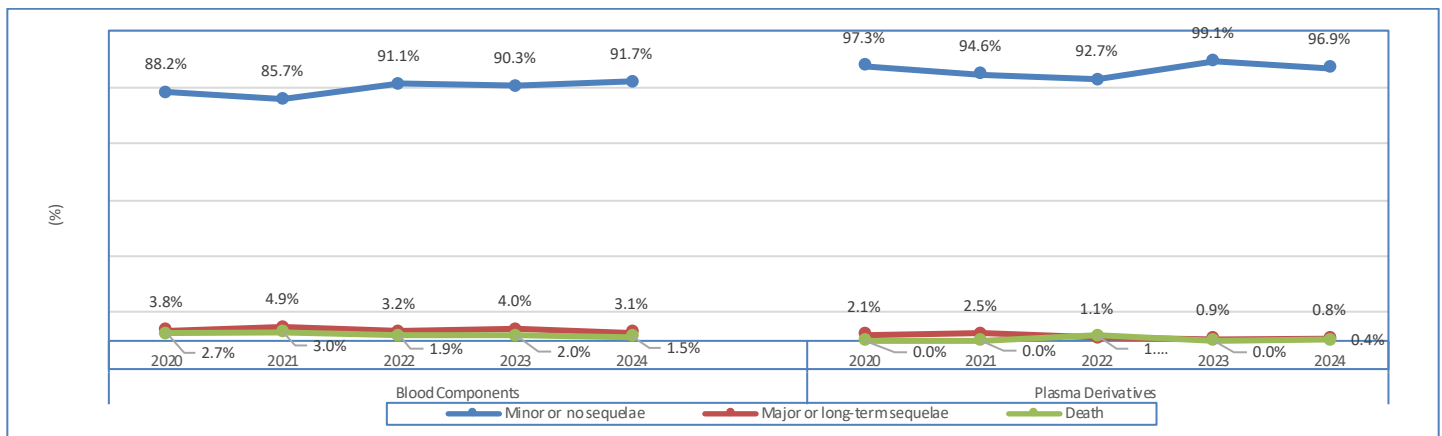
The detailed definitions of outcomes of ATRs are provided in Annex A and the number of ATRs by outcome reported during the five year (2020-2024), are presented in Annex F. The overall ATRs (%) by outcome for all transfusions, blood components and plasma derivatives are provided in (Table 5) and represented in Figure 5 for transfusion of blood components and plasma derivatives. The vast majority of ATRs resulted in minor or no sequelae (91.6%, n=3,732/4,073). The outcome resulting in major or long-term sequelae and deaths accounted for 3.0% (n=123/4,073) and 1.6% (n=66/4,073) respectively. The ATRs by outcome showed consistent patterns with small yearly variations transfusion of blood components or plasma derivatives (Figure 5). Among the blood components, the ATRs resulted-in ‘Minor or no-sequelae’ are consistently lower and ‘Major or long-term sequelae are consistently higher compared to outcomes for plasma derivatives (Table 5, Figure 5). Of the ATRs resulting in death, the vast majority (90.9%, 60/66) were due to blood components and six deaths (9.1%, 6/66) were due to plasma derivatives.

Table 5: ATRs (%) by Outcome and Year - All Transfusions, Blood Components and Plasma Derivatives, TTISS 2020-2024

ATRs Outcome	All Transfusions						Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	N	2020	2021	2022	2023	2024	N	2020	2021	2022	2023	2024	N
Minor or no sequelae	91.6%	88.7%	91.6%	93.3%	93.5%	3732	88.2%	85.7%	91.1%	90.3%	91.7%	2408	97.3%	94.6%	92.7%	99.1%	96.9%	1324
Major or long-term sequelae	3.1%	4.1%	2.5%	2.9%	2.3%	123	3.8%	4.9%	3.2%	4.0%	3.1%	102	2.1%	2.5%	1.1%	0.9%	0.8%	21
Death	1.7%	2.0%	1.8%	1.3%	1.2%	66	2.7%	3.0%	1.9%	2.0%	1.5%	60	0.0%	0.0%	1.8%	0.0%	0.4%	6
Not determined	3.6%	5.2%	4.0%	2.5%	3.1%	152	5.4%	6.3%	3.9%	3.7%	3.7%	125	0.6%	2.9%	4.4%	0.0%	1.9%	27
(N)	897	848	866	683	779	4073	560	568	593	455	519	2695	337	280	273	228	260	1378

Note: Because of rounding’s sum of the entries of outcome levels may not be 100%.

