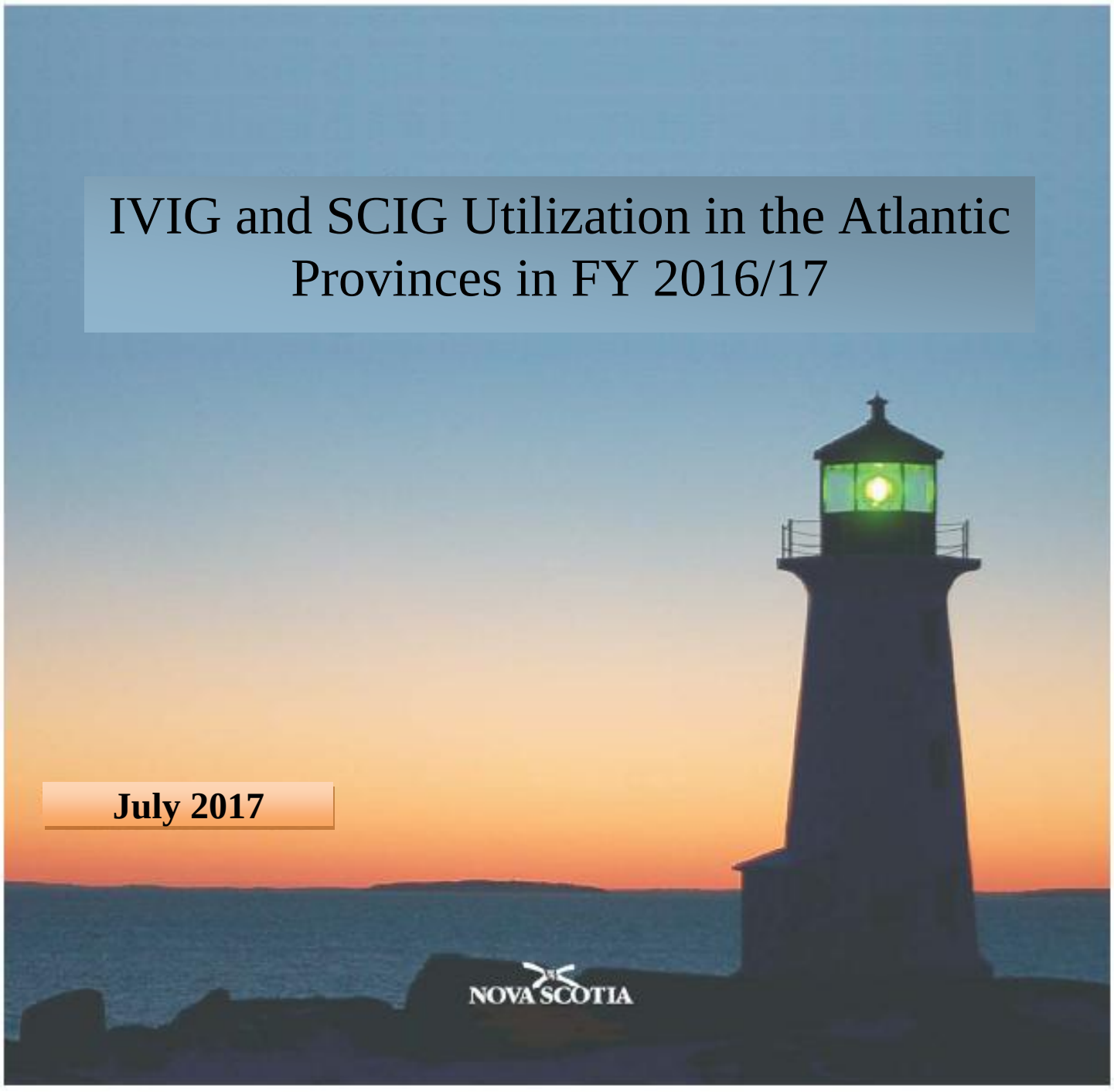
NOVA SCOTIA PROVINCIAL
BLOOD COORDINATING PROGRAM

IVIG and SCIG Utilization in the Atlantic Provinces in FY 2016/17



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1 Executive Summary

This report provides an overview of the **distribution** and **utilization** of intravenous immunoglobulin (IVIG) and subcutaneous immunoglobulin (SCIG) in the Atlantic Provinces for the 2016/17 fiscal year.

When compared with many other developed countries, Canada has the third highest per capita consumption of IVIG and SCIG; the distribution of these immune globulins in Canada has continued to rise over the last ten years by 5 to 10% each year. In the 2016/17 fiscal year, Canada had a rise in the distribution by 9% from what it was in the previous year. Atlantic Canada demonstrated a 13% increase in the distribution of IVIG and SCIG in 2016/17 from what it was in 2015/16. Prince Edward Island was the only province/territory to exhibit a decrease in the distribution of IVIG and SCIG in 2016/17. The growth rate in distribution for Newfoundland and Labrador was 10 %, an increase from 3.4% in 2015/16. Nova Scotia exhibited a growth of 23% while New Brunswick's growth for this fiscal year was 8%. These increases are attributed to a rise in the new cases treated with IVIG/SCIG, an increase in the grams utilized as unlicensed-not indicated (UL-N) indications and the lack of compliance with dosing by adjusted body weight.

During 2016/17 the use of IVIG/ SCIG increased in Neurology, Hematology, Immunology and Dermatology while Rheumatology decreased compared to last year. The top three uses of IVIG and SCIG in Atlantic Canada are for the treatment of Primary Immune Deficiency (PID), Chronic Inflammatory Demyelinating Polyradiculoneuropathy (CIDP) and Immune Thrombocytopenia Purpura (ITP). The Atlantic use of IG increased for Immune Thrombocytopenia Purpura (ITP), Multifocal Motor Neuropathy (MMN), Guillian Barré Syndrome (GBS), Primary Immune Deficiency (PID), Chronic Inflammatory Demyelinating Polyradiculoneuropathy (CIDP), Myasthenia Gravis (MG) and Secondary Immune Deficiency (SID).

In Atlantic Canada this year, 4.1% of the total IVIG administered, was given for Unlabeled conditions (UL-N) for which there is no evidence to support the use of IVIG; this is an increase from 3% in 2015/16.

The dosing of IVIG, based on dosing body weight rather than actual body weight, was introduced by the Nova Scotia Provincial Blood Coordinating Program (NSPBCP) in 2010/11. It is applicable to all patients excluding patients with Guillian Barré Syndrome, solid organ transplant and those who are shorter than 5 feet in height. In 2016/17, the analysis of 1,143 Atlantic patients revealed that 66% of those eligible were dosed according to their dosing body weight compared to 89% in 2015/16. There was an estimated cost avoidance of $3,289,859 for 57,739 grams.

The combined total of IVIG discards in the Atlantic Provinces increased from 720 grams in 2015/16 to 1,075 grams in 2016/17. This year's discards are 0.25% of the total distribution.

In conclusion, The Atlantic distribution of 194g/1000 population of IVIG and SCIG is less than the Canadian distribution of 204g/1000 population in 2016/17. Distribution increased in the Atlantic Provinces by 13% during the 2016/17 fiscal year from the 6% in 2015/16. Among Canadian Provinces New Brunswick at 144g/1000 population is ranked second best in per capita distribution of IVIG/SCIG after the Territories, while Nova Scotia and Newfoundland and Labrador have a growth rate of 23% and 10% respectively. While the majority of the IVIG and SCIG transfused in Atlantic Canada have been appropriate, 4.1% was utilized in patients with conditions for which there are little

or no evidence to support its use. The NSPBCP continues to be effective in monitoring the use of IVIG and determining the indications and appropriateness of its use. The data generated through the Atlantic Collaborative allows the development of strategies for optimizing the use of IVIG with the end goal being to ensure that patients are dosed appropriately, clinical benefit is achieved, adverse reactions are avoided, and product wastage is minimized.

2 Introduction

This report is a summary of the utilization of IVIG and SCIG in the Atlantic Provinces for the fiscal year 2016/17. The purpose of this report is to describe the use of IVIG and SCIG in the Atlantic Provinces, to identify recommendations for improvement in data quality, and to identify strategies for optimizing appropriate use of these products to minimize product wastage.

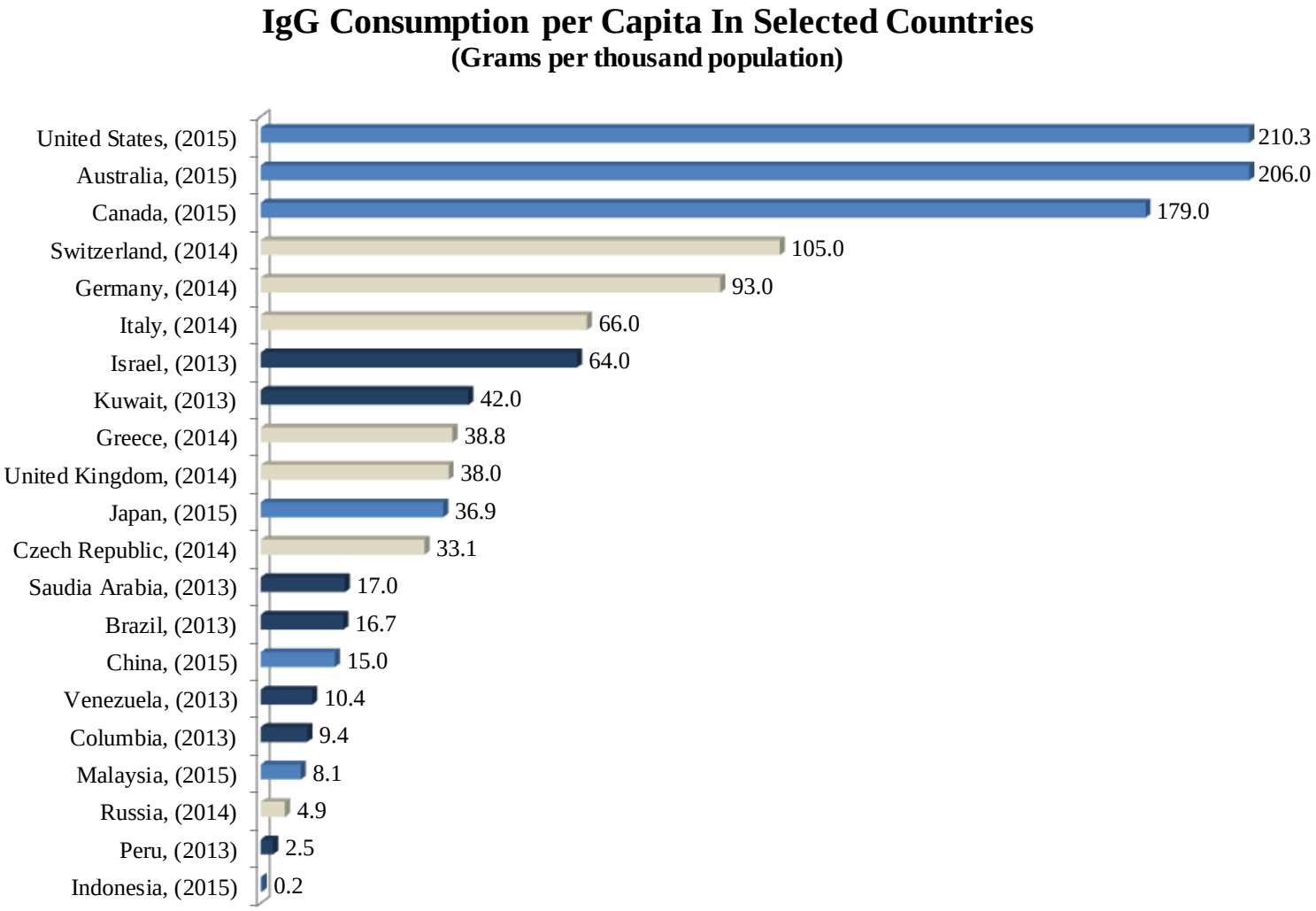
In this report the NSPBCP continues to publish the comparison of IVIG and SCIG distribution data with the rest of Canada, as this serves as a benchmark for the Atlantic Provinces. The Atlantic Provinces and the rest of Canada are examined separately in this report.

The data analysis for this report was conducted on a subset of the data that was reported to NSPBCP on or before May 23, 2017. Any data submitted after this date is not included in this report's analysis but will impact on next year's analysis.

3 International and National Perspective

Figure 1 shows an international comparison of per capita IVIG and SCIG consumption for 2011 to 2013 in select countries of the world. Canada was the second highest user of IVIG and SCIG in 2012. The IVIG and SCIG consumption was 118g/1000 population in Canada for 2009 which increased to 168.5g/1000 population in 2012. The United States and Canada are using two to three times more than other countries.

