



Molecular Imaging CRO Network

Micron's ViewPoint

The Utilization Situation of Imaging Endpoint - An Imaging Endpoint List -



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Introduction

- Currently (2022), Imaging Endpoints*¹ are widely used in clinical trials for drug and medical device development.
- When designing a clinical trial, drug or medical device development managers or researchers (hereinafter referred to as "study sponsors"), need to select the appropriate Endpoints based on the objectives of the clinical trial.
- When Imaging Endpoints are used in clinical trials, a study sponsor may have difficulty with the process of deriving an Imaging Endpoint which matches the purpose of the clinical trial (e.g. whether or not to standardize imaging parameters and perform centralized image interpretation).
- When considering the selection of Imaging Endpoints and the procedure for deriving Imaging Endpoints, it is useful to refer to guidance and guidelines for the use of Imaging Endpoints published by regulatory authorities and various academic societies, as well as past clinical trials which Imaging Endpoints have been used.
- In this article, a list of Imaging Endpoints according to disease type is introduced (Imaging Endpoint List Ver. 1.0) in Appendix 1. The list is created based on information from ClinicalTrial.gov, a U.S. clinical trial information database.
- In addition, using the results of the research conducted to prepare the Imaging Endpoint List Ver. 1.0, we also introduce the trends in the number of the Imaging Studies*² over the past 20 years with the Imaging Endpoint as well as by disease type, and the use of centralized image interpretation*³.
- The research methodology for this article is described in Appendix 2.

*1: Endpoints using medical imaging such as CT, MRI, PET, echography, photograph, etc.

*2: In the research performed for creating this article, studies included are those that meet at least one of following conditions: either the use of medical imaging that is indicated, or the use of endpoint with the use of medical imaging is clearly described, in the "Outcome measure" of ClinicalTrial.gov.

*3: In the research performed for creating this article, described in the "Outcome measure" of Clinical Trial.gov as a method for reducing bias and variability used in the process for deriving Imaging Endpoints, such as Independent Read, Blind Review, Central Review, and Imaging Core-Lab, etc.



Overview of Imaging Studies 1

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List of Diseases Which Imaging Studies are Often Used

25,474 Imaging Studies were identified from 115,830 Phase I to Phase III clinical trials initiated from January 1, 2000 to December 31, 2019 registered on ClinicalTrial.gov. The table below describes the diseases with higher numbers of the most imaging studies by ICD classification in accordance with the research for this article. The table shows the Imaging Endpoint is used in clinical trials for various diseases.

ICD Classification	Disease in Which the Imaging Study was Commonly Used (in accordance with the research for this article.)
A00-B99 Infectious and Parasitic Diseases	Tuberculosis, AIDS
C00-D49 Neoplasms	Skin cancer, esophageal cancer, stomach cancer, colorectal cancer, liver cancer, lung cancer, kidney cancer, lymphoma, leukemia
D50-D89 Haematological and Immunological Diseases	Myelofibrosis, sickle cell disease
E00-E90 Endocrine, Nutritional and Metabolic Diseases	Diabetes, obesity, amyloidosis, Gaucher's disease, hypophosphatasia, hypophosphatemia, mucopolysaccharidosis
F00-F99 Mental and Behavioral Disorders	Alzheimer's disease, Lewy body dementia, alcoholism, schizophrenia, PTSD, ADHD
G00-G99 Diseases of the Nervous System	Amyotrophic lateral sclerosis, Parkinson's disease, multiple sclerosis, epilepsy, cerebral palsy
H00-H59 Diseases of the Eye and Adnexa	Dry eye, age-related macular degeneration, central serous chorioretinopathy, diabetic retinopathy, retinal detachment, glaucoma
I00-I99 Diseases of the Circulatory System	Myocardial infarction, arteriosclerosis obliterans, pulmonary hypertension, arrhythmia, cerebral infarction, cerebral hemorrhage, lower-limb ischemia
J00-J99 Diseases of the Respiratory System	Nasal polyp, sinusitis, COPD, emphysema, idiopathic pulmonary fibrosis, pneumonia
K00-K93 Diseases of the Digestive System	Dental caries, periodontitis, gastroesophageal reflux disease, esophagitis, gastritis, colitis, hepatitis, pancreatitis, fatty liver
L00-L99 Diseases of the Skin and Subcutaneous Tissue	Dermatitis, psoriasis, solar keratosis, alopecia, onychomycosis, pressure ulcer, leukoplakia, scars, wrinkles
M00-M99 Diseases of the Musculoskeletal System and Connective Tissue	Osteoarthritis, rheumatoid arthritis, low back pain, degenerative intervertebral disc, herniated disc, osteoporosis, osteonecrosis, osteopenia
N00-N99 Diseases of the Genitourinary System	Uterine fibroids, renal impairment, overactive bladder, benign prostatic hyperplasia, endometriosis, infertility
Q00-Q99 Congenital Malformations, Deformations and Chromosomal Abnormalities	Polycystic kidney disease, osteogenesis imperfecta, epidermolysis bullosa, fragile X syndrome
R00-R99 Not Elsewhere Classified	Aging
S00-T98 Injury, Poisoning and Certain Other Consequences of External Causes	Brain injury, spinal cord injury, fracture, wounds, burn injury, in-stent restenosis
Z00-Z99 Factors Influencing Health Status and Contact with Health Services (e.g. Surgery)	Artificial joint replacement
Healthy	Healthy person
Unlabeled	-

