

부록 2

분과별 개발단계별 결과물(근거표 포함)

1. 신경두정부 분과 바로가기
2. 심장 분과 바로가기
3. 치과 분과 바로가기
4. 흉부 분과 바로가기

2. 근거기반 임상영상 가이드라인 수용개작 단계별 정리

가. 신경두경부 분과

1) 핵심질문 선정

가) PICO의 선정

표 1. 신경두경부 PICO 선정

	Population	Intervention	Comparator	Outcome
1	pituitary gland의 기능저하의 성인	역동성 조영증강 MRI	Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
2	pituitary gland의 기능 과다 성인	역동성 조영증강 MRI	Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
3	요붕증 성인환자	역동성 조영증강 MRI	Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
4	pituitary apoplexy 증상이 있는 성인	역동성 조영증강 MRI	Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
5	postpituitary or sellar mass resection 받은 성인	비역동성 or 역동성 조영증강 MRI	CT or Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
6	precocious puberty 있는 경우의 소아	역동성 조영증강 MRI	Sellar CT	터어키안의 뇌하수체의 영상 진단의 정확성
7	박동성 이명을 호소하는 성인	CT 혈관조영술	MR 혈관조영술	박동성 이명의 영상진단의 정확성
8	일측성 혹은 비대칭성의 비박동성 이명을 호소하는 성인	조영증강 전후 측두골 MRI	측두골 CT	일측성/비대칭성 비박동성 이명 영상진단의 정확성
9	양측성 혹은 대칭성 비박동성 이명을 호소하는 성인	영상 검사 이득 없음	측두골 CT, 측두골 MRI	양측성/대칭성 비박동성 이명에서 불필요한 검사 지양

나) 문장형 핵심 질문

표 2. 신경두경부 문장형 핵심질문

핵심질문	
핵심질문 1	성인에서 뇌하수체의 기능저하가 의심되거나 알고 있는 경우 최초 검사는 ?
핵심질문 2	성인에서 뇌하수체의 기능과다가 의심되거나 알고 있는 경우 최초 검사는?
핵심질문 3	성인에서 요붕증(diabetes insipidus) 있을 때 최초 검사는?
핵심질문 4	성인에서 뇌하수체 출중(pituitary apoplexy) 있을 때 최초 검사는?
핵심질문 5	성인에서 뇌하수체나 터키안 종양 수술 (postpituitary or sellar mass resection)을 받았던 경우 최초 검사는?

핵심질문 6	소아에서 성조숙증이 있는 경우 최초 검사는?
핵심질문 7	성인에서 성인에서 근간대경련 (myoclonus) 나 유스타키오관의 이상 없이 나타난 주관적 혹은 객관적인 박동성 이명에서 1차적 평가에 적절한 영상 검사는?
핵심질문 8	성인에서 이경검사상의 이상이나 비대칭성 청력저하, 신경학적 결손 혹은 외상의 병력 없이 비대칭성 혹은 일측성의 주관적인 비박동성 이명이 나타난 경우 1차적 평가에 적절한 영상 검사는?
핵심질문 9	성인에서 청력 감소나 신경학적 결손 혹은 외상의 병력 없이 나타난 대칭적 혹은 양측성의 비박동성 이명의 경우 1차적 평가에 적절한 영상 검사는?

2) 핵심질문별 진료지침 검색

가) 핵심질문 1-6

검색대상 핵심질문

KQ1. 성인에서 뇌하수체의 기능저하가 의심되거나 알고 있는 경우 최초 검사는 ?
KQ2. 성인에서 뇌하수체의 기능과다가 의심되거나 알고 있는 경우 최초 검사는?
KQ3. 성인에서 요붕증(diabetes insipidus) 있을 때 최초 검사는?
KQ4. 성인에서 뇌하수체 종중(pituitary apoplexy) 있을 때 최초 검사는?
KQ5. 성인에서 뇌하수체나 터키안 종양 수술 (postpituitary or sellar mass resection)을 받았던 경우 최초 검사는?
KQ6. 소아에서 성조숙증이 있는 경우 최초 검사는?

국외DB 검색전략 및 결과

표 3. 신경두경부 핵심질문 1,2,4,5 국외 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	Hypopituitarism/ OR Hyperpituitarism/ OR Pituitary Gland/ OR Pituitary Apoplexy/	55,289
	2	((pituitary OR sellar OR parasellar OR suprasellar) AND (tumor OR mass* OR adenoma* OR apoplexy OR hemorrhage*)).tw	25,768
	3	(empty sella OR hypopituitar* OR hyperpituitar* OR Cushing syndrome OR hyperprolactinemia OR acromegaly OR gigantism OR hypogonadotropic OR hypogonadismempty sella OR postpituitary).tw	21,665
	4	OR/1-3	89,917
검사	5	Magnetic Resonance Imaging/ OR Magnetic Resonance Angiography/ OR (MRI OR MRA OR Sellar Magnetic Resonance Imaging).tw	475,490
	6	Tomography, X-Ray Computed/ OR (Sellar Computed Tomography OR CT OR MDCT).tw	519,117
	7	(imaging OR Radilog* OR Radiograph* OR diagnosis).tw.	1,966,645
	8	OR/5-7	2,439,877
P&검사	9	4 AND 8	15,392

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
지침필터	10	(guideline* OR recommendation*).ti. OR (practice guideline OR guideline).pt	113,581
종합	11	9 AND 10	58

표 4. 신경두경부 핵심질문 1,2,4,5 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	'hypopituitarism'/mj OR 'hyperpituitarism'/mj OR 'hypophysis apoplexy'/mj	6,982
	2	((pituitary OR sellar OR parasellar OR suprasellar) AND (tumor OR mass* OR adenoma* OR apoplexy OR hemorrhage*)):ab,ti	37,364
	3	(empty sella OR hypopituitar* OR hyperpituitar* OR Cushing syndrome OR hyperprolactinemia OR acromegaly OR gigantism OR hypogonadotropic OR hypogonadismempty sella OR postpituitary):ab,ti	1,574
	4	#1 OR #2 OR #3	43,490
검사	5	'nuclear magnetic resonance imaging'/mj OR 'magnetic resonance angiography'/mj OR (MRI OR MRA OR Sellar Magnetic Resonance Imaging):ab,ti	264,399
	6	'computer assisted tomography'/mj OR (Sellar Computed Tomography OR CT OR MDCT):ab,ti	614,152
	7	(imaging OR Radilog* OR Radiograph* OR diagnosis):ab,ti	3,281,636
	8	#5 OR #6 OR #7	3,653,077
P&검사	9	#4 AND #8	14,432
지침필터	10	guideline*:ti,kw OR recommendation*:ti,kw	167,986
종합	11	#9 AND #10	44

표 5. 신경두경부 핵심질문 1,2,4,5 국외 GIN

검색일: 2020. 07. 09		
N	검색어	검색 결과
1	pituitary AND (disease OR tumor)	17

국내DB 검색전략 및 결과

표 6. 신경두경부 핵심질문 1,2,4,5 국내 문헌DB

검색일: 2020. 07. 06				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	pituitary AND (tumor OR mass OR disease) and guideline [ALL]	0	
	2	pituitary AND (tumor OR mass OR disease) and recommendation[ALL]	1	

검색일: 2020. 07. 06				
검색 사이트	N	검색어	관련 문헌	비고
2.KMBASE	3	소계	1	
	4	단순중복 제거 후	1	
	1	([ALL=뇌하수체질환] AND [ALL=지침])	0	
	2	([ALL=뇌하수체질환] AND [ALL=권고])	0	
	3	([ALL=뇌하수체질환] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 7. 신경두경부 핵심질문 1,2,4,5 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

국외DB 검색전략 및 결과

표 8. 신경두경부 핵심질문 3 국외 Ovid-Medline

검색일: 2020. 07. 02			
구분	N	검색어	검색 결과
P	1	exp Diabetes Insipidus/ OR Histiocytosis, Langerhans-Cell/	13,229
	2	(germ-line AND (tumor* OR lymphoma* OR leukemia)).tw	2,264
	3	(diabetes insipidus OR Langerhans cell histiocytosis OR Langerhans cell metastasis OR craniopharyngioma, meningioma OR Rathke cleft cyst OR sarcoid OR lymphocytic hypophysitis OR granulomatous infiltration OR empty sella OR hypothalamicneurohypophyseal axis).tw	14,992
	4	OR/1-3	22,227
지침필터	5	(guideline* OR recommendation*).ti. OR (practice guideline OR guideline).pt	113,316
종합	6	4 AND 5	32

표 9. 신경두경부 핵심질문 3 국외 Ovid-Embase

검색일: 2020. 07. 02			
구분	N	검색어	검색 결과
P	1	'diabetes insipidus'/mj OR 'Langerhans cell histiocytosis'/mj	11,313
	2	('germ-line' AND (tumor* OR lymphoma* OR leukemia)):ab,ti	184
	3	('diabetes insipidus' OR 'Langerhans cell histiocytosis' OR 'Langerhans cell metastasis' OR 'craniopharyngioma, meningioma' OR 'Rathke cleft cyst' OR sarcoid OR 'lymphocytic hypophysitis' OR 'granulomatous infiltration ' OR 'empty sella' OR 'hypothalamicneurohypophyseal axis'):ab,ti	24,195
	4	#1 OR #2 OR #3	30,529
지침필터	5	guideline*:ti,kw OR recommendation*:ti,kw	167,717
종합	6	#4 AND #5	49

표 10. 신경두경부 핵심질문 3 국외 GIN

검색일: 2020. 07. 06		
N	검색어	검색 결과
1	diabetes insipidus OR Langerhans cell histiocytosis OR germ-line	0

국내DB 검색전략 및 결과

표 11. 신경두경부 국내 문헌DB

검색일: 2020. 07. 06				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	diabetes insipidus and guideline [ALL]	0	
	2	diabetes insipidus and recommendation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=요붕증] AND [ALL=지침])	0	
	2	([ALL=요붕증] AND [ALL=권고])	0	
	3	([ALL=요붕증] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 12. 신경두경부 핵심질문 3 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

국외DB 검색전략 및 결과

표 13. 신경두경부 핵심질문 6 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	Puberty, Precocious/ OR Hamartoma/ OR Astrocytoma/ OR Septo-Optic Dysplasia/	26,820
	2	(precocious puberty OR pituitary adenoma* OR Rathke cleft cyst* OR hamartoma* OR astrocytoma* OR septo-optic dysplasia).tw.	37694
	3	1 OR 2	48,166
검사	4	Sellar Magnetic Resonance Imaging.tw OR Magnetic Resonance Imaging/ OR Magnetic Resonance Angiography/ OR (MRI OR MRA).tw	475,490
	5	Tomography, X-Ray Computed/ OR Sellar Computed Tomography. tw OR (CT OR MDCT).tw	519,117
	6	(imaging OR Radiolog* OR Radiograph* OR diagnosis).tw.	1,966,645
	7	OR/4-6	2,439,877
P&검사	8	3 AND 7	17,006
지침필터	9	(guideline* OR recommendation*).ti. OR (practice guideline OR guideline).pt	113,581

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
종합	10	8 AND 9	43

표 14. 신경두경부 핵심질문 6 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	'precocious puberty'/mj OR 'hamartoma'/mj OR 'astrocytoma'/mj OR 'septo-optic dysplasia'/mj	21,741
	2	(precocious puberty OR pituitary adenoma* OR Rathke cleft cyst* OR hamartoma* OR astrocytoma* OR septo-optic dysplasia):ab,ti	1,216
	3	#1 OR #2	22,583
검사	4	'nuclear magnetic resonance imaging'/mj OR 'magnetic resonance angiography'/mj OR (MRI OR MRA OR Sellar Magnetic Resonance Imaging):ab,ti	264,399
	5	'computer assisted tomography'/mj OR (Sellar Computed Tomography OR CT OR MDCT):ab,ti	614,152
	6	(imaging OR Radilog* OR Radiograph* OR diagnosis):ab,ti	3,281,636
	7	#4 OR #5 OR #6	3,653,077
P&검사	8	#3 AND #7	6,222
지침필터	9	guideline*:ti,kw OR recommendation*:ti,kw	167,986
종합	10	#8 AND #9	13

표 15. 신경두경부 핵심질문 6 국외 GIN

검색일: 2020. 07. 09		
N	검색어	검색 결과
1	precocious puberty OR hamartoma OR astrocytoma OR septo-optic dysplasia)	4

국내DB 검색전략 및 결과

표 16. 신경두경부 핵심질문 6 국내 문헌DB

검색일: 2020. 07. 06				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	precocious puberty and guideline [ALL]	0	
	2	precocious puberty and recommendation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=성조숙증] AND [ALL=지침])	0	
	2	([ALL=성조숙증] AND [ALL=권고])	0	
	3	([ALL=성조숙증] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 17. 신경두경부 핵심질문 6 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

3) 진료지침 선별

가) 핵심질문 흐름도

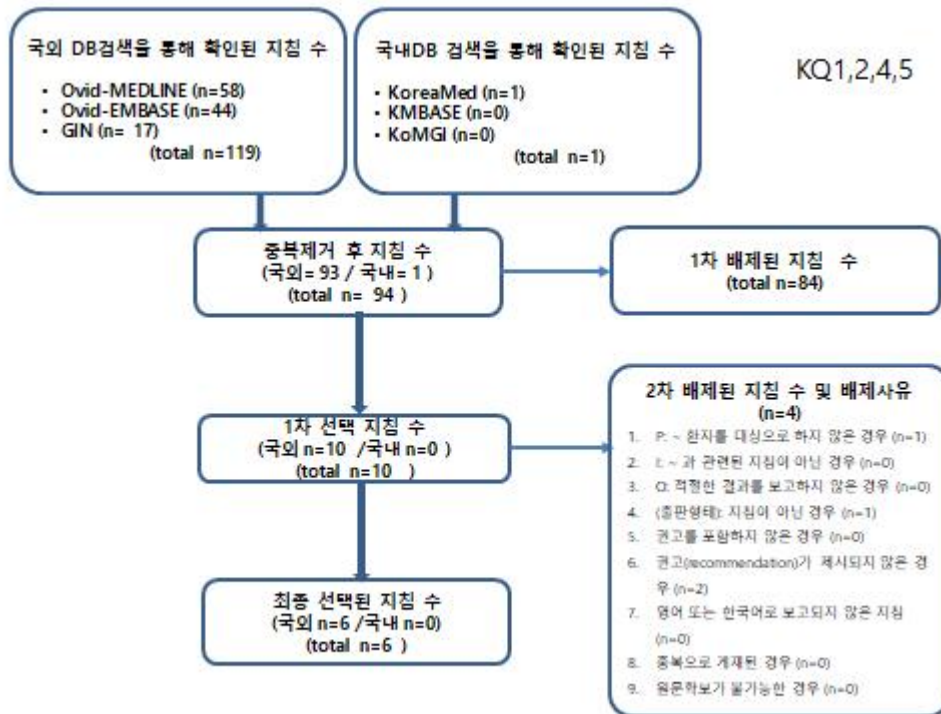


그림 1. 신경두경부 핵심질문 1,2,4,5 흐름도

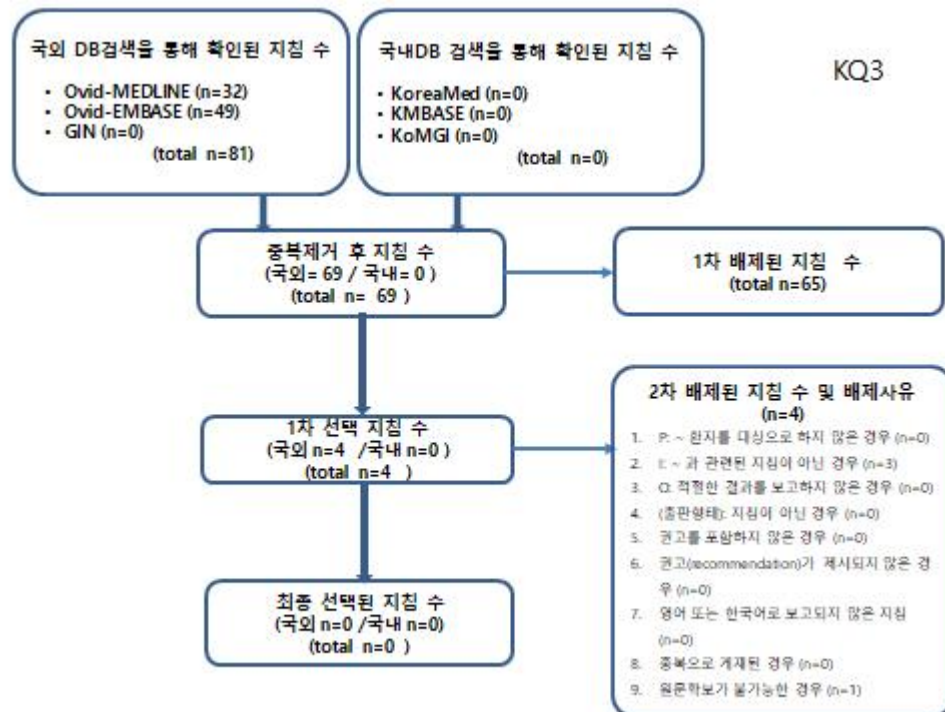


그림 2. 신경두경부 핵심질문 3 흐름도

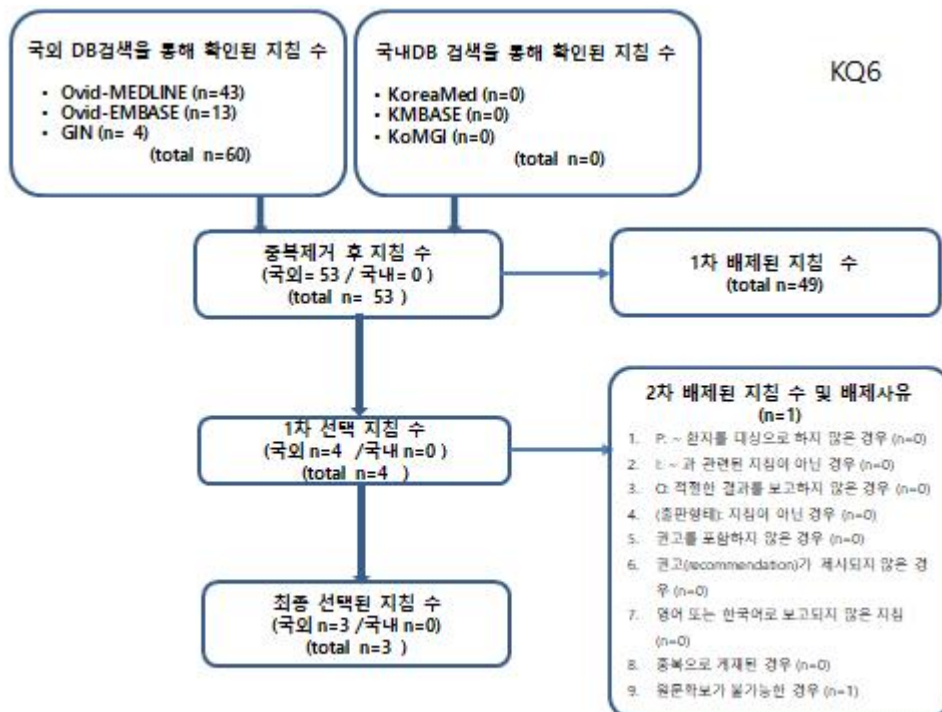


그림 3. 신경두경부 핵심질문 6 흐름도

4) 진료지침 평가

가) 진료지침 질 평가 결과

표 18. 신경두경부 핵심질문 1-6 질 평가결과

핵심질문 1-6

지침 제목	AGREE점수	개발위원회 의견
Clinical practice guideline for the diagnosis and treatment of pituitary apoplexy	50	추천함
2013 European thyroid association guidelines for the diagnosis and treatment of thyrotropin-secreting pituitary tumors	44	추천안함
American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the Diagnosis and Treatment of Acromegaly--2011 update: executive summary	60	추천함
Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline	53	추천함
Guidelines for acromegaly management: an update	42	추천안함
American Association of Clinical Endocrinologists Medical Guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients--2002 update	34	추천안함
American College of Radiology (ACR) Appropriateness Criteria® Neuroendocrine Imaging Revised 2018	104	ACR
Use of local data to enhance uptake of published recommendations: an example from the diagnostic evaluation of precocious puberty	50	추천함
Towards a Rational and Efficient Diagnostic Approach in Children Referred for Tall Stature and/or Accelerated Growth to the General Paediatrician	31	추천안함
Central precocious puberty in girls: An evidence-based diagnosis tree to predict central nervous system abnormalities	52	추천함

추천안함: AGREE II < 50

나) 수용성과 적용성 평가결과

표 19. 신경두경부 핵심질문 1-6 수용성과 적용성 평가결과

핵심질문 1-6

구분	평가항목	지침 A	지침 B	지침 C	지침 D
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예	예
	가치와 선호도가 유사하다.	예	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예	예
	해당권고는 수용할 만하다.	예	예	예	예

적 용 성	해당 중재 및 장비는 이용가능하다.	예	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예	예
	해당권고는 적용할 만하다.	예	예	예	예

지침 A : Clinical practice guideline for the diagnosis and treatment of pituitary apoplexy

지침 B : Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline

지침 C : American College of Radiology (ACR) Appropriateness Criteria® Neuroendocrine Imaging Revised 2018

지침 D : American Association of Clinical Endocrinologists Medical Guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients--2002 update

5) 핵심질문별 권고 및 근거정리

가) 권고비교표

표 20. 신경두경부 핵심질문 1-6 권고비교표

핵심질문 1-6

구 분	지침 A	지침 B
권 고	Recommendations for the initial clinical assessment. - All patients in whom pituitary apoplexy is suspected should urgently undergo magnetic resonance imaging (MRI) to confirm the diagnosis (III, B). Recommendations for surgery in patients on initial conservative management - In patients with impaired visual acuity or consciousness or a worsening of visual field defects, urgent MRI should be performed to plan for surgical decompression, including ventricular diversion in the event of hydrocephalus (IV, C).	1.1. To establish the diagnosis of hyperprolactinemia, we recommend a single measurement of serum prolactin; a level above the upper limit of normal confirms the diagnosis as long as the serum sample was obtained without excessive venipuncture stress. We recommend against dynamic testing of prolactin secretion for the diagnosis of hyperprolactinemia (1 XXXX).
	Recommendations for clinical monitoring in the early postoperative period - If visual impairment is found, urgent MRI should be performed and the patient should urgently be re-evaluated by the neurosurgical team (✓)	1.2. In patients with asymptomatic hyperprolactinemia, we suggest assessing for macroprolactin (2 XXOO). 1.3. When there is a discrepancy between a very large pituitary tumor and a mildly elevated prolactin level, we recommend serial dilution of serum samples to eliminate an artifact that can occur with some immunoradiometric assays leading to a falsely low prolactin value ("hook effect") (1 XXXX).
	Recommendations for mid or long-term follow-up - Patients who have experienced apoplexy and have residual tumor will require radiographic follow-up (MRI) and, when indicated, should complete treatment with repeat surgery, medical	4.3. We suggest that with careful clinical and biochemical follow-up therapy may be tapered and perhaps discontinued in patients who have been treated with dopamine agonists for at least 2 yr, who no longer have elevated serum prolactin, and who have no visible tumor remnant

	<p>treatment, or radiotherapy (III, B).</p> <ul style="list-style-type: none"> - Control MRI is recommended 3 or 6 months after apoplexy. If residual tumor or recurrence is found, monitoring is recommended every year during the first 3 or 5 years, and every 2 or 3 years thereafter (IV, C) - At least annual monitoring is required in all patients. It is recommended that patients be followed up by a multidisciplinary team experienced in pituitary diseases (endocrinologists, neurosurgeons, ophthalmologists, and radiologists) (✓) 	<p>on MRI (2 XOOO).</p> <p>6.3. We recommend against the use of routine pituitary MRI during pregnancy in patients with microadenomas or intrasellar macroadenomas unless there is clinical evidence for tumor growth such as visual field compromise (1 XXOO).</p> <p>6.5. We recommend formal visual field assessment followed by MRI without gadolinium in pregnant women with prolactinomas who experience severe headaches and/or visual field changes (1 XXOO).</p>
권고 방법	<p>Grades of recommendation</p> <p>A Level of evidence Ia or Ib.</p> <p>B Level of evidence IIa, IIb, or III.</p> <p>C Level of evidence IV.</p> <p>(✓) Good clinical practice.</p>	<p>In terms of the strength of the recommendation, strong recommendations use the phrase “we recommend” and the number 1, and weak recommendations use the phrase “we suggest” and the number 2. Cross-filled circles indicate the quality of the evidence, such that XOOO denotes very low quality evidence; XXOO, low quality; XXXO, moderate quality; and XXXX, high quality</p>
구분	지침 C	지침 D
권고	<p>Variant 1: MRI sella without and with IV contrast or MRI sella without IV contrast is usually appropriate for the initial imaging of adults with suspected or known hypofunctioning pituitary gland (hypopituitarism, growth hormone deficiency, growth deceleration, panhypopituitarism, hypogonadotropic hypogonadism). The addition of IV contrast is preferred for the assessment of pituitary lesions; however, a noncontrast MRI also provides diagnostic detail.</p>	<p>Prolactin level</p> <ul style="list-style-type: none"> - Further endocrinologic evaluation with magnetic resonance imaging (MRI) scanning of the pituitary gland is indicated for unexplained hyperprolactinemia. <p>Bone Densitometry</p> <ul style="list-style-type: none"> - Because hypogonadism frequently results in low bone density and increased fracture risk, baseline hip and spine bone densitometry studies should be performed to assess the initial situation and allow future interventions to be based on any deterioration in bone density that may occur over time. - Regardless of treatment, bone density studies should be repeated in 1 to 2 years to determine whether bone mass is being appropriately maintained. <p>Pituitary imaging</p> <ul style="list-style-type: none"> - In cases of acquired hypogonadotropic hypogonadism not clearly attributable to a specific

		<p>cause, pituitary imaging studies with MRI or computed tomography may be needed to evaluate for structural lesions in the hypothalamic-pituitary region.</p> <ul style="list-style-type: none"> - In general, MRI done with and without a contrast agent is recommended as the initial pituitary imaging study in patients requiring delineation of a pituitary pathologic condition - Although no published studies have clearly indicated a particular level of testosterone in the setting of hypogonadotropic hypogonadism that should prompt pituitary evaluation, a total testosterone concentration of 150 ng/dL or below has been considered a reasonable level at which to pursue pituitary imaging, even in the absence of other symptoms. <p>Vanishing Testes Syndrome (Congenital Anorchism or Prepubertal Functional Castrate)</p> <ul style="list-style-type: none"> - MRI is recommended to assess the possibility of a retained intraabdominal dysgenetic gonad because this would be associated with an increased risk of a malignant lesion and would necessitate removal. <p>Pituitary tumors</p> <ul style="list-style-type: none"> - Patients with acquired hypogonadotropic hypogonadism may require assessment for a possible pituitary tumor with appropriate pituitary imaging studies, such as MRI, and determination of a prolactin level.
권고등급	<p>Variant 1: Usually Appropriate</p> <p>Variant 2: Usually Appropriate</p> <p>Variant 3: Usually Appropriate</p> <p>Variant 4: Usually Appropriate</p> <p>Variant 5: Usually Appropriate</p> <p>Variant 6: Usually Appropriate</p>	<p>Most of the content herein is based on literature reviews. In areas of uncertainty, professional judgment was applied. We encourage medical professionals to use this information in conjunction with their best clinical judgment. The presented recommendations may not be appropriate in all situations. Any decision by practitioners to apply these guidelines must be made in light of local resources and individual patient circumstances.</p>

지침 A : Clinical practice guideline for the diagnosis and treatment of pituitary apoplexy

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나) 근거표

표 21. 신경두경부 핵심질문 1-6 근거표

핵심질문 1-6

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Bonneville, J.F., Magnetic Resonance Imaging of Pituitary Tumors, in Frontiers of Hormone Research. 2016. p. 97-120.	Review/Other-Dx	N/A	2
Esteves, C., et al., Pituitary incidentalomas: analysis of a neuroradiological cohort. Pituitary, 2015. 18(6): p. 777-781.	Observational-Dx	71 pituitary incidentalomas	4
Vicente, A., B. Lecumberri, and M. Gálvez, [Clinical practice guideline for the diagnosis and treatment of pituitary apoplexy]. Endocrinol Nutr, 2013. 60(10): p. 582.e1-582.e12.	Review/Other-Dx	N/A	2
Melmed, S., et al., Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab, 2011. 96(2): p. 273-88.	Review/Other-Dx	N/A	2
Burns, J., et al., ACR Appropriateness Criteria(®) Neuroendocrine Imaging. J Am Coll Radiol, 2019. 16(5s): p. S161-s173	Review/Other-Dx	N/A	2
Petak, S.M., et al., American Association of Clinical Endocrinologists Medical Guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients--2002 update. Endocr Pract, 2002. 8(6): p. 440-56.	Review/Other-Dx	N/A	2
Go, J.L. and A.G. Rajamohan, Imaging of the Sella and Parasellar Region. Radiologic Clinics of North America, 2017. 55(1): p. 83-101.	Review/Other-Dx	N/A	2
Guitelman, M., et al., Primary empty sella (PES): A review of 175 cases. Pituitary, 2013. 16(2): p. 270-274.	Observational-Dx	175 patients	2
Glastonbury, C.M., A.G. Osborn, and K.L. Salzman, Masses and malformations of the third ventricle: Normal anatomic relationships and differential diagnoses. Radiographics, 2011. 31(7): p. 1889-1905.	Review/Other-Dx	N/A	5
Wu, L.M., et al., Usefulness of dual-energy computed tomography imaging in the differential diagnosis of sellar meningiomas and pituitary adenomas: Preliminary report. PLoS ONE, 2014. 9(3).	Observational-Dx	51 patients	4
Heshmati, H.M., et al., Hypopituitarism caused by intrasellar aneurysms. Mayo Clinic Proceedings, 2001. 76(8): p. 789-793.	Review/Other-Dx	4,087 patients	2

Glezer, A., D.B. Paraiba, and M.D. Bronstein, Rare Sellar Lesions. <i>Endocrinology and Metabolism Clinics of North America</i> , 2008. 37(1): p. 195–211.	Review/Other-Dx	N/A	2
Rennert, J. and A. Doerfler, Imaging of sellar and parasellar lesions. <i>Clinical Neurology and Neurosurgery</i> , 2007. 109(2): p. 111–124.	Review/Other-Dx	N/A	2
Garel, C. and J. Léger, Contribution of magnetic resonance imaging in non-tumoral hypopituitarism in children. <i>Hormone Research</i> , 2007. 67(4): p. 194–202.	Review/Other-Dx	N/A	2
Hess, C.P. and W.P. Dillon, Imaging the Pituitary and Parasellar Region. <i>Neurosurgery Clinics of North America</i> , 2012. 23(4): p. 529–542.	Review/Other-Dx	N/A	2
Isik, S., et al., Clinical and radiological findings in macroprolactinemia. <i>Endocrine</i> , 2012. 41(2): p. 327–333.	Observational-Dx	337 patients	5
Dietemann, J.L., et al., CT and MRI of suprasellar lesions. <i>Journal of Neuroradiology</i> , 1992. 19(1): p. 1–22.	Review/Other-Tx	N/A	2
Chakeres, D.W., A. Curtin, and G. Ford, Magnetic resonance imaging of pituitary and parasellar abnormalities. <i>Radiologic Clinics of North America</i> , 1989. 27(2): p. 265–281.	Review/Other-Dx	N/A	2
Patel, S.N., et al., Re-evaluation of the role of image guidance in minimally invasive pituitary surgery: Benefits and outcomes. <i>Computer Aided Surgery</i> , 2011. 16(2): p. 47–53.	Observational-Dx	120 patients	5
Kakite, S., et al., Three-dimensional gradient echo versus spin echo sequence in contrast-enhanced imaging of the pituitary gland at 3 T. <i>European Journal of Radiology</i> , 2011. 79(1): p. 108–112.	Observational-Dx	33 patients	2
Hughes, J.D., et al., Magnetic resonance elastography detects tumoral consistency in pituitary macroadenomas. <i>Pituitary</i> , 2016. 19(3): p. 286–292.	Observational-Dx	10 patients	3
Gao, R., et al., Dynamic gadolinium-enhanced MR imaging of pituitary adenomas: Usefulness of sequential sagittal and coronal plane images. <i>European Journal of Radiology</i> , 2001. 39(3): p. 139–146.	Observational-Dx	18 patient	2
Sahdev, A., et al., Imaging in Cushing's syndrome. <i>Arquivos Brasileiros de Endocrinologia e Metabologia</i> , 2007. 51(8): p. 1319–1328.	Review/Other-Dx	N/A	2
López, J., et al., Petrosal sinus sampling for diagnosis of Cushing's disease: Evidence of false negative results. <i>Clinical Endocrinology</i> , 1996. 45(2): p. 147–156.	Observational-Dx	32 patients	5
Pisaneschi, M. and G. Kapoor, Imaging the sella and parasellar region. <i>Neuroimaging Clinics of North America</i> , 2005. 15(1): p. 203–219.	Review/Other-Dx	N/A	2
Abele, T.A., et al., Non-pituitary origin sellar tumours mimicking pituitary macroadenomas. <i>Clinical Radiology</i> , 2012. 67(8): p. 821–827.	Review/Other-Dx	N/A	2
Briet, C., et al., Pituitary Apoplexy. <i>Endocr Rev</i> , 2015.	Review/Other-	N/A	2

36(6): p. 622–45.	Dx		
Wong, A., et al., Update on prolactinomas. Part 1: Clinical manifestations and diagnostic challenges. <i>Journal of Clinical Neuroscience</i> , 2015. 22(10): p. 1562–1567.	Review/Other-Dx	N/A	2
Tosaka, M., et al., Assessment of hemorrhage in pituitary macroadenoma by T2*-weighted gradient-echo MR imaging. <i>AJNR Am J Neuroradiol</i> , 2007. 28(10): p.2023–9.	Observational-Dx	25 patients	2
Bladowska, J., et al., Are T2-weighted images more useful than T1-weighted contrast-enhanced images in assessment of postoperative sella and parasellar region? <i>Med Sci Monit</i> , 2011. 17(10): p. Mt83–90.	Observational-Dx	101 patients	3
Ziu, M., et al., Congress of Neurological Surgeons Systematic Review and Evidence-Based Guideline on Posttreatment Follow-up Evaluation of Patients With Nonfunctioning Pituitary Adenomas. <i>Neurosurgery</i> , 2016. 79(4): p. E541–3.	Metaanalysis	23 Studies	2
Coulter, I.C., et al., Radiologic follow-up of non-functioning pituitary adenomas: rationale and cost effectiveness. <i>J Neurooncol</i> , 2009. 93(1): p. 157–63.	Observational- Tx	49 patients	3
Kiliç, T., et al., Determining optimal MRI follow-up after transsphenoidal surgery for pituitary adenoma: scan at 24 hours postsurgery provides reliable information. <i>Acta Neurochir (Wien)</i> , 2001. 143(11): p. 1103–26.	Observational-Dx	80 Pituitary Adenoma Cases	3
Cortet-Rudelli, C., et al., Etiological diagnosis of hyperprolactinemia. <i>Annales d'Endocrinologie</i> , 2007. 68(2–3): p. e15–e22.	Review/Other-Dx	N/A	2
Macpherson, P., et al., Pituitary microadenomas – Does Gadolinium enhance their demonstration? <i>Neuroradiology</i> , 1989. 31(4): p. 293–298.	Observational-Dx	10 patients	5
Eroukhmanoff, J., et al., MRI follow-up is unnecessary in patients with macroprolactinomas and long-term normal prolactin levels on dopamine agonist treatment. <i>Eur J Endocrinol</i> , 2017. 176(3): p. 323–328.	Observational-Dx	115 patients	2
Heck, A., et al., Intensity of pituitary adenoma on T2-weighted magnetic resonance imaging predicts the response to octreotide treatment in newly diagnosed acromegaly. <i>Clinical Endocrinology</i> , 2012. 77(1): p. 72–78.	Observational-Dx	45 patients	2
Debeneix, C., et al., Hypothalamic hamartoma: comparison of clinical presentation and magnetic resonance images. <i>Horm Res</i> , 2001. 56(1–2): p. 12–8.	Observational-Dx	19 patients	5
Freeman, J.L., et al., MR imaging and spectroscopic study of epileptogenic hypothalamic hamartomas: analysis of 72 cases. <i>AJNR Am J Neuroradiol</i> , 2004. 25(3): p. 450–62.	Observational-Dx	72 patients	5
Grunt, J.A., et al., When should cranial magnetic resonance imaging be used in girls with early sexual	Observational-Dx	130 female patients	5

development? J Pediatr Endocrinol Metab, 2004. 17(5): p. 775–80.			
Di Iorgi, N., et al., The use of neuroimaging for assessing disorders of pituitary development. Clin Endocrinol (Oxf), 2012. 76(2): p. 161–76.	Review/Other-Dx	N/A	2
Ng, S.M., et al., Cranial MRI scans are indicated in all girls with central precocious puberty. Arch Dis Child, 2003. 88(5): p. 414–8; discussion 414–8.	Observational-Dx	67 girls	5
Zucchini, S., et al., Role of magnetic resonance imaging in hypothalamic–pituitary disorders. Horm Res, 1995. 44 Suppl 3: p. 8–14.	Review/Other-Dx	N/A	2
Carel, J.C., et al., Consensus statement on the use of gonadotropin-releasing hormone analogs in children. Pediatrics, 2009. 123(4): p. e752–62.	Review/Other-Dx	N/A	2
Chung, E.M., et al., From the radiologic pathology archives: precocious puberty: radiologic–pathologic correlation. Radiographics, 2012. 32(7): p. 2071–99.	Review/Other-Dx	N/A	2
Choi, K.H., et al., Boys with precocious or early puberty: incidence of pathological brain magnetic resonance imaging findings and factors related to newly developed brain lesions. Ann Pediatr Endocrinol Metab, 2013. 18(4): p. 183–90.	Observational-Dx	61 boys	3
Kaplowitz, P.B., Do 6–8 year old girls with central precocious puberty need routine brain imaging? Int J Pediatr Endocrinol, 2016. 2016: p. 9.	Review/Other-Dx	N/A	2
Klein, D.A., et al., Disorders of Puberty: An Approach to Diagnosis and Management. Am Fam Physician, 2017. 96(9): p. 590–599.	Review/Other-Dx	N/A	2
Mogensen, S.S., et al., Pathological and incidental findings on brain MRI in a single-center study of 229 consecutive girls with early or precocious puberty. PLoS One, 2012. 7(1): p. e29829.	Observational-Dx	229 girls	2
Pedicelli, S., et al., Routine screening by brain magnetic resonance imaging is not indicated in every girl with onset of puberty between the ages of 6 and 8 years. J Clin Endocrinol Metab, 2014. 99(12): p. 4455–61.	Observational-Dx	182 girls	2
Rieth, K.G., et al., CT of cerebral abnormalities in precocious puberty. AJR Am J Roentgenol, 1987. 148(6): p. 1231–8.	Review/Other-Dx	90 children	2
Macpherson, P., et al., Invasive v non-invasive assessment of the carotid arteries prior to trans-sphenoidal surgery. Neuroradiology, 1987. 29(5): p. 457–61.	Observational-Dx	47 patient	3
Carel, J.C. and J. Léger, Clinical practice. Precocious puberty. N Engl J Med, 2008. 358(22): p. 2366–77.	Review/Other-Dx	N/A	2
Oatman, O.J., et al., Endocrine and pubertal disturbances in optic nerve hypoplasia, from infancy to adolescence. Int J Pediatr Endocrinol, 2015. 2015(1): p. 8	Observational-Dx	101 patients	2

나) 핵심질문 7-9

검색대상 핵심질문

KQ7. 성인에서 근간대경련 (myoclonus) 나 유스타키오관의 이상 없이 나타난 주관적 혹은 객관적인 박동성 이명에서 1차적 평가에 적절한 영상 검사는?

