

Katanic, Janine

From: Goerner, Frank <fgoerner@Queens.Org>
Sent: Monday, January 27, 2020 3:40 PM
To: Katanic, Janine; Schippers, Dale
Cc: Chadwick, Darlena
Subject: [External_Sender] RE: [EXTERNAL] Additional information request re: dosimetry estimates
Attachments: Additional information for May 2019 NRC inspection, Jan27, 2020.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Dr. Katanic,

Attached is our response to your below questions.

Frank Goerner, Ph.D.

Medical Physicist
The Queen's Medical Center
Office: (808)691-7063
Fax: (808)691-4507

From: Katanic, Janine <Janine.Katanic@nrc.gov>
Sent: Friday, January 10, 2020 4:59 AM
To: Schippers, Dale <dschippers@Queens.Org>; Goerner, Frank <fgoerner@Queens.Org>
Subject: [EXTERNAL] Additional information request re: dosimetry estimates

Aloha Dale/Frank,

I'm hoping that you can provide some additional information regarding the dosimetry program and your 6/24/2019 dosimetry evaluation, as the inspection is still open.

1. Provide an overview of the dosimetry methods used for the IR physicians from 2011 to present. Was the same dosimetry system and methodology used during the entire time or did it change? Explain the number, type, location, and frequency of exchange of dosimeters that were expected to be worn by the IR physicians (i.e. collar, torso, under lead, over lead, lead correction) and what methodology would normally be used to assign dose (i.e. EDE 1, EDE2). Provide the name of the dosimetry vendor and has it been the same since 2011.
2. In your 6/24/2019 dosimetry evaluation you used a methodology to assign dose to those individuals that were not wearing their dosimeters. In this regard, you used Drs. [REDACTED] and [REDACTED] as examples of individuals that wore badges. For Dr. [REDACTED] your table only gives partial data, and Dr. [REDACTED] appears to have years where he didn't wear a dosimeter but became more compliant starting in 2017. Further describe or demonstrate that your use of the [REDACTED] data is appropriate and conservative. Case load and case type will be highly variable across the IR physicians. Are the [REDACTED] and [REDACTED] case complexities representative of the other IR physicians? For example you noted that Dr. [REDACTED] often used a different machine – so does his data need to be evaluated differently? Can machine data be extracted? Were the machines used in 2011 the same as the equipment used in the subsequent years? Your [REDACTED] data is based on recent years; perhaps in earlier years when he was not wearing a dosimeter the equipment was less refined and more dose intensive. Additional information is needed to support your use of per case EDE= 2 mrem; SDE & LDE = 5 mrem; and that less than 10 cases is M. While we want your estimates to be realistic, we need more information and rationale to support the methodology.

3. Your 6/24/2019 dosimetry evaluation addresses in part [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED]. Were there any other IR physicians that worked at Queens and were involved in the Y-90 program but are no longer with Queens and were not included in the evaluation? If so, please include those individuals.
4. Additional information is needed about occupational dose received from other NRC licensed or non-licensed facilities. Two questions: (1) while working at Queens, did any of the IR physicians receive occupational radiation dose at any other facility? If no, a definitive statement to that effect needs to be made. If yes, then that occupational dose would need to be included in your annual estimates. (2) Several of these IR physicians (i.e. [REDACTED], [REDACTED], [REDACTED]) show mid-year start dates at Queens. For example, Dr. [REDACTED] started in August 2018. When he started Queens should have either obtained his calendar year 2018 prior occupational dose or an estimate of his calendar year prior dose should have been made. Do you have that data? It needs to be included in your annual estimates. For example [REDACTED] started at Queens in August 2014 and for the 5 months you estimate EDE2 as 760 mrem. You need to provide his annual dose. How do you know that in the months prior to starting at Queens he didn't receive 4500 mrem and therefore he would be over the annual limit based on your estimate.
5. Of all of these IR physicians [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED] as well as any others who might have left, do you have any way to identify how many Y-90 cases were performed or observed by each during each year? For example, Dr. [REDACTED] started in 2014. Did he perform or observe any Y-90 in 2014, 2015, etc.? If there is no practical way to obtain this info, is there an estimate of how many Y-90 procedures were performed by each? Or are you just making the assumption that any of these IR physicians could have performed or observed at least one Y-90 procedure each year? What is the dose contribution from each Y-90 procedure?
6. For each of the IR physicians, we need the full data in the tables, including a column for number of procedures, and to continue the data in the tables through the end of 2019 if possible. Clarify what is meant by "absent" – does that mean a badge was not turned in as opposed to a badge that was turned in but "unused"? Also: [REDACTED], [REDACTED], [REDACTED] – you didn't provide a table – we need the final data so that we can see the annual estimates; and [REDACTED] and [REDACTED] – you only provided data for months they had an M - we need the final data so that we can see the annual estimates. For those individuals that started mid-year, include the other CY months.
7. After the dose estimates are complete, how does Queens intend on correcting the dosimetry records with the new assigned dose?
8. For the years 2011 – 2019, were annual reports provided to these IR physicians and any others who might have left (i.e. NRC Form 5 or equivalent)?
9. What is the name of the organization/physician group that the IR physicians are contracted under? Has it been the same since 2011?

Thanks

Janine

Janine F. Katanic, PhD, CHP
Senior Health Physicist
Division of Nuclear Materials Safety
Materials Inspection Branch
US Nuclear Regulatory Commission
Region IV
office: 817-200-1151
email: Janine.Katanic@nrc.gov



THE QUEEN'S MEDICAL CENTER

1301 Punchbowl Street ▪ Honolulu, Hawaii 96813 ▪ Phone (808) 538-9011 ▪ FAX: (808) 547-4646

January 27, 2020

Janine F. Katanic, PhD, CHP
Senior Health Physicist
Division of Nuclear Materials Safety
Materials Inspection Branch
US Nuclear Regulatory Commission, Region IV

Dr. Katanic,

This letter addresses your request for additional information pertaining to corrective actions following your inspection on May 28 – 30, 2019.

Each item, as listed in your email of January 10, is listed below with our response.

1. Provide an overview of the dosimetry methods used for the IR physicians from 2011 to present. Was the same dosimetry system and methodology used during the entire time or did it change? Explain the number, type, location, and frequency of exchange of dosimeters that were expected to be worn by the IR physicians (i.e. collar, torso, under lead, over lead, lead correction) and what methodology would normally be used to assign dose (i.e. EDE 1, EDE2). Provide the name of the dosimetry vendor and has it been the same since 2011.

We have used the same vendor, Landauer, and methodology for the time period of 2011 until now. Each IR physician is assigned a collar badge and we use the EDE2 formula to assign their DDE dose. The badges are exchanged on a monthly basis.

2. In your 6/24/2019 dosimetry evaluation you used a methodology to assign dose to those individuals that were not wearing their dosimeters. In this regard, you used Drs. [REDACTED] and [REDACTED] as examples of individuals that wore badges. For Dr. [REDACTED] your table only gives partial data, and Dr. [REDACTED] appears to have years where he didn't wear a dosimeter but became more compliant starting in 2017. Further describe or demonstrate that your use of the [REDACTED]/[REDACTED] data is appropriate and conservative.

Case load and case type will be highly variable across the IR physicians. Are the [REDACTED] and [REDACTED] case complexities representative of the other IR physicians? For example you noted that Dr. [REDACTED] often used a different machine – so does his data need to be evaluated differently?

Can machine data be extracted? Were the machines used in 2011 the same as the equipment used in the subsequent years? Your [REDACTED] data is based on recent years; perhaps in earlier years when he was not wearing a dosimeter the equipment was less refined and more dose intensive.

Additional information is needed to support your use of per case EDE= 2 mrem; SDE & LDE = 5 mrem; and that less than 10 cases is M. While we want your estimates to be realistic, we need more information and rationale to support the methodology.

At the end of this document we updated the dosimetry data for all of the IR physicians. We have now included all of the data for Dr. [REDACTED] and Dr. [REDACTED]. On average, the IR physicians do the same types of exams so the case complexities are representative of the other IR physicians. The exception would be Dr. [REDACTED] since he is involved with the most complex cases.

Since we now have dosimetry and exam volume for each radiologist for the past six months, we determined the average exposure per exam for each radiologist and used this data to estimate previous doses. This better represents the case load and individual practice habits of each radiologist and provides a more accurate estimate.

Dose Per case by Radiologist 6/1/2019-12/31/2019								
	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
EDE2	0.5 mrem	0.9 mrem	1.0 mrem	1.8 mrem	1.4 mrem	1.2 mrem	4.1 mrem	1.3 mrem
LDE	1.8 mrem	2.9 mrem	3.3 mrem	5.9 mrem	4.8 mrem	4.0 mrem	13.8 mrem	4.3 mrem
SDE	1.8 mrem	2.8 mrem	2.2 mrem	5.9 mrem	4.6 mrem	3.9 mrem	13.3 mrem	4.1 mrem

The current fluoroscopy equipment in our IR suites was installed prior to 2011 so the scattered radiation levels are expected to be the same during this time period. We are unable to extract prior exam data (e.g. Air Kerma to the reference point) from our Philips IR fluoroscopy units.

No we do not believe that Dr. [REDACTED] needs to be evaluated differently. It is clear from the amount of dose he gets and from our observations, discussions with him and discussions with his colleagues that he regularly wears his badge.

3. Your 6/24/2019 dosimetry evaluation addresses in part [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED]. Were there any other IR physicians that worked at Queens and were involved in the Y-90 program but are no longer with Queens and were not included in the evaluation? If so, please include those individuals.

We did discover another IR physician ([REDACTED], MD) through our compilation of case numbers for the amount of Y-90 procedures. The additional IR physician worked at Queens from September 2011-November 2012. It is likely that he did some Y-90 cases. However, we have no way of determining how many or if he did any Y-90 cases. We have records of his doses which are included now. We also do not know how many total cases he did in IR so do not have a good method of estimating what his dose should have been.

4. Additional information is needed about occupational dose received from other NRC licensed or non-licensed facilities. Two questions: (1) while working at Queens, did any of the IR physicians receive occupational radiation dose at any other facility?
If no, a definitive statement to that effect needs to be made. If yes, then that occupational dose would need to be included in your annual estimates.