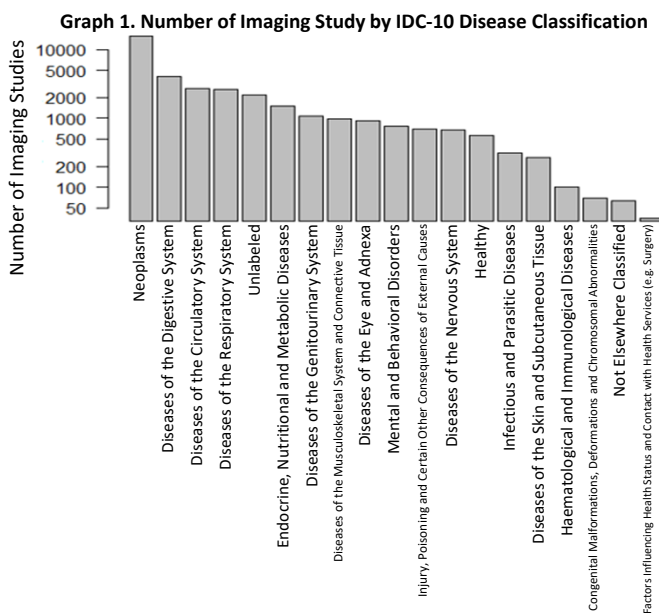


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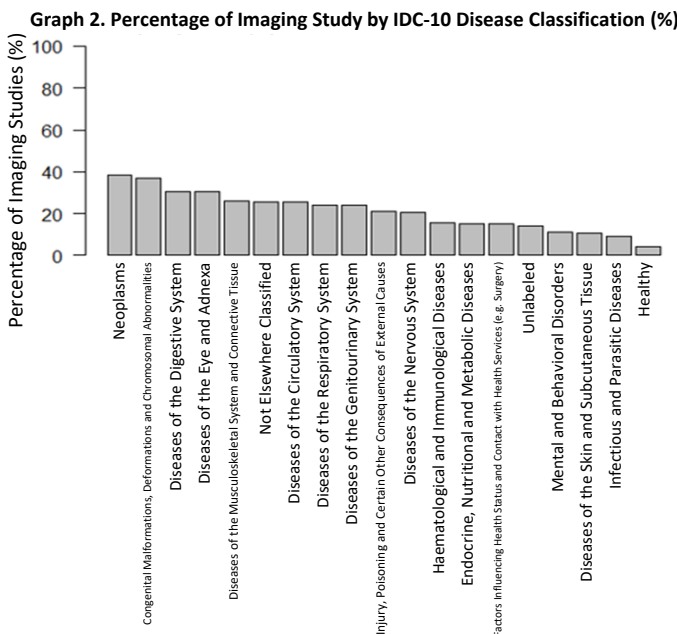
Overview of Imaging Studies 2

Current Status of Imaging Study by Disease Category

- The number of studies by ICD classification and the number of Imaging Studies by ICD classification are shown below.
- Imaging studies were most commonly performed for neoplasms, followed by digestive diseases, circulatory diseases, and respiratory diseases. Logarithmic graphs were used to illustrate the number of Imaging Study cases because of the large range from the maximum (neoplasms: 15,837) to the minimum (surgeries: 35) (Graph 1).
- Regarding the ratio of Imaging Studies to the total number of studies for each ICD category, the largest in neoplasms, followed by gastrointestinal, ocular, and musculoskeletal connective tissue if typically focus on those with more than 500 Imaging Studies (Graph 2).



