FANC AFCN

federaal agentschap voor nucleaire controle

agence fédérale de contrôle nucléaire

Recent initiatives of the FANC

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Belgian nuclear medicine survey

Reminder objectives of the national survey :

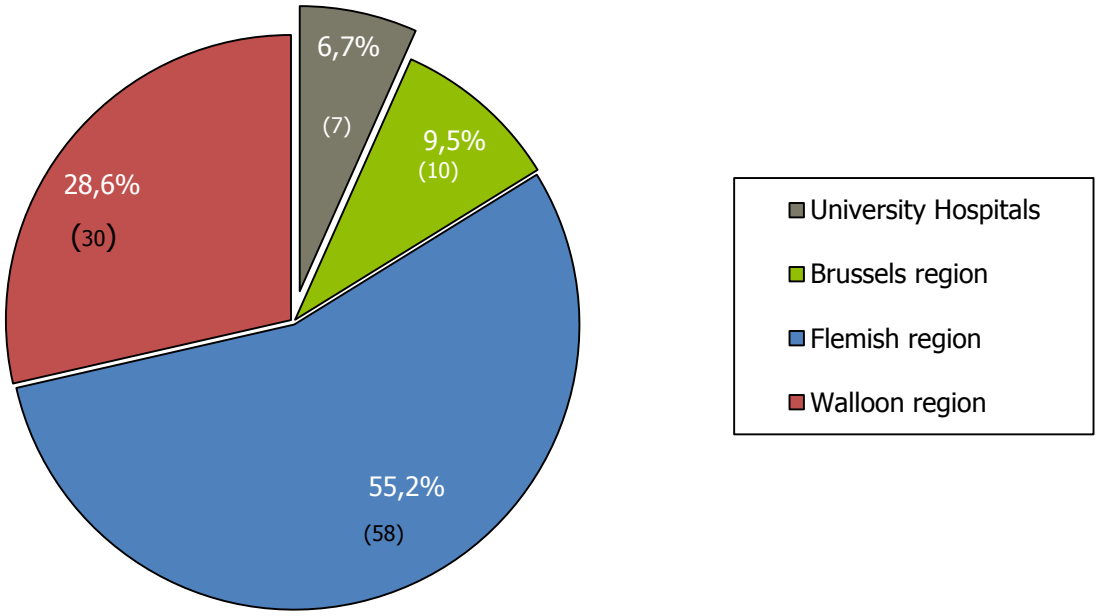
1. Review the average administered activities
2. Assess trends in the frequency of different nuclear medicine procedures
3. But also some information on equipment (comparison with radiological parc)

Belgian nuclear medicine survey

Survey carried out on volontary basis near the Belgian nuclear medicine services

Responses received : 105 or 65,5% (Estimated nuclear medicine services : 160)

Distribution of responses :



Belgian nuclear medicine survey

1. Equipment

		Gamma camera, SPECT or SPECT/CT				
		System				
		A	B	C	D	E
	Response	105	92	49	15	10
Number of detector heads	1	16,4%	20,7%	31,9%	21,4%	77,8%
	2	79,5%	79,3%	61,7%	71,4%	22,2%
	3	4,1%	-	6,4%	7,1%	-
Angulation of detector heads	Fixed	12,3%	21,4%	20,9%	25,0%	50,0%
	90°	14,0%	9,5%	4,7%	8,3%	16,7%
	180°	45,6%	44,0%	34,9%	50,0%	33,3%
	360°	28,1%	25,0%	39,5%	16,7%	-
Used for SPECT ?	Yes	88,4%	85,7%	66,7%	92,3%	22,2%
	No	11,6%	14,3%	33,3%	7,7%	77,8%

Belgian nuclear medicine survey

1. Equipment

		PET or PET/CT		
		System		
		A	B	C
		23	6	1
Used for research?	Yes	30,4%	28,6%	-
	No	69,6%	71,4%	100%

	OSTEODENSITOMETRY	
	Response percent	Response count
GE (Lunar)	43,4	23
Hologic	56,6	30
Norland	0	0
Other	0	0