The IR physicians did not receive any occupational dose at other facilities.

(2) Several of these IR physicians (i.e. [REDACTED], [REDACTED], [REDACTED]) show mid-year start dates at Queens. For example, Dr. [REDACTED] started in August 2018. When he started Queens should have either obtained his calendar year 2018 prior occupational dose or an estimate of his calendar year prior dose should have been made. Do you have that data? It needs to be included in your annual estimates.

For example [REDACTED] started at Queens in August 2014 and for the 5 months you estimate EDE2 as 760 mrem. You need to provide his annual dose. How do you know that in the months prior to starting at Queens he didn't receive 4500 mrem and therefore he would be over the annual limit based on your estimate?

We added prior dose to our dose table (listed below) for Drs. [REDACTED], [REDACTED] and [REDACTED].

5. Of all of these IR physicians [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED] as well as any others who might have left, do you have any way to identify how many Y-90 cases were performed or observed by each during each year? For example, Dr. [REDACTED] started in 2014. Did he perform or observe any Y-90 in 2014, 2015, etc.? If there is no practical way to obtain this info, is there an estimate of how many Y-90 procedures were performed by each? Or are you just making the assumption that any of these IR physicians could have performed or observed at least one Y-90 procedure each year? What is the dose contribution from each Y-90 procedure?

Yes we were able to compile the number of Y-90 cases each IR physician did each year starting in 2013, we do not have data for 2011 or 2012.

Number of Y-90 cases per year by IR physician								
	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2013	5	6	0	0	8	5	5	0
2014	3	5	0	9	5	3	7	0
2015	0	11	0	18	14	13	9	0
2016	8	7	0	13	9	12	7	0
2017	5	9	0	14	9	9	9	0
2018	3	8	2	19	17	9	6	6
2019	4	14	59	16	13	9	8	7

We measured the IR physician's exposure during the preparation and administration of Y-90 for 3 cases using a 451P ion chamber. The exposure ranged from 7 – 21 μ R per case.

6. For each of the IR physicians, we need the full data in the tables, including a column for number of procedures, and to continue the data in the tables through the end of 2019 if possible. Clarify what is meant by "absent" – does that mean a badge was not turned in as opposed to a badge that was turned in but "unused"? Also: [REDACTED], [REDACTED], [REDACTED] – you didn't provide a table – we need the final data so that we can see the annual estimates; and [REDACTED] and [REDACTED] – you only provided data for months they had an M - we need the final data so that we can see the annual estimates. For those individuals that started mid-year, include the other CY months.

Absent means that the badge was not turned in and possibly lost.

Unused means the badge was turned in but was not taken out of the saran wrap so assumed to have not been used.

Full tables as requested above are provided at the end of this letter. Note that the annual dose calculation includes any estimated doses as well as dose from previous institution.

7. After the dose estimates are complete, how does Queens intend on correcting the dosimetry records with the new assigned dose?

We will work with Landauer to have the dose estimates added to their exposure history.

8. For the years 2011 – 2019, were annual reports provided to these IR physicians and any others who might have left (i.e. NRC Form 5 or equivalent)?

Form 5 reports were provided to each radiologist for years 2016 through present. Years prior to that, the RSO was different and we do not have any records of Form 5s for those years. Each physician did received the monthly Landauer reports which included their annual dose.

9. What is the name of the organization/physician group that the IR physicians are contracted under? Has it been the same since 2011?

The IR physician group is called Radiology Associates, Inc. The name has been the same since prior to 2011.

Dale Schippers

Dale Schippers, RSO, DABR

Annual Dose by Radiologist

[REDACTED] MD Annual Dose History					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2011	Unknown	419 cases	539 mrem	1813 mrem	1802 mrem
2012	Unknown	373 cases	736 mrem	2472 mrem	2471 mrem
2013	5	553 cases	660 mrem	2218 mrem	2215 mrem
2014	3	333 cases	334 mrem	1117 mrem	1114 mrem
2015	0	278 cases	369 mrem	1238 mrem	1236 mrem
2016	8	557 cases	784 mrem	2645 mrem	2646 mrem
2017	5	454 cases	905 mrem	2557 mrem	2555 mrem
2018	3	416 cases	592 mrem	1998 mrem	1994 mrem
2019	4	433 cases	232 mrem	784 mrem	780 mrem

████████ MD Annual Dose History					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2011	Unknown	516 cases	452 mrem	1509 mrem	1470 mrem
2012	Unknown	525 cases	395 mrem	1239 mrem	1208 mrem
2013	6	652 cases	474 mrem	1584 mrem	1544 mrem
2014	5	691 cases	605 mrem	2021 mrem	1969 mrem
2015	11	475 cases	414 mrem	1383 mrem	1348 mrem
2016	7	439 cases	384 mrem	1284 mrem	1251 mrem
2017	9	807 cases	706 mrem	2360 mrem	2300 mrem
2018	8	503 cases	440 mrem	1471 mrem	1433 mrem

████████ MD Annual Dose History					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2018	2	192 cases	1320 mrem	4405 mrem	4287 mrem
2019	59	886 cases	866 mrem	2893 mrem	2818 mrem

████████ MD Annual Dose History					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2014	9	435 cases	774 mrem	2582 mrem	2561 mrem
2015	18	997 cases	1774 mrem	5917 mrem	5870 mrem
2016	13	947 cases	1547 mrem	5160 mrem	5120 mrem
2017	14	815 cases	1450 mrem	4837 mrem	4798 mrem
2018	19	818 cases	1539 mrem	5164 mrem	5138 mrem
2019	16	500 cases	874 mrem	2914 mrem	2891 mrem

████████ Annual Dose History				
Annual Totals with any Estimations Applied				
	# Cases	EDE2	LDE	SDE
2011	Unknown	152 mrem	511 mrem	511 mrem
2012	Unknown	758 mrem	2545 mrem	2535 mrem

<div> <div></div> MD Annual Dose History </div>					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2011	Unknown	678 cases	884 mrem	2947 mrem	2845 mrem
2012	Unknown	261 cases	518 mrem	1732 mrem	1692 mrem
2013	8	200 cases	446 mrem	1667 mrem	1756 mrem
2014	5	544 cases	662 mrem	2211 mrem	2161 mrem
2015	14	519 cases	599 mrem	2008 mrem	1965 mrem
2016	9	534 cases	599 mrem	1999 mrem	1965 mrem
2017	9	556 cases	367 mrem	1226 mrem	1198 mrem
2018	17	367 cases	472 mrem	1577 mrem	1528 mrem
2019	13	498 cases	729 mrem	2432 mrem	2359 mrem

<div> <div></div> 772 Annual Dose History </div>					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2011	Unknown	274 cases	371 mrem	1238 mrem	1220 mrem
2012	Unknown	261 cases	500 mrem	1683 mrem	1659 mrem
2013	5	200 cases	476 mrem	1769 mrem	1855 mrem
2014	3	544 cases	593 mrem	1984 mrem	1942 mrem
2015	13	519 cases	502 mrem	1684 mrem	1654 mrem
2016	12	534 cases	611 mrem	2039 mrem	2001 mrem
2017	9	556 cases	579 mrem	1933 mrem	1885 mrem
2018	9	367 cases	418 mrem	1398 mrem	1356 mrem
2019	9	326 cases	352 mrem	1174 mrem	1142 mrem

<div> <div></div> MD Annual Dose History </div>					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2011	0	303 cases	1866 mrem	6219 mrem	6019 mrem
2012	0	228 cases	1621 mrem	5447 mrem	5351 mrem
2013	5	322 cases	1378 mrem	4595 mrem	4527 mrem
2014	7	391 cases	1017 mrem	3413 mrem	3353 mrem
2015	9	499 cases	1955 mrem	6535 mrem	6426 mrem
2016	7	526 cases	1692 mrem	5643 mrem	5522 mrem
2017	9	468 cases	977 mrem	3263 mrem	3201 mrem
2018	6	451 cases	1496 mrem	4987 mrem	4840 mrem
2019	8	401 cases	1546 mrem	5155 mrem	4988 mrem

MD Annual Dose History					
Annual Totals with any Estimations Applied					
	Y-90 Cases	# Cases	EDE2	LDE	SDE
2018	6	257 cases	2526 mrem	8467 mrem	8344 mrem
2019	7	394 cases	643 mrem	2157 mrem	2129 mrem

Full Data Tables:

MD Dose History 12/2011-12/2019							
	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Nov 2011	404	511 mrem	1720 mrem	1710 mrem	511 mrem	1720 mrem	1710 mrem
Dec-11	15 cases	28 mrem	93 mrem	92 mrem	28 mrem	93 mrem	92 mrem
Jan-12	9 cases	32 mrem	108 mrem	108 mrem	32 mrem	108 mrem	108 mrem
Feb-12	35 cases	M	M	M	19 mrem	64 mrem	64 mrem
Mar-12	22 cases	59 mrem	201 mrem	201 mrem	59 mrem	201 mrem	201 mrem
Apr-12	20 cases	193 mrem	650 mrem	650 mrem	193 mrem	650 mrem	650 mrem
May-12	62 cases	118 mrem	396 mrem	396 mrem	118 mrem	396 mrem	396 mrem
Jun-12	26 cases	M	M	M	14 mrem	48 mrem	48 mrem
Jul-12	38 cases	M	M	M	21 mrem	70 mrem	69 mrem
Aug-12	44 cases	80 mrem	265 mrem	266 mrem	80 mrem	265 mrem	266 mrem
Sep-12	13 cases	58 mrem	191 mrem	192 mrem	58 mrem	191 mrem	192 mrem
Oct-12	6 cases	1 mrem	3 mrem	2 mrem	1 mrem	3 mrem	2 mrem
Nov-12	41 cases	110 mrem	371 mrem	371 mrem	110 mrem	371 mrem	371 mrem
Dec-12	57 cases	M	M	M	31 mrem	105 mrem	104 mrem
Jan-13	111 cases	176 mrem	591 mrem	591 mrem	176 mrem	591 mrem	591 mrem
Feb-13	57 cases	57 mrem	190 mrem	191 mrem	57 mrem	190 mrem	191 mrem
Mar-13	134 cases	254 mrem	854 mrem	854 mrem	254 mrem	854 mrem	854 mrem
Apr-13	90 cases	15 mrem	50 mrem	50 mrem	15 mrem	50 mrem	50 mrem
May-13	4 cases	M	M	M	M	M	M
Jun-13	0 cases	M	0 mrem	0 mrem	M	0 mrem	0 mrem
Jul-13	22 cases	34 mrem	113 mrem	110 mrem	34 mrem	113 mrem	110 mrem
Aug-13	19 cases	10 mrem	32 mrem	32 mrem	10 mrem	32 mrem	32 mrem
Sep-13	40 cases	35 mrem	117 mrem	118 mrem	35 mrem	117 mrem	118 mrem
Oct-13	39 cases	40 mrem	133 mrem	133 mrem	40 mrem	133 mrem	133 mrem
Nov-13	16 cases	30 mrem	99 mrem	98 mrem	30 mrem	99 mrem	98 mrem
Dec-13	21 cases	M	M	M	11 mrem	39 mrem	38 mrem
Jan-14	50 cases	UNUSED	0 mrem	0 mrem	27 mrem	92 mrem	91 mrem
Feb-14	9 cases	M	M	M	M	M	M
Mar-14	8 cases	0 mrem	1 mrem	M	0 mrem	1 mrem	M