Figure 1



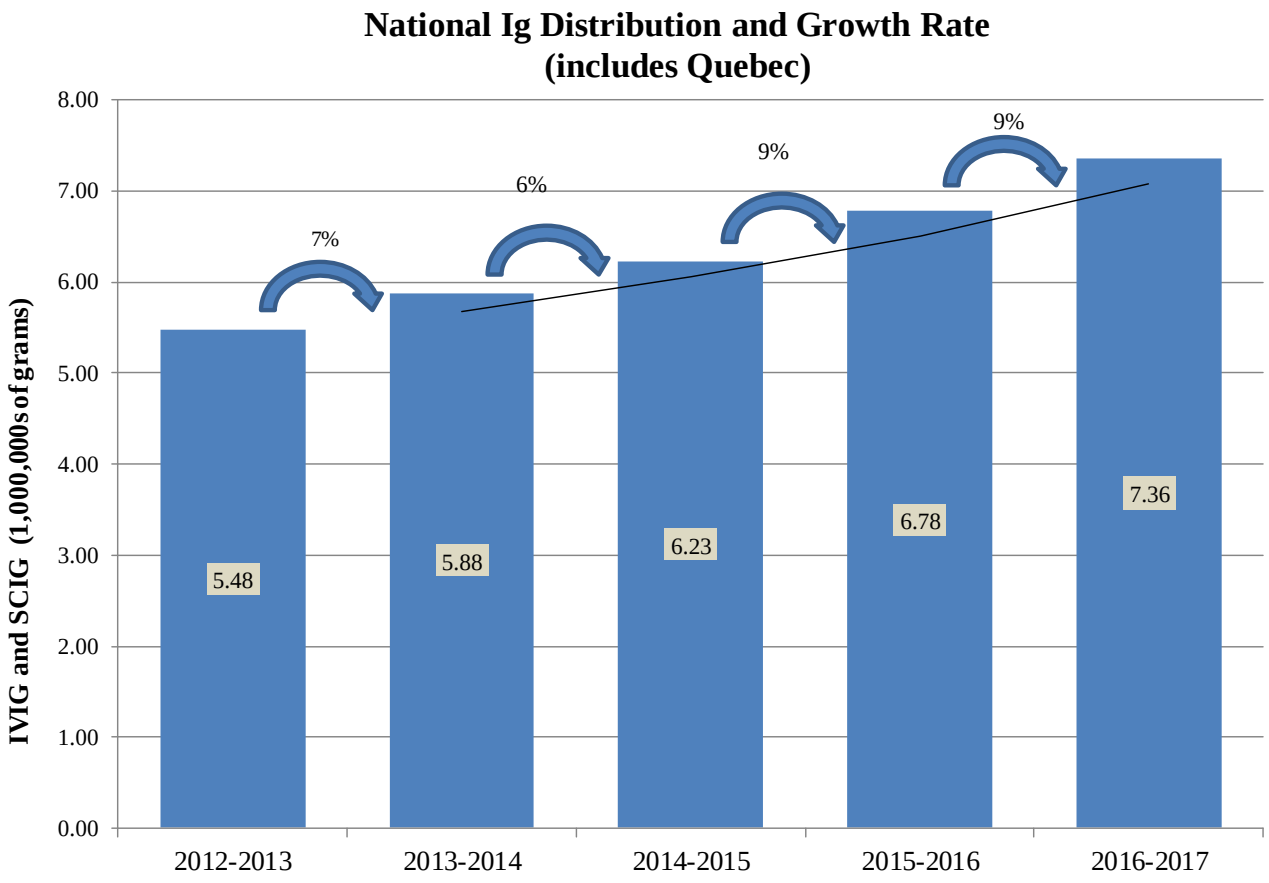

National Ig Distribution and Growth Rate
(includes Quebec)
IVIG and SCIG (1,000,000s of grams)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
7%
6%
9%
9%
5.48
5.88
6.23
6.78
7.36
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017

Figure 3

IVIG and SCIG Distribution and Growth Rate in Atlantic Canada

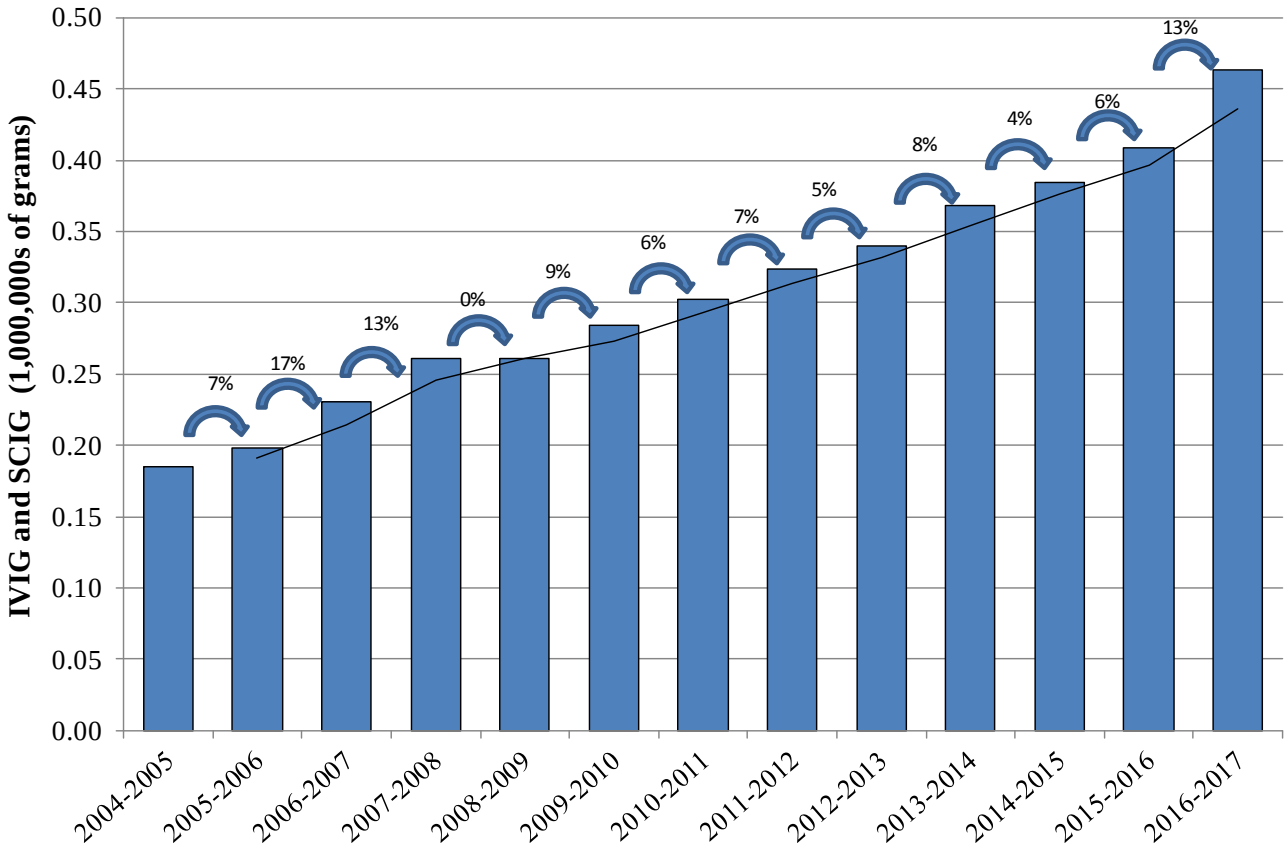


Figure 3 shows Atlantic Canada's combined annual distribution of IVIG and SCIG for the last thirteen years. This graph demonstrates the steady increases to the distribution rate. Atlantic Canada saw a 13% distribution increase in 2016/17 from the previous fiscal year.

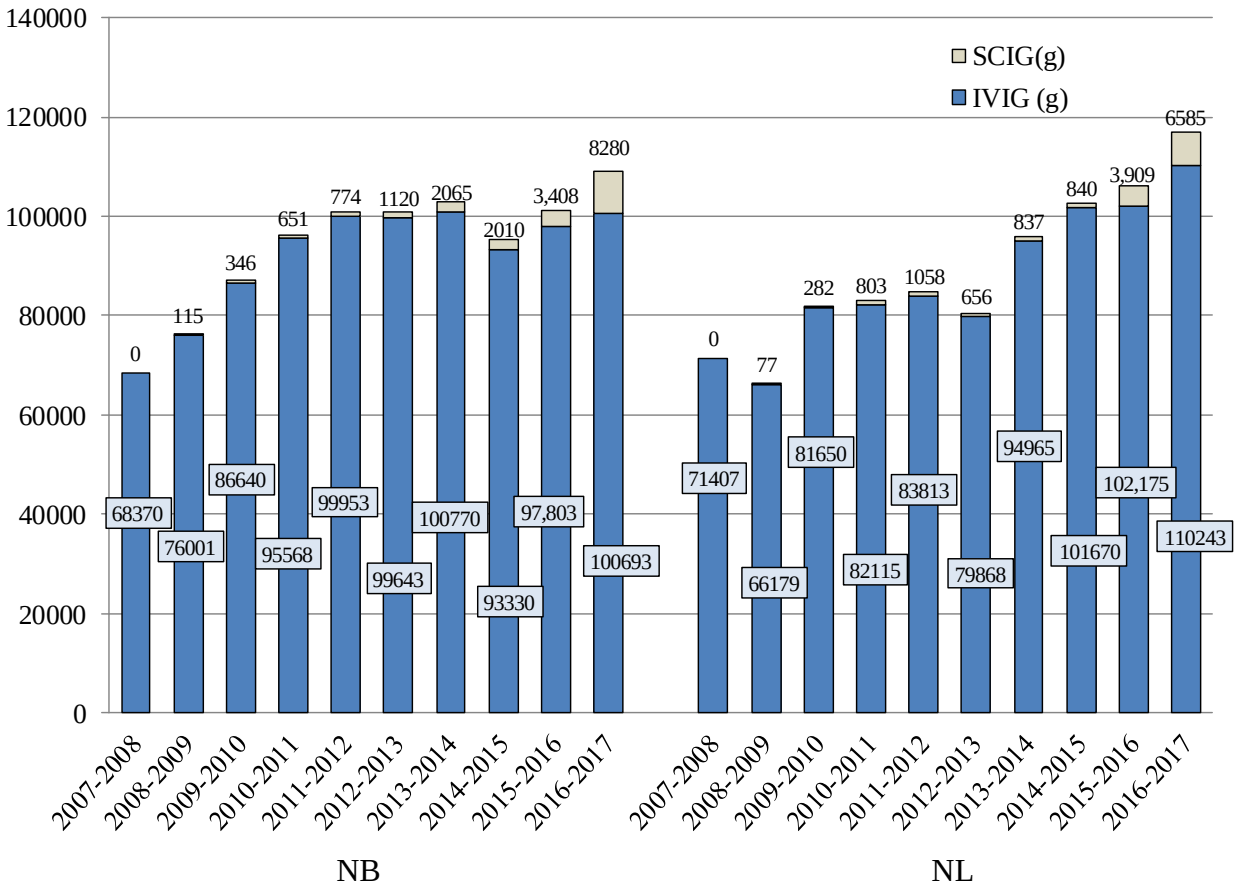
4 Provincial Distribution Trends

This section summarizes the total amounts of IVIG and SCIG *distributed* to facilities in the Atlantic Provinces in recent fiscal years. While different from the amount of IVIG and SCIG *utilized*, it provides a reference for monitoring year-to-year trends.

Figure 4 demonstrates the total grams of IVIG and SCIG distributed by CBS to New Brunswick and Newfoundland and Labrador from the 2007/08 fiscal year until 2016/17.

Figure 4

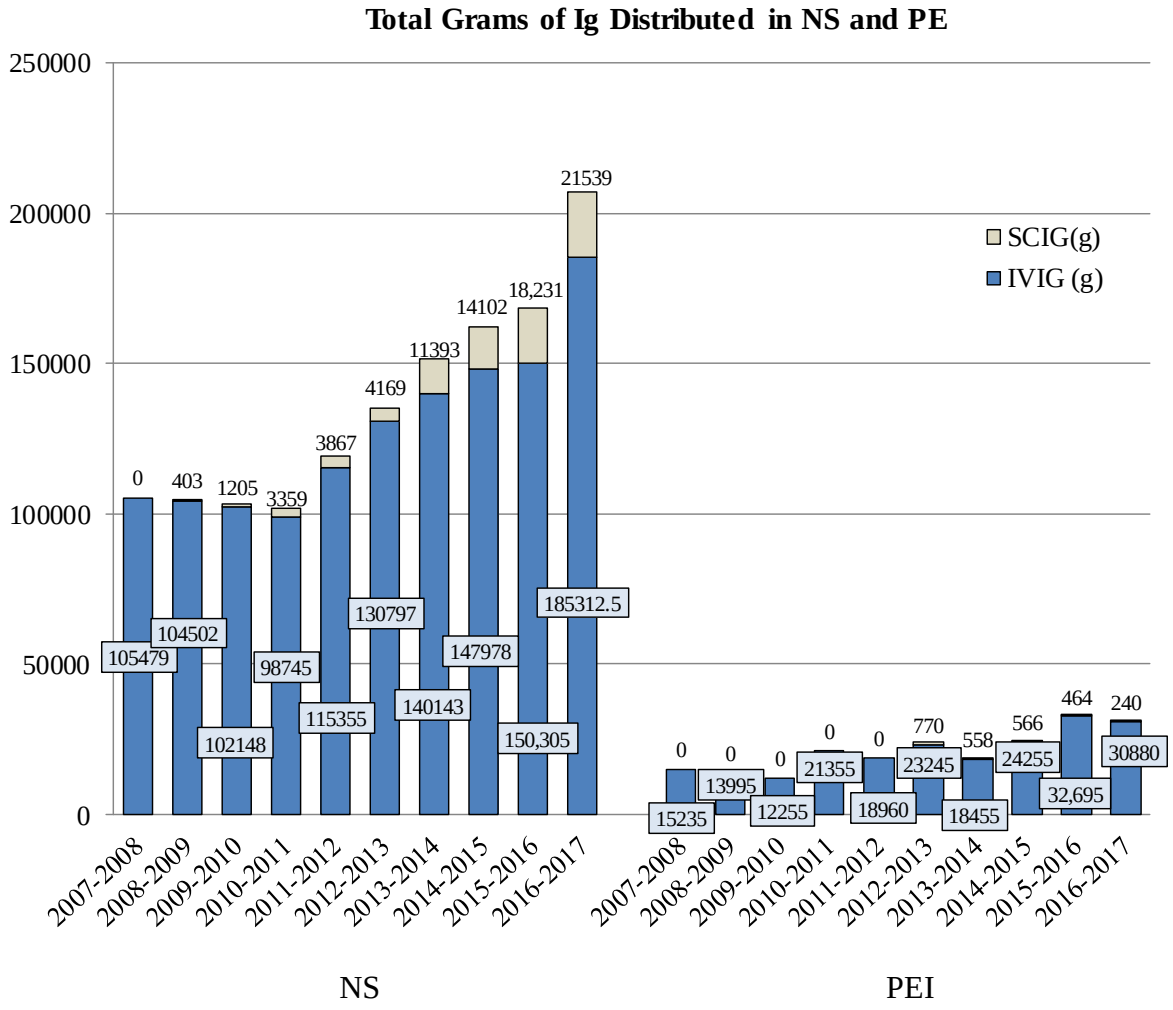
Total Grams of Ig Distributed in NB and NL



New Brunswick exhibited an 8% increase in the distribution of IVIG and SCIG in 2016/17, slightly higher than the 6.2% increase during 2015/16. The growth rate in distribution for Newfoundland and Labrador was 10%, an increase from 3.5% in 2015/16.