Belgian nuclear medicine survey

1. Equipment

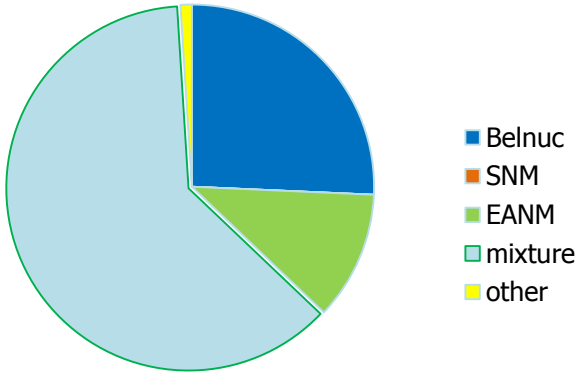
	Non-imaging equipment				
	System				
	A	B	C	D	E
Response	105	72	41	17	10
Well counter	14,7%	13,9%	19,5%	23,5%	20%
Dose calibrator	77,1%	38,9%	26,8%	35,3%	20%
Thyroid counter	-	1,4%	-	5,9%	10%
Intra-operative probe	7,3%	41,7%	34,1%	23,5%	20%
Other	0,9%	4,2%	19,5%	11,8%	30%

Belgian nuclear medicine survey

2. Guidelines

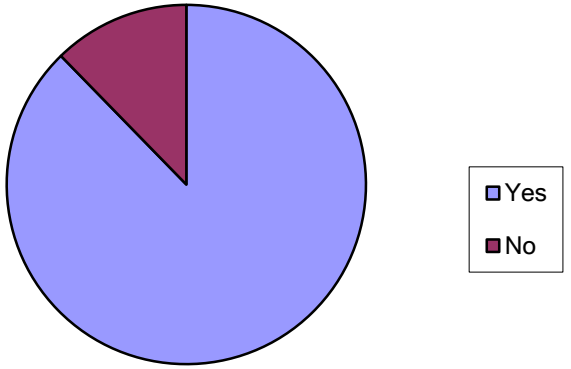
Which guidelines are used for the determination of the injected activity

Answer options	Response percent
Belnuc	25,7
SNM	0
EANM	11,4
Mixture	61,9
Other	1,0



Are pediatric guidelines being applied?

Answer options	Response percent
Yes	87,7
No	12,3



FANC federal agency for nuclear control

Belgian nuclear medicine survey

3. Frequency of procedures

Diagnostic conventional nuclear medicine procedures		Number of responses :	105			
			Planar		SPECT	
			Response Count	Response %	Response Count	Response %
Osteo-articular	**Bone imaging**	**Tc-99m phosphates**	**102**	**97,1**	**102**	**97,1**
	Peripheral vascular scintigraphy	Tc-99m HSA	44	41,9	17	16,2
	Bone narrow scintigraphy	Tc-99m colloid	51	48,6	38	36,2
Brain	**Cerebral blood flow**	**Tc-99m HMPAO**			**57**	**54,3**
	Cerebral blood flow	**Tc-99m ECD**			**52**	**49,5**
	Cisternography	In-111 DTPA	28	26,7	22	21,0
	Dopamine transporter	I-123 Ioflupane			80	76,2
	Brain tumor	I-123 IMT				
Cardiovascular	**Myocardial perfusion**	**Tc-99m Sestamibi**			**58/10** [1]	**55,2/9,5**
	Myocardial perfusion	**Tc-99m Tetrofosmin**			**48/20** [2]	**45,7/19,0**
	Myocardial perfusion	**Tl-201 chloride**			**30/23** [3]	**28,6/21,9**
	Cardiac blood pool	**Tc-99m RBC**	**37**	**35,2**	**14**	**13,3**
	Cardiac blood pool	**Tc-99m HSA**	**41**	**39,0**	**19**	**18,1**
	Cardiac (right-left) shunt	Tc-99m MAA	11	10,5		
	First-pass ventriculography	Tc-99m pertechnetate	6	5,7		
Inflammation & infection	Leukocyte scintigraphy	In-111 oxine labeled WBC	11	10,5		
	Leukocyte scintigraphy	Tc-99m HMPAO labeled WBC	31	29,5		
	Inflammation and infection	Ga-67 citrate	43	41,0	38	36,2
	Inflammation and infection	Tc-99m nanocolloid	13	12,4	11	10,5
	Immunoglobulin scintigraphy	Tc-99m HIG	36	34,3	20	19,0