Apr-14	28 cases	41 mrem	139 mrem	140 mrem	41 mrem	139 mrem	140 mrem
May-14	33 cases	4 mrem	14 mrem	15 mrem	4 mrem	14 mrem	15 mrem
Jun-14	50 cases	78 mrem	259 mrem	259 mrem	78 mrem	259 mrem	259 mrem
Jul-14	52 cases	114 mrem	381 mrem	381 mrem	114 mrem	381 mrem	381 mrem
Aug-14	41 cases	17 mrem	56 mrem	54 mrem	17 mrem	56 mrem	54 mrem
Sep-14	4 cases	M	M	M	M	M	M
Oct-14	23 cases	32 mrem	110 mrem	110 mrem	32 mrem	110 mrem	110 mrem
Nov-14	3 cases	M	M	M	M	M	M
Dec-14	32 cases	20 mrem	65 mrem	64 mrem	20 mrem	65 mrem	64 mrem
Jan-15	20 cases	23 mrem	77 mrem	77 mrem	23 mrem	77 mrem	77 mrem
Feb-15	6 cases	4 mrem	14 mrem	13 mrem	4 mrem	14 mrem	13 mrem
Mar-15	41 cases	36 mrem	121 mrem	121 mrem	36 mrem	121 mrem	121 mrem
Apr-15	32 cases	63 mrem	210 mrem	211 mrem	63 mrem	210 mrem	211 mrem
May-15	14 cases	UNUSED	0 mrem	0 mrem	8 mrem	26 mrem	26 mrem
Jun-15	6 cases	9 mrem	29 mrem	29 mrem	9 mrem	29 mrem	29 mrem
Jul-15	23 cases	49 mrem	162 mrem	162 mrem	49 mrem	162 mrem	162 mrem
Aug-15	17 cases	14 mrem	48 mrem	48 mrem	14 mrem	48 mrem	48 mrem
Sep-15	15 cases	26 mrem	87 mrem	86 mrem	26 mrem	87 mrem	86 mrem
Oct-15	45 cases	52 mrem	176 mrem	176 mrem	52 mrem	176 mrem	176 mrem
Nov-15	50 cases	81 mrem	273 mrem	273 mrem	81 mrem	273 mrem	273 mrem
Dec-15	9 cases	5 mrem	15 mrem	14 mrem	5 mrem	15 mrem	14 mrem
Jan-16	12 cases	88 mrem	293 mrem	293 mrem	88 mrem	293 mrem	293 mrem
Feb-16	24 cases	M	M	M	13 mrem	44 mrem	44 mrem
Mar-16	28 cases	46 mrem	153 mrem	152 mrem	46 mrem	153 mrem	152 mrem
Apr-16	54 cases	68 mrem	230 mrem	230 mrem	68 mrem	230 mrem	230 mrem
May-16	55 cases	29 mrem	100 mrem	100 mrem	29 mrem	100 mrem	100 mrem
Jun-16	61 cases	124 mrem	418 mrem	418 mrem	124 mrem	418 mrem	418 mrem
Jul-16	48 cases	15 mrem	51 mrem	52 mrem	15 mrem	51 mrem	52 mrem
Aug-16	67 cases	72 mrem	242 mrem	242 mrem	72 mrem	242 mrem	242 mrem
Sep-16	36 cases	29 mrem	99 mrem	100 mrem	29 mrem	99 mrem	100 mrem
Oct-16	51 cases	119 mrem	405 mrem	405 mrem	119 mrem	405 mrem	405 mrem
Nov-16	47 cases	62 mrem	211 mrem	211 mrem	62 mrem	211 mrem	211 mrem
Dec-16	74 cases	120 mrem	399 mrem	399 mrem	120 mrem	399 mrem	399 mrem
Jan-17	32 cases	52 mrem	176 mrem	177 mrem	52 mrem	176 mrem	177 mrem
Feb-17	40 cases	157 mrem	531 mrem	532 mrem	157 mrem	531 mrem	532 mrem
Mar-17	73 cases	72 mrem	240 mrem	237 mrem	72 mrem	240 mrem	237 mrem
Apr-17	22 cases	M	M	M	12 mrem	40 mrem	40 mrem
May-17	66 cases	88 mrem	302 mrem	302 mrem	88 mrem	302 mrem	302 mrem
Jun-17	20 cases	14 mrem	46 mrem	46 mrem	14 mrem	46 mrem	46 mrem
Jul-17	47 cases	86 mrem	291 mrem	291 mrem	86 mrem	291 mrem	291 mrem
Aug-17	36 cases	96 mrem	326 mrem	326 mrem	96 mrem	326 mrem	326 mrem
Sep-17	47 cases	117 mrem	395 mrem	395 mrem	117 mrem	395 mrem	395 mrem
Oct-17	26 cases	16 mrem	52 mrem	51 mrem	16 mrem	52 mrem	51 mrem
Nov-17	21 cases	30 mrem	99 mrem	99 mrem	30 mrem	99 mrem	99 mrem

Dec-17	24 cases	168 mrem	59 mrem	59 mrem	168 mrem	59 mrem	59 mrem
Jan-18	43 cases	92 mrem	311 mrem	311 mrem	92 mrem	311 mrem	311 mrem
Feb-18	36 cases	50 mrem	169 mrem	169 mrem	50 mrem	169 mrem	169 mrem
Mar-18	39 cases	45 mrem	149 mrem	149 mrem	45 mrem	149 mrem	149 mrem
Apr-18	51 cases	86 mrem	290 mrem	290 mrem	86 mrem	290 mrem	290 mrem
May-18	41 cases	29 mrem	98 mrem	97 mrem	29 mrem	98 mrem	97 mrem
Jun-18	38 cases	62 mrem	214 mrem	214 mrem	62 mrem	214 mrem	214 mrem
Jul-18	61 cases	101 mrem	342 mrem	342 mrem	101 mrem	342 mrem	342 mrem
Aug-18	32 cases	11 mrem	35 mrem	34 mrem	11 mrem	35 mrem	34 mrem
Sep-18	6 cases	10 mrem	32 mrem	31 mrem	10 mrem	32 mrem	31 mrem
Oct-18	26 cases	39 mrem	129 mrem	128 mrem	39 mrem	129 mrem	128 mrem
Nov-18	26 cases	59 mrem	198 mrem	198 mrem	59 mrem	198 mrem	198 mrem
Dec-18	17 cases	UNUSED			9 mrem	31 mrem	31 mrem
Jan-19	62 cases	39 mrem	134 mrem	135 mrem	39 mrem	134 mrem	135 mrem
Feb-19	27 cases	10 mrem	32 mrem	31 mrem	10 mrem	32 mrem	31 mrem
Mar-19	35 cases	26 mrem	87 mrem	85 mrem	26 mrem	87 mrem	85 mrem
Apr-19	21 cases	20 mrem	65 mrem	65 mrem	20 mrem	65 mrem	65 mrem
May-19	43 cases	5 mrem	16 mrem	16 mrem	5 mrem	16 mrem	16 mrem
Jun-19	12 cases	12 mrem	39 mrem	38 mrem	12 mrem	39 mrem	38 mrem
Jul-19	26 cases	4 mrem	12 mrem	11 mrem	4 mrem	12 mrem	11 mrem
Aug-19	45 cases	33 mrem	114 mrem	114 mrem	33 mrem	114 mrem	114 mrem
Sep-19	32 cases	16 mrem	54 mrem	55 mrem	16 mrem	54 mrem	55 mrem
Oct-19	51 cases	28 mrem	93 mrem	93 mrem	28 mrem	93 mrem	93 mrem
Nov-19	17 cases	9 mrem	30 mrem	29 mrem	9 mrem	30 mrem	29 mrem
Dec-19	62 cases	32 mrem	108 mrem	108 mrem	32 mrem	108 mrem	108 mrem

MD Dose History 12/2011-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Nov 2011	477	10 mrem	34 mrem	34 mrem	417 mrem	1395 mrem	1359 mrem
Dec-11	39 cases	UNUSED			34 mrem	114 mrem	111 mrem
Jan-12	8 cases	M	M	M	M	M	M
Feb-12	46 cases	M	M	M	40 mrem	135 mrem	131 mrem
Mar-12	14 cases	18 mrem	18 mrem	18 mrem	18 mrem	18 mrem	18 mrem
Apr-12	85 cases	16 mrem	16 mrem	16 mrem	16 mrem	16 mrem	16 mrem
May-12	63 cases	M	M	M	55 mrem	184 mrem	180 mrem
Jun-12	68 cases	M	M	M	60 mrem	199 mrem	194 mrem
Jul-12	11 cases	M	M	M	10 mrem	32 mrem	31 mrem
Aug-12	6 cases	M	M	M	M	M	M
Sep-12	49 cases	M	M	M	43 mrem	143 mrem	140 mrem
Oct-12	107 cases	M	M	M	94 mrem	313 mrem	305 mrem
Nov-12	34 cases	M	M	M	30 mrem	99 mrem	97 mrem
Dec-12	34 cases	M	M	M	30 mrem	99 mrem	97 mrem

