Bureau of Infectious Disease and Laboratory Sciences

Hemovigilance Program Data Summary

January 1-December 31, 2019

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Bureau of Infectious Disease and Laboratory Sciences
The Massachusetts Public Health State Laboratory
305 South Street
Jamaica Plain, MA 02130

For questions about this report, contact:
Alexandra.dejesus@state.ma.us or Melissa.cumming@state.ma.us

Acknowledgments
This report was prepared by the following MDPH staff:

Alexandra De Jesus, MPH, CIC
Melissa Cumming, MS, CIC
Christina Brandeburg, MPH, CIC

Executive Summary

Introduction

This report includes data submitted by Massachusetts blood banks to the Hemovigilance Module of the National Healthcare Safety Network (NHSN) from January 1, 2019 through December 31, 2019. The purpose of this report is to provide information on transfusion activity in the state, as well as on transfusion-associated adverse events. Blood banks in Massachusetts can examine their own facility metrics and use this report for comparison and context.

The members of the Massachusetts Hemovigilance Technical Advisory Group (TAG) appreciate the committed participation of Massachusetts blood banks and transfusion services in reporting hemovigilance data to NHSN for the past 4 years and hope that the availability of the metrics contained in this report will be useful to them for comparison, context, and quality improvement.

Key Findings

- There was an overall decrease in all transfused product types in 2019 except platelets, which saw a modest increase across all three bed size groups (BSG).
- There was an overall decrease in total products discarded in 2019, with plasma making up the largest proportion (36%) of all product discards.
- There was a nearly seven-fold increase in whole blood transfusions in 2019, driven primarily by a facility in BSG 3 (≥ 300 beds) that began a low-titer O whole blood emergency release program.
- Febrile non-hemolytic transfusion reactions (FNHTRs) continue to comprise the highest number of adverse reactions.
- The number of transfusion associated dyspnea (TAD) cases increased 2.3 times from 13 cases in 2018 (reported by 4 facilities) to 30 in 2019 (reported by 5 facilities).
- 93% of TAD cases in 2019 were reported by two facilities in BSG 3.
- 43% of TAD cases were reported in the month of April by four facilities; three in BSG 3 and one in BSG 2 (100-299 beds).
- Platelets continue to be the blood product associated with both the highest and most variable rate of adverse reactions over time, than those associated with other blood product types.

Technical Notes

The following are inclusion criteria for the adverse reactions included in this report:

- Case criteria – the reaction must either definitively or probably meet the NHSN case reporting criteria
- Imputability – the reaction must definitely, probably, or possibly meet NHSN imputability criteria
- Reaction type – the reaction must be one of twelve specified types in NHSN, excluding “Other” and “Unknown”
- Allergic reactions – *non-severe* allergic reactions are excluded from analysis and reporting is not required

Current reaction definitions and imputability criteria can be found at the following link:
https://www.cdc.gov/nhsn/PDFs/Biovigilance/BV-HV-protocol-current.pdf.

Data Summary

This report includes data submitted by all 68 blood banks licensed in Massachusetts. Submission of data through the NHSN Hemovigilance Module is a regulatory requirement under 105 CMR 135.120 for all blood banks and transfusion services in Massachusetts. Complete denominator and adverse reaction data were submitted by all 68 facilities for all months covered. Facilities were stratified into three bed size groups for this report. One blood bank ceased operation in early 2019 and was excluded from this report, having transfused no blood products prior to closure.

Responses to a NHSN annual facility survey, which describe facility characteristics, were provided by 66 blood banks. For the two facilities that did not submit a 2019 annual facility survey, the 2018 annual facility survey was used. Bed size characteristics from the annual facility survey data can be found in Table 1. Eighty-eight percent of facilities were College of American Pathologists (CAP) accredited, 51% were accredited by AABB, and 53% indicated accreditation by the Joint Commission.

The volume of blood products transfused by Massachusetts blood banks varied widely. The number of whole blood units transfused statewide increased by 135% from 2017 to 2019. Only 4 facilities transfused whole blood in 2019, and one facility in BSG 3 began a low titer O whole blood emergency release program. Nearly all blood banks, 67 (99%) attempted to issue only leukocyte-reduced or leuko-poor cellular components. Twelve (18%) blood banks collected blood at their facility, and seven (10%) performed point of issue bacterial testing on platelets prior to transfusion.

The number of red blood cell (RBC) type and screen procedures performed by Massachusetts blood banks ranged from 178 to 90,351 (mean: 9,894) and RBC crossmatches ranged from 117 to 61,069 (mean: 5,705). The number of products transfused statewide, decreased from an average of 31,187 products per month in 2018 to an average of 30,361 products per month in 2019. The monthly average number of discarded products in 2019 was 2,016, representing a 4.5% decrease from 2018.

Three transfusion-transmitted infections were reported in 2019, one of which was a *Babesia microti* infection associated with transfused RBCs. The 2019 rate of transfusion-transmitted infections in Massachusetts was 0.082 infections per 10,000 products transfused.