KQ8. 성인에서 이경검사상의 이상이나 비대칭성 청력저하, 신경학적 결손 혹은 외상의 병력 없이 비대칭성 혹은 일측성의 주관적인 비박동성 이명이 나타난 경우 1차적 평가에 적절한 영상 검사는?

KQ9. 성인에서 청력 감소나 신경학적 결손 혹은 외상의 병력 없이 나타난 대칭적 혹은 양측성의 비박동성 이명의 경우 1차적 평가에 적절한 영상 검사는?

국외DB 검색전략 및 결과

표 22. 신경두경부 핵심질문 7-9 국외 Ovid-Medline

검색일: 2020. 07. 09			
구분	N	검색어	검색 결과
P	1	exp Tinnitus/ OR Temporomandibular Joint Disorders/ OR Endolymphatic Hydrops/ OR Meniere Disease/ OR Vascular Malformations/	31,531
	2	(Tinnitus OR Vascular Malformation* OR atherosclerotic carotid artery disease* OR jugular bulb abnormal* OR abnormal emissary vein* OR vascular mass* OR vascular variant*).tw.	16,507
	3	(dural AV fistula OR venous hum* OR temporomandibular joint disorder OR endolymphatic hydrops OR Meniere disease).tw.	1,964
	4	or/1-3	40,925
검사	5	Magnetic Resonance Imaging/ OR Magnetic Resonance Angiography/ OR (MRI OR MRA).tw	475,488
	6	Tomography, X-Ray Computed/ OR Computed Tomography angiography/ OR (CT OR MDCT).tw	525,698
	7	(imaging OR Radilog* OR Radiograph* OR diagnosis).tw.	1,966,645
	8	OR/5-7	2,444,419
P&검사	9	4 AND 8	13,096
지침필터	10	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	113,581
종합	11	9 AND 10	70

표 23. 신경두경부 핵심질문 7-9 국외 Ovid-Embase

검색일: 2020. 07. 02			
구분	N	검색어	검색 결과
P	1	'tinnitus'/exp OR 'temporomandibular joint disorder'/mj OR 'Meniere disease'/mj	36,789
	2	(Tinnitus OR 'Vascular Malformation*' OR 'atherosclerotic carotid artery disease*' OR 'jugular bulb abnormal*')	25,773

검색일: 2020. 07. 02			
구분	N	검색어	검색 결과
		OR 'abnormal emissary vein*' OR 'vascular mass*' OR 'vascular variant*'):ab,ti	
	3	(dural AV fistula OR 'venous hum*' OR 'temporomandibular joint disorder' OR 'endolymphatic hydrops' OR 'Meniere disease'):ab,ti	2,763
	4	#1 OR #2 OR #3	51,128
검사	5	'nuclear magnetic resonance imaging'/mj OR 'magnetic resonance angiography'/mj OR (MRI OR MRA):ab,ti	489,412
	6	'computer assisted tomography'/mj OR 'computed tomographic angiography'/mj OR (CT OR MDCT):ab,ti	618,247
	7	(imaging OR Radilog* OR Radiograph* OR diagnosis):ab,ti	3,281,636
	8	#5 OR #6 OR #7	3,751,745
P&검사	9	#4 AND #8	14,960
지침필터	10	guideline*:ti,kw OR recommendation*:ti,kw	167,986
종합	11	#9 AND #10	72

표 24. 신경두경부 핵심질문 7-9 국외 GIN

검색일: 2020. 07. 06		
N	검색어	검색 결과
1	Tinnitus	2

국내DB 검색전략 및 결과

표 25. 신경두경부 핵심질문 7-9 국내 문헌DB

검색일: 2020. 07. 06				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	Tinnitus and guideline [ALL]	0	
	2	Tinnitus and recommendation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=이명] AND [ALL=지침])	15	
	2	([ALL=이명] AND [ALL=권고])	9	
	3	([ALL=이명] AND [ALL=가이드라인])	2	
	4	소계	26	
	5	단순중복 제거 후	26	

표 26. 신경두경부 핵심질문 7-9 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

3) 진료지침 선별

가) 핵심질문 흐름도

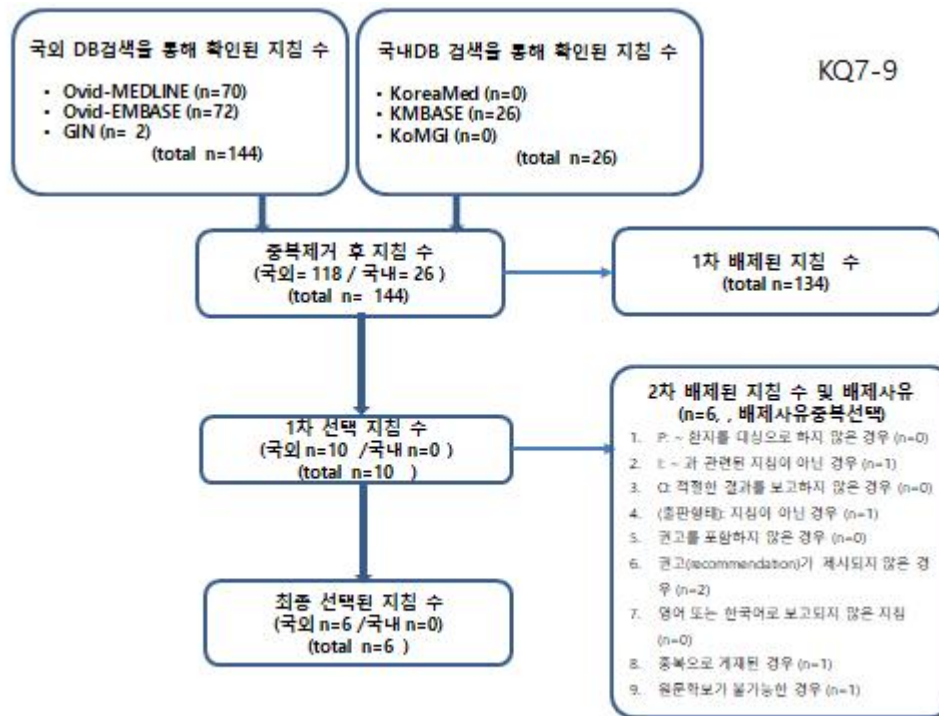


그림 4. 신경두경부 핵심질문 7-9 흐름도

4) 진료지침 평가

가) 진료지침 질 평가 결과

표 27. 신경두경부 핵심질문 7-9 질 평가결과

핵심질문 7-9

지침 제목	AGREE점수	개발위원회 의견
Clinical Practice Guideline: Meniere's Disease Executive Summary	90	추천함
Assessment and management of tinnitus: summary of NICE guidance	72	추천함
Clinical practice guideline: tinnitus	90	추천함
Eano guideline on the diagnosis and treatment of vestibular schwannoma	30	추천안함
ACR Appropriateness Criteria® Tinnitus	98	ACR

추천안함: AGREE II < 50

나) 수용성과 적용성 평가결과

표 28. 신경두경부 핵심질문 7-9 수용성과 적용성 평가결과

핵심질문 7-9

구분	평가항목	지침 A	지침 B	지침 C	지침 D
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예	예
	가치와 선호도가 유사하다.	예	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예	예
	해당권고는 수용할 만하다.	예	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예	예
	해당권고는 적용할 만하다.	예	예	예	예

지침 A : Clinical Practice Guideline: Meniere's Disease

지침 B : Assessment and management of tinnitus: summary of NICE guidance.

지침 C : ACR Appropriateness Criteria((R)) Tinnitus.

지침 D : Clinical practice guideline: tinnitus

표 29. 신경두경부 핵심질문 7-9 권고비교표

핵심질문 7-9

구분	지침 A	지침 B
권고	STATEMENT 4. UTILITY OF IMAGING: Clinicians may offer magnetic resonance imaging (MRI) of the internal auditory canal and posterior fossa in patients with possible Me´nie`re's disease and audiometrically verified asymmetric sensorineural hearing loss.	<p>Non-pulsatile tinnitus</p> <ul style="list-style-type: none"> ● Offer magnetic resonance imaging (MRI) of internal auditory meatuses (IAM) to people with non-pulsatile tinnitus who have associated neurological, otological, or head and neck signs and symptoms. If they are unable to have MRI (IAM), offer contrast enhanced CT (IAM). ● Consider MRI (IAM) for people with unilateral or asymmetrical non-pulsatile tinnitus who have no associated neurological, audiological, otological, or head and neck signs and symptoms. If they are unable to have MRI (IAM), consider contrast-enhanced CT (IAM). <p>Pulsatile tinnitus</p> <ul style="list-style-type: none"> ● Offer imaging to people with pulsatile tinnitus. ● For people with synchronous pulsatile tinnitus, consider <ul style="list-style-type: none"> ■ Magnetic resonance angiography (MRA) or MRI of head, neck, temporal bone, and IAM if clinical examination and audiological assessment are normal, or contrast enhanced CT of head, neck, temporal bone, and IAM if they cannot have MRA or MRI. ■ Contrast enhanced CT of temporal bone if an osseous or middle ear abnormality is suspected

		(for example, glomus tumour), followed by MRI if further investigation of soft tissue is required. ● For people with non-synchronous pulsatile tinnitus (for example caused by palatal myoclonus) consider MRI of the head or if they cannot have MRI, contrast enhanced CT of the head.
권고등급	Option based on observational and case studies with a preponderance of benefit over harm.	Based on the experience and opinion of the GC
구분	지침 C	지침 D
권고	<ul style="list-style-type: none"> ● In patients with pulsatile tinnitus, temporal bone CT and CTA are appropriate to evaluate for a middle ear mass or vascular etiology. MRI may be considered as a noninvasive alternative to screen for a suspected intracranial vascular malformation. ● Given concern for retrocochlear process, MRI of the internal auditory canals is the most appropriate imaging test for subjective nonpulsatile unilateral tinnitus without a clinically evident cause or other associated symptoms. ● If there is concomitant asymmetric hearing loss, neurologic deficit, or head trauma, imaging should be guided by those respective ACR Appropriateness Criteria documents, rather than the presence of tinnitus. ● Imaging is not indicated in all cases of tinnitus symptoms and is usually not appropriate for symmetric or bilateral, subjective, nonpulsatile tinnitus in the absence of other symptoms. 	STATEMENT 3. IMAGING STUDIES: Clinicians should not obtain imaging studies of the head and neck in patients with tinnitus, specifically to evaluate the tinnitus, unless they have 1 or more of the following: tinnitus that localizes to 1 ear, pulsatile tinnitus, focal neurological abnormalities, or asymmetric hearing loss
권고등급	KQ 1: Usually Appropriate KQ 2: Usually Appropriate KQ 3: Usually Not Appropriate	Strong recommendation against

지침 A : Clinical Practice Guideline: Meniere's Disease

지침 B : Assessment and management of tinnitus: summary of NICE guidance

지침 C : ACR Appropriateness Criteria((R)) Tinnitus

지침 D : Clinical practice guideline: tinnitus

나) 근거표

표 30. 신경두경부 핵심질문 7-9 근거표

핵심질문 7-9

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Health, N.I.o. National Institute on Deafness and Other Communication Disorders (NIDCD). Quick statistics. 2017 [cited 2017 September 1]	Review/Other-Dx	N/A	2
Fife, T.D., Neuro-otology of systemic disease, in Neuro-logical Disorders due to Systemic Disease, S.L. Lewis, Editor. 2013, Wiley-Blackwell Health Sciences: Oxford, UK. p. 145-54.	Review/Other-Dx	N/A	5
Tunkel, D.E., et al., Clinical practice guideline: tinnitus. Otolaryngol Head Neck Surg, 2014. 151(2 Suppl): p. S1-S40.	Review/Other-Dx	N/A	2
Basura, G.J., et al., Clinical Practice Guideline: Meniere's Disease Executive Summary. Otolaryngol Head Neck Surg, 2020. 162(4): p. 415-434.	Review/Other-Dx	N/A	2
Expert Panel on Neurologic, I., et al., ACR Appropriateness Criteria((R)) Tinnitus. J Am Coll Radiol, 2017. 14(11S): p. S584-S591.	Review/Other-Dx	N/A	2
Lewis, S., et al., Assessment and management of tinnitus: summary of NICE guidance. Bmj, 2020. 368: p. m976.	Review/Other-Dx	N/A	2
Sonmez, G., et al., Imaging of pulsatile tinnitus: a review of 74 patients. Clin Imaging, 2007. 31(2): p. 102-8.	Review/Other-Dx	74 patients	5
Alaani, A., S.V. Chavda, and R.M. Irving, The crucial role of imaging in determining the approach to glomus tympanicum tumours. European Archives of Oto-Rhino-Laryngology, 2009. 266(6): p. 827-831.	Review/Other-Dx	9 patients	5
Bierry, G., et al., Middle ear adenomatous tumor: A not so rare glomus tympanicum-mimicking lesion. Journal of Neuroradiology, 2010. 37(2): p. 116-121.	Review/Other-Dx	N/A	5
Sismanis, A., Pulsatile tinnitus. Otolaryngologic Clinics of North America, 2003. 36(2): p. 389-402.	Review/Other-Dx	N/A	5
Zhao, P., et al., Persistent petrosquamosal sinus in adults: qualitative imaging evaluation on high-resolution CT venography. Acta Radiol, 2014. 55(2): p. 225-30.	Observational-Dx	532 patients	4
Narvid, J., et al., CT angiography as a screening tool for dural arteriovenous fistula in patients with pulsatile tinnitus: feasibility and test characteristics. AJNR Am J Neuroradiol, 2011. 32(3): p. 446-53.	Observational-Dx	7 patients	2
Spittau, B., et al., Dural arteriovenous fistulas of the hypoglossal canal: systematic review on imaging anatomy, clinical findings, and endovascular management. J Neurosurg, 2015. 122(4): p. 883-903.	Review/Other-Tx	120 cases	5
Grewal, A.K., et al., Clinical presentation and imaging findings in patients with pulsatile tinnitus and sigmoid sinus diverticulum/dehiscence. Otol Neurotol, 2014. 35(1): p. 16-21.	Review/Other-Dx	261 patients	5

Harvey, R.S., et al., Pulse-synchronous tinnitus and sigmoid sinus wall anomalies: descriptive epidemiology and the idiopathic intracranial hypertension patient population. <i>Otol Neurotol</i> , 2014. 35(1): p. 7-15.	Review/Other-Dx	13 patients	5
Schoeff, S., et al., Imaging prevalence of sigmoid sinus dehiscence among patients with and without pulsatile tinnitus. <i>Otolaryngol Head Neck Surg</i> , 2014. 150(5): p. 841-6.	Review/Other-Dx	194 patients	5
Ellenstein, A., N. Yusuf, and M. Hallett, Middle ear myoclonus: two informative cases and a systematic discussion of myogenic tinnitus. <i>Tremor Other Hyperkinet Mov (N Y)</i> , 2013. 3.	Review/Other-Dx	N/A	5
Fox, G.N. and M.T. Baer, Palatal myoclonus and tinnitus in children. <i>West J Med</i> , 1991. 154(1): p. 98-102.	Review/Other-Dx	1 patient	5
Park, S.N., et al., Clinical characteristics and therapeutic response of objective tinnitus due to middle ear myoclonus: a large case series. <i>Laryngoscope</i> , 2013. 123(10): p. 2516-20.	Observational-Tx	58 patients	2
Sinclair, C.F., L.E. Gurey, and A. Blitzer, Palatal myoclonus: algorithm for management with botulinum toxin based on clinical disease characteristics. <i>Laryngoscope</i> , 2014. 124(5): p. 1164-9.	Observational-Dx	15 patients	5
Remley, K.B., et al., Pulsatile tinnitus and the vascular tympanic membrane: CT, MR, and angiographic findings. <i>Radiology</i> , 1990. 174(2): p. 383-9.	Review/Other-Dx	107 patients	5
Willinsky, R.A., Tinnitus: imaging algorithms. <i>Can Assoc Radiol J</i> , 1992. 43(2): p. 93-9.	Review/Other-Dx	N/A	5
Hillman, T.A., et al., Reversible peripheral vestibulopathy: the treatment of superior canal dehiscence. <i>Otolaryngol Head Neck Surg</i> , 2006. 134(3): p. 431-6.	Observational-Tx	30 patients	4
Ceylan, N., et al., CT imaging of superior semicircular canal dehiscence: added value of reformatted images. <i>Acta Otolaryngol</i> , 2010. 130(9): p. 996-1001.	Review/Other-Dx	93 patients	5
Cho, I.K., et al., 3-Dimensional reconstruction of the venous system in patients suffering from pulsatile tinnitus. <i>Acta Otolaryngol</i> , 2012. 132(3): p. 285-9.	Observational-Dx	11 patients and 12 normal control ears	4
Liu, Z., et al., Sigmoid sinus diverticulum and pulsatile tinnitus: analysis of CT scans from 15 cases. <i>Acta Radiol</i> , 2013. 54(7): p. 812-6.	Observational-Dx	15 patients	5
Mattox, D.E. and P. Hudgins, Algorithm for evaluation of pulsatile tinnitus. <i>Acta Otolaryngol</i> , 2008. 128(4): p. 427-31.	Review/Other-Dx	54 patients	5
Krishnan, A., et al., CT arteriography and venography in pulsatile tinnitus: preliminary results. <i>AJNR Am J Neuroradiol</i> , 2006. 27(8): p. 1635-8.	Observational-Dx	16 patients	5

Deuschl, C., et al., Value of DSA in the diagnostic workup of pulsatile tinnitus. PLoS One, 2015. 10(2): p. e0117814.	Observational-Dx	54 patients	4
Noguchi, K., et al., Intracranial dural arteriovenous fistulas: evaluation with combined 3D time-of-flight MR angiography and MR digital subtraction angiography. AJR Am J Roentgenol, 2004. 182(1): p. 183-90.	Observational-Dx	17 MR angiograms in 15 patients and 35 MR angiograms in 35 controls	2
Chadha, N.K. and G.M. Weiner, Vascular loops causing otological symptoms: a systematic review and meta-analysis. Clin Otolaryngol, 2008. 33(1): p. 5-11.	Meta-analysis	5 studies	2
Guevara, N., et al., Microvascular decompression of cochlear nerve for tinnitus incapacity: pre-surgical data, surgical analyses and long-term follow-up of 15 patients. Eur Arch Otorhinolaryngol, 2008. 265(4): p. 397-401.	Review/Other-Dx	15 patients	5
Nowé, V., et al., Does the location of a vascular loop in the cerebellopontine angle explain pulsatile and non-pulsatile tinnitus? Eur Radiol, 2004. 14(12): p. 2282-9.	Observational-Dx	47 patients	4
Expert Panel on Neurologic, I., et al., ACR Appropriateness Criteria((R)) Hearing Loss and/or Vertigo. J Am Coll Radiol, 2018. 15(11S): p. S321-S331.	Review/Other-Dx	N/A	2
Expert Panel on Neurologic, I., et al., ACR Appropriateness Criteria((R)) Cerebrovascular Disease. J Am Coll Radiol, 2017. 14(5S): p. S34-S61.	Review/Other-Dx	N/A	2
Shetty, V.S., et al., ACR Appropriateness Criteria Head Trauma. J Am Coll Radiol, 2016. 13(6): p. 668-79.	Review/Other-Dx	N/A	2
Gimsing, S., Vestibular schwannoma: when to look for it? J Laryngol Otol, 2010. 124(3): p. 258-64.	Observational-Dx	199 vestibular schwannoma patients and 225 nontumor patients	4
Jiang, Z.Y., et al., Intracochlear schwannomas confined to the otic capsule. Otol Neurotol, 2011. 32(7): p. 1175-9.	Review/Other-Dx	10 cases	5
Springborg, J.B., L. Poulsen, and J. Thomsen, Nonvestibular schwannoma tumors in the cerebellopontine angle: a structured approach and management guidelines. Skull Base, 2008. 18(4): p. 217-27.	Review/Other-Dx	N/A	5
Chen, Y.C., et al., Altered intra- and interregional synchronization in resting-state cerebral networks associated with chronic tinnitus. Neural Plast, 2015. 2015: p. 475382.	Review/Other-Dx	29 patients and 30 controls	5

Pyykkö, I., et al., Magnetic resonance imaging of the inner ear in Meniere's disease. <i>Otolaryngol Clin North Am</i> , 2010. 43(5): p. 1059-80.	Review/Other-Dx	N/A	5
Wu, Q., et al., The correlation between symptoms of definite Meniere's disease and endolymphatic hydrops visualized by magnetic resonance imaging. <i>Laryngoscope</i> , 2016. 126(4): p. 974-9.	Observational-Dx	54 patients	4
de Aguiar, P.H., et al., Brainstem cavernomas: a surgical challenge. <i>Einstein (Sao Paulo)</i> , 2012. 10(1): p. 67-73.	Review/Other-Tx	13 patients	5
Saito, N., et al., Clinical and radiologic findings of inner ear involvement in sickle cell disease. <i>AJNR Am J Neuroradiol</i> , 2011. 32(11): p. 2160-4.	Review/Other-Dx	89 patients	5
Shulman, A., B. Goldstein, and A.M. Strashun, Central nervous system neurodegeneration and tinnitus: a clinical experience. Part I: Diagnosis. <i>Int Tinnitus J</i> , 2007. 13(2): p. 118-31.	Review/Other-Dx	96 patients	5
Arai, M., T. Takada, and M. Nozue, Orthostatic tinnitus: an otological presentation of spontaneous intracranial hypotension. <i>Auris Nasus Larynx</i> , 2003. 30(1): p. 85-7.	Observational-Dx	1 patient	5
Ferrante, E., et al., Spontaneous intracranial hypotension syndrome: report of twelve cases. <i>Headache</i> , 2004. 44(6): p. 615-22.	Review/Other-Dx	12 patients	5
Isildak, H., S. Albayram, and H. Isildak, Spontaneous intracranial hypotension syndrome accompanied by bilateral hearing loss and venous engorgement in the internal acoustic canal and positional change of audiography. <i>J Craniofac Surg</i> , 2010. 21(1): p. 165-7.	Review/Other-Dx	1 patient	5
Falcioni, M., A. Taibah, and Rohit, Pulsatile tinnitus as a rare presenting symptom of residual cholesteatoma. <i>J Laryngol Otol</i> , 2004. 118(2): p. 165-6.	Review/Other-Dx	1 patient	5
Lao, Z., et al., Labyrinthine sequestrum: four case studies. <i>Otolaryngol Head Neck Surg</i> , 2012. 147(3): p. 535-7.	Review/Other-Tx	4 patients	5
Samii, M., et al., Cavernous angiomas within the internal auditory canal. <i>J Neurosurg</i> , 2006. 105(4): p. 581-7.	Review/Other-Dx	7 patients	5
Yamashita, K., et al., The radiological diagnosis of fenestral otosclerosis: the utility of histogram analysis using multidetector row CT. <i>Eur Arch Otorhinolaryngol</i> , 2014. 271(12): p. 3277-82.	Observational-Dx	38 patients and 30 controls	4
van de Langenberg, R., et al., Predictors of volumetric growth and auditory deterioration in vestibular schwannomas followed in a wait and scan policy. <i>Otol Neurotol</i> , 2011. 32(2): p. 338-44.	Observational-Dx	63 patients	5
Nowé, V., P. Van de Heyning, and P.M. Parizel, MRI in patients with otovestibular complaints of unknown origin. <i>B-ent</i> , 2007. 3 Suppl 7: p. 27-35.	Observational-Dx	430 patients	5

나. 심장 분과

1) 핵심질문 선정

가) PICO의 선정

표 31. 심장 PICO 선정

	Population	Intervention	Comparator	Outcome
1	심전도의 지속적인 ST 분절상승이 있지만, 심근경색은 배제된 급성 흉통 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
2	급성 관상동맥증후군의 가능성이 낮은 급성 흉통 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
3	급성 관상동맥증후군의 가능성이 중증도인 급성 흉통 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
4	급성 관상동맥증후군의 가능성이 높은 급성 흉통 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
5	위험인자는 있지만 관상동맥질환의 병력이 없는 무증상환자	석회수치 측정(Ca scoring) CT	coronary artery angiography	진단 정확성, 임상적 유용성
6	심장이식수술을 받은 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
7	관상동맥질환의 병력이 없고 새로 진단된 성인 심부전 환자	심장(관상동맥) CT	echocardiography, coronary artery angiography	진단 정확성, 임상적 유용성
8	관상동맥 우회술(CABG) 이외의 심장수술이 필요한 성인 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
9	관상동맥 석회수치가 400 이하인 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
10	관상동맥 우회술(CABG)을 시행한 환자	심장(관상동맥) CT	coronary artery angiography	진단 정확성, 임상적 유용성
11	심장판막질환이 의심되는 환자	심장(관상동맥) CT	echocardiography	진단 정확성, 임상적 유용성
12	인공심장판막의 기능이 상이 의심되는 환자	심장(관상동맥) CT	echocardiography	진단 정확성, 임상적 유용성
13	심장 종괴(종양 및 혈전)가 의심되는 환자	심장(관상동맥) CT	echocardiography, cardiac MRI	진단 정확성, 임상적 유용성

14	심방세동의 전기소작술이 예정된 환자	심장(관상동맥) CT	echocardiography, cardiac MRI	시술 전 진단 정확성, 임상적 유용성
15	우심실 기능의 정량적인 분석이 필요한 환자	심장(관상동맥) CT	echocardiography, cardiac MRI	정량적 분석 정확성, 임상적 유용성

나) 문장형 핵심 질문

표 32. 심장 문장형 핵심질문

핵심질문	
핵심질문 1	심근경색이 배제된 급성 흉통이 있는 환자에서 심전도의 지속적인 ST 분절상승이 있을 때 심장 CT가 적절한가?
핵심질문 2	급성 흉통이 있으나, 급성 관상동맥증후군(Acute coronary syndrome)의 위험도가 낮은 환자에서 관상동맥 CT가 적절한가?
핵심질문 3	급성 흉통이 있고 급성관상동맥증후군(Acute coronary syndrome)의 위험도가 중등도인 환자에서 관상동맥 CT가 적절한가?
핵심질문 4	급성 흉통이 있고 급성관상동맥증후군(Acute coronary syndrome)의 위험도가 높은 환자에서 관상동맥 CT가 적절한가?
핵심질문 5	위험인자는 있지만 관상동맥질환의 병력이 없는 무증상환자에서 관상동맥 석회수치 측정(Ca scoring) CT가 적절한가?
핵심질문 6	심장이식수술 후 관상동맥 평가를 위해 관상동맥 CT가 적절한가?
핵심질문 7	관상동맥질환의 병력이 없는 환자에서 새로 진단된 심부전의 원인평가를 위해 심장 CT가 적절한가?
핵심질문 8	관상동맥 우회술(CABG) 이외의 심장수술이 필요한 환자에서 수술 전 관상동맥의 평가를 위해 관상동맥 CT가 적절한가?
핵심질문 9	관상동맥 석회수치가 400 이하인 환자에서 관상동맥의 평가를 위해 관상동맥 CT가 적절한가?
핵심질문 10	관상동맥 우회술(CABG) 시행 후 이식혈관의 평가를 위해 심장 CT가 적절한가?
핵심질문 11	심장판막질환이 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?
핵심질문 12	인공심장판막의 기능 이상이 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?
핵심질문 13	심장 종괴(종양 및 혈전)가 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?
핵심질문 14	심방세동의 전기소작술이 예정된 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?
핵심질문 15	우심실 기능의 정량적 분석이 필요한 환자에서 심장 CT가 적절한가?

2) 핵심질문별 진료지침 검색

가) 핵심질문 1-4

검색대상 핵심질문

KQ 1. 심근경색이 배제된 급성 흉통이 있는 환자에서 심전도의 지속적인 ST 분절상승이 있을 때 심장 CT가 적절한가?
KQ 2. 급성 흉통이 있으나, 급성관상동맥증후군(Acute coronary syndrome)의 위험도가 낮은 환자에서 관상동맥 CT가 적절한가?
KQ 3. 급성 흉통이 있고 급성관상동맥증후군(Acute coronary syndrome)의 위험도가 중등도인 환자에서 관상동맥 CT가 적절한가?
KQ 4. 급성 흉통이 있고 급성관상동맥증후군(Acute coronary syndrome)의 위험도가 높은 환자에서 관상동맥 CT가 적절한가?

국외DB 검색전략 및 결과

표 33. 심장 핵심질문 1-4 국외 Ovid-Medline

검색일: 2020. 07. 14.			
구분	N	검색어	검색 결과
P	1	(acute chest pain OR ST elevation OR non-myocardi* infarct* OR myocardi* infarct*).tw.	179,067
	2	Acute Coronary Syndrome/ OR Myocardial Infarction/	178,005
	3	1 OR 2	239,598
검사	4	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw OR Tomography, X-Ray Computed/	2,414,535
	5	(coronary OR cardiac OR cardio*).tw	1,248,367
	6	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).tw OR exp Coronary Angiography/ OR exp Percutaneous Coronary Intervention/	132,309
	7	(4 AND 5) OR 6	268,624
P&검사	8	3 AND 7	62,688
지침필터	9	(guideline* OR recommendation* OR statement*).ti. OR (practice guideline OR guideline).pt	124,558
종합	10	8 AND 9	641
연도제한	11	limit 10 to yr="2010 -Current"	339
	12	11 not (editorial/ or letter/)	315

표 34. 심장 핵심질문 1-4 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	('acute chest pain' OR 'ST elevation' OR 'non-myocardi* infarct*' OR 'myocardi* infarct*'):ab,ti	290,371
	2	'acute coronary syndrome'/mj OR 'heart infarction'/mj	137,213
	3	#1 OR #2	335,589
	4	(imaging or radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,773,528
	5	(coronary OR cardiac OR cardio*):ab,ti	2,021,043

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
검사	6	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj OR 'percutaneous coronary intervention'/mj	159,777
	7	(#4 AND #5) OR #6	429,161
P&검사	8	#3 AND #7	87,926
지침필터	9	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
종합	10	#8 AND #9	674
연도제한	11	#10 AND [2010-2020]/py	472

표 35. 심장 핵심질문 1-4 국외 GIN

검색일: 2019. 05. 15		
N	검색어	검색 결과
1	Acute Coronary Syndrome	7

국내DB 검색전략 및 결과

표 36. 심장 핵심질문 1-4 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	Acute Coronary Syndrome [ALL] and guideline[ALL]	0	
	2	Acute Coronary Syndrome [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=관상동맥증후군] AND [ALL=지침])	0	
	2	([ALL=관상동맥증후군] AND [ALL=권고])	1	
	3	([ALL=관상동맥증후군] AND [ALL=가이드라인])	0	
	4	소계	1	
	5	단순중복 제거 후	1	

표 37. 심장 핵심질문 1-4 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

나) 핵심질문 5,9

검색대상 핵심질문

KQ 5. 위험인자는 있지만 관상동맥질환의 병력이 없는 무증상환자에서 관상동맥 석회수치 측정(Ca scoring) CT가 적절한가?
KQ 9. 관상동맥 석회수치가 400 이하인 환자에서 관상동맥의 평가를 위해 관상동맥 CT가 적절한가?

국외DB 검색전략 및 결과

표 38. 심장 핵심질문 5,9 국외 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	(coronary adj3 (calcification OR calcium scor*)).tw	4,389
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw. OR Tomography, X-Ray Computed/	2,414,535
	3	(coronary OR cardiac OR cardio*).tw.	1,248,367
	4	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI OR Ca scoring CT).tw. OR exp Coronary Angiography/ OR exp Percutaneous Coronary Intervention/	132,309
	5	(2 AND 3) OR 4	268,624
P&검사	6	1 AND 5	3,300
지침필터	7	(guideline* OR recommendation* OR statement*).ti. OR (practice guideline OR guideline).pt	124,558
종합	8	6 AND 7	25
연도제한	9	limit 8 to yr="2010 -Current"	19

표 39. 심장 핵심질문 5,9 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	(coronary NEAR/3 (calcification OR 'calcium scor*')):ab,ti	9,028
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,773,528
	3	(coronary OR cardiac OR cardio*):ab,ti	2,021,043
	4	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI OR 'Ca scoring CT':ab,ti OR 'coronary angiography'/mj OR 'percutaneous coronary intervention'/mj	159,777
	5	(#2 AND #3) OR #4	429,161
P&검사	6	#1 AND #5	5,085
지침필터	7	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
종합	8	#6 AND #7	32
연도제한	9	#8 AND [2010-2020]/py	26

표 40. 심장 핵심질문 5,9 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	coronary calcification	0

국내DB 검색전략 및 결과

표 41. 심장 핵심질문 5,9 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	coronary calcification [ALL] and guideline[ALL]	0	
	2	coronary calcification [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	(([ALL=관상동맥석회화] AND [ALL=지침]))	0	
	2	(([ALL=관상동맥석회화] AND [ALL=권고]))	0	
	3	(([ALL=관상동맥석회화] AND [ALL=가이드라인]))	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 42. 심장 핵심질문 5,9 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

다) 핵심질문 6,8

검색대상 핵심질문

KQ 6. 심장이식수술 후 관상동맥 평가를 위해 관상동맥 CT가 적절한가?
KQ 8. 관상동맥 우회술(CABG) 이외의 심장수술이 필요한 환자에서 수술 전 관상동맥의 평가를 위해 관상동맥 CT가 적절한가?

국외DB 검색전략 및 결과

표 43. 심장 핵심질문 6,8 국외 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	((cardi* OR heart) adj2 (surgery OR operation OR transplant)).tw	69,080
	2	Heart Transplantation/	34,208
	3	1 OR 2	93,034
검사	4	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw OR exp Tomography, X-Ray Computed/	2,425,582
	5	(coronary OR cardiac OR cardio*).tw	1,248,367
	6	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).tw OR exp Coronary Angiography/ OR exp Percutaneous Coronary Intervention/	132,309
	7	(4 AND 5) OR 6	269,212
P&검사	8	3 AND 7	11,021
지침필터	9	(guideline* OR recommendation* OR statement*).ti. OR (practice guideline OR guideline).pt	124,558
총합	10	8 AND 9	140
연도제한	11	limit 10 to yr="2010 -Current"	93

표 44. 심장 핵심질문 6,8 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	((cardi* OR heart) NEAR/2 (surgery OR operation OR transplant)):ab,ti	120,493
	2	'heart transplantation'/mj	29,008
	3	#1 OR #2	139,942
검사	4	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR 'comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,73,528
	5	(coronary OR cardiac OR cardio*):ab,ti	2,021,043
	6	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	159,77
	7	(#4 AND #5) OR #6	429,161
P&검사	8	#3 AND #7	19,741
지침필터	9	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
종합	10	#8 AND #9	158
연도제한	11	#10 AND [2010-2020]/py	120

표 45. 심장 핵심질문 6,8 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	heart surgery OR heart operation OR heart transplant	14

국내DB 검색전략 및 결과

표 46. 심장 핵심질문 6,8 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	heart surgery [ALL] and guideline[ALL]	0	
	2	heart surgery [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=심장수술] AND [ALL=지침])	2	
	2	([ALL=심장수술] AND [ALL=권고])	3	
	3	([ALL=심장수술] AND [ALL=가이드라인])	0	
	4	소계	5	
	5	단순중복 제거 후	5	

표 47. 심장 핵심질문 6,8 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

라) 핵심질문 7,15

검색대상 핵심질문

KQ 7. 관상동맥질환의 병력이 없는 환자에서 새로 진단된 심부전의 원인평가를 위해 심장 CT가 적절한가?
KQ 15. 우심실 기능의 정량적 분석이 필요한 환자에서 심장 CT가 적절한가?

국외DB 검색전략 및 결과

표 48. 심장 핵심질문 7,15 국외 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	Heart Failure/ OR Ventricular Dysfunction, Left/ OR (Ventricl* dysfunction OR heart failure).tw.	138,857
	2	Ventricular Function, Right/ OR ((right ventricle) AND (function OR volume)).tw	10,495
	3	1 OR 2	147,708
검사	4	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw OR exp Tomography, X-Ray Computed/	2,425,582
	5	(coronary OR cardiac OR cardio*).tw	1,248,367
	6	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).tw OR exp Coronary Angiography/ or exp Percutaneous Coronary Intervention/	132,309
	7	(4 AND 5) OR 6	269,212
P&검사	8	3 AND 7	16,732
지침필터	9	(guideline* OR recommendation* OR statement*).ti. or (practice guideline or guideline).pt	124,558
종합	10	8 AND 9	187
연도제한	11	limit 10 to yr="2010 -Current"	105

표 49. 심장 핵심질문 7,15 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	'congestive heart failure'/mj OR 'heart left ventricle function'/mj OR ('Ventricl* dysfunction' OR 'heart failure'):ab,ti	297,409
	2	'heart right ventricle function'/mj OR ('right ventricle' AND (function OR volume)):ab,ti	13,507
	3	#1 OR #2	307,956
검사	4	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,773,528
	5	(coronary OR cardiac OR cardio*):ab,ti	2,021,043
	6	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	159,777
	7	(#4 AND #5) OR #6	429,161

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P&검사	8	#3 AND #7	46,966
지침필터	9	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
종합	10	#8 AND #9	446
연도제한	11	#10 AND [2010-2020]/py	330

표 50. 심장 핵심질문 7,15 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	Heart Failure	34

국내DB 검색전략 및 결과

표 51. 심장 핵심질문 7,15 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	Heart Failure [ALL] and guideline[ALL]	0	
	2	Heart Failure [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=심부전] AND [ALL=지침])	0	
	2	([ALL=심부전] AND [ALL=권고])	0	
	3	([ALL=심부전] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 52. 심장 핵심질문 7,15 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

마) 핵심질문 10

검색대상 핵심질문

KQ10. 관상동맥 우회술(CABG) 시행 후 이식혈관의 평가를 위해 심장 CT가 적절한가?