[1] 2 days/1 day (x)

[2] 2 days/1 day (x)

[3] Stress-redis/reinjection

Belgian nuclear medicine survey

3. Frequency of procedures

Diagnostic conventional nuclear medicine procedures		Number of responses :	105			
			Planar		SPECT	
			Response Count	Response %	Response Count	Response %
Gastrointestinal Tract	**Gastro emptying**	**Tc-99m labeled compounds**	**94**	**89,5**		
	Gastro emptying	In-111 DTPA	5	4,8		
	Gastro-esophageal reflux	**Tc-99m labeled compounds**	**80**	**76,2**		
	Salivary gland	Tc-99m pertechnetate	66	62,9		
	Hepatobiliary scintigraphy	Tc-99m HIDA, BRIDA, …	49	46,7		
	Meckel scintigraphy	**Tc-99m pertechnetate**	**85**	**81,0**	**42**	**40,0**
	Colonic transit	In-111 labeled non-absorbable compounds	6	5,7	3	2,9
	Hepatic and spleen	Tc-99m colloid	33	31,4	21	20,0
	Hepatic blood pool (hemangiona)	Tc-99m RBC	7	6,7	8	7,6
	Hepatic perfusion	Tc-99m MAA	5	4,8		
	Spleen scintigraphy	Tc-99m denatured erythocytes	13	12,4	6	5,7
	Peritoneal cavity	Tc-99m colloid	13	12,4		
	Gastrointestinal bleeding	Tc-99m RBC	42	40,0	24	22,9
	Gastrointestinal bleeding	Tc-99m colloid	15	14,3	8	7,6
Nephrology	**Renal cortical scintigraphy**	**Tc-99m DMSA**	**93**	**88,6**	**63**	**60,0**
	Renography	**Tc-99m MAG3**	**82**	**78,1**		
	Renography	Tc-99m EC	2	1,9		
	Renography	Tc-99m DTPA	55	52,4		
	Renography	I-123 Hippuran	1	1,0		
	Direct cystography	Tc-99m pertechnetate, DTPA or colloid	18	17,1		
	Indirect cystography	Tc-99m MAG3	15	14,3		
Respiratory System	**Lung perfusion**	**Tc-99m MAA**	**97**	**92,4**	**65**	**61,9**
	Lung ventilation	Tc-99m DTPA aerosol	68	64,8	34	32,4
	Lung ventilation	Tc-99m Technegas	16	15,2	13	12,4

Belgian nuclear medicine survey

3. Frequency of procedures

Diagnostic conventional nuclear medicine procedures		Number of responses :	105			
			Planar		SPECT	
			Response Count	Response %	Response Count	Response %
Endocrinology & Oncology	**Thyroid scintigraphy**	**Tc-99m pertechnetate**	**100**	**95,2**	**54**	**51,4**
	Thyroid scintigraphy	**I-123 sodium iodide**	**40**	**38,1**	**19**	**18,1**
	Thyroid uptake	I-123 sodium iodide	33	31,4		
	Thyroid uptake	I-131 sodium iodide	16	15,2		
	Pre-therapeutic total body	I-123 sodium iodide	10	9,5		
	Pre-therapeutic total body	I-131 sodium iodide	25	23,8		
	Post-ablation follow-up TB	I-131 sodium iodide	34	32,4		
	Parathyroid scintigraphy	Tc-99m Sestamibi	66	62,9		
	Parathyroid scintigraphy	Tc-99m Tetrofosmin	25	23,8		
	Parathyroid scintigraphy	Tc-99m pertechnetate	57	54,3		
	Parathyroid scintigraphy	I-123 sodium iodide	26	24,8		
	Parathyroid scintigraphy	Tl-201 chloride	7	6,7		
	Scintimammography	Tc-99m Sestamibi	11	10,5		
	Scintimammography	Tc-99m Tetrofosmin	11	10,5		
	Scintimammography	Tl-201 chloride	1	1,0		
	Adrenal scintigraphy	I-131 iodo-cholesterol	15	14,3		
	Tumor imaging	Tl-201 chloride	7	6,7	4	3,8
	Tumor imaging	Ga-67	30	28,6	25	23,8
	Somatostatine receptor	In-111 pentetreotide	59	56,2	56	53,3
	Adrenal medulla and neural crest tumor	I-123 ou I-131 labeled MIBG	57	54,3		
	Lymphoscintigraphy	Tc-99m nanocolloid	78	74,3		
	Sentinel node breast carcinoma	Tc-99m nanocolloid	84	80,0		
	Sentinel node in melanoma	Tc-99m nanocolloid	70	66,7		
	Radioimmunoscintigraphy	Tc-99m labeled AB	12	11,4		
	Radioimmunoscintigraphy	I-123 labeled AB	1	1,0		
	Radioimmunoscintigraphy	In-111 labeled AB	1	1,0		