In 2019, there were 364,333 blood products transfused and a total of 674 adverse reactions classified as possibly, probably, or definitely related to transfusion, yielding an overall reaction rate of 18.5 reactions per 10,000 products transfused. Sixty-one (9%) of the reported reactions were considered serious or life-threatening, and none of the reactions were fatal. Febrile non-hemolytic reactions (FNHTRs) were reported more frequently than other reaction types, making up 77% of all adverse reactions reported.

The Technical Advisory Group (TAG) was established in June 2014 to provide guidance to the Massachusetts Department of Public Health (MDPH) in the analysis and use of statewide hemovigilance data.

Current members of the TAG are:

Chester Andrzejewski, Jr., PhD, MD, FCAP
Medical Director
System Transfusion Medicine/Blood Banking and Apheresis Medicine Services
Baystate Health/ Baystate Medical Center

Christina Brandeburg, MPH, CIC
Epidemiologist
Bureau of Infectious Disease and Laboratory Sciences
Massachusetts Department of Public Health

Melissa Cumming, MS, CIC
Epidemiologist
Hemovigilance Coordinator
Bureau of Infectious Disease and Laboratory Sciences
Massachusetts Department of Public Health

Alexandra De Jesus, MPH, CIC
Epidemiologist
Bureau of Infectious Disease and Laboratory Sciences
Massachusetts Department of Public Health

Alfred DeMaria, Jr., MD
Medical and Laboratory Consultant
Bureau of Infectious Disease and Laboratory Sciences
Massachusetts Department of Public Health

Elzbieta Griffiths, MD
Medical Director, Blood Bank,
Donor Center and Coagulation
Surgical Pathologist Mount Auburn Hospital

Michele Herman, MT (ASCP)
Compliance Officer - Transfusion Medicine
Beth Israel Deaconess Medical Center

Kimberly Knox, RN, MHA, CIC
Infection Prevention and Control Coordinator
Milford Regional Medical Center

Eileen McHale, RN, BSN
Healthcare Associated Infection Coordinator
Bureau of Health Care Safety and Quality
Massachusetts Department of Public Health

Lynne O'Hearn, MT (ASCP)
Transfusion Safety Officer
Baystate Medical Center

Jorge Rios, MD
Medical Director
American Red Cross Blood Services
Massachusetts Region

Lynne Uhl, MD
Vice Chair and Division Director for Laboratory and Transfusion Medicine
Beth Israel Deaconess Medical Center

Jason Viau, BS, MT (ASCP)
Senior Medical Technologist II, Blood Bank
Lahey Hospital & Medical Center
President
Massachusetts Association of Blood Banks

Pamela Waksmonski, MS, MT (ASCP), PMP, CRA
Clinical Laboratory Program Manager
Bureau of Health Care Safety and Quality
Massachusetts Department of Public Health

Table of Contents

List of abbreviations **6**

Table 1: Bed Size Characteristics from the 2019 Annual Facility Survey……..**7**

Figure 1: Volume of Blood Products Transfused in Massachusetts, 2017-2019..... **8**

Table 2: Transfusion Volume by Bed Size Group, Product Type, and Year, 2017-2019 ..... **9**

Figure 2: Volume of Blood Products Discarded in Massachusetts, 2017-2019..... **10**

Table 3: Number and Ratio of Discarded Products by Type and Bed Size Group, 2019……..... **11**

Table 4: Number of Adverse Reactions in Massachusetts, 2018-2019……**12**

Table 5: Number of Adverse Reactions by Type, Age Group, and Gender, 2019……..**13**

Table 6: Summary of Transfusion-transmitted Infections in Massachusetts, 2019..... **14**

Figure 3: Rates of Adverse Reactions per 10,000 Transfused Products by Product Type…….**15**

Figure 4: Rates of Adverse Reactions per 10,000 Transfused Products by Bed Size Group…….**16**

Table 7: Rates of Adverse Reactions per 10,000 Total Units Transfused by Component Type..**17-18**

