

The gap in the amount of monthly antimicrobial use according to the data source: Electronic Health Record Data vs. National Health Insurance Claim Data in Korea

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Results

Background

- Korea has single health insurance system and insurance claim information on almost all medical practices in Korean hospitals is collected and processed by the Health Insurance Review and Assessment Service (HIRA).
- Since information about prescription of almost all hospitals is available in National Health Insurance (NHI) claim data, recently established the Korea National Antimicrobial Use Analysis System (KONAS) has been using NHI claim data as data source.
- The purpose of this study is to validate the accuracy of NHI claim data.

Methods

- **Study hospitals:** Four tertiary-care hospitals in Korea
- **Data:** all antimicrobial agents prescribed in the study hospitals between Jan 2019 and Dec 2019.
 - ✓ NHI claim data extracted by HIRA
 - ✓ Data extracted by common data model based on electronic health record (EHR) in each hospital.
- **Antibiotics and antifungal agents**
 - ✓ Definition: Anatomical Therapeutic Chemical class J01 and J02. Antiviral, antitubercular, antiparasitic, and topical antimicrobial agents were excluded.
 - ✓ Measurement of antimicrobial consumption: Days of therapy (DOT)/1,000 patient-days
- **HIRA/EHR ratio:** The ratio of monthly antimicrobial consumption calculated using the NHI claim data compared to that calculated using the common data model

- The monthly HIRA/EHR ratio

- ✓ broad-spectrum antibiotics predominantly used for hospital-onset infections: 1.08-1.12
- ✓ broad-spectrum antibiotics predominantly used for community-acquired infections: 1.11-1.21
- ✓ antibacterial agents predominantly used for resistant gram-positive infections : 1.15-1.31

- ✓ narrow-spectrum beta-lactam agents: 1.00-1.05
- ✓ antifungal agents predominantly used for invasive candidiasis: 1.00-1.27
- ✓ antibacterial agents predominantly used for extensive antibiotic-resistant gram-negative bacteria: 0.70-1.09

Table 1. Comparison of the amount of systemic antimicrobial use (administered by oral and parenteral route) for total patients by data source (unit: DOT/1,000 patient-days)