Belgian nuclear medicine survey

3. Frequency of procedures

PET		Number of responses :	19	
			Response Count	Response %
Brain imagine	**Glucose metabolism**	**F-18 FDG**	**16**	**84,2**
	Cerebral blood flow	O-15 methionine	0	
	Brain tumor imaging	C-11 methionine	3	15,8
	Brain tumor imaging	F-18 FET	5	26,3
Cardiovascular imagine	**Myocardial metabolism**	**F-18 FDG**	**11**	**57,9**
	Myocardial metabolism	C-11-acetate	0	
	Myocardial perfusion	N-13-NH3	1	5,3
	Myocardial perfusion	Rb-82	0	
Oncology	**Tumor imaging**	**F-18 FDG**	**17**	**89,5**
Inflammation and infection	**Inflammation and infection**	**F-18 FDG**	**13**	**68,4**

Belgian nuclear medicine survey

3. Frequency of procedures

Diagnostic conventional nuclear medicine procedures

	Number of administrations		
Osteo-articular	**170.359**	**Bone imaging**	Tc-99m phosphates
Cardiovascular	**67.051**	**Myocardial perfusion**	Tc-99m Sestamibi
		Myocardial perfusion	Tc-99m Tetrofosmin
		Myocardial perfusion	Tl-201 chloride
		Cardiac blood pool	Tc-99m RBC
		Cardiac blood pool	Tc-99m HSA
Endocrinology & Oncology	**51.325**	**Thyroid scintigraphy**	Tc-99m pertechnetate
		Thyroid scintigraphy	I-123 sodium iodide
Nephrology	**9.341**	**Renal cortical scintigraphy**	Tc-99m DMSA
		Renography	Tc-99m MAG3
		Renography	Tc-99m EC
		Renography	Tc-99m DTPA
		Renography	I-123 Hippuran
Gastrointestinal Tract	**7.245**	**Gastro emptying**	Tc-99m labeled compounds
		Gastro-esophageal reflux	Tc-99m labeled compounds
		Meckel scintigraphy	Tc-99m pertechnetate

Diagnostic PET and PET-CT procedures

	Number of administrations		
Brain imagine	**1.865**	**Glucose metabolism**	F-18 FDG
Cardiovascular imagine	**1.139**	**Myocardial metabolism**	F-18 FDG
Oncology	**29.502**	**Tumor imaging**	F-18 FDG
Inflammation and infection	**1.326**	**Inflammation and infection**	F-18 FDG

Belgian nuclear medicine survey

4. Administered activities

	Belgian Society for Nuclear Medicine Guidelines for the Reference Administer Activities				Survey		
System	*Tracer*	*Ref.activities MBq*	*Maximum MBq*	*Minimum MBq*	*Mean activity MBq*	*Maximum MBq*	*Minimum MBq*
Osteo-articular							
Bone	Tc-99m-HDP/MDP	740	925	70	774	1000	400
Perfusion	Tc-99m-HSA	220	370	55	430	925	74
Endocrinology							
Thyroid	Tc-99m-Pertechnetate	110	200	20	145	380	37
	I-123	40	50	5	30	150	7,7
	Thyroid cancer (I-131)	110	370	20			
Parathyroid	Thallium (Tl-201)	70	110	16	72	111	37
	Tc-99m-agent	740	900	95	586	740	37
Adrenals	I-123-MIBG	185	260	30	183	400	37
	I-131-MIBG	40	80	20	62	185	17,5
Tumor detection							
Breast	Tc-99m-agent	740	900	NA	739	925	540
Gallium	67-GA-citrate	220	370	30	168	370	74
Octreotide	In-111-Octreotide	220	220	30	179	1700	37
FDG	F-18-FDG	260	370	70	263	370	150
Lung							
Lung Perfusion	Tc-99m-MAA	110	220	20	186	370	70
Brain							
Perfusion	Tc-99m-agent	740	1110	140	766	1110	440
Cisterno	In-111-DTPA	20	40	3	49	185	15