List of Abbreviations

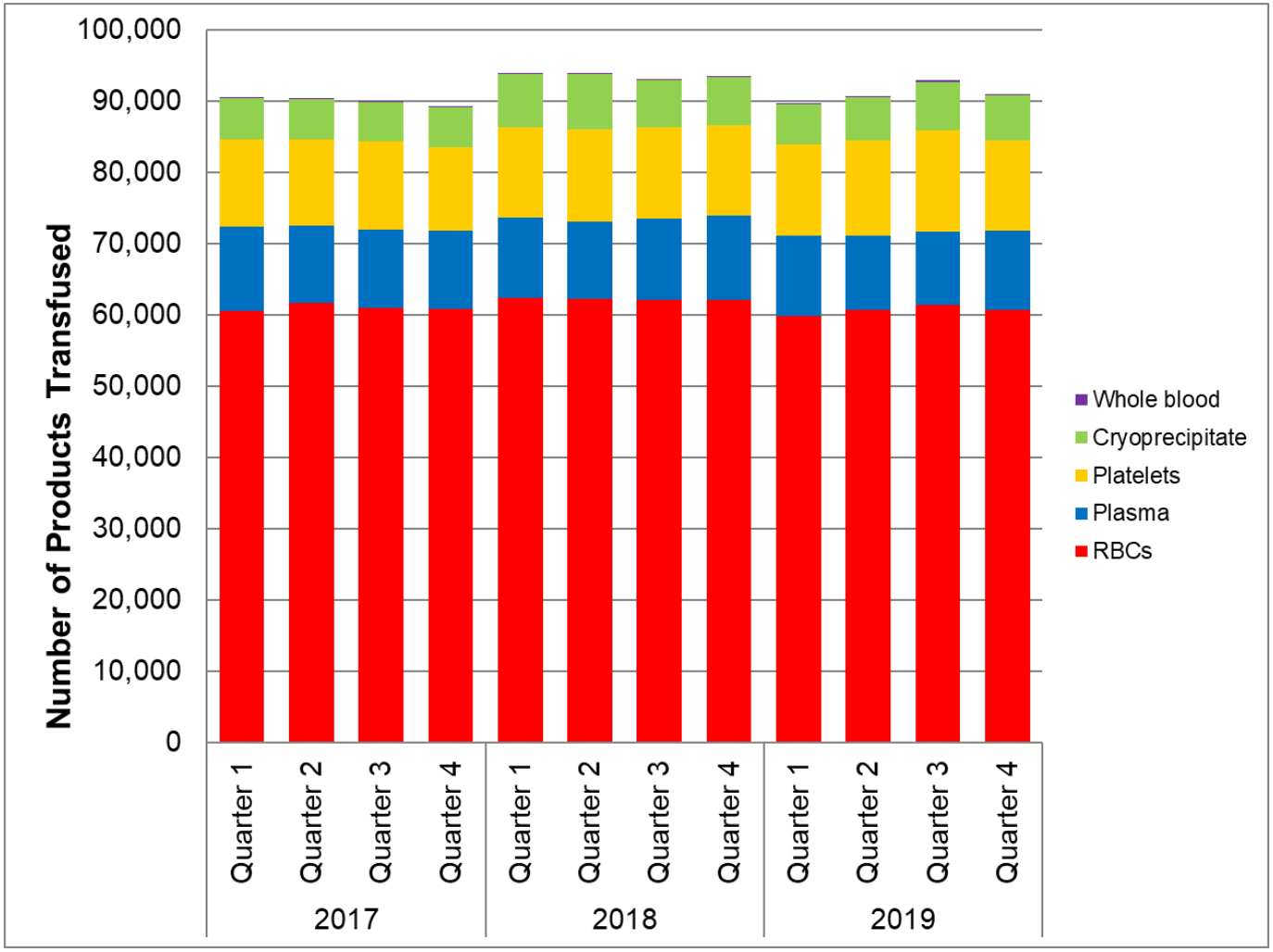
- AABB – formerly American Association of Blood Banks
- AHTR – Acute hemolytic transfusion reaction
- ALLERG – Allergic reaction
- CAP – College of American Pathologists
- DHTR – Delayed hemolytic transfusion reaction
- DSTR – Delayed serologic transfusion reaction
- FNHTR – Febrile non-hemolytic transfusion reaction
- HTR – Hypotensive transfusion reaction
- PTP – Post-transfusion purpura
- TJC – The Joint Commission
- TACO – Transfusion-associated circulatory overload
- TAD – Transfusion-associated dyspnea
- TAGVHD – Transfusion-associated graft versus host disease
- TRALI – Transfusion-related acute lung injury
- TTI – Transfusion-transmitted infection

Table 1: Bed Size Characteristics from the 2019 Annual Facility Survey

		BSG 1 (1-99 Beds)	BSG 2 (100-299 Beds)	BSG 3 (≥ 300 Beds)
Number of Hospitals		15	38	15
Average Number of Beds Served by Transfusion Service (range)		60 (14-97)	191 (100-291)	501 (302-1,011)
Average Number of Inpatient Surgeries (range)		583 (0-2,361)	2,098 (160-9,000)	7,363 (1,736-20,000)
Average Number of Outpatient Surgeries (range)		2,225 (0-12,080)	4,504 (0-12,135)	14,503 (6,963-25,500)
Transfusion Service Serves Cancer Center (includes adult and pediatric)		8 (47%)	25 (66%)	14 (93%)
Medical School Affiliation	Major Teaching Hospital	3 (20%)	10 (26%)	12 (80%)
	Graduate Teaching Hospital	0	8 (21%)	1 (7%)
	Undergraduate Teaching Hospital	0	10 (26%)	0
Trauma Level	Level 1	0	0	9 (60%)
	Level 2	0	2 (5%)	1 (7%)
	Level 3	0	7 (18%)	2 (13%)
	Level 4	1 (7%)	0	0
	Level NA	14 (93%)	29 (76%)	3 (20%)
Community Setting	Rural	6 (40%)	1 (3%)	0
	Suburban	9 (60%)	23(61%)	6 (40%)
	Urban	0	14 (37%)	9 (60%)

For those facilities that did not submit a 2019 annual facility survey, the most recent prior year submission was used.

