

World Journal of *Gastroenterology*

World J Gastroenterol 2019 February 28; 25(8): 888-1036



**REVIEW**

- 888** Current and future pharmacological therapies for managing cirrhosis and its complications
Kockerling D, Nathwani R, Forlano R, Manousou P, Mullish BH, Dhar A

MINIREVIEWS

- 909** Outcomes of per oral endoscopic pyloromyotomy in gastroparesis worldwide
Mekaroonkamol P, Shah R, Cai Q

ORIGINAL ARTICLE**Basic Study**

- 923** Dbx2 exhibits a tumor-promoting function in hepatocellular carcinoma cell lines *via* regulating Shh-Gli1 signaling
Hu YT, Li BF, Zhang PJ, Wu D, Li YY, Li ZW, Shen L, Dong B, Gao J, Zhu X
- 941** Dynamic changes of key metabolites during liver fibrosis in rats
Yu J, He JQ, Chen DY, Pan QL, Yang JF, Cao HC, Li LJ
- 955** Procyanidin B2 protects against diet-induced obesity and non-alcoholic fatty liver disease *via* the modulation of the gut microbiota in rabbits
Xing YW, Lei GT, Wu QH, Jiang Y, Huang MX

Case Control Study

- 967** Triggers of histologically suspected drug-induced colitis
Brechmann T, Günther K, Neid M, Schmiegeler W, Tannapfel A

Retrospective Study

- 980** Women on the liver transplantation waitlist are at increased risk of hospitalization compared to men
Rubin JB, Sinclair M, Rahimi RS, Tapper EB, Lai JC
- 989** Two-year delay in ulcerative colitis diagnosis is associated with anti-tumor necrosis factor alpha use
Kang HS, Koo JS, Lee KM, Kim DB, Lee JM, Kim YJ, Yoon H, Jang HJ
- 1002** Big-data analysis: A clinical pathway on endoscopic retrograde cholangiopancreatography for common bile duct stones
Zhang W, Wang BY, Du XY, Fang WW, Wu H, Wang L, Zhuge YZ, Zou XP

Observational Study

- 1012** Lethal-7-related polymorphisms are associated with susceptibility to and prognosis of gastric cancer
Jia ZF, Cao DH, Wu YH, Jin MS, Pan YC, Cao XY, Jiang J

EVIDENCE-BASED MEDICINE

- 1024** Establishing a model to measure and predict the quality of gastrointestinal endoscopy
Wang LW, Lin H, Xin L, Qian W, Wang TJ, Zhang JZ, Meng QQ, Tian B, Ma XD, Li ZS

CASE REPORT

- 1031** Crohn's-like acute severe colitis associated with Hermansky-Pudlak syndrome: A case report
Giroit P, Le Berre C, De Maissin A, Freyssinet M, Trang-Poisson C, Bourreille A

ABOUT COVER

Editorial board member of *World Journal of Gastroenterology*, Yoshihiro Ikura, DSc, MD, Chief Doctor, Professor, Department of Pathology, Takatsuki General Hospital, Takatsuki 569-1192, Osaka, Japan

AIMS AND SCOPE

World Journal of Gastroenterology (*World J Gastroenterol*, *WJG*, print ISSN 1007-9327, online ISSN 2219-2840, DOI: 10.3748) is a peer-reviewed open access journal. The *WJG* Editorial Board consists of 642 experts in gastroenterology and hepatology from 59 countries.

The primary task of *WJG* is to rapidly publish high-quality original articles, reviews, and commentaries in the fields of gastroenterology, hepatology, gastrointestinal endoscopy, gastrointestinal surgery, hepatobiliary surgery, gastrointestinal oncology, gastrointestinal radiation oncology, etc. *WJG* is dedicated to become an influential and prestigious journal in gastroenterology and hepatology, to promote the development of above disciplines, and to improve the diagnostic and therapeutic skill and expertise of clinicians.

INDEXING/ABSTRACTING

The *WJG* is now indexed in Current Contents®/Clinical Medicine, Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports®, Index Medicus, MEDLINE, PubMed, PubMed Central, Scopus and Directory of Open Access Journals. The 2018 edition of Journal Citation Report® cites the 2017 impact factor for *WJG* as 3.300 (5-year impact factor: 3.387), ranking *WJG* as 35th among 80 journals in gastroenterology and hepatology (quartile in category Q2).

