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ORIGINAL ARTICLE

Current Status of Pathologic Examinations in Korea, 2011–2015, Based on the Health Insurance Review and Assessment Service Dataset

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Background: Pathologic examinations play an important role in medical services. Until recently, the overall status of pathologic examinations in Korea has not been identified. I conducted a nationwide survey of pathologic examination status using the insurance reimbursements (IRs) dataset from the Health Insurance Review and Assessment Service (HIRA). The aims of this study were to estimate current pathologic examination status in Korea and to provide information for future resource arrangement in the pathology area. **Methods:** I asked HIRA to provide data on IR requests, including pathologic examinations from 2011 to 2015. Pathologic examination status was investigated according to the following categories: annual statistics, requesting department, type of medical institution, administrative district, and location at which pathologic examinations were performed. **Results:** Histologic mapping, immunohistochemistry, and cervicovaginal examinations have increased in the last 5 years. Internal medicine, general surgery, obstetrics/gynecology, and urology were the most common medical departments requesting pathologic examinations. The majority of pathologic examinations were frequently performed in tertiary hospitals. About 60.3% of pathologic examinations were requested in medical institutions located in Seoul, Gyeonggi-do, and Busan. More than half of the biopsies and aspiration cytologic examinations were performed using outside services. The mean period between IR requests and 99 percentile IR request completion inspections was 6.2 months. **Conclusions:** This survey was based on the HIRA dataset, which is one of the largest medical datasets in Korea. The trends of some pathologic examinations were reflected in the policies and needs for detailed diagnosis. The numbers and proportions of pathologic examinations were correlated with the population and medical institutions of the area, as well as patient preference. These data will be helpful for future resource arrangement in the pathology area.

Key Words: Insurance; Pathology, surgical; Cytological pathology; Reimbursement

Pathologic examinations play an important role in medical services. Until recently, overall pathologic examination status in Korea has not been investigated. Understanding the current pathologic examination status is important to establishing future plans for resource arrangement. Byeon and Kim[1] reported the estimated pathologic examination status in Korea using the Health Insurance Review and Assessment Service (HIRA)–National Patient Sample (NPS). Because the HIRA-NPS data was statistically extracted (selection probability, 0.03), some amount of statistical error is inevitable.[2] The current study is a follow-up study using the raw dataset from HIRA. The HIRA dataset did not contain any rejected inspections of insurance reimbursement (IR) requests or new diagnostic techniques that were not approved by various government organizations. However, this dataset is one of the largest medical datasets and it best reflects the current pathologic examination status in Korea. The aims of this study are to estimate the current pathologic examination status according to multiple parameters in Korea, to provide information for future resource arrangement in the pathology era, and to compare differences between NPS and the raw data.

MATERIALS AND METHODS

I requested HIRA to provide the IRs for various pathologic examinations (Table 1) from 2011 to 2015 (data extraction was performed in May 2016). The HIRA provided the data after anonymizing the patient identification numbers and hospital identification numbers. Primary data processing was performed using the R Statistical Software (Foundation for Statistical Computing, Vienna, Austria) ver. 3.2.3 in a remote access system for HIRA. Secondary data processing was performed using the R

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Table 1. Pathologic examination codes using in this study

Main category	Subcategory	Claim codes
Biopsy	1–3 pieces/4–6 pieces/7–9 pieces/10–12 pieces/ more than 13 pieces	C5911/C5912/C5913/C5914/C5915
Non-maligGro	NPB≤6/NPB≥7	C5916/C5917
MaligGro LND	NPB≤20/NPB≥21	C5918/C5919
MaligGro LNDX	NPB≤15/NPB≥16	C5500/C5504
MAPPING	LND/LNDX	C5505/C5508
FS	1–2 specimens/3–6 specimens/7–10 specimens/ equal and more than 11 specimens	C5511/C5512/C5513/C5514
BONE	-	C5520
SPECIAL	Reticulin/Massons' Trichrome/others	C5531/C5532/C5533
IF	IgG/IgA/IgM/IgE/C3/C4/HBsAg/fibrinogen/others	C5541/C5542/C5543/C5544/C5545/C5549/C5546/ C5547/C5548
EM	-	C5550
ENZYME	ATPase-pH 9.4/ATPase-pH 4.9/NADH/acetylcholinesterase/ chloroacetate esterase/others	C5561/C5562/C5563/C5564/C5565/C5566
Etc.	Et cetera	-
IHC	Interpretation by qualified doctor	C5575006
	Interpretation by non-qualified doctor	C5575
	HR	C5590
	EGFR pharmDx kit	CZ503006
	Morphometric Analysis	CY552
CERVIX	Smear/L-based	C5920/CX541
BFC	General/using cytospin examination/L-based	C5930/C5931/CZ521
AC	Conventional/L-AC	C5941/C5943
CB	After BFC/after AC/L-AC	C5940/C5942/C5944
HER2 (FISH)	-	C5967
HER2 (SISH)	-	CZ988
MSI test	-	CX574
OUTSIDE	-	Claim code+009 (subnumber)

Non-maligGro, resected specimen requiring gross sectioning; NPB, number of paraffin blocks; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy; ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; HR, examination of hormone receptor in tissue; CERVIX, cervicovaginal cytopathology; L-, liquid based; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2 (FISH), *HER2* gene fluorescence *in situ* hybridization; HER2 (SISH), *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

Statistical Software ver. 3.3.1 using the t2.micro instance in the Amazon Elastic Compute Cloud (Amazon, Seattle, WA, USA). To evaluate the tendency of each pathologic examination number from 2011 to 2015, linear regression was applied. A p-value less than .05 was regarded as statistically significant.

I estimated the mean period between IR requests and completion of the IR inspections as follows. Since HIRA did not provide the exact date of completion for the IR inspections and provided their data on a monthly basisinstead, a table containing monthly pathologic examination status from January 2011 to December 2014 was formulated, as seen in Table 1 (pathologic examinations in 2015 were excluded due to incomplete IR request inspections). Using this table as the reference table, I obtained sequentially cumulative data by adding up the monthly number, thereby marking the period pertaining to the 33, 66, and 99 percentile inspections of IR requests. Next, I made up the same table again as sequentially. I obtained the time more than 33, 66 and 99 percentile inspections of IR requests were done.