Figure 1: Volume of Blood Products Transfused in Massachusetts, 2017-2019



In 2017 & 2018, 69 facilities reported NHSN Hemovigilance data. In 2019, 68 facilities were reporting.

Table 2: Transfusion Volume by Bed Size Group, Product Type, and Year, 2017-2019

Bed Size Group	Product	2017 Volume Transfused *	2018 Volume Transfused **	2019 Volume Transfused ***	Δ (2018-2019)	%Δ (2018-2019)
BSG 1: 1-99 Beds	RBCs	12,110	9,694	8,524	-1,170	-12.1
	Plasma	824	566	459	-107	-18.9
	Platelets	827	601	649	48	8.0
	Cryoprecipitate	16	24	40	16	66.7
	Whole blood	0	0	0	0	NA
BSG 2: 100-299 Beds	RBCs	71,346	71,038	67,963	-3,075	-4.3
	Plasma	8,926	8,353	7,742	-611	-7.3
	Platelets	6,156	6,143	6,423	280	4.6
	Cryoprecipitate	915	1,300	966	-334	-25.7
	Whole blood	207	63	1	-62	-98.4
BSG 3: ≥ 300 Beds	RBCs	160,721	168,240	166,221	-2,019	-1.2
	Plasma	34,824	36,400	34,936	-1,464	-4.0
	Platelets	41,503	44,400	46,154	1,754	4.0
	Cryoprecipitate	21,580	27,414	23,733	-3,681	-13.4
	Whole blood	16	13	522	509	3, 915.4
All facilities	RBCs	244,177	248,972	242,708	-6,264	-2.5
	Plasma	44,574	45,319	43,137	-2,182	-4.8
	Platelets	48,486	51,144	53,226	2,082	4.1
	Cryoprecipitate	22,511	28,738	24,739	-3,999	-13.9
	Whole blood	223	76	523	447	588.2

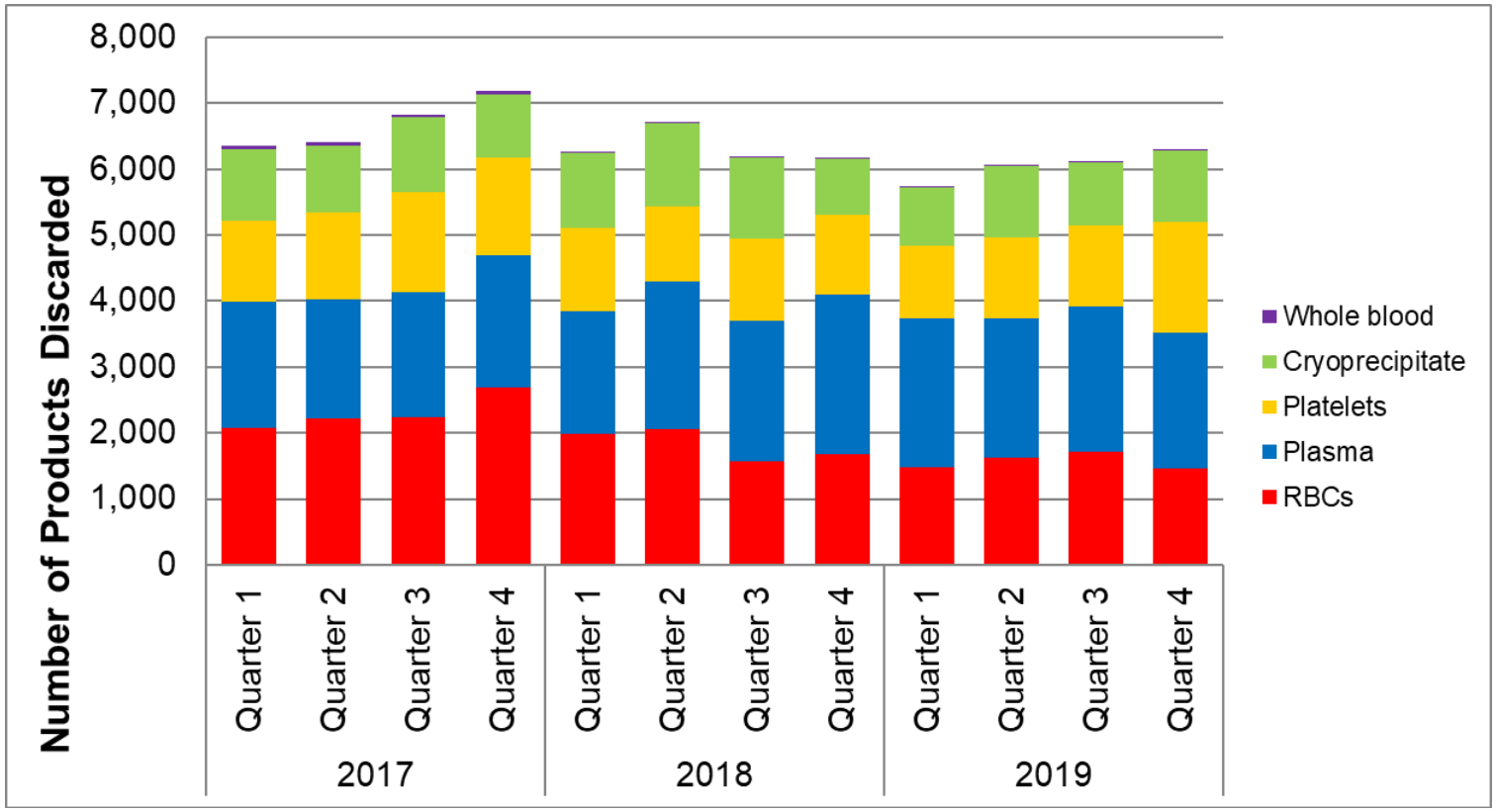
* In 2017, 17 facilities were in Bed Size Group 1, 38 in Bed Size Group 2, and 14 in Bed Size Group 3.