Figure 5 demonstrates the total grams of IVIG and SCIG distributed by CBS to Nova Scotia and Prince Edward Island from the 2007/08 fiscal year until 2016/17.

Figure 5



Nova Scotia has shown an increasing trend in IVIG and SCIG distribution in the past seven years. There was a substantial growth of 23% in 2016/17 from 4% in 2015/16. The increasing growth rate is attributable to the increase in patients being treated with IVIG/SCIG, the increase in the grams utilized as UL-N indications and a decrease in the dosing of patients by dosing body weight.

Prince Edward Island was the only Atlantic province to exhibit a decrease in distribution at -6.1% for this fiscal year after an increase of 33.6% in 2015/16.

Table 1 highlights the actual cost of IVIG/SCIG distributed in Atlantic Canada; both in the current and for the past 5 fiscal years.

Table 1: Total Grams and Cost of Ig Distributed to the Atlantic Provinces by Fiscal Year

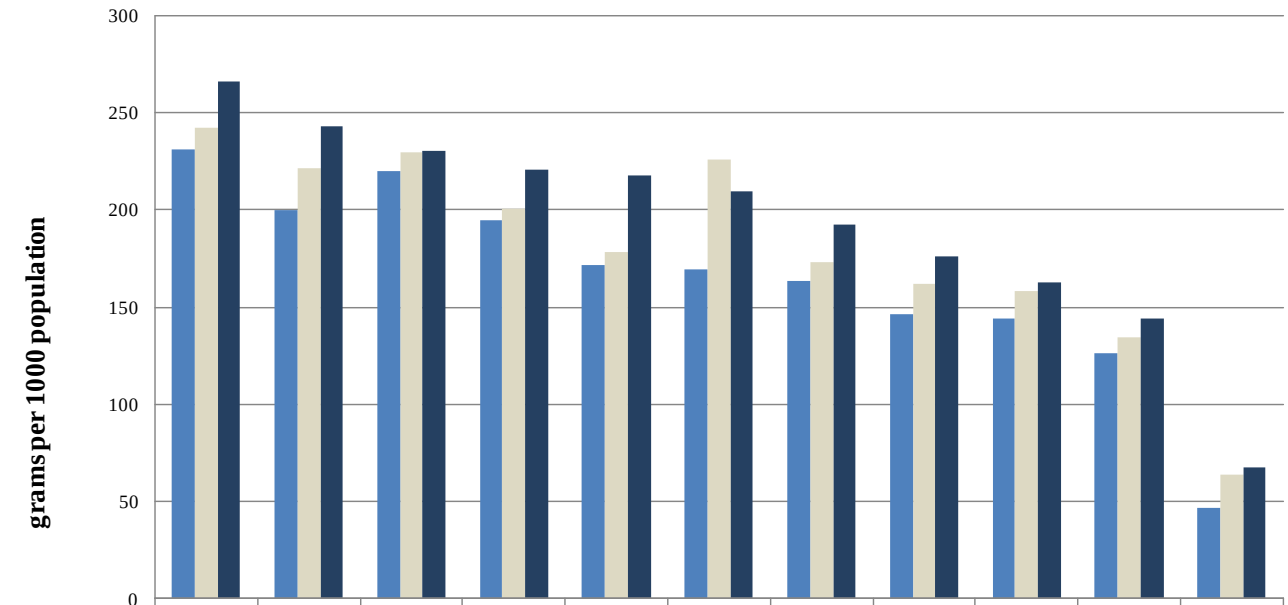
Fiscal Year	Avg. Price per gram	New Brunswick		Nova Scotia		Prince Edward Island		Newfoundland & Labrador	
		Grams	Cost	Grams	Cost	Grams	Cost	Grams	Cost
2011-2012	$58.97	100,727	$5,940,309	119,222	$7,031,042	18,960	$1,118,155	84,870	$5,005,162
2012-2013	$55.29	100,763	$5,571,253	134,967	$7,462,434	24,015	$1,327,812	80,524	$4,452,220
2013-2014	$48.74	102,835	$5,011,807	151,536	$7,385,297	19,013	$926,626	95,802	$4,669,051
2014-2015	$47.85	95,340	$4,561,917	162,080	$7,755,341	24,821	$1,187,659	102,510	$4,904,995
2015-2016	$51.28	101,211	$5,189,482	168,536	$8,642,809	33,159	$1,700,446	106,084	$5,440,152
2016-2017	$62.38	108,973	$6,852,853	206,852	$12,942,465	31,120	$1,948,132	116,828	$7,309,682

The price of IVIG/SCIG increased by $11.10 per gram in 2016/17. All Atlantic Provinces saw the overall cost of Ig *increase* from last fiscal year due to the rise in the amount distributed except Prince Edward Island whose cost increased while distribution decreased. This would be due to the price increase per gram. The variation and impact of the IVIG costs demonstrates how continued appropriate utilization is essential to ensuring that this expensive product is available to those who most need it.

Figure 6 below compares the amount of IVIG and SCIG distributed, per thousand population, among the Canadian provinces and territories for the last three fiscal years.

Figure 6

National IVIG and SCIG Distribution per 1000 Population



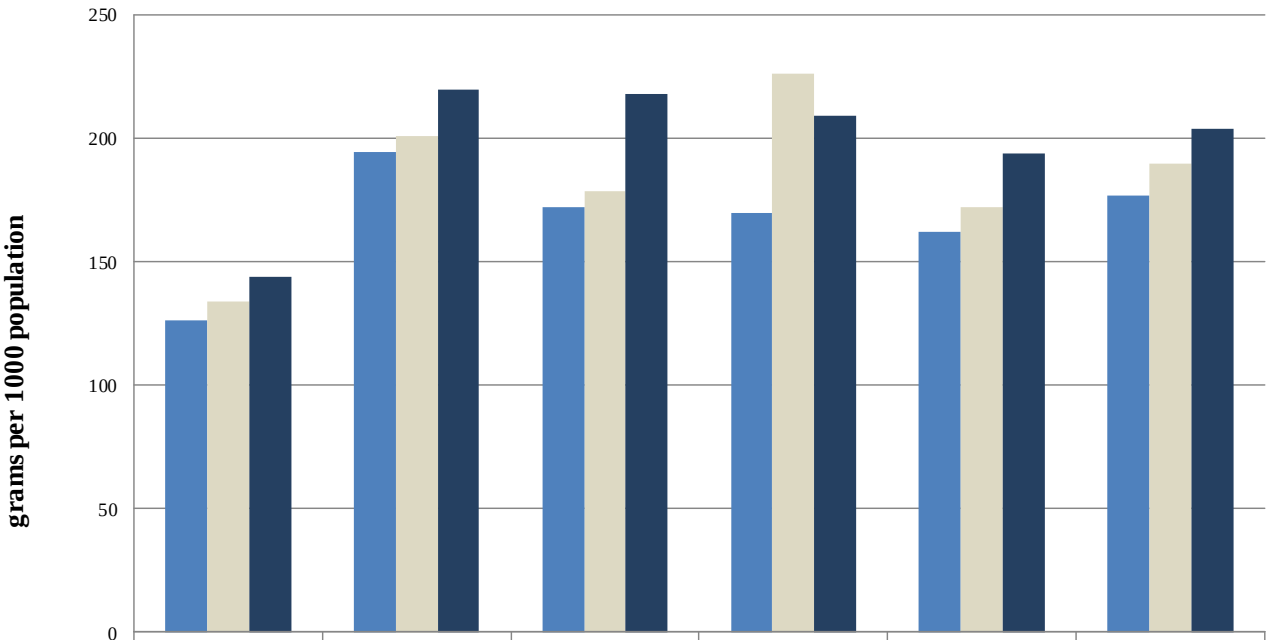
	QC	AB	MN	NL	NS	PEI	SK	BC	ON	NB	YT/NT/ NU
2014-2015	231	200	220	195	172	170	163	147	144	126	47
2015-2016	242	222	230	201	179	226	173	162	158	134	64
2016-2017	266	243	231	220	218	209	193	176	163	144	68

All Canadian Provinces and Territories exhibited a rise in the per capita distribution of IVIG/SCIG except Prince Edward Island. At the distribution of 144 per thousand population this year, New Brunswick is the lowest in distribution (per 1000 population) in the country again this year, behind the territories.

Figure 7 below compares the amount of IVIG and SCIG distributed, per thousand population, among the Atlantic provinces, Atlantic region and rest of the Canadian provinces and territories excluding Atlantic Canada for the last three fiscal years.

Figure 7

Atlantic IVIG and SCIG Distribution per 1000 Population



	NB	NL	NS	PEI	Atlantic	Rest of Canada
2014-2015	126	195	172	170	162	177
2015-2016	134	201	179	226	172	190
2016-2017	144	220	218	209	194	204

Nova Scotia, New Brunswick and Newfoundland & Labrador exhibited a rise in the per capita distribution of IVIG/SCIG. At the distribution of 144 per thousand population this year, New Brunswick is the lowest in distribution (per 1000 population) among the Atlantic Provinces.

All Atlantic provinces, collectively, also show an increase in distribution per thousand population. At the distribution of 194 per thousand population this year, the Atlantic Region is slightly lower than the rest of the country in distribution per 1000 population.

5 Utilization Data

The information presented in the remainder of this report is derived from the Intravenous Immunoglobulin Network (IVIN) database housed at the NSPBCP. The following sections provide information regarding the data used to create the graphs and tables and should be considered in the interpretation of the utilization information in this report.

5.1 Data Collection

By gathering and storing data for this report through the Intravenous Immunoglobulin Network (IVIN) system, we are ensuring that it remains current and reproducible. On occasion, revisions, corrections and additions may be identified following the publication of the annual report. In the event that this occurs, the data in the database is adjusted and the amendments are documented. When conducting analyses on past years the amended data is used. This is a consideration when noting differences in numbers between previous reports and the current report.

The NSPBCP continues to successfully liaise with one of the Zones in Nova Scotia and the Lab Information System manager to obtain a quarterly data extract from the Zone's Laboratory Information System (LIS). This approach has decreased human resource dependence as well as eliminated manual data entry errors. It is recommended that in order to minimize the human error, jurisdictions consider the option of exploring extracts of data from Laboratory Information System (LIS) into IVIN.

The population of reference for this report is all patients who received doses of IVIG and/or SCIG for any indication.

5.2 Data Quality

The NSPBCP strives to continuously improve the quality of data obtained for analysis. To this end, the program reviews all of the submitted data for inconsistencies and to identify any incomplete data entry fields. Most of these checks are now completed using automated integrity queries. Any inconsistencies discovered by the queries are investigated and resolved. All cases with indications marked as "insufficient" or as "other" are identified on a quarterly basis so that the correct information pertaining to the diagnosis may be sought. This is done to minimize ambiguity in the categorization of disease indications; the appropriateness of IVIG and SCIG use is based on this information. Clinical experts are consulted electronically to assign an appropriateness category (L, UL-I, UL-N) whenever IVIG is used for any new indication.

As previously mentioned, this report includes data received by the NSPBCP for the fiscal year 2016/17 as of May 23, 2017. The data is extracted from the database and that is the source used for generating the report. Data for fiscal year 2016/17 can continue to be entered into the database but it will not be part of the extract used for generating the report. However for previous fiscal years, an updated or live database is used for a true reflection of the revisions, corrections and submissions on data that were completed after the generation of previous annual reports. This may reflect as a variation in the indications, utilized IVIG grams and overall appropriateness of use of IVIG from what was presented in the previous annual reports.

Data submissions were reviewed for missing data on a quarterly period which contributed to quality improvement of the Atlantic IVIG/SCIG Utilization report and must be continued.
Percent capture of the distribution data for the Atlantic Provinces during the time period of this report was greater than 95%. This is based on the amount of IVIG or SCIG reported as *utilized (transfused + discarded)* divided by the total amount of IVIG or SCIG *distributed.*

Table 2: Percent Capture for IVIG

Province	Percent Capture 2014-2015	Percent Capture 2015-2016	Percent Capture 2016-2017
New Brunswick	99	99	100
Nova Scotia	100	100	99
Prince Edward Island	102	96	101
Newfoundland and Labrador	99	98	99

Percent capture of the IVIG distribution data for the Atlantic Provinces during the time period of this report increased slightly from the previous year. The high percent capture of IVIG supports the fact that the utilization data in this report is representative of the actual overall utilization and a result of a continuous evaluation, reminders, support and mutual effort between the NSPBCP and the data submitters throughout the Atlantic Provinces.