국외DB 검색전략 및 결과

표 53. 심장 핵심질문 10 국외 Ovid-Medline

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	Coronary Artery Bypass/ OR (coronary artery bypass graft* OR CABG).tw.	58,949
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw. OR exp Tomography, X-Ray Computed/	2,425,582
	3	(coronary OR cardiac OR cardio*).tw.	1,248,367
	4	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	146,337
	5	(2 AND 3) OR 4	280,015
P&검사	6	1 AND 5	19,155
지침필터	7	(guideline* OR recommendation* OR statement*).ti. OR (practice guideline or guideline).pt	124,558
종합	8	6 AND 7	181
연도제한	9	limit 8 to yr="2010 -Current"	91

표 54. 심장 핵심질문 10 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	'coronary artery bypass graft'/mj OR ('coronary artery bypass graft*' OR CABG):ab,ti	93,227
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,773,528
	3	(coronary OR cardiac OR cardio*):ab,ti	2,021,043
	4	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj OR 'percutaneous coronary intervention'/mj	159,777
	5	(#2 AND #3) OR #4	429,161
P&검사	6	#1 AND #5	24,625
지침필터	7	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
종합	8	#6 AND #7	250
	9	#8 AND [2010-2020]/py	171

표 55. 심장 핵심질문 10 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	coronary artery bypass graft	2

국내DB 검색전략 및 결과

표 56. 심장 핵심질문 10 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	coronary artery bypass graft [ALL] and guideline[ALL]	0	
	2	coronary artery bypass graft [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=관상동맥우회술] AND [ALL=지침])	4	
	2	([ALL=관상동맥우회술] AND [ALL=권고])	1	
	3	([ALL=관상동맥우회술] AND [ALL=가이드라인])	0	
	4	소계	5	
	5	단순중복 제거 후	5	

표 57. 심장 핵심질문 10 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

바) 핵심질문 11-12

검색대상 핵심질문

KQ 11. 심장판막질환이 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?
 KQ 12. 인공심장판막의 기능이상 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?

국외DB 검색전략 및 결과

표 58. 심장 핵심질문 11-12 국외 Ovid-Medline

구분	N	검색어	검색 결과
P	1	Heart Valve Diseases/	23,848
	2	((valve OR valvular) AND (obstruction OR dysfunction OR abnormal* OR disease OR replace* OR prosthetic)).tw.	71,035
	3	(coronary OR cardiac OR cardio* OR heart).tw	1,601,494
	4	1 OR (2 AND 3)	62,427
검사	5	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw OR exp Tomography, X-Ray Computed/	2,425,582
	6	(coronary OR cardiac OR cardio*).tw	1,248,367
	7	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).tw OR exp Coronary Angiography/ OR exp Percutaneous Coronary Intervention/	132,309
	8	(5 AND 6) OR 7	269,212
P&검사	9	4 AND 8	10,919

구분	N	검색어	검색 결과
지침필터	10	(guideline* OR recommendation* OR statement*).ti. or (practice guideline OR guideline).pt	124,558
총합	11	9 AND 10	129
	12	limit 11 to yr="2010 -Current"	88

표 59. 심장 핵심질문 11-12 국외 Ovid-Embase

검색일: 2020. 07. 14			
구분	N	검색어	검색 결과
P	1	'valvular heart disease'/mj	9,690
	2	((valve OR valvular) AND (obstruction OR dysfunction OR abnormal* OR disease OR replace* OR prosthetic)):ab,ti	124,563
	3	(coronary OR cardiac OR cardio* OR heart):ab,ti	2,546,883
	4	#1 OR (#2 AND #3)	92,282
검사	5	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT or ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,773,528
	6	(coronary OR cardiac OR cardio*):ab,ti	2,021,043
	7	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	159,777
	8	(#5 AND #6) OR #7	429,161
P&검사	9	#4 AND #8	20,605
지침필터	10	guideline*:ti OR recommendation*:ti OR statement*:ti	166,182
총합	11	#9 AND #10	155
연도제한	12	#11 AND [2010-2020]/py	127

표 60. 심장 핵심질문 11-12 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	Heart Valve Diseases	18

국내DB 검색전략 및 결과

표 61. 심장 핵심질문 11-12 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	Heart Valve Diseases [ALL] and guideline[ALL]	0	
	2	Heart Valve Diseases [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=심장판막질환] AND [ALL=지침])	1	
	2	([ALL=심장판막질환] AND [ALL=권고])	0	
	3	([ALL=심장판막질환] AND [ALL=가이드라인])	0	

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
	4	소계	1	
	5	단순중복 제거 후	1	

표 62. 심장 핵심질문 11-12 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

사) 핵심질문 13

검색대상 핵심질문

KQ13. 심장 종괴(종양 및 혈전)가 의심되는 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?

국외DB 검색전략 및 결과

표 63. 심장 핵심질문 13 국외 Ovid-Medline

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
P	1	(cardiac tumo?r* OR cardiac mass*).mp.	4,887
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).mp OR exp Tomography, X-Ray Computed/	4,913,333
	3	(coronary OR cardiac OR cardio*).mp	1,592,293
	4	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).mp OR exp Coronary Angiography/ or exp Percutaneous Coronary Intervention/	149,077
	5	(2 AND 3) OR 4	522,201
P&검사	6	1 AND 5	2,956
지침필터	7	(guideline* OR recommendation* .ti. OR (practice guideline or guideline).pt	116,580
종합	8	6 AND 7	6

표 64. 심장 핵심질문 13 국외 Ovid-Embase

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
P	1	('cardiac tumo?r*' OR 'cardiac mass*'):ab,ti	4,688

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
검사	2	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,887,829
	3	(coronary OR cardiac OR cardio*):ab,ti	2,069,063
	4	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	163,958
	5	(#2 AND #3) OR #4	441,718
P&검사	6	#1 AND #5	1,782
지침필터	7	guideline*:ti OR recommendation*:ti OR statement*:ti	171,963
총합	8	#6 AND #7	5

표 65. 심장 핵심질문 13 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	(cardiac mass) OR (cardiac tumor)	0

국내DB 검색전략 및 결과

표 66. 심장 핵심질문 13 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	cardiac tumor [ALL] and guideline[ALL]	0	
	2	cardiac tumor [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=심장종괴] AND [ALL=지침])	0	
	2	([ALL=심장종괴] AND [ALL=권고])	0	
	3	([ALL=심장종괴] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 67. 심장 핵심질문 13 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

아) 핵심질문 14

검색대상 핵심질문

KQ14. 심방세동의 전기소작술이 예정된 환자에서 심장 내부 및 주변 구조물의 평가를 위해 심장 CT가 적절한가?

국외DB 검색전략 및 결과

표 68. 심장 핵심질문 14 국외 Ovid-Medline

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
P	1	Atrial Fibrillation/ OR atrial fibrillation.tw.	72,629
	2	Radiofrequency Ablation/ OR Catheter Ablation/ OR (radiofrequency ablation OR catheter ablation).tw.	37,328
	3	(coronary OR cardiac OR cardio*).tw	1,271,407
	4	1 OR (2 AND 3)	77,827
검사	5	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR (comput* adj2 tomography)).tw OR exp Tomography, X-Ray Computed/	2,475,154
	6	(coronary OR cardiac OR cardio*).tw	1,271,407
	7	((coronary OR cardiac OR cardio*) AND angiography) OR Percutaneous Coronary Intervention OR PCI).tw OR exp Coronary Angiography/ or exp Percutaneous Coronary Intervention/	134,767
	8	(5 AND 6) OR 7	274,930
P&검사	9	4 AND 8	7,534
지침필터	10	(guideline* OR recommendation* .ti. OR (practice guideline or guideline).pt	116,580
종합	11	9 AND 10	94
연도제한	12	limit 11 to yr="2010 -Current"	69

표 69. 심장 핵심질문 14 국외 Ovid-Embase

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
P	1	'atrial fibrillation'/mj OR 'atrial fibrillation':ab,ti	176,793
	2	'radiofrequency ablation'/mj OR 'catheter ablation'/mj OR ('radiofrequency ablation' OR 'catheter ablation'):ab,ti	50,255
	3	(coronary OR cardiac OR cardio*):ab,ti	2,069,063
	4	#1 OR (#2 AND #3)	184,144
검사	5	(imaging OR radiolog* OR radiograp* OR diagnosis OR CT OR ('comput* NEAR/2 tomography')):ab,ti OR 'computer assisted tomography'/mj	3,887,829
	6	(coronary OR cardiac OR cardio*):ab,ti	2,069,063
	7	((coronary OR cardiac OR cardio*) AND angiography) OR 'Percutaneous Coronary Intervention' OR PCI):ab,ti OR 'coronary angiography'/mj or 'percutaneous coronary intervention'/mj	163,958
	8	(#5 AND #6) OR #7	441,718
P&검사	9	#4 AND #8	20,600
지침필터	10	guideline*:ti OR recommendation*:ti	153,552

검색일: 2020. 11. 25			
구분	N	검색어	검색 결과
총합	11	#9 AND #10	207
	12	#11 AND [2010-2020]/py	174

표 70. 심장 핵심질문 14 국외 GIN

검색일: 2020. 07. 14		
N	검색어	검색 결과
1	Atrial Fibrillation	11

국내DB 검색전략 및 결과

표 71. 심장 핵심질문 14 국내 문헌DB

검색일: 2020. 07. 14				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	Atrial Fibrillation [ALL] and guideline[ALL]	0	
	2	cardiac tumor OR Atrial Fibrillation [ALL] and recommendatation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=심방세동] AND [ALL=지침])	0	
	2	([ALL=심방세동] AND [ALL=권고])	0	
	3	([ALL=심방세동] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 72. 심장 핵심질문 14 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

3) 진료지침 선별

가) 핵심질문 흐름도

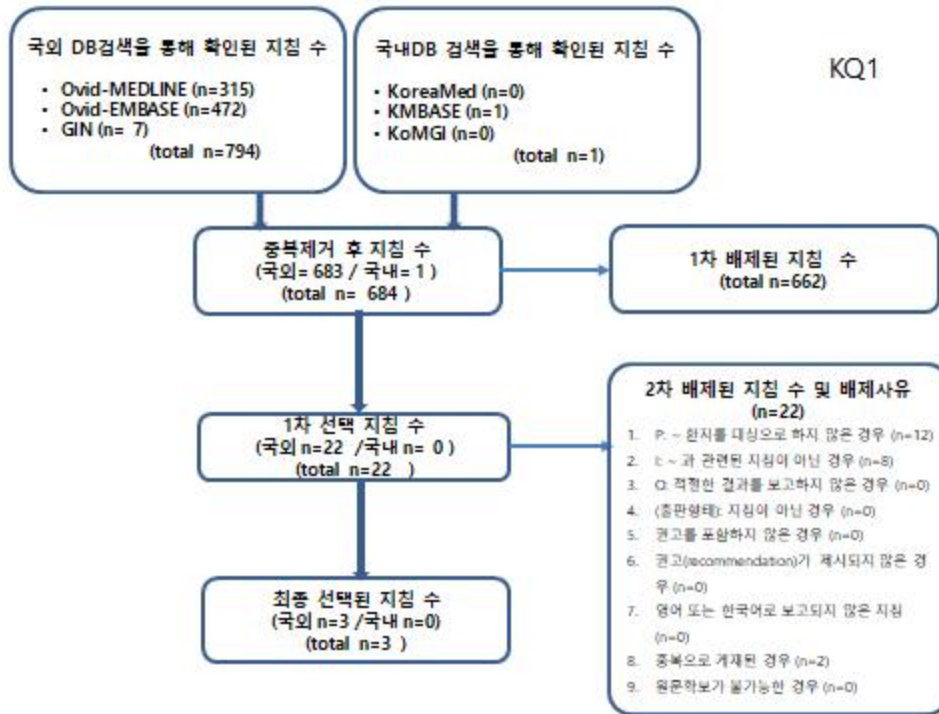


그림 5. 심장 핵심질문 1 흐름도

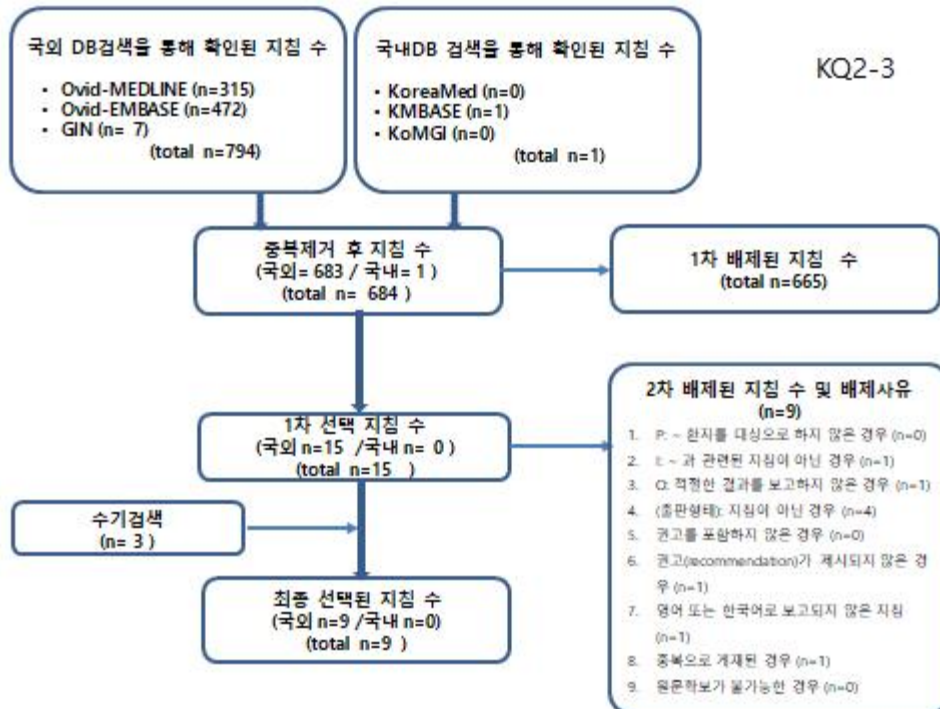


그림 6. 심장 핵심질문 2-3 흐름도

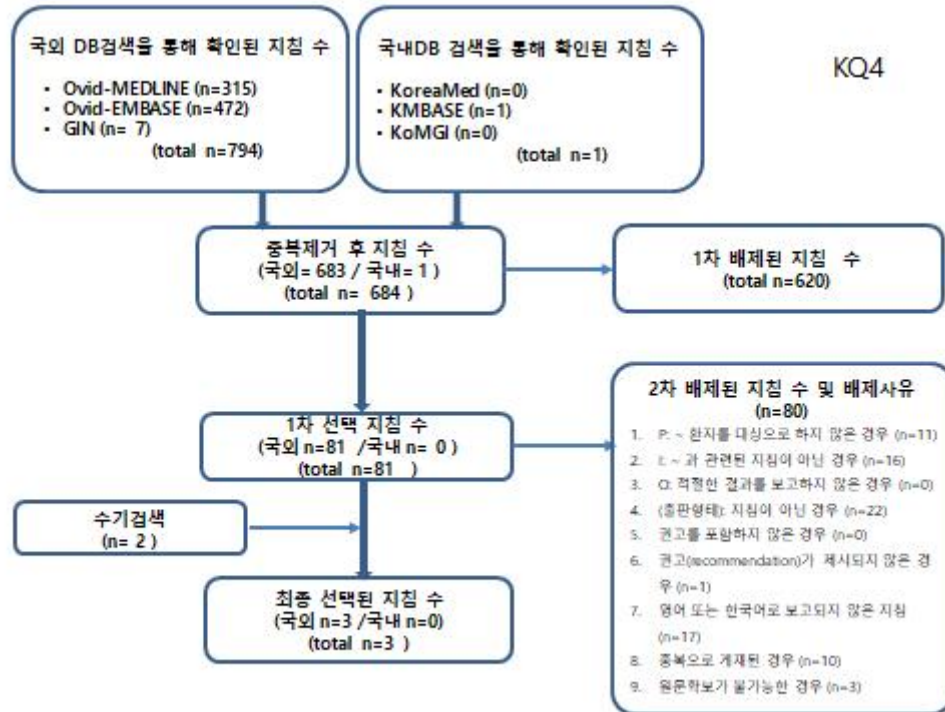


그림 7. 심장 핵심질문 4 흐름도

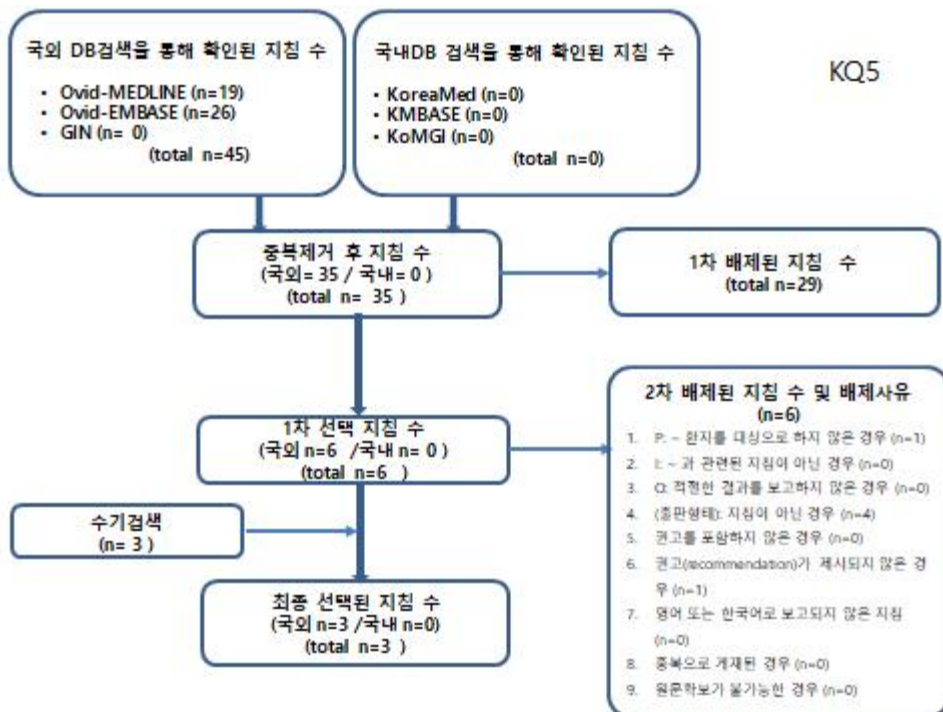


그림 8. 심장 핵심질문 5 흐름도

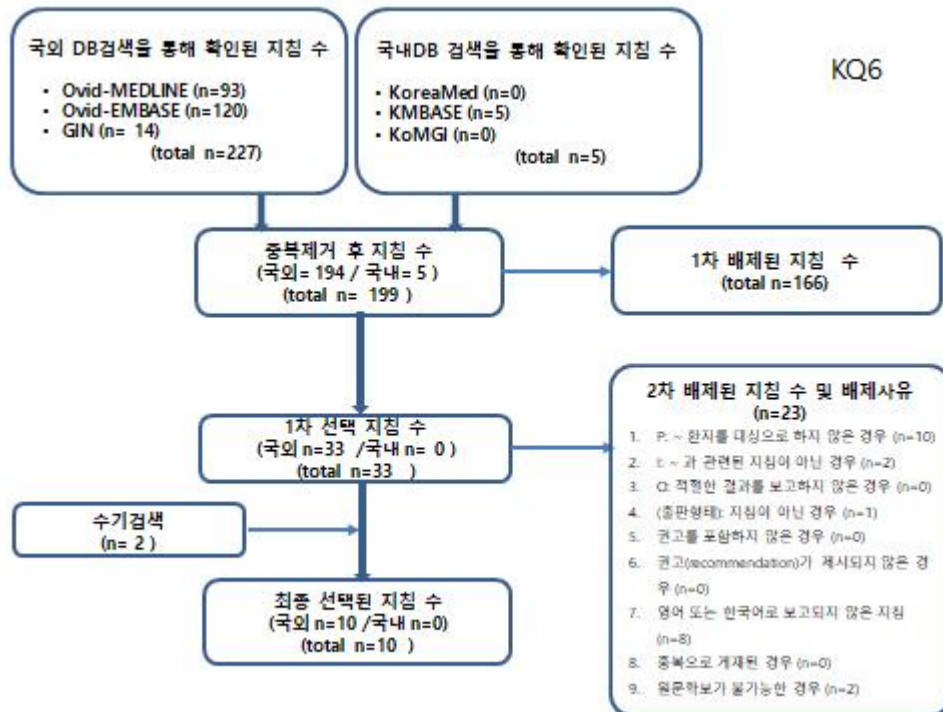


그림 9. 심장 핵심질문 6 흐름도

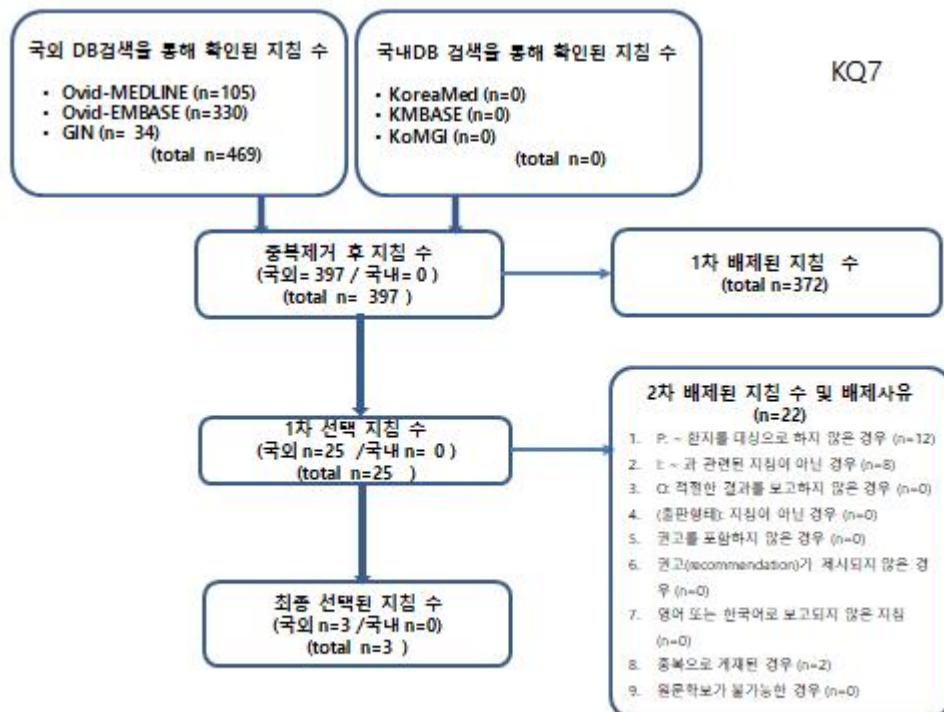


그림 10. 심장 핵심질문 7 흐름도

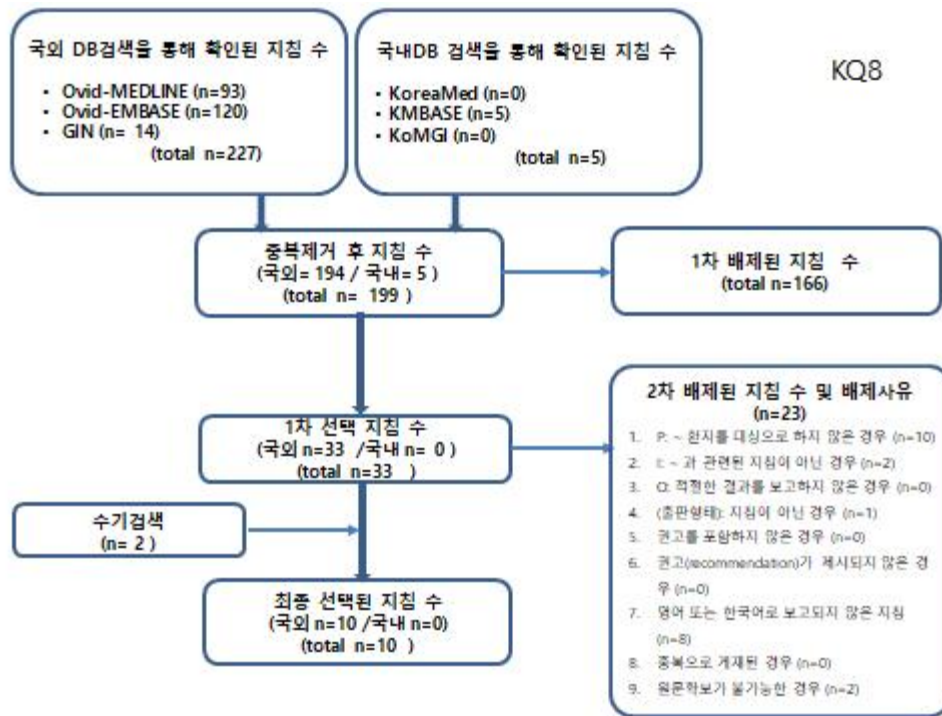


그림 11. 심장 핵심질문 8 흐름도

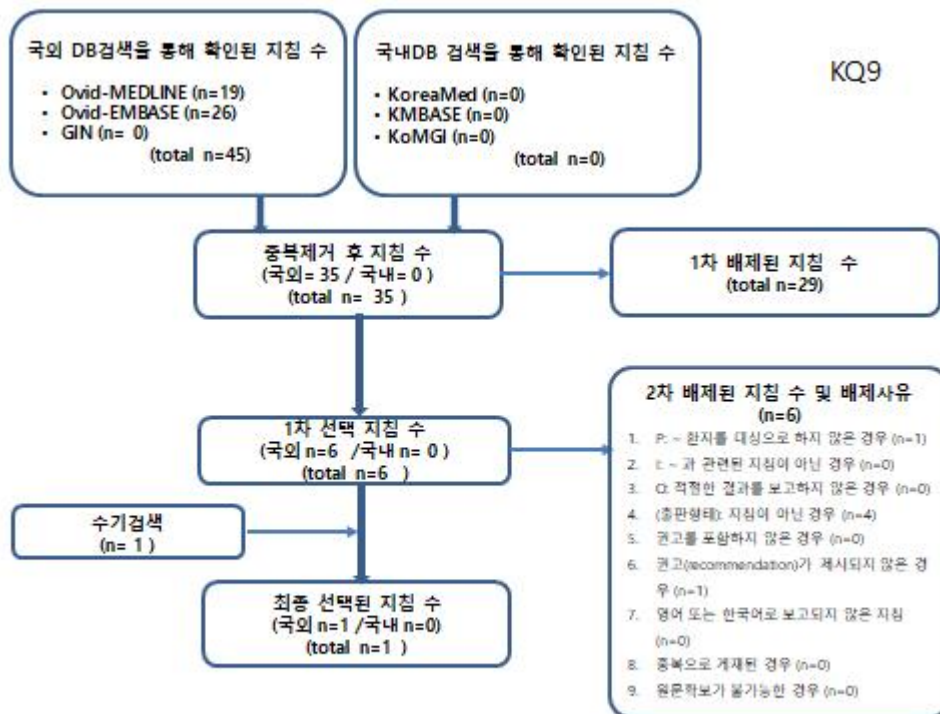


그림 12. 심장 핵심질문 9 흐름도

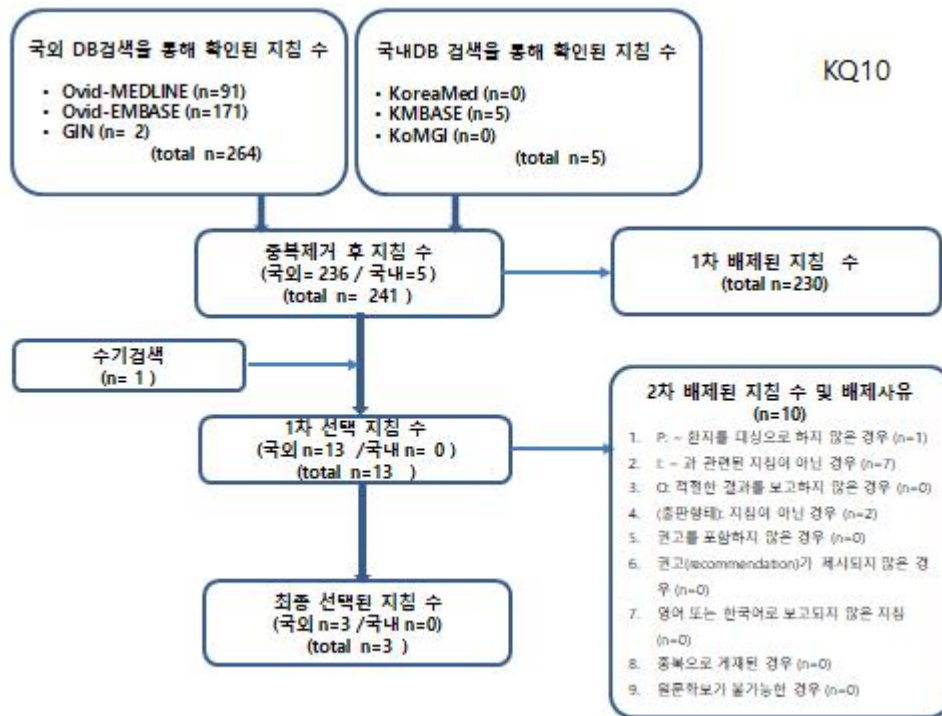


그림 13. 심장 핵심질문 10 흐름도

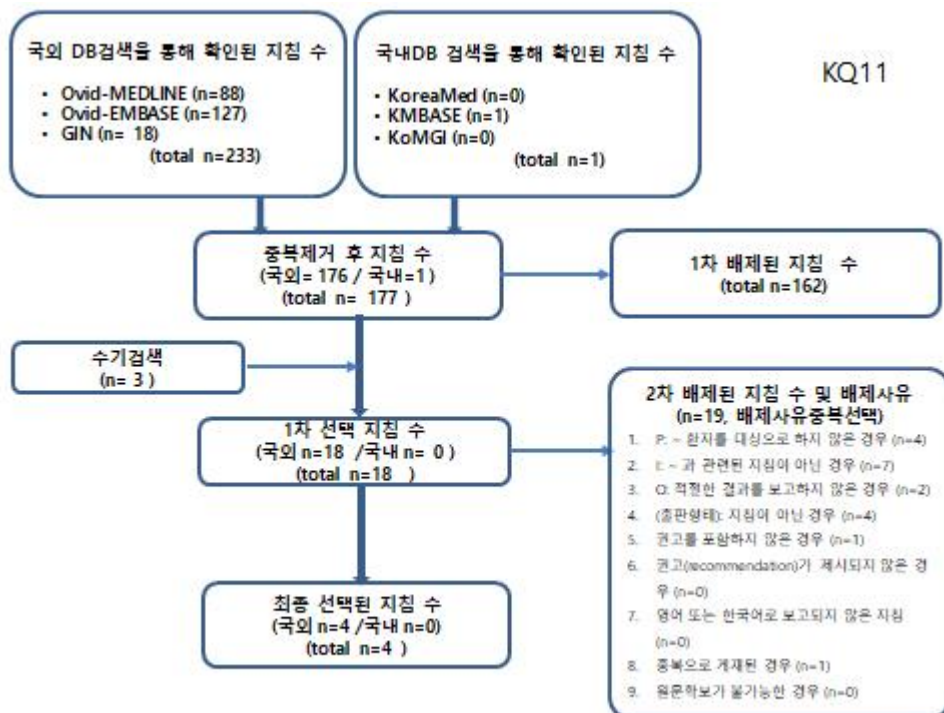


그림 14. 심장 핵심질문 11 흐름도

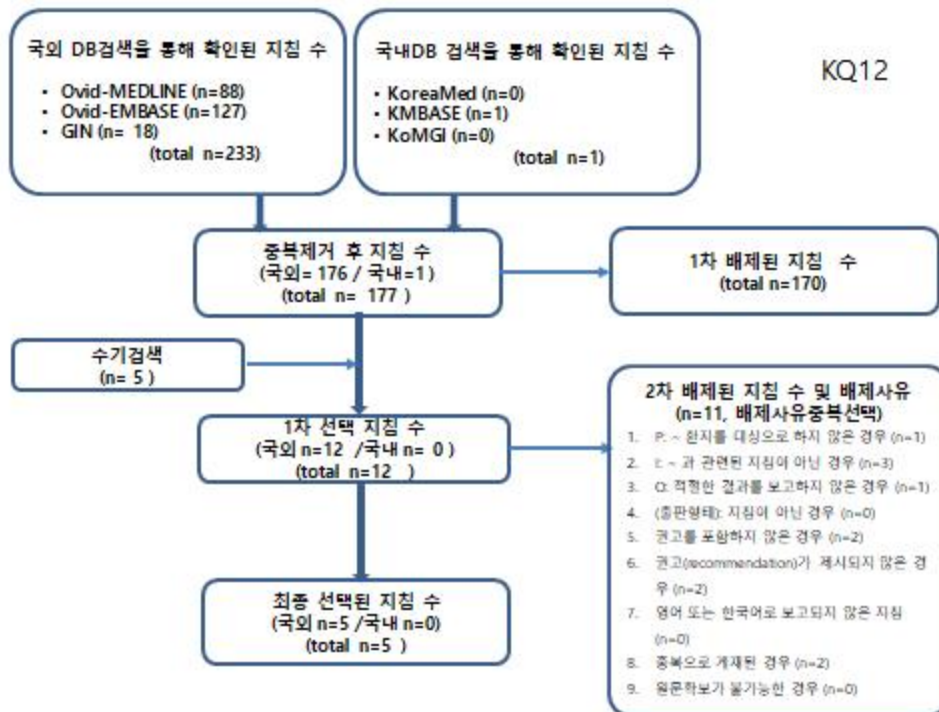


그림 15. 심장 핵심질문 12 흐름도

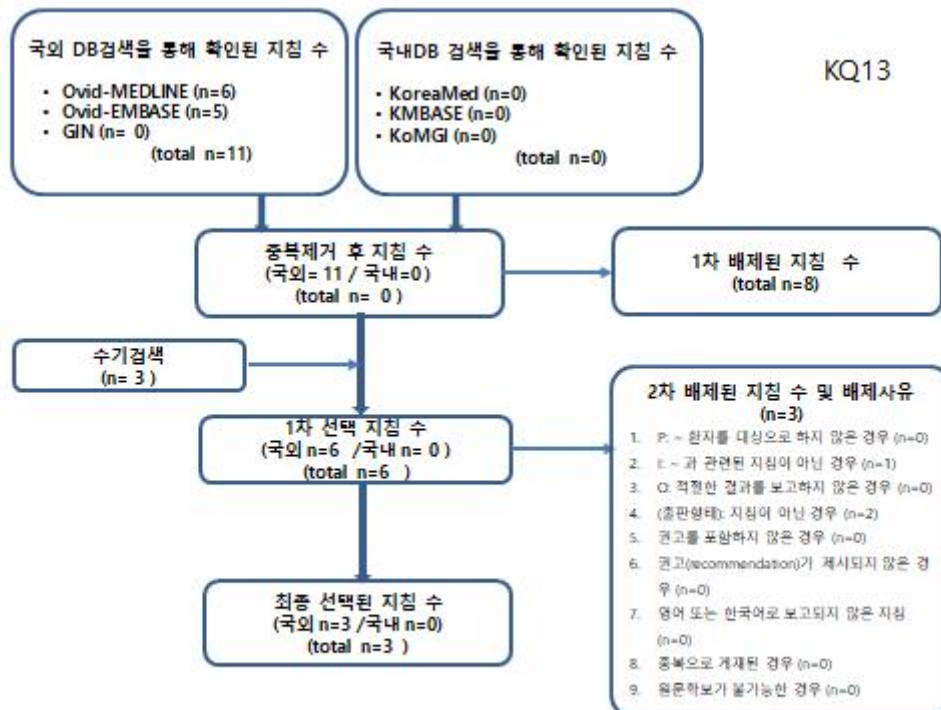


그림 16. 심장 핵심질문 13 흐름도

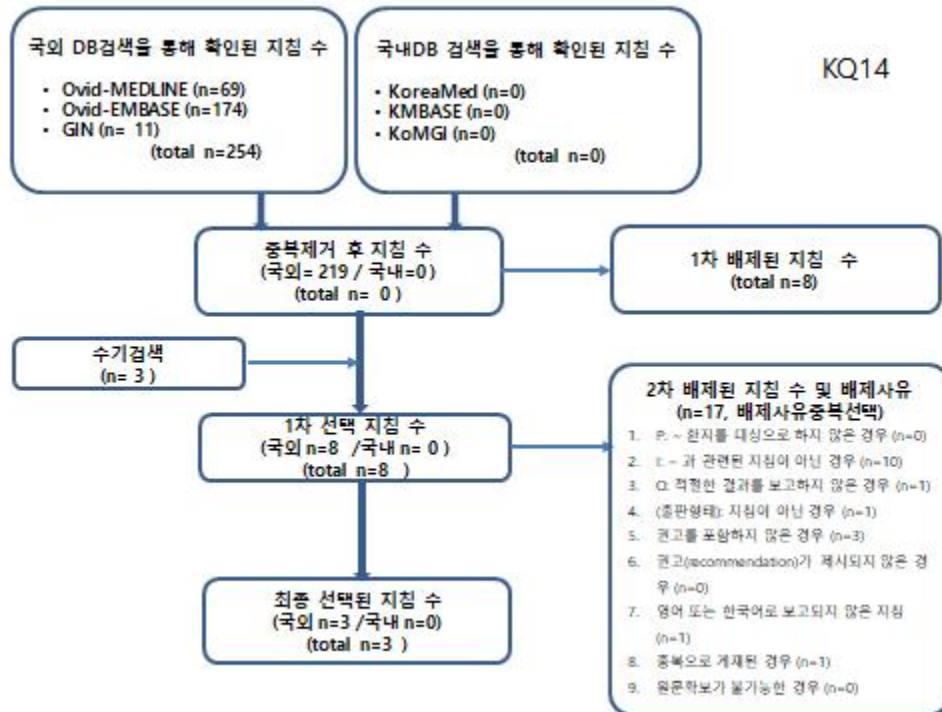


그림 17. 심장 핵심질문 14 흐름도

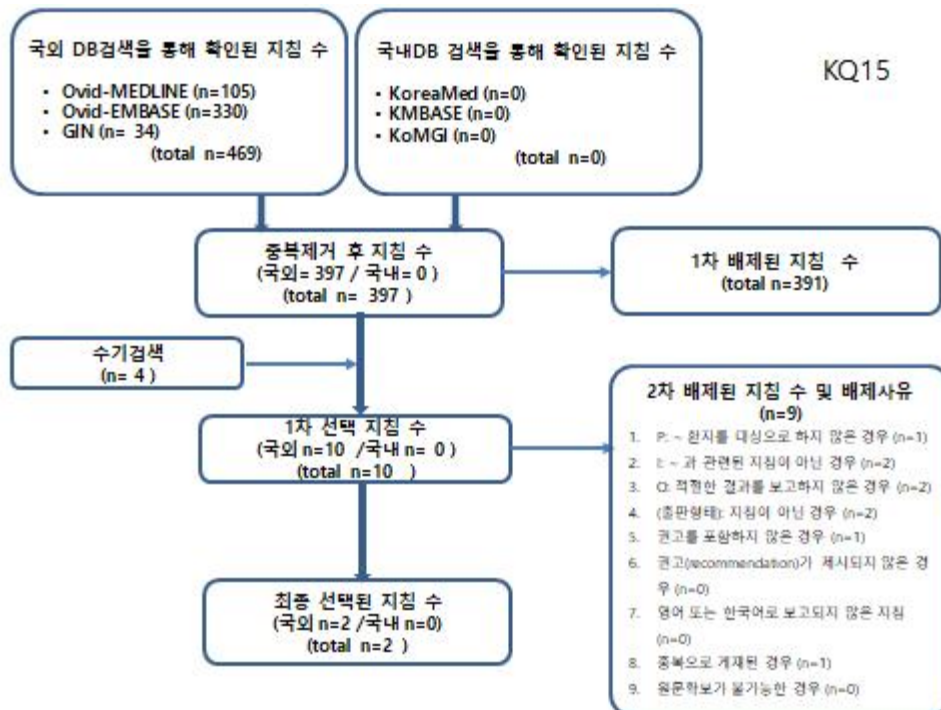


그림 18. 심장 핵심질문 15 흐름도

4) 진료지침 평가

가) 진료지침 질 평가 결과

* 심장분과는 AGREE 점수 40점 미만의 문헌에 대해 추천안함으로 진행

표 73. 심장 핵심질문 1 질 평가결과

핵심질문 1

지침 제목	AGREE점수	개발위원회 의견
JCS 2018 Guideline on Diagnosis and Treatment of Acute Coronary Syndrome	46	추천함
Guidelines for Diagnosis and Treatment of Patients With Vasospastic Angina (Coronary Spastic Angina) (JCS 2013)	50	추천함
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함