Figure 5: ATRs (%) by Outcome and Year for Blood Components and Plasma Derivatives, TTISS 2020-2024



### 5.1 ATRs Outcome Leading to ‘Major or Long-Term Sequelae’

Of the ATRs resulting in major or long-term sequelae, the majority (82.9%, n=102/123) were related to blood components and (17.1%, n=21/123) were related to plasma derivatives (Table 5.1). In terms of all transfusions, one-quarter of ATRs resulting in major or long-term sequelae were TACO (23.6%, n=29/123) followed by SAAR (16.3%, n=20/123). Similar patterns were observed among the ATRs due to transfusions of blood components.

Among transfusions of plasma derivatives, ATRs resulting in major or long-term sequelae were rare and sparsely distributed during the five-year reporting period. SAAR and IVIG-HD accounted for 23.8% (n=5/21) and 14.3% (n=3/21), respectively, whereas no case of TACO and TRALI were reported during a five year period (Table 5.1).

Table 5.1: ATRs Resulting in Major or Long-Term Sequelae - All Transfusions, Transfusions of Blood Components and Plasma Derivatives, TTISS 2020 -2024

ATRs	All Transfusions						Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	9	7	7	2	4	29	9	7	7	2	4	29	0	0	0	0	0	0
IVig-HD	2	0	1	0	0	3	0	0	0	0	0	0	2	0	1	0	0	3
SAAR	3	7	4	2	4	20	1	7	2	2	3	15	2	0	2	0	1	5
HYPT	0	5	0	0	1	6	0	5	0	0	1	6	0	0	0	0	0	0
AHR	2	0	3	1	2	8	2	0	3	1	2	8	0	0	0	0	0	0
DHR	1	3	1	4	2	11	1	2	1	4	2	10	0	1	0	0	0	1
TAD	1	2	0	3	2	8	1	1	0	3	2	7	0	1	0	0	0	1
TRALI	6	1	0	3	0	10	6	1	0	3	0	10	0	0	0	0	0	0
ASPT	0	2	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2
BACT	0	1	2	0	0	3	0	1	2	0	0	3	0	0	0	0	0	0
OTHER	4	7	4	5	3	23	1	4	4	3	2	14	3	3	0	2	1	9
Total	28	35	22	20	18	123	21	28	19	18	16	102	7	7	3	2	2	21

### 5.2 ATRs Leading to Death

Among the total number of reported deaths, almost two thirds (65.2%, 43/66) were deemed to be transfusion related classified as (definite, probable and possible), while one third (34.8%, n=23/66) were deemed to be non transfusion related, classified as (doubtful, ruled out, not determined) (Table 5.2). Non-transfusion related deaths were not considered for further analysis.

Table 5.2: Transfusion and Non-Transfusion-Related Deaths by Imputability, TTISS 2020 -2024

ATRs	All Transfusions							Blood Components Transfusions							Plasma Derivatives Transfusions									
	Related			Not Related				Tot	Related			Not Related				Tot	Related			Not Related				Tot
	Def	Psb	Prb	Doubt	Ruled out	Not det	Def		Psb	Prb	Doubt	Ruled out	Not det	Def	Psb		Prb	Doubt	Ruled out	Not det				
TACO	0	13	5	6	4	3	31	0	12	4	6	4	3	29	0	1	1	0	0	0	0	2		
SAAR	0	1	0	0	1	0	2	0	0	0	0	1	0	1	0	1	0	0	0	0	0	1		
HYPT	0	1	0	1	1	0	3	0	1	0	1	1	0	3	0	0	0	0	0	0	0	0		
AHR	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0		
DHR	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0		
TAD	0	10	0	0	0	0	10	0	8	0	0	0	0	8	0	2	0	0	0	0	0	2		
TRALI	0	7	2	3	0	0	12	0	6	2	3	0	0	11	0	1	0	0	0	0	0	1		
BACT	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0		
OTHER	0	1	1	2	0	1	5	0	1	1	2	0	1	5	0	0	0	0	0	0	0	0		
Total	0	35	8	12	7	4	66	0	30	7	12	7	4	60	0	5	1	0	0	0	0	6		

While, 43 deaths were deemed probably or possibly related to transfusion (37 due to blood components, 6 due to plasma derivatives) no death was deemed definitely related to transfusions. Among transfusions of blood components, TACO, TAD and TRALI were the leading causes of death (41.9%, n=18/43) and (23.3%, n=10/43) and (20.9%, 9/43), respectively, whereas AHR, BAC and HYPT accounted one death each during the five years. Two deaths classified 'Other' were due to causes not classified among the listed ATRs in the TTISS manual. Among the plasma derivatives, TACO and TAD accounted for two deaths each and TRALI and SAAR accounted for one death each. Two deaths classified as 'Other' were due to causes not classifiable among the listed ATRs. (Table 5.2).