Table 3 shows an improved percent capture of the SCIG distribution data for Newfoundland & Labrador only. The remaining Atlantic Provinces exhibit a decrease during the time period of this report from what it was in 2015/16.

Table 3: Percent Capture for SCIG

Province	Percent Capture 2014-2015	Percent Capture 2015-2016	Percent Capture 2016-2017
New Brunswick	89	104	91
Nova Scotia	86	91	79
Prince Edward Island	93	85	79
Newfoundland and Labrador	92	71	90

Home administration of SCIG has successfully helped transition patients from depending on hospital administration of this product to administering in the comfort of their own home.

Once a patient has successfully completed the education sessions and are comfortable self administering SCIG, the product is dispensed from the Blood Transfusion Service to the patient in 3 month allotments. Patients track the utilization of the product and return the log sheets to the Blood Transfusion Service at the same time as they receive their next supply of product. If the patient fails to return the log sheets, they are only provided with a 1 week supply of product. Data is then entered into IVIN using the returned log sheets. This often causes a lower percent capture while waiting for the log sheets to be returned.

6 Prevalence and Incidence of the Use of IVIG and SCIG in the Atlantic Provinces

The study of prevalence and incidence of cases using IVIG and SCIG is used to understand the variation in the trends of IVIG and SCIG distribution over a period of time. Population data used to calculate prevalence and incidence was taken from the website of Statistics Canada.

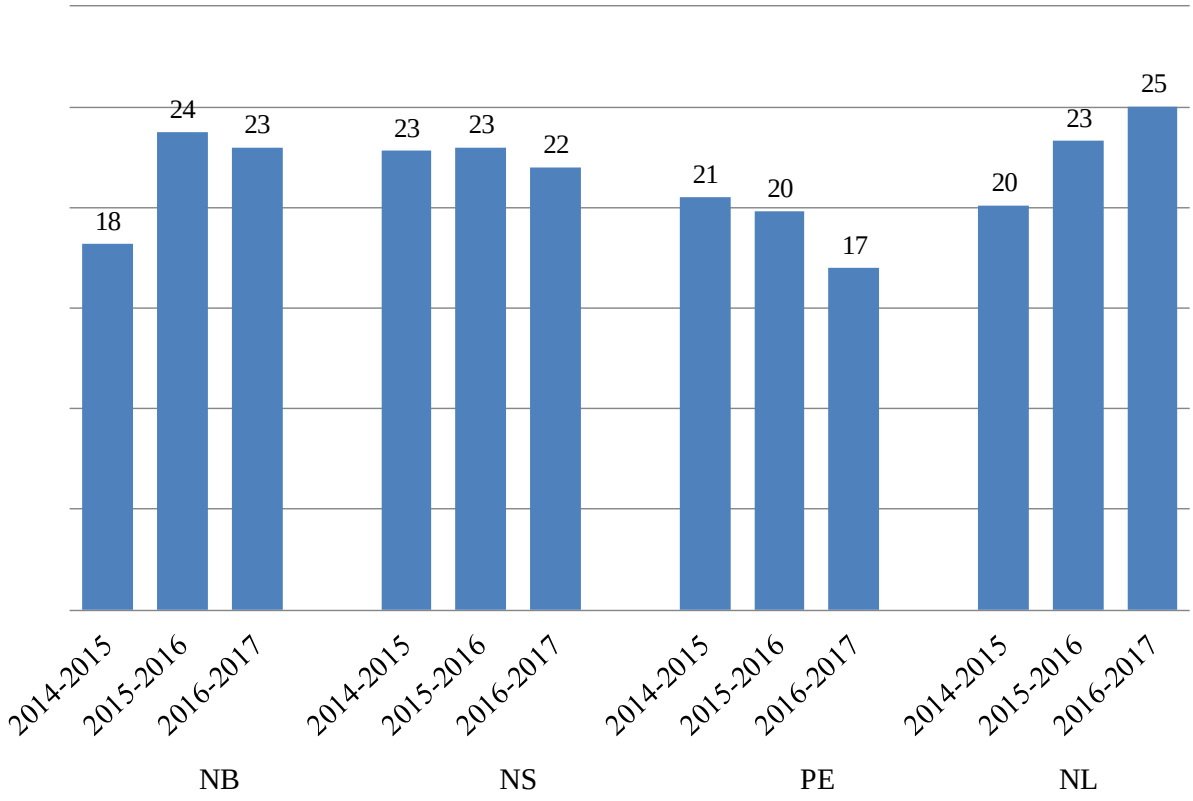
6.1 Incidence

Incidence refers to the rate at which new cases of a disease occur in a population during a specified period. It is also calculated per 100,000 population to avoid display in decimals.

Figure 8 shows yearly provincial comparison of the incidence rates of patients requiring either IVIG or SCIG treatment in the Atlantic Provinces over the last three fiscal years.

New Brunswick's incidence rate has fluctuated over the past few years with a large increase in 2015/16 to 24 new cases per 100,000 and then a decrease of 1 in 2016/17 to 23. Nova Scotia exhibited a large decrease in 2015/16 to 16 new cases however in 2016/17 had a large increase to 22. Prince Edward Island is the only Atlantic Province that exhibits a declining trend over the past 3 years with the total of 17 new cases in 2016/17 per 100,000 population while Newfoundland and Labrador exhibits an increasing trend over the past 3 years and currently has 25 new cases for 2016/17.

Figure 8
Incidence of Cases on IVIG and SCIG
(per 100,000 pop)



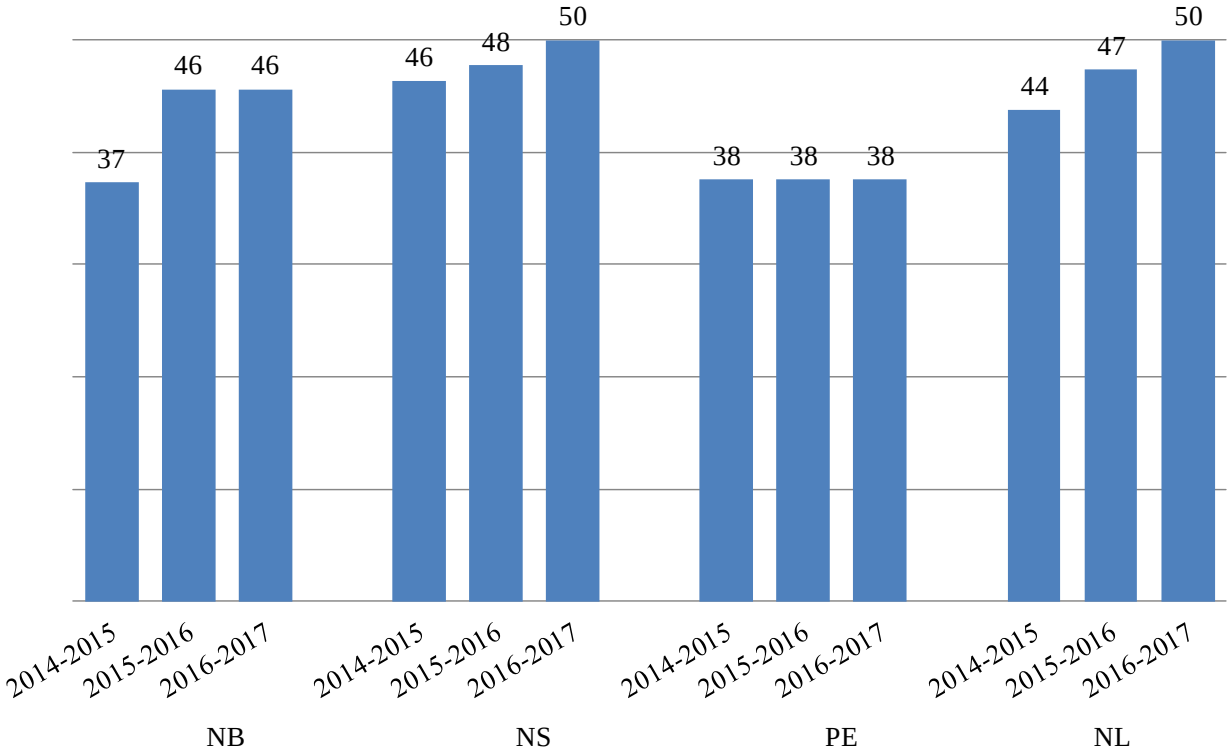
6.2 Prevalence

Prevalence is broadly defined as the proportion of individuals in a population having a disease. In this case, prevalence refers to the proportion of individuals (calculated per 100,000 population) that are receiving IVIG and/or SCIG.

Figure 9 shows that the prevalence rate for individuals requiring either IVIG or SCIG increased in Nova Scotia and Newfoundland & Labrador while New Brunswick and Prince Edward Island remained the same again this fiscal year.

Figure 9

Prevalence of Cases on IVIG and SCIG
(per 100,000 pop)



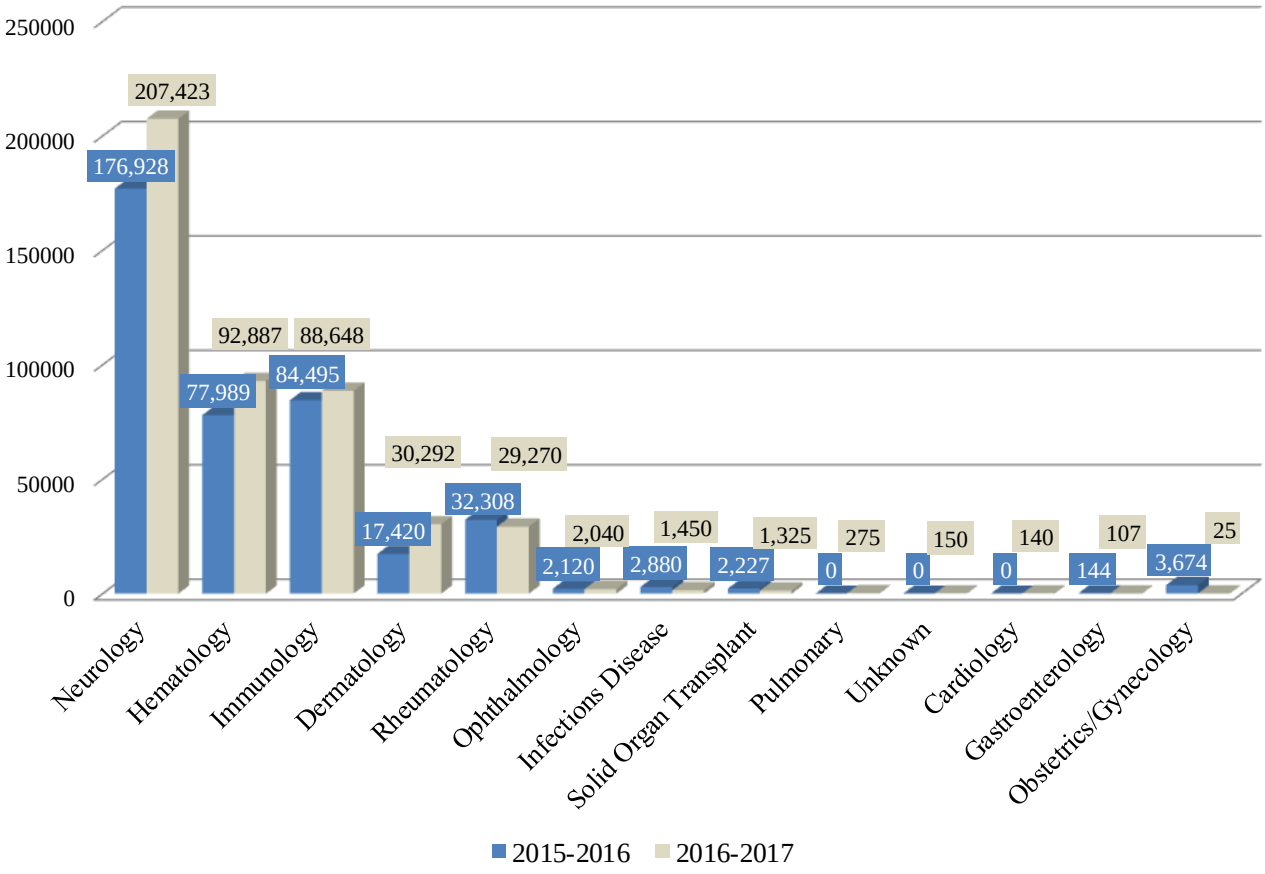
7 Disease Categories and Indications

When IVIG was first introduced in the early 1980s, it was used exclusively for immune deficiencies. Since that time the number of indications for its use has expanded across a wide range of specialties.

Figure 10 shows the total grams of Atlantic IVIG and SCIG used by major disease categories in the last two fiscal years. It is important to consider that the disease category is based on the categorization of the indication for use and does not necessarily reflect the specialty of the ordering physician.

