VERMONT
DEPARTMENT OF HEALTH

Annual X-Ray Inspection Report 2018
Radiological Health

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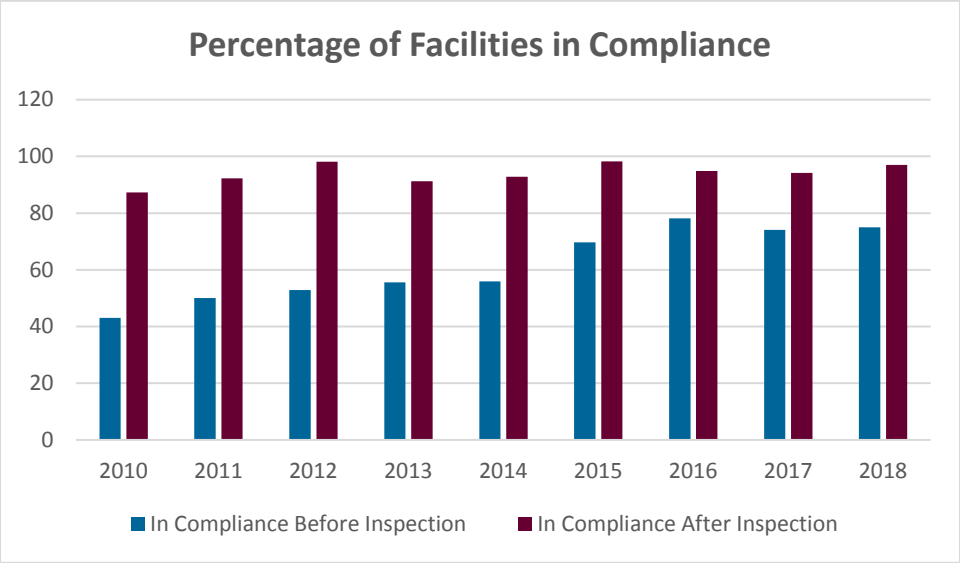
Executive Summary

The Vermont Department of Health performs radiation inspections of facilities around the state that own x-ray equipment. These inspections are performed at different intervals depending on the type of facility. The National Council on Radiation Protection and Measurements (NCRP) recommends that medical facilities, including chiropractic facilities, be inspected every two years. Dental and veterinary facilities are recommended to be inspected every four years. Because podiatric x-ray machines are similar to dental units, podiatric facilities are also inspected every four years.

A total of 100 x-ray facilities were inspected in 2018. Out of the 100 facilities, 75 (75%) were in full compliance at the time of the inspection. Twenty-two (88%) of those facilities that were not in compliance came into compliance after the inspection. Overall, 94 out of the 100 facilities (94%) were in compliance thirty days after the inspection. Noncompliance items can be related either to facility issues (such as film processing and patient shielding) or to radiographic issues (such as patient or public exposure and the condition of the x-ray unit).



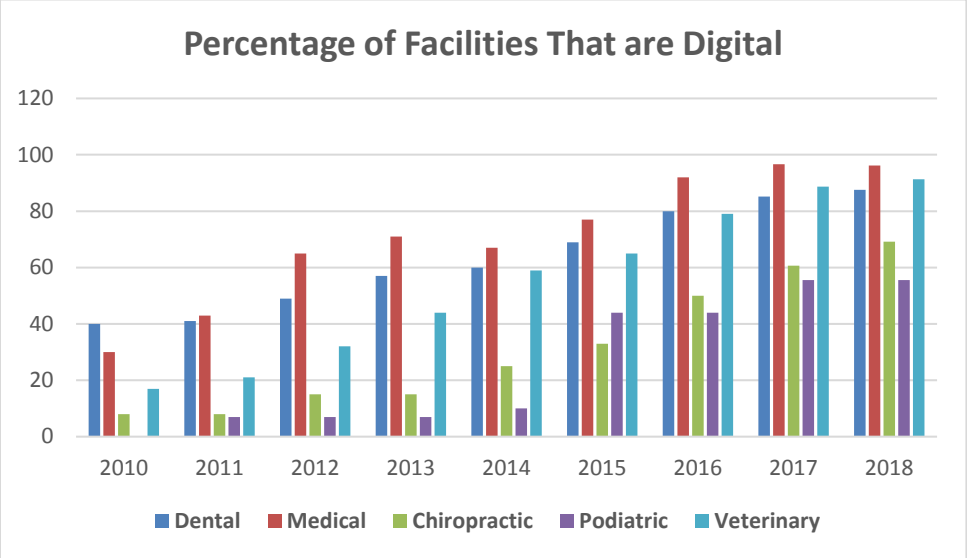
The use of film was the source of the most noncompliances in 2018. Facilities that utilize film imaging systems must ensure that their film, darkroom, and processing areas meet the requirements to provide appropriate diagnostic images. An additional area of concern in 2018 is the lack of review of personnel monitoring records. Facilities are required to provide personnel dose monitoring unless it can be demonstrated that employees will receive less than 10% of the maximum occupational dose limit. Facilities that provide dosimeters to monitor employees' radiation doses are also required to review the monitoring results with these employees on a periodic basis. The monitoring of dose levels is necessary to ensure that all personnel are taking steps to reduce dose. Another ongoing area of concern is the lack of satisfactory lead aprons. While lead aprons were available in all of the facilities inspected, some were stored improperly. If aprons are folded or otherwise not stored flat, they can develop creases and defects that reduce their effectiveness. The list of inspection items can be found on pages 5 to 8.

Annual dose rates to x-ray equipment operators at the facilities inspected were less than the Vermont maximum allowed limit of 5000 millirem and most were less than 1% of this limit. Annual dose rates to the public were less than the maximum allowed limit of 100 millirem at all inspected facilities.

Radiation doses to patients were less than the Vermont maximum allowed doses for all facilities. Please refer to the charts for each type of facility ("Dose to Patients per Exposure"). Vermont recommended doses and NCRP Diagnostic Reference Levels (DRL's) are shown for comparison and as goals for all facilities. DRL's are guides for reducing radiation dose while maintaining or improving image quality and are not intended to serve as regulatory limits.

Doses to the patient and the operator tend to be less for x-ray facilities that use faster speed film or digital imaging. For example, as the speed of dental intra-oral film increases from "D" to "F," the average patient dose per exposure decreases from 0.47 to 0.29 millirem. The use of digital x-ray decreases the average dose per exposure from 0.29 millirem for "F" speed film to 0.16 millirem for direct digital x-rays.

As more facilities begin to use digital x-ray systems, we should see decreases in the total facility noncompliances as darkrooms, film, and film processing are no longer needed. Approximately 88% of dental, 91% of veterinary, 96% of medical, 56% of podiatric, and 69% of chiropractic facilities in Vermont are using digital x-ray. Eighty-eight percent of all facilities are now using digital x-ray.



Exposures to the operator and to the public are measured at the configuration of highest exposure. Operator exposures are measured at the position the operator stands when making the exposure, as indicated by the facility. Exposure to the public is measured at the doorway while aiming the x-ray tube out of the exam room door (if possible) from approximately the patient position for an x-ray exam.