The number of deaths by ATR type and year are detailed in Table 5.2A. The average number of annual deaths was 8.6 (Range:5-12). TACO being the leading cause represented 3.6 deaths/year (Range: 2-6 deaths) whereas, the average number of deaths for TAD and TRALI represented 2.0 and 1.8 per year (Range: 1-4 deaths), respectively. Of the six deaths due to plasma derivatives, five were reported in 2022 and one in 2024 (Table 5.2A). The changes over time in the number of deaths should be interpreted with caution given the smaller number of cases reported and inherent variations in annual reporting.

To consider the relationship between age and transfusion-related deaths, the overall median age at death was 73, whereas the median age for male and female was 74.0 and 73.0 years, respectively. These findings suggest that ATR-related deaths generally occur at much older ages where in addition to transfusions, other underlying co-morbidities may be playing a role.

Table 5.2A: Annual Number of Deaths and Death Rates per Million Units of Blood Components (BCs) Transfused, TTISS 2020 -2024

ATRs	Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	4	6	2	3	1	16	0	0	1	0	1	2
SAAR	0	0	0	0	0	0	0	0	1	0	0	1
AHR	0	0	1	0	0	1	0	0	0	0	0	0
HYPT	0	1	0	0	0	1	0	0	0	0	0	0
TAD	0	3	1	2	2	8	0	0	2	0	0	2
TRALI	2	1	3	0	2	8	0	0	1	0	0	1
BACT	1	0	0	0	0	1	0	0	0	0	0	0
Other	0	1	0	0	1	2	0	0	0	0	0	0
(A): Annual Deaths	7	12	7	5	6	37	0	0	5	0	1	6
(B): BCs Units Transfused	1,134,866	1,193,834	1,181,035	869,940	886,077	4,071,918	-	-	-	-	-	-
	Death Rate /Million Units of Blood Components Transfused											
C= A/B: Death Rate/million	6	10	6	6	7	9	-	-	-	-	-	-

## Summary

Among the total ATRs reported during the five-year period (2020-2024):

- Overall, 2/3 of ATRs were related to the transfusion of blood components and 1/3 were related to plasma derivatives.
- TACO and IVIG-HD were the most commonly reported ATRs among recipients of blood components and plasma derivatives, respectively.
- Overall, one in ten ATRs was definitely, and nine in ten, were probably or possibly, related to transfusion.
- Of the overall deaths reported, two thirds were transfusion-related and one third were non-transfusion-related.

- Among the transfusion-related deaths, the vast majority (86.0%) were due to blood components and 14.0% were due to plasma derivatives.
- TACO, TAD and TRALI were the leading causes of deaths.
- TTISS findings demonstrate trends and outcomes similar to that of other high income countries.

Note: The changes over time in the number of deaths should be interpreted with caution given the small number of cases reported and inherent variations in annual reporting.

Annex A: Case Definitions-Severity, Imputability, Outcome	
Severity Levels of Adverse Transfusion Reactions (ATRs)	
Severity Levels of ATRs	Definitions
Grade 1 (Non-severe)	<i>No permanent damage or impairment of a bodily function.</i>
Grade 2 (Severe)	<i>Patient required in-patient hospitalization or prolongation of hospitalization directly attributable to the reaction; or the adverse reaction resulted in persistent/ significant disability or incapacity; or it necessitated medical/surgical intervention to preclude permanent/significant damage or impairment of a bodily function.</i>
Grade 3 (Life-threatening)	<i>Patient required major intervention following the transfusion (vasopressors, intubation, transferred to intensive care).</i>
Grade 4 (Death)	<i>Patient's death was suspected to be the consequence of the transfusion reaction.</i>
Not determined	<i>Consequences of the transfusion reaction were not certain.</i>