ICD Classification	Imaging Studies	All Trials
A00-B99 Infectious and Parasitic Diseases	316	3,462
C00-D49 Neoplasms	15,837	40,943
D50-D89 Haematological and Immunological Diseases	101	646
E00-E90 Endocrine, Nutritional and Metabolic Diseases	1,493	9,776
F00-F99 Mental and Behavioral Disorders	765	6,861
G00-G99 Diseases of the Nervous System	677	3,320
H00-H59 Diseases of the Eye and Adnexa	923	3,033
I00-I99 Diseases of the Circulatory System	2,762	10,829
J00-J99 Diseases of the Respiratory System	2,603	10,817
K00-K93 Diseases of the Digestive System	4,061	13,250
L00-L99 Diseases of the Skin and Subcutaneous Tissue	267	2,486
M00-M99 Diseases of the Musculoskeletal System and Connective Tissue	969	3,751
N00-N99 Diseases of the Genitourinary System	1,062	4,453
Q00-Q99 Congenital Malformations, Deformations and Chromosomal Abnormalities	69	186
R00-R99 Not Elsewhere Classified	64	250
S00-T98 Injury, Poisoning and Certain Other Consequences of External Causes	700	3,341
Z00-Z99 Factors Influencing Health Status and Contact with Health Services (e.g. Surgery)	35	231
Healthy	572	13,436
Unlabeled	2,179	15,259



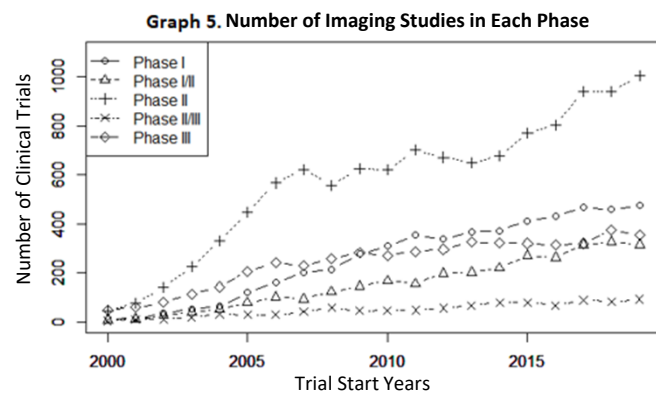
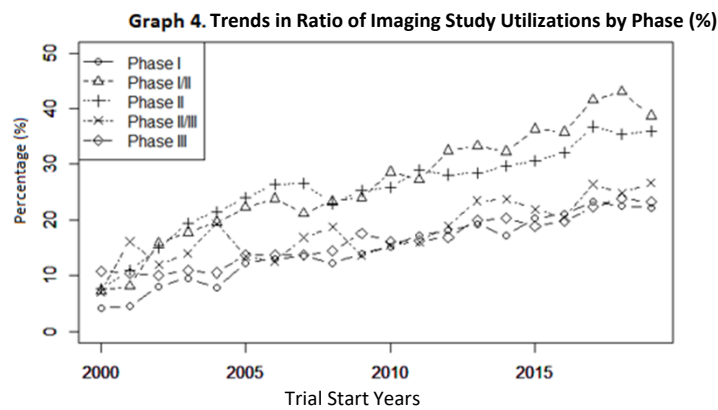
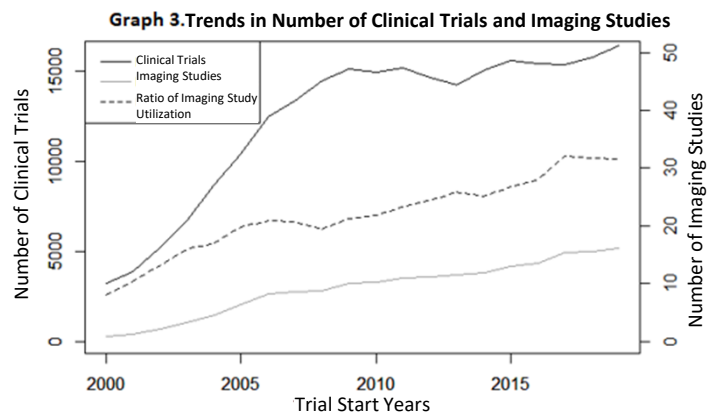


Overview of Imaging Studies 3

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Yearly Changes in Imaging Study Implementation

- Trends in the number of Imaging Study cases is shown in Graph 3 below.
- The total number of Phase I to III trials has been increasing since 2000, with the number and proportion of Imaging Studies increasing alongside this (Graph 3).
- Looking at the utilization rate of Imaging Study by study phase, the utilization rates in Phase I/II and Phase II are higher than those in other phases (Graph 4).
- If all Imaging Studies are categorized by study phase, as of 2019, the majority of Imaging Studies were for Phase II clinical trials, followed by Phase I and III respectively. (Graph 5).