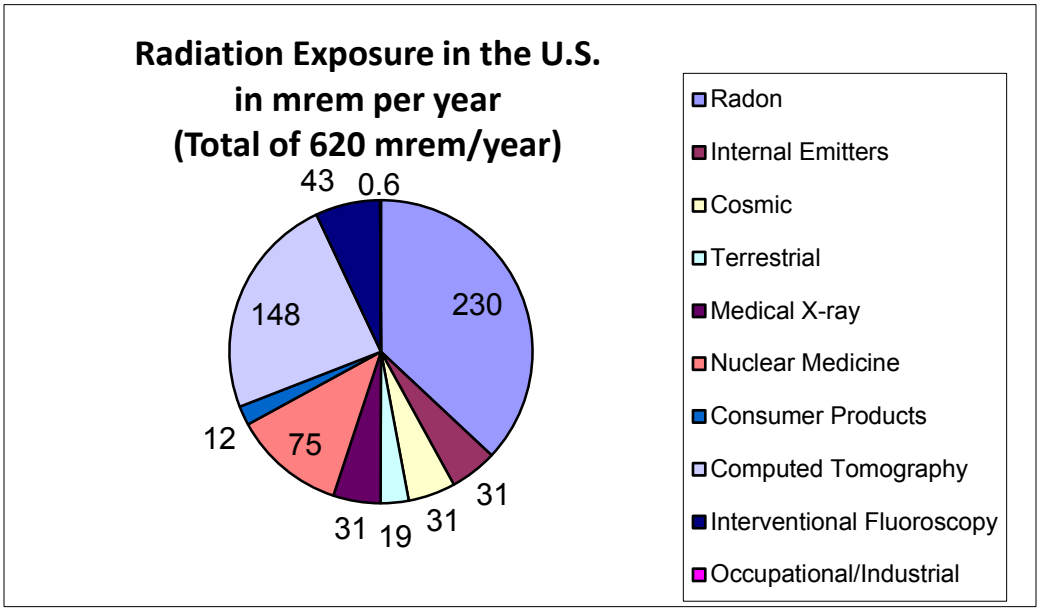
Operator and public exposures are measured in milliroentgen per hour using a Fluke 451B ion chamber. The exposure per hour is converted to annual dose in millirem using the number of x-rays the facility takes within a given time period. One milliroentgen is equal to 0.5 millirem (American National Standard Institute 6.1.1-1991) for whole body exposure from scattered radiation for operators and the public.

Patient entrance skin exposures (ESE's) are measured in milliroentgen using a RaySafe X2 detector, then converted to millirem using the factors in the following table based on the organ of greatest risk. Multiplication of the factor by the number of milliroentgen per exam results in the dose in millirem.

Exam Type	Factor	Organ
Dental	0.0015	brain
PA (posteroanterior) Chest	0.1044	lung
AP (anteroposterior) Cervical Spine	0.0435	thyroid
AP Thoracic Spine	0.1044	lung
AP Lumbar Spine	0.1044	stomach/colon
AP Abdomen	0.1044	stomach/colon
AP Retrograde	0.1044	stomach/colon
Lateral Skull	0.0218	brain
Hand	0.0087	skin
Wrist	0.0087	skin
Arm	0.1044	bone marrow
Shoulder	0.1044	bone marrow
Leg	0.1044	bone marrow
Knee	0.1044	bone marrow
Ankle	0.0087	skin
DP (dorsal-plantar) Foot	0.0087	skin
Lateral Foot	0.0087	skin

Adapted from National Council on Radiation Protection and Measurements Report No. 116 tissue weighting factors and conversion factor from roentgen to rad of 0.87 rad/roentgen.

The average radiation dose to a member of the U.S. population from both natural and man-made sources is 620 millirem per year, according to the National Council on Radiation Protection and Measurements (NCRP). On average, about 300 millirem is from medical uses of radiation.



Adapted from NCRP Report No. 160, 2009, Ionizing Radiation Exposures of the Population of the United States.

Inspection Items

The following boxed sections indicate the individual items that are specifically checked during an inspection, divided into twelve general groups: the facility items of film/screen, processing, darkroom/safelight, personnel monitoring, and patient shielding; and the radiographic items of collimation, timer, kVp/filtration, patient entrance skin exposure criteria, public exposure criteria, operator conditions, and physical condition (of x-ray unit, shielding, etc.). These inspection items are drawn primarily from the National Council on Radiation Protection and Measurements (NCRP).

Some inspection items may pertain only to specific types of facilities. For example, lead gloves tend to be needed primarily while holding animals at veterinary facilities, while panoramic units are found only in dental facilities. Other inspection items apply to all facilities, such as public exposure limits.

New facilities are not cited for noncompliant items but are allowed a period of approximately one month to correct any noncompliant items found in the initial inspection.

Facility Noncompliance Items	
Film/Screen	Dental film is less than E speed X-ray film speed is less than 400 Film is not protected from scatter radiation Film is not stored properly Film is exposed to chemicals Out of date film is used Film and screen types not matched No screen installation date is on outside of cassette Screen and cassettes are not of the same type or age Screen cleaning interval is inadequate Screen cleaning solution and lint-free wipes are not used per manufacturer instructions Cassette check is inadequate Cassettes are not permanently identified for their type of use Film viewbox is not available Film viewbox is not cleaned periodically Viewbox bulbs are not of the same intensity and color Luminance of viewboxes is not similar Viewbox bulbs are not replaced annually Technique factors are not recorded in the patient log book Left/right markers are not used on clinical radiographs Clinical radiographs are not properly identified

Film Processing	Thermometer is not available for manual processing Timer is not available for manual processing Floating cover is not present for manual processing Sight development is used No evidence of daily log is kept Developing technique recommended by the manufacturer is not used Developer and fixer temperature are not maintained in limits Processor cleaning interval is inadequate Processor is not operating properly Processor cleaning date is not recorded Clean-up film for processing x-ray films (except intra-oral) is not run
Darkroom/Safelight	Safelight bulb is greater than 15 watts Safelight is too close to the work area Light leaks are detected in the safelight housing Light leaks are detected in the safelight lens Safelight is improperly filtered Darkroom is not light tight Darkroom is not free of dust and dirt Daylight processor arm cuffs are not acceptable Daylight processor is not light tight Darkroom temperature and/or humidity are not acceptable Other light sources are present in the dark room
Personnel Monitoring	Personnel monitoring devices are required but not available Control dosimeters are not properly used or stored Employee dosimeters are not properly used Employee dosimeters are not properly stored No evidence of employee review of records Personnel monitoring records are incomplete No radiation safety officer is designated for large practices Evidence of personnel holding film during exposure
Personnel/Patient Shielding	Satisfactory lead aprons are unavailable Satisfactory thyroid shields are unavailable Satisfactory gonadal shields are unavailable Lead aprons are improperly stored Lead aprons are not checked for tears and holes (radiographically or visually) on at least an annual basis Individuals (e.g. parents/guardians) holding patients are not protected No documentation of LMP (last menstrual period) Repeat rate analysis is not performed Mobile equipment exposure switch cord is less than 6 feet long Non-essential individuals are in the x-ray room during exposure