Figure 10

IVIG and SCIG (g) Use By Disease Category in the Atlantic Provinces

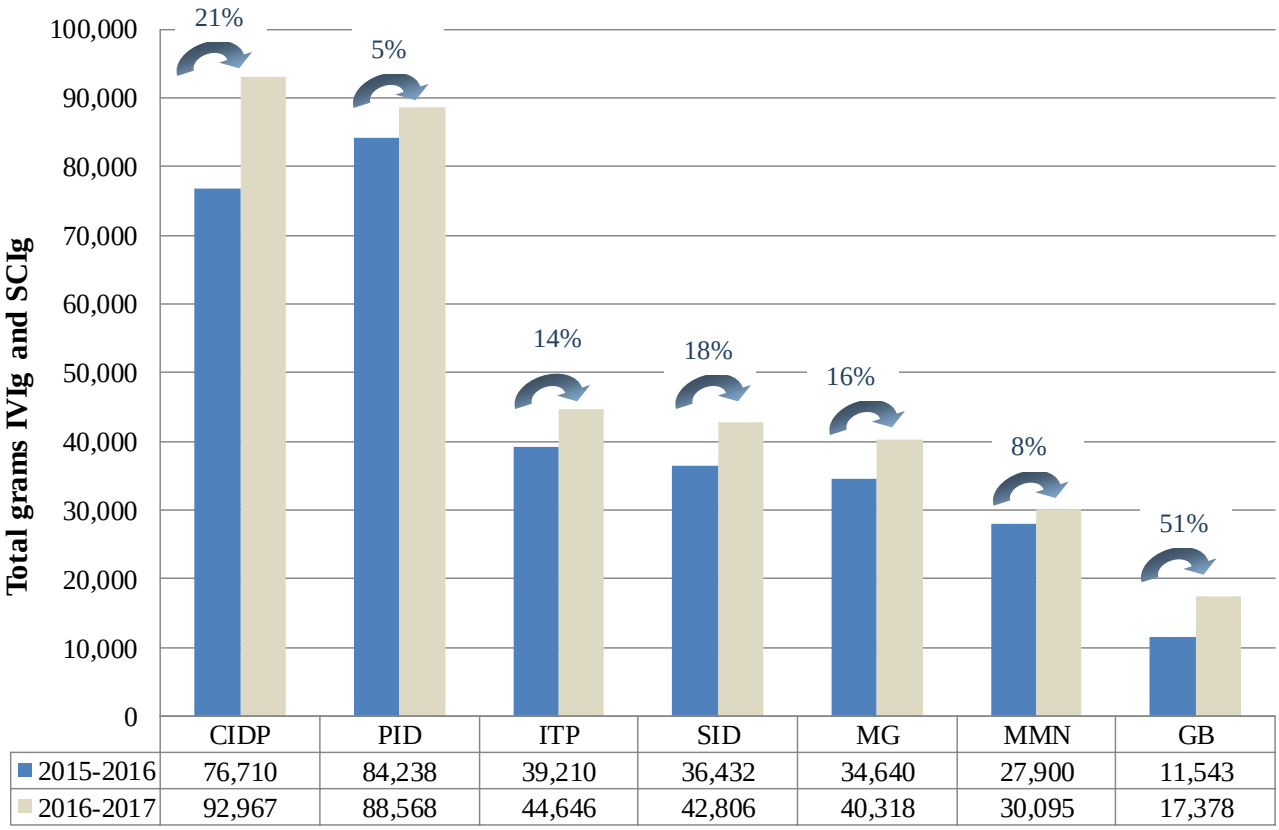


There was a rise in use of IVIG and SCIG for neurological conditions by 17%, hematological conditions by 19%, immunological conditions by 5% and dermatological conditions by 74% in 2016/17 of what it was in 2015/16. Rheumatological conditions saw a *decrease* of 3,038 grams exhibiting a decline by 9.4% of what it was in the previous year, as did Ophthalmological, Infectious Disease, Solid Organ Transplant, Gastroenterological and Obstetrics/Gynecological. There was use in Pulmonary and Cardiology conditions during this fiscal year when there was none in the last fiscal year. There was one condition that remains unknown.

Figure 11 shows the total IVIG and SCIG used in each of the most common indications in the Atlantic Provinces in the last three fiscal years.

Figure 11

IVIG and SCIG Use by Indication in the Atlantic Provinces



	CIDP	PID	ITP	SID	MG	MMN	GB
2015-2016	76,710	84,238	39,210	36,432	34,640	27,900	11,543
2016-2017	92,967	88,568	44,646	42,806	40,318	30,095	17,378

There was an increase in all nine of the most common indications during 2016/17. The largest increase was for Guillain-Barre Syndrome (GBS) followed by Chronic Inflammatory Demyelinating Polyradiculoneuropathy (CIDP) and Primary Immune Deficiency (PID).

Graphs showing provincial utilization of IVIG and SCIG for all nine most common indications for IVIG/SCIG use can be found in Appendix A.

Table 4 shows the comparison of the top five indications by usage of IVIG and SCIG (g) in each Atlantic province during 2016/17. While not all provinces have the same top three indications for use, they do all share commonalities in their lists.

Table 4: Top Indications

NB		NS		PE		NL	
Indication	**g**	**Indication**	**g**	**Indication**	**g**	**Indication**	**g**
SID	21,900	PID	54,174	CIDP	12,255	CIDP	22,825
CIDP	21,543	CIDP	36,345	PID	3,715	ITP	14,682
PID	18,611	MG	17,528	SPS	2,790	MG	13,035
ITP	10,546	ITP	16,903	ITP	2,515	PID	12,068
MG	9,135	MMN	13,800	MMN	2,300	SID	9,887

In 2016/17 the highest amount of IVIG/SCIG was used for Primary immune deficiency in Nova Scotia. This was the third ranked indication by amount of IVIG/SCIG use in New Brunswick and the second ranked indication in Prince Edward Island. Use of IVIG for Chronic Inflammatory Demyelinating Polyradiculoneuropathy (CIDP) was ranked highest in Newfoundland and Labrador and Prince Edward, second in Nova Scotia and New Brunswick. This indication has become the highest user of IVIG in the Atlantic Provinces.

8 Request Approval Process

In an effort to optimize the appropriate use of IVIG, the Atlantic Blood Utilization Strategy (ABUS) Working Group developed an Atlantic-wide IVIG request approval system. Through this process, requests for IVIG are reviewed to determine if the indication, as well as the dosing, frequency and duration of treatment, meet the guidelines for use. In the event of a discrepancy, the ordering physician is contacted and discussion ensues regarding the variation. If the ordering physician continues to feel that a given case merits a change from the guidelines, he or she is asked to discuss the case with a consultant with the relevant clinical expertise. The pathway thus taken by the request is allocated a number representing the route it took for its approval. These pathway numbers are recorded and submitted for each and every new request of IVIG.

The distribution of the Atlantic request approval pathways taken by new IVIG orders during 2016/17 is as follows: 1,597 requests passed through the approval process. There were 1,097 (69%) requests that met the guidelines upon initial submission. Out of the remaining 500 orders, 41 (8%) were for indications not listed in the guidelines (non neurology, non immunology and non hematology

patients). Of the remaining 459 orders, consultation occurred between the ordering physician and Blood Transfusion Services staff and/or the clinical expert in 42 (9%) of the cases while 417 (91%) orders were dispensed as requested when a clinical expert consultation was required but did not occur.

Where a consult happened, 16 (38%) were revised to meet the guideline after consultation with Blood Transfusion Services staff or the clinical expert, 25 (60%) were dispensed as requested despite consultation with a clinical expert and 1 (2%) request was **withdrawn** after the ordering MD consulted with the clinical expert.

Table 5: Request Approval Pathways

Pathway	Description	NB	NS	PEI	NL	Atlantic
1	Request was for an indication not listed in the guidelines	28	4	5	4	41
2	Request met the guidelines upon initial submission	334	261	63	439	1,097
3	Request was **revised** to meet the guidelines after discussion with BTS staff	1	3	0	4	8
4	Request was **withdrawn** after discussion with BTS staff	0	0	0	0	0
5	Request was **revised** to meet the guidelines after the ordering MD consulted with the clinical expert	1	1	2	4	8
6	Request was **withdrawn** after the ordering MD consulted with the clinical expert	0	0	0	1	1
7	The original request was granted even after the ordering MD consulted with the clinical expert	0	1	7	17	25
8	Consultation with the clinical expert was required but did not occur	11	398	3	5	417
Total		375	668	80	474	1,597

9 Appropriateness of Use

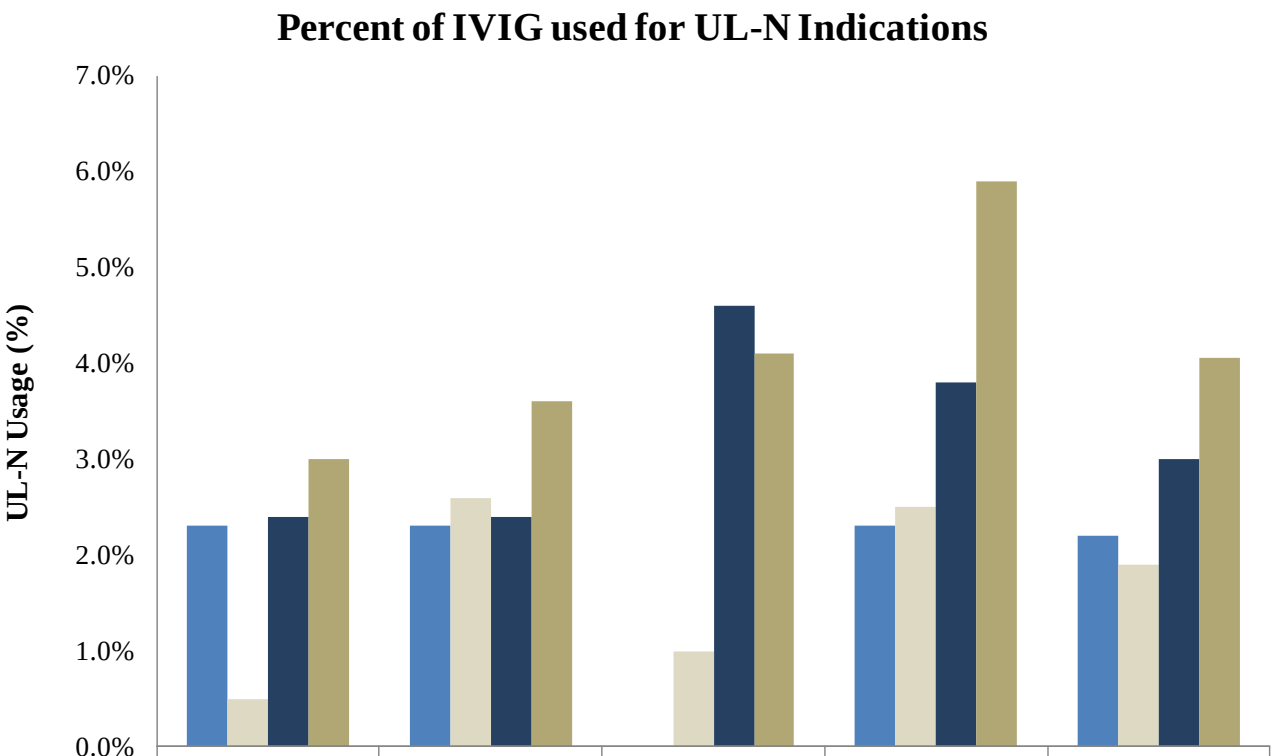
9.1 Appropriateness of Indications

When IVIG utilization data is received by the NSPBCP, the indications for the use of IVIG are categorized based on their appropriateness for use with this product. The following describes the categories used:

Category	Explanation
L (labeled/licensed)	The manufacturer can advertise the use of IVIG for these conditions.
UL-I (unlabeled, indicated)	The manufacturer cannot advertise the use of IVIG for these conditions, but there is some evidence to support its use.
UL-N (unlabeled, not indicated)	There is no evidence to support the use of IVIG for these conditions.
II (insufficient information)	The NSPBCP was unable to obtain sufficient information. In most cases the indication provided is only a symptom or overly general diagnosis rather than the specific indication for the use of IVIG. This category is addressed in the Data Collection section of this report.

Figure 12 shows the proportion of IVIG used for Unlabelled, not indicated (UL-N) conditions in the Atlantic Provinces.

Figure 12



	NB	NS	PE	NL	Atlantic
2013-2014	2.3%	2.3%	0.0%	2.3%	2.2%
2014-2015	0.5%	2.6%	1.0%	2.5%	1.9%
2015-2016	2.4%	2.4%	4.6%	3.8%	3.0%
2016-2017	3.0%	3.6%	4.1%	5.9%	4.1%

This year, Atlantic use of IVIG for UL-N indications increased from 3% in 2015/16 to 4.1% of the total use. Every province exhibited an increase except Prince Edward Island.

Table 6 lists the Atlantic UL-N indications for IVIG during 2016/17 fiscal year by total grams utilized.

Table 6: UL-N Indications

Indication	IVIG(grams)
1. Chronic Urticaria	7,130
2. Rapid-Onset Obesity with Hypothalamic Dysfunction, Hypoventilation and Autonomic Dysregulation (ROHHAD)	2,795
3. Neutrophilic Panniculitis	1,000
4. Lichen Planus	960
5. Pityriasis Rubra	885
6. Transverse Myelitis	850
7. Vasculitis Neuropathy	790
8. Gestational Pemphigoid (Unresponsive to Steroids)	310
9. Acute Autoimmune Mediated Ataxia	275
10. Bronchial infections	275
11. Polyarthritis/polychondritis/lytic bone lesions	275
12. CMV pneumonia	240
13. Seizures	183
14. Acute Hemolytic Anemia	170
15. Autoimmune Retinopathy	150
16. Myocarditis	140
17. Paraneoplastic Neuropathy	125
18. Crohn's Disease	107
19. Inclusion Body Myositis	100
20. Paraneoplastic Cerebellar Degeneration	100
21. Thrombotic thrombocytopenic purpura	100
22. Leukemia	89
23. Gangrene	80
24. Refractory thrombocytopenia	45
Total	**17,173**

Because the price per gram varies depending on both availability and U.S. dollar exchange rates, it is imperative that IVIG be utilized appropriately with the goal being to reduce the amount used for conditions where it is not likely to be of clinical benefit (UL-N indications) to as close to zero grams as possible. Just under $1.1million was spent for UL-N indications in Atlantic Canada this year. This is an increase of 88% from 2015/16.