** In 2018, 17 facilities were in Bed Size Group 1, 37 in Bed Size Group 2, and 15 in Bed Size Group 3.

*** In 2019, 15 facilities were in Bed Size Group 1, 38 in Bed Size Group 2, and 15 in Bed Size Group 3.

Bed Size Group categorization was assigned based on the corresponding year's annual facility survey.

Figure 2: Volume of Blood Products Discarded in Massachusetts, 2017-2019



In 2017 & 2018, 69 facilities reported NHSN Hemovigilance data. In 2019, 68 facilities were reporting.

Table 3: Number and Ratio of Discarded Products by Type and Bed Size Group Massachusetts, 2019 (N=68 facilities)

2019 Bed Size Group	Product	Volume Transfused	Number of Products Discarded	Discard Ratio*
BSG 1: 1-99 Beds (N=15)	RBCs	8,524	148	1.7
	Plasma	459	262	57.1
	Platelets	649	182	28.0
	Cryoprecipitate	40	18	45.0
	Whole blood	0	0	NA
BSG 2: 100-299 Beds (N=38)	RBCs	67,963	2,063	3.0
	Plasma	7,742	1,877	24.2
	Platelets	6,423	1,555	24.2
	Cryoprecipitate	966	252	26.1
	Whole blood	1	2	200.0
BSG 3: ≥ 300 Beds (N=15)	RBCs	166,221	4,062	2.4
	Plasma	34,936	6,501	18.6
	Platelets	46,154	3,487	7.6
	Cryoprecipitate	23,733	3,757	15.8
	Whole blood	522	28	5.4
All facilities	RBCs	242,708	6,273	2.6
	Plasma	43,137	8,640	20.0
	Platelets	53,226	5,224	9.8
	Cryoprecipitate	24,739	4,027	16.3
	Whole blood	523	30	5.7

* Discard ratio = the number of products discarded for every 100 products transfused.

Table 4: Number of Adverse Reactions in Massachusetts, 2018-2019

Adverse Reaction Description	2018	2019
AHTR	1	2
ALLERG	25	31
DHTR	8	8
DSTR	32	36
FNHTR	491	516
HTR	4	5
TTI	2	3
TACO	40	42
TAD	13	30
TRALI	1	1
Total	**617**	**674**

Data are current as of June 20, 2020 and are subject to change.

Table 5: Number of Adverse Reactions by Type, Age Group, and Gender in Massachusetts, 2019