<table>
<tr><th colspan="2">Radiographic Noncompliance Items</th></tr>
<tr><td>Collimation</td><td>X-ray beam is not restricted to the appropriate area
X-ray beam is not restricted to the appropriate size
Collimator light is not aligned with the x-ray field
Collimation is not used in taking radiographs
Collimator light is not bright enough under normal room lighting
Collimator light problems (e.g. mirror broken, mirror obstructed)
Inadequate collimation is used for clinical radiographs</td></tr>
<tr><td>Timer</td><td>Timer does not terminate exposure
Timer activates at zero
Timer is inaccurate
Timer repeatability is unacceptable
No deadman switch is available</td></tr>
<tr><td>kVp and Filtration</td><td>kVp is greater than 10% of set value
kVp repeatability is unacceptable
Dental intra-oral x-ray is operating at less than 50 kVp or greater than 100 kVp
Filtration in beam is less than required
Technique charts are not available or up to date</td></tr>
<tr><td>Patient Entrance Skin Exposure Criteria (ESEC)</td><td>Maximum ESEC in milliroentgen for the following non-specialty radiographic exams shall not be exceeded when technical factors for an average adult are utilized:
<table>
<tr><th>Examination</th><th>ESEC mR maximum</th><th>ESEC mR recommended</th><th>Body part thickness (cm)</th></tr>
<tr><td>PA Chest</td><td>30</td><td>15</td><td>23</td></tr>
<tr><td>AP Cervical Spine</td><td>250</td><td>175</td><td>13</td></tr>
<tr><td>AP Thoracic Spine</td><td>900</td><td>600</td><td>23</td></tr>
<tr><td>AP Lumbar Spine</td><td>1000</td><td>675</td><td>23</td></tr>
<tr><td>AP Abdomen</td><td>750</td><td>500</td><td>23</td></tr>
<tr><td>AP Retrograde Pyelogram</td><td>900</td><td>600</td><td>23</td></tr>
<tr><td>Lateral Skull</td><td>300</td><td>200</td><td>15</td></tr>
<tr><td>Dental (bitewing/periapical)</td><td>700</td><td>350</td><td>N/A</td></tr>
</table>
Technique factors are not adjusted for minimum patient exposure
ESE for all x-ray units in facility are not within 20% of one another
Typical exposure value for the x-ray unit is not posted
ESEC repeatability is greater than 5%</td></tr>
<tr><td>Public Exposure</td><td>Public exposure limit of 100 millirem per year exceeded
Public is not protected from scatter radiation</td></tr>
</table>

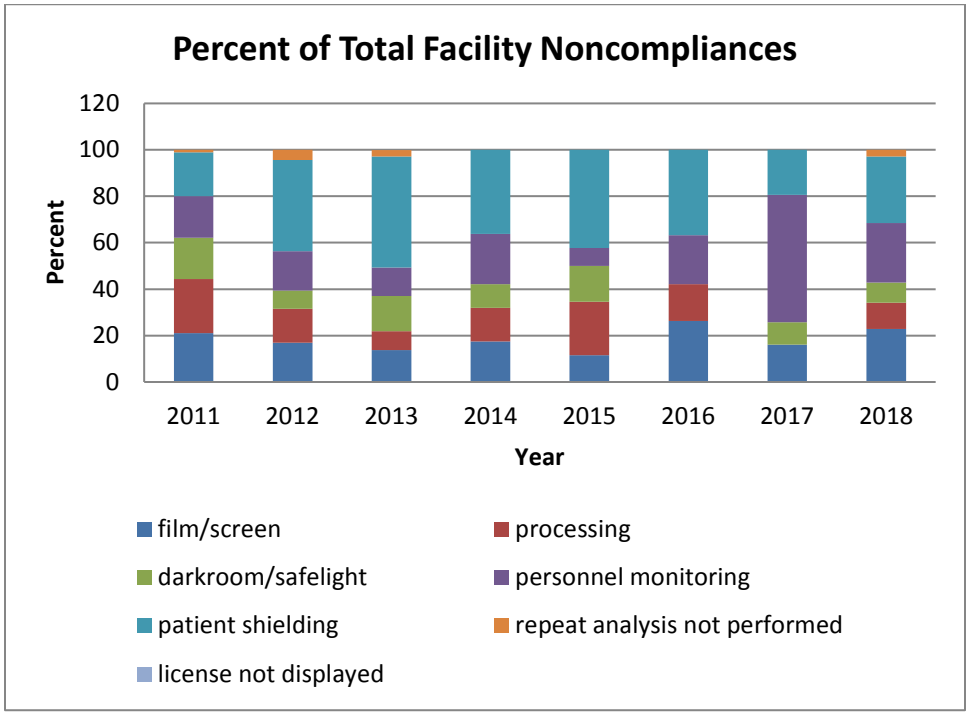
Operator Conditions	Operator exposure limit of 5000 millirem per year exceeded Operator cannot observe patient during exposure Operator cannot monitor kVp, mA, time, mAs during exposure Operator is not protected during exposure Satisfactory lead gloves are not available Mobile or stationary exposure switch cord is less than 6 feet long Exposure switch not located to prevent x-ray activation when operator is outside of the control booth Untrained personnel are operating the x-ray machines Individuals less than 18 years old are holding animals and/or film assembly Veterinary operator holds x-ray tube during exposure
Physical Condition (x-ray unit, shielding, etc.)	Single console for multiple tubes does not indicate energized tube Panoramic or 3D unit does not reset before restarting Motion of panoramic or 3D unit is not smooth or is impeded X-ray tube head locks into position for panoramic, cephalometric or 3D unit Table locks, tube crane locks, bucky-cassette locks are not functioning Filters for soft tissue imaging for cephalometric imaging are not available Focal spot is not indicated on the x-ray tube Source to image distance is less than 7 7/8 inches for intra-oral x-ray tubes Source to image distance is less than 40 inches for medical and stationary veterinary x-ray machines Unit is inaccurate/not calibrated in terms of examination distance (source to image and source to skin distances) Tube head is unstable (drifts or bounces) Overhead crane does not move easily Exposure switch is not labeled Unit does not have visual indication of kVp, mA, time or mAs Unit does not have audible/visual indication of exposure Angulation indicator on x-ray unit is not functioning Structural shielding is inadequate Door interlock system is not functioning Condition of high voltage and other cables is inadequate X-ray head leaks oil Wires are exposed on tube head X-ray exposure button is missing or broken Wires are exposed on exposure switch Preventive maintenance records for x-ray machines and processor are not kept No FDA or manufacturer label on the x-ray machine Mechanical restraints/anesthesia/lead gloves not used for animals X-ray warning signs not used during portable veterinary use Bare sheet lead on walls/doors is not covered
X-ray unit is not registered	
Vermont State licenses are not displayed	