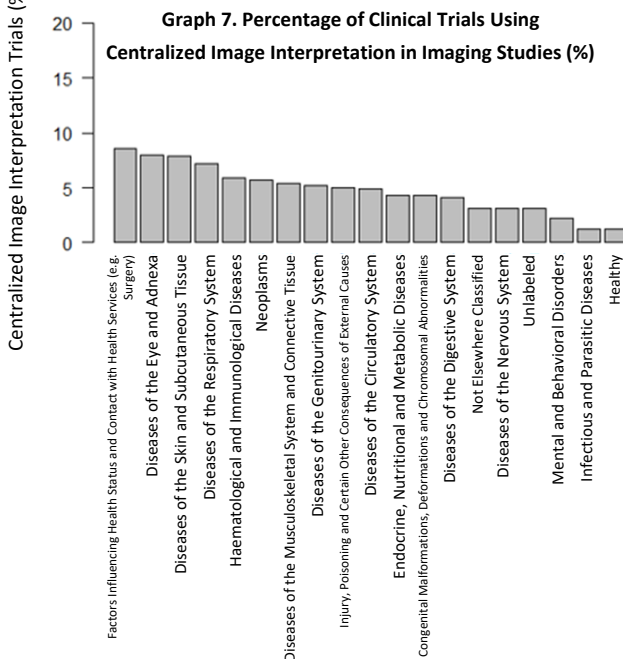
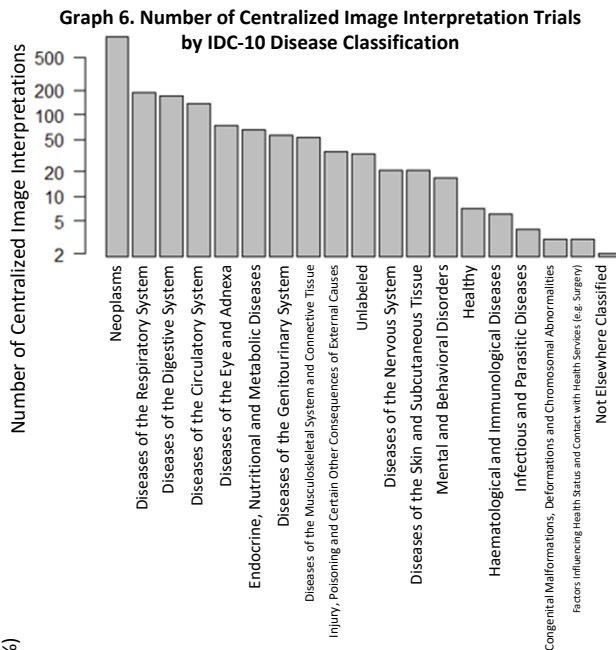


Overview of Imaging Studies 4

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Utilization of Centralized Image Interpretation in Imaging Studies by Disease Classification

- Graph 6 and 7 describes the number of centralized image interpretations used and the percentage of centralized image interpretations used in the Imaging Studies according to ICD classification .
- The use of centralized image interpretation was highest for neoplasms, followed by respiratory diseases, digestive diseases, and circulatory diseases respectively (Graph 6).
- Disease category which uses the Centralized Image Interpretation the most was the eye and adnexa, followed by respiratory organs, neoplasms, and musculoskeletal/connective tissue if typically focus on those with more than 500 Imaging Studies (Graph 7).



ICD Classification	Centralized Image Interpretation	Imaging Studies
A00-B99: Infectious and Parasitic Diseases	4	316
C00-D49: Neoplasms	896	15,837
D50-D89: Haematological and Immunological Diseases	6	101
E00-E90: Endocrine, Nutritional and Metabolic Diseases	65	1,493
F00-F99: Mental and Behavioral Disorders	17	765
G00-G99: Diseases of the Nervous System	21	677
H00-H59: Diseases of the Eye and Adnexa	74	923
I00-I99: Diseases of the Circulatory System	135	2,762
J00-J99: Diseases of the Respiratory System	187	2,603
K00-K93: Diseases of the Digestive System	167	4,061
L00-L99: Diseases of the Skin and Subcutaneous Tissue	21	267
M00-M99: Diseases of the Musculoskeletal System and Connective Tissue	52	969
N00-N99: Diseases of the Genitourinary System	55	1,062
Q00-Q99: Congenital Malformations, Deformations and Chromosomal Abnormalities	3	69
R00-R99: Not Elsewhere Classified	2	64
S00-T98: Injury, Poisoning and Certain Other Consequences of External Causes	35	700
Z00-Z99: Factors Influencing Health Status and Contact with Health Services (e.g. Surgery)	3	35
Healthy	7	572
Unlabeled	33	2,179