RESULTS

The abbreviations used in this study are as follows. AC, aspiration cytopathology; BFC, body fluid cytopathology; BONE, histopathologic examination for bone; CB, cell block; CERVIX, cervicovaginal cytopathology; EM, tissue electron microscopy; ENZYME, enzyme histochemistry; FS, emergency histopathologic examination during surgery; HER2 (FISH), *HER2* gene fluorescence *in situ* hybridization; HER2 (SISH), *HER2* gene silver *in situ* hybridization; HR, examination of hormone receptor in tissue; IF, tissue immunofluorescent microscopic examination;

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IHC, immunohisto(cyto)chemistry; L-, liquid based; LND, with lymph node dissection; LNDX, without lymph node dissection; MaligGro, resected specimen for malignant tumor requiring gross sectioning; MAPPING, histologic mapping of tumor; MSI, microsatellite instability; Non-maligGro, resected specimen requiring gross sectioning; NPB, number of paraffin blocks; OUTSIDE, outside slide interpretation; SPECIAL, special stain examinations.

A summary and the details for annual pathologic examination status are given in Table 2 and Supplementary Table S1, respectively. Among the main categories, it was found that the total numbers of MAPPING, IF, EM, IHC, CERVIX, and BFC increased during 2011–2015, while the total numbers of ENZYME and CB were decreased. In more detail, the following pathologic examinations increased in 2011–2015: non-maligGro with NPB ≤6, MAPPING LND, MAPPING LNDX, Masson's trichrome stain, IF (IgG, IgA, IgM, C3, C4, fibrinogen, others), EM, IHC (interpretation by qualified doctor, HR, EGFR pharmDx kit), L-CERVIX, L-BFC, L-AC, CB after L-AC, and some of OUTSIDE (C5500009, C5912009, C5916009, C5917009). The following pathologic examinations decreased in 2011-2015: biopsy (more than 13 pieces), IF (IgE and hepatitis B surface antigen), ENZYME (acetylcholinesterase), CERVIX by smear, BFC (general), AC (conventional), and CB (AC). Note that no chloroacetate esterase examinations were performed during the last 5 years.

Most medical and dental departments requested various pathologic examinations (a summary is given in Tables 3 and 4 and the details are given in Supplementary Table S2), but the proportions were quite different. Internal medicine (13,917,799, 46.29%), general surgery (6,334,913, 21.07%), obstetrics/gynecology (3,444,796, 11.46%), and urology (1,769,651, 5.89%) were the most common medical departments (25,467,159, 84.70%) requesting pathologic examinations. These proportions were similar to those of the previous study.[1]

A summary and the details of the pathologic examination status according to type of medical institution are listed in Table 5 and Supplementary Table S3, respectively. The numbers of each type of medical institution were not included in this analysis. The majority of pathologic examinations were frequently performed in a tertiary hospital. Among the different pathologic examinations, biopsy and AC were frequently performed in clinics.

A summary and the details of the pathologic examination status according to the administrative district are listed in Tables 6, 7, and Supplementary Table S4, respectively. About 60.3% of pathologic examinations (20,787,770) were requested in medical institutions located in Seoul (12,249,590, 35.5%), Gyeonggi-do (5,517,990, 16.0%), and Busan (3,020,190, 8.8%).

A summary and the details of the pathologic examination status according to the location at which examinations were performed are listed in Table 8 and Supplementary Table S5, respectively. More than 90% of the resected specimens for malignant tumors requiring gross sectioning (MaligGro) LND, MaligGro LNDX, MAPPING, emergency histopathologic examination during surgery (FS), ENZYME, IHC, CB, and OUTSIDE were performed in their own hospitals. More than half of the biopsies and AC examinations were performed using outside services.

The mean periods between IR requests and the 33, 66, and 99 percentiles IR request inspection completions were 2.2, 2.8, and 6.2 months, respectively. The kernel density estimation plot for each percentile can be found in Fig. 1. The 95 and 99 percentile values of the period for 99 percentile IR request inspection completion were 11 and 25 months, respectively.

DISCUSSION

In this study, I investigated various pathologic examination status according to the following categories: annual statistics, requesting department, type of medical institution, administrative district, and location at which pathologic examinations were performed in Korea, 2011–2015. In the last 5 years, the total numbers of MAPPING and IHC increased. These trends reflect the need for a more accurate pathologic diagnosis. Contrary to how the number of conventional cytopathologic examinations decreased, the number of variable liquid-based cytopathologic examinations increased. After FISH and SISH based *HER2* gene examinations were approved by insurance companies in 2013, the number of *HER2* gene examinations increased. These trends reflect both insurance and public health policies.

Throughout many medical institutions in Korea, pathologists will order a large amount of pathologic examinations for diagnosis. However, only 0.04% of pathologic examinations have been claimed by pathologic departments. These discrepancies come from the difference between actual and administrative claims. In tertiary and general hospitals, various medical examinations were requested based on the inpatient department. In clinics, medical examinations were usually requested based on the major disease code of the patient.

According to HIRA (http://opendata.hira.or.kr/op/opc/olapMdclRcStatsInfo.do) and the Ministry of the Interior (http://