Summary of All Inspections

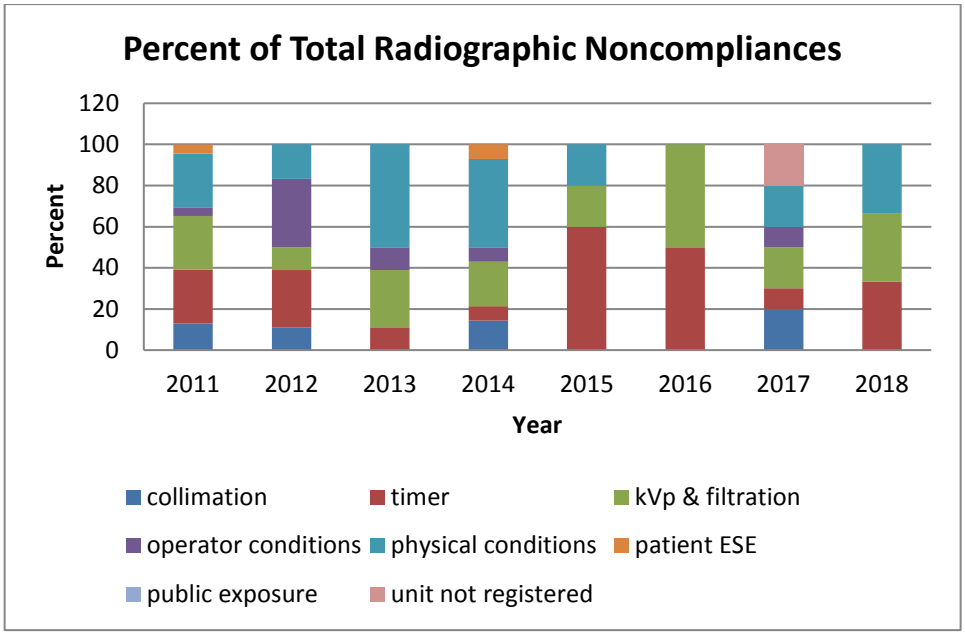
Total Number of Inspections Performed	100
Total Number of Facilities Not in Compliance	25

Total Noncompliances	38
Average noncompliances per noncompliant facility	1.52
Range of number of noncompliances per facility	0 – 3

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	8	22.8
Processing	4	11.4
Darkroom/Safelight	3	8.6
Personnel Monitoring	9	25.7
Patient Shielding	10	28.6
License Not Displayed	0	0.0
Repeat Analysis Not Performed	1	2.9
Total Facility Noncompliances	35	100.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	1	33.3
kVp & Filtration	1	33.3
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	1	33.4
Unit not registered	0	0.0
Total Radiographic Noncompliances	3	100.0



Annual Dose to Occupational Worker			
Type of Facility	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Dental[1]	1.8	0.001 – 80	5000
Medical[1]	2.3	0.001 – 11	5000
Chiropractic	0.01	0.0002 – 0.04	5000
Podiatric	0.02	NA	5000
Veterinary[1]	16	0.0003 – 139	5000

[1]The wide range in doses for dental, medical, and veterinary facilities reflects the variety of machine types and examinations performed in these facilities.

Annual Dose to Public			
Type of Facility	**Average millirem per year**	**Range millirem per year**	**Maximum Allowable millirem per year**
Dental[1]	2.4	0.007 – 46	100
Medical	0.04	0.0001 – 0.23	100
Chiropractic	0.39	0.0003 – 1.5	100
Podiatric	0.37	NA	100
Veterinary[1]	6.1	0.00004 – 69	100

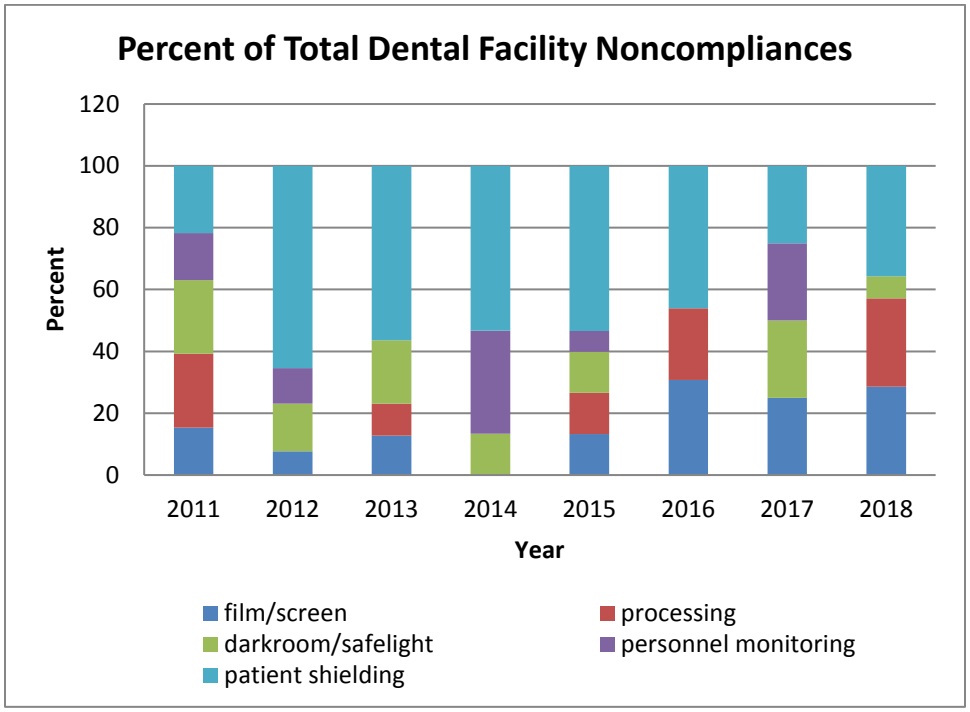
[1]The wide range in doses for dental and veterinary facilities reflects the variety of machine types and examinations performed in these facilities.

Dental Inspections

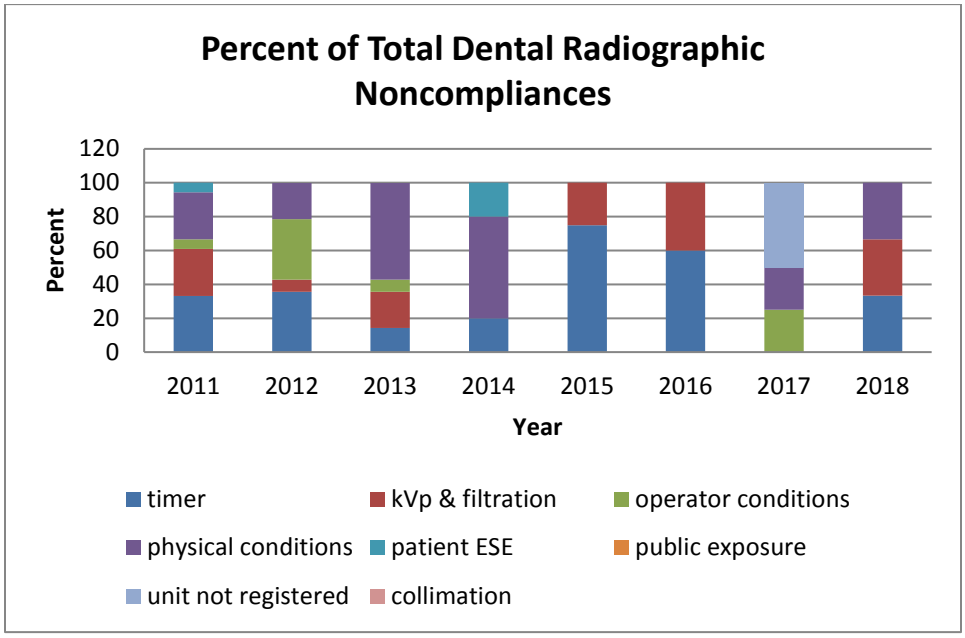
Total Number of Inspections Performed	55
Total Number of Facilities Not in Compliance	10