9.2 IgG Levels for Immune Deficiencies

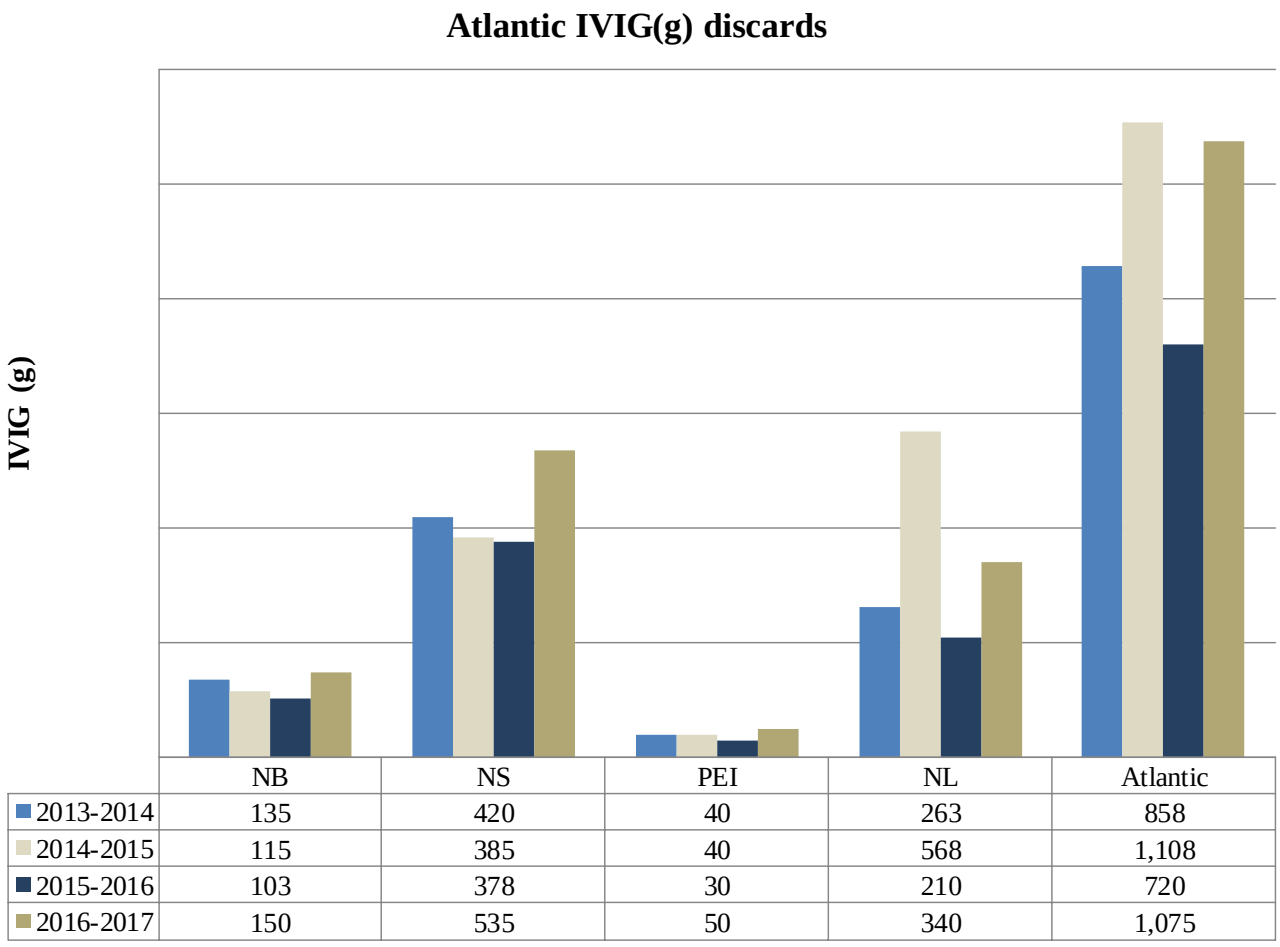
When patients are receiving IVIG or SCIG for the treatment of immune deficiencies, it is recommended that serum IgG trough levels be measured on a regular basis and the dose of IVIG and SCIG be adjusted to keep the IgG level between the target range of 7 and 10g/L.

While reviewing the data for 2016/17, it was discovered that IgG levels entered by the data submitters into IVIN were not trough levels. After further investigation, it was apparent the IgG levels in IVIN could not be analyzed as many times the recorded level was taken a day or two after the patient received their IVIg infusion when their IgG level was at a peak rather than a trough.

10 Discards

One goal of the NSPBCP is to optimize appropriate use as well as to minimize wastage. Figure 15 shows a summary of the discarded IVIG during this past fiscal year in the Atlantic Provinces.

Figure 15



	NB	NS	PEI	NL	Atlantic
2013-2014	135	420	40	263	858
2014-2015	115	385	40	568	1,108
2015-2016	103	378	30	210	720
2016-2017	150	535	50	340	1,075

The total discards increased from 720g in 2015/16 to 1,075g in 2016/17.

Increases in discards were seen in all Atlantic Provinces. The cause of the majority of wastage of IVIG in this fiscal year was breakage and returned to lab temperature/visually unacceptable.

Table 7 summarizes the reasons given for the amount (g) of discarded product discussed above.

Table 7: Reasons for IVIG discards

Reasons	NB	NS	PEI	NL	Atlantic
Broken	95	160	5	165	425
Expired	0	5	0	20	25
Incorrectly reconstituted	10	0	0	0	10
Product failed to reconstitute properly	0	10	0	0	10
Reconstituted, not used	10	5	5	0	20
Returned to lab temperature/visually unacceptable	0	90	40	125	255
Spiked not transfused/sterility/integrity of product compromised	35	265	0	30	330
Total	**150**	**535**	**50**	**340**	**1,075**

It is recommended that the data on discards continue to be collected and monitored. In order to minimize the discards, continuous education regarding the care for and the use of IVIG and early return of the unused products to the laboratory if not transfused should be emphasized.

11 Dosing Intravenous Immune Globulin (IVIG) Based on Dosing Body Weight (DBW)

Adverse reactions like hemolysis are substantially more likely to happen when a high dose of IVIG is infused. Some Canadian jurisdictions have made recommendations to use adjusted weight based dosing instead of actual patient weight. Dosing weight, an intermediate between ideal body weight and actual body weight, was developed to more accurately dose IVIG. With most of the IVIG being used for appropriate indications and dosing, dosing IVIG based on an adjusted body weight rather than on actual weight may add to safety from hemolysis and may decrease the use of IVIG in patients with a high deviation from ideal body weight.

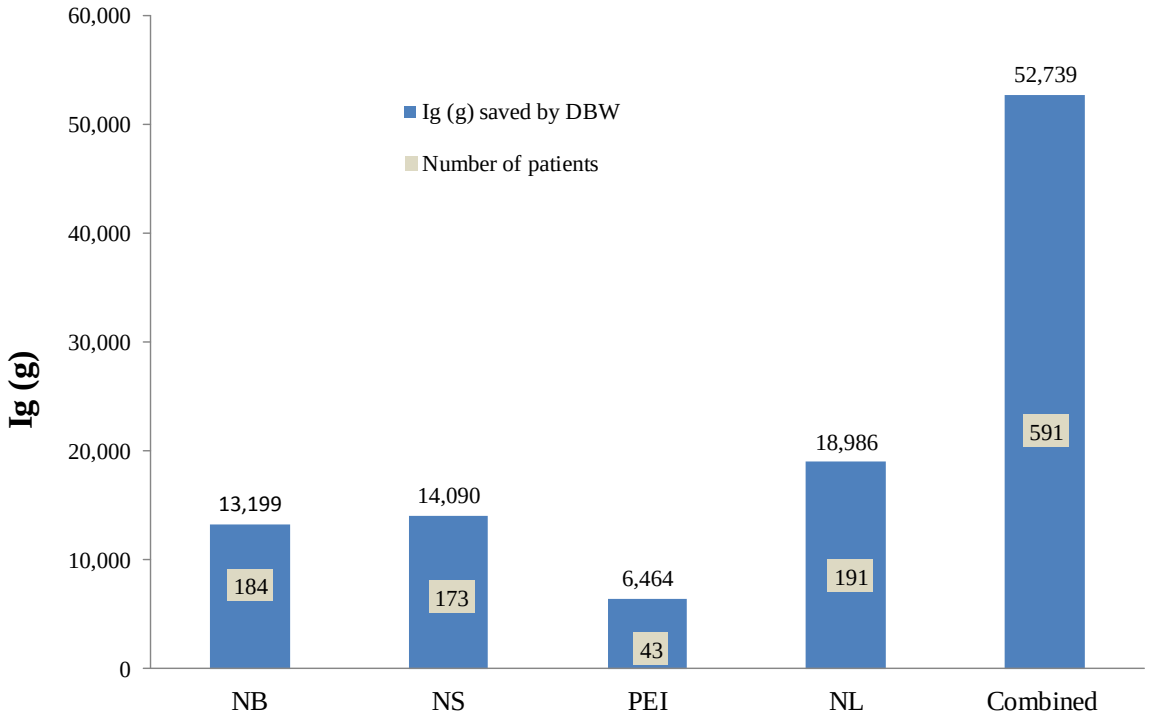
Actual body weight (which includes the weight of adipose tissue of the patient) is used for calculating the dose of fat soluble drugs. As intravenous immunoglobulin is not lipid soluble, an adjusted body weight is appropriate to use for dosing.

Patients with Gillian Barré Syndrome and Solid Organ Transplant are excluded from dosing body weight. Also patients less than 5ft in height and those having a lack of expected clinical response are also excluded. These four categories are not included in the calculations of savings.

Figure 16 reveals the total grams saved of IVIG for this fiscal year and the number of patients dosed according to DBW.

Figure 16

Savings Using Dosing Based on Adjusted Body Weight (DBW)



In 2016/2017, 1,143 Atlantic patients received immunoglobulin. Of the 897 patients eligible, 591 (66%) were dosed based on adjusted body weight resulting in an avoidance of 57,739 grams worth $3,289,859.

12 Subcutaneous Immunoglobulin

12.1 Atlantic Guidelines

In 2012, Atlantic guidelines for Subcutaneous Immunoglobulin Home Administration Programs were approved and disseminated after stakeholder feedback and a pilot implementation. The guidelines included appropriate indications, dosing, and the patient education material for push and pump methods of self administration. At this time the only labeled use of SCIG are for PID and SID.

In total there were 108 patients on SCIG in the Atlantic Provinces this year, up from 99 in 2015/16. There were 4 new patients on SCIG in Nova Scotia bringing a total to 64 cases. New Brunswick had 6 new patients bringing their total to 24 patients, Newfoundland and Labrador

did not have any new cases, keeping the total of patients at 19 and and Prince Edward Island decreased from 2 patients to 1.

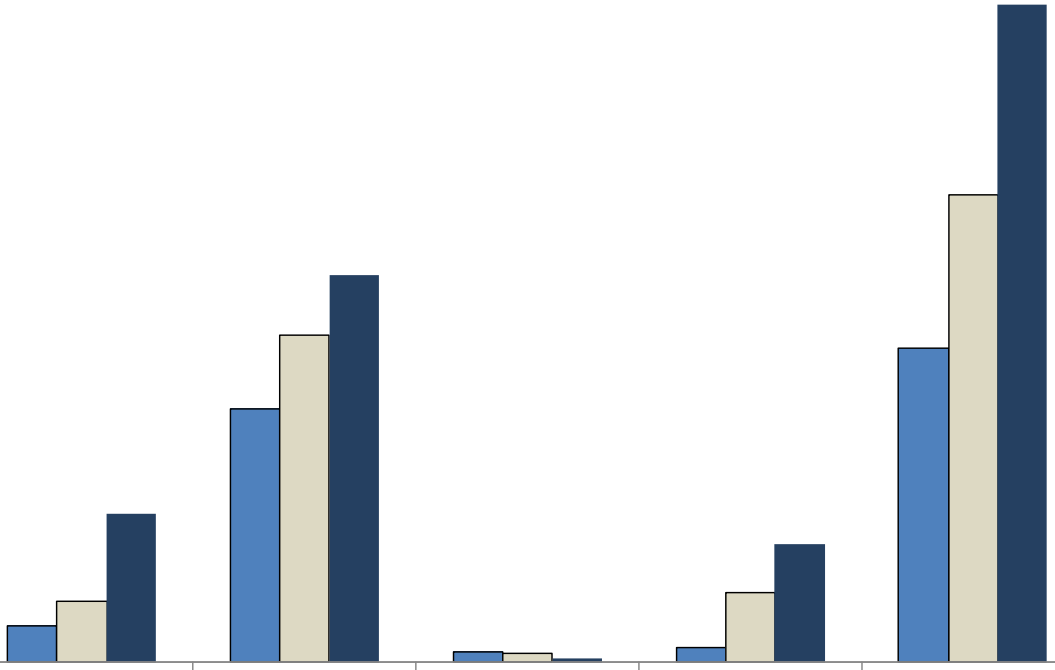
In 2016/17, SCIG was licensed to be used for both Primary Immune Deficiencies and Secondary Immune Deficiencies. 36,644 grams of SCIG was distributed in the Atlantic Provinces, an increase from 26,012 grams in 2015/16.