Imputability Level (Relationship) of Adverse Transfusion Reaction (ATRs)	
Imputability Levels of ATRs	Definitions
Definite	<i>Clinical and/or laboratory event occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives and was proven by investigation to have been caused by transfusion.</i>
Probable	<i>Clinical and/or laboratory event occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives and did not seem to be explainable by any other cause.</i>
Possible	<i>Clinical and/or laboratory event occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives but could be explained by concurrent disease(s) or by the administration of a drug or other agent.</i>
Doubtful	<i>Clinical and/or laboratory event occurred within a reasonable timeframe in relation to the transfusion but the preponderance of data supports an alternative explanation.</i>
Ruled out	<i>Clinical and/or laboratory event occurred within a time frame inconsistent with the administration of the blood, blood component, or plasma derivatives or, if it occurred within a consistent time period but it was proven to have no relationship to the transfusion.</i>
Not determined	<i>It remains to be determined whether the event was related to the administration of the blood, blood component or plasma derivatives. Further information is forthcoming however was not available at time of data provision.</i>

Outcome Levels of Adverse Transfusion Reactions (ATRs)	
Outcome of ATRs	Definition
Minor sequelae	<i>Patient had no sequelae or permanent disability from the reaction or developed antibodies to low/medium frequency antigens (&lt; 95%).</i>
Major sequelae	<i>Patient developed either an infection with a persistent infectious agent (HIV, HBV or HCV), or a transfusion reaction with major or long-term sequelae; or the anticipation of difficulties with future transfusions (e.g., development of antibodies to antigens present in more than 95% of donations).</i>
Death	
Not determined	<i>The outcome of the adverse event was deemed uncertain.</i>

Imputability Levels (relationship) of Transfusion Related Deaths	
Imputability-Relationship of ATRs	Definition
Definite	<i>Death occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives and was proven by investigation to have been caused by transfusion.</i>
Probable	<i>Death occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives and did not seem to be explainable by any other cause.</i>
Possible	<i>Death occurred within a time frame consistent with the administration of the blood, blood component, or plasma derivatives but could be explained by concurrent disease(s) or by the administration of a drug or other agent.</i>
Doubtful	<i>Death occurred within a reasonable time frame in relation to the transfusion but the preponderance of data supports an alternative explanation.</i>
Ruled out	<i>Death occurred within a time frame inconsistent with the administration of the blood, blood component, or plasma derivatives, if it occurred within a consistent time period but it was proven to have no relationship to the transfusion.</i>
Not determined	<i>It could not be determined if the death was related to transfusion.</i>

ATRs	All Transfusions						Blood Components						Plasma Derivatives					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	280	283	316	223	232	1334	259	257	281	198	209	1204	21	26	35	25	23	130
IVIg-HD	114	94	97	93	96	494	0	0	0	0	0	0	114	94	97	93	96	494
SAAR	88	90	82	67	63	390	60	72	56	50	41	279	28	18	26	17	22	111
HYPT	87	77	88	48	84	384	69	59	70	39	74	311	18	18	18	9	10	73
AHR	10	4	29	13	18	74	10	3	24	9	12	58	0	1	5	4	6	16
DHR	44	25	32	23	34	158	43	19	29	19	29	139	1	6	3	4	5	19
TAD	49	61	76	63	74	323	42	52	59	54	58	265	7	9	17	9	16	58
TRALI	23	21	12	10	4	70	23	21	11	10	3	68	0	0	1	0	1	2
ASPT	10	10	5	9	2	36	0	0	0	0	0	0	10	10	5	9	2	36
BACT	10	8	8	8	8	42	10	8	8	8	8	42	0	0	0	0	0	0
OTHER	182	175	121	126	164	768	44	77	55	68	85	329	138	98	66	58	79	439
Total	897	848	866	683	779	4073	560	568	593	455	519	2695	337	280	273	228	260	1378

Province / Territory	2020	2021	2022	2023	2024
British Columbia	159,779	168,849	162,376	186,533	179,878
Yukon Territory	884	858	—	—	—
Alberta(*)	104,762	101,376	122,286	84,482	111,063
Saskatchewan	40,882	36,292	32,355	30,368	30,089
Manitoba	30,460	43,801	43,202	40,808	45,498
Ontario	438,286	462,115	451,710	445,445	434,114
Québec (*)	280,487	294,906	285,256	—	—
New Brunswick	26,442	28,584	28,817	30,511	31,291
Nova Scotia	33,087	34,164	34,059	31,703	33,112
Newfoundland & Labrador	15,680	18,033	15,877	15,436	15,477
Prince Edward Island	3,502	4,034	4,255	3,926	4,627
Northwest Territories	635	822	862	728	828
Total	1,134,866	1,193,834	1,181,035	869,940	886,077