추천안함: AGREE II < 40

표 74. 심장 핵심질문 2-3 질 평가결과

핵심질문 2-3

지침 제목	AGREE점수	개발위원회 의견
SCCT guidelines on the use of coronary computed tomographic angiography for patients presenting with acute chest pain to the emergency department: A Report of the Society of Cardiovascular Computed Tomography Guidelines Committee	38	추천안함
Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis Clinical guideline	88	추천함
Korean guidelines for the appropriate use of cardiac CT	88	추천함
2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging	62	추천함

추천안함: AGREE II < 40

표 75 심장 핵심질문 4 질 평가결과

핵심질문 4

지침 제목	AGREE점수	개발위원회 의견
SCCT guidelines on the use of coronary computed tomographic angiography for patients presenting with acute chest pain to the emergency department: A Report of the Society of Cardiovascular Computed Tomography Guidelines Committee	38	추천안함
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함
2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging	62	추천함

추천안함: AGREE II < 40

표 76. 심장 핵심질문 5 질 평가결과

핵심질문 5

지침 제목	AGREE점수	개발위원회 의견
Korean Guidelines for the Appropriate Use of Cardiac CT	82	추천함
2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.	42	추천함
2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Clinical Practice Guidelines.	44	추천함

추천안함: AGREE II < 40

표 77. 심장 핵심질문 6 질 평가결과

핵심질문 6

지침 제목	AGREE점수	개발위원회 의견
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함

추천안함: AGREE II < 40

표 78. 심장 핵심질문 7 질 평가결과

핵심질문 7

지침 제목	AGREE점수	개발위원회 의견
2017 Comprehensive Update of the Canadian Cardiovascular Society Guidelines for the Management of Heart Failure	48	추천함
2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure	56	추천함
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함

추천안함: AGREE II < 40

표 79. 심장 핵심질문 8 질 평가결과

핵심질문 8

지침 제목	AGREE점수	개발위원회 의견
2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines	80	추천함
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함
2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task	65	추천함

Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)		
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추천안함: AGREE II < 40

표 80. 심장 핵심질문 9 질 평가결과

핵심질문 9

지침 제목	AGREE점수	개발위원회 의견
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함

추천안함: AGREE II < 40

표 81. 심장 핵심질문 10 질 평가결과

핵심질문 10

지침 제목	AGREE점수	개발위원회 의견
ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons	84	추천함
Korean guidelines for the appropriate use of cardiac CT	88	추천함
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance	59	추천함

추천안함: AGREE II < 40

표 82. 심장 핵심질문 11 질 평가결과

핵심질문 11

지침 제목	AGREE점수	개발위원회 의견
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ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons	60	추천함
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance	59	추천함
Korean guidelines for the appropriate use of cardiac CT	88	추천함
2017 ESC/EACTS Guidelines for the management of valvular heart disease The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) guideline	71	추천함

추천안함: AGREE II < 40

표 83. 심장 핵심질문 12 질 평가결과

핵심질문 12

지침 제목	AGREE점수	개발위원회 의견
ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons	60	추천함
2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular	73	추천함

Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines		
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance)	59	추천함
2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging	62	추천함
Korean guidelines for the appropriate use of cardiac CT	88	추천함

추천안함: AGREE II < 40

표 84. 심장 핵심질문 13 질 평가결과

핵심질문 13

지침 제목	AGREE점수	개발위원회 의견
Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함
ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and the Society of Thoracic Surgeons	48	추천함

추천안함: AGREE II < 40

표 85. 심장 핵심질문 14 질 평가결과

핵심질문 14

지침 제목	AGREE점수	개발위원회 의견
Clinical recommendations on Cardiac-CT in 2015: A position paper of the Working Group on Cardiac-CT and Nuclear Cardiology of the Italian Society of Cardiology	16	추천안함
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 Appropriate Use Criteria	54	추천함

Korean Guidelines for the Appropriate Use of Cardiac CT	88	추천함
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추천안함: AGREE II < 40

표 86. 심장 핵심질문 15 질 평가결과

핵심질문 15

지침 제목	AGREE점수	개발위원회 의견
ASCI 2010 appropriateness criteria for cardiac computed tomography: a report of the Asian Society of Cardiovascular Imaging cardiac computed tomography and cardiac magnetic resonance imaging guideline Working Group	55	추천함
Korean guidelines for the appropriate use of cardiac CT	88	추천함

추천안함: AGREE II < 40

나) 수용성과 적용성 평가결과

표 87. 심장 핵심질문 1 수용성과 적용성 평가결과

핵심질문 1

구분	평가항목	지침 A	지침 B	지침 C
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : JCS 2018 Guideline on Diagnosis and Treatment of Acute Coronary Syndrome

지침 C : Guidelines for Diagnosis and Treatment of Patients With Vasospastic Angina (Coronary Spastic Angina) (JCS 2013)

표 88. 심장 핵심질문 2-3 수용성과 적용성 평가결과

핵심질문 2-3

구분	평가항목	지침 A	지침 B	지침 C
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

지침 C : Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis

표 89. 심장 핵심질문 4 수용성과 적용성 평가결과

핵심질문 4

구분	평가항목	지침 A	지침 B
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예
	가치와 선호도가 유사하다.	예	예
	권고로 인한 이득은 유사하다.	예	예
	해당권고는 수용할 만하다.	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예
	필수적인 전문기술이 이용가능하다.	예	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

표 90. 심장 핵심질문 5 수용성과 적용성 평가결과

핵심질문 5

구분	평가항목	지침 A	지침 B	지침 C
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.

지침 C : 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Clinical Practice Guidelines.

표 91. 심장 핵심질문 6 수용성과 적용성 평가결과

핵심질문 6

구분	평가항목	지침 A	지침 B
수	인구 집단(유병률, 발생률 등)이 유사	예	아니오

용 성	하다.		
	가치와 선호도가 유사하다.	예	예
	권고로 인한 이득은 유사하다.	예	아니오
	해당권고는 수용할 만하다.	예	예
적 용 성	해당 중재 및 장비는 이용가능하다.	예	예
	필수적인 전문기술이 이용가능하다.	예	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : The International Society of Heart and Lung Transplantation Guidelines for the care of heart transplant recipients

표 92. 심장 핵심질문 7 수용성과 적용성 평가결과

핵심질문 7

구 분	평가항목	지침 A	지침 B	지침 C
수 용 성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적 용 성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

지침 B : 2017 Comprehensive Update of the Canadian Cardiovascular Society Guidelines for the Management of Heart Failure

지침 C : Korean Guidelines for the Appropriate Use of Cardiac CT

표 93. 심장 핵심질문 8 수용성과 적용성 평가결과

핵심질문 8

구 분	평가항목	지침 A	지침 B	지침 C
수 용 성	인구 집단(유병률, 발생률 등)이 유사하다.	아니오	예	아니오
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	아니오	예	아니오
	해당권고는 수용할 만하다.	예	예	예
적 용 성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines

지침 B : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 C : 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)

표 94. 심장 핵심질문 9 수용성과 적용성 평가결과

핵심질문 9

구분	평가항목	지침 A
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예
	가치와 선호도가 유사하다.	예
	권고로 인한 이득은 유사하다.	예
	해당권고는 수용할 만하다.	예
적용성	해당 중재 및 장비는 이용가능하다.	예
	필수적인 전문기술이 이용가능하다.	예
	법률적/제도적 장벽이 없다.	예
	해당권고는 적용할 만하다.	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

표 95. 심장 핵심질문 10 수용성과 적용성 평가결과

핵심질문 10

구분	평가항목	지침 A	지침 B	지침 C
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	불확실	불확실
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : Korean guidelines for the appropriate use of cardiac CT

지침 B : ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 C : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance

표 96. 심장 핵심질문 11 수용성과 적용성 평가결과

핵심질문 11

구분	평가항목	지침 A	지침 B	지침 C	지침 D
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	불확실	불확실	예	아니오
	가치와 선호도가 유사하다.	예	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예	예
	해당권고는 수용할 만하다.	예	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예	예
	해당권고는 적용할 만하다.	예	예	예	예

지침 A : ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 B : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance

지침 C : Korean guidelines for the appropriate use of cardiac CT

지침 D : 2017 ESC/EACTS Guidelines for the management of valvular heart disease The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) guideline

표 97. 심장 핵심질문 12 수용성과 적용성 평가결과

핵심질문 12

구분	평가항목	지침 A	지침 B	지침 C	지침 D	지침 E
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예	예	예
	가치와 선호도가 유사하다.	예	예	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예	예	예
	해당권고는 수용할 만하다.	예	예	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예	예	예
	해당권고는 적용할 만하다.	예	예	예	예	예

지침 A : ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria

for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 B : 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

지침 C : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance)

지침 D : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

지침 E : Korean guidelines for the appropriate use of cardiac CT

표 98. 심장 핵심질문 13 수용성과 적용성 평가결과

핵심질문 13

구분	평가항목	지침 A	지침 B
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	불확실
	가치와 선호도가 유사하다.	예	예
	권고로 인한 이득은 유사하다.	예	예
	해당권고는 수용할 만하다.	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예
	필수적인 전문기술이 이용가능하다.	예	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	예	예

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B: ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and the Society of Thoracic Surgeons

표 99. 심장 핵심질문 14 수용성과 적용성 평가결과

핵심질문 14

구분	평가항목	지침 A	지침 B
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분			
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	불확실	예
	가치와 선호도가 유사하다.	예	예
	권고로 인한 이득은 유사하다.	예	예
	해당권고는 수용할 만하다.	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예
	필수적인 전문기술이 이용가능하다.	예	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	예	예

지침 A : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 Appropriate Use Criteria for Cardiac Computed Tomography

지침 B: Korean Guidelines for the Appropriate Use of Cardiac CT

표 100. 심장 핵심질문 15 수용성과 적용성 평가결과

핵심질문 15

구분	평가항목	지침 A	지침 B
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	불확실	예
	가치와 선호도가 유사하다.	예	예
	권고로 인한 이득은 유사하다.	예	예
	해당권고는 수용할 만하다.	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예
	필수적인 전문기술이 이용가능하다.	예	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	예	예

지침 A : ASCI 2010 appropriateness criteria for cardiac computed tomography: a report of the Asian Society of Cardiovascular Imaging cardiac computed tomography and cardiac magnetic resonance imaging guideline Working Group

지침 B: Korean guidelines for the appropriate use of cardiac CT

5) 핵심질문별 권고 및 근거정리

가) 권고비교표

표 101. 심장 핵심질문 1 권고비교표

핵심질문 1

구분	지침 A	지침 B	지침 C
권고	In cases where myocardial infarction has been excluded and persistent ECG ST-segment elevation is observed, coronary CT angiography can be considered	ST-T changes are often observed in patients with vasospastic angina, AAD, acute pulmonary thromboembolism, takotsubo syndrome, fulminant myocarditis, or acute pericarditis. Also, various circumstances including ventri-	MDCT in patients suspected of having vasospastic angina

		<p>cular hypertrophy, intravenous conduction disturbance, cardiomyopathy, metabolic disturbance, electrolyte abnormalities, medications such as digitalis, and so on, influence ST-T changes. It is important not to confuse other causes of ST-T changes with ACS by considering clinical features and other diagnostic test results.</p> <p>Chest x-ray should be performed for patients with signs or symptoms of cardiac disease (congestive heart failure, cardiac valvular disease, or ischemic heart disease), pericardial disease, or aortic disease (acute aortic dissection).</p> <p>When chest x-ray reveals an enlarged or double shadow of the superior mediastinum or shifted intimal calcification in the aortic wall, acute aortic dissection should be suspected and differentiated by ultrasonography and contrast computed tomography (CT).</p> <p>When chest x-ray reveals disruption or blockage of the pulmonary artery or focal ischemia, acute pulmonary thromboembolism should be suspected, and ultrasonography and contrast CT should be performed.</p>	
권고등급	U	I	Class IIb: As judged from available opinions, neither the benefits nor the efficacy of a method of evaluation or treatment have been well established

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : JCS 2018 Guideline on Diagnosis and Treatment of Acute Coronary Syndrome
 지침 C : Guidelines for Diagnosis and Treatment of Patients With Vasospastic Angina (Coronary Spastic Angina) (JCS 2013)

표 102. 심장 핵심질문 2 권고비교표

핵심질문 2

구분	지침 A	지침 B	지침 C
권고	<p>4. For acute chest pain patients with normal ECG and normal myocardial enzyme levels, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A).</p> <p>5. For low or intermediate pretest probability patients with uninterpretable ECG results, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A) and can be considered in high pretest probability patients (Appropriateness Criteria U, Level of Evidence B).</p> <p>6. In patients with non-diagnostic ECGs or unclear myocardial enzyme levels, coronary CT angiography is recommended for patients with a low or intermediate pretest probability (Appropriateness Criteria A, Level of Evidence A) and can be considered for patients with a high pretest probability (Appropriateness Criteria U, Level of Evidence B).</p>	<p>1-2. Symptomatic: Acute Chest Pain Suspected of Acute Coronary Syndrome.</p> <p>(1) Normal ECG AND cardiac biomarker.</p> <p>7. Low global CAD risk: CCTA appropriate (A)</p> <p>(2) Non-diagnostic ECG OR equivocal cardiac biomarker.</p> <p>10. Low global CAD risk: CCTA appropriate (A)</p>	<p>1.3.4 Diagnostic testing for people in whom stable angina cannot be excluded by clinical assessment alone</p> <p>1.3.4.1 Include the typicality of anginal pain features (see recommendation 1.3.3.1) in all requests for diagnostic investigations and in the person's notes.[2010, amended 2016]</p> <p>1.3.4.2 Use clinical judgement and take into account people's preferences and comorbidities when considering diagnostic testing. [2010]</p> <p>1.3.4.3 Offer 64-slice (or above) CT coronary angiography if:</p> <ul style="list-style-type: none"> - clinical assessment (see recommendation 1.3.3.1) indicates typical or atypical angina or - clinical assessment indicates non-anginal chest pain but 12-lead resting ECG has been done and indicates ST-T changes or Q waves. [2016]
권고 등급	Appropriateness Criteria A, Level of Evidence A	Appropriate A	Appropriate A

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

지침 C : Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis

표 103. 심장 핵심질문 3 권고비교표

핵심질문 3

구 분	지침 A	지침 B	지침 C
권 고	<p>4. For acute chest pain patients with normal ECG and normal myocardial enzyme levels, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A).</p> <p>5. For low or intermediate pretest probability patients with uninterpretable ECG results, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A) and can be considered in high pretest probability patients (Appropriateness Criteria U, Level of Evidence B).</p> <p>6. In patients with non-diagnostic ECGs or unclear myocardial enzyme levels, coronary CT angiography is recommended for patients with a low or intermediate pretest probability (Appropriateness Criteria A, Level of Evidence A) and can be considered for patients with a high pretest probability (Appropriateness Criteria U, Level of Evidence B).</p>	<p>1-2. Symptomatic: Acute Chest Pain Suspected of Acute Coronary Syndrome.</p> <p>(1) Normal ECG AND cardiac biomarker.</p> <p>8. Intermediate global CAD risk: CCTA appropriate (A)</p> <p>(2) Non-diagnostic ECG OR equivocal cardiac biomarker.</p> <p>11. Intermediate global CAD risk: CCTA appropriate (A)</p>	<p>1.3.4 Diagnostic testing for people in whom stable angina cannot be excluded by clinical assessment alone</p> <p>1.3.4.1 Include the typicality of anginal pain features (see recommendation 1.3.3.1) in all requests for diagnostic investigations and in the person's notes.[2010, amended 2016]</p> <p>1.3.4.2 Use clinical judgement and take into account people's preferences and comorbidities when considering diagnostic testing. [2010]</p> <p>1.3.4.3 Offer 64-slice (or above) CT coronary angiography if:</p> <ul style="list-style-type: none"> - clinical assessment (see recommendation 1.3.3.1) indicates typical or atypical angina or - clinical assessment indicates non-anginal chest pain but 12-lead resting ECG has been done and indicates ST-T changes or Q waves. [2016]
권 고 등 급	Appropriateness Criteria A, Level of Evidence A	Appropriate A	Appropriate A

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

지침 C : Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis

표 104. 심장 핵심질문 4 권고비교표

핵심질문 4

구 분	지침 A	지침 B
권 고	<p>4. For acute chest pain patients with normal ECG and normal myocardial enzyme levels, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A).</p> <p>5. For low or intermediate pretest probability patients with uninterpretable ECG results, coronary CT angiography is recommended (Appropriateness Criteria A, Level of Evidence A) and can be considered in high pretest probability patients (Appropriateness Criteria U, Level of Evidence B).</p> <p>6. In patients with non-diagnostic ECGs or unclear myocardial enzyme levels, coronary CT angiography is recommended for patients with a low or intermediate pretest probability (Appropriateness Criteria A, Level of Evidence A) and can be considered for patients with a high pretest probability (Appropriateness Criteria U, Level of Evidence B).</p>	<p>1. Normal ECG AND cardiac biomarker, High global CAD risk, CCTA: appropriate (A)</p> <p>2. Non-diagnostic ECG OR equivocal cardiac biomarker, High global CAD risk CCTA appropriate (A)</p>
권 고 등 급	Appropriateness Criteria U, Level of Evidence B	appropriate (A)

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

표 105. 심장 핵심질문 5 권고비교표

핵심질문 5

구 분	지침 A	지침 B	지침 C
권 고	Coronary calcium scoring for risk assessment and detection of CAD in asymptomatic patients: Coronary calcium scoring is recommended in	In adults at intermediate risk ($\geq 7.5\%$ to $< 20\%$ 10-year ASCVD risk) or selected adults at borderline risk (5% to $< 7.5\%$ 10-year ASCVD risk),	In intermediate-risk or selected borderline-risk adults, if the decision about statin use remains uncertain, it is reasonable to use a CAC score in

	patient at intermediate risk of CAD(Appropriateness Criteria A, Level of Evidence A).	if risk-based decisions for preventive interventions (eg, statin therapy) remain uncertain, it is reasonable to measure a coronary artery calcium score to guide clinician-patient risk discussion.	the decision to withhold, postpone or initiate statin therapy.
권고등급		Class Iia (Moderate)	Class Iia (Moderate)

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.

지침 C : 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Clinical Practice Guidelines.

표 106. 심장 핵심질문 6 권고비교표

- 지침 B: 2010년도 가이드라인이고 방법론 적용이 잘 되어있지 않아 (AGREE 점수는 낮을 것 같아서) AGREE 평가를 진행하지 않고, 1,2차, 최종선택, AGREE 평가 이후에 문헌 추가해서 권고비교표에 넣음

핵심질문 6

구분	지침 A	지침 B
권고	Coronary CT angiography is recommended for the confirmation of coronary allograft vasculopathy after cardiac transplantation	
권고등급	A	Class Iib, Level of Evidence C

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : The International Society of Heart and Lung Transplantation Guidelines for the care of heart transplant recipients

표 107. 심장 핵심질문 7 권고비교표

핵심질문 7

구분	지침 A	지침 B	지침 C
권고	Cardiac CT may be considered in patients with HF and low to intermediate pre-test probability of CAD or those	Cardiac catheterization with hemodynamic measurements and contrast ventriculography, computed tomography (CT),	Coronary CT angiography is recommended in patients with low or intermediate pretest probability and with reduced

	with equivocal non-invasive stress tests in order to rule out coronary artery stenosis.	and CMR imaging can be used when other noninvasive tests are inconclusive and might be required for specific cardiomyopathies catheterization with hemodynamic measurements and contrast ventriculography, computed tomography (CT), and CMR imaging can be used when other non-invasive tests are inconclusive and might be required for specific cardiomyopathies	left ventricular ejection fraction Coronary CT angiography can be considered in patients with high pretest probability Coronary CT angiography can be considered in patients with normal left ventricular ejection fraction
권고등급	IIb	Strong Recommendation; Low-Quality Evidence	A/U/U

지침 A : 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

지침 B : 2017 Comprehensive Update of the Canadian Cardiovascular Society Guidelines for the Management of Heart Failure

지침 C : Korean Guidelines for the Appropriate Use of Cardiac CT

표 108. 심장 핵심질문 8 권고비교표

핵심질문 8

구분	지침 A	지침 B	지침 C
권고	The decreased risk of coronary computerized tomography angiography compared with invasive angiography may encourage its use to determine preoperatively the presence and extent of Diagnostic cardiovascular testing continues to evolve, with newer imaging modalities being developed, such as coronary calcium scores, computed tomography angiography, and cardiac magnetic resonance imaging. The value of these modalities in preoperative screening is uncertain and warrants further study CAD. However, any additive value	Coronary artery assessment prior to non-coronary cardiac surgery. Coronary CT angiography is recommended for the preoperative assessment of the coronary artery prior to non-coronary cardiac surgery (Appropriateness Criteria A, Level of Evidence A).	Computed tomography can be used to detect coronary calcium, which reflects coronary atherosclerosis, and CT angiography is useful for excluding coronary artery disease (CAD) in patients who are at low risk of atherosclerosis. Currently, no data are available in the setting of preoperative risk stratification.

	in decision making of coronary computed tomography angiography and calcium scoring is uncertain, given that data are limited and involve patients undergoing noncardiac surgery.		
권고등급	권고가 없음.	A	권고가 없음.

Recommendations on imaging stress testing before surgery in asymptomatic patients

Recommendations	Class ^a	Level ^b
Imaging stress testing is recommended before high-risk surgery in patients with more than two clinical risk factors and poor functional capacity (<4 METs). ^c	I	C
Imaging stress testing may be considered before high- or intermediate-risk surgery in patients with one or two clinical risk factors and poor functional capacity (<4 METs). ^c	IIb	C
Imaging stress testing is not recommended before low-risk surgery, regardless of the patient's clinical risk.	III	C

지침 A : 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines

지침 B : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 C : 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)

표 109. 심장 핵심질문 9 권고비교표

핵심질문 9

구분	지침 A
권고	Coronary CT angiography is recommended in symptomatic patients with a CAC less than or equal to 400.
권고등급	Appropriateness Criteria A, Level of Evidence A

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

표 110. 심장 핵심질문 10 권고비교표

핵심질문 10

구 분	지침 A	지침 B	지침 C
권 고	<p>1) CT is recommended in the evaluation of graft patency in patients suspected of ischemic chest pain after CABG (Appropriateness Criteria A, Level of Evidence A).</p> <p>2) CT is recommended in asymptomatic patients if more than 5 years have passed since CABG was performed (Appropriateness Criteria A, Level of Evidence A).</p> <p>3) CT can be considered in asymptomatic patients if it has been less than 5 years since CABG was performed (Appropriateness Criteria U, Level of Evidence A).</p>	<p>1) Coronary CT angiography may be appropriate for the evaluation of ischemic equivalent in symptomatic patients after CABG.</p> <p>2) In asymptomatic patients, Coronary CT angiography is rarely appropriate after CABG.</p>	<p>1) Cardiac CT is appropriate for the evaluation of graft patency after CABG in symptomatic patients (ischemic equivalent).</p> <p>2) The use of CT angiography is uncertain in asymptomatic patients who underwent prior CABG \geq 5 yrs ago.</p> <p>3) The use of CT angiography is inappropriate for risk assessment in asymptomatic patients who underwent prior CABG $<$ 5 yrs ago.</p>
권 고 등 급	A-Appropriate, U-Uncertain	May Be Appropriate, Rarely Appropriate	May Be Appropriate, Rarely Appropriate

지침 A : Korean guidelines for the appropriate use of cardiac CT

지침 B : ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 C: ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance

표 111. 심장 핵심질문 11 권고비교표

핵심질문 11

구 분	지침 A	지침 B
권 고	<p>1) The use of cardiac CT is appropriate for the re-evaluation(<1yr) of the size and morphology of the aortic sinuses and ascending aorta in patients with a bicuspid AV and ascending aorta diameter >4cm with 1 of the following: i) aortic diameter >4.5cm, ii) rapid rate of change in aortic diameter, iii) family history (first-degree relative) of aortic dissection.</p> <p>2) The use of cardiac CT may be appropriate in case of inadequate TTE images for the evaluation of possible valvular heart disease due to patient characteristics, and for characterization of native or prosthetic valves with clinical signs and symptoms suggesting valve dysfunction.</p> <p>3) The use of cardiac CT may be appropriate in suspected infective endocarditis with moderate to high pretest probability.</p> <p>4) The use of cardiac CT may be appropriate in symptomatic severe aortic stenosis by calculated valve area and low flow/low gradient and low LVEF.</p> <p>5) The use of cardiac CT may be appropriate in severe aortic stenosis by calculated valve area and low flow/low gradient and preserved LVEF and for assessment of morphology, including calcification.</p> <p>6) The use of cardiac CT may be appropriate when there is discrepancy between resting Doppler echocardiographic findings and clinical symptoms or signs to evaluate mean mitral gradient and pulmonar artery pressure.</p> <p>7) The use of cardiac CT may be appropriate to establish etiology of chronic secondary MR, including a possible ischemic etiology.</p> <p>8) The use of cardiac CT may be appropriate to evalaute the presence and severity of aortic regurgitation in dilated aortic sinuses or ascending aorta or a bicuspid aortic</p>	<p>The use of cardiac CT is appropriate for the characterization of native cardiac valves and suspected clinically significant valvular dysfunction, and when images from other noninvasive methods are inadequate.</p>

	valve. 9) The use of cardiac CT may be appropriate when there is discordance between clinical assessment and TTE about the severity of aortic regurgitation. 10) The use of cardiac CT may be appropriate for assessment of RV systolic function and systolic and diastolic volumes in case of severe tricuspid regurgitation and suboptimal TTE images. 11) The use of cardiac CT may be appropriate for further evaluation of valvular mass . 12) The use of cardiac CT may be appropriate for re-evaluation of infective endocarditis in a patient with a change in clinical status or cardiac examination.	
권고등급	Appropriate, May Be Appropriate, Rarely Appropriate	A-Appropriate
구분	지침 C	지침 D
권고	Cardiac CT is recommended when valvular disease is suspected and other noninvasive test methods are not appropriate. (Appropriateness Criteria A, Level of Evidence A)	The degree of valve calcification by multi-slice CT is related to aortic stenosis severity and outcome. It has become particularly important for the quantification of valve calcification when assessing aortic stenosis severity in low-gradient aortic stenosis
권고등급	A-Appropriate	없음

지침 A : ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 B : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance

지침 C : Korean guidelines for the appropriate use of cardiac CT

지침 D : 2017 ESC/EACTS Guidelines for the management of valvular heart disease The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) guideline

표 112. 심장 핵심질문 12 권고비교표

핵심질문 12

구분	지침 A		지침 B	
권고	임상적으로 기계 인공 판막 또는 조직 판막의 기능 이상이 의심되며 경흉부초음파 혹은 경식도 초음파 영상의 질이 부적절한 경우 판막의 평가를 위해 심장 CT를 시행하는 것은 적절하다. (Appropriate) 임상적으로 기계 인공 판막 또는 조직 판막의 기능 이상이 의심될 때 판막의 평가를 위해 심장 CT를 시행하는 것은 특수한 경우 적절할 수 있다. (maybe appropriate). 인공 심장 판막 기능 이상으로 진단 받은 환자에서 치료 방침 변경이나 결정을 위한 재평가 목적, 인공 심장 판막의 심내막염 환자에서 내과적 치료를 고려하는 경우 진행이나 합병증의 위험도가 높거나 임상적/심장학적 검사에서 변화가 있는 환자에서 심장 CT를 시행하는 것은 적절할 수 있다. (maybe appropriate)		기계 인공 판막의 혈전이 의심되는 환자에서 판막의 기능 및 움직임, 혈전의 유무 및 범위 평가를 위하여 심장 CT가 유용하다는 근거가 존재하며, CT를 포함한 multimodality imaging이 즉시 시행되어야 한다.(indicated)	
	A or M		1	
구분	지침 C	지침 D	지침 E	
권고	임상적으로 인공 판막의 기능 이상이 의심되는 환자에서 다른 비침습적 영상 검사의 질이 부적절한 경우 인공 판막의 특성 평가 (Characterization)를 위해 심장 CT를 사용하는 것은 적절하다. (appropriate)	경흉부 심초음파에서의 정보가 적절하지 않을 경우 인공 심장 판막의 평가를 위해 심장 CT를 사용하는 것은 적절하다(appropriate). 인공 심장 판막 치환술 후 첫번째 평가를 위해 심장 CT를 사용하는 것은 불확실하다 (uncertain).	인공 판막의 기능 이상이 의심되며 다른 비침습적 영상 검사가 적절하지 않은 경우 심장 CT가 권장된다.	
	A	A	A	
권고 등급				

지침 A : ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions,

Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons

지침 B : 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

지침 C : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance)

지침 D : 2017 Multimodality Appropriate Use Criteria for Noninvasive Cardiac Imaging: Expert Consensus of the Asian Society of Cardiovascular Imaging

지침 E : Korean guidelines for the appropriate use of cardiac CT

표 113. 심장 핵심질문 13 권고비교표

핵심질문 13

구 분	지침 A	지침 B
권 고	Cardiac CT can be considered as a primary method of evaluating the presence of cardiac mass (tumor or emboli) (Appropriateness Criteria U, level of evidence C) Cardiac CT is recommended when evaluating cardiac mass (tumor or emboli) that cannot be assessed with other noninvasive methods (Appropriateness Criteria A, Level of Evidence A)	For initial evaluation of cardia mass, suspected tumor or thrombus, or potential source of emboli, CT is appropriate
권 고 등 급	U (Uncertain), A (Appropriate)	A (appropriate)

지침 A : Korean Guidelines for the Appropriate Use of Cardiac CT

지침 B : ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and the Society of Thoracic Surgeons

표 114. 심장 핵심질문 14 권고비교표

핵심질문 14

구	지침 A	지침 B
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분		
권고	Cardiac CT evaluation of intra- and extracardiac structures prior to radiofrequency ablation for atrial fibrillation is appropriate	Cardiac CT evaluation of intra- and extracardiac structures prior to radiofrequency ablation for atrial fibrillation is appropriate
권고 등급	A (appropriate)	A (appropriate)

지침 A : ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 Appropriate Use Criteria for Cardiac Computed Tomography
Korean Guidelines for the Appropriate Use of Cardiac CT

표 115. 심장 핵심질문 15 권고비교표

핵심질문 15

구분	지침 A	지침 B
권고	부정맥 유발 우심근병증 및 폐색전증이 의심되는 환자에서 우심실의 기능 평가를 위한 심장 CT는 적절하다 (appropriate).	심장 CT는 우심실 기능의 정량적인 분석에 있어서 심장 MRI와 비교 시 정확하고 재현성이 높은 방법으로 권장된다 (appropriate)
권고 등급	A	A

지침 A : ASCI 2010 appropriateness criteria for cardiac computed tomography: a report of the Asian Society of Cardiovascular Imaging cardiac computed tomography and cardiac magnetic resonance imaging guideline Working Group

지침 B : Korean guidelines for the appropriate use of cardiac CT

나) 근거표

표 116. 심장 핵심질문 1 근거표

핵심질문 1

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Usefulness of 64-slice multidetector computed tomography as an initial diagnostic approach in patients with acute chest pain	Obsevational	266	2
Severe coronary spasm occasionally detected by coronary computed tomography	case report	1	5
Severe lasting coronary spasm detected by multidetector row computed tomography	case report	1	5
ST-segment elevation in conditions other than acute myocardial infarction	Review article		2
Clinical Implications of Electrocardiograms for Patients With Type A Acute Aortic Dissection	Review article		2

Risk factors for diagnostic delay in acute aortic dissection	Obsevational	115	4
Frequency and implication of ST-T abnormalities on hospital admission electrocardiograms in patients with type A acute aortic dissection	Obsevational	233	4
Differences in negative T waves among acute coronary syndrome, acute pulmonary embolism, and Takotsubo cardiomyopathy	Obsevational	300	4

표 117. 심장 핵심질문 2-3 근거표

핵심질문 2-3

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Chang SA, Choi SI, Choi EK, Kim HK, Jung JW, Chun EJ, et al. Usefulness of 64-slice multidetector computed tomography as an initial diagnostic approach in patients with acute chest pain. Am Heart J 2008;156:375-383	prospective	713	2
Goldstein JA, Gallagher MJ, O'Neill WW, Ross MA, O'Neil BJ, Raff GL. A randomized controlled trial of multi-slice coronary computed tomography for evaluation of acute chest pain. J Am Coll Cardiol 2007;49:863-871	prospective	197	1
May JM, Shuman WP, Strote JN, Branch KR, Mitsumori LM, Lockhart DW, et al. Low-risk patients with chest pain in the emergency department: negative 64-MDCT coronary angiography may reduce length of stay and hospital charges. AJR Am J Roentgenol 2009;193:150-154	prospective	53	2
Samad Z, Hakeem A, Mahmood SS, Pieper K, Patel MR, Simel DL, et al. A meta-analysis and systematic review of computed tomography angiography as a diagnostic triage tool for patients with chest pain presenting to the emergency department. J Nucl Cardiol 2012;19:364-376	meta-analysis and systematic review	386 studies	1
Hoffmann U, Truong QA, Schoenfeld DA, Chou ET, Woodard PK, Nagurney JT, et al. Coronary CT angiography versus standard evaluation in acute chest pain. N Engl J Med 2012;367:299-308	prospective	1,273	1
Chang HJ, Lin FY, Gebow D, et al. Selective Referral Using CCTA Versus Direct Referral for Individuals Referred to Invasive Coronary Angiography for Suspected CAD: A Randomized, Controlled, Open-Label Trial. JACC Cardiovasc Imaging. 2019;12(7 Pt 2):1303-1312	prospective	1,664	1

표 118. 심장 핵심질문 4 근거표

핵심질문 4

문헌정보	연구유형	대상자 수	문헌 질
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			KCIG
Chang SA, Choi SI, Choi EK, Kim HK, Jung JW, Chun EJ, et al. Usefulness of 64-slice multidetector computed tomography as an initial diagnostic approach in patients with acute chest pain. Am Heart J 2008;156:375-383	prospective	713	2
Goldstein JA, Gallagher MJ, O'Neill WW, Ross MA, O'Neil BJ, Raff GL. A randomized controlled trial of multi-slice coronary computed tomography for evaluation of acute chest pain. J Am Coll Cardiol 2007;49:863-871	prospective	197	1
May JM, Shuman WP, Strote JN, Branch KR, Mitsumori LM, Lockhart DW, et al. Low-risk patients with chest pain in the emergency department: negative 64-MDCT coronary angiography may reduce length of stay and hospital charges. AJR Am J Roentgenol 2009;193:150-154	prospective	53	2
Samad Z, Hakeem A, Mahmood SS, Pieper K, Patel MR, Simel DL, et al. A meta-analysis and systematic review of computed tomography angiography as a diagnostic triage tool for patients with chest pain presenting to the emergency department. J Nucl Cardiol 2012;19:364-376	meta-analysis and systematic review	386 studies	1
Hoffmann U, Truong QA, Schoenfeld DA, Chou ET, Woodard PK, Nagurney JT, et al. Coronary CT angiography versus standard evaluation in acute chest pain. N Engl J Med 2012;367:299-308	prospective	1,273	1

표 119. 심장 핵심질문 5 근거표

핵심질문 5

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Kondos GT, Hoff JA, Sevrakov A, Daviglius ML, Garside DB, Devries SS, et al. Electron-beam tomography coronary artery calcium and cardiac events: a 37-month follow-up of 5635 initially asymptomatic low- to intermediate-risk adults. Circulation 2003;107:2571-2576	Original	8,855	2
Taylor AJ, Bindeman J, Feuerstein I, Cao F, Brazaitis M, O'Malley PG. Coronary calcium independently predicts incident premature coronary heart disease over measured cardiovascular risk factors: mean three-year outcomes in the Prospective Army Coronary Calcium (PACC) project. J Am Coll Cardiol 2005;46:807-814	Original	2,000	2
Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2019;139:e1082-1143.	Guideline		5

Blaha MJ, Cainzos-Achirica M, Greenland P, et al. Role of coronary artery calcium score of zero and other negative risk markers for cardiovascular disease: The Multi-Ethnic Study of Atherosclerosis (MESA). Circulation. 2016;133: 849-58.	Original	6,814	2
Yeboah J, Young R, McClelland RL, et al. Utility of nontraditional risk markers in atherosclerotic cardiovascular disease risk assessment. J Am Coll Cardiol. 2016;67: 139-47.	Original	6,814	2
Loria CM, Liu K, Lewis CE, et al. Early adult risk factor levels and subsequent coronary artery calcification: the CARDIA Study. J Am Coll Cardiol. 2007;49:2013-20.	Original	3,043	2
Carr JJ, Jacobs DR Jr, Terry JG, et al. Association of coronary artery calcium in adults aged 32 to 46 years with incident coronary heart disease and death. JAMA Cardiol. 2017;2:391-9.	Original	3,043	2