Jan-13	64 cases	M	M	M	56 mrem	187 mrem	182 mrem
Feb-13	43 cases	M	M	M	38 mrem	126 mrem	123 mrem
Mar-13	50 cases	M	M	M	44 mrem	146 mrem	142 mrem
Apr-13	26 cases	M	M	M	23 mrem	76 mrem	74 mrem
May-13	27 cases	M	M	M	24 mrem	79 mrem	77 mrem
Jun-13	89 cases	M	M	M	78 mrem	260 mrem	254 mrem
Jul-13	102 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Aug-13	53 cases	M	M	M	46 mrem	155 mrem	151 mrem
Sep-13	52 cases	M	M	M	46 mrem	152 mrem	148 mrem
Oct-13	55 cases	M	M	M	48 mrem	161 mrem	157 mrem
Nov-13	9 cases	M	M	M	M	M	M
Dec-13	82 cases	UNUSED			72 mrem	240 mrem	234 mrem
Jan-14	61 cases	UNUSED			53 mrem	178 mrem	174 mrem
Feb-14	113 cases	M	M	M	99 mrem	331 mrem	322 mrem
Mar-14	49 cases	M	M	M	43 mrem	143 mrem	140 mrem
Apr-14	42 cases	M	M	M	37 mrem	123 mrem	120 mrem
May-14	75 cases	M	M	M	66 mrem	219 mrem	214 mrem
Jun-14	67 cases	M	M	M	59 mrem	196 mrem	191 mrem
Jul-14	88 cases	M	M	M	77 mrem	257 mrem	251 mrem
Aug-14	38 cases	M	M	M	33 mrem	111 mrem	108 mrem
Sep-14	28 cases	M	M	M	25 mrem	82 mrem	80 mrem
Oct-14	61 cases	M	M	M	53 mrem	178 mrem	174 mrem
Nov-14	26 cases	M	M	M	23 mrem	76 mrem	74 mrem
Dec-14	43 cases	M	M	M	38 mrem	126 mrem	123 mrem
Jan-15	39 cases	M	M	M	34 mrem	114 mrem	111 mrem
Feb-15	55 cases	M	M	M	48 mrem	161 mrem	157 mrem
Mar-15	51 cases	M	M	M	45 mrem	149 mrem	145 mrem
Apr-15	54 cases	M	M	M	47 mrem	158 mrem	154 mrem
May-15	29 cases	UNUSED			25 mrem	85 mrem	83 mrem
Jun-15	2 cases	M	M	M	M	M	M
Jul-15	85 cases	M	M	M	74 mrem	249 mrem	242 mrem
Aug-15	20 cases	M	M	M	18 mrem	58 mrem	57 mrem
Sep-15	30 cases	M	M	M	26 mrem	88 mrem	85 mrem
Oct-15	49 cases	M	M	M	43 mrem	143 mrem	140 mrem
Nov-15	28 cases	M	M	M	25 mrem	82 mrem	80 mrem
Dec-15	33 cases	M	M	M	29 mrem	97 mrem	94 mrem
Jan-16	48 cases	M	M	M	42 mrem	140 mrem	137 mrem
Feb-16	42 cases	M	M	M	37 mrem	123 mrem	120 mrem
Mar-16	35 cases	M	M	M	31 mrem	102 mrem	100 mrem
Apr-16	31 cases	M	M	M	27 mrem	91 mrem	88 mrem
May-16	33 cases	M	M	M	29 mrem	97 mrem	94 mrem
Jun-16	14 cases	M	M	M	12 mrem	41 mrem	40 mrem
Jul-16	47 cases	M	M	M	41 mrem	137 mrem	134 mrem
Aug-16	32 cases	M	M	M	28 mrem	94 mrem	91 mrem

Sep-16	52 cases	M	M	M	46 mrem	152 mrem	148 mrem
Oct-16	32 cases	M	M	M	28 mrem	94 mrem	91 mrem
Nov-16	25 cases	M	M	M	22 mrem	73 mrem	71 mrem
Dec-16	48 cases	M	M	M	42 mrem	140 mrem	137 mrem
Jan-17	78 cases	M	M	M	68 mrem	228 mrem	222 mrem
Feb-17	62 cases	M	M	M	54 mrem	181 mrem	177 mrem
Mar-17	76 cases	M	M	M	67 mrem	222 mrem	217 mrem
Apr-17	108 cases	M	M	M	95 mrem	316 mrem	308 mrem
May-17	66 cases	M	M	M	58 mrem	193 mrem	188 mrem
Jun-17	39 cases	M	M	M	34 mrem	114 mrem	111 mrem
Jul-17	63 cases	M	M	M	55 mrem	184 mrem	180 mrem
Aug-17	50 cases	M	M	M	44 mrem	146 mrem	142 mrem
Sep-17	46 cases	M	M	M	40 mrem	135 mrem	131 mrem
Oct-17	89 cases	M	M	M	78 mrem	260 mrem	254 mrem
Nov-17	71 cases	M	M	M	62 mrem	208 mrem	202 mrem
Dec-17	59 cases	M	M	M	52 mrem	173 mrem	168 mrem
Jan-18	73 cases	M	M	M	64 mrem	214 mrem	208 mrem
Feb-18	32 cases	M	M	M	28 mrem	94 mrem	91 mrem
Mar-18	52 cases	M	M	M	46 mrem	152 mrem	148 mrem
Apr-18	53 cases	M	M	M	46 mrem	155 mrem	151 mrem
May-18	34 cases	M	M	M	30 mrem	99 mrem	97 mrem
Jun-18	40 cases	M	M	M	35 mrem	117 mrem	114 mrem
Jul-18	52 cases	M	M	M	46 mrem	152 mrem	148 mrem
Aug-18	31 cases	M	M	M	27 mrem	91 mrem	88 mrem
Sep-18	35 cases	M	M	M	31 mrem	102 mrem	100 mrem
Oct-18	46 cases	M	M	M	40 mrem	135 mrem	131 mrem
Nov-18	14 cases	M	M	M	12 mrem	41 mrem	40 mrem
Dec-18	41 cases	M	M	M	36 mrem	120 mrem	117 mrem
Jan-19	42 cases	M	M	M	37 mrem	123 mrem	120 mrem
Feb-19	41 cases	M	M	M	36 mrem	120 mrem	117 mrem
Mar-19	39 cases	M	M	M	34 mrem	114 mrem	111 mrem
Apr-19	58 cases	M	M	M	51 mrem	170 mrem	165 mrem
May-19	39 cases	7 mrem	24 mrem	23 mrem	7 mrem	24 mrem	23 mrem
Jun-19	41 cases	15 mrem	50 mrem	47 mrem	15 mrem	50 mrem	47 mrem
Jul-19	34 cases	14 mrem	45 mrem	44 mrem	14 mrem	45 mrem	44 mrem
Aug-19	41 cases	62 mrem	206 mrem	198 mrem	62 mrem	206 mrem	198 mrem
Sep-19	19 cases	1 mrem	2 mrem	3 mrem	1 mrem	2 mrem	3 mrem
Oct-19	50 cases	64 mrem	213 mrem	206 mrem	64 mrem	213 mrem	206 mrem
Nov-19	44 cases	31 mrem	103 mrem	101 mrem	31 mrem	103 mrem	101 mrem
Dec-19	37 cases	47 mrem	159 mrem	159 mrem	47 mrem	159 mrem	159 mrem

Report prepared by:

MD Dose History 1/2018-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Aug 2018		866 mrem	2893 mrem	2818 mrem	866 mrem	2893 mrem	2818 mrem
Sep-18	57 cases	80 mrem	268 mrem	261 mrem	80 mrem	268 mrem	261 mrem
Oct-18	65 cases	220 mrem	732 mrem	701 mrem	220 mrem	732 mrem	701 mrem
Nov-18	36 cases	120 mrem	399 mrem	398 mrem	120 mrem	399 mrem	398 mrem
Dec-18	34 cases	M	M	M	34 mrem	113 mrem	109 mrem
Jan-19	41 cases	21 mrem	70 mrem	69 mrem	21 mrem	70 mrem	69 mrem
Feb-19	78 cases	61 mrem	203 mrem	197 mrem	61 mrem	203 mrem	197 mrem
Mar-19	86 cases	62 mrem	208 mrem	205 mrem	62 mrem	208 mrem	205 mrem
Apr-19	47 cases	66 mrem	228 mrem	228 mrem	66 mrem	228 mrem	228 mrem
May-19	66 cases	91 mrem	303 mrem	302 mrem	91 mrem	303 mrem	302 mrem
Jun-19	94 cases	35 mrem	115 mrem	112 mrem	35 mrem	115 mrem	112 mrem
Jul-19	94 cases	173 mrem	575 mrem	561 mrem	173 mrem	575 mrem	561 mrem
Aug-19	81 cases	101 mrem	336 mrem	321 mrem	101 mrem	336 mrem	321 mrem
Sep-19	75 cases	63 mrem	210 mrem	203 mrem	63 mrem	210 mrem	203 mrem
Oct-19	81 cases	91 mrem	303 mrem	292 mrem	91 mrem	303 mrem	292 mrem
Nov-19	71 cases	43 mrem	144 mrem	137 mrem	43 mrem	144 mrem	137 mrem
Dec-19	72 cases	59 mrem	198 mrem	191 mrem	59 mrem	198 mrem	191 mrem

MD Dose History 1/2014-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Jul 2014		M	M	M	M	M	M
Jul-14	55 cases	M	M	M	98 mrem	326 mrem	324 mrem
Aug-14	104 cases	M	M	M	185 mrem	617 mrem	612 mrem
Sep-14	65 cases	M	M	M	116 mrem	386 mrem	383 mrem
Oct-14	31 cases	M	M	M	55 mrem	184 mrem	183 mrem
Nov-14	120 cases	UNUSED			214 mrem	712 mrem	706 mrem
Dec-14	60 cases	UNUSED			107 mrem	356 mrem	353 mrem
Jan-15	106 cases	M	M	M	189 mrem	629 mrem	624 mrem
Feb-15	94 cases	M	M	M	167 mrem	558 mrem	553 mrem
Mar-15	89 cases	M	M	M	158 mrem	528 mrem	524 mrem
Apr-15	106 cases	M	M	M	189 mrem	629 mrem	624 mrem
May-15	65 cases	M	M	M	116 mrem	386 mrem	383 mrem
Jun-15	121 cases	M	M	M	215 mrem	718 mrem	712 mrem
Jul-15	83 cases	M	M	M	148 mrem	493 mrem	489 mrem
Aug-15	78 cases	M	M	M	139 mrem	463 mrem	459 mrem
Sep-15	45 cases	M	M	M	80 mrem	267 mrem	265 mrem
Oct-15	83 cases	M	M	M	148 mrem	493 mrem	489 mrem
Nov-15	32 cases	M	M	M	57 mrem	190 mrem	188 mrem