http://jpatholtm.org/

Table 2. Annual pathologic examination status and trend

Main category	2011	2012	2013	2014	2015	Total	Growth rates (%) by 2011	Slope	Adjusted R-squared	p-value
Biopsy	2,084,502 (20.24)	2,092,015 (20.31)	2,086,267 (20.25)	2,052,391 (19.92)	1,985,718 (19.28)	10,300,893 (100)	–4.7	–23,719.2	.617	.072
Non-maligGro	1,269,834 (18.90)	1,371,044 (20.41)	1,349,030 (20.08)	1,340,151 (19.95)	1,388,338 (20.66)	6,718,397 (100)	9.3	20,611.5	.354	.172
MaligGro LND	100,204 (20.04)	106,599 (21.32)	107,083 (21.42)	97,288 (19.46)	88,838 (17.77)	500,012 (100)	–11.3	–3,204.3	.273	.212
MaligGro LNDX	40,003 (18.99)	41,651 (19.77)	42,958 (20.39)	43,528 (20.66)	42,553 (20.20)	210,693 (100)	6.4	697.7	.524	.103
MAPPING	28,429 (15.16)	35,866 (19.12)	38,546 (20.55)	42,042 (22.42)	42,662 (22.75)	187,545 (100)	50.1	3,464.2	.867	.014
FS	111,477 (20.19)	116,373 (21.08)	114,943 (20.82)	107,726 (19.51)	101,583 (18.40)	552,102 (100)	–8.9	–2,843.5	.424	.141
BONE	15,705 (21.11)	15,267 (20.52)	14,275 (19.19)	14,516 (19.51)	14,643 (19.68)	74,406 (100)	–6.8	–287.5	.462	.126
SPECIAL	362,898 (19.53)	364,742 (19.63)	372,751 (20.07)	385,799 (20.77)	371,494 (20.00)	1,857,684 (100)	2.4	3,824.9	.266	.216
IF	59,173 (18.40)	63,043 (19.60)	64,959 (20.20)	66,347 (20.63)	68,110 (21.18)	321,632 (100)	15.1	2,117.8	.939	.004
EM	8,945 (19.07)	9,344 (19.92)	9,452 (20.15)	9,522 (20.30)	9,637 (20.55)	46,900 (100)	7.7	156.2	.821	.022
ENZYME	2,399 (27.80)	1,901 (22.03)	1,437 (16.65)	1,479 (17.14)	1,415 (16.39)	8,631 (100)	–41	–239	.717	.044
IHC	550,773 (17.15)	610,637 (19.01)	653,438 (20.34)	698,083 (21.73)	699,285 (21.77)	3,212,216 (100)	27	38,447	.909	.008
CERVIX	209,750 (17.67)	224,052 (18.88)	226,773 (19.11)	245,152 (20.65)	281,166 (23.69)	1,186,893 (100)	34	16,393.2	.849	.017
BFC	490,524 (18.99)	514,410 (19.92)	511,839 (19.82)	530,399 (20.54)	535,708 (20.74)	2,582,880 (100)	9.2	10,635.7	.861	.015
AC	292,502 (21.91)	314,290 (23.55)	294,545 (22.07)	231,264 (17.33)	202,235 (15.15)	1,334,836 (100)	–30.9	–26,356	.683	.053
CB	117,159 (21.76)	115,878 (21.52)	112,949 (20.98)	103,139 (19.15)	89,320 (16.59)	538,445 (100)	–23.8	–6,841.7	.817	.023
HER2	0 (NA)	0 (NA)	1,176 (10.28)	5,031 (43.96)	5,238 (45.77)	11,445 (100)	NA	1,550.7	.814	.023
MSI	11,837 (20.56)	10,763 (18.70)	10,831 (18.81)	11,919 (20.70)	12,219 (21.22)	57,569 (100)	3.2	192	–.060	.444
OUTSIDE	65,609 (18.04)	72,877 (20.04)	75,695 (20.81)	76,649 (21.07)	72,906 (20.04)	363,736 (100)	11.1	1,836.6	.267	.215

Values are presented as number (%).
Non-maligGro, resected specimen requiring gross sectioning; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy; ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; CERVIX, cervicovaginal cytopathology; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2, *HER2* gene fluorescence *in situ* hybridization and *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

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Table 3. Pathologic examination numbers according to requesting department in 2011–2015: part I (sort based on department codes)

Requesting department	Biopsy	Non-maligGro	MaligGro LND	MaligGro LNDX	MAPPING	FS	BONE	SPECIAL	IF	EM
General	1,983 (0.02)	1,891 (0.03)	5 (<0.01)	2 (<0.01)	0	0	3 (<0.01)	74 (<0.01)	0	0
Internal medicine	6,743,794 (65.47)	2,094,401 (31.17)	10,822 (2.16)	12,804 (6.08)	101,570 (54.16)	17,044 (3.09)	36,536 (49.10)	1,347,183 (72.52)	219,154 (68.14)	30,851 (65.78)