(\*): Yukon numerator and denominator data for 2022-2024 was a part of BC where as for QC Numerator and Denominator data was not provided for 2023 and 2024

ATRs	All Transfusions																		
	Definite						Possible						Probable						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
TACO	21	21	27	30	33	132	128	136	140	92	112	608	131	126	149	101	87	594	
IVIg-HD	11	8	9	13	10	51	35	34	12	16	23	120	68	52	76	64	63	323	
SAAR	11	10	11	13	13	58	27	33	18	30	26	134	50	47	53	24	24	198	
HYPT	4	1	2	2	3	12	53	45	50	35	51	234	30	31	36	11	30	138	
AHR	4	3	8	9	6	30	2	0	9	1	7	19	4	1	12	3	5	25	
DHR	22	7	17	10	20	76	14	9	10	9	5	47	8	9	5	4	9	35	
TAD	1	3	0	1	0	5	30	35	58	45	54	222	18	23	18	17	20	96	
TRALI	3	0	0	1	0	4	13	15	6	7	2	43	7	6	6	2	2	23	
ASPT	1	2	1	2	0	6	3	3	1	2	2	11	6	5	3	5	0	19	
BACT	1	1	2	0	1	5	7	6	6	6	6	31	2	1	0	2	1	6	
OTHER	6	6	5	5	17	39	86	64	79	77	81	387	90	105	37	44	66	342	
Total	85	62	82	86	103	418	398	380	389	320	369	1856	414	406	395	277	307	1799	

ATRs	Blood Components																		
	Definite						Possible						Probable						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
TACO	21	18	22	23	32	116	119	125	122	85	102	553	119	114	137	90	75	535	
SAAR	4	5	6	10	6	31	18	25	12	21	22	98	38	42	38	19	13	150	
HYPT	2	1	2	1	3	9	44	36	43	29	43	195	23	22	25	9	28	107	
AHR	4	2	6	5	4	21	2	0	8	1	4	15	4	1	10	3	4	22	
DHR	22	5	16	9	18	70	13	6	9	7	4	39	8	8	4	3	7	30	
TAD	1	3	0	1	0	5	27	30	44	39	43	183	14	19	15	14	15	77	
TRALI	3	0	0	1	0	4	13	15	5	7	2	42	7	6	6	2	1	22	
BACT	1	1	2	0	1	5	7	6	6	6	6	31	2	1	0	2	1	6	
OTHER	3	2	2	1	6	14	30	31	35	50	44	190	11	44	18	17	35	125	
Total	61	37	56	51	70	275	273	274	284	245	270	1346	226	257	253	159	179	1074	

ATRs	Plasma Derivatives																		
	Definite						Possible						Probable						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
TACO	0	3	5	7	1	16	9	11	18	7	10	55	12	12	12	11	12	59	
IVIg-HD	11	8	9	13	10	51	35	34	12	16	23	120	68	52	76	64	63	323	
SAAR	7	5	5	3	7	27	9	8	6	9	4	36	12	5	15	5	11	48	
HYPT	2	0	0	1	0	3	9	9	7	6	8	39	7	9	11	2	2	31	
AHR	0	1	2	4	2	9	0	0	1	0	3	4	0	0	2	0	1	3	
DHR	0	2	1	1	2	6	1	3	1	2	1	8	0	1	1	1	2	5	
TAD	0	0	0	0	0	0	3	5	14	6	11	39	4	4	3	3	5	19	
TRALI	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	
ASPT	1	2	1	2	0	6	3	3	1	2	2	11	6	5	3	5	0	19	
OTHER	3	4	3	4	11	25	56	33	44	27	37	197	79	61	19	27	31	217	
Total	24	25	26	35	33	143	125	106	105	75	99	510	188	149	142	118	128	725	