Dec-15	95 cases	M	M	M	169 mrem	564 mrem	559 mrem
Jan-16	41 cases	M	M	M	73 mrem	243 mrem	241 mrem
Feb-16	105 cases	49 mrem	163 mrem	163 mrem	49 mrem	163 mrem	163 mrem
Mar-16	61 cases	M	M	M	109 mrem	362 mrem	359 mrem
Apr-16	59 cases	M	M	M	105 mrem	350 mrem	347 mrem
May-16	16 cases	M	M	M	28 mrem	95 mrem	94 mrem
Jun-16	114 cases	M	M	M	203 mrem	677 mrem	671 mrem
Jul-16	36 cases	M	M	M	64 mrem	214 mrem	212 mrem
Aug-16	102 cases	M	M	M	182 mrem	605 mrem	601 mrem
Sep-16	104 cases	M	M	M	185 mrem	617 mrem	612 mrem
Oct-16	105 cases	M	M	M	187 mrem	623 mrem	618 mrem
Nov-16	108 cases	M	M	M	192 mrem	641 mrem	636 mrem
Dec-16	96 cases	M	M	M	171 mrem	570 mrem	565 mrem
Jan-17	30 cases	M	M	M	53 mrem	178 mrem	177 mrem
Feb-17	56 cases	M	M	M	100 mrem	332 mrem	330 mrem
Mar-17	104 cases	M	M	M	185 mrem	617 mrem	612 mrem
Apr-17	74 cases	M	M	M	132 mrem	439 mrem	436 mrem
May-17	92 cases	M	M	M	164 mrem	546 mrem	542 mrem
Jun-17	98 cases	M	M	M	174 mrem	582 mrem	577 mrem
Jul-17	55 cases	M	M	M	98 mrem	326 mrem	324 mrem
Aug-17	67 cases	M	M	M	119 mrem	398 mrem	394 mrem
Sep-17	41 cases	M	M	M	73 mrem	243 mrem	241 mrem
Oct-17	61 cases	M	M	M	109 mrem	362 mrem	359 mrem
Nov-17	94 cases	M	M	M	167 mrem	558 mrem	553 mrem
Dec-17	43 cases	M	M	M	77 mrem	255 mrem	253 mrem
Jan-18	76 cases	M	M	M	135 mrem	451 mrem	447 mrem
Feb-18	47 cases	M	M	M	84 mrem	279 mrem	277 mrem
Mar-18	115 cases	M	M	M	205 mrem	683 mrem	677 mrem
Apr-18	66 cases	M	M	M	117 mrem	392 mrem	389 mrem
May-18	61 cases	79 mrem	270 mrem	270 mrem	79 mrem	270 mrem	270 mrem
Jun-18	71 cases	151 mrem	505 mrem	505 mrem	151 mrem	505 mrem	505 mrem
Jul-18	56 cases	M	M	M	100 mrem	332 mrem	330 mrem
Aug-18	106 cases	251 mrem	852 mrem	852 mrem	251 mrem	852 mrem	852 mrem
Sep-18	17 cases	57 mrem	196 mrem	196 mrem	57 mrem	196 mrem	196 mrem
Oct-18	69 cases	M	M	M	123 mrem	410 mrem	406 mrem
Nov-18	67 cases	M	M	M	119 mrem	398 mrem	394 mrem
Dec-18	67 cases	M	M	M	119 mrem	398 mrem	394 mrem
Jan-19	26 cases	M	M	M	46 mrem	154 mrem	153 mrem
Feb-19	9 cases	M	M	M	M	M	M
Mar-19	16 cases	M	M	M	28 mrem	95 mrem	94 mrem
Apr-19	77 cases	M	M	M	137 mrem	457 mrem	453 mrem
May-19	79 cases	M	M	M	141 mrem	469 mrem	465 mrem
Jun-19	54 cases	122 mrem	407 mrem	395 mrem	122 mrem	407 mrem	395 mrem
Jul-19	25 cases	63 mrem	210 mrem	209 mrem	63 mrem	210 mrem	209 mrem

Aug-19	67 cases	104 mrem	348 mrem	348 mrem	104 mrem	348 mrem	348 mrem
Sep-19	37 cases	60 mrem	200 mrem	200 mrem	60 mrem	200 mrem	200 mrem
Oct-19	22 cases	40 mrem	134 mrem	133 mrem	40 mrem	134 mrem	133 mrem
Nov-19	40 cases	69 mrem	231 mrem	231 mrem	69 mrem	231 mrem	231 mrem
Dec-19	48 cases	63 mrem	209 mrem	209 mrem	63 mrem	209 mrem	209 mrem

*** [REDACTED] Dose History 1/2018-12/2019**

	# Cases	Recorded Dose		
		EDE2	LDE	SDE
Jan-Aug 2011		M	M	M
Sep-11	Unknown	11 mrem	35 mrem	35 mrem
Oct-11	Unknown	5 mrem	18 mrem	18 mrem
Nov-11	Unknown	33 mrem	111 mrem	111 mrem
Dec-11	Unknown	102 mrem	347 mrem	347 mrem
Jan-12	Unknown	212 mrem	716 mrem	716 mrem
Feb-12	Unknown	126 mrem	420 mrem	420 mrem
Mar-12	Unknown	Unused		
Apr-12	Unknown	5 mrem	15 mrem	15 mrem
May-12	Unknown	55 mrem	187 mrem	184 mrem
Jun-12	Unknown	107 mrem	356 mrem	356 mrem
Jul-12	Unknown	29 mrem	96 mrem	96 mrem
Aug-12	Unknown	146 mrem	493 mrem	486 mrem
Sep-12	Unknown	77 mrem	257 mrem	258 mrem
Oct-12	Unknown	M	M	M
Nov-12	Unknown	2 mrem	5 mrem	4 mrem

*-We were unable to determine how many cases Dr. [REDACTED] performed in IR or if any of them were Y-90 cases.

[REDACTED] MD Dose History 12/2011-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Nov 2011	615	8 mrem	66 mrem	63 mrem	882 mrem	2940 mrem	2839 mrem
Dec-11	63 cases	2 mrem	7 mrem	6 mrem	2 mrem	7 mrem	6 mrem
Jan-12	51 cases	1 mrem	4 mrem	4 mrem	1 mrem	4 mrem	4 mrem
Feb-12	50 cases	123 mrem	411 mrem	401 mrem	123 mrem	411 mrem	401 mrem
Mar-12	16 cases	50 mrem	166 mrem	167 mrem	50 mrem	166 mrem	167 mrem
Apr-12	4 cases	M	M	M	M	M	M
May-12	5 cases	20 mrem	68 mrem	67 mrem	20 mrem	68 mrem	67 mrem
Jun-12	8 cases	4 mrem	13 mrem	13 mrem	4 mrem	13 mrem	13 mrem
Jul-12	3 cases	58 mrem	198 mrem	199 mrem	58 mrem	198 mrem	199 mrem

Aug-12	47 cases	ABSENT	0 mrem	0 mrem	67 mrem	225 mrem	217 mrem
Sep-12	8 cases	M	M	M	M	M	M
Oct-12	7 cases	65 mrem	215 mrem	204 mrem	65 mrem	215 mrem	204 mrem
Nov-12	11 cases	57 mrem	189 mrem	185 mrem	57 mrem	189 mrem	185 mrem
Dec-12	51 cases	M	M	M	73 mrem	244 mrem	235 mrem
Jan-13	2 cases	7 mrem	23 mrem	23 mrem	7 mrem	23 mrem	23 mrem
Feb-13	6 cases	225 mrem	929 mrem	1035 mrem	225 mrem	929 mrem	1035 mrem
Mar-13	17 cases	M	M	M	24 mrem	81 mrem	78 mrem
Apr-13	7 cases	M	M	M	M	M	M
May-13	46 cases	60 mrem	203 mrem	203 mrem	60 mrem	203 mrem	203 mrem
Jun-13	45 cases	16 mrem	54 mrem	50 mrem	16 mrem	54 mrem	50 mrem
Jul-13	9 cases	M	M	M	M	M	M
Aug-13	2 cases	12 mrem	39 mrem	39 mrem	12 mrem	39 mrem	39 mrem
Sep-13	10 cases	41 mrem	136 mrem	131 mrem	41 mrem	136 mrem	131 mrem
Oct-13	4 cases	30 mrem	100 mrem	99 mrem	30 mrem	100 mrem	99 mrem
Nov-13	44 cases	30 mrem	100 mrem	96 mrem	30 mrem	100 mrem	96 mrem
Dec-13	8 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Jan-14	2 cases	21 mrem	73 mrem	74 mrem	21 mrem	73 mrem	74 mrem
Feb-14	52 cases	62 mrem	205 mrem	198 mrem	62 mrem	205 mrem	198 mrem
Mar-14	56 cases	146 mrem	486 mrem	472 mrem	146 mrem	486 mrem	472 mrem
Apr-14	83 cases	46 mrem	152 mrem	147 mrem	46 mrem	152 mrem	147 mrem
May-14	55 cases	64 mrem	214 mrem	214 mrem	64 mrem	214 mrem	214 mrem
Jun-14	30 cases	77 mrem	257 mrem	251 mrem	77 mrem	257 mrem	251 mrem
Jul-14	47 cases	M	M	M	67 mrem	225 mrem	217 mrem
Aug-14	4 cases	45 mrem	150 mrem	145 mrem	45 mrem	150 mrem	145 mrem
Sep-14	78 cases	66 mrem	221 mrem	221 mrem	66 mrem	221 mrem	221 mrem
Oct-14	56 cases	22 mrem	74 mrem	74 mrem	22 mrem	74 mrem	74 mrem
Nov-14	37 cases	45 mrem	150 mrem	144 mrem	45 mrem	150 mrem	144 mrem
Dec-14	44 cases	2 mrem	4 mrem	4 mrem	2 mrem	4 mrem	4 mrem
Jan-15	5 cases	77 mrem	258 mrem	254 mrem	77 mrem	258 mrem	254 mrem
Feb-15	52 cases	62 mrem	215 mrem	215 mrem	62 mrem	215 mrem	215 mrem
Mar-15	63 cases	ABSENT			90 mrem	301 mrem	291 mrem
Apr-15	32 cases	UNUSED	0 mrem	0 mrem	46 mrem	153 mrem	148 mrem
May-15	24 cases	56 mrem	191 mrem	191 mrem	56 mrem	191 mrem	191 mrem
Jun-15	105 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Jul-15	4 cases	M	M	M	M	M	M
Aug-15	69 cases	31 mrem	103 mrem	98 mrem	31 mrem	103 mrem	98 mrem
Sep-15	40 cases	24 mrem	81 mrem	78 mrem	24 mrem	81 mrem	78 mrem
Oct-15	18 cases	60 mrem	199 mrem	199 mrem	60 mrem	199 mrem	199 mrem
Nov-15	57 cases	39 mrem	129 mrem	126 mrem	39 mrem	129 mrem	126 mrem
Dec-15	50 cases	113 mrem	376 mrem	363 mrem	113 mrem	376 mrem	363 mrem
Jan-16	77 cases	18 mrem	60 mrem	60 mrem	18 mrem	60 mrem	60 mrem
Feb-16	58 cases	47 mrem	158 mrem	158 mrem	47 mrem	158 mrem	158 mrem
Mar-16	56 cases	75 mrem	249 mrem	242 mrem	75 mrem	249 mrem	242 mrem