RESPONSIBLE EDITORS
FOR THIS ISSUEResponsible Electronic Editor: *Shu-Yu Yin*Proofing Editorial Office Director: *Ze-Mao Gong*

NAME OF JOURNAL

World Journal of Gastroenterology

ISSN

ISSN 1007-9327 (print) ISSN 2219-2840 (online)

LAUNCH DATE

October 1, 1995

FREQUENCY

Weekly

EDITORS-IN-CHIEF

Subrata Ghosh, Andrzej S Tarnawski

EDITORIAL BOARD MEMBERS

<http://www.wjgnet.com/1007-9327/editorialboard.htm>

EDITORIAL OFFICE

Ze-Mao Gong, Director

PUBLICATION DATE

February 28, 2019

COPYRIGHT

© 2019 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Establishing a model to measure and predict the quality of gastrointestinal endoscopy

Luo-Wei Wang, Han Lin, Lei Xin, Wei Qian, Tian-Jiao Wang, Jian-Zhong Zhang, Qian-Qian Meng, Bo Tian, Xu-Dong Ma, Zhao-Shen Li

ORCID number: Luo-Wei Wang (0000-0002-6588-0542); Han Lin (0000-0002-0137-5176); Lei Xin (0000-0002-8861-5055); Wei Qian (0000-0002-8693-2090); Tian-Jiao Wang (0000-0002-7537-8089); Jian-Zhong Zhang (0000-0002-2820-3630); Qian-Qian Meng (0000-0003-4719-1425); Bo Tian (0000-0002-1571-7771); Xu-Dong Ma (0000-0002-5943-0879); Zhao-Shen Li (0000-0002-9638-8067).

Author contributions: Li ZS and Ma XD designed and supervised the study equally; Wang LW, Lin H and Xin L contributed equally, conducted this survey and wrote the manuscript; Qian W, Wang TJ, Zhang JZ, and Tian B collected and analyzed the data.

Conflict-of-interest statement:

There are no conflicts of interest arising from this work.

PRISMA 2009 Checklist statement:

The authors have read the PRISMA 2009 Checklist and checked the manuscript accordingly.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Luo-Wei Wang, Han Lin, Lei Xin, Wei Qian, Tian-Jiao Wang, Qian-Qian Meng, Zhao-Shen Li, Digestive Endoscopy Center, Department of Gastroenterology, Changhai Hospital, Naval Medical University, Shanghai 200433, China

Jian-Zhong Zhang, Unimed Scientific Inc., Wuxi 214000, Jiangsu Province, China

Bo Tian, Department of Intensive Care Unit, Shanghai East Hospital, Tongji University, Shanghai 200120, China

Xu-Dong Ma, Department of Medical Quality, Medical and Health Administration, National Health Commission of China, Beijing 100044, China

Corresponding author: Zhao-Shen Li, MD, Attending Doctor, Digestive Endoscopy Center, Department of Gastroenterology, Changhai Hospital, Naval Medical University, 168 Changhai Road, Shanghai 200433, China. lizhaoshenmd@163.com

Telephone: +86-21-31161347

Fax: +86-21-55621735

Abstract

BACKGROUND

Tens of millions of gastrointestinal endoscopic procedures are performed every year in China, but the quality varies significantly and related factors are complex. Individual endoscopist- and endoscopy division-related factors may be useful to establish a model to measure and predict the quality of endoscopy.

AIM

To establish a model to measure and predict the quality of gastrointestinal endoscopic procedures in mainland China.

METHODS

Selected data on endoscopy experience, equipment, facility, qualification of endoscopists, and other relevant variables were collected from the National Database of Digestive Endoscopy of China. The multivariable logistic regression analysis was used to identify the potential predictive variables for occurrence of medical malpractice and patient disturbance. Linear and nonlinear regressions were used to establish models to predict incidence of endoscopic complications.

RESULTS

In 2012, gastroscopy/colonoscopy-related complications in mainland China included bleeding in 4,359 cases (0.02%) and perforation in 914 (0.003%).

[ses/by-nc/4.0/](#)

Manuscript source: Unsolicited manuscript

Received: December 11, 2018

Peer-review started: December 11, 2018

First decision: January 6, 2019

Revised: January 15, 2019

Accepted: January 28, 2019

Article in press: January 28, 2019

Published online: February 28, 2019

Endoscopic-retrograde-cholangiopancreatography-related complications included severe acute pancreatitis in 593 cases (0.3%), bleeding in 2,151 (1.10%), perforation in 257 (0.13%) and biliary infection in 4,125 (2.11%). Moreover, 1,313 (5.0%) endoscopists encountered with medical malpractice, and 5,243 (20.0%) encountered with the disturbance from patients. The length of endoscopy experience, weekly working hours, weekly night shifts, annual vacation days and job satisfaction were predictors for the occurrence of medical malpractice and patient disturbance. However, the length of endoscopy experience and the ratio of endoscopists to nurses were not adequate to establish an effective predictive model for endoscopy complications.