Belgian nuclear medicine survey

4. Administered activities

	Belgian Society for Nuclear Medicine Guidelines for the Reference Administer Activities				Survey		
System	Tracer	Ref.activities MBq	Maximum MBq	Minimum MBq	Average MBq	Maximum MBq	Minimum MBq
Uro-genital							
Renal							
DMSA	Tc-99m-DMSA	150	185	11	170	400	72
DTPA	Tc-99m-DTPA	185	250	40	223	800	55
MAG3	Tc-99m-MAG3	70	200	15	164	444	50
VUR	Tc-99m-DTPA	7	40	3	42	74	18
Gastro-enterology							
Gastric Emptying / reflux	Tc-99m-colloid	40	55	15	52	555/185	17/10
Bleeding	Red Cells/Tc-99m-HSA	740	925	125	595	925	185
Meckel	Pertechnetate	185	260	40	240	740-555	36-174
Liver	Tc-99m-colloid	185	260	40	200	485	110
Galbladder	Tc-99m-iminodiacetate	70	185	25	150	370	37
Salivary Glands	Pertechnetate	110	200	20	207	555	37
Heart							
Perfusion	Thallium (Tl-201)	150	150	15	89	150	37
	Tc-99m-agent (1 day)	S 300/ R 900	S 300/ R 900	125	450	925/1250	280/720
	Tc-99m-agent (2 days)	S 900/ R 900	S 900/ R 900	125	750	1055	335
Ventricular function	Tc-99m-agent	740	925	125	725	925(915)	555(148)
Infection/inflammation							
Immonoglobulins	Tc-99m-HIG	370	555	55	650	800	185
White Blood Cells	White Cells/HMPAO	550	740	80	600	1000	185
White Blood Cells	In-111-oxinate	20	40	9	40	75	25
Nanocolloid	Tc-99m-nanocolloid	370	740	60	508	925	18

Belgian nuclear medicine survey

5. Benchmarking

System	Tracer	BELNUC Ref.activities MBq	SURVEY Mean activity MBq	Ottawa Hospital Injected Activity MBq	France DRL MBq	Switzerland DRL MBq	DDM2 MCV MBq	DDM2 Range MBq
Osteo-articular								
Bone	Tc-99m-HDP/MDP	740	774	925	700	700	600	500-1110
Perfusion	Tc-99m-HSA	220	430					
Endocrinology								
Thyroid	Tc-99m-Pertechnetate	110	145		80	75	80	75-200
	I-123	40	30		10	10	20	10-25
Parathyroid	Tc-99m-agent	740	586			550		400-900
Tumor detection								
FDG	F-18-FDG	260	263	444	350	337		350-400
Lung								
Lung Perfusion	Tc-99m-MAA	110	186	185	240	180		100-280
Brain								
Perfusion	Tc-99m-agent	740	766		500/800	800	500	500-1110
Cisterno	In-111-DTPA	20	49			40		
Uro-genital								
Renal								
DMSA	Tc-99m-DMSA	150	170			120	150	70-183
DTPA	Tc-99m-DTPA	185	223		370	200	200	150-540
MAG3	Tc-99m-MAG3	70	164		200	100	100	70-370
Gastro-enterology								
Gastric Emptying / reflux	Tc-99m-colloid	40	52			40		
Bleeding	Red Cells/Tc-99m-HSA	740	595			750		
Meckel	Pertechnetate	185	240			180		
Liver	Tc-99m-colloid	185	200					
Galbladder	Tc-99m-iminodiacetate	70	150			200		
Heart								
Perfusion	Thallium (Tl-201)	150	89	130	S 110/ R 40	100	110	75-150
	Tc-99m-agent (1 day)	S 300/ R 900	450	S 1100/R 370	S 300/ R 800	S 600/R 600	1000	300-1500
	Tc-99m-agent (2 days)	S 900/ R 900	750	S 1100/ R 1100	S 850/ R 850	S 300/ R 900	1000	300-1500
Ventricular function	Tc-99m-agent	740	725	1100	850	1000	750	600-1000
Infection/inflammation								
Immonoglobulins	Tc-99m-HIG	370	650			700		
White Blood Cells	White Cells/HMPAO	550	600					
White Blood Cells	In-111-oxinate	20	40					