표 120. 심장 핵심질문 6 근거표

핵심질문 6

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Evaluation of coronary allograft vasculopathy using multi-detector row computed tomography: a systematic review. Eur J Cardiothorac Surg 2012;41:415-422	Systematic Review	272	2
Detection of coronary artery disease in orthotopic heart transplant recipients with 64-detector row computed tomography angiography. J Heart Lung Transplant 2006; 25: 1363-1366	Observational study (prospective)	20	4
Detection of transplant coronary artery disease using multidetector computed tomography with adaptative multisegment reconstruction. J Am Coll Cardiol 2006;48:772-778	Observational study	54	4
Detection of high-grade stenoses with multislice computed tomography in heart transplant patients. J Heart Lung Transplant 2008;27:310-316	Observational study	66	4
The International Society of Heart and Lung Transplantation Guidelines for the care of heart transplant recipients	Guideline		
Cardiac allograft vasculopathy after heart transplantation: electrocardiographically gated cardiac CT angiography for assessment	Observational study (prospective)	138	4
Coronary computed tomography angiography for the detection of cardiac allograft vasculopathy: a meta-analysis of prospective trials	Systematic Review	615	1
European Association of Cardiovascular Imaging/ Cardiovascular Imaging Department of the Brazilian Society of Cardiology recommendations for the use of cardiac imaging to assess and follow patients after heart transplantation	Recommendation		

Dual-source cardiac computed tomography angiography (CCTA) in the follow-up of cardiac transplant: comparison of image quality and radiation dose using three different imaging protocols	Observational study (prospective)	150	4
Coronary computed tomography in heart transplant patients: detection of significant stenosis and cardiac allograft vasculopathy, image quality, and radiation dose Show all authors Anne Günther, Lars Aaberge, Andreas Abildgaard, ...	Observational study (prospective)	52	4
Image Quality of Prospectively ECG-Triggered Coronary CT Angiography in Heart Transplant Recipients Read More: https://www.ajronline.org/doi/full/10.2214/AJR.17.18546	Observational study (retrospective)	100	4
Quantitative coronary computed tomography angiography for the detection of cardiac allograft vascul	Observational study (retrospective)	50	4
Canadian Cardiovascular Society/Canadian Cardiac Transplant Network Position Statement on Heart Transplantation: Patient Eligibility, Selection, and Post-Transplantation	Position Statement		

표 121. 심장 핵심질문 7 근거표

핵심질문 7

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Diagnostic performance of computed tomography angiography for differentiating ischemic vs nonischemic cardiomyopathy	observational	452	4
CT angiography with cardiac MRI: non-invasive functional and anatomical assessment for the etiology in newly diagnosed heart failure	Prospective study	28	2
Combined coronary and late-enhanced multidetector-computed tomography for delineation of the etiology of left ventricular dysfunction: comparison with coronary angiography and contrast-enhanced cardiac magnetic resonance imaging	observational	24	4
Sixty-four-slice multidetector computed tomography: an accurate imaging modality for the evaluation of coronary arteries in dilated cardiomyopathy of unknown etiology	observational	132	4
Non-invasive diagnosis of ischaemic heart failure using 64-slice computed tomography	observational	93	4
Diagnostic accuracy of multidetector computed tomography coronary angiography in patients with dilated cardiomyopathy	observational	62	4
Accuracy of multi-slice computed tomography for measurement of left ventricular ejection fraction compared with cardiac magnetic resonance imaging and two-dimensional transthoracic echocardiography: a systematic review and	meta-analysis	1,250	2

meta-analysis			
Incremental prognostic significance of left ventricular dysfunction to coronary artery disease detection by 64-detector row coronary computed tomographic angiography for the prediction of all-cause mortality: results from a two-centre study of 5330 patients	observational	5,330	4
Prognostic value of 64-slice cardiac computed tomography severity of coronary artery disease, coronary atherosclerosis, and left ventricular ejection fraction	observational	2,076	4

표 122. 심장 핵심질문 8 근거표

핵심질문 8

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Ahn J-H, Park JR, Min JH, et al. Risk stratification using computed tomography coronary angiography in patients undergoing intermediate-risk noncardiac surgery. J Am Coll Cardiol. 2013;61:661-8.	Observational study (retrospective)	239	4
Catalán P, Leta R, Hidalgo A, Montiel J, Alomar X, Viladés D, et al. Ruling out coronary artery disease with noninvasive coronary multidetector CT angiography before noncoronary cardiovascular surgery. Radiology 2011;258: 426-434	Observational study (prospective)	161	4
Buffa V, De Cecco CN, Cossu L, Fedeli S, Vallone A, Ruopoli R, et al. Preoperative coronary risk assessment with dual-source CT in patients undergoing noncoronary cardiac surgery. Radiol Med 2010;115:1028-1037	Observational study (prospective)	100	4
Stagnaro N, Della Latta D, Chiappino D. Diagnostic accuracy of MDCT coronary angiography in patients referred for heart valve surgery. Radiol Med 2009;114: 728-742	Observational study (prospective)	55	4
Shrivastava V, Vundavalli S, Mitchell L, Dunning J. Is cardiac computed tomography a reliable alternative to percutaneous coronary angiography for patients awaiting valve surgery? Interact Cardiovasc Thorac Surg 2007;6:105-109	Meta analysis	11 studies	3
Shrivastava V, Vundavalli S, Mitchell L, Dunning J. Is cardiac computed tomography a reliable alternative to percutaneous coronary angiography for patients awaiting valve surgery? Interact Cardiovasc Thorac Surg 2007;6:105-109		50	4
Pouleur AC, le Polain de Waroux JB, Kefer J, Pasquet A, Coche E, Vanoverschelde JL, et al. Usefulness of 40-slice multidetector row computed tomography to detect coronary disease in patients prior to cardiac valve surgery. Eur Radiol 2007;17:3199-3207	Observational study (prospective)	82	4

Reant P, Brunot S, Lafitte S, Serri K, Leroux L, Corneloup O, et al. Predictive value of noninvasive coronary angiography with multidetector computed tomography to detect significant coronary stenosis before valve surgery. Am J Cardiol 2006;97:1506-1510	Observational study (prospective)	40	4
Meijboom WB, Mollet NR, Van Mieghem CA, Kluin J, Weustink AC, Pugliese F, et al. Pre-operative computed tomography coronary angiography to detect significant coronary artery disease in patients referred for cardiac valve surgery. J Am Coll Cardiol 2006;48:1658-1665	Observational study (prospective)	145	4
Gilard M, Cornily JC, Pennec PY, Joret C, Le Gal G, Mansourati J, et al. Accuracy of multislice computed tomography in the preoperative assessment of coronary disease in patients scheduled for heart valve surgery		48	4
Bettencourt N, Rocha J, Carvalho M, Leite D, Toschke AM, Melica B, et al. Multislice computed tomography in the exclusion of coronary artery disease in patients with presurgical valve disease. Circ Cardiovasc Imaging 2009;2:306- 313		452	4
Vahanian A, Alfieri O, Andreotti F, Antunes MJ, Baron-Esquivias G, Baumgartner H et al. Guidelines on the management of valvular heart disease (version 2012): The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J 2012;33:2451-2496	Guidelines		
2017 ESC/EACTS Guidelines for the management of valvular heart disease The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)	Guidelines		

Recommendations on imaging stress testing before surgery in asymptomatic patients

Recommendations	Class ^a	Level ^b
Imaging stress testing is recommended before high-risk surgery in patients with more than two clinical risk factors and poor functional capacity (<4 METs). ^c	I	C
Imaging stress testing may be considered before high- or intermediate-risk surgery in patients with one or two clinical risk factors and poor functional capacity (<4 METs). ^c	IIb	C
Imaging stress testing is not recommended before low-risk surgery, regardless of the patient's clinical risk.	III	C

표 123. 심장 핵심질문 9 근거표

핵심질문 9

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Dedic A, Genders TS, Ferket BS, Galema TW, Mollet NR, Moelker A, et al. Stable angina pectoris: head-to-head comparison of prognostic value of cardiac CT and exercise testing. Radiology 2011;261:428-436	Original	471	2
Arbab-Zadeh A, Miller JM, Rochitte CE, Dewey M, Niinuma H, Gottlieb I, et al. Diagnostic accuracy of computed tomography coronary angiography according to pretest probability of coronary artery disease and severity of coronary arterial calcification. The CORE-64 (Coronary Artery Evaluation Using 64-Row Multidetector Computed Tomography Angiography) International Multicenter Study. J Am Coll Cardiol 2012;59:379-387	Original	371	2
Budoff MJ, Shaw LJ, Liu ST, Weinstein SR, Mosler TP, Tseng PH, et al. Long-term prognosis associated with coronary calcification: observations from a registry of 25253 patients. J Am Coll Cardiol 2007;49:1860-1870	Original	25,253	2
Abdulla J, Pedersen KS, Budoff M, Kofoed KF. Influence of coronary calcification on the diagnostic accuracy of 64-slice computed tomography coronary angiography: a systematic review and meta-analysis. Int J Cardiovasc Imaging 2012;28:943-953	Review		5
Budoff MJ, Dowe D, Jollis JG, Gitter M, Sutherland J, Halamert E, et al. Diagnostic performance of 64-multidetector row coronary computed tomographic angiography for evaluation of coronary artery stenosis in individuals without known coronary artery disease: results from the prospective multicenter ACCURACY (Assessment by Coronary	Original	230	1

표 124. 심장 핵심질문 10 근거표

핵심질문 10

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Use of 64-slice CT in symptomatic patients after coronary bypass surgery: evaluation of grafts and coronary arteries. Eur Heart J 2007;28:1879-1885	observational (Retrospective)	52 symptomatic patients (109 grafts, 123 distal coronary run-offs	2

		and 116 non-bypassed coronary branches)	
The benefit of 64-MDCT prior to invasive coronary angiography in symptomatic post-CABG patients. Int J Cardiovasc Imaging 2007;23:369-377	observational (Retrospective)	34 patients (69 bypass grafts)	2
Diagnostic performance of 16- and 64-section spiral CT for coronary artery bypass graft assessment:meta-analysis. Radiology 2008;247:679-686	meta-analysis	723 patients and 2,023 grafts, from 15 studies	2
Improved noninvasive assessment of coronary artery bypass grafts with 64-slice computed tomographic angiography in an unselected patient population. J Am Coll Cardiol 2007;49:946-950	observational (Prospective)	138 consecutive patients with a total of 418 bypass grafts.	1
Diagnostic accuracy of noninvasive coronary angiography in patients after bypass surgery using 64-slice spiral computed tomography with 330-ms gantry rotation. Circulation 2006;114:2334-2341; quiz 2334	observational (Prospective)	50 consecutive patients with a total of 138 grafts	1
Multi-detector computed tomography in coronary artery bypass graft assessment: a meta-analysis. Ann Thorac Surg 2007;83:341-348	meta-analysis		2
ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons	guideline		1
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for	guideline		1

Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance			
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표 125. 심장 핵심질문 11 근거표

핵심질문 11

문헌정보	연구유형	대상자 수	문헌 질 KCIG
ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for Multimodality Imaging in Valvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons	guideline		1
2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: Executive Summary A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines	guideline		1
ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance	guideline		1
Quantification of aortic valve area with ECG-gated multi-detector spiral computed tomography in patients with aortic stenosis and comparison of two image analysis methods. Int J Cardiol 2009;135:266-269	observational (comparative study)	32 patients	3
Aortic valve area: meta-analysis of diagnostic performance of multi-detector computed tomography for aortic valve area measurements as compared to transthoracic echocardiography. Int J Cardiovasc Imaging 2009;25:601-609	meta-analysis		2
Aortic valve area: meta-analysis of diagnostic performance of multi-detector computed tomography for aortic valve area measurements as compared to transthoracic echocardiography. Int J Cardiovasc Imaging 2009;25:601-609	observational (comparative study)	56 patients	3

Bicuspid aortic valve: spectrum of imaging findings at cardiac MDCT and cardiovascular MRI. AJR Am J Roentgenol 2012;198:89-97	Review article		2
CT angiography of the cardiac valves: normal, diseased, and postoperative appearances. Radiographics 2009;29:1393-1412	Review article		2
Cardiac CT angiography for the diagnosis of mitral valve prolapse: comparison with echocardiography. Radiology 2010;254:374-383	observational (comparative study)	112 patients	4
Assessment of mitral valve anatomy and geometry with multislice computed tomography. JACC Cardiovasc Imaging 2009;2:556-565	observational	151 patients	4
Morphological and dynamic features of normal mitral valve evaluated by dual-source computed tomography. Int J Cardiol 2010;145:633-636	observational	62 patients	4
Measurement of aortic valve calcification using multislice computed tomography: correlation with haemodynamic severity of aortic stenosis and clinical implication for patients with low ejection fraction. Heart 2011;97:721-726.	observational	179 patients	2

표 126. 심장 핵심질문 12 근거표

핵심질문 12

문헌정보	연구유형	대상자 수	문헌 질 KCIG
2006 ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR appropriateness criteria for cardiac computed tomography and cardiac magnetic resonance imaging: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria-Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology.	guideline		2
2010 ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR appropriate use criteria for cardiac computed tomography: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the	guideline		1

Society for Cardiovascular Magnetic Resonance.			
Gündüz S, Özkan M, Kalçık M, et al. Sixty-four-section cardiac computed tomography in mechanical prosthetic heart valve dysfunction: thrombus or pannus. <i>Circ Cardiovasc Imaging</i> . 2015;8:e003246.	Study without consistently applied reference standards	62	3
Suh YJ, Lee S, Im DJ, et al. Added value of cardiac computed tomography for evaluation of mechanical aortic valve: emphasis on evaluation of pannus with surgical findings as standard reference. <i>Int J Cardiol</i> . 2016;214:454-60.	cross-sectional	25	1
Symersky P, Budde RPJ, de Mol BAJM, Prokop M. Comparison of multidetector-row computed tomography to echocardiography and fluoroscopy for evaluation of patients with mechanical prosthetic valve obstruction. <i>Am J Cardiol</i> . 2009;104:1128-34.	Study without consistently applied reference standards	13	3
ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 Appropriateness Criteria for Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging*: A Report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology	guideline		2
ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 Appropriateness Criteria for Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging*: A Report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology	guideline		2
ASCI 2010 appropriateness criteria for cardiac computed tomography: a report of the Asian Society of Cardiovascular Imaging cardiac computed tomography and cardiac magnetic resonance imaging guideline Working Group	guideline		1
Symersky P, Budde RPJ, de Mol BAJM, Prokop M. Comparison of multidetector-row computed tomography to echocardiography and fluoroscopy for evaluation of patients with mechanical prosthetic valve obstruction. <i>Am J</i>	Study without consistently applied reference	13	3

Cardiol. 2009;104:1128-34.	standards		
Tsai IC, Lin YK, Chang Y, Fu YC, Wang CC, Hsieh SR, et al. Correctness of multi-detector-row computed tomography for diagnosing mechanical prosthetic heart valve disorders using operative findings as a gold standard. Eur Radiol 2009;19:857-867	Study without consistently applied reference standards	25	3
Habets J, Symersky P, van Herwerden LA, de Mol BA, Spijkerboer AM, Mali WP, et al. Prosthetic heart valve assessment with multidetector-row CT: imaging characteristics of 91 valves in 83 patients. Eur Radiol 2011;21:1390-1396	Study with poor reference standard	84	4
Teshima H, Hayashida N, Fukunaga S, Tayama E, Kawara T, Aoyagi S, et al. Usefulness of a multidetector-row computed tomography scanner for detecting pannus formation. Ann Thorac Surg 2004;77:523-526	Study without consistently applied reference standards	28	4

표 127. 심장 핵심질문 13 근거표

핵심질문 13

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Kim EY, Choe YH, Sung K, Park SW, Kim JH, Ko YH. Multidetector CT and MR imaging of cardiac tumors. Korean J Radiol 2009;10:164-175	review article		
Anavekar NS, Bonnichsen CR, Foley TA, Morris MF, Martinez MW, Williamson EE, et al. Computed tomography of cardiac pseudotumors and neoplasms. Radiol Clin North Am 2010;48:799-816	review article		
Hur J, Kim YJ, Lee HJ, Nam JE, Ha JW, Heo JH, et al. Dual enhanced cardiac CT for detection of left atrial appendage thrombus in patients with stroke: a prospective comparison study with transesophageal echocardiography. Stroke 2011;42:2471-2477	prospective	83	1
Hur J, Kim YJ, Lee HJ, Ha JW, Heo JH, Choi EY, et al. Left atrial appendage thrombi in stroke patients: detection with two-phase cardiac CT angiography versus transesophageal echocardiography. Radiology 2009;251:683-690	prospective	55	1

표 128. 심장 핵심질문 14 근거표

핵심질문 14

문헌정보	연구유형	대상자 수	문헌 질 KCIG
Chyou JY, Biviano A, Magno P, Garan H, Einstein AJ. Applications of computed tomography and magnetic resonance imaging in percutaneous ablation therapy for	review article		

atrial fibrillation. J Interv Card Electrophysiol 2009;26:47-57			
Hemminger EJ, Girskey MJ, Budoff MJ. Applications of computed tomography in clinical cardiac electrophysiology. J Cardiovasc Comput Tomogr 2007;1:131-142	review article		
Saremi F, Tafti M. The role of computed tomography and magnetic resonance imaging in ablation procedures for treatment of atrial fibrillation. Semin Ultrasound CT MR 2009;30:125-156	review article		
Abbara S, Cury RC, Nieman K, Reddy V, Moselewski F, Schmidt S, et al. Noninvasive evaluation of cardiac veins with 16- MDCT angiography. AJR Am J Roentgenol 2005;185:1001-1006	retrospective	54	3
Jongbloed MR, Lamb HJ, Bax JJ, Schuijf JD, de Roos A, van der Wall EE, et al. Noninvasive visualization of the cardiac venous system using multislice computed tomography. J Am Coll Cardiol 2005;45:749-753	retrospective	38	3
Tada H, Kurosaki K, Naito S, Koyama K, Itoi K, Ito S, et al. Three-dimensional visualization of the coronary venous system using multidetector row computed tomography. Circ J 2005;69:165-170	retrospective	70	3

표 129. 심장 핵심질문 15 근거표

핵심질문 15

문헌정보	연구유형	대상자 수	문헌 질 KCIG
International, multidisciplinary update of the 2006 Appropriateness Criteria for cardiac computed tomography	guideline		5
Guo YK, Gao HL, Zhang XC, Wang QL, Yang ZG, Ma ES. Accuracy and reproducibility of assessing right ventricular function with 64-section multi-detector row CT: comparison with magnetic resonance imaging. Int J Cardiol 2010;139:254-262	cross-sectional	47	2
Maffei E, Messalli G, Martini C, Nieman K, Catalano O, Rossi A, et al. Left and right ventricle assessment with Cardiac CT: validation study vs. Cardiac MR. Eur Radiol 2012;22:1041-1049	cross-sectional	79	2
Sugeng L, Mor-Avi V, Weinert L, Niel J, Ebner C, Steringer-Mascherbauer R, et al. Multimodality comparison of quantitative volumetric analysis of the right ventricle. JACC Cardiovasc Imaging 2010;3:10-18	cross-sectional	28	2

다. 치과 분과

1) 핵심질문 선정

가) PICO의 선정

표 130. 치과 PICO 선정

	Population	Intervention	Comparator	Outcome
1	pulp capping 이나 pulpotomy를 시행하고자 하는 환자	치근단 방사선검사	임상검사	임상적 유효성
2	치근단 병소를 치료하기 위해 근관치료를 완료한 성인환자	periapical radiography	panoramic radiography, cone-beam computed tomography	임상적 유효성
3	영구치 맹출장애 환자	파노라마 방사선검사	치근단 방사선검사	진단의 정확성
4	근관치료 중인 환자	periapical view	CBCT, panoramic radiograph	(근관측정)정확성
5	임플란트 환자	Periapical view	임상검사	임상적 유효성, 진단의 정확성

나) 문장형 핵심 질문

표 131. 치과 문장형 핵심질문

핵심질문	
핵심질문 1	치수 생활력을 유지하기 위한 술식인 pulp capping이나 pulpotomy를 시작할 때 적절한 영상검사는 무엇인가?
핵심질문 2	치아의 근관치료 완료 후 추적검사를 위한 적절한 영상 검사는 무엇인가?
핵심질문 3	영구치 맹출장애가 관찰되는 환자에서 적절한 검사는 무엇인가?
핵심질문 4	비수술적 근관치료 중 적절한 영상 검사는 무엇인가?
핵심질문 5	임플란트 수술 중 적절한 영상 검사는 무엇인가?

2) 핵심질문별 진료지침 검색

가) 핵심 질문 1

검색대상 핵심 질문

KQ1. 치수 생활력을 유지하기 위한 술식인 pulp capping이나 pulpotomy를 시작할 때 적절한 영상검사는 무엇인가?

국외DB 검색전략 및 결과

표 132. 치과 핵심질문 1 국외 Ovid-Medline

검색일: 2020. 4. 20			
구분	N	검색어	검색 결과
P	1	exp Dental Caries/ or exp Dental Pulp Capping/ or exp Pulpotomy/ or (dental caries* or dental pulp capping or pulpotomy).mp	51,864
검사	2	exp Radiography, Dental/ OR (periapical radiogra*).tw	22,777
	3	((imaging or radiolog* or radiograp*) and (oral or dental)).tw	28,588
	4	OR/2-3	45,608
P&검사	5	1 AND 4	2,369
지침필터	6	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	111,865
종합	7	5 AND 6	24

표 133. 치과 핵심질문 1 국외 Ovid-Embase

검색일: 2020. 4. 25			
구분	N	검색어	검색 결과
P	1	'dental caries'/exp or 'dental pulp capping'/exp or 'pulpotomy'/exp or ('dental caries*' or 'dental pulp capping' or pulpotomy):ab,ti,kw	59,255
검사	2	'dental radiology'/exp OR ('periapical radiogra*'):ab,ti,kw	20,271
	3	((imaging or radiolog* or radiograp*) and (oral or dental)):ab,ti,kw	50,889
	4	#2 OR #3	65,789
P&검사	5	#1 AND #4	2,921
지침필터	6	guideline*:ti,kw OR recommendation*:ti,kw	164,916
종합	7	#5 AND #6	25

표 134. 치과 핵심질문 1 국외 GIN

검색일: 2020. 4. 26		
N	검색어	검색 결과
1	dental caries*	4
2	pulpotomy	0

국내DB 검색전략 및 결과

표 135. 치과 핵심질문 1 국내 문헌DB

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	dental caries and guideline [ALL]	5	
	2	dental caries and recommendation[ALL]	0	
	3	소계	5	
	4	단순중복 제거 후	5	
2.KMBASE	1	([ALL=치수생활력] AND [ALL=지침])	0	
	2	([ALL=치수생활력] AND [ALL=권고])	0	
	3	([ALL=치수생활력] AND [ALL=가이드라인])	0	

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
	4	소계	0	
	5	단순중복 제거 후	0	

표 136. 치과 핵심질문 1 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

나) 핵심질문 2

검색대상 핵심질문

KQ2. 치아의 근관치료 완료 후 추적검사를 위한 적절한 영상 검사는 무엇인가?

국외DB 검색전략 및 결과

표 137. 치과 핵심질문 2 국외 Ovid-Medline

검색일: 2020. 5. 15			
구분	N	검색어	검색 결과
P	1	(root canal treat* or root canal therap* or periodic recall check).mp.	14,385
검사	2	exp Cone-Beam Computed Tomography/ OR (Cone-Beam Comput* Tomograph* or CBCT).mp	11,475
	3	exp Radiography, Dental/ OR (periapical radiogra* OR panoramic radiogra* OR dental radiogra*).tw	24,013
	4	((imaging or radiolog* or radiograp*) and (oral or dental)).tw	28,647
	5	OR/2-4	55,242
P&검사	6	1 AND 5	1,344
지침필터	7	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	112,249
종합	8	6 AND 7	7

표 138. 치과 핵심질문 2 국외 Ovid-Embase

검색일: 2020. 5. 15			
구분	N	검색어	검색 결과
P	1	('root canal treat*' or 'root canal therap*' or 'periodic recall check'):ab,ti,kw	4,438
검사	2	'cone beam computed tomography'/exp OR ('Cone Beam Comput* Tomograph*' or CBCT):ab,ti,kw	21,809
	3	'dental radiology'/exp OR ('periapical radiogra*' OR 'panoramic radiogra*' OR 'dental radiogra*'):ab,ti,kw	24,548
	4	((imaging or radiolog* or radiograp*) and (oral or dental)):ab,ti,kw	51,110
	5	#2 OR #3 OR #4	86,525
P&검사	6	#1 AND #5	808

검색일: 2020. 5. 15			
구분	N	검색어	검색 결과
지침필터	7	guideline*:ti,kw OR recommendation*:ti,kw	165,704
종합	8	#6 AND#7	4

표 139. 치과 핵심질문 2 국외 GIN

검색일: 2020. 5. 15		
N	검색어	검색 결과
1	root canal treat*	0
2	periodic recall check	0

국내DB 검색전략 및 결과

표 140. 치과 핵심질문 2 국내 문헌DB

검색일: 2020. 5. 15				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	root canal treatment and guideline [ALL]	1	
	2	root canal treatment and recommendation[ALL]	2	
	3	소계	3	
	4	단순중복 제거 후	2	
2.KMBASE	1	([ALL=근관치료] AND [ALL=지침])	1	
	2	([ALL=근관치료] AND [ALL=권고])	1	
	3	([ALL=근관치료] AND [ALL=가이드라인])	0	
	4	소계	2	
	5	단순중복 제거 후	2	

표 141. 치과 핵심질문 2 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

다) 핵심질문 3

검색대상 핵심질문

KQ3. 영구치 맹출장애가 관찰되는 환자에서 적절한 검사는 무엇인가?

국외DB 검색전략 및 결과

표 142. 치과 핵심질문 3 국외 Ovid-Medline

검색일: 2020. 4. 20			
구분	N	검색어	검색 결과
P	1	(exp Tooth, Impacted/ or exp Tooth Eruption, Ectopic/ or exp Tooth, Unerupted/) or (tooth impaction* or ectopic impaction* or unerupted tooth or maleruption*).mp	9,334

검색일: 2020. 4. 20			
구분	N	검색어	검색 결과
검사	2	exp Radiography, Dental/ OR (periapical radiogra* OR panoramic radiogra* OR dental radiogra*).tw	24,000
	3	((imaging or radiolog* or radiograp*) and (oral or dental)).tw	28,565
	4	OR/2-3	46,035
P&검사	5	1 AND 4	374
지침필터	6	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	111,833
종합	7	5 AND 6	8

표 143. 치과 핵심질문 3 국외 Ovid-Embase

검색일: 2020. 4. 25			
구분	N	검색어	검색 결과
P	1	'tooth impaction'/exp or 'tooth eruption'/exp or 'unerupted tooth'/exp or ('tooth impaction*' or 'ectopic impaction*' or 'unerupted tooth' or maleruption*):ab,ti,kw	743
검사	2	'dental radiology'/exp OR ('periapical radiogra*' OR 'panoramic radiogra*' OR 'dental radiogra*'):ab,ti,kw	24,493
	3	((imaging or radiolog* or radiograp*) and (oral or dental)):ab,ti,kw	50,889
	4	#2 OR #3	86,187
P&검사	5	#1 AND #4	863
지침필터	6	guideline*:ti,kw OR recommendation*:ti,kw	164,916
종합	7	#5 AND #6	1

표 144. 치과 핵심질문 3 국외 GIN

검색일: 2020. 4. 26		
N	검색어	검색 결과
1	tooth impaction*	0
2	maleruption*	0

국내DB 검색전략 및 결과

표 145. 치과 핵심질문 3 국내 문헌DB

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	tooth impaction and guideline [ALL]	0	
	2	tooth impaction and recommendation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=맹출장애] AND [ALL=지침])	0	
	2	([ALL=맹출장애] AND [ALL=권고])	0	
	3	([ALL=맹출장애] AND [ALL=가이드라인])	0	
	4	소계	0	
	5	단순중복 제거 후	0	

표 146. 치과 핵심질문 3 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

라) 핵심질문 4

검색대상 핵심질문

KQ4. 비수술적 근관치료 중 적절한 영상 검사는 무엇인가?

국외DB 검색전략 및 결과

표 147. 치과 핵심질문 4 국외 Ovid-Medline

검색일: 2020. 4. 20				
구분	N	검색어	검색 결과	
P	1	exp "Root Canal Therapy"/ or (root canal treat* or root canal therap* or endodontic treat* or endodontic therap* or working length).mp.	23,773	
검사	2	exp Cone-Beam Computed Tomography/ OR (Cone-Beam Comput* Tomograph* or CBCT).mp	11,432	
	3	exp Radiography, Dental/ OR (panoramic radiogra* OR periapical radiogra* OR dental radiogra*).tw	24,005	
	4	((imaging or radiolog* or radiograp*) and (oral or dental)).tw	28,588	
	5	OR/2-4	55,140	
P&검사	6	1 AND 5	2,163	
지침필터	7	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	111,865	
총합	8	6 AND 7	9	

표 148. 치과 핵심질문 4 국외 Ovid-Embase

검색일: 2020. 4. 25				
구분	N	검색어	검색 결과	
P	1	'endodontic procedure'/exp or ('root canal treat*' or 'root canal therap*' or 'endodontic treat*' or 'endodontic therap*' or 'working length'):ab,ti,kw	12,711	
검사	2	'cone beam computed tomography'/exp OR ('Cone Beam Comput* Tomograph*' or CBCT):ab,ti,kw	21,692	
	3	'dental radiology'/exp OR ('panoramic radiogra*' OR 'periapical radiogra*' OR 'dental radiogra*'):ab,ti,kw	24,493	
	4	((imaging or radiolog* or radiograp*) and (oral or dental)):ab,ti,kw	50,889	
	5	#2 OR #3 OR #4	86,187	
P&검사	6	#1 AND #5	2,216	
지침필터	7	guideline*:ti,kw OR recommendation*:ti,kw	164,916	
총합	8	#6 AND #7	10	

표 149. 치과 핵심질문 4 국외 GIN

검색일: 2019. 05. 02		
N	검색어	검색 결과
1	root canal treat*	0
2	endodontic therap*	0

국내DB 검색전략 및 결과

표 150. 치과 핵심질문 4 국내 문헌DB

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	endodontic procedure and guideline [ALL]	0	
	2	endodontic procedure and recommendation[ALL]	0	
	3	소계	0	
	4	단순중복 제거 후	0	
2.KMBASE	1	([ALL=근관치료] AND [ALL=지침])	1	
	2	([ALL=근관치료] AND [ALL=권고])	1	
	3	([ALL=근관치료] AND [ALL=가이드라인])	0	
	4	소계	2	
	5	단순중복 제거 후	2	

표 151. 치과 핵심질문 4 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

마) 핵심질문 5

검색대상 핵심질문

KQ5. 임플란트 수술 중 적절한 영상 검사는 무엇인가?

국외DB 검색전략 및 결과

표 152. 치과 핵심질문 5 국외 Ovid-Medline

검색일: 2020. 4. 20			
구분	N	검색어	검색 결과
P	1	exp Dental Implants/ or exp Maxillary Sinus/ or exp Mental Foramen/ or exp Cortical Bone/ or (dental implant* or tooth implant* or maxillary sinus or mandibular canal or mental foramen or cortical bone).mp.	62,447

검색일: 2020. 4. 20			
구분	N	검색어	검색 결과
검사	2	exp Cone-Beam Computed Tomography/ OR (Cone-Beam Comput* Tomograph* or CBCT).mp	11,430
	3	exp Radiography, Dental/ OR (panoramic radiogra* OR periapical radiogra* OR dental radiogra*).tw	24,000
	4	((imaging or radiolog* or radiograp*) and (oral or dental)).tw	28,582
	5	OR/2-4	55,132
P&검사	6	1 AND 5	5,147
지침필터	7	(guideline* or recommendation*).ti. or (practice guideline or guideline).pt	111,833
총합	8	6 AND 7	18

표 153. 치과 핵심질문 5 국외 Ovid-Embase

검색일: 2020. 4. 25			
구분	N	검색어	검색 결과
P	1	'tooth implant'/exp or 'maxillary sinus'/exp or 'mental foramen'/exp or 'cortical bone'/exp or ('dental implant*' or 'tooth implant*' or 'maxillary sinus' or 'mandibular canal' or 'mental foramen' or 'cortical bone'):ab,ti,kw	64,303
검사	2	'cone beam computed tomography'/exp OR ('Cone Beam Comput* Tomograph* or CBCT):ab,ti,kw	21,692
	3	'dental radiology'/exp OR ('panoramic radiogra*' OR 'periapical radiogra*' OR 'dental radiogra*'):ab,ti,kw	24,493
	4	((imaging or radiolog* or radiograp*) and (oral or dental)):ab,ti,kw	50,889
	5	#2 OR #3 OR #4	86,187
P&검사	6	#1 AND #5	7,147
지침필터	7	guideline*:ti,kw OR recommendation*:ti,kw	164,916
총합	8	#6 AND #7	19

표 154. 치과 핵심질문 5 국외 GIN

검색일: 2020. 4. 26		
N	검색어	검색 결과
1	dental implant*	21
2	tooth implant*	5

국내DB 검색전략 및 결과

표 155. 치과 핵심질문 5 국내 문헌DB

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	dental implant and guideline [ALL]	1	
	2	dental implant and recommendation[ALL]	3	
	3	소계	4	
	4	단순중복 제거 후	4	

검색일: 2020. 4. 26				
검색 사이트	N	검색어	관련 문헌	비고
2.KMBASE	1	([ALL=임플란트] AND [ALL=지침])	5	
	2	([ALL=임플란트] AND [ALL=권고])	5	
	3	([ALL=임플란트] AND [ALL=가이드라인])	3	
	4	소계	13	
	5	단순중복 제거 후	13	

