

Supplementary Materials for “Utilization and Quality Assessment of Digestive Endoscopy in China: Results from 5-year Consecutive Nationwide Surveys”

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Supplemental table 1. The process of proposal of digestive endoscopy quality indicators by the National Digestive Endoscopy Improvement System of China.

Initially proposed indicators	First round of Delphi process	Second round of Delphi process
Traceability rate of endoscopic decontamination records	✓	x
Qualification rate of endoscopic report	x	x
Rate of adequate gastric preparation before EGD	x	x
Rate of adequate examination time during EGD	x	x
Rate of optical and chemical staining during EGD	x	x
Endoscopic biopsy rate during EGD	✓	x
The proportion of early cancer in all upper GI cancer	The proportion of early cancer in all esophageal cancer during diagnostic EGD The proportion of early cancer in all gastric cancer during diagnostic EGD	✓ ✓
Rate of adequate bowel preparation before colonoscopy	✓	✓
Cecal intubation rate during colonoscopy	✓	✓
Adenoma detection rate of colonoscopy	✓	✓
Polyp detection rate of colonoscopy	x	x
Rate of adequate withdrawal time during colonoscopy	✓	✓
Rate of proper indication of ESD	x	x
Complete resection rate of ESD for early cancer	✓	✓
Success rate of deep cannulation of the ducts of interest during ERCP	✓	✓
Success rate of extraction of common bile duct stones < 1 cm	✓	✓
Diagnostic rate for malignancy in patients receiving EUS-FNA of suspected malignant masses	✓	✓
Complete examination rate of small-bowel capsule endoscopy	✓	✓
Positive finding rate of small-bowel capsule endoscopy	x	x
Adverse event rate during EGD	Combine 5 indicators: Severe adverse event rate	
Adverse event rate during colonoscopy		
Adverse event rate during ESD		✓
Adverse event rate during ERCP		
Adverse event rate during EUS		
-	Newly proposed: Complete examination rate of diagnostic EGD	✓
-	Newly proposed: Complete examination rate of the desired lesions during diagnostic EUS	✓
-	-	Newly proposed: Complete examination

Supplemental table 2. The inclusion of quality indicators in each annual survey and EQI development.

Quality indicators	Included in 2015 survey	Included in 2016 survey	Included in 2017 survey	Included in 2018 survey	Included in 2019 survey	Included in EQI development
Process indicators						
Complete examination rate of diagnostic EGD	No	No	No	No	Yes	Yes
Rate of adequate bowel preparation before colonoscopy	No	No	No	No	Yes	Yes
Cecal intubation rate during colonoscopy	Yes	Yes	Yes	Yes	Yes	Yes
Rate of adequate withdrawal time during colonoscopy	No	No	No	No	No	No
Complete examination rate of small-bowel capsule endoscopy	Yes	Yes	No	No	Yes	Yes
Complete examination rate of gastric capsule endoscopy	No	No	No	No	No	No
Success rate of deep cannulation of the ducts of interest during ERCP	Yes	Yes	Yes	Yes	Yes	Yes
Complete examination rate of the desired lesions during diagnostic EUS	No	No	No	No	Yes	No
Outcome indicators						
Severe adverse event rate	Yes	Yes	Yes	Yes	Yes	Yes
The proportion of early cancer in all esophageal cancer during diagnostic EGD	Yes	Yes	Yes	Yes	Yes	Yes
The proportion of early cancer in all gastric cancer during diagnostic EGD	Yes	Yes	Yes	Yes	Yes	Yes
Adenoma detection rate of colonoscopy	Yes	Yes	Yes	Yes	Yes	Yes
Complete resection rate of endoscopic submucosal dissection for early cancer	Yes	Yes	Yes	Yes	Yes	Yes
Success rate of extraction of common bile duct stones < 1 cm	No	No	No	No	Yes	Yes
Diagnostic rate for malignancy in patients receiving EUS-FNA of suspected malignant masses	Yes	Yes	Yes	Yes	Yes	Yes

EGD, esophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound; EQI, endoscopy quality index; FNA, fine-needle aspiration.