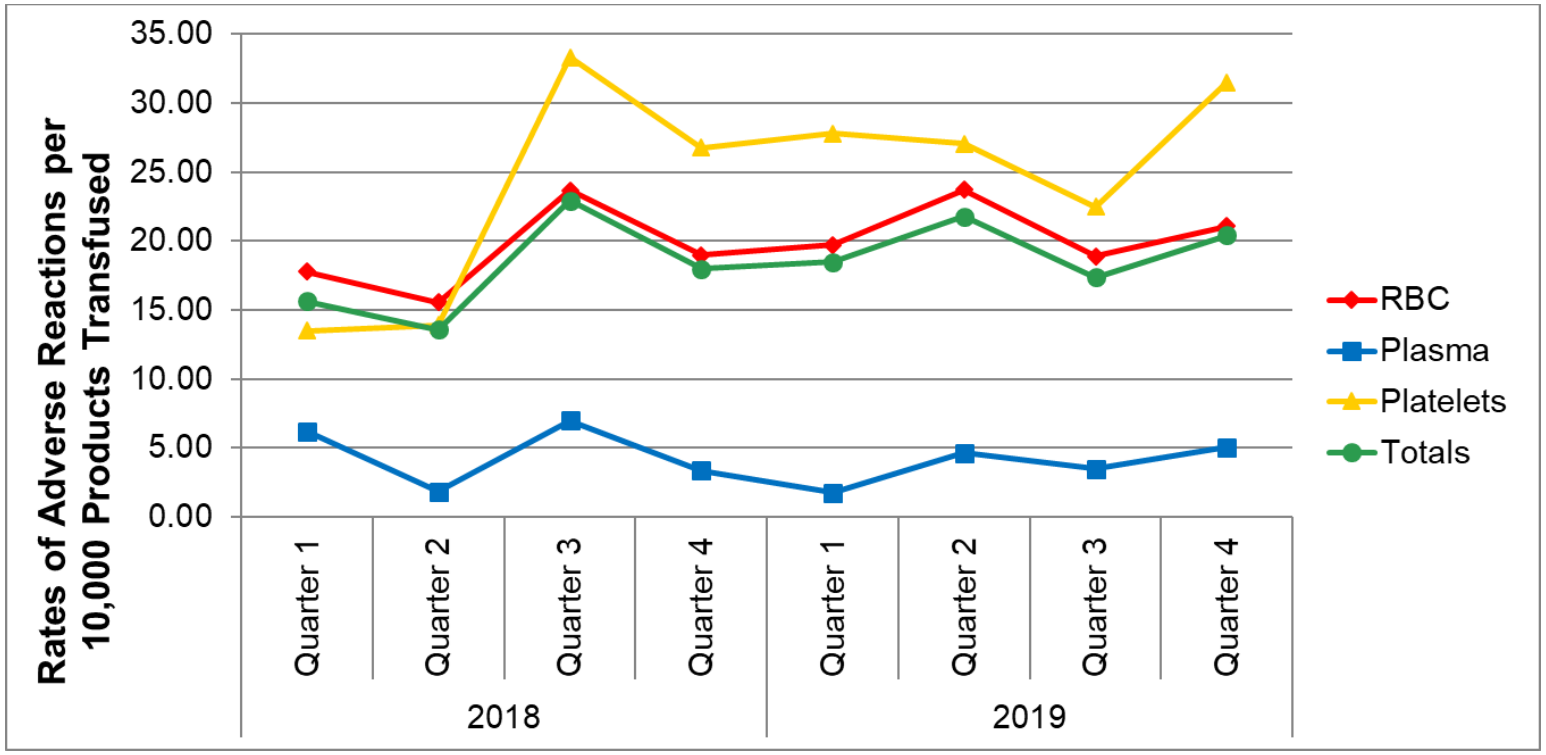
Age Group	AHTR			ALLERG			DHTR			DSTR			FNHTR			HTR			TTI			TACO			TAD			TRALI			Total
	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total	
<4 mos	0	0	0	1	0	1	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
4 mos-3 yrs	0	0	0	0	0	0	0	0	0	0	0	0	5	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
4-18 yrs	0	0	0	1	2	3	0	0	0	0	1	1	17	30	47	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	53
All <= 18 yrs	0	0	0	2	2	4	0	0	0	0	1	1	25	35	60	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	67
19-29 yrs	0	0	0	1	0	1	0	0	0	0	0	0	11	15	26	0	0	0	0	0	0	0	0	0	3	1	4	0	0	0	31
30-39 yrs	0	0	0	1	2	3	1	0	1	2	0	2	17	16	33	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	41
40-49 yrs	0	1	1	6	2	8	0	0	0	2	2	4	31	25	56	1	1	2	0	0	0	3	1	4	1	0	1	0	0	0	76
50-59 yrs	0	1	1	0	1	1	0	0	0	5	3	8	30	38	68	0	0	0	0	0	0	4	1	5	2	0	2	0	0	0	85
60-69 yrs	0	0	0	1	3	4	2	0	2	7	3	10	54	66	120	0	2	2	1	1	2	8	7	15	7	4	11	0	1	1	167
70-79 yrs	0	0	0	2	6	8	1	2	3	4	2	6	40	54	94	0	1	1	0	0	0	7	6	13	2	5	7	0	0	0	132
80-89 yrs	0	0	0	2	0	2	2	0	2	2	2	4	24	26	50	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0	62
>= 90 yrs	0	0	0	0	0	0	0	0	0	1	0	1	8	1	9	0	0	0	0	0	0	2	0	2	1	0	1	0	0	0	13
TOTAL	0	2	2	15	16	31	6	2	8	23	13	36	240	276	516	1	4	5	1	2	3	26	16	42	19	11	30	0	1	1	674

Non-severe allergic reactions were excluded from analyses.