Apr-16	54 cases	112 mrem	372 mrem	368 mrem	112 mrem	372 mrem	368 mrem
May-16	85 cases	101 mrem	338 mrem	336 mrem	101 mrem	338 mrem	336 mrem
Jun-16	17 cases	31 mrem	103 mrem	104 mrem	31 mrem	103 mrem	104 mrem
Jul-16	40 cases	2 mrem	8 mrem	7 mrem	2 mrem	8 mrem	7 mrem
Aug-16	13 cases	24 mrem	80 mrem	77 mrem	24 mrem	80 mrem	77 mrem
Sep-16	35 cases	37 mrem	123 mrem	118 mrem	37 mrem	123 mrem	118 mrem
Oct-16	43 cases	29 mrem	98 mrem	98 mrem	29 mrem	98 mrem	98 mrem
Nov-16	47 cases	22 mrem	74 mrem	70 mrem	22 mrem	74 mrem	70 mrem
Dec-16	9 cases	101 mrem	336 mrem	327 mrem	101 mrem	336 mrem	327 mrem
Jan-17	120 cases	101 mrem	337 mrem	331 mrem	101 mrem	337 mrem	331 mrem
Feb-17	59 cases	72 mrem	239 mrem	233 mrem	72 mrem	239 mrem	233 mrem
Mar-17	42 cases	59 mrem	197 mrem	198 mrem	59 mrem	197 mrem	198 mrem
Apr-17	50 cases	3 mrem	9 mrem	8 mrem	3 mrem	9 mrem	8 mrem
May-17	5 cases	2 mrem	6 mrem	5 mrem	2 mrem	6 mrem	5 mrem
Jun-17	11 cases	M	M	M	16 mrem	53 mrem	51 mrem
Jul-17	7 cases	M	M	M	M	M	M
Aug-17	111 cases	20 mrem	68 mrem	67 mrem	20 mrem	68 mrem	67 mrem
Sep-17	38 cases	20 mrem	67 mrem	66 mrem	20 mrem	67 mrem	66 mrem
Oct-17	38 cases	7 mrem	22 mrem	21 mrem	7 mrem	22 mrem	21 mrem
Nov-17	20 cases	62 mrem	206 mrem	197 mrem	62 mrem	206 mrem	197 mrem
Dec-17	55 cases	7 mrem	22 mrem	21 mrem	7 mrem	22 mrem	21 mrem
Jan-18	20 cases	59 mrem	195 mrem	187 mrem	59 mrem	195 mrem	187 mrem
Feb-18	65 cases	43 mrem	144 mrem	138 mrem	43 mrem	144 mrem	138 mrem
Mar-18	17 cases	M	M	M	24 mrem	81 mrem	78 mrem
Apr-18	9 cases	18 mrem	60 mrem	60 mrem	18 mrem	60 mrem	60 mrem
May-18	45 cases	80 mrem	270 mrem	270 mrem	80 mrem	270 mrem	270 mrem
Jun-18	37 cases	M	M	M	53 mrem	177 mrem	171 mrem
Jul-18	50 cases	16 mrem	52 mrem	51 mrem	16 mrem	52 mrem	51 mrem
Aug-18	20 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Sep-18	18 cases	19 mrem	63 mrem	60 mrem	19 mrem	63 mrem	60 mrem
Oct-18	28 cases	44 mrem	146 mrem	140 mrem	44 mrem	146 mrem	140 mrem
Nov-18	28 cases	73 mrem	243 mrem	232 mrem	73 mrem	243 mrem	232 mrem
Dec-18	30 cases	M	M	M	43 mrem	143 mrem	138 mrem
Jan-19	20 cases	M	M	M	29 mrem	96 mrem	92 mrem
Feb-19	8 cases	11 mrem	37 mrem	36 mrem	11 mrem	37 mrem	36 mrem
Mar-19	21 cases	26 mrem	88 mrem	88 mrem	26 mrem	88 mrem	88 mrem
Apr-19	32 cases	65 mrem	218 mrem	218 mrem	65 mrem	218 mrem	218 mrem
May-19	26 cases	0 mrem	0 mrem	0 mrem	37 mrem	124 mrem	120 mrem
Jun-19	65 cases	147 mrem	489 mrem	476 mrem	147 mrem	489 mrem	476 mrem
Jul-19	47 cases	110 mrem	366 mrem	352 mrem	110 mrem	366 mrem	352 mrem
Aug-19	26 cases	13 mrem	42 mrem	40 mrem	13 mrem	42 mrem	40 mrem
Sep-19	38 cases	55 mrem	183 mrem	177 mrem	55 mrem	183 mrem	177 mrem
Oct-19	53 cases	111 mrem	370 mrem	353 mrem	111 mrem	370 mrem	353 mrem
Nov-19	81 cases	67 mrem	224 mrem	219 mrem	67 mrem	224 mrem	219 mrem

Dec-19

81 cases

59 mrem

195 mrem

188 mrem

59 mrem

195 mrem

188 mrem

Dose History 12/2011-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Nov 2011	211	330 mrem	1101 mrem	1083 mrem	330 mrem	1101 mrem	1083 mrem
Dec-11	63 cases	41 mrem	137 mrem	137 mrem	41 mrem	137 mrem	137 mrem
Jan-12	51 cases	122 mrem	419 mrem	419 mrem	122 mrem	419 mrem	419 mrem
Feb-12	50 cases	1 mrem	4 mrem	4 mrem	1 mrem	4 mrem	4 mrem
Mar-12	16 cases	123 mrem	411 mrem	401 mrem	123 mrem	411 mrem	401 mrem
Apr-12	4 cases	50 mrem	166 mrem	167 mrem	50 mrem	166 mrem	167 mrem
May-12	5 cases	M	M	M	M	M	M
Jun-12	8 cases	20 mrem	68 mrem	67 mrem	20 mrem	68 mrem	67 mrem
Jul-12	3 cases	4 mrem	13 mrem	13 mrem	4 mrem	13 mrem	13 mrem
Aug-12	47 cases	58 mrem	198 mrem	199 mrem	58 mrem	198 mrem	199 mrem
Sep-12	8 cases	ABSENT	0 mrem	0 mrem	ABSENT	0 mrem	0 mrem
Oct-12	7 cases	M	M	M	M	M	M
Nov-12	11 cases	65 mrem	215 mrem	204 mrem	65 mrem	215 mrem	204 mrem
Dec-12	51 cases	57 mrem	189 mrem	185 mrem	57 mrem	189 mrem	185 mrem
Jan-13	2 cases	M	M	M	M	M	M
Feb-13	6 cases	7 mrem	23 mrem	23 mrem	7 mrem	23 mrem	23 mrem
Mar-13	17 cases	225 mrem	929 mrem	1035 mrem	225 mrem	929 mrem	1035 mrem
Apr-13	7 cases	M	M	M	M	M	M
May-13	46 cases	M	M	M	55 mrem	185 mrem	179 mrem
Jun-13	45 cases	60 mrem	203 mrem	203 mrem	60 mrem	203 mrem	203 mrem
Jul-13	9 cases	16 mrem	54 mrem	50 mrem	16 mrem	54 mrem	50 mrem
Aug-13	2 cases	M	M	M	M	M	M
Sep-13	10 cases	12 mrem	39 mrem	39 mrem	12 mrem	39 mrem	39 mrem
Oct-13	4 cases	41 mrem	136 mrem	131 mrem	41 mrem	136 mrem	131 mrem
Nov-13	44 cases	30 mrem	100 mrem	99 mrem	30 mrem	100 mrem	99 mrem
Dec-13	8 cases	30 mrem	100 mrem	96 mrem	30 mrem	100 mrem	96 mrem
Jan-14	2 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Feb-14	52 cases	21 mrem	73 mrem	74 mrem	21 mrem	73 mrem	74 mrem
Mar-14	56 cases	62 mrem	205 mrem	198 mrem	62 mrem	205 mrem	198 mrem
Apr-14	83 cases	146 mrem	486 mrem	472 mrem	146 mrem	486 mrem	472 mrem
May-14	55 cases	46 mrem	152 mrem	147 mrem	46 mrem	152 mrem	147 mrem
Jun-14	30 cases	64 mrem	214 mrem	214 mrem	64 mrem	214 mrem	214 mrem
Jul-14	47 cases	77 mrem	257 mrem	251 mrem	77 mrem	257 mrem	251 mrem
Aug-14	4 cases	M	M	M	M	M	M
Sep-14	78 cases	45 mrem	150 mrem	145 mrem	45 mrem	150 mrem	145 mrem
Oct-14	56 cases	66 mrem	221 mrem	221 mrem	66 mrem	221 mrem	221 mrem
Nov-14	37 cases	22 mrem	74 mrem	74 mrem	22 mrem	74 mrem	74 mrem
Dec-14	44 cases	45 mrem	150 mrem	144 mrem	45 mrem	150 mrem	144 mrem