Total Noncompliances	17
Average noncompliances per noncompliant facility	1.7
Range of number of noncompliances per facility	0 – 3

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	4	28.6
Processing	4	28.6
Darkroom/Safelight	1	7.1
Personnel Monitoring	0	0.0
Patient Shielding	5	35.7
Total Facility Noncompliances	14	100.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	1	33.3
kVp & Filtration	1	33.3
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	1	33.4
Unit not registered	0	0.0
Total Radiographic Noncompliances	3	100.0



Dose to Patients per Exposure

Exam Type	Average millirem per exposure	Range millirem per exposure	Vermont state maximum dose millirem[1]	Vermont state recommended dose millirem[2]	NCRP DRL millirem[3]
Intra-oral D speed film	0.47	0.28 – 0.73	1.05	0.53	0.28
Intra-oral E speed film	0.20	NA[4]	1.05	0.53	0.28
Intra-oral F speed film	0.29	0.16 - 0.48	1.05	0.53	0.28
Intra-oral Portable digital	0.12	0.06 – 0.23	1.05	0.53	0.28
Intra-oral CR digital	0.23	0.04 – 0.55	1.05	0.53	0.28
Intra-oral DR digital	0.17	0.04 – 0.70	1.05	0.53	0.28
Panoramic film	0.74	0.54 – 1.01	--	--	--
Panoramic CR digital	0.86	0.38 – 1.41	--	--	--
Panoramic DR digital	0.80	0.22 – 1.39	--	--	--
Cephalometric film	NA	NA	--	--	0.024
Cephalometric digital	0.12	0.05 – 0.20	--	--	0.024
Cephalometric scanner	0.21	NA	--	--	0.024
3 Dimensional	0.72	0.18 – 1.14	--	--	--

[1]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations maximum entrance skin exposure criteria of 700 milliroentgens per radiograph, so (700 x 0.0015) for the brain as the organ of greatest risk.

[2]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations recommended entrance skin exposure criteria of 350 milliroentgens per radiograph, so (350 x 0.0015) for the brain as the organ of greatest risk.

[3]DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 145, 2003

[4]NA = Not applicable

Annual Dose to Occupational Worker

Exam Type	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Intra-oral D speed film	1.50	0.78 – 2.35	5000
Intra-oral E speed film	0.02	0.02 – 0.03	5000
Intra-oral F speed film	0.31	0.005 – 0.92	5000
Intra-oral Portable digital	7.93	0.26 – 19	5000
Intra-oral CR digital	0.70	0.001 – 4.93	5000
Intra-oral DR digital	0.94	0.002 – 15	5000
Panoramic film	0.24	0.04 – 0.64	5000
Panoramic CR digital	0.44	0.07 – 1.16	5000
Panoramic DR digital	2.86	0.009 – 16	5000
Cephalometric film	NA	NA	5000
Cephalometric digital	1.66	0.06 – 5.96	5000
Cephalometric scanner	3.12	NA	5000
3 Dimensional	13	0.008 – 80	5000

Annual Dose to Public

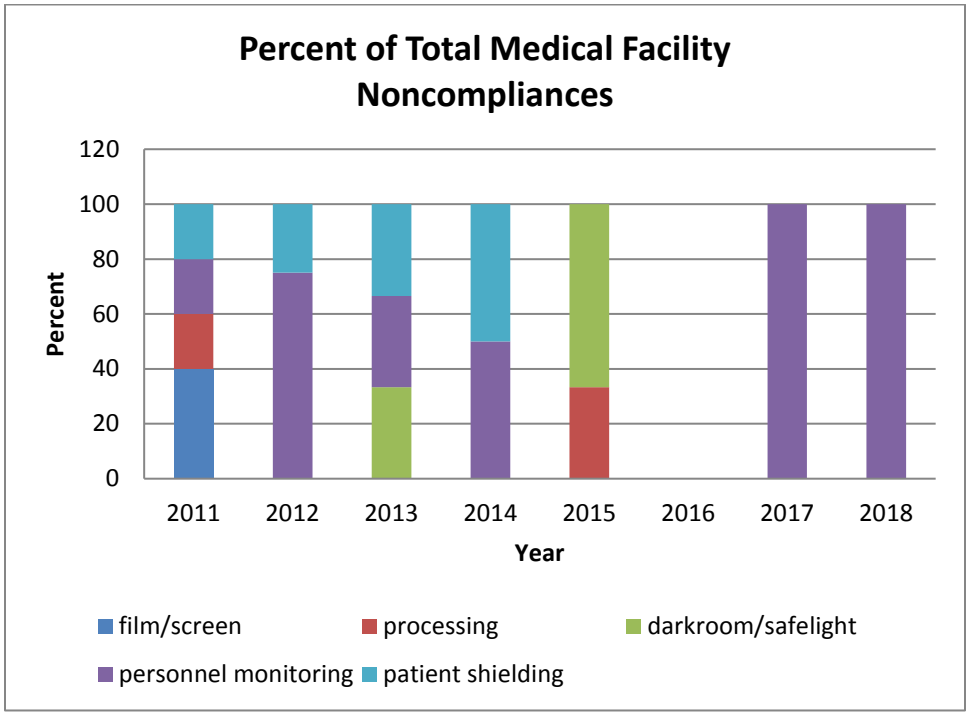
Exam Type	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Intra-oral D speed film	4.57	2.77 – 6.34	100
Intra-oral E speed film	0.68	0.38 – 0.98	100
Intra-oral F speed film	2.40	0.08 – 6.86	100
Intra-oral Portable digital	2.81	0.08 – 5.91	100
Intra-oral CR digital	1.86	0.04 – 7.93	100
Intra-oral DR digital	1.74	0.01 – 30	100
Panoramic film	0.17	0.03 – 0.42	100
Panoramic CR digital	0.37	0.10 – 1.10	100
Panoramic DR digital	4.57	0.007 – 46	100
Cephalometric film	NA	NA	100
Cephalometric digital	7.47	0.19 – 20	100
Cephalometric scanner	7.09	NA	100
3 Dimensional	6.38	0.25 – 17	100

Medical Inspections

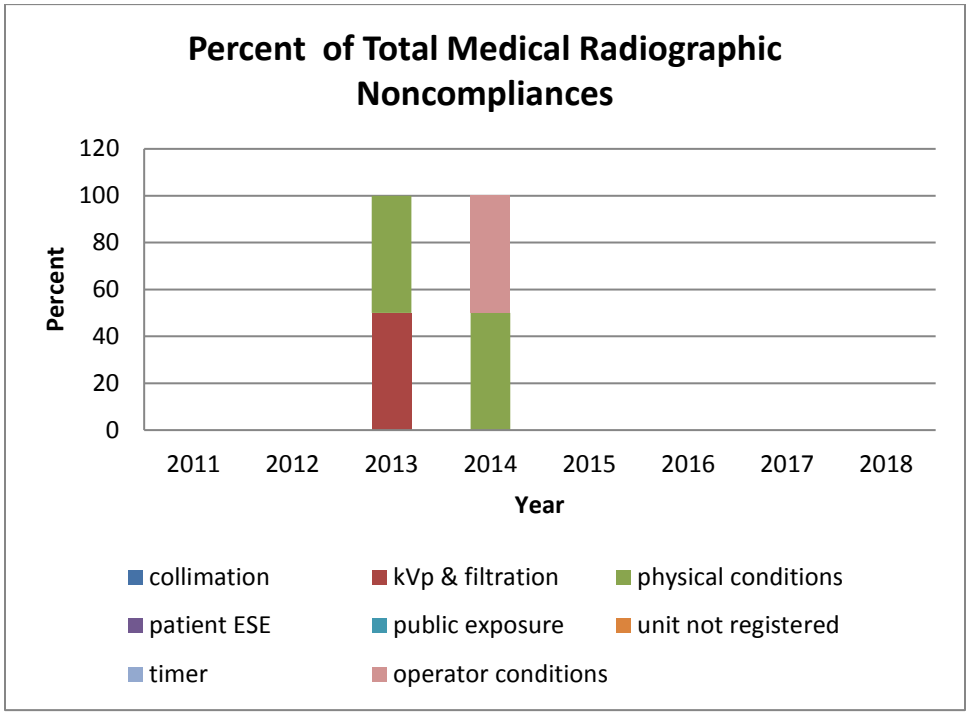
Total Number of Inspections Performed	8
Total Number of Facilities Not in Compliance	4