Table 6: Summary of Transfusion-transmitted infections in Massachusetts, 2019

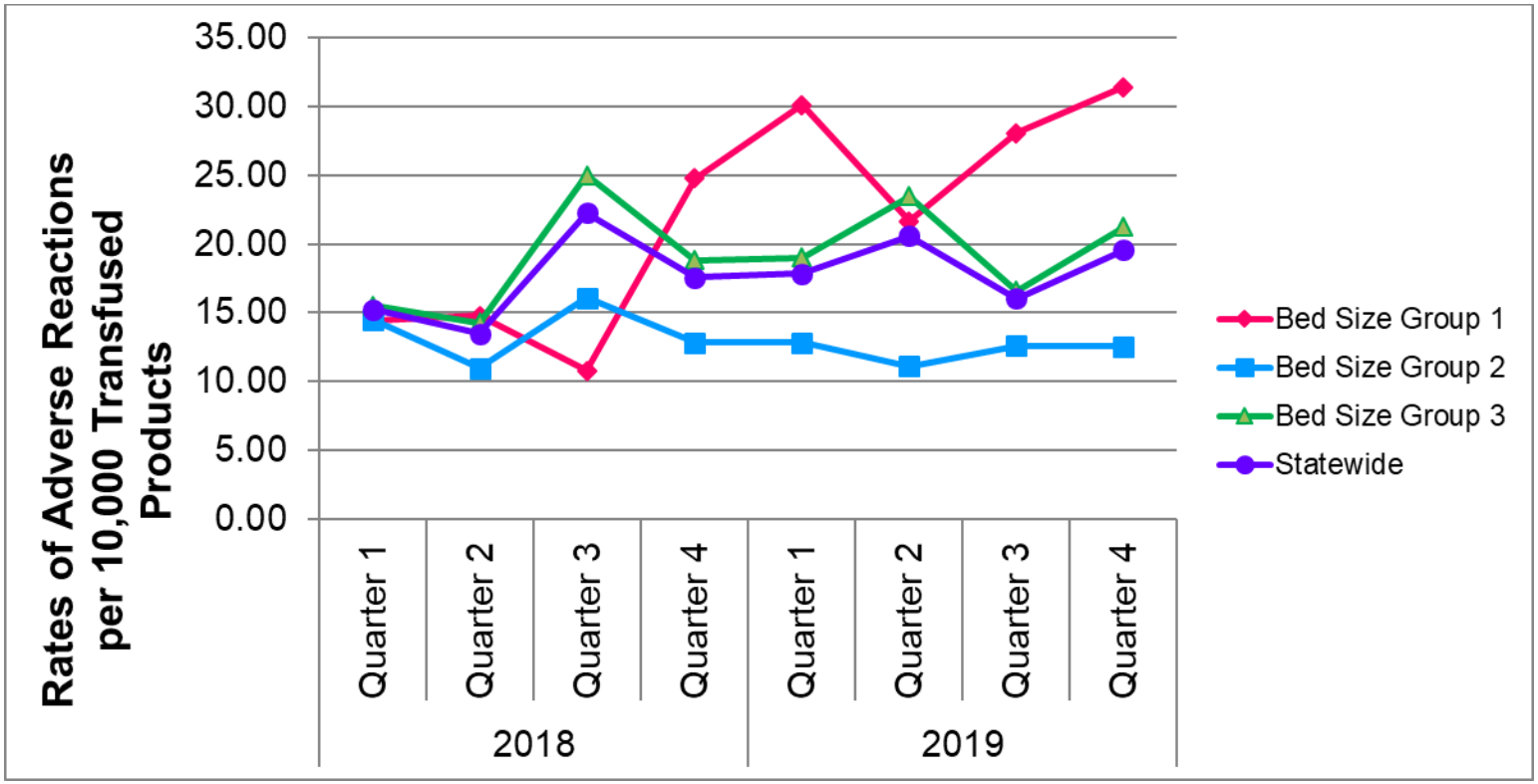
Adverse Reaction Date	Number of Days from Tranfusion to Reaction	Age at Adverse Reaction	Gender	Infection	Case Definition	Severity	Imputability	Associated Unit	Unit Tested	Unit Tested Positive	Donor Tested	Donor Tested Positive
4/2019	0	11	Male	*Staphylococcus pasteuri*	Definitive	Severe	Possible	Platelets	N	NA	N	NA
5/2019	0	60	Female	*Staphylococcus hominis & Staphylococcus epidermidis*	Definitive	Non-Severe	Possible	Red Blood Cells	Y	Y	N	NA
9/2019	39	69	Male	*Babesia microti*	Definitive	Non-Severe	Possible	Red Blood Cells	N	NA	Y	Y

Figure 3: Rates of Adverse Reactions per 10,000 Transfused Products by Product Type in Massachusetts, 2018-2019



In 2017 & 2018, 69 facilities reported NHSN Hemovigilance data. In 2019, 68 facilities were reporting.

Figure 4: Rates of Adverse Reactions per 10,000 Transfused Products By Bed Size Group in Massachusetts, 2018-2019



In 2017 & 2018, 69 facilities reported NHSN Hemovigilance data. In 2019, 68 facilities were reporting.

Table 7: Rates of Adverse Reactions per 10,000 Total Units (Full and Aliquot) Transfused by Component Type, 2019