Jan-15	5 cases	2 mrem	4 mrem	4 mrem	2 mrem	4 mrem	4 mrem
Feb-15	52 cases	77 mrem	258 mrem	254 mrem	77 mrem	258 mrem	254 mrem
Mar-15	63 cases	62 mrem	215 mrem	215 mrem	62 mrem	215 mrem	215 mrem
Apr-15	32 cases	ABSENT			39 mrem	128 mrem	125 mrem
May-15	24 cases	UNUSED	0 mrem	0 mrem	29 mrem	96 mrem	93 mrem
Jun-15	105 cases	56 mrem	191 mrem	191 mrem	56 mrem	191 mrem	191 mrem
Jul-15	4 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Aug-15	69 cases	M	M	M	83 mrem	277 mrem	269 mrem
Sep-15	40 cases	31 mrem	103 mrem	98 mrem	31 mrem	103 mrem	98 mrem
Oct-15	18 cases	24 mrem	81 mrem	78 mrem	24 mrem	81 mrem	78 mrem
Nov-15	57 cases	60 mrem	199 mrem	199 mrem	60 mrem	199 mrem	199 mrem
Dec-15	50 cases	39 mrem	129 mrem	126 mrem	39 mrem	129 mrem	126 mrem
Jan-16	77 cases	113 mrem	376 mrem	363 mrem	113 mrem	376 mrem	363 mrem
Feb-16	58 cases	18 mrem	60 mrem	60 mrem	18 mrem	60 mrem	60 mrem
Mar-16	56 cases	47 mrem	158 mrem	158 mrem	47 mrem	158 mrem	158 mrem
Apr-16	54 cases	75 mrem	249 mrem	242 mrem	75 mrem	249 mrem	242 mrem
May-16	85 cases	112 mrem	372 mrem	368 mrem	112 mrem	372 mrem	368 mrem
Jun-16	17 cases	101 mrem	338 mrem	336 mrem	101 mrem	338 mrem	336 mrem
Jul-16	40 cases	31 mrem	103 mrem	104 mrem	31 mrem	103 mrem	104 mrem
Aug-16	13 cases	2 mrem	8 mrem	7 mrem	2 mrem	8 mrem	7 mrem
Sep-16	35 cases	24 mrem	80 mrem	77 mrem	24 mrem	80 mrem	77 mrem
Oct-16	43 cases	37 mrem	123 mrem	118 mrem	37 mrem	123 mrem	118 mrem
Nov-16	47 cases	29 mrem	98 mrem	98 mrem	29 mrem	98 mrem	98 mrem
Dec-16	9 cases	22 mrem	74 mrem	70 mrem	22 mrem	74 mrem	70 mrem
Jan-17	120 cases	101 mrem	336 mrem	327 mrem	101 mrem	336 mrem	327 mrem
Feb-17	59 cases	101 mrem	337 mrem	331 mrem	101 mrem	337 mrem	331 mrem
Mar-17	42 cases	72 mrem	239 mrem	233 mrem	72 mrem	239 mrem	233 mrem
Apr-17	50 cases	59 mrem	197 mrem	198 mrem	59 mrem	197 mrem	198 mrem
May-17	5 cases	3 mrem	9 mrem	8 mrem	3 mrem	9 mrem	8 mrem
Jun-17	11 cases	2 mrem	6 mrem	5 mrem	2 mrem	6 mrem	5 mrem
Jul-17	7 cases	M	M	M	M	M	M
Aug-17	111 cases	M	M	M	134 mrem	446 mrem	432 mrem
Sep-17	38 cases	20 mrem	68 mrem	67 mrem	20 mrem	68 mrem	67 mrem
Oct-17	38 cases	20 mrem	67 mrem	66 mrem	20 mrem	67 mrem	66 mrem
Nov-17	20 cases	7 mrem	22 mrem	21 mrem	7 mrem	22 mrem	21 mrem
Dec-17	55 cases	62 mrem	206 mrem	197 mrem	62 mrem	206 mrem	197 mrem
Jan-18	20 cases	7 mrem	22 mrem	21 mrem	7 mrem	22 mrem	21 mrem
Feb-18	65 cases	59 mrem	195 mrem	187 mrem	59 mrem	195 mrem	187 mrem
Mar-18	17 cases	43 mrem	144 mrem	138 mrem	43 mrem	144 mrem	138 mrem
Apr-18	9 cases	M	M	M	M	M	M
May-18	45 cases	18 mrem	60 mrem	60 mrem	18 mrem	60 mrem	60 mrem
Jun-18	37 cases	80 mrem	270 mrem	270 mrem	80 mrem	270 mrem	270 mrem
Jul-18	50 cases	M	M	M	60 mrem	201 mrem	195 mrem
Aug-18	20 cases	16 mrem	52 mrem	51 mrem	16 mrem	52 mrem	51 mrem

Sep-18	18 cases	1 mrem	2 mrem	2 mrem	1 mrem	2 mrem	2 mrem
Oct-18	28 cases	19 mrem	63 mrem	60 mrem	19 mrem	63 mrem	60 mrem
Nov-18	28 cases	44 mrem	146 mrem	140 mrem	44 mrem	146 mrem	140 mrem
Dec-18	30 cases	73 mrem	243 mrem	232 mrem	73 mrem	243 mrem	232 mrem
Jan-19	20 cases	M	M	M	24 mrem	80 mrem	78 mrem
Feb-19	8 cases	M	M	M	M	M	M
Mar-19	21 cases	11 mrem	37 mrem	36 mrem	11 mrem	37 mrem	36 mrem
Apr-19	32 cases	26 mrem	88 mrem	88 mrem	26 mrem	88 mrem	88 mrem
May-19	26 cases	14 mrem	46 mrem	44 mrem	14 mrem	46 mrem	44 mrem
Jun-19	39 cases	42 mrem	139 mrem	134 mrem	42 mrem	139 mrem	134 mrem
Jul-19	38 cases	23 mrem	76 mrem	74 mrem	23 mrem	76 mrem	74 mrem
Aug-19	4 cases	67 mrem	224 mrem	218 mrem	67 mrem	224 mrem	218 mrem
Sep-19	48 cases	39 mrem	129 mrem	124 mrem	39 mrem	129 mrem	124 mrem
Oct-19	55 cases	60 mrem	200 mrem	196 mrem	60 mrem	200 mrem	196 mrem
Nov-19	24 cases	33 mrem	111 mrem	107 mrem	33 mrem	111 mrem	107 mrem
Dec-19	11 cases	M	M	M	13 mrem	44 mrem	43 mrem

MD Dose History 12/2011-12/2019

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Nov 2011	269 cases	1628 mrem	5425 mrem	5244 mrem	1628 mrem	5425 mrem	5244 mrem
Dec-11	34 cases	238 mrem	794 mrem	775 mrem	238 mrem	794 mrem	775 mrem
Jan-12	5 cases	53 mrem	178 mrem	174 mrem	53 mrem	178 mrem	174 mrem
Feb-12	21 cases	89 mrem	295 mrem	287 mrem	89 mrem	295 mrem	287 mrem
Mar-12	26 cases	142 mrem	474 mrem	463 mrem	142 mrem	474 mrem	463 mrem
Apr-12	3 cases	149 mrem	519 mrem	519 mrem	149 mrem	519 mrem	519 mrem
May-12	61 cases	380 mrem	1268 mrem	1236 mrem	380 mrem	1268 mrem	1236 mrem
Jun-12	19 cases	22 mrem	78 mrem	78 mrem	22 mrem	78 mrem	78 mrem
Jul-12	3 cases	64 mrem	214 mrem	210 mrem	64 mrem	214 mrem	210 mrem
Aug-12	8 cases	220 mrem	732 mrem	709 mrem	220 mrem	732 mrem	709 mrem
Sep-12	7 cases	106 mrem	353 mrem	352 mrem	106 mrem	353 mrem	352 mrem
Oct-12	7 cases	98 mrem	331 mrem	331 mrem	98 mrem	331 mrem	331 mrem
Nov-12	11 cases	207 mrem	703 mrem	703 mrem	207 mrem	703 mrem	703 mrem
Dec-12	57 cases	91 mrem	302 mrem	289 mrem	91 mrem	302 mrem	289 mrem
Jan-13	50 cases	233 mrem	777 mrem	772 mrem	233 mrem	777 mrem	772 mrem
Feb-13	13 cases	143 mrem	478 mrem	458 mrem	143 mrem	478 mrem	458 mrem
Mar-13	16 cases	103 mrem	344 mrem	344 mrem	103 mrem	344 mrem	344 mrem
Apr-13	64 cases	161 mrem	537 mrem	528 mrem	161 mrem	537 mrem	528 mrem
May-13	69 cases	181 mrem	604 mrem	585 mrem	181 mrem	604 mrem	585 mrem
Jun-13	14 cases	171 mrem	568 mrem	564 mrem	171 mrem	568 mrem	564 mrem
Jul-13	38 cases	211 mrem	702 mrem	695 mrem	211 mrem	702 mrem	695 mrem
Aug-13	12 cases	62 mrem	206 mrem	204 mrem	62 mrem	206 mrem	204 mrem
Sep-13	14 cases	38 mrem	128 mrem	128 mrem	38 mrem	128 mrem	128 mrem