Home administration of SCIG has successfully helped transition patients from depending on hospital administration of this product to administering in the comfort of their own home.

We expect this program to continue to grow in Atlantic Canada as patients and practitioners are becoming more aware of the health benefits and cost savings associated with home administration. A 2013 Transfusion Medicine article estimated that SCIG treatment, rather than IVIG treatment, reduced cost to the healthcare system per patient of $5,736 over 3 years, principally due to less use of hospital personnel.

Figure 17

Distribution of SCIG (g) in the Atlantic Provinces



	NB	NS	PEI	NL	Atlantic
2014-2015	2,010	14,102	566	840	17,518
2015-2016	3,408	18,231	464	3,909	26,012
2016-2017	8,280	21,539	240	6,585	36,644

Table 8: Number of SCIG Patients

Fiscal Year	Province	# Patients Receiving SCIG
2015-2016	NB	18
	NS	60
	PE	2
	NL	19
	Atlantic	101
2016-2017	NB	24
	NS	64
	PE	1
	NL	19
	Atlantic	108

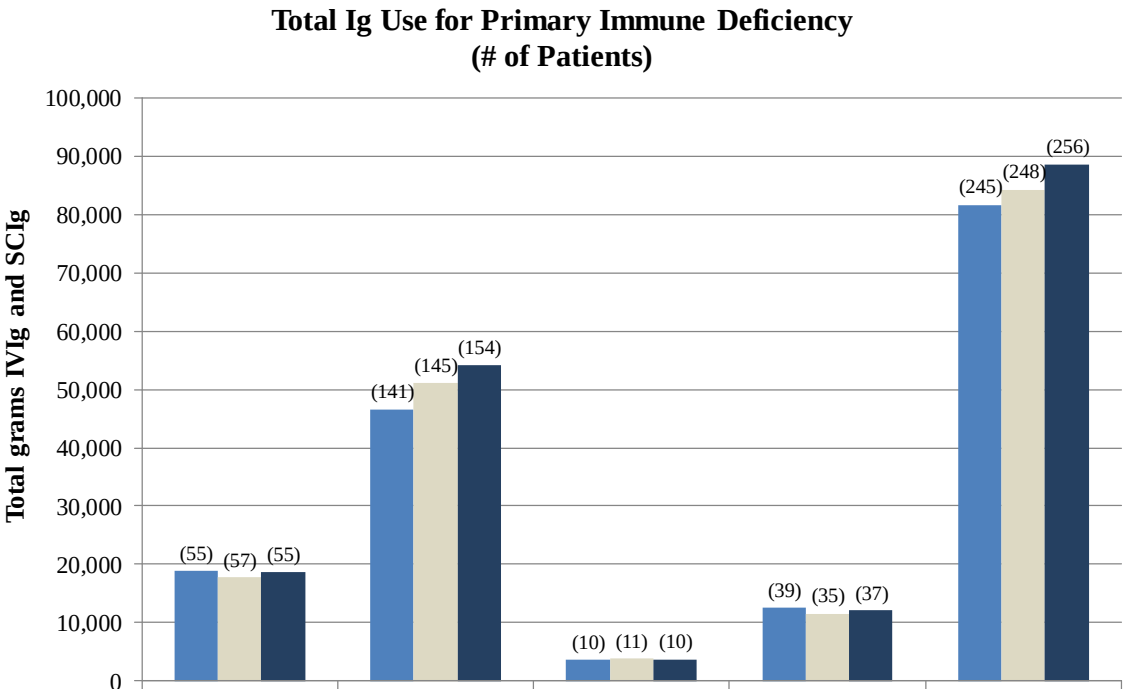
13 Recommendations

During the June 30, 2017 Atlantic Blood Utilization Stategy (ABUS) working group meeting, the following recommendations were made:

- Provide education to blood bank technologists regarding:
    - The importance of having an order in the lab prior to dispense of product, ensure it is written in SOPs
    - Develop a formal process to train the technologists reviewing the orders
- Implement processes such as New Brunswick has to better control growth of inappropriate ordering:
    - Review orders prior to dispense
    - Outcome questionnaires for UL-N orders
    - Letters to physicians:
        i. Not dosing by DBW
        ii. Lowest dose possible to achieve clinical effectiveness
        iii. Evidence to support the use if not meeting criteria
- Determine why there are such variances in the grams ordered vs. the grams dispensed
- Determine if increase is utilization is DBW related, increasing in dosing and/or frequency
- Determine the process for re-inventorying product outside of the lab for longer than 30 minutes

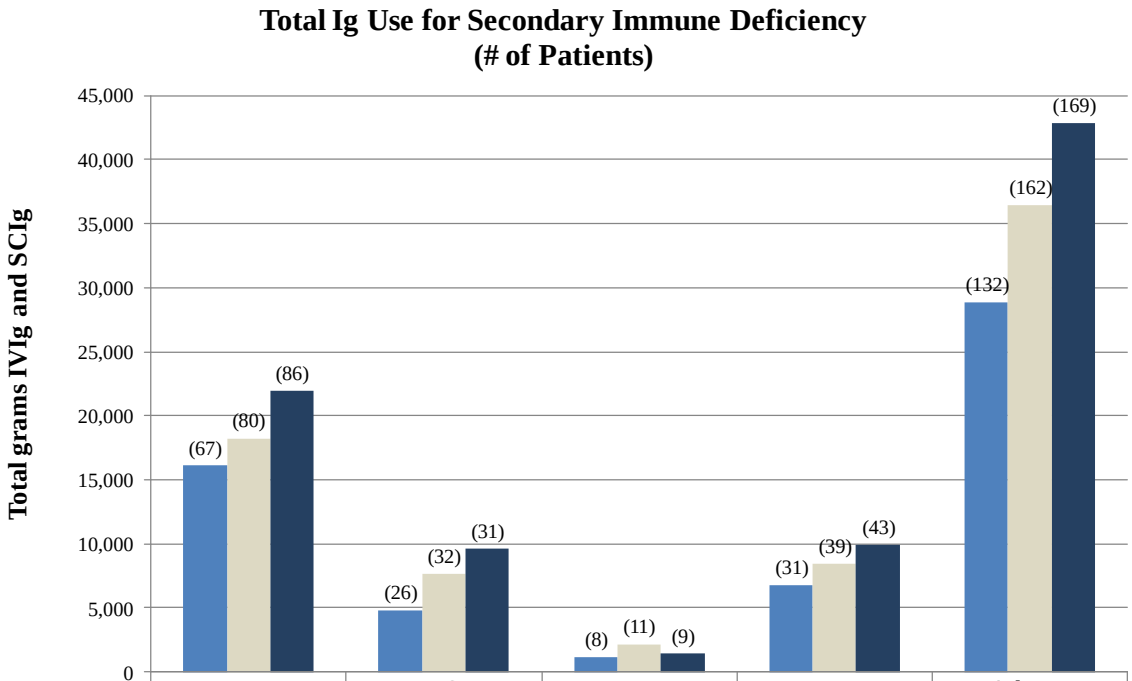
Appendix A per Capita Utilization of IVIG/SCIG for Most Common Indications

Figure A1



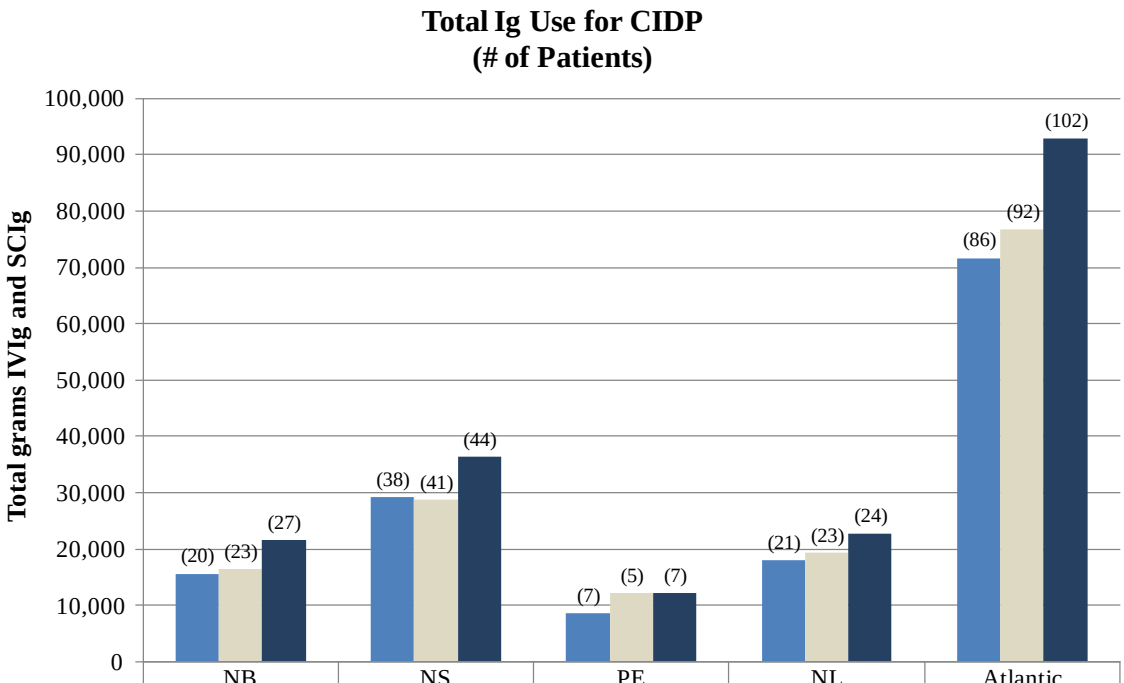
	NB	NS	PE	NL	Atlantic
2014-2015	18,899	46,509	3,703	12,522	81,632
2015-2016	17,710	51,067	3,861	11,600	84,238
2016-2017	18,611	54,174	3,715	12,068	88,568

Figure A2



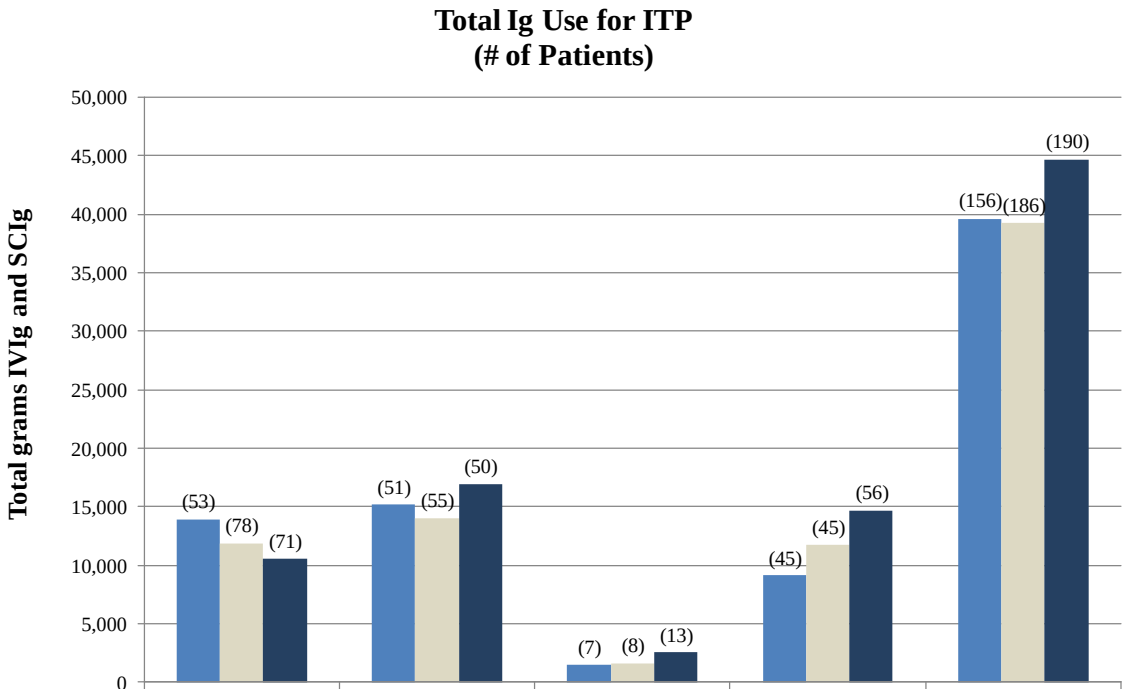
	NB	NS	PE	NL	Atlantic
2014-2015	16,095	4,798	1,140	6,801	28,834
2015-2016	18,224	7,629	2,160	8,419	36,432
2016-2017	21,900	9,605	1,415	9,887	42,806