Total Noncompliances	4
Average noncompliances per noncompliant facility	1
Range of number of noncompliances per facility	0 – 1

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	0	0.0
Processing	0	0.0
Darkroom/Safelight	0	0.0
Personnel Monitoring	4	100.0
Patient Shielding	0	0.0
Total Facility Noncompliances	4	100.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0
Total Radiographic Noncompliances	0	0.0



Dose to Patients per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont state maximum dose millirem[1]	Vermont state recommended dose millirem[2]	NCRP DRL millirem[3]
PA Chest	2.28	1.83 – 2.68	3.13	1.57	1.8
AP Cervical Spine	NA[4]	NA	10.88	7.61	--
AP Thoracic Spine	NA	NA	93.96	62.64	--
AP Lumbar Spine	58	38 – 98	104.4	70.47	50
AP Abdomen	NA	NA	78.3	52.2	41
AP Retrograde	NA	NA	93.96	62.64	--
Lateral Skull	NA	NA	6.54	4.36	--
Hand	0.13	0.11 – 0.14	--	--	--
Wrist	0.11	NA	--	--	--
Arm	NA	NA	--	--	--
Shoulder	16	14 – 18	--	--	--
Leg	NA	NA	--	--	--
Knee	6.14	5.52 – 7.10	--	--	--
Ankle	0.20	0.19 – 0.20	--	--	--
DP Foot	NA	NA	--	--	--
Lateral Foot	NA	NA	--	--	--
Fluoroscopy					
Wrist	0.01	NA	--	--	--
Knee	NA	NA	--	--	--
Ankle	NA	NA	--	--	--
AP Cervical	NA	NA	--	--	--
AP Lumbar	87	43 – 162	--	--	--
Fluoroscopy Spot Film	0.82	0.71 – 0.92	--	--	--
Sinus	NA	NA	--	--	--

[1]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations maximum entrance skin exposure criteria per radiograph

Example: For a PA chest exam the lung is the organ of greatest risk so the maximum dose would be (30 x 0.1044) millirem.

[2]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations recommended entrance skin exposure criteria per radiograph

Example: For a PA chest exam the lung is the organ of greatest risk so the recommended dose would be (15 x 0.1044) millirem.

[3]DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 172, 2012

[4]NA = not applicable

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
2.27	0.001 – 11	5000

Annual Dose to Public

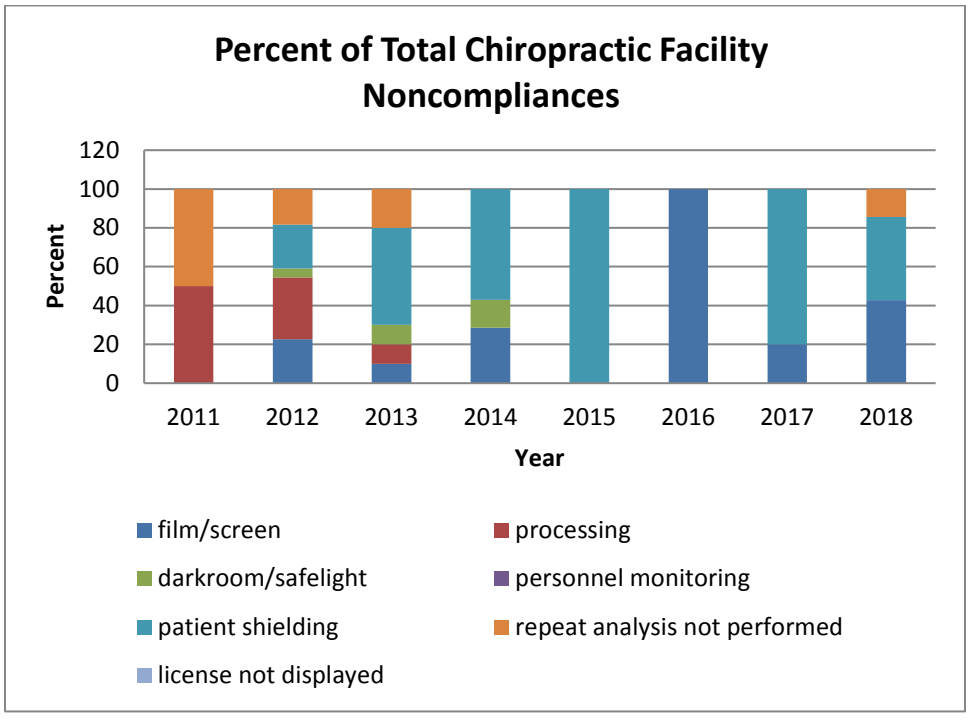
Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
0.04	0.0001 – 0.23	100

Chiropractic Inspections

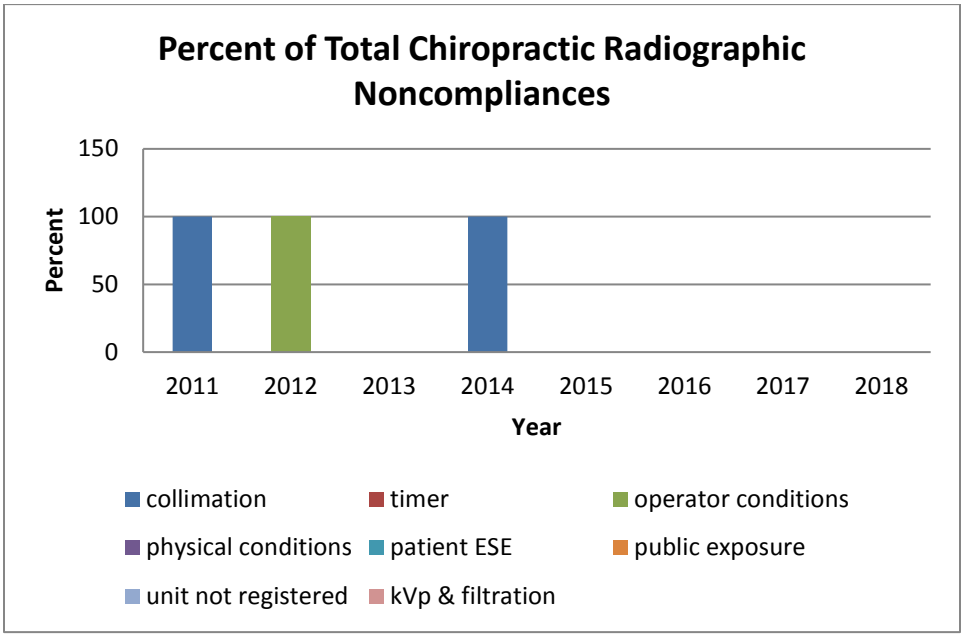
Total Number of Inspections Performed	7
Total Number of Facilities Not in Compliance	4