Neurology	26,860 (0.26)	9,082 (0.14)	78 (0.02)	205 (0.10)	50 (0.03)	573 (0.10)	174 (0.23)	10,438 (0.56)	834 (0.26)	1,083 (2.31)
Psychiatry	7,026 (0.07)	1,895 (0.03)	11 (<0.01)	12 (0.01)	14 (0.01)	32 (0.01)	13 (0.02)	1,245 (0.07)	107 (0.03)	9 (0.02)
General surgery	1,309,516 (12.71)	1,679,607 (25.00)	379,207 (75.84)	73,301 (34.79)	57,975 (30.91)	298,270 (54.02)	406 (0.55)	193,095 (10.39)	36,140 (11.24)	5,525 (11.78)
Orthopedic surgery	128,100 (1.24)	452,910 (6.74)	649 (0.13)	6,321 (NA)	249 (0.13)	15,707 (2.84)	26,557 (35.69)	19,256 (1.04)	582 (0.18)	287 (0.61)
Neurosurgery	56,583 (0.55)	181,773 (2.71)	347 (0.07)	13,422 (6.37)	35 (0.02)	29,625 (5.37)	2,979 (NA)	18,216 (0.98)	673 (0.21)	3,672 (7.83)
Thoracic surgery	28,438 (0.28)	100,518 (1.50)	34,694 (6.94)	11,248 (5.34)	2,892 (1.54)	48,875 (8.85)	261 (0.35)	33,537 (1.81)	209 (0.06)	122 (0.26)
Plastic surgery	8,598 (0.08)	110,218 (1.64)	1,916 (0.38)	8,022 (3.81)	1,337 (0.71)	14,533 (2.63)	420 (0.56)	4,498 (0.24)	98 (0.03)	56 (0.12)
Anesthesiology	1,038 (0.01)	835 (0.01)	10 (<0.01)	8 (<0.01)	1 (<0.01)	20 (<0.01)	5 (0.01)	110 (0.01)	2 (<0.01)	0
Obstetrics and gynecology	888,109 (8.62)	1,078,597 (16.05)	26,431 (5.29)	16,294 (7.73)	4,194 (2.24)	43,154 (7.82)	53 (0.07)	16,801 (0.90)	136 (0.04)	152 (0.32)
Pediatrics	37,839 (0.37)	16,037 (0.24)	118 (0.02)	388 (0.18)	23 (0.01)	1,309 (0.24)	3,856 (5.18)	23,871 (1.28)	16,039 (4.99)	3,784 (8.07)
Ophthalmology	20,154 (0.20)	22,715 (0.34)	36 (0.01)	611 (0.29)	10 (0.01)	1,317 (0.24)	14 (0.02)	3,399 (0.18)	132 (0.04)	85 (0.18)
Otorhinolaryngology	123,136 (1.20)	396,701 (5.90)	31,590 (6.32)	17,180 (8.15)	464 (0.25)	50,489 (9.14)	148 (0.20)	46,797 (2.52)	254 (0.08)	197 (0.42)
Dermatology	340,839 (3.31)	222,969 (3.32)	121 (0.02)	4,481 (2.13)	472 (0.25)	5,487 (0.99)	9 (0.01)	80,731 (4.35)	41,682 (12.96)	70 (0.15)
Urology	286,191 (2.78)	215,571 (3.21)	12,449 (2.49)	45,382 (21.54)	17,938 (9.56)	22,137 (4.01)	70 (0.09)	15,361 (0.83)	1,916 (0.60)	542 (1.16)
Radiology	89,520 (0.87)	7,732 (0.12)	1 (<0.01)	2 (<0.01)	1 (<0.01)	4 (<0.01)	300 (0.40)	1,113 (0.06)	0	4 (0.01)
Radiation oncology	2,430 (0.02)	113 (<0.01)	0	0	0	1 (<0.01)	0	202 (0.01)	8 (<0.01)	1 (<0.01)
Pathology	391 (<0.01)	15 (<0.01)	0	0	0	3 (<0.01)	0	3,249 (0.17)	19 (0.01)	4 (0.01)
Laboratory medicine	338 (<0.01)	46 (<0.01)	0	0	0	0	24 (0.03)	921 (0.05)	0	1 (<0.01)
Tuberculosis	233 (<0.01)	20 (<0.01)	0	0	0	0	6 (0.01)	122 (0.01)	0	0
Rehabilitation medicine	8,784 (0.09)	4,392 (0.07)	37 (0.01)	181 (0.09)	30 (0.02)	385 (0.07)	104 (0.14)	2,131 (0.11)	500 (0.16)	135 (0.29)
Nuclear medicine	118 (<0.01)	15 (<0.01)	0	0	1 (<0.01)	0	0	82 (<0.01)	0	0
Family medicine	146,907 (1.43)	49,855 (0.74)	31 (0.01)	17 (0.01)	240 (0.13)	62 (0.01)	23 (0.03)	26,784 (1.44)	263 (0.08)	10 (0.02)
Emergency medicine	15,072 (0.15)	6,035 (0.09)	166 (0.03)	190 (0.09)	41 (0.02)	276 (0.05)	97 (0.13)	5,778 (0.31)	1,381 (0.43)	309 (0.66)
Occupational and environmental medicine	1,876 (0.02)	98 (<0.01)	0	0	0	0	1 (<0.01)	63 (<0.01)	0	0
Preventive medicine	1,394 (0.01)	4,229 (0.06)	0	0	2 (<0.01)	0	0	3 (<0.01)	0	0
Dental department	25,596 (0.25)	60,112 (0.89)	1,293 (0.26)	622 (0.30)	6 (<0.01)	2,799 (0.51)	2,347 (3.15)	2,624 (0.14)	1,503 (0.47)	1 (<0.01)
Etc.	30 (<0.01)	15 (<0.01)	0	0	0	0	0	0	0	0
Summary	10,300,893 (100)	6,718,397 (100)	500,012 (100)	210,693 (100)	187,545 (100)	552,102 (100)	74,406 (100)	1,857,684 (100)	321,632 (100)	46,900 (100)