Overview of Imaging Studies 5

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Trends in the Use of Centralized Image Interpretation in the Imaging Study

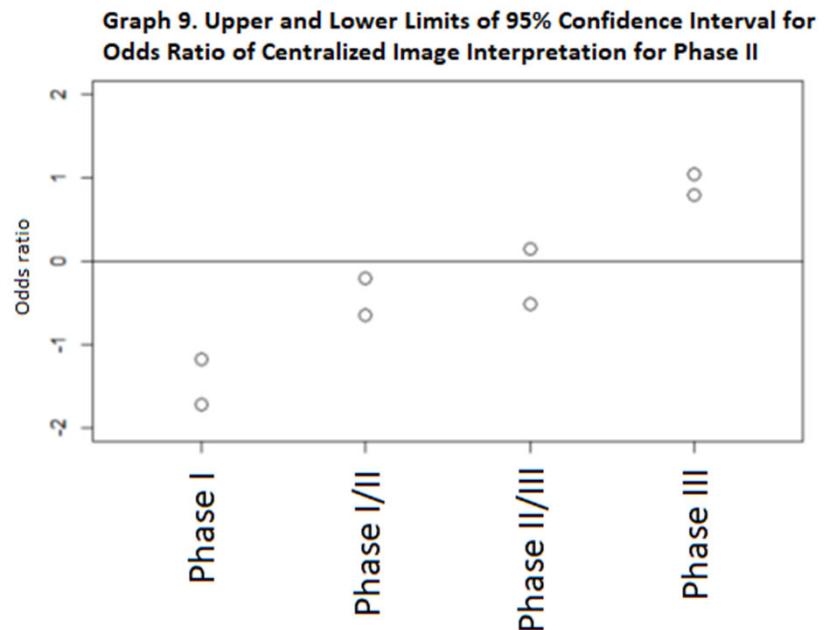
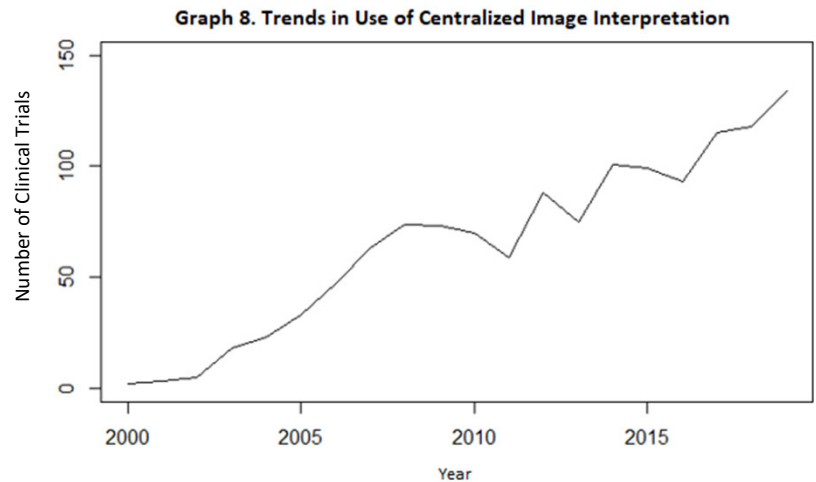
- Trends in the number of centralized image interpretations and the odds ratio of using centralized image interpretation by phase (odds ratio against Phase II*1) are shown in Graph 8.
- The number of centralized image interpretations has been increasing since 2000 (Graph 8).
- The percentage of centralized image interpretations used was higher in Phase III and lower in Phase I and Phase I/II when using Phase II as a baseline comparator (Graph 9).

*1: Logarithmic odds ratio of using centralized image interpretation against Phase II in and Phase X

$$\log\left(\left(\frac{Cx}{Nx - Cx}\right) / \left(\frac{C2}{N2 - C2}\right)\right)$$

Cx: Number of centralized image interpretations performed in Phase X
Nx: Number of imaging studies performed in Phase X

C2: Number of centralized image interpretations performed in Phase II
N2: Number of imaging studies performed in Phase II





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Conclusion

This article was written based on the analysis of ClinicalTrial.gov registry information. Key findings include:

- Imaging Endpoint is used in clinical trials for a wide variety of diseases
- Imaging Endpoint usage is rising
- Imaging Endpoint usage is particularly high in Phase II of clinical trials
- The use of centralized image interpretation is increasing in studies using Imaging Endpoint
- In Phase III, it was found that centralized interpretation is likely to be used.

This indicates that Imaging Endpoints have been actively used in past trials to evaluate treatments, and that the use of centralized image interpretation has been considered in accordance with the characteristics of the trials.