Total Noncompliances	7
Average noncompliances per noncompliant facility	1.75
Range of number of noncompliances per facility	0 – 2

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	3	42.8
Processing	0	0.0
Darkroom/Safelight	0	0.0
Personnel Monitoring	0	0.0
Patient Shielding	3	42.8
License Displayed	0	0.0
Repeat Analysis	1	14.4
Total Facility Noncompliances	7	100.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0
Total Radiographic Noncompliances	0	0.0



Dose to Patients per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont state maximum dose millirem[1]	Vermont state recommended dose millirem[2]	NCRP DRL millirem[3]
PA Chest	NA[4]	NA	3.13	1.57	1.8
AP Cervical Spine	3.91	2.08 – 8.09	10.88	7.61	--
AP Thoracic Spine	26	18 – 36	93.96	62.64	--
AP Lumbar Spine	39	29 – 61	104.4	70.47	50
AP Abdomen	NA	NA	78.3	52.2	41
AP Retrograde	NA	NA	93.96	62.64	--
Lateral Skull	NA	NA	6.54	4.36	--

[1]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations maximum entrance skin exposure criteria per radiograph

Example: For a PA chest exam the lung is the organ of greatest risk so maximum dose would be (30 x 0.1044) millirem.

[2]Calculated from the Radiological Health Rule Part 5. Chapter 3. regulations recommended entrance skin exposure criteria per radiograph

Example: For a PA chest exam the lung is the organ of greatest risk so recommended dose would be (15 x 0.1044) millirem.

[3]DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 172, 2012
[4]NA = not applicable

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
0.01	0.0002 – 0.04	5000

Annual Dose to Public

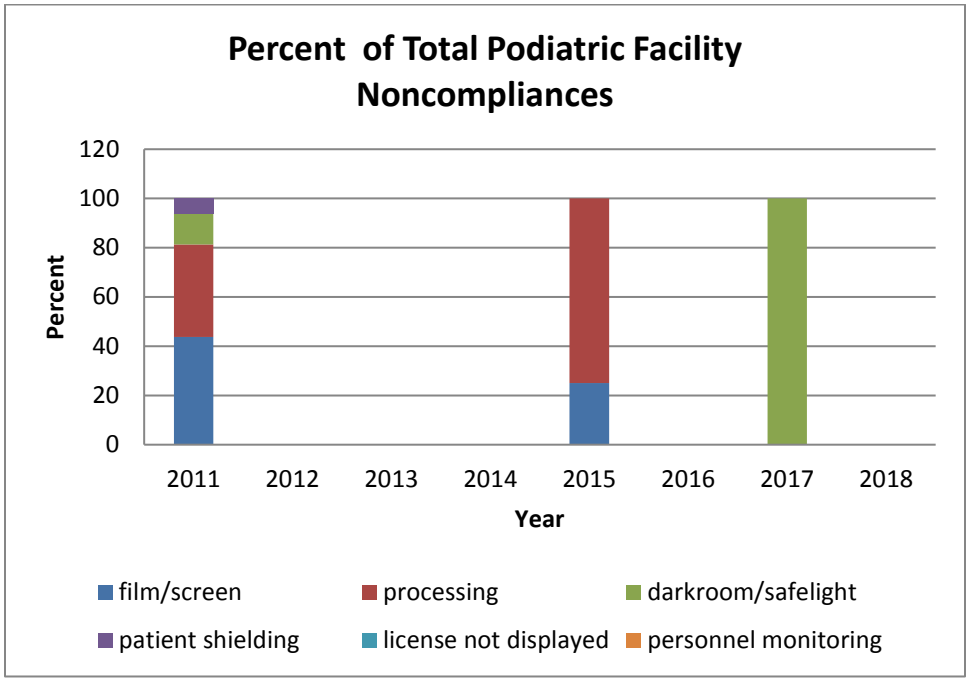
Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
0.39	0.0003 – 1.47	100

Podiatric Inspections

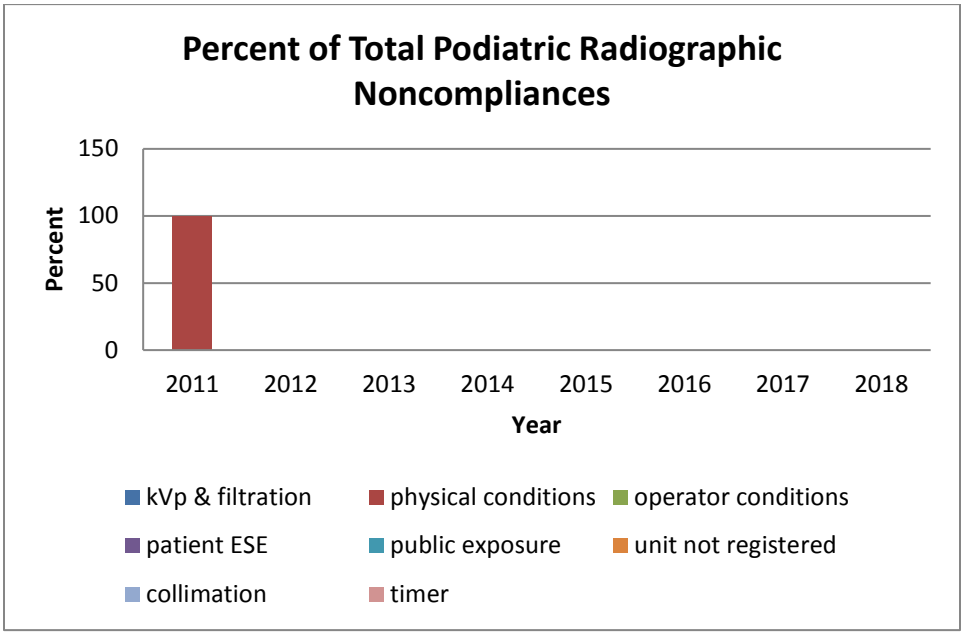
Total Number of Inspections Performed	1
Total Number of Facilities Not in Compliance	0

Total Noncompliances	0
Average noncompliances per noncompliant facility	NA
Range of number of noncompliances per facility	NA

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	0	0.0
Processing	0	0.0
Darkroom/Safelight	0	0.0
Personnel Monitoring	0	0.0
Patient Shielding	0	0.0
Total Facility Noncompliances	0	0.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0
Total Radiographic Noncompliances	0	0.0



Dose to Patients per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont state maximum dose millirem	Vermont state recommended dose millirem	NCRP DRL millirem
DP Foot	0.13	NA[1]	--	--	--
Lateral Foot	0.16	NA	--	--	--