Annex E: The Annual Number of ATRs Reported by Severity Levels and by Transfusion of Blood Products, TTISS 2020-2024																									
ATRs	All Transfusions																								
	Grade 1 (non-severe)						Grade 2 (severe)						Grade 3 (life-threatening)						Not determined						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
TACO	158	175	217	145	164	859	102	83	67	58	57	367	13	17	24	13	10	77	7	8	8	7	1	31	
IVIg-HD	108	86	88	86	95	463	6	8	9	7	1	31	0	0	0	0	0	0	0	0	0	0	0	0	
SAAR	29	34	28	16	10	117	50	47	35	40	45	217	9	9	19	10	8	55	0	0	0	1	0	1	
HYPT	70	57	76	42	72	317	12	15	11	5	10	53	5	4	1	0	2	12	0	1	0	1	0	2	
AHR	4	3	17	7	9	40	6	0	7	5	7	25	0	1	5	1	2	9	0	0	0	0	0	0	
DHR	29	14	18	11	24	96	12	9	9	11	8	49	0	0	1	1	1	3	3	2	4	0	1	10	
TAD	37	48	59	51	61	256	11	9	12	9	9	50	1	4	5	3	4	17	0	0	0	0	0	0	
TRALI	0	1	0	0	1	2	16	12	4	7	1	40	6	8	7	3	2	26	1	0	1	0	0	2	
ASPT	4	4	1	2	2	13	6	6	4	7	0	23	0	0	0	0	0	0	0	0	0	0	0	0	
BACT	3	4	6	7	6	26	6	4	2	1	2	15	1	0	0	0	0	1	0	0	0	0	0	0	
OTHER	166	159	106	111	142	684	14	11	14	12	19	70	2	3	0	3	2	10	0	2	1	0	1	4	
Total	608	585	616	478	586	2873	241	204	174	162	159	940	37	46	62	34	31	210	11	13	14	9	3	50	
Blood Components																									
	Grade 1 (non-severe)						Grade 2 (severe)						Grade 3 (life-threatening)						Not determinant						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
	TACO	148	162	198	126	146	780	93	71	57	52	55	328	12	17	19	13	7	68	6	7	7	7	1	28
SAAR	19	27	18	15	5	84	35	38	24	27	33	157	6	7	14	7	3	37	0	0	0	1	0	1	
HYPT	55	44	59	36	63	257	9	11	10	3	9	42	5	3	1	0	2	11	0	1	0	0	0	1	
AHR	4	3	15	5	5	32	6	0	4	3	5	18	0	0	5	1	2	8	0	0	0	0	0	0	
DHR	28	12	18	9	21	88	12	7	7	9	6	41	0	0	1	1	1	3	3	0	3	0	1	7	
TAD	32	40	48	42	47	209	9	8	9	9	7	42	1	4	2	3	4	14	0	0	0	0	0	0	
TRALI	0	1	0	0	1	2	16	12	4	7	0	39	6	8	6	3	2	25	1	0	1	0	0	2	
BACT	3	4	6	7	6	26	6	4	2	1	2	15	1	0	0	0	0	1	0	0	0	0	0	0	
OTHER	38	67	48	57	72	282	6	5	7	8	11	37	0	3	0	3	2	8	0	2	0	0	0	2	
Total	327	360	410	297	366	1760	192	156	124	119	128	719	31	42	48	31	23	175	10	10	11	8	2	41	
Plasma Derivatives																									
	Grade 1 (non-severe)						Grade 2 (severe)						Grade 3 (life-threatening)						Not determinant						
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	
	TACO	10	13	19	19	18	79	9	12	10	6	2	39	1	0	5	0	3	9	1	1	1	0	0	3
IVIg-HD	108	86	88	86	95	463	6	8	9	7	1	31	0	0	0	0	0	0	0	0	0	0	0	0	
SAAR	10	7	10	1	5	33	15	9	11	13	12	60	3	2	5	3	5	18	0	0	0	0	0	0	
HYPT	15	13	17	6	9	60	3	4	1	2	1	11	0	1	0	0	0	1	0	0	0	1	0	1	
AHR	0	0	2	2	4	8	0	0	3	2	2	7	0	1	0	0	0	1	0	0	0	0	0	0	
DHR	1	2	0	2	3	8	0	2	2	2	2	8	0	0	0	0	0	0	0	2	1	0	0	3	
TAD	5	8	11	9	14	47	2	1	3	0	2	8	0	0	3	0	0	3	0	0	0	0	0	0	
TRALI	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	
ASPT	4	4	1	2	2	13	6	6	4	7	0	23	0	0	0	0	0	0	0	0	0	0	0	0	
OTHER	128	92	58	54	70	402	8	6	7	4	8	33	2	0	0	0	0	2	0	0	1	0	1	2	
Total	281	275	206	181	220	1113	49	48	50	43	31	221	6	4	14	3	8	35	1	3	3	1	1	9	