Micron will continue to propose the optimal Imaging Endpoint for each clinical trial and the optimal operation of the Imaging Endpoint, based on the examples left by predecessors and in consultation with sponsors.

Appendix 1 – Imaging Endpoint List Ver.1.0 is intended to be developed as a tool that can be used in this process, outlining a final complete set of conditions. Features of this tool include that it:

- Can be viewed by anyone
- Includes a comprehensive list of frequently used Imaging Endpoints in clinical trials
- List the advantages and disadvantages of using each Imaging Endpoint

In order to promote optimal development of this tool it is hoped that people will read the Imaging Endpoint List and provide feedback on imperfections, errors, and other improvements that can be made.



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LinkedIn	https://www.linkedin.com/company/micron-imaging/
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Imaging Endpoint List Ver.1.0 (1/5)

ICD Classification	Disease	Evaluation Items and Methods	Major Modalities Used
A00-B99 Infectious and Parasitic Diseases	Tuberculosis	Chest X-ray evaluation	Radiography, echography, DEXA, CT, etc.
	AIDS	Bone mineral content assessment	
C00-D49 Neoplasms	Neoplasms in general	<p>Tumor objective response rate, progression free survival, complete remission, disease control rate, disease free survival, RECIST, and other efficacy criteria tailored to the tumor and treatment method*</p> <p>*Although RECIST (including RECIST 1.1) is the basic efficacy criteria, other efficacy criteria are often used for the following cancers or therapies: Tumors for which response criteria other than RECIST are widely used Liver cancer: mRECIST GIST: Choi criteria Malignant pleural mesothelioma: mRECIST Prostate cancer: PCWG2, PCWG3 Glioma: RANO Leukemia: Cheson criteria, CLL2008 Lymphoma: Cheson2007, Lugano</p> <p>Treatments for which efficacy criteria other than RECIST are often used: Immunotherapy: irRC, irRECIST, iRECIST, iRANO, LYRIC</p>	CT, MRI, PET, echography, bone scan, radiography, endoscopy, etc.
D50-D89 Haematological and Immunological Diseases	Myelofibrosis	Spleen volume, tumor objective response rate (ORR), progression free survival (PFS)	Echography, MRI, radiography, CT, etc.
	Sickle cell disease	Tricuspid regurgitation velocity, chest X-ray	
E00-E90 Endocrine, Nutritional and Metabolic Diseases	Diabetes	Retinal thickness, body fat content, left ventricular ejection fraction, vascular lumen formation, liver fat content, blood flow dependent vasodilatory response, etc.	DEXA, MRI, echography, CT, PET, OCT, angiography, etc.
	Failure to thrive	Bone age	
	Obesity	Body fat content, fMRI, liver fat content, bone mineral content	
	Amyloidosis	Amyloid PET	
	Gaucher's disease	Liver volume, spleen volume, bone mineral content	
	Hypophosphatasia, hypophosphatemia	Radiographic Global Impression of Change Scale	
	Mucopolysaccharidosis	Brain volume, spleen volume, liver volume	

Imaging Endpoint List Ver.1.0 (2/5)

ICD Classification	Disease	Evaluation Items and Methods	Major Modalities Used
F00-F99 Mental and Behavioral Disorders	Alzheimer's disease	Brain volume, Tau-PET, Amyloid PET, FDG-PET, fMRI, ARIA, cerebral blood flow	MRI, fMRI, PET, MRS, SPECT, etc.
	Huntington's disease	Brain volume	
	MCI	Brain volume, fMRI, Amyloid PET, Tau-PET	
	Alcoholism, cocaine dependence, nicotine dependence, clinical depression, obsessive-compulsive disorder, post-traumatic stress disorder, autism, attention deficit hyperactivity disorder	fMRI	
	Schizophrenia, anxiety disorder	fMRI Receptor Imaging	
G00-G99 Diseases of the Nervous System	Parkinson's disease	Dopamine transporter imaging, fMRI, 18-F-DOPA PET	MRI, PET, echography, OCT, fMRI, DTI, etc.
	Multiple sclerosis	Brain volume, T1 Lesion, T2 Lesion, Gd-enhanced lesion	
	Epilepsy	Bladder ultrasound	
	Muscular dystrophy	Left ventricular ejection fraction, bone mineral content, muscle mass	
	Cerebral palsy	Assessment of white matter	
H00-H59 Diseases of the Eye and Adnexa	Age-related macular degeneration	Retinal thickness (central fovea thickness, subretinal fluid thickness, etc.) map shrinkage area, and leakage of contrast media	OCT, fluorescein angiography, fundus autofluorescence, fundoscopy, etc.
	Central serous chorioretinopathy, diabetic retinopathy, glaucoma	Retinal thickness (central fovea thickness, subretinal fluid thickness, etc.)	