CONCLUSION

The workload and job satisfaction of endoscopists are valuable predictors for medical malpractice or patient disturbance. More comprehensive data are needed to establish quality-predictive models for endoscopic complications.

Key words: Endoscopy; Gastroscopy; Colonoscopy; Endoscopic retrograde cholangiopancreatography; Quality control; Predictive model; Performance predictor

©The Author(s) 2019. Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Tens of millions of gastrointestinal endoscopic procedures are performed each year in China, but there is significant variation in the quality of endoscopy, and the method of measuring quality remains unknown. We collected data from the National Database of Digestive Endoscopy of China to establish a model to measure and predict the quality of gastrointestinal endoscopy in mainland China. The length of endoscopy experience, weekly working hours, weekly night shifts, annual vacation days and job satisfaction were predictors of medical malpractice and patient disturbance. The length of experience and endoscopist/nurse ratio were not adequate to establish a model for the prediction of endoscopic complications.

Citation: Wang LW, Lin H, Xin L, Qian W, Wang TJ, Zhang JZ, Meng QQ, Tian B, Ma XD, Li ZS. Establishing a model to measure and predict the quality of gastrointestinal endoscopy. *World J Gastroenterol* 2019; 25(8): 1024-1030

URL: <https://www.wjgnet.com/1007-9327/full/v25/i8/1024.htm>

DOI: <https://dx.doi.org/10.3748/wjg.v25.i8.1024>

INTRODUCTION

Tens of millions of endoscopic procedures are performed every year in China, but there is significant variation in the quality of endoscopy^[1-8]. Factors affecting the quality of endoscopy are complex and include personnel who perform the procedure, as well as procedures and equipment, which all may result in outcome variation.

Various organizations have developed structured procedures for the management of underperforming endoscopists. There have been studies about performance measures generated by evidence-based consensus that can be used for upper gastrointestinal endoscopy^[9-11]. Performance measures can be used to measure the quality of organizational structure, healthcare procedures or clinical outcomes, providing feedbacks to endoscopists with suboptimal performance to improve their quality of procedures. Hence, it might be beneficial to predict the overall quality of endoscopy in a system consisting of human resources, procedures and equipment. This particularly matters for large developing countries, which urgently need to improve the overall quality of endoscopy.

MATERIALS AND METHODS

Conduct of the survey

As part of its endoscopy quality initiative, the Society of Digestive Endoscopy of the Chinese Medical Association, with support from the National Health and Family

Planning Commission, conducted a nationwide survey in hospitals in all 31 provinces, autonomous regions and municipalities of mainland China in 2013, to investigate the digestive endoscopy infrastructure and overall performance of endoscopic procedures.

Two sets of questionnaires were used in the survey: one was completed by the endoscopic division of each hospital, collecting data that included hospital characteristics, composition and number of endoscopic staff, type and volume of endoscopic procedures, and endoscopic facilities and equipment. The other was completed by individual endoscopists, collecting clinical practice data that included staff work status, weekly working hours, night shifts, vacation days, revenue, work volume, work satisfaction, medical malpractice and patient disturbance. The endoscopic divisions of 6,127 hospitals and 26,203 endoscopists completed and returned the respective questionnaires. All data were imported into the National Database of Digestive Endoscopy.

Data synthesis

The endoscopic divisions of each hospitals were required to follow the Digestive Endoscopy Diagnosis and Treatment Technological Management Regulations by the National Health and Family Planning Commission of China. The survey showed that all of the hospitals had equivalent equipment that had been acquired in accordance with government standards. In the analysis for this study, it was therefore assumed that procedures and equipment were equivalent and there was no difference among the hospitals that participated in the nationwide survey. This assumption meant that the analysis focused on the characteristics of human resources as potential predictive variables at the level of an endoscopic division or endoscopist.

At the level of an endoscopic division, the nationwide survey collected data about gastroscopy, colonoscopy, duodenoscopy, endoscopic ultrasonography, endoscopic retrograde cholangiopancreatography (ERCP), and other endoscopic procedures. We selected the three most common procedures to be analyzed, which included gastroscopy, colonoscopy and ERCP. In the analysis, we only considered the overall complications and did not analyze individual complications. Major complications in the records included gastroscopy/colonoscopy/ERCP-related bleeding and perforation, severe acute pancreatitis and biliary infection.

Statistical analysis

Multivariable logistic regression analyses were used to examine and identify the potential predictive variables for the occurrence of medical malpractice and patient disturbance. Covariates with $P < 0.20$ were selected to be included in the full multivariable model for prediction. Linear and nonlinear (root, square, log) regressions were used to establish models for predicting the incidence of endoscopic complications. The outcome variables (dependent) and predictor variables (independent) are listed in [Table 1](#).