Supplemental table 3. The regional distribution of hospitals included in Survey 2019 and from official information.

Province	Number of hospitals included in Survey 2019	Percentage (%)	Number of hospitals performing endoscopy from official information in 2019	Percentage (%)
Beijing	38	1.50	64	1.02
Tianjin	26	1.02	48	0.77
Hebei	191	7.52	344	5.50
Shanxi	124	4.88	194	3.10
Inner Mongolia	35	1.38	167	2.67
Liaoning	117	4.60	206	3.29
Jilin	46	1.81	129	2.06
Heilongjiang	56	2.20	185	2.96
Shanghai	43	1.69	114	1.82
Jiangsu	111	4.37	320	5.12
Zhejiang	70	2.75	271	4.33
Anhui	67	2.64	281	4.49
Fujian	76	2.99	182	2.91
Jiangxi	83	3.27	224	3.58
Shandong	173	6.81	423	6.76
Henan	184	7.24	383	6.13
Hubei	65	2.56	241	3.85
Hunan	47	1.85	304	4.86
Guangdong	180	7.08	208	3.33
Guangxi	69	2.72	245	3.92
Hainan	19	0.75	38	0.61
Chongqing	66	2.60	136	2.17
Sichuan	182	7.16	414	6.62
Guizhou	113	4.45	173	2.77
Yunnan	113	4.45	261	4.17
Tibet	16	0.63	20	0.32
Shaanxi	121	4.76	275	4.40
Gansu	36	1.42	165	2.64
Qinghai	9	0.35	64	1.02
Ningxia	14	0.55	47	0.75
Xinjiang	51	2.01	127	2.03
Total	2541	100.00	6253	100.00

Supplemental table 4. The grade distribution of the hospitals included in Survey 2019 and from official information.

Hospital grade	Number of hospitals included in Survey 2019	Percentage (%)	Number of hospitals performing endoscopy from official information in 2019	Percentage (%)
Tertiary	1606	63.20	4017	64.24
Secondary	935	36.80	2236	35.76
Total	2541	100.00	6253	100.00

Supplemental table 5. Total variance explanation in principal component analysis of 12 quality indicators.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.555	29.625	29.625	3.555	29.625	29.625	3.093	25.775	25.775
2	1.662	13.847	43.472	1.662	13.847	43.472	2.088	17.396	43.171
3	1.571	13.092	56.564	1.571	13.092	56.564	1.601	13.341	56.511
4	1.005	8.375	64.939	1.005	8.375	64.939	1.011	8.427	64.939
5	0.875	7.294	72.233						
6	0.762	6.350	78.583						
7	0.731	6.093	84.676						
8	0.595	4.960	89.636						
9	0.448	3.737	93.373						
10	0.407	3.388	96.761						
11	0.324	2.703	99.464						
12	0.064	0.536	100.000						

Supplemental table 6. Univariate analysis between potential associated factors and EQI.

Variables	EQI of all hospitals		EQI of Grade II hospitals		EQI of Grade III hospitals	
	Correlation coefficient	P value	Correlation coefficient	P value	Correlation coefficient	P value
Grade of hospital	0.562	0.000	N/A	N/A	N/A	N/A
The total population	0.064	0.001	0.04	0.109	0.089	0.007
Proportion of urban population	0.264	0.000	0.268	0.000	0.164	0.000
Gross regional product (GDP)	0.189	0.000	0.138	0.0000	0.181	0.000
GDP per capita	0.279	0.000	0.262	0.000	0.212	0.000
Per capita disposable income of residents	0.290	0.000	0.289	0.000	0.199	0.000
Health expenditure	0.086	0.000	0.044	0.076	0.109	0.000
Number of endoscopists	0.604	0.000	0.448	0.000	0.533	0.000
Annual volume of digestive endoscopy	0.278	0.000	0.083	0.001	0.527	0.000
Region where the hospital located	N/A	0.000	N/A	0.000	N/A	0.000

EQI, endoscopy quality index; GDP, gross domestic product.