Values are presented as number (%).
Non-maligGro, resected specimen requiring gross sectioning; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy.

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Table 4. Pathologic examination numbers according to requesting department in 2011–2015: part II (sort based on department codes)

Requesting department	ENZYME	IHC	CERVIX	BFC	AC	CB	HER2	MSI	OUTSIDE	Summary
General	0	5 (<0.01)	363 (0.03)	275 (0.01)	846 (0.06)	13 (<0.01)	1 (0.01)	0	0	5,461 (0.02)
Internal medicine	2,324 (26.93)	897,900 (27.95)	36,501 (3.08)	1,259,857 (48.78)	622,477 (46.63)	369,897 (68.70)	2,622 (22.91)	3,317 (5.76)	108,745 (29.90)	13,917,799 (46.29)
Neurology	2,312 (26.79)	5,100 (0.16)	1,412 (0.12)	53,245 (2.06)	2,423 (0.18)	1,852 (0.34)	5 (0.04)	8 (0.01)	148 (0.04)	115,882 (0.39)
Psychiatry	8 (0.09)	391 (0.01)	666 (0.06)	2,330 (0.09)	435 (0.03)	153 (0.03)	1 (0.01)	2 (<0.01)	24 (0.01)	14,374 (0.05)
General surgery	139 (1.61)	1,413,101 (43.99)	6,204 (0.52)	104,518 (4.05)	489,190 (36.65)	49,603 (9.21)	8,311 (72.62)	53,777 (93.41)	177,028 (48.67)	6,334,913 (21.07)
Orthopedic surgery	321 (3.72)	34,131 (1.06)	3,285 (0.28)	35,414 (1.37)	12,788 (0.96)	3,055 (0.57)	13 (0.11)	7 (0.01)	3,004 (0.83)	742,636 (2.47)
Neurosurgery	186 (2.16)	95,260 (2.97)	1,915 (0.16)	35,088 (1.36)	3,349 (0.25)	2,957 (0.55)	23 (0.20)	8 (0.01)	825 (0.23)	446,936 (1.49)
Thoracic surgery	6 (0.07)	91,268 (2.84)	314 (0.03)	42,808 (1.66)	3,034 (0.23)	13,872 (2.58)	30 (0.26)	92 (0.16)	7,707 (2.12)	419,925 (1.40)
Plastic surgery	91 (1.05)	24,684 (0.77)	107 (0.01)	991 (0.04)	482 (0.04)	388 (0.07)	130 (1.14)	2 (<0.01)	1,254 (0.34)	177,825 (0.59)
Anesthesiology	0	58 (<0.01)	70 (0.01)	371 (0.01)	135 (0.01)	31 (0.01)	0	0	5 (<0.01)	2,699 (0.01)
Obstetrics and gynecology	17 (0.20)	152,242 (4.74)	1,099,372 (92.63)	56,916 (2.20)	28,236 (2.12)	14,401 (2.67)	21 (0.18)	203 (0.35)	19,467 (5.35)	3,444,796 (11.46)
Pediatrics	2,489 (28.84)	31,051 (0.97)	116 (0.01)	38,929 (1.51)	1,821 (0.14)	1,494 (0.28)	0	4 (0.01)	1,258 (0.35)	180,426 (0.60)
Ophthalmology	63 (0.73)	10,629 (0.33)	59 (<0.01)	1,608 (0.06)	848 (0.06)	364 (0.07)	1 (0.01)	0	384 (0.11)	62,429 (0.21)
Otorhinolaryngology	4 (0.05)	125,340 (3.90)	460 (0.04)	9,871 (0.38)	83,493 (6.25)	27,339 (5.08)	1 (0.01)	7 (0.01)	21,799 (5.99)	935,270 (3.11)
Dermatology	197 (2.28)	77,791 (2.42)	308 (0.03)	4,179 (0.16)	3,150 (0.24)	219 (0.04)	7 (0.06)	0	4,957 (1.36)	787,669 (2.62)
Urology	9 (0.10)	193,693 (6.03)	26,181 (2.21)	876,070 (33.92)	31,351 (2.35)	11,392 (2.12)	4 (0.03)	24 (0.04)	13,370 (3.68)	1,769,651 (5.89)
Radiology	2 (0.02)	33,526 (1.04)	298 (0.03)	1,356 (0.05)	31,699 (2.37)	23,850 (4.43)	254 (2.22)	1 (<0.01)	856 (0.24)	190,519 (0.63)
Radiation oncology	0	915 (0.03)	3,773 (0.32)	100 (<0.01)	155 (0.01)	256 (0.05)	1 (0.01)	9 (0.02)	1,367 (0.38)	9,331 (0.03)
Pathology	1 (0.01)	81 (<0.01)	1 (<0.01)	206 (0.01)	3,255 (0.24)	3,488 (0.65)	1 (0.01)	0	10 (<0.01)	10,724 (0.04)
Laboratory medicine	0	7,006 (0.22)	112 (0.01)	22 (<0.01)	5 (<0.01)	2 (<0.01)	0	0	3 (<0.01)	8,480 (0.03)
Tuberculosis	0	75 (<0.01)	10 (<0.01)	1,276 (0.05)	43 (<0.01)	87 (0.02)	0	0	61 (0.02)	1,933 (0.01)
Rehabilitation medicine	392 (4.54)	1,884 (0.06)	648 (0.05)	6,636 (0.26)	606 (0.05)	940 (0.17)	10 (0.09)	8 (0.01)	65 (0.02)	27,868 (0.09)
Nuclear medicine	0	62 (<0.01)	7 (<0.01)	44 (<0.01)	2,514 (0.19)	682 (0.13)	0	0	58 (0.02)	3,583 (0.01)
Family medicine	5 (0.06)	3,524 (0.11)	2,536 (0.21)	16,582 (0.64)	11,341 (0.85)	4,132 (0.77)	1 (0.01)	5 (0.01)	398 (0.11)	262,716 (0.87)
Emergency medicine	64 (0.74)	3,939 (0.12)	2,156 (0.18)	31,115 (1.20)	514 (0.04)	7,460 (1.39)	8 (0.07)	95 (0.17)	293 (0.08)	74,989 (0.25)
Occupational and environmental medicine	0	18 (<0.01)	1 (<0.01)	159 (0.01)	81 (0.01)	2 (<0.01)	0	0	1 (<0.01)	2,300 (0.01)
Preventive medicine	0	5 (<0.01)	2 (<0.01)	24 (<0.01)	188 (0.01)	0	0	0	1 (<0.01)	5,848 (0.02)
Dental department	1 (0.01)	8,537 (0.27)	15 (<0.01)	2,875 (0.11)	372 (0.03)	516 (0.10)	0	0	648 (0.18)	109,867 (0.37)
Etc.	0	0	1 (<0.01)	15 (<0.01)	5 (<0.01)	0	0	0	0	66 (<0.01)
Summary	8,631 (100)	3,212,216 (100)	1,186,893 (100)	2,582,880 (100)	1,334,836 (100)	538,445 (100)	11,445 (100)	57,569 (100)	363,736 (100)	30,066,915 (100)

Values are presented as number (%).
ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; CERVIX, cervicovaginal cytopathology; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2, *HER2* gene fluorescence *in situ* hybridization and *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

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Table 5. Pathologic examination status according to types of medical institutions in 2011–2015