Annex F: The Annual Number of ATRs Reported by Outcome due to the Transfusion of Blood Products, TTISS 2020-2024																								
ATRs	All transfusions																							
	Minor or no sequelae						Major or long-term sequelae						Death						Not determined					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	249	246	285	208	216	1204	9	7	7	2	4	29	10	9	6	4	2	31	12	21	18	9	10	70
Tlg-HD	112	93	94	93	95	487	2	0	1	0	0	3	0	0	0	0	0	0	0	1	2	0	1	4
SAAR	85	81	74	63	56	359	3	7	4	2	4	20	0	0	1	1	0	2	0	2	3	1	3	9
HYPT	83	70	87	48	80	368	0	5	0	0	1	6	1	1	0	0	1	3	3	1	1	0	2	7
AHR	6	1	23	10	15	55	2	0	3	1	2	8	0	0	1	0	0	1	2	3	2	2	1	10
DHR	39	21	27	19	32	138	1	3	1	4	2	11	0	0	1	0	0	1	4	1	3	0	0	8
YAD	46	56	73	57	68	300	1	2	0	3	2	8	0	3	3	2	2	10	2	0	0	1	2	5
TRALI	9	9	6	3	1	28	6	1	0	3	0	10	3	3	4	0	2	12	5	8	2	4	1	20
ASPT	10	8	5	9	2	34	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
BACT	8	6	6	8	7	35	0	1	2	0	0	3	1	0	0	0	0	1	1	1	0	0	1	3
OTHER	175	161	113	119	156	724	4	7	4	5	3	23	0	1	0	2	2	5	3	6	4	0	3	16
Total	822	752	793	637	728	3732	28	35	22	20	18	123	15	17	16	9	9	66	32	44	35	17	24	152
Blood Components																								
ATRs	All transfusions																							
	Minor or no sequelae						Major or long-term sequelae						Death						Not determined					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	228	221	255	183	195	1082	9	7	7	2	4	29	10	9	5	4	1	29	12	20	14	9	9	64
SAAR	59	64	52	46	35	256	1	7	2	2	3	15	0	0	0	1	0	1	0	1	2	1	3	7
HYPT	65	53	69	39	70	296	0	5	0	0	1	6	1	1	0	0	1	3	3	0	1	0	2	6
AHR	6	1	18	6	9	40	2	0	3	1	2	8	0	0	1	0	0	1	2	2	2	2	1	9
DHR	38	17	25	15	27	122		2	1	4	2	10	0	0	1	0	0	1	4	0	2	0	0	6
TAD	39	48	58	48	52	245	1	1	0	3	2	7	0	3	1	2	2	8	2	0	0	1	2	5
TRALI	9	9	6	3	1	28	6	1	0	3	0	10	3	3	3	0	2	11	5	8	2	4	0	19
BACT	8	6	6	8	7	35	0	1	2	0	0	3	1	0	0	0	0	1	1	1	0	0	1	3
OTHER	42	68	51	63	80	304	1	4	4	3	2	14	0	1	0	2	2	5	1	4	0	0	1	6
Total	494	487	540	411	476	2408	21	28	19	18	16	102	15	17	11	9	8	60	30	36	23	17	19	125
Plasma derivatives																								
ATRs	All transfusions																							
	Minor or no sequelae						Major or long-term sequelae						Death						Not determined					
	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total	2020	2021	2022	2023	2024	Total
TACO	21	25	30	25	21	122	0	0	0	0	0	0	0	0	1	0	1	2	0	1	4	0	1	6
Tlg-HD	112	93	94	93	95	487	2	0	1	0	0	3	0	0	0	0	0	0	0	1	2	0	1	4
SAAR	26	17	22	17	21	103	2	0	2	0	1	5	0	0	1	0	0	1	0	1	1	0	0	2
HYPT	18	17	18	9	10	72	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
AHR	0	0	5	4	6	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
DHR	1	4	2	4	5	16	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	2
TAD	7	8	15	9	16	55	0	1	0	0	0	1	0	0	2	0	0	2	0	0	0	0	0	0
TRALI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1
ASPT	10	8	5	9	2	34	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	133	93	62	56	76	420	3	3	0	2	1	9	0	0	0	0	0	2	2	4	0	2	10	
Total	328	265	253	226	252	1324	7	7	3	2	2	21	0	0	5	0	1	6	2	8	12	0	5	27