Antimicrobial class	Data source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Total antibacterial agents	HIRA	1,120.92	1,072.58	1,056.78	1,059.00	1,085.66	1,068.98	1,049.70	1,079.51	1,094.57	1,084.71	1,097.11	1,058.33	1,077.25
	EHR	986.02	972.90	950.55	953.41	964.03	950.43	944.03	961.94	975.24	969.53	976.39	963.78	963.85
	Ratio	1.14	1.10	1.11	1.11	1.13	1.12	1.11	1.12	1.12	1.12	1.12	1.10	1.12
Broad-spectrum antibiotics predominantly used for hospital-onset infections	HIRA	215.31	217.64	202.28	203.34	198.17	198.91	196.64	205.34	197.30	203.03	201.42	199.07	203.09
	EHR	196.17	195.35	181.32	186.63	180.90	183.35	179.81	186.08	180.77	182.96	184.26	179.06	184.62
	Ratio	1.10	1.11	1.12	1.09	1.10	1.08	1.09	1.10	1.09	1.11	1.09	1.11	1.10
Broad-spectrum antibiotics predominantly used for community-acquired infections	HIRA	479.57	440.84	434.41	435.04	453.97	448.25	434.05	449.17	455.28	442.46	447.12	423.65	445.34
	EHR	395.13	387.21	375.99	376.27	385.02	381.41	377.83	380.93	392.79	378.85	383.50	381.11	382.93
	Ratio	1.21	1.14	1.16	1.16	1.18	1.18	1.15	1.18	1.16	1.17	1.17	1.11	1.16
Antibacterial agents predominantly used for resistant gram-positive infections	HIRA	48.96	50.15	47.19	46.31	46.92	48.26	45.50	49.65	45.65	51.04	49.63	46.98	47.99
	EHR	41.37	43.45	40.43	38.62	39.93	39.13	37.89	39.71	37.72	40.48	37.84	37.57	39.48
	Ratio	1.18	1.15	1.17	1.20	1.18	1.23	1.20	1.25	1.21	1.26	1.31	1.25	1.22
Narrow-spectrum beta-lactam agents	HIRA	213.93	206.05	212.54	205.72	209.15	208.08	215.48	208.83	213.82	203.76	206.89	210.38	209.61
	EHR	209.64	204.21	209.63	202.89	200.75	197.77	205.86	203.87	204.43	203.12	202.26	204.87	204.13
	Ratio	1.02	1.01	1.01	1.01	1.04	1.05	1.05	1.02	1.05	1.00	1.02	1.03	1.03
Antifungal agents predominantly used for invasive candidiasis	HIRA	24.30	24.95	22.40	22.93	22.68	22.44	21.36	23.84	22.29	22.00	20.20	18.68	22.32
	EHR	20.29	19.72	20.82	19.41	21.76	19.53	21.42	21.81	20.68	20.21	19.86	17.44	20.26
	Ratio	1.20	1.27	1.08	1.18	1.04	1.15	1.00	1.09	1.08	1.09	1.02	1.07	1.10
Antibacterial agents predominantly used for extensive antibiotic-resistant gram-negative bacteria	HIRA	5.57	4.17	4.29	4.97	4.55	3.15	3.35	3.74	4.46	4.11	4.97	2.91	4.18
	EHR	5.11	5.27	6.12	5.68	5.51	4.03	3.59	4.50	6.23	4.94	6.13	3.65	5.05
	Ratio	1.09	0.79	0.70	0.88	0.83	0.78	0.93	0.83	0.72	0.83	0.81	0.80	0.83
Carbapenem	HIRA	57.22	54.06	52.44	53.56	49.56	50.52	52.47	52.26	53.49	57.62	56.87	50.18	53.32
	EHR	49.40	48.75	46.02	48.99	43.68	46.54	46.73	45.78	48.98	50.87	51.32	45.35	47.66
	Ratio	1.16	1.11	1.14	1.09	1.13	1.09	1.12	1.14	1.09	1.13	1.11	1.11	1.12
Fluoroquinolone	HIRA	112.78	101.94	97.00	95.64	98.63	101.81	92.01	95.68	99.56	95.06	98.98	96.76	98.79
	EHR	116.77	115.54	106.50	103.66	108.84	103.76	102.26	104.03	105.12	105.47	110.97	115.20	108.13
	Ratio	0.97	0.88	0.91	0.92	0.91	0.98	0.90	0.92	0.95	0.90	0.89	0.84	1.04
Metronidazole	HIRA	65.03	66.11	63.15	59.35	63.09	60.17	58.18	60.09	65.18	64.83	63.75	61.84	62.50
	EHR	52.35	55.24	52.74	49.90	54.01	50.50	50.78	49.00	53.16	55.09	51.61	49.11	51.91
	Ratio	1.24	1.20	1.20	1.19	1.17	1.19	1.15	1.23	1.23	1.18	1.24	1.26	1.20
Glycopeptide	HIRA	46.38	47.61	45.04	44.19	45.00	46.38	43.83	47.64	43.20	47.59	47.52	45.03	45.77
	EHR	38.43	41.12	38.04	36.69	38.08	37.37	36.47	37.92	35.04	37.87	35.16	35.47	37.28
	Ratio	1.21	1.16	1.18	1.20	1.18	1.24	1.20	1.26	1.23	1.26	1.35	1.27	1.23
3 rd and 4 th generation cephalosporin	HIRA	374.90	354.93	356.35	360.80	374.49	363.94	362.28	371.50	369.08	359.74	359.64	342.37	362.59
	EHR	324.14	316.31	313.46	321.25	324.98	321.10	320.93	324.14	331.20	314.75	317.20	311.31	320.07
	Ratio	1.16	1.12	1.14	1.12	1.15	1.13	1.13	1.15	1.11	1.14	1.13	1.10	1.13
Aminoglycoside	HIRA	25.24	23.69	23.47	25.08	24.83	23.98	23.49	25.89	22.80	24.28	23.96	22.57	24.12
	EHR	26.45	24.74	23.80	24.96	25.80	24.40	24.04	25.61	22.85	24.73	25.26	22.04	24.56
	Ratio	0.95	0.96	0.99	1.00	0.96	0.98	0.98	1.01	1.00	0.98	0.95	1.02	0.98
Macrolide	HIRA	20.67	16.93	18.35	23.70	28.58	24.33	24.58	25.54	32.92	37.54	39.88	37.03	27.53
	EHR	14.91	11.95	12.07	15.71	18.92	16.90	17.95	18.84	21.28	25.17	27.83	25.26	18.94
	Ratio	1.39	1.42	1.52	1.51	1.51	1.44	1.37	1.36	1.55	1.49	1.43	1.47	1.45

Conclusion: The monthly antimicrobial consumption calculated using NHI claim data differs from that calculated using EHR data by up to 30%. It would be desirable to establish a system that can analyze and monitor antimicrobial consumption using EHR data in each hospital in Korea in the future.