Imaging Endpoint List Ver.1.0 (3/5)

ICD Classification	Disease	Evaluation Items and Methods	Major Modalities Used
I00-I99 Diseases of the Circulatory System	Ischemic heart disease	Left ventricular ejection fraction, endovascular lumen area, infarct size, left ventricle volume, wall motion, TIMI flow grade	Echography, angiography, MRI, CT, OCT, SPECT, CT, IVUS, venography, etc.
	Pulmonary hypertension	Left ventricular ejection fraction, tricuspid regurgitation, left ventricle volume	
	Arrhythmia	Left ventricular ejection fraction, pulmonary embolism, venous thrombosis	
	Cerebral hemorrhage	Cerebral blood flow, hematoma size, cerebral hemorrhage, edema size	
	Cerebral infarction	Infarct size, cerebral blood flow, ischemic area	
	Atherosclerosis	Endovascular lumen area (lumen diameter, lumen volume, lumen area, etc.), left ventricular ejection fraction, aneurysm, intima-media thickness, blood flow dependent vasodilatory response, atherosclerotic plaque volume	
	Lower-limb ischemia	Endovascular lumen area (lumen diameter, lumen volume, lumen area, etc.), disease free survival, cerebral blood flow, aneurysm evaluation, pulmonary embolism evaluation, ischemia size	
J00-J99 Diseases of the Respiratory System	Sinusitis, nasal polyp	Endoscopic evaluation (Kennedy Score, etc.), polyp size	CT, radiography, echography, endoscopy, lung scintigraphy, etc.
	Idiopathic pulmonary fibrosis	Chest X-ray evaluation, pulmonary embolism evaluation, quantitative lung fibrosis	
	Pneumonia	Chest X-ray evaluation, pulmonary embolism evaluation	
K00-K93 Diseases of the Digestive System	Esophagitis, gastroesophageal reflux disease	Endoscopic evaluation (LA grade, etc.)	Endoscopy, echography, radiography, CT, MRI, MRS, MRE, DEXA, etc.
	Crohn's disease	Endoscopic evaluation (SES-CD, CDEIS, etc.)	
	Ulcerative colitis	Endoscopic evaluation (Mayo Score, UCEIS, etc.)	
	Cirrhosis	Liver firmness, liver fibrosis evaluation, liver volume, blood flow evaluation, bone mineral content	
	Fatty liver, non-alcoholic fatty liver disease	Liver fat content, liver firmness, liver fibrosis evaluation	
	Hepatitis	Bone mineral content, liver fat content, liver firmness, liver fibrosis evaluation	

Imaging Endpoint List Ver.1.0 (4/5)

ICD Classification	Disease	Evaluation Items and Methods	Major Modalities Used
L00-L99 Diseases of the Skin and Subcutaneous Tissue	Psoriasis	Infiltrate thickness, psoriatic arthritis evaluation (e.g., Modified Total Sharp Score)	Photography, echography, etc.
	Acne vulgaris	Assessment of lesion count and lesion area using photographs	
M00-M99 Diseases of the Musculoskeletal System and Connective Tissue	Knee cartilage	Knee cartilage volume, joint space width, knee cartilage treatment evaluation (MOCART, BLOKS, etc.)	Radiography, DXA, MRI, CT, echography, bone scan
	Osteoarthritis	Knee cartilage volume, joint space width, knee arthritis treatment assessment (WOMRMS, Kellgren-Lawrence grade, MOAKS, etc.), bone mineral content	
	Rheumatoid arthritis	Joint space width, erosion score, rheumatoid arthritis treatment evaluation (Modified Total Sharp Score, RAMRIS, etc.)	
	Spondyloarthritis	Joint space width, Erosion Score, Spondyloarthritis evaluation (ASspiMRI, SPARCC score, etc.)	
	Osteoporosis, osteopenia	Bone mineral content, fracture assessment	
N00-N99 Diseases of the Genitourinary System	Kidney disease	Renal volume, left ventricular ejection fraction, bone mineral content	Echography, radiography, MRI, DEXA, CT, etc.
	Overactive bladder	Bladder ultrasound	
	Benign prostatic hyperplasia	Prostate volume	
	Endometriosis	Bone mineral content, endometrial thickness	
	Infertility	Fetal ultrasound, follicular evaluation, endometrial thickness	
Q00-Q99 Congenital Malformations, Deformations and Chromosomal Abnormalities	Polycystic kidney disease	Renal volume, liver volume	MRI, CT, radiography, DEXA, photography, etc.
	Osteogenesis imperfecta	Bone mineral content, fracture assessment	
	Epidermolysis bullosa	Wound site evaluation/wound site area	