Component Type	Transfused	All Adv Reactions		ALLERGIC		FNHTR		AHTR		DSTR		HTR		DHTR	
	N	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
All Components															
All	364,333	674	18.50	31	0.85	516	14.16	2	0.05	36	0.99	5	0.14	8	0.22
Severe Adverse Reactions		50	1.37	8	0.22	16	0.44	1	0.03	0	0.00	1	0.03	4	0.11
Life Threatening Adverse Reactions		11	0.30	7	0.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Fatal Adverse Reactions		0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
RBCS															
All	242,708	506	20.85	12	0.49	398	16.40	0	0.00	35	1.44	3	0.12	8	0.33
Collection method															
Apheresis	31,647	65	20.54	2	0.63	52	16.43	0	0.00	2	0.63	0	0.00	1	0.32
Whole blood-derived	211,061	433	20.52	9	0.43	344	16.30	0	0.00	32	1.52	3	0.14	7	0.33
Irradiation															
Irradiated	112,285	268	23.87	3	0.27	235	20.93	0	0.00	13	1.16	1	0.09	3	0.27
Not irradiated	130,423	230	17.63	8	0.61	161	12.34	0	0.00	21	1.61	2	0.15	5	0.38
Leukoreduction															
Leukoreduced	232,152	483	20.81	10	0.43	382	16.45	0	0.00	34	1.46	3	0.13	8	0.34
Not leukoreduced	10,556	15	14.21	1	0.95	14	13.26	0	0.00	0	0.00	0	0.00	0	0.00
Platelets															
All	53,226	139	26.12	12	2.25	104	19.54	2	0.38	1	0.19	1	0.19	0	0.00
Collection method															
Apheresis	52,074	135	25.92	10	1.92	102	19.59	2	0.38	1	0.19	1	0.19	0	0.00
Whole blood-derived	1,152	4	34.72	2	17.36	2	17.36	0	0.00	0	0.00	0	0.00	0	0.00
Irradiation															
Irradiated	49,083	114	23.23	11	2.24	87	17.73	2	0.41	0	0.00	1	0.20	0	0.00
Not irradiated	4,143	25	60.34	1	2.41	17	41.03	0	0.00	1	2.41	0	0.00	0	0.00
Leukoreduction															
Leukoreduced	53,200	139	26.13	12	2.26	104	19.55	2	0.38	1	0.19	1	0.19	0	0.00
Not leukoreduced	26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Plasma															
All	43,137	17	3.94	7	1.62	7	1.62	0	0.00	0	0.00	1	0.23	0	0.00
Collection method															
Apheresis	3,208	1	3.12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Whole blood-derived	39,929	16	4.01	7	1.75	7	1.75	0	0.00	0	0.00	1	0.25	0	0.00
Cryoprecipitate															
All	24,739	2	0.00	0	0.00	2	0.81	0	0.00	0	0.00	0	0.00	0	0.00
Whole Blood															
All	523	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Ten adverse reactions were associated with an “unknown” transfused blood product. These reactions were included in the overall adverse reaction rate calculations, but were excluded from component-specific rate calculations. Five FNHTRs, 4 TACOs, and 1 TAD reported an “unknown” blood product implicated.

Table 7: Rates of Adverse Reactions per 10,000 Total Units (Full and Aliquot) Transfused by Component Type, 2019

Component Type	Transfused	TACO		TAD		TRALI		TTI	
	N	N	Rate	N	Rate	N	Rate	N	Rate
All Components									
All	364,333	42	1.15	30	0.82	1	0.03	3	0.08
Severe Adverse Reactions		13	0.36	6	0.16	0	0.00	1	0.03
Life Threatening Adverse Reactions		3	0.08	1	0.03	0	0.00	0	0.00
Fatal Adverse Reactions		0	0.00	0	0.00	0	0.00	0	0.00
RBCS									
All	242,708	33	1.36	15	0.62	0	0.00	2	0.08
Collection method									
Apheresis	31,647	7	2.21	1	0.32	0	0.00	0	0.00
Whole blood-derived	211,061	23	1.09	13	0.62	0	0.00	2	0.09
Irradiation									
Irradiated	112,285	5	0.45	6	0.53	0	0.00	2	0.18
Not irradiated	130,423	25	1.92	8	0.61	0	0.00	0	0.00
Leukoreduction									
Leukoreduced	232,152	30	1.29	14	0.60	0	0.00	2	0.09
Not leukoreduced	10,556	0	0.00	0	0.00	0	0.00	0	0.00
Platelets									
All	53,226	5	0.94	12	2.25	1	0.19	1	0.19
Collection method									
Apheresis	52,074	5	0.96	12	2.30	1	0.19	1	0.19
Whole blood-derived	1,152	0	0.00	0	0.00	0	0.00	0	0.00
Irradiation									
Irradiated	49,083	5	1.02	6	1.22	1	0.20	1	0.20
Not irradiated	4,143	0	0.00	6	14.48	0	0.00	0	0.00
Leukoreduction									
Leukoreduced	53,200	5	0.94	12	2.26	1	0.19	1	0.19
Not leukoreduced	26	0	0.00	0	0.00	0	0.00	0	0.00
Plasma									
All	43,137	0	0.00	2	0.46	0	0.00	0	0.00
Collection method									
Apheresis	3,208	0	0.00	1	3.12	0	0.00	0	0.00
Whole blood-derived	39,929	0	0.00	1	0.25	0	0.00	0	0.00
Cryoprecipitate									
All	24,739	0	0.00	0	0.00	0	0.00	0	0.00
Whole blood									
All	523	0	0.00	0	0.00	0	0.00	0	0.00

Ten adverse reactions were associated with an “unknown” transfused blood product. These reactions were included in the overall adverse reaction rate calculations, but were excluded from component-specific rate calculations. Five FNHTRs, 4 TACOs, and 1 TAD reported an “unknown” blood product implicated.