Pathologic examination	Tertiary hospital	General hospital	Hospital	Convalescent hospital	Clinic	Dental hospital	Dental clinic	Public health center	Public health center and county hospital	Oriental hospital	Summary
Biopsy	2,354,632 (22.86)	2,617,426 (25.41)	1,387,062 (13.47)	13,460 (0.13)	3,910,624 (37.96)	13,285 (0.13)	898 (0.01)	0	2,767 (0.03)	739 (0.01)	10,300,893 (100)
Non-maligGro	1,727,593 (25.71)	2,362,797 (35.17)	1,161,784 (17.29)	3,929 (0.06)	1,440,209 (21.44)	18,397 (0.27)	384 (0.01)	0	2,197 (0.03)	1,107 (0.02)	6,718,397 (100)
MaligGro LND	332,395 (66.48)	149,342 (29.87)	13,548 (2.71)	2 (<0.01)	4,032 (0.81)	693 (0.14)	0	0	0	0	500,012 (100)
MaligGro LNDX	151,392 (71.85)	56,436 (26.79)	1,999 (0.95)	16 (0.01)	567 (0.27)	282 (0.13)	0	0	1 (<0.01)	0	210,693 (100)
MAPPING	132,776 (70.80)	52,851 (28.18)	1,705 (0.91)	7 (<0.01)	205 (0.11)	1 (<0.01)	0	0	0	0	187,545 (100)
FS	388,171 (70.31)	158,797 (28.76)	3,730 (0.68)	21 (<0.01)	104 (0.02)	1,279 (0.23)	0	0	0	0	552,102 (100)
BONE	35,926 (48.28)	27,499 (36.96)	9,264 (12.45)	5 (0.01)	333 (0.45)	1,378 (1.85)	1 (<0.01)	0	0	0	74,406 (100)
SPECIAL	817,633 (44.01)	756,183 (40.71)	57,218 (3.08)	778 (0.04)	224,562 (12.09)	1,301 (0.07)	0	0	1 (<0.01)	8 (<0.01)	1,857,684 (100)
IF	226,147 (70.31)	91,857 (28.56)	519 (0.16)	503 (0.16)	1,450 (0.45)	1,156 (0.36)	0	0	0	0	321,632 (100)
EM	35,284 (75.23)	11,411 (24.33)	61 (0.13)	0	144 (0.31)	0	0	0	0	0	46,900 (100)
ENZYME	7,524 (87.17)	1,093 (12.66)	9 (0.10)	0	5 (0.06)	0	0	0	0	0	8,631 (100)
IHC	2,205,781 (68.67)	966,307 (30.08)	25,241 (0.79)	351 (0.01)	9,041 (0.28)	5,481 (0.17)	0	0	12 (<0.01)	2 (<0.01)	3,212,216 (100)
CERVIX	490,880 (41.36)	449,685 (37.89)	70,512 (5.94)	592 (0.05)	174,700 (14.72)	0	0	3 (<0.01)	503 (0.04)	18 (<0.01)	1,186,893 (100)
BFC	1,201,031 (46.50)	1,053,678 (40.79)	162,061 (6.27)	2,248 (0.09)	161,414 (6.25)	2,319 (0.09)	0	0	106 (<0.01)	23 (<0.01)	2,582,880 (100)
AC	219,121 (16.42)	335,929 (25.17)	152,361 (11.41)	645 (0.05)	626,573 (46.94)	145 (0.01)	1 (<0.01)	0	32 (<0.01)	29 (<0.01)	1,334,836 (100)
CB	293,874 (54.58)	196,885 (36.57)	20,101 (3.73)	124 (0.02)	27,092 (5.03)	369 (0.07)	0	0	0	0	538,445 (100)
HER2	8,605 (75.19)	2,747 (24.00)	86 (0.75)	6 (0.05)	1 (0.01)	0	0	0	0	0	11,445 (100)
MSI	49,100 (85.29)	8,318 (14.45)	151 (0.26)	0	0	0	0	0	0	0	57,569 (100)
OUTSIDE	276,885 (76.12)	75,385 (20.73)	1,391 (0.38)	47 (0.01)	9,667 (2.66)	360 (0.10)	0	0	0	1 (<0.01)	363,736 (100)
Summary	10,954,750 (36.43)	9,374,626 (31.18)	3,068,803 (10.21)	22,734 (0.08)	6,590,723 (21.92)	46,446 (0.15)	1,284 (<0.01)	3 (<0.01)	5,619 (0.02)	1,927 (0.01)	30,066,915 (100)

Values are presented as number (%).
Non-maligGro, resected specimen requiring gross sectioning; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy; ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; CERVIX, cervicovaginal cytopathology; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2, *HER2* gene fluorescence *in situ* hybridization and *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

http://jpatholtm.org/

Table 6. Pathologic examination status according to administrative districts in 2011–2015: part I (sort based on administrative districts codes)

Administrative district	Biopsy	Non-maligGro	MaligGro LND	MaligGro LNDX	MAPPING	FS	BONE	SPECIAL	IF	EM
Etc.	0	21 (<0.01)	0	0	0	0	0	0	0	0
Seoul	3,569,090 (30.24)	2,487,048 (32.18)	267,423 (46.34)	113,181 (46.84)	109,012 (50.46)	317,546 (49.92)	22,231 (27.33)	830,214 (37.57)	169,672 (46.92)	26,715 (51.53)
Busan	1,007,783 (8.54)	718,747 (9.30)	57,598 (9.98)	26,132 (10.81)	18,263 (8.45)	61,611 (9.69)	9,156 (11.25)	101,122 (4.58)	39,230 (10.85)	5,599 (10.80)
Incheon	701,281 (5.94)	457,064 (5.91)	42,029 (7.28)	20,095 (8.32)	12,743 (5.90)	41,553 (6.53)	5,388 (6.62)	158,767 (7.18)	18,329 (5.07)	1,915 (3.69)
Daegu	914,814 (7.75)	505,092 (6.54)	43,935 (7.61)	13,662 (5.65)	9,264 (4.29)	35,356 (5.56)	10,090 (12.40)	161,162 (7.29)	22,793 (6.30)	3,466 (6.68)
Gwangju	419,909 (3.56)	314,418 (4.07)	9,260 (1.60)	2,575 (1.07)	1,216 (0.56)	7,133 (1.12)	635 (0.78)	31,555 (1.43)	6,476 (1.79)	1,167 (2.25)
Daejeon	435,340 (3.69)	309,986 (4.01)	19,421 (3.37)	3,075 (1.27)	3,934 (1.82)	13,359 (2.10)	6,968 (8.56)	66,516 (3.01)	12,276 (3.39)	1,732 (3.34)
Ulsan	250,163 (2.12)	168,514 (2.18)	8,207 (1.42)	4,827 (2.00)	138 (0.06)	8,178 (1.29)	2,136 (2.63)	41,843 (1.89)	6,577 (1.82)	698 (1.35)
Gyeonggi-do	1,978,367 (16.76)	1,287,772 (16.66)	67,488 (11.70)	28,882 (11.95)	37,470 (17.35)	78,222 (12.30)	11,599 (14.26)	436,544 (19.75)	49,950 (13.81)	5,760 (11.11)
Gangwon-do	228,857 (1.94)	150,249 (1.94)	6,447 (1.12)	3,586 (1.48)	4,503 (2.08)	10,730 (1.69)	3,151 (3.87)	67,670 (3.06)	7,882 (2.18)	758 (1.46)
Chungcheongbuk-do	250,413 (2.12)	171,847 (2.22)	5,083 (0.88)	1,591 (0.66)	590 (0.27)	5,706 (0.90)	1,927 (2.37)	61,513 (2.78)	2,266 (0.63)	385 (0.74)
Chungcheongnam-do	313,423 (2.66)	155,444 (2.01)	5,393 (0.93)	2,529 (1.05)	3,700 (1.71)	6,237 (0.98)	177 (0.22)	41,352 (1.87)	6,644 (1.84)	727 (1.40)
Jeollabuk-do	349,185 (2.96)	192,196 (2.49)	11,396 (1.97)	7,030 (2.91)	4,207 (1.95)	14,340 (2.25)	3,226 (3.97)	20,504 (0.93)	3,829 (1.06)	458 (0.88)
Jeollanam-do	295,622 (2.50)	177,955 (2.30)	16,774 (2.91)	7,613 (3.15)	30 (0.01)	11,400 (1.79)	245 (0.30)	35,185 (1.59)	1,056 (0.29)	200 (0.39)
Gyeongsangbuk-do	451,285 (3.82)	220,085 (2.85)	1,936 (0.34)	816 (0.34)	1,159 (0.54)	1,852 (0.29)	1,028 (1.26)	44,136 (2.00)	2,140 (0.59)	270 (0.52)
Gyeongsangnam-do	532,322 (4.51)	352,022 (4.55)	12,136 (2.10)	5,078 (2.10)	8,698 (4.03)	19,881 (3.13)	2,205 (2.71)	78,121 (3.54)	9,437 (2.61)	1,572 (3.03)
Jeju	100,466 (0.85)	57,359 (0.74)	2,538 (0.44)	961 (0.40)	1,094 (0.51)	3,023 (0.48)	1,194 (1.47)	33,540 (1.52)	3,070 (0.85)	426 (0.82)
Sejong-si	4,372 (0.04)	3,023 (0.04)	0	0	0	0	0	104 (<0.01)	0	0
Summary	11,802,692 (100)	7,728,842 (100)	577,064 (100)	241,633 (100)	216,021 (100)	636,127 (100)	81,356 (100)	2,209,848 (100)	361,627 (100)	51,848 (100)