표 156. 치과 핵심질문 5 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

3) 진료지침 선별

가) 핵심질문 흐름도

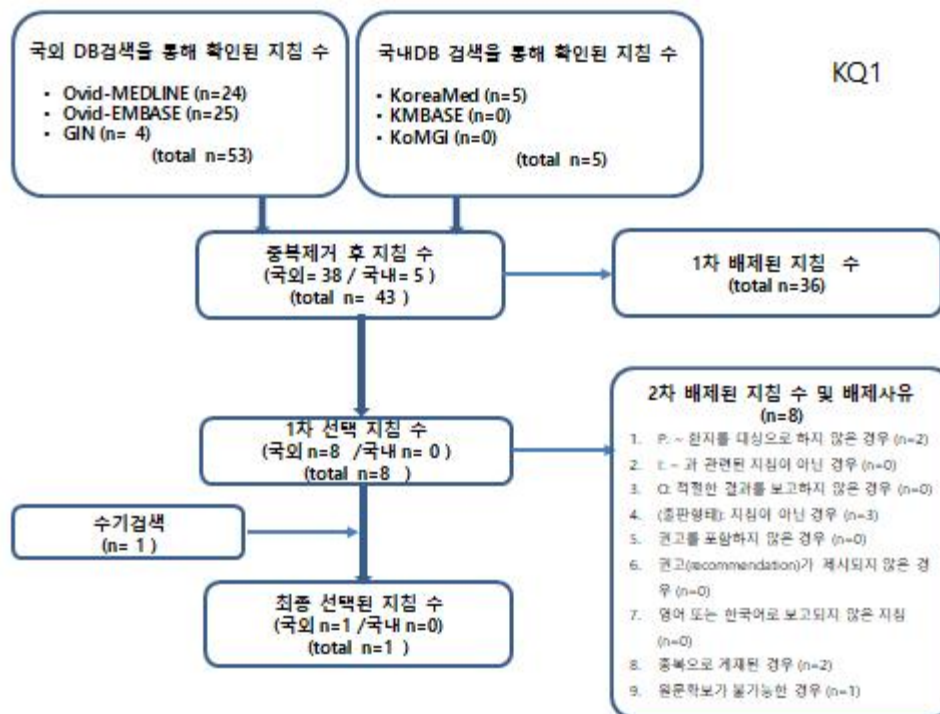


그림 19. 치과 핵심질문 1 흐름도

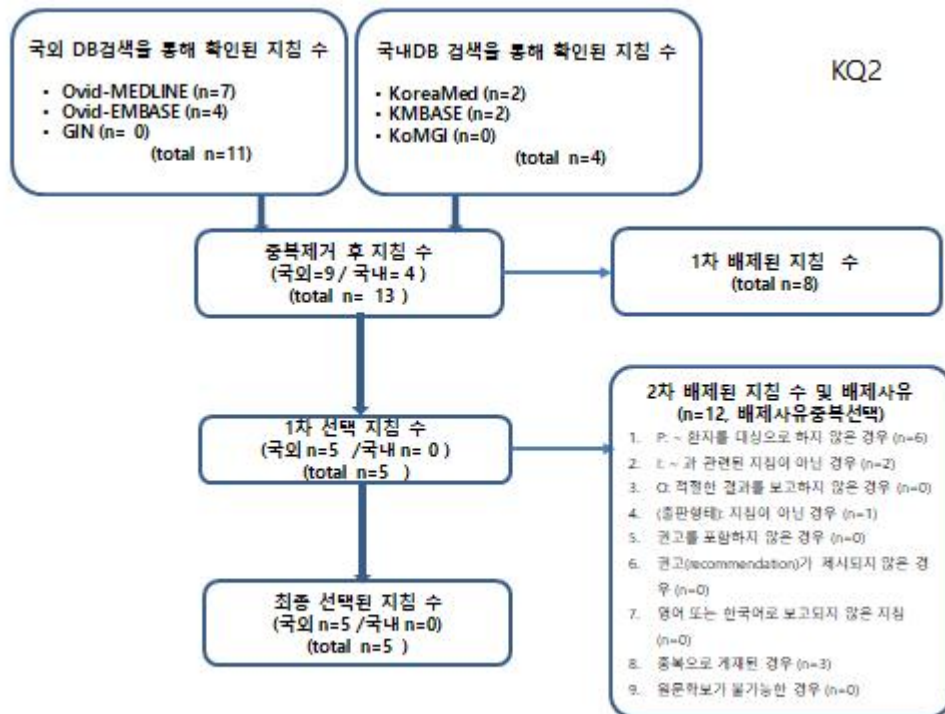


그림 20. 치과 핵심질문 2 흐름도

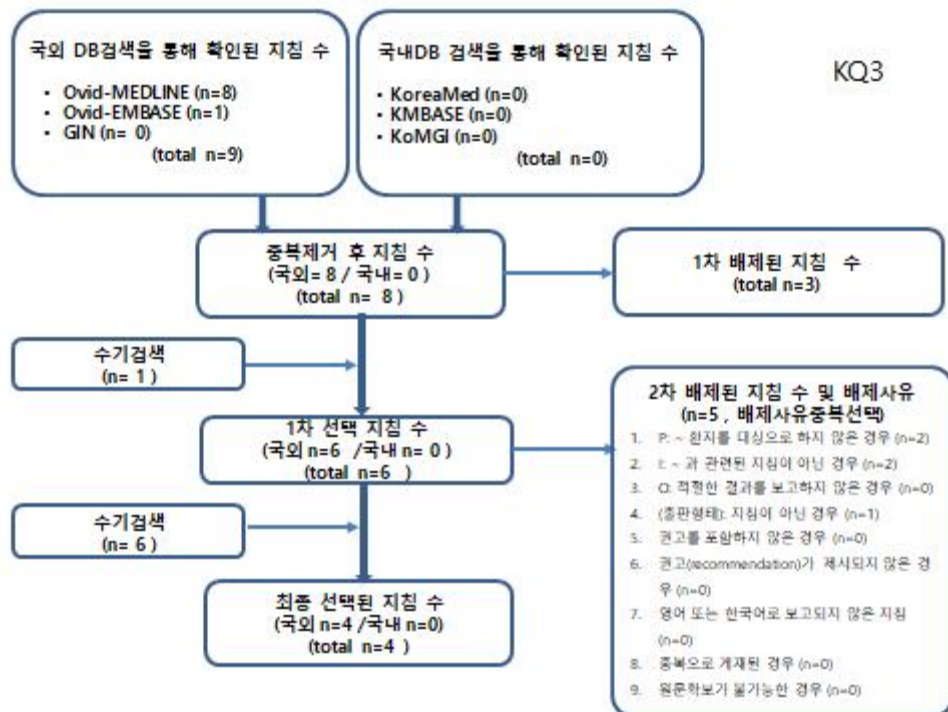


그림 21. 치과 핵심질문 3 흐름도

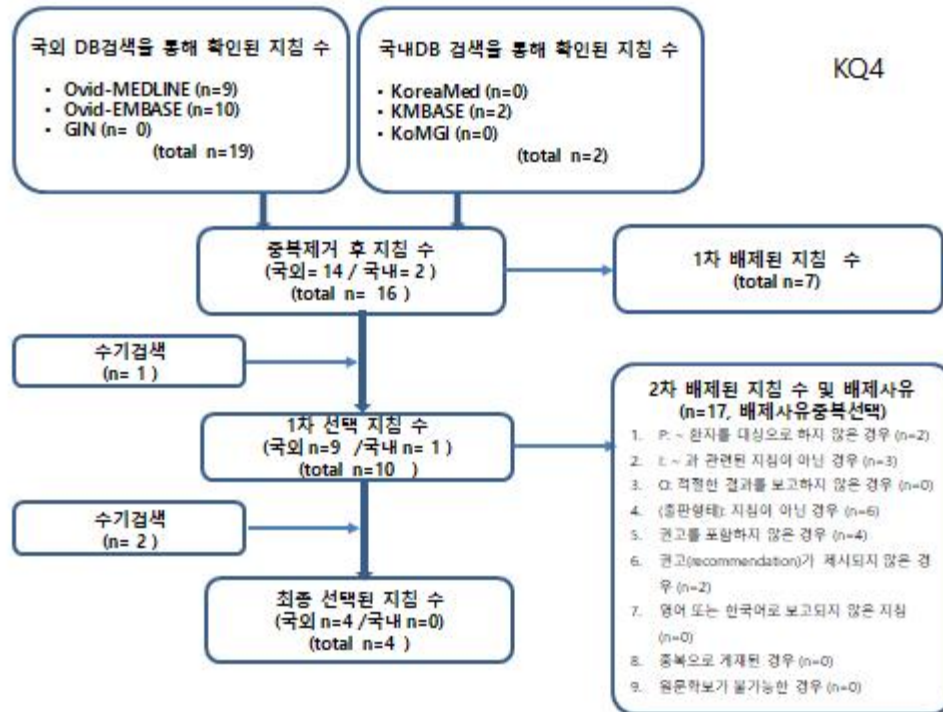


그림 22. 치과 핵심질문 4 흐름도

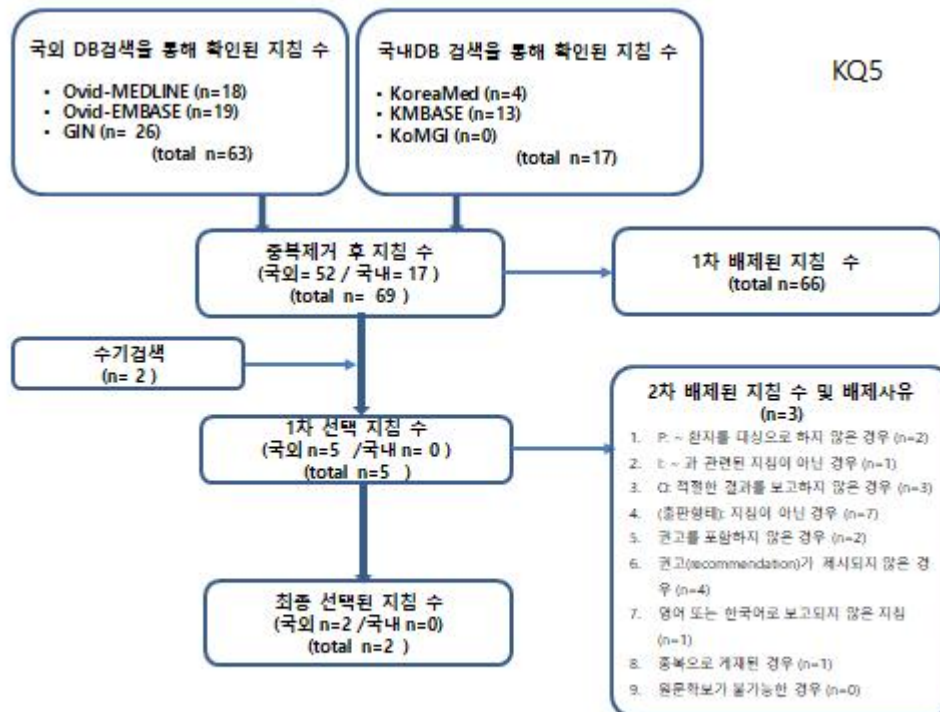


그림 23. 치과 핵심질문 5 흐름도

4) 진료지침 평가

가) 진료지침 질 평가 결과

표 157. 치과 핵심질문 1 질 평가결과

핵심질문 1

지침 제목	AGREE점수	개발위원회 의견
Selection Criteria for Dental Radiography	78	추천함

추천안함: AGREE II < 50

표 158. 치과 핵심질문 2 질 평가결과

핵심질문 2

지침 제목	AGREE점수	개발위원회 의견
AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update	47	추천안함
Guidelines for surgical endodontics	20	추천안함
Selection Criteria for Dental Radiography	89	추천함

추천안함: AGREE II < 50

표 159. 치과 핵심질문 3 질 평가결과

핵심질문 3

지침 제목	AGREE점수	개발위원회 의견
Radiation protection 136 European guidelines on radiation protection in dental radiology	82	추천함
Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)	100	추천함

추천안함: AGREE II < 50

표 160. 치과 핵심질문 4 질 평가결과

핵심질문 4

지침 제목	AGREE점수	개발위원회 의견
AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update	18	추천안함
Evidence and Professional Guidelines for Appropriate Use of Cone Beam Computed Tomography	16	추천안함
Selection Criteria for Dental Radiography	36	추천안함
Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)	48	추천안함

추천안함: AGREE II < 50

표 161. 치과 핵심질문 5 질 평가결과

핵심질문 5

지침 제목	AGREE점수	개발위원회 의견
Selection Criteria for Dental Radiography	76	추천함

추천안함: AGREE II < 50

나) 수용성과 적용성 평가결과

표 162. 치과 핵심질문 1 수용성과 적용성 평가결과

핵심질문 1

구분	평가항목	지침 A
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예
	가치와 선호도가 유사하다.	예
	권고로 인한 이득은 유사하다.	예
	해당권고는 수용할 만하다.	예
적용성	해당 중재 및 장비는 이용가능하다.	예
	필수적인 전문기술이 이용가능하다.	예
	법률적/제도적 장벽이 없다.	예
	해당권고는 적용할 만하다.	예

지침 A : Selection Criteria for Dental Radiography

표 163. 치과 핵심질문 2 수용성과 적용성 평가결과

핵심질문 2

구분	평가항목	지침 A	지침 B	지침 C
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update

지침 B : Guidelines for Surgical Endodontics

지침 C : Selection Criteria for Dental Radiography

표 164. 치과 핵심질문 3 수용성과 적용성 평가결과

핵심질문 3

구분	평가항목	지침 A	지침 B
----	------	------	------

수 용 성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예
	가치와 선호도가 유사하다.	아니오	예
	권고로 인한 이득은 유사하다.	예	예
	해당권고는 수용할 만하다.	예	예
적 용 성	해당 중재 및 장비는 이용가능하다.	불확실	예
	필수적인 전문기술이 이용가능하다.	아니오	예
	법률적/제도적 장벽이 없다.	예	예
	해당권고는 적용할 만하다.	불확실	예

지침 A : Radiation protection 136_European guidelines on radiation protection in dental radiology

지침 B : Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)

표 165. 치과 핵심질문 4 수용성과 적용성 평가결과

핵심질문 4

구 분	평가항목	지침 A	지침 B	지침 C
수 용 성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예
	가치와 선호도가 유사하다.	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예
	해당권고는 수용할 만하다.	예	예	예
적 용 성	해당 중재 및 장비는 이용가능하다.	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예
	해당권고는 적용할 만하다.	예	예	예

지침 A : AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update

지침 B : Selection Criteria for Dental Radiography

지침 C : Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)

표 166. 치과 핵심질문 5 수용성과 적용성 평가결과

핵심질문 5

구 분	평가항목	지침 A
수 용 성	인구 집단(유병률, 발생률 등)이 유사하다.	예
	가치와 선호도가 유사하다.	예
	권고로 인한 이득은 유사하다.	예
	해당권고는 수용할 만하다.	예
적 용 성	해당 중재 및 장비는 이용가능하다.	예
	필수적인 전문기술이 이용가능하다.	예
	법률적/제도적 장벽이 없다.	예
	해당권고는 적용할 만하다.	예

지침 A : Selection Criteria for Dental Radiography

5) 핵심질문별 권고 및 근거정리

가) 권고비교표

표 167. 치과 핵심질문 1 권고비교표

핵심질문 1	
구분	지침 A
권고	A baseline radiograph is essential for treatment planning in vital procedures. (Pulp capping and pulpotomy are performed to retain pulp vitality, especially in teeth with immature apices. A radiograph is necessary at the time of initial treatment to inform treatment planning and provide a baseline for evaluation of the procedure. Radiographic review of teeth treated in this way should be undertaken periodically but only combined with a full clinical examination. Radiological success may manifest in the formation of a hard-tissue bridge at the site of the pulp dressing, continued root development and root-end closure. If a tooth treated in this way becomes symptomatic or clinical signs of failure are apparent, then radiographs will be required for further treatment planning.)
권고 등급	C

지침 A : Selection Criteria for Dental Radiography

표 168. 치과 핵심질문 2 권고비교표

핵심질문2			
구분	지침 A	지침 B	지침 C
권고	<p>Intraoral radiographs should be considered the imaging modality of choice for immediate postoperative imaging. Limited FOV CBCT should be the imaging modality of choice when evaluating the non-healing of previous endodontic treatment to help determine the need for further treatment, such as non-surgical, surgical or extraction.</p> <p>Limited FOV CBCT should be the imaging modality of choice for non-surgical re-treatment to assess endodontic treatment complications, such as over-extended root canal obturation material, separated endodontic instruments, and localization</p>	<p>평행촬영법으로 촬영한 치근단방사선영상은 좋은 진단정보를 줄 수 있으며, 추가로 수평/수직각을 주고 촬영한 치근단방사선영상으로 더 많은 정보를 얻을 수 있다.</p> <p>Cone beam CT는 대구치의 치근단 수술 전 평가를 위해 촬영하며 훌륭한 정보를 제공한다.</p> <p>성공적인 근관치료의 방사선험적 소견은 정상 PDL space의 두 배를 넘지 않아야 하며, 치근단 주위의 방사선 투과상이 관찰되지 않아야 한다. 치조백선과 골소주 패턴도 정상적이어야 하며 치근흡수는 관찰되지 않아야 한다.</p> <p>완전히 회복되지 않은 경우는 방사선영상에서는 치근단 골의 부분적인 회복을 관찰할 수 있다. 이는 섬유성 반흔조직일 가능성도 있으</p>	<p>At least one post-operative radiograph is necessary to assess the success of the obturation, and to act as a baseline for assessment of apical pathology or healing.</p> <p>Limited-volume, high-resolution CBCT may be justifiable for selected cases where endodontic treatment is complicated by concurrent factors, such as resorption lesions, combined periodontal/endodontic lesions, suspected perforations, treatment planning prior to periapical microsurgery and atypical root canal anatomy. In every case being considered for CBCT, careful thought should be given to</p>

	of perforations.	<p>며 피질골이 관통된 경우 관찰될 수 있다.</p> <p>결과가 확실하지 않은 경우 약간의 증상이 임상적으로 나타나며 방사선영상에서는 부분적인 회복이 관찰된다.</p> <p>실패의 경우에는 징후나 증상을 전부/일부만 관찰할 수 있고 방사선영상에서는 회복이 관찰되지 않는다.</p>	<p>whether the CBCT equipment is capable of providing the limited volumes (fields of view), and whether high-resolution images required for endodontic imaging can be obtained without an unacceptable increase in radiation dose.</p> <p>A further follow-up radiograph should be taken at one year after completion of treatment</p>
권고 등급	권고의 등급이 불확실하여 작성하지 않음		<p>C. Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality on expert opinion and conventional literature review.</p> <p>B. Requires availability of well-conducted clinical studies but no randomised clinical trials on the topic of recommendation.</p>

지침 A : AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update

지침 B : Guidelines for Surgical Endodontics

지침 C : Selection Criteria for Dental Radiography

표 169. 치과 핵심질문 3 권고비교표

핵심질문 3

구분	지침 A	지침 A
권고	<p>Panoramic radiograph or lateral oblique views: Identification of the developing dentition. Confirmation of the presence/absence of teeth.</p> <p>Occlusal views: Identification of abnormality/potential pathology and to localise unerupted teeth.</p>	<p>CBCT may be indicated for the localised assessment of an impacted tooth (including consideration of resorption of an adjacent tooth) where the current imaging method of choice is conventional dental radiography and when the information cannot be obtained adequately by lower dose conventional (traditional) radiography.</p> <p>CBCT may be indicated for pre-surgical</p>

		assessment of an unerupted tooth in selected cases where conventional radiographs fail to provide the information required.
권고 등급		C GP

지침 A : Radiation protection 136_European guidelines on radiation protection in dental radiology

지침 B : Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)

표 170. 치과 핵심질문 4 권고비교표

핵심질문 4

구분	지침 A	지침 B	지침 C
권고	Recommendation 4: If a pre-operative CBCT has not been taken, limited FOV CBCT should be considered as the imaging modality of choice for intra-appointment identification and localization of calcified canals.	CBCT is not indicated as a standard method for demonstration of root canal anatomy. Limited volume, high resolution CBCT may be indicated, for selected cases where conventional intraoral radiographs provide information on root canal anatomy which is equivocal or inadequate for planning treatment, most probably in multi-rooted teeth	Unless there is confidence about working length(s) derived from an electronic apex locator, at least one good-quality radiograph is necessary to confirm working length. If there are any doubts about the integrity of the apical constriction or resistance taper of the prepared root canal, a mid-fill radiograph should be taken to confirm the position of the root filling before final compaction is carried out.
권고 등급	없음	GP	C

지침 A : AAE and AAOMR Joint Position Statement Use of Cone Beam Computed Tomography in Endodontics 2015 Update

지침 B : Selection Criteria for Dental Radiography

지침 C : Radiation No 172 Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines)

표 171. 치과 핵심질문 5 권고비교표

핵심질문 5

구분	지침 A
권고	Radiography immediately after implant placement is only recommended where there is doubt about the position of the implant in relation to adjacent anatomical structures, or where there are unexpected complications during surgery which warrant radiographic examination. In the immediate post-surgical period, a radiograph may be justified if there are unexpected signs or symptoms.

권고 등급	권고의 등급이 불확실하여 작성하지 않음
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지침 A : Selection Criteria for Dental Radiography

나) 근거표

표 172. 치과 핵심질문 1 근거표

핵심질문 1

문헌정보	연구유형	대상자수	문헌 질 KCIG
Bjorndal L, Simon S, Tomson PL, Duncan HF Management of deep caries and the exposed pulp. Int Endod J 2019;52:949-973.	systematic review		2
Dammaschke T, Galler K, Krastl G. Current recommendations for vital pulp treatment. Dtsch Zahnärztl Z Int 2019;1:43-52	systematic review		2
Paula-Silva WFG, Wu MK, Leonardo MR, da Silva LAB, Wesselink PR. Accuracy of periapical radiography and cone-beam computed tomography scans in diagnosing apical periodontitis using histopathological findings as a gold standrad. J Endod 2009;35:1009-1012.	RCT	83 roots of dog's teeth	2
Patel S, Dawood A, Whaites E, Ford TP. New dimensions in endodontic imaging: Part 1. Conventional and alternative radiographic systems. Int Endod J 2009;42:447-462.	systematic review		2
Patel S, Horner K. The use of cone beam computed tomography in endodontics. Int Endod J 2009;42:755-756.	editorial		5
American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. The reference manual of pediatric dentistry. Chicago, Ill: American Academy of Pediatric Dentistry; 2020:384-392.	review		2

표 173. 치과 핵심질문 2 근거표

- 권고비교 근거표에서 가이드라인만 참고하고 나머지 문헌은 거의 가이드라인 내용과 대동소이하여 근거표를 작성하지 않았습니다.

표 174. 치과 핵심질문 3 근거표

핵심질문 3

문헌정보	연구유형	대상자수	문헌 질 KCIG
Hintze, H., A. Wenzel, and S. Williams. 1990. Diagnostic value of clinical examination for the identification of children in need of orthodontic treatment compared with clinical examination and screening pantomography. Eur J Orth 12:385-388.	research	90	3
Isaacson, K. G., and A. R. Thom (ed.). 2001. Guidelines	Guideline		1

for the use of radiographs in clinical Orthodontics, 2nd ed. British Orthodontic Society, London.			
Guerrero ME, Shahbazian M, Elsieña Bekkering G, Nackaerts O, Jacobs R, Horner K. The diagnostic efficacy of cone beam CT for impacted teeth and associated features: a systematic review. J Oral Rehabil 2011; 38: 208-216.	Systemic review		1

표 175. 치과 핵심질문 4 근거표

핵심질문 4			
문헌정보	연구유형	대상자수	문헌 질 KCIG
MPJ Gordon, NP Chandler, Electronic apex locators. Int Endod J. 2004	Review		4
Haffner C, Folwaczny M, Galler K, Hickel R. Accuracy of electronic apex locators in comparison to actual length--an in vivo study. J Dent. 2005 Sep;33(8):619-25.	comparative study	40	2
Kang JA, Kim SK. Accuracies of seven different apex locators under various conditions. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008 Oct;106(4):e57-62.	comparative study	40	3
Vizzotto MB, Silveira PF, Arús NA, Montagner F, Gomes BP, Da Silveira HE. CBCT for the assessment of second mesiobuccal (MB2) canals in maxillary molar teeth: effect of voxel size and presence of root filling. Int Endod J. 2013;46(9):870- 876.	comparative study	n=89	2
Michetti J, Maret D, Mallet J-P, Diemer F. Validation of cone beam computed tomography as a tool to explore root canal anatomy. J Endod. 2010;36(7):1187-1190	comparative study	n=9	3
Blattner TC, George N, Lee CC, Kumar V, Yelton CDJ. Efficacy of cone-beam computed tomography as a modality to accurately identify the presence of second mesiobuccal canals in maxillary first and second molars: a pilot study. J Endod 2010; 36: 867-870	comparative study	n=12	3
Cotton TP, Geisler TM, Holden DT, Schwartz SA, Schindler WG. Endodontic applications of cone-beam volumetric tomography. J Endod 2007; 33: 1121-1132.	review		5
Nair MK, Nair UP. Digital and advanced imaging in endodontics: a review. J Endod 2007; 33:1-6.	review		5
Patel S, Dawood A. The use of cone beam computed tomography in the management of external cervical resorption lesions. Int Endod J 2007; 40: 730-737.	case report	1	4
Scarfe WC, Levin MD, Gane D, Farman AG. Use of cone beam computed tomography in endodontics. Int J Dent	review		5

2009; 2009:634567. Epub 2010 Mar 31.			
Soğur E, Baksi BG, Gröndahl H-G. Imaging of root canal fillings: a comparison of subjective image quality between limited cone-beam CT, storage phosphor and film radiography. Int Endod J 2007; 40: 179-185	comparative study	n=17	2

표 176. 치과 핵심질문 5 근거표

핵심질문 5			
문헌정보	연구유형	대상자수	문헌 질 KCIG
Harris D, et al. E.A.O. guidelines for the use of diagnostic imaging in implant dentistry 2011. A consensus workshop organized by the European Association for Osseointegration at the Medical University of Warsaw. Clin Oral Implants Res. 2012 Nov;23(11):1243-53.			5

라. 흉부 분과

1) 핵심질문 선정

가) PICO의 선정

표 177. 흉부 PICO 선정

	Population	Intervention	Comparator	Outcome
1	Asymptomatic contacts of patients with COVID-19	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Diagnostic accuracy (sensitivity, specificity)
2	Symptomatic patients with suspected COVID-19	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Diagnostic accuracy (sensitivity, specificity)
3	Patients with confirmed COVID-19 and mild symptoms not currently hospitalized	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Clinical outcomes of interest: Mortality Need for and length of hospital stay Need for and length of ICU stay Need for and length of respiratory support Complications of imaging
4	Patients with confirmed COVID-19 ,hospitalized	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Clinical outcomes of interest: Mortality Need for and length of hospital stay Need for and length of ICU stay Need for and length of respiratory support Complications of imaging
5	Patients with confirmed COVID-19 ,hospitalized	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Clinical outcomes of interest: Mortality Need for and length of hospital stay Need for and length of ICU stay Need for and length of respiratory support Complications of imaging
6	Patients with confirmed COVID-19	Imaging(including CT pulmonary angiogra-	Alternative imaging or No	Diagnostic accuracy (sensitivity,

	and suspicion of pulmonary embolism	phy, low extremity venous ultrasound)	imaging	specificity)
7	Patients with COVID-19 whose symptoms resolved	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Clinical outcomes of interest: Mortality Need for and length of hospital stay Need for and length of ICU stay Need for and length of respiratory support Complications of imaging
8	Patients with COVID-19 whose symptoms resolved	Chest imaging (including CXR , CT scan)	Alternative chest imaging or No chest imaging	Clinical outcomes of interest: Mortality Need for and length of hospital stay Need for and length of ICU stay Need for and length of respiratory support Complications of imaging

나) 문장형 핵심질문

표 178. 흉부 문장형 핵심질문

핵심질문	
핵심질문 1	무증상 COVID-19 확진자와 접촉한 사람에 대하여 RT-PCR 검사를 이용할 수 없거나 결과가 지연되는 경우 COVID-19의 진단 과정에 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
핵심질문 2	호흡기증상/발열 등 유증상 COVID-19가 의심되는 증상이 있는 환자에 대하여 RT-PCR 검사를 이용할 수 없거나, 결과가 지연되는 경우, 또는 RT-PCR 검사와 함께 COVID-19의 진단 과정에 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
핵심질문 3	생활치료센터 입소자 등 입원하지 않은 확진 환자 COVID-19가 확인된 무증상 또는 경미한 증상이 있는 입원하지 않은 환자에게 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
핵심질문 4	입원한 환자 COVID-19가 확인된 입원 환자의 증상의 경중* 및 위험요인의 유무**에 따라 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
핵심질문 5	입원한 환자 COVID-19가 확인된 입원 환자가 치료 방법을 결정하거나 수정하는데 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?

핵심질문 6	입원한 환자 COVID-19가 확인된 환자에서 임상적으로 객혈 또는 폐색전증이 의심되는 경우 영상검사(CT 폐혈관조영술, CT하지정맥조영술 등)를 사용해야 합니까?
핵심질문 7	회복된 환자 증상이 호전된 COVID-19 환자의 경우, 병원 퇴원에 대한 결정을 하는데 흉부 영상검사(CXR, CT 스캔)를 추가해야 합니까?
핵심질문 8	회복된 환자 COVID-19에서 회복된 환자를 추적 검사할 때 폐 손상 여부를 평가하기 위하여 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?

***증상의 경중**

경증: 폐 기능 장애 또는 손상의 증거가 없음 (예: 저산소 혈증 없음, 경증 호흡 곤란)

중등도: 심각한 폐 기능 장애 또는 손상의 증거 (예: 저산소 혈증, 중등도의 호흡 곤란)

****질병 진행의 위험 요인**

65 세 이상의 연령과 동반 질환의 유무에 따른 임상적 판단 (예 : 심혈관 질환, 당뇨병, 만성 호흡기 질환, 고혈압, 면역 저하)

2) 핵심질문별 진료지침 검색

가) 핵심질문 1-8

검색대상 핵심질문

KQ1. COVID-19 확진자와 접촉한 사람에 대하여 RT-PCR 검사를 이용할 수 없거나 결과가 지연되는 경우 COVID-19의 진단 과정에 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
KQ2. COVID-19가 의심되는 증상이 있는 환자에 대하여 RT-PCR 검사를 이용할 수 없거나, 결과가 지연되는 경우, 또는 RT-PCR 검사와 함께 COVID-19의 진단 과정에 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
KQ3. COVID-19가 확인된 무증상 또는 경미한 증상이 있는 입원하지 않은 환자에게 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
KQ4. COVID-19가 확인된 입원 환자의 증상의 경중* 및 위험요인의 유무**에 따라 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
KQ5. COVID-19가 확인된 입원 환자가 치료 방법을 결정하거나 수정하는데 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?
KQ6. COVID-19가 확인된 환자에서 임상적으로 객혈 또는 폐색전증이 의심되는 경우 영상검사(CT 폐혈관조영술, CT하지정맥조영술 등)를 사용해야 합니까?
KQ7. 증상이 호전된 COVID-19 환자의 경우, 병원 퇴원에 대한 결정을 하는데 흉부 영상검사(CXR, CT 스캔)를 추가해야 합니까?
KQ8. COVID-19에서 회복된 환자를 추적 검사할 때 폐 손상 여부를 평가하기 위하여 흉부 영상검사(CXR, CT 스캔)를 사용해야 합니까?

국외DB 검색전략 및 결과

표 179. 흉부 핵심질문 1-8 국외 Ovid-Medline

검색일: 2020. 06. 24			
구분	N	검색어	검색 결과
COVID-19	1	(2019-nCoV or COVID-19 or SARS-CoV-2 or 2019 novel	7,455

검색일: 2020. 06. 24			
구분	N	검색어	검색 결과
		coronavirus).mp	
	2	(exp coronavirus/ or coronavirus.mp.) and (wuhan or novel or "2019").mp.	4,251
	3	1 or 2	9,054
	4	limit 3 to yr="2019 - current"	7,583
검사	5	exp Tomography, X-Ray Computed/ or (chest imaging or radiograph* or radiolog* or CXR or CT or (Comput* adj2 Tomograph*)).mp.	1,220,084
P&검사	6	4 AND 5	569
지침필터	7	(guideline* or recommendation* or advice or consensus or statement or guide*).ti,ab. or (practice guideline or guideline).pt	884,670
종합	8	6 AND 7	59

표 180. 흥부 핵심질문 1-8 국외 Ovid-Embase

검색일: 2020. 07. 02			
구분	N	검색어	검색 결과
COVID-19	1	'2019-ncov':ab,ti OR 'covid-19':ab,ti OR 'sars-cov-2':ab,ti OR '2019 novel coronavirus':ab,ti	20,445
	2	('coronavirus infection'/exp OR coronavirus:ab,ti) AND (wuhan:ab,ti OR novel:ab,ti OR '2019':ab,ti)	8,651
	3	#1 OR #2	22,978
	4	#3 AND (2019:py OR 2020:py)	21,325
검사	5	'computer assisted tomography'/exp or ('chest imaging' or radiograph* or radiolog* or CXR or CT or 'Comput* NEAR Tomograph*'):ab,ti	1,738,770
P&검사	6	#4 AND #5	1,563
지침필터	7	guideline*:ti OR recommendation*:ti	147,953
종합	8	#6 AND #7	36

표 181. 흥부 핵심질문 1-8 국외 GIN

검색일: 2020. 07. 01		
N	검색어	검색 결과
1	(COVID-19) OR coronavirus	9

국내DB 검색전략 및 결과

표 182. 흥부 국내 문헌DB

검색일: 2020. 07. 01				
검색 사이트	N	검색어	관련 문헌	비고
1.KoreaMed	1	COVID-19 and guideline [ALL]	0	
	2	COVID-19 and recommendation[ALL]	1	

검색일: 2020. 07. 01				
검색 사이트	N	검색어	관련 문헌	비고
2.KMBASE	3	소계	1	
	4	단순중복 제거 후	1	
	1	([ALL=COVID-19] AND [ALL=지침])	4	
	2	([ALL=COVID-19] AND [ALL=권고])	1	
	3	([ALL=COVID-19] AND [ALL=가이드라인])	0	
	4	소계	5	
	5	단순중복 제거 후	5	

표 183. 흥부 핵심질문 1-8 국내 진료지침DB

검색사이트	N	지침 제목	연도	개발학회
KoMGI	1	* 검색결과 없음		
	2	소계 (0건)		

3) 진료지침 선별

가) 핵심질문 흐름도

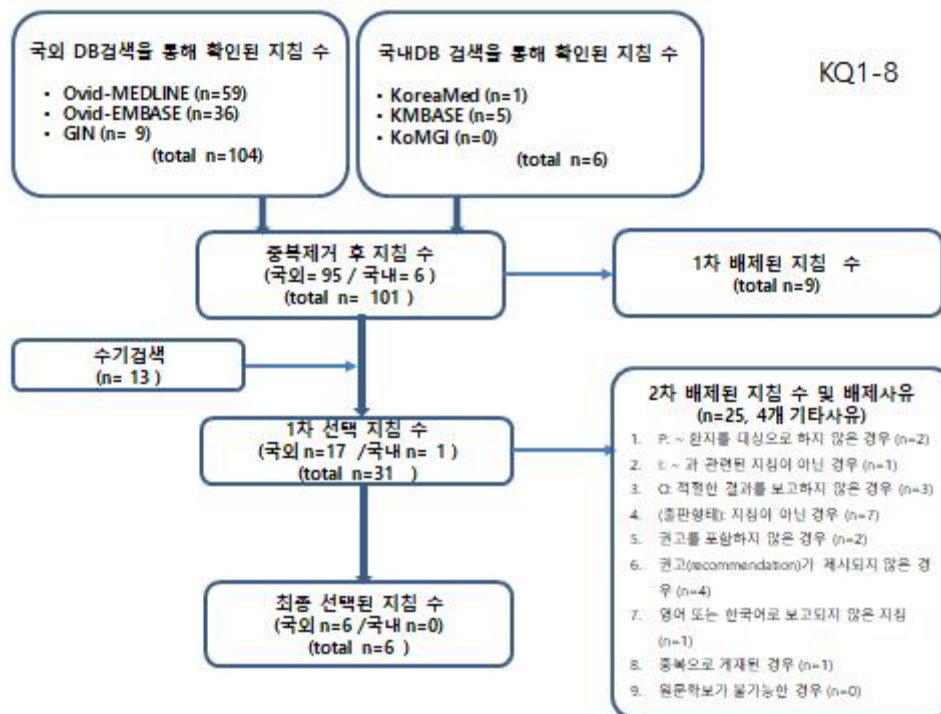


그림 24. 흥부 핵심질문 1-8 흐름도

4) 진료지침 평가

가) 진료지침 질 평가 결과

표 184. 흉부 핵심질문 1-8 질 평가결과

핵심질문 1-8

지침 제목	AGREE점수	개발위원회 의견
CT and COVID-19: Chinese experience and recommendations concerning detection, staging and follow-up	24	추천안함
Emergency Radiology During the COVID-19 Pandemic: The Canadian Association of Radiologists Recommendations for Practice	30	추천안함
World Health Organization. (2020). Use of chest imaging in COVID-19: a rapid advice guide	108	추천함
The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society	70	추천함
Canadian Society of Thoracic Radiology/Canadian Association of Radiologists Consensus Statement Regarding Chest Imaging in Suspected and Confirmed COVID-19	33	추천안함
Recommendations of the Thoracic Imaging Section of the German Radiological Society for clinical application of chest imaging and structured CT reporting in the COVID-19 pandemic	27	추천안함

추천안함: AGREE II < 50

나) 수용성과 적용성 평가결과

표 185. 흉부 핵심질문 1-8 수용성과 적용성 평가결과

핵심질문 1-8

구분	평가항목	지침 A	지침 B	지침 C	지침 D	지침 E	지침 F
수용성	인구 집단(유병률, 발생률 등)이 유사하다.	예	예	예	예	예	예
	가치와 선호도가 유사하다.	예	예	예	예	예	예
	권고로 인한 이득은 유사하다.	예	예	예	예	예	예
	해당권고는 수용할 만하다.	예	예	예	예	예	예
적용성	해당 중재 및 장비는 이용가능하다.	예	예	예	예	예	예
	필수적인 전문기술이 이용가능하다.	예	예	예	예	예	예
	법률적/제도적 장벽이 없다.	예	예	예	예	예	예
	해당권고는 적용할 만하다.	예	예	예	예	예	예

지침 A : CT and COVID-19: Chinese experience and recommendations concerning detection, staging and follow-up

지침 B : Emergency Radiology During the COVID-19 Pandemic: The Canadian Association of Radiologists Recommendations for Practice

지침 C : World Health Organization. (2020). Use of chest imaging in COVID-19: a rapid advice

guide

지침 D : The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society

지침 E : Canadian Society of Thoracic Radiology/Canadian Association of Radiologists Consensus Statement Regarding Chest Imaging in Suspected and Confirmed COVID-19

지침 F : Recommendations of the Thoracic Imaging Section of the German Radiological Society for clinical application of chest imaging and structured CT reporting in the COVID-19 pandemic

5) 핵심질문별 권고 및 근거정리

가) 권고비교표

표 186. 흉부 핵심질문 1-8 권고비교표

핵심질문 1-8		
구분	지침 A	지침 B
권 고	KQ1	
	KQ2	CT was considered a major modality for diagnosis, even before receiving the RT-PCR tests. Those clinically diagnosed case should be isolated and receive medical treatment. This should be considered with much attention by other countries if a huge population is waiting for the RT-PCR test, due to the lack of kits, delay waiting for the results, as well as false negative cases. CT can be considered a useful test for relieving quickly difficult situations.
	KQ3	Chest radiography and chest computed tomography (CT) are the primary imaging modalities for the evaluation patients with known or suspected COVID-19 infection in the ED.
	KQ4	
	KQ5	
	KQ6	
	KQ7	

	KQ8	Due to CT with high sensitivity, follow-up CT is recommended to evaluate the improvement or recurrence on the first week of discharge, timely helping the management.	
권고등급		No recommendation	No recommendation
구분		지침 C	지침 D
권고	KQ1	For asymptomatic contacts of patients with COVID-19, WHO suggests not using chest imaging for the diagnosis of COVID-19.	Imaging is not routinely indicated as a screening test for COVID-19 in asymptomatic individuals
	KQ2	For symptomatic patients with suspected COVID-19, WHO suggests using chest imaging for the diagnostic workup of COVID-19 when: (1) RT-PCR testing is not available; (2) RT-PCR testing is available, but results are delayed; and (3) initial RT-PCR testing is negative, but with high clinical of suspicion of COVID-19.	
	KQ3	For patients with suspected or confirmed COVID-19, not currently hospitalized and with mild symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to decide on hospital admission versus home discharge.	Imaging is not indicated for patients with mild features of COVID-19 unless they are at risk for disease progression
	KQ4	For patients with suspected or confirmed COVID-19, not currently hospitalized and with moderate to severe symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to decide on regular ward admission versus intensive care unit (ICU) admission.	Imaging is indicated for patients with moderate to severe features of COVID-19 regardless of COVID-19 test results In a resource-constrained environment where access to CT is limited, chest radiography may be preferred for patients with COVID-19 unless features of respiratory worsening warrant the use of CT
	KQ5	For patients with suspected or confirmed COVID-19, currently hospitalized and with moderate to severe symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to inform the therapeutic management.	Imaging is indicated for patients with COVID-19 and evidence of worsening respiratory status Daily chest radiographs are NOT indicated in stable intubated patients with COVID-19
	KQ6	For symptomatic patients with suspected COVID-19, WHO suggests using chest imaging for the diagnostic workup of COVID-19 Imaging should be used as one element of the diagnostic workup in those have	CT is more sensitive for early parenchymal lung disease, disease progression, and alternative diagnoses including acute heart failure from COVID-19 myocardial injury (18) and when acquired with intravenous contrast

		presentations that could represent complications of COVID-19 (e.g, pulmonary arterial thrombosis or thromboembolism);	material, pulmonary thromboembolism Leveling these superior capabilities depends upon the availability of CT capacity, particularly considering the potential reduction in CT scanner availability due to the additional time required to clean and disinfect equipment following imaging of patients with suspected COVID-19.
	KQ7	For hospitalized patients with COVID-19 whose symptoms are resolved, WHO suggests not using chest imaging in addition to clinical and/or laboratory assessment to inform the decision regarding discharge.	
	KQ8		CT is indicated in patients with functional impairment and/or hypoxemia after recovery from COVID-19
권고등급		Conditional recommendation, based on very low certainty evidence	No recommendation
구분		지침 E	지침 F
권고	KQ1	When the RT-PCR assay is not yet available, a chest radiograph is useful.	
	KQ2	1) In outpatient clinics, A chest X-ray is not recommended in individuals presenting with mild symptoms because imaging is often normal and this may be falsely reassuring. 2) In the emergency department setting, a chest radiograph is useful in a patient with concerning symptoms, when the RT-PCR assay is not yet available. 3) If a patient with an initial negative RT-PCR result returns to the emergency department with worsening symptoms, a chest X-ray may be useful to detect COVID-19 pneumonia and complications. A negative chest X-ray still does not exclude the possibility of COVID-19 infection, and repeat RT-PCR testing is still required. 4) Due to the higher risk of lung infection in immunosuppressed patients in general, it is reasonable to image patients with suspected respiratory infection and a negative chest radiographs with CT of the chest.	Chest radiography and chest computed tomography (CT) are the primary imaging modalities for the evaluation patients with known or suspected COVID-19 infection in the ED.
	KQ3	Chest X-rays are useful in clinically worsening patients, but daily chest X-rays in stable patients are not necessary and may increase	

		the risk of viral transmission to health care workers.	
KQ4		In patients presenting with moderate to severe symptoms, CXR, if available, may be useful in addition to clinical judgment to determine whether there is a need for additional assessment in a hospital setting. Chest X-rays are useful in clinically worsening patients, but daily chest X-rays in stable patients are not necessary and may increase the risk of viral transmission to health care workers.	CT allows a reliable assessment of the initial extent of the disease. CT and chest radiography allow an assessment of the course of the disease to support clinical evaluation. Imaging can thus contribute to an interdisciplinary analysis to assess the individual prognosis of patients.
KQ5		CT should only be performed if the results are expected to influence patient management. Chest X-rays are useful in clinically worsening patients, but daily chest X-rays in stable patients are not necessary and may increase the risk of viral transmission to health care workers.	CT allows a reliable assessment of the initial extent of the disease. CT and chest radiography allow an assessment of the course of the disease to support clinical evaluation. Imaging can thus contribute to an interdisciplinary analysis to assess the individual prognosis of patients.
KQ6		Computed tomography pulmonary angiography should be performed in the setting of suspected acute pulmonary embolism (PE).	Chest radiography and CT in particular can detect complications. In addition to superinfection, thrombotic and embolic events should be particularly mentioned, since COVID-19 can obviously lead to hypercoagulopathy. Such complications should be treated with intravenous contrast, and a low-dose CT strategy should be abandoned.
KQ7			
KQ8			
권고등급		No recommendation	No recommendation