Oct-13	12 cases	19 mrem	64 mrem	61 mrem	19 mrem	64 mrem	61 mrem
Nov-13	9 cases	7 mrem	22 mrem	22 mrem	7 mrem	22 mrem	22 mrem
Dec-13	11 cases	50 mrem	165 mrem	166 mrem	50 mrem	165 mrem	166 mrem
Jan-14	57 cases	79 mrem	269 mrem	269 mrem	79 mrem	269 mrem	269 mrem
Feb-14	54 cases	70 mrem	234 mrem	232 mrem	70 mrem	234 mrem	232 mrem
Mar-14	58 cases	124 mrem	412 mrem	400 mrem	124 mrem	412 mrem	400 mrem
Apr-14	48 cases	214 mrem	728 mrem	728 mrem	214 mrem	728 mrem	728 mrem
May-14	28 cases	43 mrem	144 mrem	143 mrem	43 mrem	144 mrem	143 mrem
Jun-14	4 cases	82 mrem	272 mrem	264 mrem	82 mrem	272 mrem	264 mrem
Jul-14	25 cases	81 mrem	269 mrem	259 mrem	81 mrem	269 mrem	259 mrem
Aug-14	34 cases	128 mrem	427 mrem	407 mrem	128 mrem	427 mrem	407 mrem
Sep-14	16 cases	5 mrem	17 mrem	16 mrem	5 mrem	17 mrem	16 mrem
Oct-14	15 cases	35 mrem	115 mrem	114 mrem	35 mrem	115 mrem	114 mrem
Nov-14	32 cases	72 mrem	242 mrem	242 mrem	72 mrem	242 mrem	242 mrem
Dec-14	20 cases	85 mrem	284 mrem	279 mrem	85 mrem	284 mrem	279 mrem
Jan-15	43 cases	368 mrem	1234 mrem	1234 mrem	368 mrem	1234 mrem	1234 mrem
Feb-15	35 cases	117 mrem	398 mrem	398 mrem	117 mrem	398 mrem	398 mrem
Mar-15	10 cases	134 mrem	445 mrem	429 mrem	134 mrem	445 mrem	429 mrem
Apr-15	47 cases	230 mrem	765 mrem	765 mrem	230 mrem	765 mrem	765 mrem
May-15	40 cases	UNUSED	0 mrem	0 mrem	166 mrem	553 mrem	534 mrem
Jun-15	28 cases	103 mrem	342 mrem	331 mrem	103 mrem	342 mrem	331 mrem
Jul-15	28 cases	99 mrem	333 mrem	333 mrem	99 mrem	333 mrem	333 mrem
Aug-15	100 cases	306 mrem	1019 mrem	972 mrem	306 mrem	1019 mrem	972 mrem
Sep-15	35 cases	31 mrem	104 mrem	104 mrem	31 mrem	104 mrem	104 mrem
Oct-15	37 cases	162 mrem	539 mrem	532 mrem	162 mrem	539 mrem	532 mrem
Nov-15	58 cases	128 mrem	428 mrem	423 mrem	128 mrem	428 mrem	423 mrem
Dec-15	38 cases	113 mrem	375 mrem	371 mrem	113 mrem	375 mrem	371 mrem
Jan-16	52 cases	90 mrem	299 mrem	298 mrem	90 mrem	299 mrem	298 mrem
Feb-16	42 cases	162 mrem	544 mrem	544 mrem	162 mrem	544 mrem	544 mrem
Mar-16	60 cases	187 mrem	624 mrem	606 mrem	187 mrem	624 mrem	606 mrem
Apr-16	30 cases	89 mrem	295 mrem	298 mrem	89 mrem	295 mrem	298 mrem
May-16	31 cases	129 mrem	430 mrem	420 mrem	129 mrem	430 mrem	420 mrem
Jun-16	43 cases	230 mrem	766 mrem	744 mrem	230 mrem	766 mrem	744 mrem
Jul-16	29 cases	61 mrem	203 mrem	203 mrem	61 mrem	203 mrem	203 mrem
Aug-16	87 cases	252 mrem	840 mrem	805 mrem	252 mrem	840 mrem	805 mrem
Sep-16	34 cases	101 mrem	338 mrem	338 mrem	101 mrem	338 mrem	338 mrem
Oct-16	38 cases	139 mrem	463 mrem	453 mrem	139 mrem	463 mrem	453 mrem
Nov-16	32 cases	107 mrem	356 mrem	339 mrem	107 mrem	356 mrem	339 mrem
Dec-16	48 cases	146 mrem	485 mrem	474 mrem	146 mrem	485 mrem	474 mrem
Jan-17	37 cases	78 mrem	266 mrem	266 mrem	78 mrem	266 mrem	266 mrem
Feb-17	22 cases	64 mrem	214 mrem	213 mrem	64 mrem	214 mrem	213 mrem
Mar-17	5 cases	M	M	M	M	M	M
Apr-17	29 cases	61 mrem	205 mrem	206 mrem	61 mrem	205 mrem	206 mrem
May-17	21 cases	50 mrem	166 mrem	158 mrem	50 mrem	166 mrem	158 mrem

Jun-17	58 cases	155 mrem	516 mrem	497 mrem	155 mrem	516 mrem	497 mrem
Jul-17	52 cases	153 mrem	510 mrem	497 mrem	153 mrem	510 mrem	497 mrem
Aug-17	46 cases	60 mrem	201 mrem	193 mrem	60 mrem	201 mrem	193 mrem
Sep-17	86 cases	180 mrem	599 mrem	599 mrem	180 mrem	599 mrem	599 mrem
Oct-17	51 cases	75 mrem	249 mrem	245 mrem	75 mrem	249 mrem	245 mrem
Nov-17	24 cases	29 mrem	98 mrem	97 mrem	29 mrem	98 mrem	97 mrem
Dec-17	37 cases	72 mrem	239 mrem	230 mrem	72 mrem	239 mrem	230 mrem
Jan-18	41 cases	142 mrem	473 mrem	462 mrem	142 mrem	473 mrem	462 mrem
Feb-18	46 cases	72 mrem	241 mrem	237 mrem	72 mrem	241 mrem	237 mrem
Mar-18	60 cases	221 mrem	737 mrem	711 mrem	221 mrem	737 mrem	711 mrem
Apr-18	41 cases	52 mrem	174 mrem	174 mrem	52 mrem	174 mrem	174 mrem
May-18	26 cases	45 mrem	149 mrem	142 mrem	45 mrem	149 mrem	142 mrem
Jun-18	30 cases	174 mrem	579 mrem	554 mrem	174 mrem	579 mrem	554 mrem
Jul-18	51 cases	160 mrem	533 mrem	515 mrem	160 mrem	533 mrem	515 mrem
Aug-18	44 cases	295 mrem	983 mrem	959 mrem	295 mrem	983 mrem	959 mrem
Sep-18	36 cases	58 mrem	193 mrem	186 mrem	58 mrem	193 mrem	186 mrem
Oct-18	18 cases	87 mrem	290 mrem	284 mrem	87 mrem	290 mrem	284 mrem
Nov-18	34 cases	91 mrem	303 mrem	296 mrem	91 mrem	303 mrem	296 mrem
Dec-18	24 cases	UNUSED			100 mrem	332 mrem	320 mrem
Jan-19	17 cases	17 mrem	55 mrem	54 mrem	17 mrem	55 mrem	54 mrem
Feb-19	20 cases	27 mrem	90 mrem	91 mrem	27 mrem	90 mrem	91 mrem
Mar-19	22 cases	189 mrem	631 mrem	608 mrem	189 mrem	631 mrem	608 mrem
Apr-19	41 cases	65 mrem	218 mrem	218 mrem	65 mrem	218 mrem	218 mrem
May-19	47 cases	0 mrem	0 mrem	0 mrem	195 mrem	650 mrem	627 mrem
Jun-19	22 cases	3 mrem	10 mrem	9 mrem	3 mrem	10 mrem	9 mrem
Jul-19	44 cases	135 mrem	450 mrem	436 mrem	135 mrem	450 mrem	436 mrem
Aug-19	34 cases	269 mrem	896 mrem	857 mrem	269 mrem	896 mrem	857 mrem
Sep-19	36 cases	84 mrem	279 mrem	274 mrem	84 mrem	279 mrem	274 mrem
Oct-19	25 cases	153 mrem	509 mrem	496 mrem	153 mrem	509 mrem	496 mrem
Nov-19	61 cases	255 mrem	850 mrem	815 mrem	255 mrem	850 mrem	815 mrem
Dec-19	32 cases	155 mrem	517 mrem	503 mrem	155 mrem	517 mrem	503 mrem

MD Dose History 1/2018-10/2019 Departed Queens 10/25/19

	# Cases	Recorded Dose			Estimated Dose		
		EDE2	LDE	SDE	EDE2	LDE	SDE
Jan-Jul 2018	0	643 mrem	2157 mrem	2129 mrem	643 mrem	2157 mrem	2129 mrem
Aug-18	45 cases	366 mrem	1250 mrem	1250 mrem	366 mrem	1250 mrem	1250 mrem
Sep-18	64 cases	656 mrem	2188 mrem	2173 mrem	656 mrem	2188 mrem	2173 mrem
Oct-18	33 cases	84 mrem	282 mrem	282 mrem	84 mrem	282 mrem	282 mrem
Nov-18	66 cases	214 mrem	712 mrem	701 mrem	214 mrem	712 mrem	701 mrem
Dec-18	49 cases	563 mrem	1878 mrem	1809 mrem	563 mrem	1878 mrem	1809 mrem
Jan-19	69 cases	77 mrem	255 mrem	254 mrem	77 mrem	255 mrem	254 mrem
Feb-19	72 cases	234 mrem	782 mrem	782 mrem	234 mrem	782 mrem	782 mrem

Mar-19	48 cases	68 mrem	231 mrem	231 mrem	68 mrem	231 mrem	231 mrem
Apr-19	23 cases	33 mrem	111 mrem	110 mrem	33 mrem	111 mrem	110 mrem
May-19	33 cases	42 mrem	140 mrem	135 mrem	42 mrem	140 mrem	135 mrem
Jun-19	14 cases	76 mrem	252 mrem	241 mrem	76 mrem	252 mrem	241 mrem
Jul-19	30 cases	37 mrem	123 mrem	116 mrem	37 mrem	123 mrem	116 mrem
Aug-19	32 cases	16 mrem	54 mrem	51 mrem	16 mrem	54 mrem	51 mrem
Sep-19	57 cases	58 mrem	202 mrem	203 mrem	58 mrem	202 mrem	203 mrem
Oct-19	16 cases	2 mrem	7 mrem	6 mrem	2 mrem	7 mrem	6 mrem
Nov-19	0 cases	Dr. [REDACTED] ceased working at Queen's on 10/25/2019					
Dec-19	0 cases	NA	NA	NA	NA	NA	NA