Belgian nuclear medicine survey

6. Effective doses

		Survey			Natural irradiation : 2,75 mSv	
					Approximate equivalent duration of exposure to the natural sources of radiation	
System	Tracer	Mean activity MBq	Conversion factor mSv/MBq	Effective dose mSv	(year)	(month)
Osteo-articular						
Bone	Tc-99m-HDP/MDP	774	0,0057	4,4	1,6	19,3
Perfusion	Tc-99m-HSA	430	0,01	4,3	1,6	18,8
Endocrinology						
Thyroid	Tc-99m-Pertechnetate	145	0,014	2,0	0,7	8,9
	I-123	30	0,022	0,7	0,2	2,9
Parathyroid	Thallium	72	0,22	15,8	5,8	69,1
	Tc-99m-agent	586	0,009	5,3	1,9	23
Adrenals	I-123-MIBG	183	0,013	2,4	0,9	10,4
	I-131-MIBG	62	0,14	8,7	3,2	37,9
Tumor detection						
Gallium	67-GA-citrate	168	0,1	16,8	6,1	73,3
Octreotide	In-111-Octreotide	179	0,054	9,7	3,5	42,2
FDG	F-18-FDG	263	0,019	5,0	1,8	21,8
Lung						
Lung Perfusion	Tc-99m-MAA	186	0,011	2,0	0,7	8,9
Brain						
Perfusion	Tc-99m-agent	766	0,006	4,6	1,7	20,1
Cisterno	In-111-DTPA	49	0,021	1,0	0,4	4,5

Belgian nuclear medicine survey

6. Effective doses

				Natural irradiation : 2,75 mSv		
		Survey			Approximate equivalent duration of exposure to the natural sources of radiation	
System	Tracer	Mean activity MBq	Conversion factor mSv/MBq	Effective dose mSv	(year)	(month)
Uro-genital						
Renal						
DMSA	Tc-99m-DMSA	170	0,0088	1,5	0,5	6,5
DTPA	Tc-99m-DTPA	223	0,0049	1,1	0,4	4,8
MAG3	Tc-99m-MAG3	164	0,007	1,1	0,4	5,0
Gastro-enterology						
Gastric Emptying / reflux	Tc-99m-colloïde	52	0,0094	0,5	0,2	2,1
Bleeding	Globules rouges/Tc-99m-H	595	0,01	6,0	2,2	26,0
Meckel	Pertechnétate	240	0,014	3,4	1,2	14,7
Liver	Tc-99m-colloïde	200	0,0094	1,9	0,7	8,2
Galbladder	Tc-99m-iminodiacetate	150	0,017	2,6	0,9	11,1
Salivary Glands	Pertechnétate	207	0,014	2,9	1,1	12,6
Heart						
Perfusion	Thallium (Tl-201)	89	0,22	19,6	7,1	85,4
	Tc-99m-agent (1 jour)	450	0,0079	3,6	1,3	15,5
	Tc-99m-agent (2 jours)	750	0,0079	5,9	2,2	25,9
Ventricular function	Tc-99m-agent	725	0,006	4,4	1,6	19,0
Infection/inflammation						
Immonoglobulins	Tc-99m-HIG	650	0,007	4,6	1,7	19,9
White Blood Cells	Globules blancs/HMPAO	600	0,011	6,6	2,4	28,8
White Blood Cells	In-111-oxinate	40	0,36	14,4	5,2	62,8
Nanocolloid	Tc-99m-nanocolloïde	508	0,0097	4,9	1,8	21,5