지침 A : CT and COVID-19: Chinese experience and recommendations

지침 B : Emergency Radiology During the COVID-19 Pandemic: The Canadian Association of Radiologists Recommendations for Practice

지침 C : Use of chest imaging in COVID-19: A Rapid Advice Guide

지침 D :The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society

지침 E : Canadian Society of Thoracic Radiology/Canadian Association of Radiologists Consensus Statement Regarding Chest Imaging in Suspected and Confirmed COVID-19

지침 F : Recommendations of the Thoracic Imaging Section of the German Radiological Society for clinical application of chest imaging and structured CT reporting in the COVID-19 pandemic

나) 근거표

표 187. 흉부 핵심질문 1-8 근거표

핵심질문 1-8

구분		Number and	Risk of	Indirectness	Imprecision
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		type of studies	bias		
KQ 1	CT	1 cohort study (n=1138)	No serious limitations	Direct	Serious imprecision (sensitivity)
KQ 2	CT	21 cohort studies (N=11,258) ^a	Serious limitations	Direct	Precise
	CXR	6 cohort studies (N=1606)	Serious limitations	Direct	Serious imprecision
KQ 3	CT	4 cohort studies (N=852)	Serious limitations	Direct	Precise
	CXR	3 cohort studies (N=858)	Serious limitations	Direct	Precise
KQ 4-5	CT	11 cohort studies (N=2,117)	Serious limitations	Direct	Precise
	CXR	2 cohort studies (N=223)	Serious limitations	Direct	Serious imprecision
KQ 6	CT	Imaging series: 2 (N=206)	Very serious limitations	Serious indirectness	Serious imprecision
KQ 7					
KQ 8					
구분	Inconsistency	Other considerations	Summary findings		Certainty of evidence
KQ 1	Unable to determine	None	Se: 0.18 (0.10–0.30) Sp: 0.98 (0.97–0.99)		Low
KQ 2	Consistent	None	Pooled Se: 0.89 (0.85–0.91) Pooled Sp: 0.81 (0.73–0.88)		Moderate
	Consistent	None	Pooled Se: 0.72 (0.56–0.84) Pooled Sp: 0.71 (0.51–0.86)		Low
KQ 3	Consistent	None	CT findings associated with		Low

			subsequent adverse clinical outcomes	
	Consistent	None	CXR findings associated with subsequent adverse clinical outcomes	Low
KQ 4-5	Consistent	None	CT findings predicted subsequent adverse clinical outcomes, though CT was not always an independent predictor	Low
	Consistent	None	CXR findings predicted subsequent adverse clinical outcomes	Very low
KQ 6	Consistent	None	Prevalence of pulmonary embolus 30% and 23%	Very low
KQ 7				
KQ 8				

CT: Cohort Studies of Diagnostic Accuracy for COVID-19 Diagnosis					
Author, Year Country Clinical Setting Study Dates	Eligibility Criteria	Sample Size SARS-CoV-2 Infection Prevalence	Imaging	Definition of Positive Imaging Test	Imaging Reader
Ai, et al. 202019 China (Wuhan); hospital; 6 January to 6 February 2020	Suspected of COVID-19; underwent both chest CT ima- ging and SARS- CoV-2 RT-PCR; time interval between CT and RT-	n=1014 56% SARS-CoV- 2 infection	Reconstructed slice thickness: 0.625 to 1.25mm Tube voltage: 120 kVP; automatic current tube modulation (30-70 mAs)	Imaging read as positive for COVID-19	2 radiologists who came to consensus

	PCR \leq 7 days.				
Aslan S, 2020 Turkey(Giresun); outpatient clinic; 15 March to 16 April 2020	Suspected COVID-19, with CT and RT-PCR	n=306 82% SARS-CoV-2 infection	Slice thickness: 3mm Low dose scanning protocol Tube voltage: 8 kVP, tube current 35-50 MA Dose length product 20.4 mGy.cm and effective dose 0.29 mSv	CT findings positive (Fleischner society guidelines)	3 radiologists with 7, 8, and 8 years' experience, with consensus
Barbosa P, 2020 Brazil(Sao Paolo); cancer center; February to March 2020	Suspected SARS-CoV-2 infection with CT and SARS CoV-2 RT-PCR on same day	n=91 27% SARS-CoV-2 infection	Slice thickness: Not reported	A: Typical CT findings (Society or Thoracic Radiology, American College of Radiology, and Radiological Society of North America consensus statement) B: Typical or indeterminate CT findings	2 radiologists jointly reviewed CT images
Besutti G, 2020 Italy (Reggio Emilia); ED; 13 to 23 March 2020	Suspected COVID-19 with CT and RT-PCR within 3 days	n=696 79% SARS-CoV-2 infection	Slice thickness: 2.5 mm, interval 1.25mm (reconstructed at 1.0/1.25 mm) Automatic tube current modulation	A: Highly suggestive CT findings, based on structured reporting protocol B: Highly suggestive or suggestive CT findings	Radiologist (number of radiologists unclear)
Borges da Silva Teles G, 2020 Brazil (Sao Paolo); tertiary care medical center; 15 to 24 March 2020	Suspected acute respiratory infection, CT and RT-PCR within 7 days	n=175 50% SARS-CoV-2 infection	Slice thickness: Reconstructed slice thickness 1mm Automatic milliampere setting range	A: Typical CT findings (Radiological Society of North America consensus statement)	2 radiologists (11 and 2 years of experience), with consensus

			10 to 440 mA	B: Typical or indeterminate CT findings	
Brun A, 2020 ²⁷ France (Paris); ED; 20 March to 8 April 2020	Intermediate probability for COVID-19, defined as fever and/or respiratory symptoms, atypical findings at auscultation (no crackles or unilateral crackles or diminished breath sounds), and normal or equivocal chest radiograph (including unilateral opacities)	n=307 57% SARS-CoV- 2 infection	Slice thickness: Reconstructed slice thickness 0.6 mm Unenhanced low-dose volumetric acquisition	Probable or highly probable CT findings (Radiological Society of North America consensus statement)	A: Radiologist 1 B: Radiologist 2
Caruso, et al., 2020 ^{28,67} Italy (Rome); ED; 4 to 19 March 2020	Suspected COVID-19 patients with fever and respiratory symptoms such as cough, and dyspnea; patients with mild respiratory symptoms and close contact with a confirmed COVID-19 patient; or patients with a previously positive test result. Patients	n=158 39% SARS-CoV- 2 infection	Reconstruction slice thickness: 1.25 mm Tube voltage: 120 kV; automatic current tube modulation (100–250 mAs)	CT positive for viral pneumonia using clinically available dedicated application (Thoracic VCAR v13.1, GE)	Two radiologists in consensus evaluated images using a clinically available dedication application for diagnosis of viral

	who underwent chest CT with contrast for vascular indication were excluded.				
Dangis, et al., 2020 ³³ Belgium (Bonheiden); hospital; 14 to 24 March 2020	Possible COVID-19 infection and both SARS-CoV-2 RT PCR and low-dose chest CT at presentation.	n=192 43% SARS-CoV-2 infection	Reconstructed slice thickness: 1 mm and 0.7 mm increment with standard lung-tissue kernel and 3 mm and 3 mm increment with standard soft tissue kernel Low-dose chest CT protocol applied (average patient tube voltage 100 kVp and tube current 20 mAs) Dose-length product (mGy-cm): 41.4 vs. 38.7 Effective dose (mSv): 0.58 vs. 0.54	Imaging classified as positive for COVID-19 (scored based on the presence of findings as presented by Ng et al and Shi et al)	Two radiologists with 8 and 7 years of experience
De Smet K, 2020 ^{a34} and 2020 ^{b35} Belgium (Roeselare); tertiary care medical center; 19 March to 20 April 2020	Symptomatic: Clinical suspicion of COVID-19 pneumonia, CT and RT PCR within 24 hours Asymptomatic: No COVID-19 symptoms but admitted for other conditions or procedures	Symptomatic: n=859 42% SARS-CoV-2 infection Asymptomatic: n=1138 5% SARS-CoV-2 infection	slice thickness: 1 or 1.25 mm	A: Dutch COVID-19 Reporting and Data System classification system(CORADS) score 5 B: CORADS score ≥ 4 C: CORADS score ≥ 3	2 radiologists with 24 and 9 years of experience, with consensus
Debray M, 2020 ³⁶	Suspected COVID-19,	n=241 66%	Reconstruction slice	A: CT classified as	4 senior radiologists

	with CT and RT-PCR	SARS-CoV-2 infection	thickness: 1 mm with 0.8 mm inter-slice gap Tube voltage: 120 kVp; automatic exposure control for tube current	evocative (French society of Radiology) B: CT classified as evocative or compatible	with 4 to 25 years of experience, with consensus
Ducray V, 202038 France (Lyon); ED; 3 March to 4 April 2020	Hospitalized for clinical symptoms, CT for suspected CT and RT-PCR (timing with regard to CT not reported)	n=694 41% SARS-CoV-2 infection	Slice thickness: Mean 2.3mm (range 0.6 to 3 mm) Mean volumetric Computed Tomography Dose Index: 9.71 mGy Mean dose length product: 387.4 mGy.cm	A: Surely COVID-19 CT findings B: Surely or possible COVID-19 CT findings	"Senior" radiologists, number unclear
Falaschi Z, 202039 Italy (Novara); ED; 4 March to 9 April 2020	Suspected SARS-CoV-2 infection, CT and RT-PCR within 7 days	n=773 60% SARS-CoV-2 infection	Slice thickness: Reconstructed slice thickness 1 mm Persons up to 90 kg: Mean CT dose index 8.9 mGy and mean dose length product 334.2 mGy*cm Persons ≥90 kg: Mean CT dose index 15.1 mGy and mean dose length product 557.6 mGy*cm	Typical or indeterminate CT findings (STR/ACR/RSN A)	2 radiologists with >10 years thoracic imaging experience, with consensus
Giannitto C, 202042 Italy (Milan); hospital; 1 to	Moderate or high pretest probability of COVID-19	n=41 44% SARS-CoV-2 infection	Reconstruction slice thickness: 2 mm Tube voltage	Suspected COVID-19 pneumonia (vs. non	2 radiologists with 5 and 15 years of experience in

29 March 2020	based on community or cluster transmission and moderate to severe respiratory symptoms, with CT and negative initial RT PCR within 4 days		12 kV; tube current modulation 127 mAs	COVID-19 pneumonia or negative CT)	chest imaging, with consensus
Gietema H, 2020 ⁴³ The Netherlands (Maastricht); ED; 13 to 24 March 2020	Respiratory symptoms, with CT and RT-PCR	n=193 43% SARS-CoV-2 infection	slice thickness Reconstructed slice thickness 1.25 mm Acquisition parameters 120 kVp, 50-210 mAs	CT suspicious for COVID-19 (based on Ai et al ¹⁹ , Kanne et al ¹⁰³)	Senior resident (initial reading) and experienced radiologist (final reading)
He J, 2020 ⁴⁴	Suspected COVID-19, with CT and RT-PCR	n=82 41% SARS-CoV-2 infection	slice thickness: 1 mm Tube voltage and tube current not reported	CT findings positive (Chung et al ¹⁰⁴ , Pan et al ¹⁰⁰)	2 radiologists with 14 and 17 years of experience, with consensus
Hermans J, 2020 ⁴⁵ The Netherlands (Rotterdam and Schiedam); ED; 27 March to 20 April 2020	Suspected infection with COVID-19 with 1) new respiratory symptoms for ≤2 weeks and present in last 24 hours, 2) saturation ≤94% and/or respiratory rate ≥20/minute and/or abdominal complaints; and/or 3) high clinical suspicion in the absence of symptoms;	n=319 42% SARS-CoV-2 infection	Slice thickness: Not reported Tube voltage and tube current not reported	CO-RADS score 4-5	Board-certified radiologists trained to read and classify using CO-RADS classification (number per image not reported); 2 independent radiologists consulted if needed

	with CT and RT-PCR performed within 24 hours				
Herpe G, 202046 France; 26 hospitals; 2 March to 24 April 2020	Clinical suspicion of COVID-19, with CT and RT-PCR	n=4824 53% SARS-CoV-2 infection	Slice thickness and other parameters not reported (varied)	CT positive ("in accordance with international guidelines," otherwise not described)	1 radiologist with at least 5 years of experience; in cases of doubt or difficulties, 2nd radiologist with at least 5 years of experience and consensus
Korevaar D, 202050 The Netherlands (Amsterdam); ED; 16 March to 16 April 2020	Suspected COVID-19, with CT and RT-PCR on admission	n=239 47% SARS-CoV-2 infection	Slice thickness: Not reported Low-dose CT	A: CO-RADS score 4-5 B: CO-RADS score 3-5	Radiologists with varying experience; "informal" second read performed in some cases by a dedicated acute radiologist, with consensus
Krdzalic J, 202051 The Netherlands (Heerlen/Sittard/Geleen); clinical setting not reported; 12 to 20 March 2020	Clinical suspicion of COVID-19 (fever, cough, and/or dyspnea), with CT and RT PCR	n=56 50% SARS-CoV-2 infection	Slice thickness: Reconstructed slice thickness 1.0 mm and 1.0 mm increment 120 kVp and 667 or 404 max mA	A: Positive or equivocal CT by general radiologist B: CO-RADS score 3-5 by chest radiologist	A: General radiologist report reviewed in consensus by 2 radiologists B: Chest radiologist with 5 years' experience

Kuzan T, 202052 Turkey(Istanbul); ED; 17 to 25 March 2020	Suspected COVID-19 ,with CT and RT-PCR	n=120 58% SARS-CoV- 2 infection	Slice thickness: 1.25 mm without interslice gap Tube voltage 120 kVP, automatic tube current modulation, 100-250 mAs	CT positive or indeterminate (British Society of Thoracic Imaging, version 2)	2 radiologists, with consensus
Luo N, 202057 China (Dalian City); fever clinic; 20 January to 9 February 2020	Suspected COVID-19 due to potential contact, with CT prior to treatment and RT PCR	n=140 56% SARS-CoV- 2 infection	Slice thickness: 1 mm Tube voltage 120 kV, automatic tube current	CT positive, criteria not described	2 senior radiologists, with consensus
Miranda Magalhães Santos J, 202060 Brazil (Sao Paolo); ED; 13 to 23 March 2020	Suspected COVID-19, with CT and RT-PCR within 4 days	n=71 (75 CT) 51% SARS-CoV- 2 infection	Slice thickness: Not reported Tube voltage 120 kV, mA with automatic exposure control scanner	CT typical findings (RSNA criteria)	2 radiologists with 11 and 4 years of experience, with consensus
202016 The Netherlands (Nijmegen); ED; 14 to 25 March 2020	Presenting to the emergency department with suspected COVID-19 based on lower respiratory tract infection symptoms including cough and clinically relevant dyspnea requiring hospital admission with or without fever >38 degrees C; CT	n=105 50% SARS-CoV- 2 infection	Slice thickness: Not reported Tube voltage: 100, 120 or 135 kV; low dose protocol Dose length product (mGy-cm): 39.4	Based on categorization using the COVID-19 Reporting and Data System, threshold not utilized (only AUROC reported)	Average of 8 radiologists (4 had <5 years of experience; the remainder had 5 to 27 years of experience)

	performed and SARS-CoV-2 RT-PCR within 5 days of CT.				
Schulze-Hagen M, 2020 ⁶⁸ Germany (Aachen); hospital; 29 January to 4 February 2020	Clinical symptoms of COVID-19, with CT and RT-PCR within 24 hours	n=191 39% SARS-CoV-2 infection	Reconstruction slice thickness: 3 mm and 1mm Tube voltage 80 kV and tube current 35 mA with automatic dose modulation program	CO-RADS score 3–5	1 radiologist
Song S, 2020 ⁶⁹ China (Wuhan); hospital; 29 January to 4 February 2020	Suspected COVID-19, with CT and RT-PCR within 3 days	n=211 53% SARS-CoV-2 infection	Reconstruction slice thickness: 1 mm Tube voltage 120 kV, tube current regulated by an automatic exposure control system	CT positive (based on main findings described in publications, not further specified)	2 radiologists with 8 and 4 years of experience, with consensus
Wen, et al. 2020 ⁷³ China (Hunan Province); hospital; 21 January to 14 February 2020	Under investigation for COVID-19; excluded persons with fever >14 days but no acute respiratory infection signs or symptoms or exposure history; acute respiratory infection signs or symptoms >14 days but no exposure history; and acute respiratory infection symptoms in	n=103 85% SARS-CoV-2 infection	Slice thickness: 2 to 3 mm without interslice gap Tube voltage: 120 kV, automatic current tube modulation (145–300 mAs) Computed tomography dose index (mGy): 9.34 4.13 Dose-length product (mGy-cm): 314.03	CT read as positive for COVID-19; Fleischner Society lexicon used	3 radiologists with 8 to 15 years of experience; disagreements resolved through discussion and consensus

	the last 14 days but no exposure history, laboratory tests, or other examination sufficient to exclude COVID-19. All patients were hospitalized ≥ 2 weeks.				
Yang, et al., 2020 ⁷⁴ China (Nanchang); hospital; 23 January to 9 February 2020	Evaluated for possible COVID-19 with RT-PCR for SARS-CoV-2 and CT.	n=274 19% SARS-CoV-2 infection	Slice thickness: Not reported	A: Imaging read as positive B: Imaging total score ≥ 2 C: Imaging read as positive and score ≥ 2 D: Imaging read as positive	2 radiologists jointly reviewed CT images
Author, Year Country Clinical Setting Study Dates	Reference Standard	True Positives (n)	False Positives (n)	False Negatives (n)	True Negatives (n)
Ai, et al., 2020 ¹⁹ China (Wuhan); hospital; 6 January to 6 February 2020	SARS-CoV-2 RT PCR	Overall: 580 <60 years:362 ≥ 60 years:218 Female: 308 Male: 272	Overall: 308 <60 years:225 ≥ 60 years:83 Female: 160 Male: 148	Overall:21 <60 ears:15 ≥ 60 years: 6 Female: 9 Male: 12	Overall:105 <60 years:81 ≥ 60 years:24 Female: 70 Male: 35
Aslan S, 2020 ²⁰ Turkey(Giresun);outpatient clinic; 15 March to 16 April 2020	SARS-CoV-2 RT-PCR (repeat for initial negative in some patients)	226	20	24	36
Barbosa P, 2020 ²² Brazil (Sao	SARS-CoV-2 RT-PCR	A:16 B:23	A:10 B:25	A:9 B:2	A:56 B:41

Paolo); cancer center; February to March 2020					
Besutti G, 202023 Italy (Reggio Emilia); ED; 13 to 23 March 2020	1. SARS-CoV-2 RT PCR 2. SARS-CoV-2 RT PCR (repeat for initial negative in some patients)	A1:423 A2:428 B1:520 B2:526	A1:31 A2:26 B1:61 B2:55	A1:128 A2:135 B1:31 B2:37	A1:114 A2:107 B1:84 B2:78
Borges da Silva Teles G, 202024 Brazil (Sao Paulo); tertiary care medical center; 15 to 24 March 2020	SARS-CoV-2 RT-PCR	A:64 B:72	A:1 B:11	A:23 B:15	A:86 B:77
Brun A, 202027 France (Paris); ED; 20 March to 8 April 2020	1:SARS-CoV-2 RT PCR 2:SARS-CoV-2 RT PCR or negative PCR, CT classified as highly probable or probable, and clinical diagnosis based on blinded review of clinical data and outcomes	A1:153 B1:143 1(average): 148 A2:167 B2:158 2(average): 162	A1:21 B1:24 1(average): 22 A2:7 B2:10 2(average): 8	A1:21 B1:31 1(average): 26 A2:21 B2:30 2(average): 26	A1:112 B1:109 1(average): 110 A2:112 B2:109 2(average): 110
Caruso, et al., 202028,67 Italy (Rome); ED; 4 to 19 March 2020	SARS-CoV-2 RT PCR (repeat for initial negative test)	60	42	2	54
Dangis, et al., 202033 Belgium	SARS-CoV-2 RT PCR (repeat for	1 (all patients): 72 2 (clinical	1:7 2:6	1:11 2:3	1:102 2:82

(Bonheiden); hospital; 14 to 24 March 2020	initial negative De Smet K, 2020a34 and 2020b35 Belgium (Roeselare); tertiary care medical center; 19 March to 20 April 2020 test)	symptoms >48 hours): 65			
De Smet K, 2020a34 and 2020b35 Belgium (Roeselare); tertiary care medical center; 19 March to 20 April 2020	SARS-CoV-2 RT-PCR	Symptomatic A:279 B:304 C:319 Asymptomatic A:11 B:19 C:27	Symptomatic A:33 B:76 C:138 Asymptomatic A:23 B:60 C:121	Symptomatic A:79 B:54 C:39 Asymptomatic A:49 B:41 C:33	Symptomatic A:468 B:425 C:363 Asymptomatic A:1055 B:1018 C:957
Debray M, 202036	SARS-CoV-2 RT-PCR	A:119 B:134	A:4 B:19	A:39 B:24	A:79 B:62
Ducray V, 202038 France (Lyon); ED; 3 March to 4 April 2020	SARS-CoV-2 RT-PCR	A:259 B:268	A:49 B:74	A:28 B:19	A:358 B:333
Falaschi Z, 202039 Italy (Novara); ED; 4 March to 9 April 2020	SARS-CoV-2 RT-PCR	Overall: 419 Male: 261 Female: 158 Age <50: 81 ≥50: 338 <60: 166 ≥60: 253	Overall: 66 Male: 33 Female: 33 Age <50: 16 ≥50: 50 <60: 29 ≥60: 37	Overall: 43 Male: 21 Female: 22 Age <50: 15 ≥50: 28 <60: 19 ≥60: 24	Overall: 245 Male: 108 Female: 137 Age <50: 94 ≥50: 151 <60: 126 ≥60: 119
Giannitto C, 202042 Italy (Milan); hospital; 1 to 29 March 2020	Repeat nasopharyngeal SARS-CoV-2 RT-PCR or bronchoalveolar lavage RT-PCR	14	10	6	38
Gietema H, 202043 The Netherlands	SARS-CoV-2 RT-PCR (including repeat	Overall:74	Overall:35	Overall:9	Overall:75

(Maastricht); ED; 13 to 24 March 2020	within 48 hours for initial negative)				
He J, 2020 ⁴⁴	SARS-CoV-2 RT-PCR (serial)	26	8	2	46
Hermans J, 2020 ⁴⁵ The Netherlands (Rotterdam and Schiedam); ED; 27 March to 20 April 2020	SARS-CoV-2 RT-PCR	120	22	13	163
Herpe G, 2020 ⁴⁶ France; 26 hospitals; 2 March to 24 April 2020	1. Final diagnosis 2. SARS-CoV- 2 RT PCR	A:2319 B:1999 B1(female): 749 B2(male): 1249 B3(≤ 60 years):769 B4(>60 years):1230 B5 (Prevalence <20%):743 B6 (Prevalence 20-30%):522 B7 (Prevalence 30-40%):734	A:204 B:525 B1:201 B2:324 B3:203 B4:322 B5:264 B6:90 B7:171	A:245 B:250 B1:133 B2:117 B3:105 B4:145 B5:77 B6:83 B7:90	A:2056 B:2050 B1:1072 B2:977 B3:849 B4:1201 B5:1164 B6:494 B7:392
Korevaar D, 2020 ⁵⁰ (Amsterdam); ED; 16 March to 16 April 2020	SARS-CoV-2 RT-PCR	A:104 B:119	A:38 B:62	A:8 B:3	A:89 B:65
Krdzalic J, 2020 ⁵¹ The Netherlands (Heerlen/ Sittard/Geleen);	SARS-CoV-2 RT-PCR (repeat for initial negative)	A:25 B:25	A:19 B:7	A:3 B:3	A:9 B:21

clinical setting not reported; 12 to 20 March 2020					
Kuzan T, 202052 Turkey(Istanbul) ; ED; 17 to 25 March 2020	SARS-CoV-2 RT-PCR (repeat for initial negative)	65	40	4	11
Luo N, 202057 China (Dalian City); fever clinic; 20 January to 9 February 2020	SARS-CoV-2 RT-PCR	70	7	8	55
Miranda Magalhães Santos J, 202060 Brazil (Sao Paolo); ED; 13 to 23 March 2020	SARS-CoV-2 RT-PCR	30	1	6	38
202016 The Netherlands (Nijmegen); ED; 14 to 25 March 2020	1.SARS-CoV-2 RT PCR 2.SARS-CoV-2 RT PCR or clinical diagnosis with negative RT-PCR	NR	NR	NR	NR
Schulze-Hagen M, 202068 Germany (Aachen); hospital; 29 January to 4 February 2020	SARS-CoV-2 RT-PCR (repeat and clinical course for initial negative)	71	10	4	106
Song S, 202069 China (Wuhan); hospital; 29 January to 4	SARS-CoV-2 RT-PCR (repeat for initial negative if	108	55	3	45

February 2020	clinical suspicion)					
Wen, et al., 2020 ⁷³ China (Hunan Province); hospital; 21 January to 14 February 2020	SARS-CoV-2 RT-PCR (repeat if negative) First RT-PCR positive: 42% Second RT-PCR:33% Third RT-PCR:16% Fourth RT-PCR:9%	82	7	6	8	
Yang, et al., 2020 ⁷⁴ China (Nanchang); hospital; 23 January to 9 February 2020	SARS-CoV-2 RT-PCR	A:48 B:47 C:42 D:53	A:70 B:151 C:52 D:169	A:5 B:6 C:11 D:0	A:151 B:70 C:52 D:52	
Author, Year Country Clinical Setting Study Dates	Sensitivity	Specificity	PPV	NPV	AUROC	Risk of Bias and Other Limitations
Ai, et al. 2020 ¹⁹ China (Wuhan); hospital; 6 January to 6 February 2020	Overall:0.96 (0.95–0.98) <60years: 0.96(0.94–0.98) ≥60:0.97 (0.94–0.99) Female:0.97 (0.95–0.99) Male:0.96 (0.93–0.98)	Overall:0.25 (0.22–0.30) <60years: 0.26(0.22–0.32) ≥60:0.22 (0.16–0.31) Female:0.30 (0.25–0.37) Male:0.19 (0.14–0.25)	Overall:0.65 (0.62–0.68) <60years: 0.62(0.58–0.66) ≥60years: 0.72(0.67–0.77) Female:0.66 (0.60–0.69) Male:0.65 (0.60–0.69)	Overall:0.83 (0.76–0.89) <60years: 0.84(0.76–0.90) ≥60years: 0.80(0.63–0.91) Female:0.89 (0.80–0.94) Male:0.74 (0.61–0.85)	NR	Moderate
Aslan S, 2020 ²⁰ Turkey (Giresun); outpatient clinic;	0.90 (0.86–0.949)	0.64 (0.50–0.77)	0.92 (0.89–0.94)	0.60 (0.49–0.70)	NR	Moderate

15 March to 16 April 2020						
Barbosa P, 202022 Brazil (Sao Paolo); cancer center; February to March 2020	A:0.64 (0.42–0.82) B:0.92 (0.74–0.99)	A:0.85 (0.74–0.92) B:0.62 (0.49–0.74)	A:0.62(0.46–0.75) B:0.48 (0.40–0.56)	A:0.86 (0.78–0.91) B:0.95 (0.84–0.99)	NR	Moderate
Besutti G, 202023 Italy (Reggio Emilia); ED; 13 to 23 March 2020	A1:0.77 (0.73–0.80) A2:0.76 (0.72–0.80) B1:0.94 (0.92–0.96) B2:0.93 (0.91–0.95)	A1:0.79 (0.71–0.85) A2:0.80 (0.73–0.87) B1:0.58 (0.50–0.66) B2:0.59 (0.50–0.67)	A1:0.93 (0.90–0.95) A2:0.94 (0.92–0.96) B1:0.90 (0.87–0.92) B2:0.91 (0.88–0.93)	A1:0.47 (0.41–0.54) A2:0.44 (0.38–0.51) B1:0.73 (0.64–0.81) B2:0.68 (0.58–0.76)	NR	Moderate
Borges da Silva Teles G, 202024 Brazil (Sao Paolo); tertiary care medical center;15 to 24 March 2020	A:0.74 (0.63–0.82) B:0.83 (0.73–0.90)	A:0.98 (0.92–0.997) B:0.88 (0.79–0.94)	A:0.97 (0.90–0.997) B:0.87 (0.78–0.93)	A:0.79 (0.70–0.86) B:0.84 (0.74–0.91)	NR	Moderate
Brun A, 202027 France(Paris); ED; 20 March to 8 April 2020	1(average): 0.85 (0.79–0.90) 2(average): 0.86 (0.80–0.91)	1(average): 0.83 (0.76–0.89) 2(average): 0.93 (0.87–0.979)	1(average): 0.87 (0.82–0.91) 2(average): 0.95 (0.91–0.98)	1(average): 0.81(0.75–0.86) 2(average): 0.81 (0.75–0.86)	A1:0.89 (0.86–0.93) B1:0.87 (0.83–0.91) A2:0.94 (0.91–0.97) B2:0.92 (0.89–0.95)	Moderate
Caruso, et al., 202028,67 Italy(Rome); ED; 4 to 19 March 2020	0.97 (0.88–0.99)	0.56 (0.45–0.66)	0.59 (0.53–0.64)	0.96 (0.87–0.99)	NR	Moderate
Dangis, et al., 202033	1:0.87 (0.80–0.98) 2:0.96	1:0.94 (0.89–0.982) 2:0.93	1:0.91 (0.85–0.97) 2:0.92	1:0.90 (0.85–0.96) 2:0.96	NR	Moderate

Belgium (Bonheiden); hospital; 14 to 24 March 2020	(0.91–0.999)	(0.88–0.98)	(0.85–0.98)	(0.92–0.999)		
De Smet K, 2020a34 and 2020b35 Belgium (Roeselare); tertiary care medical center; 19 March to 20 April 2020	Symptomatic A:0.78 (0.73–0.82) B:0.85 (0.81–0.89) C:0.89 (0.85–0.92) Asymptomatic A:0.18 (0.10–0.30) B:0.32 (0.20–0.45) C:0.45 (0.32–0.58)	Symptomatic A:0.93 (0.91–0.95) B:0.85 (0.81–0.88) C:0.73 (0.68–0.76) Asymptomatic A:0.98 (0.97–0.99) B:0.94 (0.93–0.96) C:0.89 (0.87–0.91)	Symptomatic A:0.89 (0.86–0.92) B:0.80 (0.76–0.83) C:0.70 (0.67–0.73) Asymptomatic A:0.32 (0.20–0.48) B:0.24 (0.20–0.28) C:0.18 (0.14–0.24)	Symptomatic A:0.86 (0.83–0.88) B:0.89 (0.86–0.91) C:0.90 (0.87–0.93) Asymptomatic A:0.96 (0.95–0.96) B:0.96 (0.95–0.97) C:0.97 (0.96–0.97)	Symptomatic :0.89 (0.87–0.91) Asymptomatic :0.70 (0.67–0.73)	Low
Debray M, 202036	A:0.75 (0.68–0.82) B:0.85 (0.78–0.90)	A:0.95 (0.88–0.99) B:0.77 (0.66–0.85)	A:0.97 (0.92–0.99) B:0.88 (0.83–0.91)	A:0.67 (0.61–0.73) B:0.72 (0.64–0.79)	NR	Moderate
Ducray V, 202038 France(Lyon); ED; 3 March to 4 April 2020	A:0.90 (0.87–0.93) B:0.93 (0.90–0.96)	A:0.88 (0.84–0.91) B:0.82 (0.78–0.85)	A:0.84 (0.80–0.88) B:0.78 (0.74–0.82)	A:0.93 (0.90–0.95) B:0.95 (0.92–0.96)	NR	Moderate
Falaschi Z, 202039 Italy(Novara); ED; 4 March to 9 April 2020	Overall:0.91 (0.88–0.93) Male:0.92 (0.89–0.95) Female:0.88 (0.82–0.92) Age<50: 0.84(0.76– 0.91) ≥50:0.91 (0.90–0.95) <60:0.90 (0.84–0.94) ≥60:0.91 (0.87–0.94)	Overall:0.79 (0.74–0.83) Male:0.77 (0.69–0.83) Female:0.81 (0.73–0.86) Age<50: 0.85(0.76– 0.91) ≥50:0.75 (0.68–0.81) <60:0.81 (0.74–0.87) ≥60:0.76 (0.69–0.83)	Overall:0.86 (0.84–0.89) Male:0.89 (0.85–0.91) Female:0.83 (0.78–0.87) Age<50: 0.84(0.76– 0.89) ≥50:0.87 (0.84–0.90) <60:0.85 (0.80–0.89) ≥60:0.87 (0.84–0.90)	Overall:0.85 (0.81–0.88) Male:0.84 (0.77–0.89) Female:0.86 (0.81–0.90) Age<50: 0.86(0.80– 0.91) ≥50:0.84 (0.79–0.89) <60:0.87 (0.81–0.91) ≥60:0.83 (0.77–0.88)	NR	Moderate
Giannitto C, 202042	0.70 (0.46–0.88)	0.79 (0.65–0.90)	0.58 (0.43–0.72)	0.86 (0.76(0.93)	0.75 (CI not	Moderate

Italy(Milan); hospital; 1 to 29 March 2020					reported)	
Gietema H, 202043 The Netherlands (Maastricht) ; ED; 13 to 24 March 2020	Overall:0.89 (0.80–0.95) 1(CURB–65 0–2):0.88 (0.79–0.94) 2(CURB–65 ≥3):1.0 (0.54–1.0) 3(SOFA score0–1): 0.62 (0.35–0.85) 4(SOFA score≥2): 0.96 (0.87–0.99)	Overall:0.68 (0.59–0.77) 1:0.70 (0.60–0.78) 2:0.54 (0.23–0.83) 3:0.70 (0.54–0.83) 4:0.67 (0.55–0.78)	Overall:0.68 (0.61–0.74) 1:0.69 (0.62–0.76) 2:0.54 (0.39–0.70) 3:0.46 (0.31–0.60) 4:0.74 (0.66–0.80)	Overall:0.89 (0.82–0.94) 1:0.88 (0.80–0.94) 2:1.00(CI notreported) 3:0.82 (0.71–0.90) 4:0.94 (0.84–0.98)	NR	Moderate
He J, 202044	0.93 (0.76–0.99)	0.85 (0.73–0.93)	0.76 (0.63–0.86)	0.96 (0.86–0.99)	NR	Moderate
Hermans J, 202045 The Netherlands (Rotterdam and Schiedam); ED; 27 March to 20 April 2020	0.90 (0.84–0.95)	0.88 (0.83–0.92)	0.84 (0.79–0.89)	0.93 (0.88–0.96)	0.91 (0.88–0.95)	Moderate
Herpe G, 202046 France; 26 hospitals; 2 March to 24 April 2020	A:0.90 (0.89–0.91) B:0.88 (0.86–0.90) B1:0.85 (0.84–0.87) B2:0.91 (0.89–0.91) B3:0.88 (0.87–0.90) B4:0.89 (0.88–0.91) B5:0.91 (0.90–0.92)	A:0.91 (0.91–0.92) B:0.80 (0.79–0.81) B1:0.84 (0.82–0.86) B2:0.75 (0.72–0.77) B3:0.81 (0.80–0.83) B4:0.79 (0.78–0.80) B5:0.82 (0.81–0.83)	A:0.92 (0.91–0.93) B:0.79 (0.78–0.81) B1:0.79 (0.77–0.81) B2:0.79 (0.77–0.80) B3:0.79 (0.78–0.81) B4:0.74 (0.72–0.76) B5:0.85 (0.84–0.86)	A:0.89 (0.87–0.90) B:0.89 (0.87–0.90) B1:0.88 (0.87–0.90) B2:0.89 (0.88–0.90) B3:0.89 (0.86–0.90) B4:0.90 (0.89–0.91) B5:0.94 (0.93–0.95)	NR	Moderate

	B6:0.86 (0.83–0.88) B7:0.89 (0.88–0.91)	B6:0.85 (0.83–0.86) B7:0.70 (0.68–0.71)	B6:0.81 (0.80–0.82)	B6:0.85 (0.84–0.87) B7:0.81 (0.79–0.84)		
Korevaar D, 202050 The Netherlands (Amsterdam); ED; 16 March to 16 April 2020	A:0.93 (0.86–0.97) B:0.98 (0.93–0.99)	A:0.70 (0.61–0.78) B:0.51 (0.42–0.60)	A:0.73 (0.68–0.78) B:0.66 (0.62–0.70)	A:0.92 (0.85–0.96) B:0.96 (0.87–0.99)	NR	Low
Krdzalic J, 202051 The Netherlands (Heerlen/Sittard/Geleen); clinical setting not reported; 12 to 20 March 2020	A:0.89 (0.72–0.98) B:0.89 (0.72–0.98)	A:0.32 (0.16–0.52) B:0.75 (0.55–0.89)	A:0.57 (0.41–0.72) B:0.78 (0.60–0.91)	A:0.75 (0.43–0.94) B:0.88 (0.68–0.97)	A:NR B:0.84(CI NR)	Moderate
Kuzan T, 202052 Turkey (Istanbul); ED; 17 to 25 March 2020	0.94 (0.86–0.98)	0.22 (0.11–0.35)	0.62 (0.58–0.66)	0.73 (0.43–0.89)	NR	Moderate
Luo N, 202057 China(Dalian City); fever clinic; 20 January to 9 February 2020	0.90 (0.81–0.95)	0.89 (0.78–0.95)	0.91 (0.83–0.95)	0.87 (0.78–0.93)	NR	High
Miranda Magalhães Santos J, 202060 Brazil (Sao Paolo); ED; 13 to	0.83 (0.67–0.94)	0.97 (0.87–0.999)	0.97 (0.81–0.995)	0.86 (0.75–0.93)	0.92 (0.84–0.99)	Moderate 140 patients who underwent CT did not undergo RT PCR;