Values are presented as number (%).
Non-maligGro, resected specimen requiring gross sectioning; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy.

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Table 7. Pathologic examination status according to administrative districts in 2011–2015: part II (sort based on administrative districts codes)

Administrative district	ENZYME	IHC	CERVIX	BFC	AC	CB	HER2	MSI	OUTSIDE	Summary
Etc.	0	0	0	0	0	0	0	0	0	21 (<0.01)
Seoul	6,622 (71.09)	1,767,200 (46.85)	543,513 (40.40)	1,146,492 (39.19)	338,246 (22.66)	273,523 (44.02)	6,944 (52.83)	36,679 (55.68)	261,862 (61.69)	12,293,213 (35.55)
Busan	521 (5.59)	309,799 (8.21)	106,119 (7.89)	307,125 (10.50)	184,239 (12.34)	42,686 (6.87)	898 (6.83)	6,723 (10.21)	24,460 (5.76)	3,027,811 (8.76)
Incheon	144 (1.55)	234,731 (6.22)	86,153 (6.40)	235,529 (8.05)	92,453 (6.19)	38,392 (6.18)	1,297 (9.87)	4,462 (6.77)	19,867 (4.68)	2,172,192 (6.28)
Daegu	501 (5.38)	402,725 (10.68)	88,991 (6.62)	131,159 (4.48)	150,027 (10.05)	64,550 (10.39)	815 (6.20)	3,096 (4.70)	22,940 (5.40)	2,584,438 (7.47)
Gwangju	136 (1.46)	36,164 (0.96)	38,359 (2.85)	74,981 (2.56)	133,266 (8.93)	4,443 (0.72)	27 (0.21)	0	1,441 (0.34)	1,083,161 (3.13)
Daejeon	53 (0.57)	71,899 (1.91)	40,038 (2.98)	83,455 (2.85)	45,632 (3.06)	7,065 (1.14)	194 (1.48)	36 (0.05)	9,240 (2.18)	1,130,219 (3.27)
Ulsan	4 (0.04)	46,112 (1.22)	18,427 (1.37)	53,310 (1.82)	30,219 (2.02)	8,665 (1.39)	153 (1.16)	2 (<0.01)	3,367 (0.79)	651,540 (1.88)
Gyeonggi-do	849 (9.11)	569,103 (15.09)	219,328 (16.30)	374,113 (12.79)	221,132 (14.81)	92,707 (14.92)	1,820 (13.85)	10,526 (15.98)	58,704 (13.83)	5,530,336 (15.99)
Gangwon-do	24 (0.26)	63,272 (1.68)	35,913 (2.67)	69,897 (2.39)	15,218 (1.02)	17,189 (2.77)	208 (1.58)	624 (0.95)	1,517 (0.36)	687,695 (1.99)
Chungcheongbuk-do	0	13,816 (0.37)	11,057 (0.82)	45,783 (1.56)	30,046 (2.01)	8,844 (1.42)	55 (0.42)	371 (0.56)	2,802 (0.66)	614,095 (1.78)
Chungcheongnam-do	6 (0.06)	26,956 (0.71)	29,260 (2.18)	56,711 (1.94)	23,501 (1.57)	17,295 (2.78)	167 (1.27)	0	2,420 (0.57)	691,942 (2.00)
Jeollabuk-do	8 (0.09)	71,973 (1.91)	28,958 (2.15)	93,002 (3.18)	54,035 (3.62)	2,377 (0.38)	150 (1.14)	259 (0.39)	3,424 (0.81)	860,557 (2.49)
Jeollanam-do	3 (0.03)	55,684 (1.48)	27,585 (2.05)	55,997 (1.91)	68,206 (4.57)	5,211 (0.84)	285 (2.17)	798 (1.21)	6,128 (1.44)	765,977 (2.22)
Gyeongsangbuk-do	10 (0.11)	8,784 (0.23)	26,061 (1.94)	58,344 (1.99)	41,342 (2.77)	6,361 (1.02)	7 (0.05)	1 (<0.01)	330 (0.08)	865,947 (2.50)
Gyeongsangnam-do	339 (3.64)	70,854 (1.88)	30,645 (2.28)	109,302 (3.74)	54,687 (3.66)	29,855 (4.80)	92 (0.70)	2,266 (3.44)	5,066 (1.19)	1,324,578 (3.83)
Jeju	95 (1.02)	22,901 (0.61)	14,340 (1.07)	30,246 (1.03)	10,421 (0.70)	2,217 (0.36)	33 (0.25)	36 (0.05)	933 (0.22)	284,893 (0.82)
Sejong-si	0	5 (<0.01)	484 (0.04)	129 (<0.01)	331 (0.02)	12 (<0.01)	0	0	2 (<0.01)	8,462 (0.02)
Summary	9,315 (100)	3,771,978 (100)	1,345,231 (100)	2,925,575 (100)	1,493,001 (100)	621,392 (100)	13,145 (100)	65,879 (100)	424,503 (100)	34,577,077 (100)

Values are presented as number (%).
ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; CERVIX, cervicovaginal cytopathology; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2, *HER2* gene fluorescence *in situ* hybridization and *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