[1]NA = not applicable

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
0.02	NA	5000

Annual Dose to Public

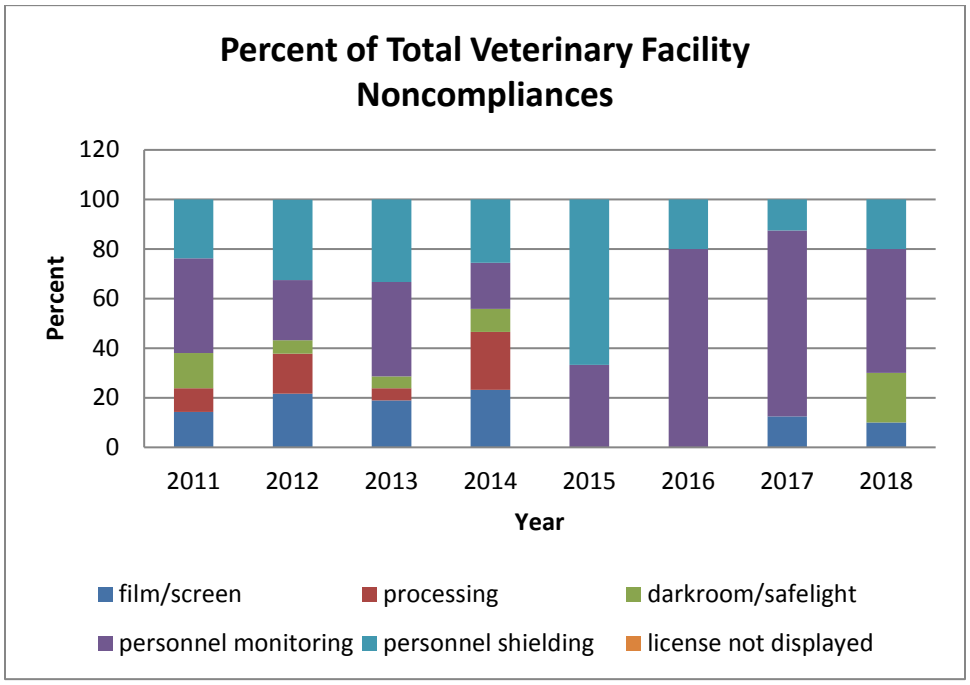
Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
0.37	NA	100

Veterinary Inspections

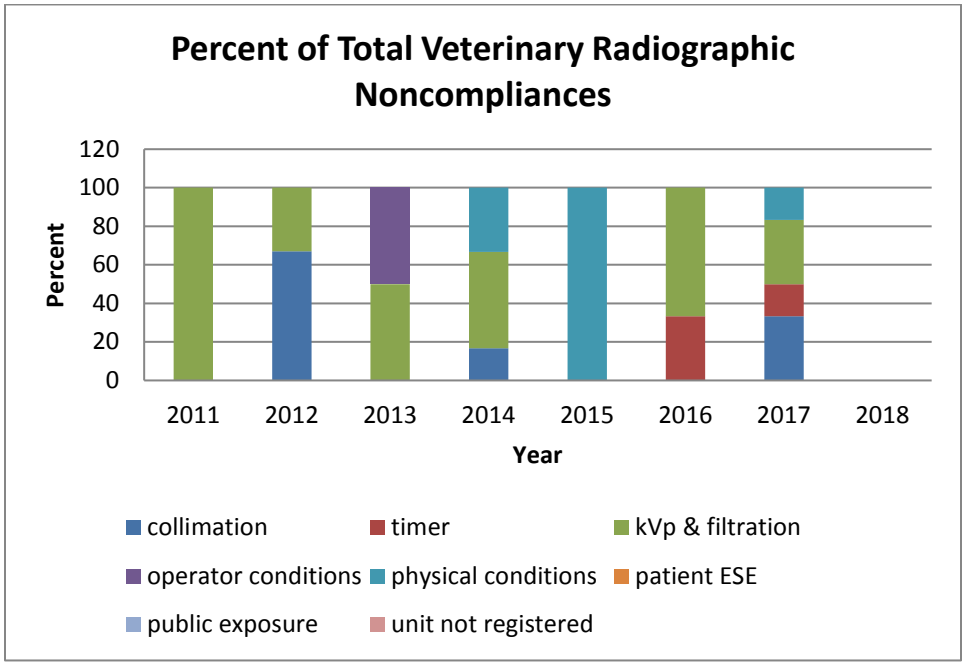
Total Number of Inspections Performed	29
Total Number of Facilities Not in Compliance	7

Total Noncompliances	10
Average number noncompliances per noncompliant facility	1.43
Range of number of noncompliances per facility	0 – 3

Facility Noncompliances		**Percentage of Total Facility Noncompliances**
Film/Screen	1	10.0
Processing	0	0.0
Darkroom/Safelight	2	20.0
Personnel Monitoring	5	50.0
Personnel Shielding	2	20.0
Total Facility Noncompliances	10	100.0



Radiographic Noncompliances		Percentage of Total Radiographic Noncompliances
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0
Total Radiographic Noncompliances	0	0.0



Exposure to Patient per Exposure

Type of Exam	Average milliroentgen per exposure	Range milliroentgen per exposure
Dog chest	53	8.49 – 172
Dog abdomen	61	12 – 132
Dog extremity	15	1.90 – 46
Dog dental	85	35 – 125
Dog CT scan	NA[1]	NA
Cat-o-gram	16	9.90 – 22
Cat chest/abdomen	27	3.92 – 70
Cat extremity	11	7.29 – 15
Cat dental	67	21 – 88
Horse hoof	17	13 – 23
Horse navicular	19	16 – 23
Horse fetlock/pastern/ankle	22	20 – 24
Horse carpus/knee	26	23 – 30
Horse hock	23	NA
Horse gaskin/forearm	NA	NA
Horse canon	NA	NA
Horse stifle/hip	NA	NA
Horse spine	NA	NA

[1]NA = not applicable

Annual Dose to Occupational Worker

Stationary X-Ray Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Operator exposure at edge of table	18	0.68 – 94	5000
Operator exposure at opposite ends of table	7.95	0.15 – 47	5000
Operator exposure 3 feet from x-ray unit	5.33	0.11 – 42	5000
Operator exposure 6 feet from x-ray unit	1.34	0.03 – 10	5000
Operator exposure behind shield, wall, or door	0.20	0.0002 – 2.50	5000
Extremity exposure	54	1.36 – 245	50,000

Portable X-Ray Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Operator exposure holding x-ray unit	0.99	0.009 – 1.99	5000
Operator exposure at end of exposure cord	0.09	0.005 – 0.25	5000
Operator exposure 3 feet from x-ray unit	0.25	0.05 – 0.50	5000
Operator exposure 6 feet from x-ray unit	0.02	0.002 – 0.03	5000
Extremity exposure	28	7.00 – 83	50,000

Dental X-Ray Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Operator exposure 6 feet from x-ray unit	0.80	0.14 – 4.22	5000
Operator exposure behind shield, wall, or door	15	0.05 – 139	5000

Annual Dose to Public

Machine Type	Average millirem per year	Range millirem per year	Maximum Allowable millirem per year
Stationary X-Ray	0.11	0.00004 – 0.56	100
Portable X-Ray	0.005	0.0002 – 0.02	100
Dental X-Ray	21	0.22 – 69	100