23 March 2020						diagnostic accuracy reported for 75 CTs continued in 71 patients
202016 The Netherlands (Nijmegen); ED; 14 to 25 March 2020	NR	NR	NR	NR	1:0.91 (0.85–0.97) 2:0.95 (0.91–0.99)	Moderate
Schulze-Hagen M, 202068 Germany (Aachen); hospital; 29 January to 4 February 2020	0.95 (0.87–0.98)	0.91 (0.85–0.96)	0.88 (0.80–0.93)	0.96 (0.91–0.99)	0.96 (0.93–0.99)	Moderate
Song S, 202069 China(Wuhan); hospital; 29 January to 4 February 2020	0.97 (0.92–0.99)	0.45 (0.35–0.55)	0.66 (0.62–0.70)	0.94 (0.83–0.98)	CT:0.71 (0.66–0.76) Basicmodel (age, mono-cyte, RBC, hypertension, dry cough):0.74 (0.67–0.80) CT+basic model:0.81 (0.75–0.87) p<0.01for CT+basic modelvs. basicmodel	Moderate
Wen, et al., 202073 China(Hunan Province); hospital; 21 January to 14	0.93 (0.86–0.97)	0.53 (0.27–0.79)	0.92 (0.87–0.95)	0.57 (0.35–0.77)	NR	Moderate NPV appears to be an error, calculated as 0.57

February 2020						
Yang, et al. 202074	A:0.91 (0.79–0.97)	A:0.68 (0.62–0.74)	A:0.41 (0.36–0.46)	A:0.97 (0.93–0.99)	A:0.79 (0.86–0.73)	Moderate
China (Nanchang); hospital; 23 January to 9 February 2020	B:0.89 (0.77–0.96)	B:0.32 (0.26–0.38)	B:0.24 (0.21–0.26)	B:0.92 (0.84–0.96)	B:0.60 (0.52–0.68)	
	C:0.79 (0.66–0.89)	C:0.50 (0.40–0.60)	C:0.45 (0.39–0.51)	C:0.83 (0.73–0.89)	C:0.78 (0.85–0.71)	
	D:1.0(0.93–1.0)	D:0.24 (0.18–0.30)	D:0.24 (0.23–0.25)	D:1.0	D:0.62 (0.69–0.54)	

CXR: Cohort Studies of Diagnostic Accuracy for COVID-19 Diagnosis

Author, Year Country Clinical Setting Study Dates	Eligibility Criteria	Sample Size SARS-CoV-2 Infection Prevalence	Imaging	Definition of Positive Imaging Test	Imaging Reader
Cozzi A, 202032 Italy (San Donato Milanese); ED; 24 February to 8 April 2020	Suspected COVID-19, with CXR and RT-PCR and CXR within 12 hours of admission	n=535 76% SARS-CoV-2 infection	Chest X-ray	Classified as positive for SARS-CoV-2 infection	1 of 7 radiologists performed original read, 1 radiologist with 5 years of experience classified CXR report as positive or negative
Ippolito D, 202047 Italy (Monza); ED; 1 to 13 March 2020	Suspected SARS-CoV-2 infection, with CXR and RT PCR	n=518 39% SARS-CoV-2 infection	Chest X-ray	Classified as positive for SARS-CoV-2 infection	1 radiologist with 15 years of experience
Kerpel A, 202048 Israel(Tel Aviv); ED; 6 to 31 March 2020	Underwent RT-PCR and CXR	n=179 58% SARS-CoV-2 infection	Chest X-ray	A: Positive (any opacity) B: RALE score	1: Radiologist with 28 years of experience 2: Radiologist with 40 years of experience
Pakray A, 202061 USA (Royal	Suspected COVID-19 with	n=110 67% SARS-CoV-	Chest X-ray	Positive (not defined)	Included (but not limited to)

Oak); ED; 12 to 28 March 2020	CXR and RT-PCR	2 infection			1 of 3 radiologists with 9 to 15 years of experience
Pare J, 202062 USA (Boston); ED; 20 March to 6 April 2020	Evaluated for COVID-19, with RT-PCR, US within 2 weeks, and CXR	n=43 63% SARS-CoV-2 infection	Chest X-ray	Positive (report included infection in the differential, based on words such as opacity, consolidation, or airspace disease)	Not reported
Peyrony O, 202063 France (Paris); ED; 9 March to 4 April 2020	Suspected COVID-19, with CXR and RT-PCR	n=129 62% SARS-CoV-2 infection	Chest X-ray	Positive (lung involvement, not otherwise described)	Not reported
Author, Year Country Clinical Setting Study Dates	Reference Standard	True Positives (n)	False Positives (n)	False Negatives (n)	True Negatives (n)
Cozzi A, 202032 Italy (San Donato Milanese); ED; 24 February to 8 April 2020	SARS-CoV-2 RT-PCR (repeat for initial negative or follow-up by phone)	A (Total): 363 B (>10 y experience): 298 C (<10 y experience): 65 D (male): 243 E (female): 120 F (Feb 24 to March 15): 105 G (March 16 to April 8): 258	A:50 B:34 C:16 D:27 E:23 F:21 G:29	A:45 B:37 C:8 D:28 E:17 F:25 G:20	A:77 B:66 C:11 D:42 E:35 F:44 G:33
Ippolito D, 202047 Italy (Monza);	SARS-CoV-2 RT-PCR	116	35	88	279

ED; 1 to 13 March 2020						
Kerpel A, 202048 Israel(Tel Aviv); ED; 6 to 31 March 2020	SARS-CoV-2 RT-PCR (repeat for initial negative)	A1: 90 A2: 72 Average: 81	A1:56 A2:55 Average:56	A1:14 A2:32 Average:23	A1:19 A2:20 Average:20	
Pakray A, 202061 USA(Royal Oak); ED; 12 to 28 March 2020	SARS-CoV-2 RT-PCR	148	2	24	16	
Pare J, 202062 USA (Boston); ED; 20 March to 6 April 2020	SARS-CoV-2 RT-PCR	14	4	13	12	
Peyrony O, 202063 France (Paris); ED; 9 March to 4 April 2020	SARS-CoV-2 RT-PCR (including repeat within 48 hours for initial negative in some patients)	41	13	39	36	
Author, Year Country Clinical Setting Study Dates	Sensitivity	Specificity	PPV	NPV	AUROC	Risk of Bias and Other Limitations
Cozzi A, 202032 Italy (San Donato Milanese);ED; 24 February to 8 April 2020	A:0.89 (0.86–0.92) B:0.89 (0.85–0.92) C:0.89 (0.80–0.95) D:0.90 (0.85–0.93) E:0.88 (0.81–0.93) F:0.81 (0.73–0.87) G:0.93	A:0.61 (0.52–0.69) B:0.66 (0.56–0.75) C:0.41 (0.22–0.61) D:0.61 (0.48–0.72) E:0.60 (0.47–0.73) F:0.68 (0.55–0.79) G:0.53	A:0.88 (0.85–0.90) B:0.90 (0.87–0.92) C:0.80 (0.75–0.85) D:0.90 (0.87–0.92) E:0.84 (0.79–0.88) F:0.83 (0.78–0.88) G:0.90	A:0.63 (0.56–0.70) B:0.64 (0.56–0.71) C:0.58 (0.38–0.75) D:0.60 (0.50–0.69) E:0.67 (0.56–0.77) F:0.64 (0.54–0.72) G:0.62	NR	High

	(0.89–0.96)	(0.40–0.66)	(0.87–0.92)	(0.50–0.73)		
Ippolito D, 202047 Italy (Monza); ED; 1 to 13 March 2020	A(overall): 0.57 (0.50–0.64) B(symptom s≤5days): 0.37 (0.24–0.52) C(symptom s>5days): 0.76 (0.47–0.67) D(age≤50 years):0.47 (0.23–0.72) E(age>50 years):0.59 (0.48–0.69)	A:0.89 (0.85–0.92) B:0.93 (0.87–0.96) C:0.68 (0.45–0.86) D:1.00 (0.94–1.00) E:0.82 (0.73–0.89)	A:0.77 (0.70–0.82) B:0.65 (0.62–0.87) C:0.85 (0.75–0.91) D:1.00 (0.90–1.00) E:0.75 (0.65–0.82)	A:0.76 (0.73–0.79) B:0.80 (0.76–0.83) C:0.56 (0.41–0.69) D:0.87 (0.81–0.91) E:0.70 (0.64–0.75)	NR	Moderate
Kerpel A, 202048 Israel (Tel Aviv); ED; 6 to 31 March 2020	A1:0.87 (0.78–0.92) A2:0.69 (0.59–0.78) Average: 0.78 (0.69–0.85)	A1:0.25 (0.16–0.37) A2:0.27 (0.17–0.38) Average: 0.26 (0.17–0.38)	A1:0.61 (0.58–0.65) A2:0.57 (0.52–0.61) Average: 0.59 (0.55–0.63)	A1:0.58 (0.42–0.72) A2:0.38 (0.28–0.50) Average: 0.47 (0.34–0.59)	B1:0.62 (0.53–0.72) B2:0.51 (0.41–0.60) B1(days 0–2):0.29 (0.14–0.44) B2(days 0–2):0.25 (0.10–0.40) B1(days 3–5):0.71 (0.57–0.92) B2(days 3–5):0.56 (0.35–0.77) B1(days ≥6):0.74 (0.57–0.90) B2(days ≥6):0.70 (0.55–0.86)	Low
Pakray A, 202061 USA (Royal Oak); ED; 12 to 28 March 2020	0.86 (0.80–0.91)	0.89 (0.65–0.99)	0.999 (0.95–0.996)	0.40 (0.31–0.50)	NR	High

Pare J, 2020 ⁶² USA (Boston); ED; 20 March to 6 April 2020	0.52 (0.32–0.71)	0.75 (0.48–0.93)	0.78 (0.58–0.90)	0.48 (0.36–0.60)	NR	High Data discrepancies ,diagnostic accuracy estimates based on data provided in study
Peyrony O, 2020 ⁶³ France (Paris); ED; 9 March to 4 April 2020	0.51 (0.40–0.63)	0.73 (0.59–0.85)	0.76 (0.65–0.84)	0.48 (0.41–0.55)	NR	High Not all patients who underwent RT–PCR underwent CXR

CT: Studies on the Association Between Imaging Findings and
Health Outcomes in Persons With COVID–19

Author, Year Country Clinical Setting Study Dates	Eligibility Criteria	Population Characteristics	Sample Size	Imaging	Imaging Timing
Chon Y, 2020 ²⁹ South Korea (Daegu); hospital; 22 February to 3 April 2020 Added for November 2020 update	COVID–19 based on SARS–CoV–2 RT–PCR, hospitalized, with CT within the first week of hospitalization	Age (mean, years): 62 Female: 73% Fever: 29% Chills: 18% Cough: 38% Sputum: 29% Rhinorrhea: 12% Myalgia: 26% Dyspnea: 16% HTN: 31% DM: 19% Chronic lung disease: 6.1% Cardiovascular disease: 7.6% Absolute lymphocyte count (cells/ μL): 1,510 C–reactive protein (mg/dL): 0.2	n=281 Hospitalized: n=281 (100%) Intubation or mortality: n=10 (3.6%)	Slice thickness: 1 mm Tube voltage 120 kVp; tube current 60 mAs with automatic exposure control	Within first week of hospitalization

		LDH (U/L): 424			
Colombi D, 202031 Italy(Piacenza) ; ED; 17 February to 10 March 2020	SARS-CoV-2 RT-PCR positive, with imaging findings on chest CT.	ICU admission or death vs. no ICU admission or death Age (mean, years): 73 vs. 62 Female: 26% vs. 24% Smoking (current or former): 18% vs. 10% CV comorbidities: 71% vs. 39% Pulmonary comorbidities: 20% vs. 14% Chronic kidney failure: 11% vs. 2% Diabetes: 20% vs. 11% Fever: 99% vs. 96% Cough: 62% vs. 60% Dyspnea: 43% vs. 28% Asthenia: 12% vs. 12% Other: 22% vs. 18% Time since symptom onset: 5 vs. 6 Temperature at admission (degrees C): 37.8 vs. 37.5 SpO2 (%): 91% vs. 94%	n=236 Hospitalized: n=236 (100%) ICU admission or death: n=108 (46%)	Reconstruction slice thickness: 1–2 mm Low-dose CT acquisition performed	Emergency department

		WBC count (x 109/L): 6.8 vs. 5.2 Lymphocyte count(x109/L): 0.87 vs. 1.1 C-reactive protein (mg/dL): 13.3 vs. 5.1			
Feng Z,202040 China(Hunan); hospital; 17 January to 1 February 2020 Added for November 2020 update	COVID-19 based on SARS-CoV-2 RT-PCR and admission chest CT	Derivation vs. validation cohorts Age (mean, years): 44 vs. 46 Female: 49% vs. 49% Lymphocyte count(x109/L): 1.1 vs. 1.1 C-reactive protein(mg/L): 17.4 vs. 16.9	Derivation vs. validation cohorts n=141 vs.106 Hospitalized: n=141 (100%) vs. 106 (100%) Mortality: n=1(0.7%) vs. 1(0.9%) ICU admission: n=4 (2.8%) vs. 4 (3.8%) Mechanical ventilation: n=6 (4.3%) vs. 5 (4.7%) Severe pneumonia: n=15 (11%) vs. 10 (9.4%)	Slice thickness: Reconstructed thickness 1mm for transverse scans and 3mm for sagital and coronal scans	Admission
Francone M, 202041 Italy (Rome); ED; 6 to 22 March 2020 Added for November 2020 update	SARS-CoV-2 RT-PCR positive, with CT	Age (mean, years): 63 Female: 35% Symptomatic: 100% Fever: 87% Cough: 52% Dyspnea: 43% Diarrhea: 9.2% Increased CRP: 87% Increased d-dimer: 88% Leukopenia:	n=130 ospitalized: n=123 (95%) Mortality: n=20 (15%)	Slice thickness: Reconstructed thickness 1mm	Unclear

		30% Decreased lymphocyte count: 62% Decreased O2 saturation: 40% Decreased PaO2/FiO2 ratio: 66% Critical: 6.9% Severe: 32% Mild: 61%			
202053 Italy (Rome); hospital: 5 to 24 March 2020 Added for November 2020 update	SARS-CoV-2 pneumonia (RT PCR positive)who underwent CT at admission	Age (mean, years): 61 Female: 36% SaO2: 97% PaO2/FiO2: 323	n=189 Hospitalized: n=189 (100%) ICU with mechanical ventilation: n=27 (14%)	Reconstruction slice thickness: 1 mm Tube voltage 120 kV; tube current 100 mAs	Admission
Li K, 202054 China (Tongji); hospital: 31 January to 5 March 2020 Added for November 2020 update	COVID-19 (SARS-CoV-2 RT-PCR positive), with CT within 1 week of admission	Age(mean, years): 57 Female: 42% DM: 15% HTN: 30% Coronary heart disease: 4% Chronic obstructive pulmonary disease: 2% Cancer: 3% Current smoker: 7% Fever: 92% Chills: 23% Cough: 75% Dyspnea: 51% Chest pain: 7% Fatigue: 34% Myalgia: 24% Respiratory	n=102 Hospitalized: n=102 (100%) Mortality: n=15 (15%)	Reconstruction slice thickness: 1.00 or 1.25mm Tube voltage 120 or 120kV, automatic tube current modulation at 100 to 400 mA	Within 1 week of admission

		rate>20/minute: 46% Duration from symptom onset (days): 11 LDH >225 U/L: 74% D-dimer >1 µg/mL: 45% C-reactive protein ≥3 mg/L: 84%			
Li Y, 2020 ⁵⁵ China (Tongji); hospital; 21 January to 14 February 2020 Added for November 2020 update	≥60 years of age, SARS-CoV-2 infection (RT-PCR positive), with CT prior to admission or within 24 hours of admission	Age (mean, years): 71 Female: 34% Fever: 80% Cough: 45% Dyspnea: 17% Chest tightness: 9.2% Fatigue and poor appetite: 21% Duration of symptoms (median, days): 7	n=98 Hospitalized: n=98 (100%) Mortality: n=46 (47%)	Reconstruction slice thickness: 1.25 mm Other parameters not reported ('no standard CT protocol applied')	Prior to admission or within 24 hours of admission
Mahdjoub E, 2020 ⁵⁸ France (Paris); hospital; 1 to 20 March 2020 Added for November 2020 update	COVID-19 (SARS-CoV-2 RT-PCR positive) with admission CT	Mechanical ventilation or death vs. no mechanical ventilation or death Age (median, years): 73.6 vs. 61.4 Female: 20% vs. 43% COPD: 15% vs. 3.3% DM: 30% vs. 22% HRN: 40% vs. 45% Coronary heart disease: 25% vs. 12%	n=142 Hospitalized: n=142 (100%) ICU or mortality: n=20 (14%)	Details not provided	Admission

		Cerebrovascular disease: 20% vs. 5.7% Respiratory rate (times/minute); 22 vs. 20 Oxygen saturation,%: 93 vs. 97			
Matos J, 202059 Italy (Genoa); EDI; 1 to 22 March 2020 Added for November 2020 update	Pneumonia symptoms (two or more of the following: fever, cough, dyspnea), SARS-CoV-2 RT-PCR positive, and positive CT scan	Age (median, years): 64 Female: 39% ≥1 comorbidity: 38% Symptomatic: 100% Duration of symptoms at time of CT (median,days); 5 Lymphocyte (% , median): 18.8 C-reactive protein (mg/L, median): 4.94	n=106 Hospitalized: n=97 (92%) Mortality: n=25 (24%) Mechanical ventilation: n=17 (16%)	Reconstruction slice thickness: 1.25 mm Tube voltage: 120 kVp smart mA tube current modulation (range 100 to 400 mA)	Admission
Raoufi M, 202064 Iran (Tehran); ED; 22 February to 22 March 2020 Added for November 2020 update	COVID-19 (SARS-CoV-2 RT-PCR positive), with CT	Age (median, years): 54 Female: 34% Cough: 60% Fever: 56% Dyspnea: 48% DM: 23% Cardiovascular disease:13% HTN: 12%	n=380 Hospitalized: n=154 (54%) Mortality: n=29 (7.6%)	Slice thickness: 4 mm Tube voltage: 100 kVp, tube current 50 to 100 mAs	Emergency department
Ruch Y, 202065 France (Strasbourg); hospital;March 2020 Added for November 2020 update	Hospitalized for COVID-19 (SARS-CoV-2 PCR positive), with CT	Age (mean, years): 66 Female: 40% BMI (mean, kg/m2): 28.9 DM: 25% HTN: 52% Chronic heart failure: 10%	n=572 Hospitalized: n=572 (100%) Early severe disease (death or ICU admission in the 7 days	Reconstruction slice thickness: 1 mm Tube voltage: 100 to 135 kV, tube current maximum 2–50 mAs	Admission

		<p>Chronic lung disease: 17%</p> <p>Fever: 76%</p> <p>Dyspnea: 70%</p> <p>Cough: 66%</p> <p>Chest pain: 9%</p> <p>SpO2 (mean): 93%</p> <p>Time from symptom onset to CT (mean,days):6.5</p> <p>C-reactive protein(mean, mg/L): 88.2</p> <p>Lymphocyte count(mean, cells/mm3):882</p> <p>Lactate(mean, mmol/L):1.0</p>	after hospital admission): n=206 (36%)		
<p>Sabri A, 202066</p> <p>Iran (Tehran); hospital: 21 February to 17 March 2020</p> <p>Added for November 2020 update</p>	<p>Hospitalized and SARS-CoV-2 RT-PCR positive, with CT</p>	<p>Age (mean, years): 54</p> <p>Female:</p> <p>Not reported</p> <p>RR >20/minute: 18%</p> <p>Pulse rate >100/minute: 33%</p> <p>Fever >38 degrees C:43%</p> <p>Oxygen saturation <88%: 20%</p>	<p>n=63</p> <p>Hospitalized: n=63 (100%)</p> <p>Mortality: n=9 (14%)</p> <p>ICU: n=18 (29%)</p>	<p>Technical parameters not reported</p>	<p>Admission</p>
<p>Wang X, 202072</p> <p>China (Hubei); hospital; dates not reported</p> <p>Added for November 2020 update</p>	<p>Hospitalized with COVID-19 (SARS-CoV-2 RT-PCR positive) and at least 2 CT scans</p>	<p>Age (median, years): 42</p> <p>Female: 45%</p> <p>HTN: 13%</p> <p>DM: 3.7%</p> <p>Cardiovascular disease: 2.5%</p> <p>Fever: 84%</p> <p>Myalgia: 29%</p> <p>Dry cough:48%</p> <p>Fatigue: 37%</p>	<p>n=161</p> <p>Hospitalized: n=161 (100%)</p> <p>Mortality: n=15 (9.3%)</p> <p>Survivors with severe disease: n=55 (34%)</p> <p>COVID-19 complication:</p>	<p>Slice thickness: Not reported</p> <p>Tube voltage: 120 kV, tube current varied</p>	<p>Unclear</p>

		Dyspnea: 5.6% Chest tightness: 17% Respiratory rate (median, per minute): 20 Lymphocyte count <1.5 109/L: 88% D-dimer ≥0.5 mg/L: 27% LDH (median, U/L): 191	37 (23%)		
Yuan M, 202075 China(Wuhan); hospital; 1 to 25 January 2020	Diagnosed with COVID-19 (SARS-CoV-2 RT-PCR positive) and discharged with recovered symptoms or died in hospital.	Mortality vs. survival Age (median, years): 68 vs. 55 Female: 60% vs. 53% Time since symptom onset (median,days):8 HTN: 50% vs. 0% DM: 60% vs. 0% Cardiac disease: 30% vs. 0% Fever: 60% vs. 88% Cough: 50% vs. 65% Myalgia: 10% vs. 12% Dyspnea: 100% vs. 6%	n=27 Hospitalized: n=27 (100%) Mortality: n=10 (37%)	Slice thickness: 5 mm	Unclear
Zheng Y, 202076 China(Wuhan); hospital; 21 January to 3 March 2020 Added for November	COVID-19 (SARS-CoV-2 RT-PCR positive), admission CT, and minimum hospital stay of 7 days	Training vs. validation cohort Age (mean, years): 44 vs. 45 Female: 38% vs. 47% Duration	Training vs. validation cohort n=166 vs. 72 Hospitalized: n=166 (100%) vs. 72 (100%)	Slice thickness: 1 mm Tube voltage and current not reported	Admission

2020 update		(median,days): 3 vs. 4 Fever: 80% vs. 69% Cough: 52% vs. 43% Fatigue: 14% vs. 12% Chest distress: 12% vs. 10% Cardiovascular and cerebrova- scular disease: 9.0% vs. 8.3% Malignancy: 2.4% vs. 2.8% Lymphocyte count (x10 ⁹ /L): 1.10 vs. 1.34 C-reactive protein(mg/L): 12.80 vs. 9.80 Oxygen treatment: 31% vs. 29%	ICU, mechanical ventilation, or mortality: n=35 (21%) vs. 10 (14%)		
Author, Year Country Clinical Setting Study Dates	Imaging Predictors	Imaging Reader	Outcome	Results	Risk of Bias and Other Limitations
Chon Y, 2020 South Korea (Daegu); hospital: 22 February to 3 April 2020 Added for November 2020 update	CT severity score 0 to 40 (Yang et al 99), 20 segments scored 0 to 2	Two radiologists with 3 and 9 years of experience	Intubation or death	Intubation or death (HR) Model 1 CT score >5: Adjusted HR 7.29 (1.37–38.68) Pleural effusion: Adjusted HR 5.67 (1.04–30.8) Model 2 Consolidation with or without	High

				ground glass opacity: Adjusted OR 1.87 (0.40–8.70) Crazy paving appearance: Adjusted HR 4.27 (0.96–19.00)	
Colombi D, 202031 Italy(Piacenza); ED; 17 February to 10 March 2020	1: Clinical model 2: Model with % lung well-aerated assessed visually and clinical parameters; threshold not prespecified 3: Model with % lung well-aerated assessed with software and clinical parameters; threshold not prespecified 4: Model with clinical parameters, well aerated lung volume <2.9 L and adipose tissue are >262 cm2; threshold not pre-specified	1: Not applicable 2: 2 radiologists with 5 and 14 years of experience 3: Software to calculate CT parameters 4: Software to calculate CT parameters	ICU admission or death	Sensitivity 1: 0.75 (0.66–0.82) 2: 0.72 (0.63–0.80) 3: 0.75 (0.66–0.83) 4: 0.75 (0.66–0.83) Specificity 1: 0.73 (0.65–0.81) 2: 0.81 (0.73–0.88) 3: 0.80 (0.72–0.86) 4: 0.81 (0.73–0.88) Positive predictive value 1: 0.70 (0.61–0.78) 2: 0.76 (0.68–0.82) 3: 0.75 (0.68–0.81) 4: 0.77 (0.69–0.83) Negative predictive value 1: 0.78 (0.72–0.83) 2: 0.78	High

				(0.73–0.83) 3: 0.80 (0.73–0.85) 4: 0.79 (0.74–0.84) AUROC 1: 0.83 (0.78–0.88) 2: 0.86 (0.81–0.90) 3: 0.86 (0.80–0.90) 4: 0.86 (0.81–0.90)	
Feng Z, 202040 China(Hunan); hospital; 17 January to 1 February 2020 Added for November 2020 update	CT severity score 0 to 25 based on extent of involvement of 5 lobes	Two radiologists with >10 years of experience, 3rd radiologist to resolve disagreement	Severe pneumonia (respiratory distress [respiratory rate ≥30/minute], hypoxia [oxygen saturation ≤93% resting], hypoxemia [arterial blood oxygen partial pressure/oxygen concentration ≤300 mm Hg], critically ill [mechanical ventilation, shock, ICU admission])	Severe pneumonia Derivation vs. validation cohort CT severity score: Adjusted OR 1.19 (1.01–1.41) vs. NR AUROC for multivariate nomogram (age, neutrophil to lymphocyte ratio, and CT severity score): 0.87 (0.77–0.96) vs. 0.90 (0.81–0.98)	Moderate Risk estimate for CT severity score not reported for validation cohort
Francone M, 202041 Italy (Rome); ED; 6 to 22 March 2020 Added for November 2020 update	CT severity score 0 to 25 (Pan et al) based on extent of involvement of 5 lobes	Not reported	Mortality	Mortality CT score ≥18 vs. <18: Adjusted HR 3.74 (1.10–12.77) AUROC for multivariate model: 0.76 (0.65 to 0.88)	High
202053	CT	Two	ICU with	ICU with	Moderate

Italy (Rome); hospital; 5 to 24 March 2020 Added for November 2020 update	semiautomatic quantitative lung volume involvement (%)	radiologists with at least 10 year experience with aid of semiautomatic system	mechanical ventilation	mechanical ventilation Lung volume involvement >23.0%: Sensitivity 0.96 (0.81–0.999) and specificity 0.96 (0.92–0.99), AUC 0.98 (0.95–1.00)	
Li K, 2020 ⁵⁴ China (Tongji); hospital; 31 January to 5 March 2020 Added for November 2020 update	CT severity score 0 to 25 (Chang et al) based on extent of involvement in 5 lobes	Two radiologists, with consensus	Mortality	Mortality, among patients with CT within 1 week of symptom onset CT total severity score (per unit increase): Adjusted OR 1.54 (1.00–2.37) CT total severity score ≥15 vs. <15: OR 35.00 (3.32–368.57) (not included in multivariate model)	Moderate Analysis restricted to patients with CT within 1 week of symptom onset
Li Y, 2020 ⁵⁵ China (Tongji); hospital; 21 January to 14 February 2020 Added for November 2020 update	CT severity score 0 to 60 (Chung et al), based on extent of involvement of 5 lobes (each scored 0 to 12)	Two radiologists with 8 and 3 years of experience; with consensus	Mortality	Mortality ≤ 5 days subgroup: CT score >14.5 sensitivity 0.83 and specificity 0.77; adjusted AUC 0.88 (0.79–0.98)	Moderate

				6–10 days subgroup: CT score 27.5 sensitivity 0.88, specificity 0.71, AUC 0.90 (0.68–0.98)	
Mahdjoub E, 202058 France (Paris); hospital; 1 to 20 March 2020 Added for November 2020 update	CT severity score 0 to 25, based on extent of involvement of 5 lobes (each scored 0 to 5)	Two radiologists, other details not provided	ICU or mortality	ICU or mortality CT score ≥ 13 vs. < 13 : Adjusted OR 44.24 (8.61–227.36) CT score (AUC): 0.85	Moderate
Matos J, 202059 Italy (Genoa); EDI; 1 to 22 March 2020 Added for November 2020 update	CT quantitative volume of disease	1 of 2 radiologists with 10 and 15 years of experience	ICU or mortality	ICU or mortality CT quantitative volume of disease: AUC 0.75 (CI not reported)	Moderate
Raoufi M, 202064 Iran (Tehran); ED; 22 February to 22 March 2020 Added for November 2020 update	CT severity score 0 to 25 (Pan et al 100), based on extent of involvement of 5 lobes (each scored 0 to 5)	1 radiologist with 10 years of experience	Mortality	Mortality CT severity score > 12 : sensitivity 0.76 (0.56–0.89) and specificity 0.76 (0.71–0.80) CT severity score: AUC: 0.80 (0.72–0.88)	Moderate
Ruch Y, 202065 France (Strasbourg); hospital; March 2020 Added for	CT lung involvement $> 50\%$	2 radiologists	Early severe disease (death or ICU admission in the 7 days after hospital admission)	Early severe disease CT lung involvement $> 50\%$: Adjusted OR 2.35	Moderate

November 2020 update				(1.24–4.46)	
Sabri A, 202066 Iran (Tehran); hospital; 21 February to 17 March 2020 Added for November 2020 update	CT severity score 0 to 20 (Jin et al 101), based on extent of involvement of 5 lobes (each scored 0 to 4) Number of lobes involved Pericardial effusion	2 radiologists with 5 years of experience, 3rd radiologist to resolve disagreements	Mortality ICU	Mortality CT severity score: 9.8 (non survivor) vs. 7 (survivor), p=0.04; not retained in multivariate model Lobes involved: 4.9 vs. 4, p<0.001; adjusted OR 7.64 (1.58–13.68) ICU admission CT severity score: 8.7 (ICU) vs. 7 (non-ICU), p=0.15; not retained in multivariate model Lobes involved: 4.8 vs. 4, p=0.03; not retained in multivariate model Pericardial effusion: 26.6% vs. 4.2%, p=0.03; adjusted OR 1.14 (95% CI 1.11 to 1.70)	High
Wang X, 202072 China (Hubei); hospital;	CT severity score 0 to 15 based on extent of	2 physicians in each hospital (5 to 25 years of	COVID-19 complication (ARDS, acute kidney injury,	COVID-19 complication CT severity score	Moderate

dates not reported Added for November 2020 update	involvement of 5 lobes (each scored 0 to 3)	experience), with consensus	liver dysfunction, acute coronary injury, septic shock, arrhythmia, secondary infection)	>10 vs. ≤5: Adjusted OR 31.28 (2.97–329.80) CT severity score 5–10 vs. ≤5: Adjusted OR 5.86 (1.70–20.23)	
Yuan M, 202075 China(Wuhan); hospital; 1 to 25 January 2020	CT score > 24.5; sum of radiologic score (1=normal attenuation, 2=ground glass, 3=consolidation) times lung parenchyma distribution score (1=<25% abnormality, 2=25–50%, 3=50–75%, 4=over 75%) for 6 lung zones (range 0 to 72)	Two radiologists, discrepancies resolved by consensus	Mortality	Sensitivity: 0.96 (CI NR) Specificity: 0.84 (CI NR) AUROC: 0.90 (0.87–0.93)	High
Zheng Y, 202076 China(Wuhan); hospital; 21 January to 3 March 2020 Added for November 2020	CT severity score 0 to 24 (Ooi et al102) based on extent of involvement of 6 lobes (each scored 0 to 4)	2 radiologists with 20 and 23 years of experience	ICU, mechanical ventilation, or mortality	ICU, mechanical ventilation, or mortality CT severity score: Adjusted HR 1.07 (0.99–1.15) Crazy paving sign: Adjusted HR 2.15	Moderate

				(1.03–4.48) Training vs. validation cohort Radiological model: AUC 0.71 (0.63–0.89) vs. 0.87 (0.80–0.94) Clinical model: AUC 0.78 (0.72–0.84) vs. 0.81 (0.74–0.88) Combined model: 0.82 (0.76–0.88) vs. 0.89 (0.82–0.96)	
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CXR: Studies on the Association Between Imaging Findings and Health Outcomes in Persons With COVID-19

Author, Year Country Clinical Setting Study Dates	Eligibility Criteria	Population characteristics	Sample Size	Imaging	Imaging Timing
Cocconcelli E, 202030 Italy (Padua); h o s p i t a l ; March to May 2020 Added for November 2020 update	SARS-CoV-2 RT-PCR positive, with CXR	Age (mean, years): 68 Female: 27% Current smoker: 9% BMI(kg/m2): 25 Duration of symptoms: 4 pO2 at admission (mmHg): 90 P/F at admission:429 Cardiovascular disease: 59% Respiratory	n=102 High-intensity medical care: n=31 Low-intensity medical care: n=71	Chest x-ray	Admission

		disease:18% Oncologic: 13%			
Kerpel A, 202048 Israel (Tel Aviv); ED; 6 to 31 March 2020 Added for November 2020 update	SARS-CoV-2 RT-PCR positive, with CXR	Age (mean, years): 57 Female: 25% Symptomatic: Not reported	n=104 Hospitalized: n=104 (100%) ICU: n=14 (13%) Mortality: n=7 (6.7%) Intubation: n=14 (13%)	Chest x-ray	Emergency department
Kim H, 202049 USA (New York); ED; 12 to 26 March 2020 Added for November 2020 update	Symptomatic (fever, cough, dyspnea, or hypoxia), SARS CoV-2 RT-PCR test, with CXR	Age (mean, years): 59 Female: 50% Symptomatic: 100% SARS-CoV-2 positive: 31% (55% were not tested)	n=416 Hospitalized: n=416 (100%) Intubated: n=32 (7.7%) Mortality: n=20 (4.8%)	Chest x-ray	Emergency department
Lichter Y, 202056 Israel (Tel Aviv); medical ward or ICU; 21 March to 4 May 2020 Added for November 2020 update	COVID-19 (SARS-CoV-2 RT-PCR positive), with CXR	Age (mean, years): 65 Female: 38% Ischemic heart disease: 18% Congestive heart failure: 9.2% Transient ischemic attack/stroke: 12% DM: 28% Smoking:11% HTN: 56% Lymphocyte count(median, 103/ μ L): 1.1 C-reactive protein(media n, mg/L):55.4 D-dimer (median,mg/L): 0.83	n=120 Hospitalized: 120 (100%) Mortality: 23 (19%) Intubation: 14(12%)	Chest x-ray	Admission

		O2 saturation: 95% Sequential organ failure assessment score (median): 1			
Toussie D, 202070 USA (New York); ED; 10 to 26 March 2020	Age 21 to 50 years, SARS CoV-2 RT-PCR positive, with CXR	Age (mean, years): 39 Female: 38% Time from symptom onset (median,days):4 Current smoker: 15% BMI ≥ 31 kg/m ² : 48% Asthma: 14% HTN: 16% DM: 12% HIV: 2% Febrile: 30%	n=338 Hospitalized: n=145 (100%) Intubation: n=28 (8.3%) Mortality: n=10 (3.0%)	Chest x-ray	Emergency department
Author, Year Country Clinical Setting Study Dates	Imaging Predictors	Imaging Reader	Outcome	Results	Risk of Bias and Other Limitations
Cocconcelli E, 202030 Italy (Padua); hospital; March to May 2020 Added for November 2020 update	CXR score 0 to 36 (0 to 3 for each of 12 lobes)	Two radiologists with >10 years of experience	High intensity medical care (invasive/non invasive ventilation or high-flow nasal cannula requiring admission to ICU)	High intensity medical care X-ray global score >3 vs. <3: Adjusted OR 0.40 (0.02-3.63)	Moderate
Kerpel A, 202048 Israel (Tel Aviv); ED; 6 to 31 March 2020 Added for November 2020 update	CXR RALE score 0 to 48 (0 to 4 for each of 12 lobes)	Poor outcome (ICU hospitalization, intubation , or death)	A: Radiologist with 28 years of experience B: Radiologist with 40 years of experience	Poor outcome Reader 1: AUROC 0.84 (0.74-0.94) Reader 2: AUROC 0.77 (0.64-0.91)	Moderate
Kim H,	Graded 1 to 3	1 experienced	Time to	CXR grade	High

202049 USA (New York); ED; 12 to 26 March 2020 Added for November 2020 update	based on extent of alveolar opacities	radiologist with >20 years of experience	discharge Intubation Mortality	(HR [unclear if adjusted], per grade increase) Time to discharge: 0.61 (0.51–0.73) Intubation: 3.69 (2.25–6.07) Mortality: 1.45 (0.83–2.54)	
Lichter Y, 202056 Israel (Tel Aviv); medical ward or ICU; 21 March to 4 May 2020 Added for November 2020 update	Presence of bilateral infiltrates, lobar infiltrates, pleural effusion, or hilar congestion	Not reported	Mortality Intubation or death	Mortality Bilateral infiltrates: HR 2.5 (1.07–6.1) Lobar infiltrates: HR 1.2 (0.2–4.3) Pleural effusion: HR 1.7 (0.5–5.0) Hilar congestion: HR 3.7 (1.07–10.2) Intubation Bilateral infiltrates: HR 2.5 (0.8–9.6) Lobar infiltrates: HR 1.7 (0.3–6.6) Pleural effusion: HR 1.8 (0.4–6.1) Hilar	High

				congestion: HR 0.7 (0.05–4.0) Intubation or mortality Bilateral infiltrates: HR 1.9 (0.8–4.4) Lobar infiltrates: HR 1.8 (0.5–4.8) Pleural effusion: HR 1.2 (0.3–3.2) Hilar congestion: HR 2.4 (0.55–7.0)	
Toussie D, 202070 USA (New York); ED; 10 to 26 March 2020	CXR score 0 to 12 (0 to 1 for each of 12 lobes)	Two radiologists with 10 and 26 years of experience	Hospital admission Intubation Prolonged stay	Hospital admission, all patients, CXR score ≥ 2 Sensitivity: 0.66 (0.58 to 0.74) Specificity: 0.79 (0.73 to 0.85) AUROC: 0.77 (0.72 to 0.82) Adjusted OR: 6.2 (3.5 to 11) Intubation, admitted patients, CXR score ≥ 3 Sensitivity: 0.68 (0.48 to 0.84) Specificity:	Moderate

				0.67 (0.57 to 0.75) AUROC: 0.74 (0.64 to 0.84) Adjusted OR: 4.7 (1.8 to 13) Prolonged stay, admitted patients, CXR score ≥ 3 Sensitivity: 0.52 (0.33 to 0.71) Specificity: 0.63 (0.53 to 0.72) AUROC: 0.62 (0.50 to 0.73) Adjusted OR: 1.1 (0.8 to 1.5)	
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