Figure A3



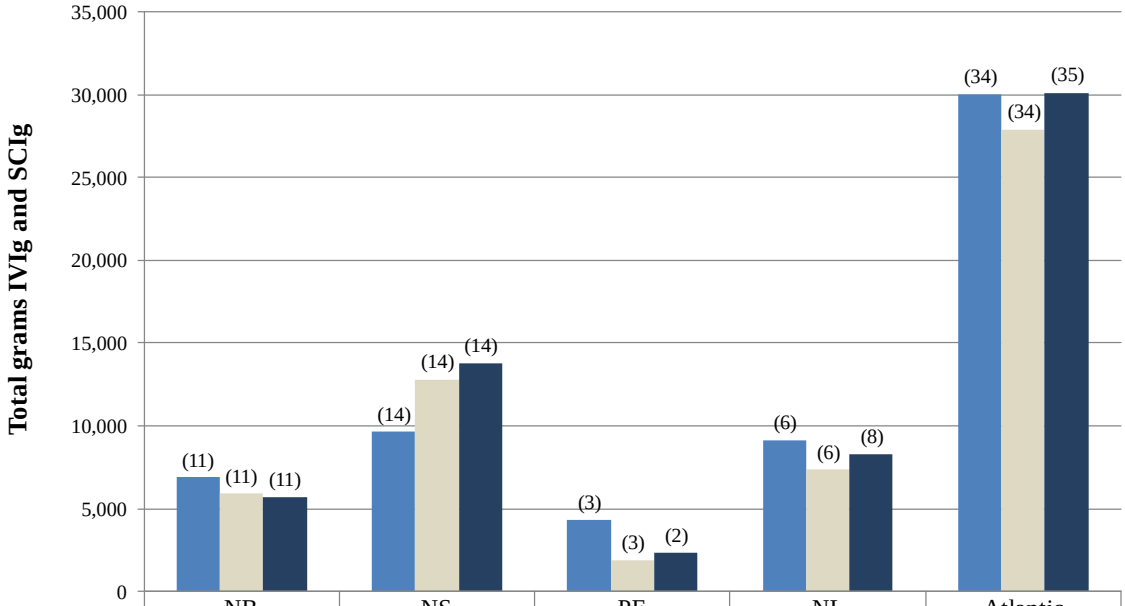
	NB	NS	PE	NL	Atlantic
2014-2015	15,659	29,250	8,680	18,125	71,714
2015-2016	16,435	28,750	12,260	19,265	76,710
2016-2017	21,543	36,345	12,255	22,825	92,967

Figure A4



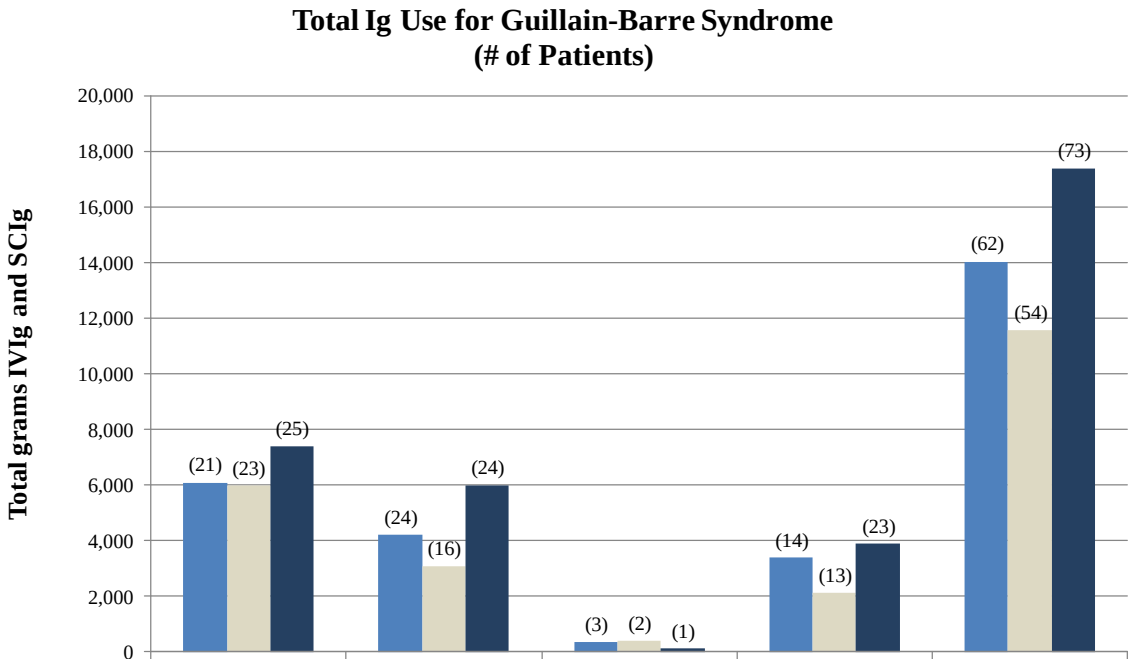
	NB	NS	PE	NL	Atlantic
2014-2015	13,898	15,157	1,460	9,105	39,620
2015-2016	11,869	14,018	1,600	11,723	39,210
2016-2017	10,546	16,903	2,515	14,682	44,646

Figure A5



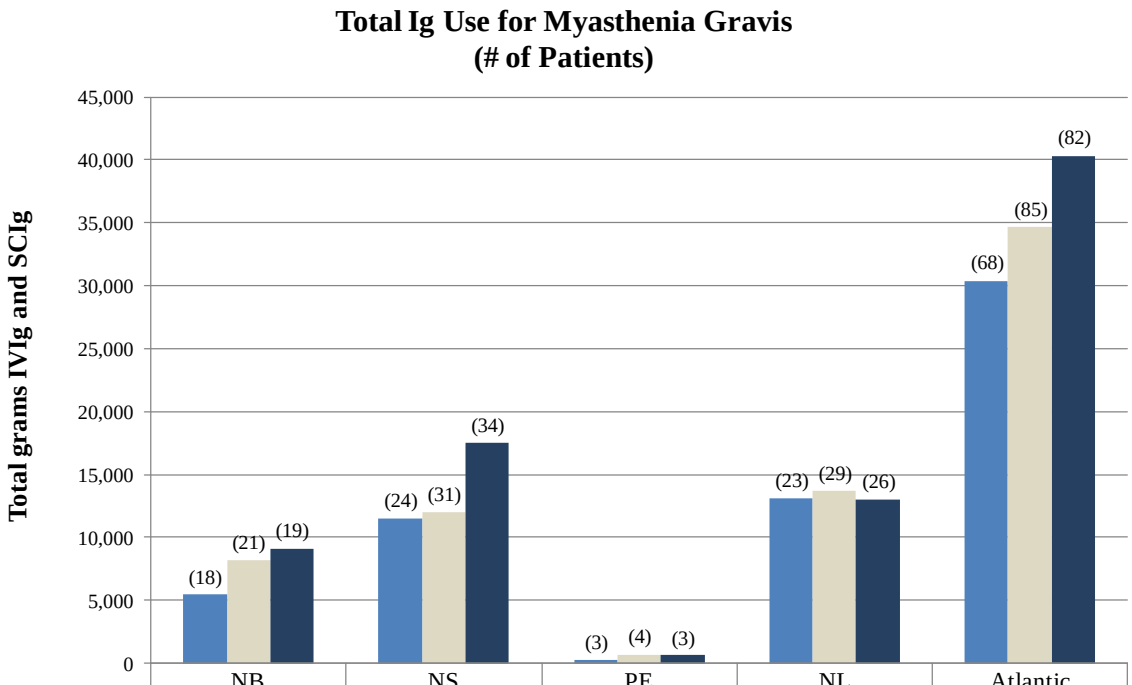
	NB	NS	PE	NL	Atlantic
2014-2015	6,875	9,650	4,310	9,145	29,980
2015-2016	5,900	12,785	1,880	7,335	27,900
2016-2017	5,715	13,800	2,300	8,280	30,095

Figure A6



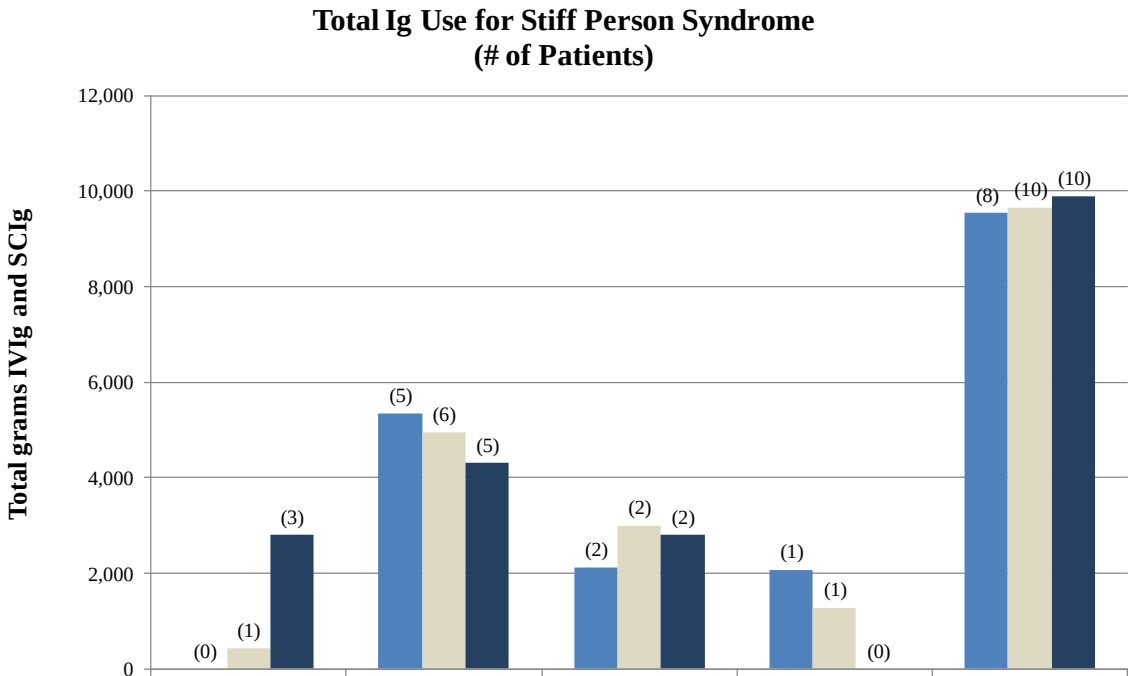
	NB	NS	PE	NL	Atlantic
2014-2015	6,086	4,188	355	3,385	14,013
2015-2016	5,964	3,081	395	2,103	11,543
2016-2017	7,393	5,998	110	3,878	17,378

Figure A7



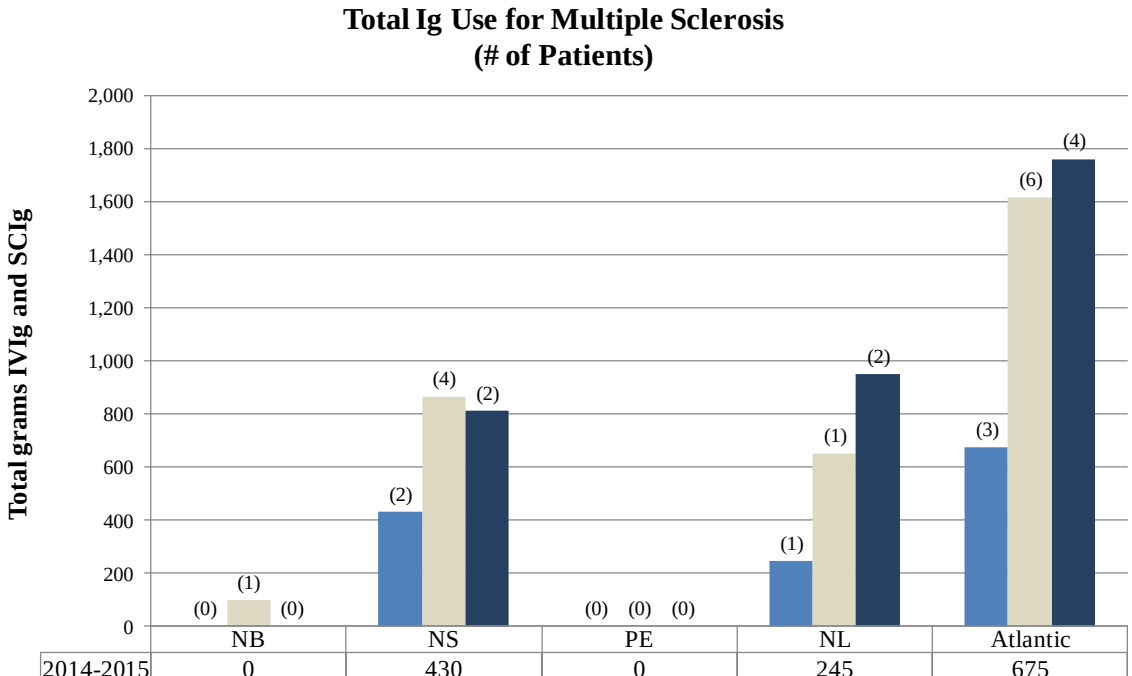
	NB	NS	PE	NL	Atlantic
2014-2015	5,438	11,525	300	13,128	30,390
2015-2016	8,205	12,010	715	13,710	34,640
2016-2017	9,135	17,528	620	13,035	40,318

Figure A8



	NB	NS	PE	NL	Atlantic
2014-2015	0	5,340	2,120	2,075	9,535
2015-2016	435	4,940	3,000	1,280	9,655
2016-2017	2,800	4,300	2,790	0	9,890

Figure A9



	NB	NS	PE	NL	Atlantic
2014-2015	0	430	0	245	675
2015-2016	100	865	0	650	1,615
2016-2017	0	810	0	950	1,760

Appendix B Year to Year New and Chronic Patients on IVIG and SCIG

Figure B1 below shows the distribution of new and chronic patients (both Adult and Pediatric) in each Atlantic province from 2014/15 to 2016/17.

Figure B1