Table 8. Summary of the types of institutions where pathologic examinations were done during 2011–2015

Pathologic examination	Performed in their own hospitals	Performed using outside services	Convalescent hospital	Etc.	Summary
Biopsy	4,484,330 (43.53)	5,784,009 (56.15)	28,542 (0.28)	4,012 (0.04)	10,300,893 (100)
Non-maligGro	3,621,714 (53.91)	3,034,515 (45.17)	61,635 (0.92)	533 (0.01)	6,718,397 (100)
MaligGro LND	475,825 (95.16)	20,673 (4.13)	3,512 (0.70)	2 (<0.01)	500,012 (100)
MaligGro LNDX	206,618 (98.07)	3,252 (1.54)	821 (0.39)	2 (<0.01)	210,693 (100)
MAPPING	185,267 (98.79)	1,123 (0.60)	1,152 (0.61)	3 (<0.01)	187,545 (100)
FS	545,200 (98.75)	4,089 (0.74)	2,806 (0.51)	7 (<0.01)	552,102 (100)
BONE	58,330 (78.39)	13,576 (18.25)	2,496 (3.35)	4 (0.01)	74,406 (100)
SPECIAL	1,487,782 (80.09)	363,521 (19.57)	5,793 (0.31)	588 (0.03)	1,857,684 (100)
IF	259,628 (80.72)	58,684 (18.25)	3,317 (1.03)	3 (<0.01)	321,632 (100)
EM	31,593 (67.36)	15,175 (32.36)	132 (0.28)	0	46,900 (100)
ENZYME	7,779 (90.13)	787 (9.12)	65 (0.75)	0	8,631 (100)
IHC	3,129,765 (97.43)	62,839 (1.96)	19,503 (0.61)	109 (<0.01)	3,212,216 (100)
CERVIX	901,312 (75.94)	278,397 (23.46)	1,057 (0.09)	6,127 (0.52)	1,186,893 (100)
BFC	2,068,613 (80.09)	490,820 (19.00)	22,888 (0.89)	559 (0.02)	2,582,880 (100)
AC	458,090 (34.32)	855,980 (64.13)	489 (0.04)	20,277 (1.52)	1,334,836 (100)
CB	505,034 (93.79)	29,688 (5.51)	3,073 (0.57)	650 (0.12)	538,445 (100)
HER2	9,856 (86.12)	1,587 (13.87)	2 (0.02)	0	11,445 (100)
MSI	35,244 (61.22)	22,325 (38.78)	0	0	57,569 (100)
OUTSIDE	356,892 (98.12)	6,640 (1.83)	165 (0.05)	39 (0.01)	363,736 (100)
Summary	18,828,872 (62.62)	11,047,680 (36.74)	157,448 (0.52)	32,915 (0.11)	30,066,915 (100)

Values are presented as number (%).
Non-maligGro, resected specimen requiring gross sectioning; MaligGro, resected specimen for malignant tumor requiring gross sectioning; LND, with lymph node dissection; LNDX, without lymph node dissection; MAPPING, histologic mapping of tumor; FS, emergency histopathologic examination during surgery; BONE, histopathologic examination for bone; SPECIAL, special stain examinations; IF, tissue immunofluorescent microscopic examination; EM, tissue electron microscopy; ENZYME, enzyme histochemistry; IHC, immunohisto(cyto)chemistry; CERVIX, cervicovaginal cytopathology; BFC, body fluid cytopathology; AC, aspiration cytopathology; CB, cell block; HER2, *HER2* gene fluorescence *in situ* hybridization and *HER2* gene silver *in situ* hybridization; MSI, microsatellite instability; OUTSIDE, outside slide interpretation.

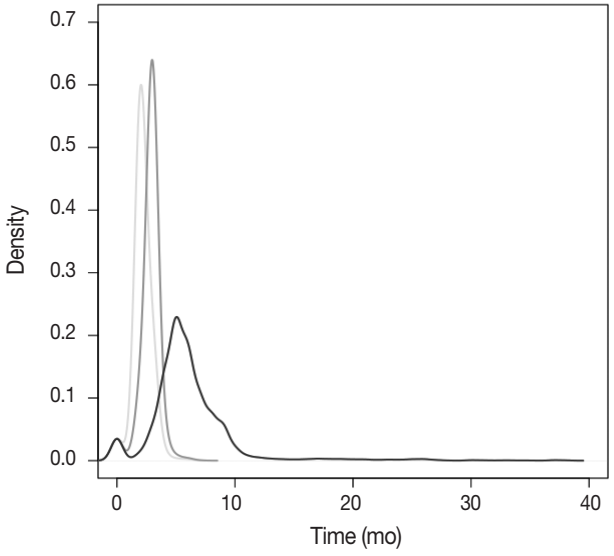

Fig. 1. The kernel density estimation plot of each percentile inspection completion of insurance reimbursement requests (light gray, 33 percentile; dark gray, 66 percentile; black, 99 percentile).

rcps.egov.go.kr:8081/jsp/stat/ppl_stat_jf.jsp), there were 53,252 medical institutions and 51,677,054 people in Korea in December, 2015 (see Supplementary Table S6). The total number of pathologic examinations in each administrative district was positively correlated with both the number of medical institutions and people in the area (both $p < .001$). About 61.7% of OUTSIDE were performed in medical institutions located in Seoul. The proportion of OUTSIDE was higher than the population ratio of Seoul (10,022,181, 19.4%). This phenomenon reflects the patient preference for major medical institutions in Seoul.

Compared to previous studies using common pathologic examination codes in 2013 (approximately 5,440,288 pathologic examinations using the NPS data), there was a 3.2% increase in pathologic examinations (5,615,395 pathologic examinations in 2013). This difference was found to be in the acceptable range as determined by the pilot study. When using the raw HIRA data, implementation of basic algorithms using the NPS data is recommended.

In conclusion, even though this survey using the HIRA dataset did not reflect the exact current status, it is still quite accurate. I expect the present study to help with future operations for the Korean Society of Pathology in terms of understanding the current status and trends of pathologic examinations. I recommended that an in-depth analysis of the status of pathologic examinations

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considering the period between IR requests and inspection completions be made after at least 1 year.

Electronic Supplementary Material

Supplementary materials are available at Journal of Pathology and Translational Medicine (http://jpatholtm.org).

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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