Imaging Endpoint List Ver.1.0 (5/5)

ICD Classification	Disease	Evaluation Items and Methods	Major Modalities Used
R00-R99 Not Elsewhere Classified	Aging	Bone mineral content, fMRI, blood flow dependent vasodilatory response, body fat content	DEXA, echography, fMRI, MRI, etc.
S00-T98 Injury, Poisoning and Certain Other Consequences of External Cause	Brain injury	White matter assessment, gray matter assessment, cerebral blood flow, fMRI	Radiography, MRI, echography, CT, DEXA, fMRI, angiography, photography, IVUS, OCT, DTI, etc.
	Spinal cord injury	Spinal cord evaluation, bone mineral content, cerebral blood flow, muscle mass	
	Fracture	Bone mineral content, fracture assessment	
	Burn injury	Wound site evaluation/wound site area	
	In-stent restenosis	Endovascular lumen area (lumen diameter, lumen volume, lumen area, etc.)	
Z00-Z99 Factors Influencing Health Status and Contact with Health Services (e.g. Surgery)	Arthroplasty	Venous thrombosis evaluation, pulmonary embolism evaluation, bone mineral content	Venography, radiography, angiography, lung scintigraphy, CT, DEXA, etc.
Healthy	Healthy Person	fMRI, receptor imaging, pharmacokinetic assessment, pharmacodynamic assessment	PET, fMRI, echography, MRI, CT, SPECT, etc.



Research Method

- Phase I through to Phase III trials that were registered on ClinicalTrial.gov and initiated between January 1, 2020 and December 31, 2019 were included.
- The information used on ClinicalTrial.gov from December 2020 to January 2021 was downloaded.

① Retrieval of all trial information

In the advanced search on ClinicalTrial.gov, phase was set to I, II and III, and the study start year was set to yearly from 2000 to 2019. The data was obtained in .csv format for the front row where .csv format was available. The trial start date and time in the acquired CSV was changed to the information specified when the CSV was downloaded.

② Creation of keyword search strategy

The following four groups of keywords were created from quasi-information.

	Classification	Definition	Examples
1	Modalities	Terms indicating the use of a specific modality	“Magnetic Resonance Imaging”, “fMRI”
2	Endpoints	Terms indicating the use of a specific endpoint	“Lumen loss”, “RECIST v1.1”
3	Other imaging	Terms that indicate the use of imaging, not just modalities and endpoints	“Radiological”, “Imaging”
4	Centralized image interpretation	Terms indicating the conduct of a blinded, central, and independent evaluations	“Angiographic Core”, “Blinded Independent Review”

③ Identification of Imaging Study

Imaging studies were identified as any studies that included the key words and had endpoints that clearly used imaging (e.g. RECIST).

④ Creation of disease keyword groups

Frequently occurring disease terms within the ClinicalTrial.gov registration information of the Imaging Study were identified and a group of disease keywords subsequently created. The classification of disease keywords was based on the ICD classification.

⑤ Endpoint keyword expansion

To ensure the comprehensiveness of endpoint identification, the endpoint identification rate (the percentage of studies in which endpoints were identified in the Imaging Study) was checked for each disease. For diseases with low endpoint identification rates, text mining techniques were used to analyze the text information obtained from the ClinicalTrial.gov web page to expand the endpoints.



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⑥ Identification of centralized image interpretation trials

The ‘Outcome Measure’ information of the trials in which keywords such as centralized image interpretation were found in the image study was confirmed, and trials that did not use imaging endpoint with centralized image interpretation were excluded.

⑦ Verification matrix of Imaging Study usage

A matrix for verifying the usage of the Imaging Study was created by the combining the vectors of the search results by each keyword and the vectors of whether or not the centralized image interpretation was conducted for all trial information, and then used to create an imaging endpoint list.

All Trial Information				Search Results of Disease			Search Results of Modality			Search Results of Endpoints			Centralize Image Interpretation
NCT.No	title	...	URL	D1	...	Dn	M1	...	Mn	E1	...	En	C
XXXX	abc1	...	https://..	1	...	0	0	...	1	1	...	0	0
YYYY	abc2	...	https://..	0	...	1	1	...	1	0	...	1	1
...	...	...	https://..	...	...	...	...	...	...	...	...	...	...
ZZZZ	abc3	...	https://..	0	...	0	0	...	0	1	...	1	0

CSV data downloaded from ClinicalTrial.gov Search results for each keyword on ClinicalTrial.gov
 (0: keyword non-possessive trial or 1: keyword possessive trial)

Figure 1. Verification matrix of Imaging Study usage