RESULTS

Overview of gastrointestinal endoscopy in mainland China in 2012

In 2012, gastrointestinal endoscopic procedures were performed in 6,128 hospitals in mainland China, involving 26,203 endoscopists and 14,532 endoscopic nurses. The total number of gastrointestinal endoscopy procedures was 28.77 million. The numbers of gastroscopy, colonoscopy and ERCP procedures were 22.25 million, 5.83 million and 200,000, respectively.

Gastroscopy- and colonoscopy-related complications included bleeding in 4,359 cases (0.02%) and perforation in 914 cases (0.003%). ERCP-related complications included severe acute pancreatitis in 593 cases (0.3%), bleeding in 2,151 cases (1.10%), perforation in 257 cases (0.13%) and biliary infection in 4,125 cases (2.11%).

According to reports from endoscopists, 1,313 (5.0%) of them encountered with medical malpractice and 5243 (20.0%) encountered with the disturbance from patients or their relatives.

Establishment of a model to measure and predict quality of gastrointestinal endoscopy

Five workload-related factors (length of endoscopy experience, weekly working hours, weekly night shifts, annual vacation days and job satisfaction) were included in the final multivariable model as impact factors for the occurrence of medical malpractice and patient disturbance ([Table 2](#)).

Linear and nonlinear (root, square, log) regression models were used to test the

Table 1 Description of outcome variables and predictor variables

	Individual endoscopist-related	Endoscopy division-related
Outcome variable	Occurrence of medical malpractice and patient disturbance	Incidence of endoscopic complications
Predictor variable	Length of experience in endoscopy	Length of experience in endoscopy
	Workload (weekly working hours)	Ratio of endoscopists to nurses
	Workload (weekly night shifts)	
	Workload (annual vacation days)	
	Job satisfaction	
	Endoscopist status (part- or full-time)	

correlation between the incidence of endoscopic complications and two selected impact factors, which included the length of endoscopy experience and the ratio of endoscopists to nurses. However, these two factors alone were not adequate to establish an effective predictive model for gastroscopy/colonoscopy- or ERCP-related complications (Tables 3 and 4).

DISCUSSION

Quality control is an important issue in the practice of gastrointestinal endoscopy^[12-21]. The primary objective of this study was to explore the feasibility of establishing a model to measure and predict the overall quality of endoscopic procedures in a system consisting of human resources, procedures and equipment, rather than to measure the performance of specific endoscopic procedures^[22-28].

With the exception of endoscopist status (part- or full-time), the other five impact factors were included in the final multivariable logistic model for predicting the occurrence of medical malpractice and patient disturbance. Even the secondary data were not optimal. They did help examine the relationship between clinical outcomes (*e.g.*, complications) and predictors based on a large sample size, which decreased the effect of selection bias. The clinical outcomes, including the incidence of endoscopic complications, occurrence of medical malpractice and disturbance from patients and their families, were regarded as valuable performance measures or quality indicators in other studies^[12,13,29]. The predictive variables were deemed to be risk factors that might affect the performance of endoscopic procedures in clinical practice, although there was a lack of strong evidence.

Medical professionals, procedures and equipment were included in the system. One assumption of the study was that the processes and equipment were equivalent among all of the hospitals in the survey. The assumption was made on the basis that all of the hospitals were required by government to follow the same regulations and all of the equipment was accredited by a government agency. It was assumed that these hospitals did not violate the rules and breach the standards, however we did not know the true status of each participant. To overcome this limitation in the future, information about process compliance and equipment accreditation status should be collected and updated regularly in the database.

We used linear and nonlinear (root, square, log) regression models to test the correlation between the incidence of endoscopic complications with the two corresponding impact factors. However, the results were not optimal and the two selected impact factors were inadequate for an effective predictive model. In the current analysis of human resource-related factors, there were only endoscopist data. However, it was clear in clinical practice that patient data are important. For example, the severity of the primary disease could affect the outcome of any endoscopic procedure. The suboptimal results indicated that there could be more impact factors and that their interactions are complex. Nevertheless, this study helped create a framework to establish a model that can help predict the quality of endoscopic procedures to some extent.

The major limitation of this study was that the analysis was based on suboptimal data. The data relevant to the quality of endoscopy from the Chinese National Database of Digestive Endoscopy could not cover all aspects of personnel, procedures and equipment. However, considering the large numbers of included hospitals and endoscopists, these data are still deemed valuable.

In conclusion, endoscopist workload-related factors might be valuable predictors for medical malpractice or patient disturbance. More comprehensive data are needed to establish a quality predictive model for endoscopic complications.

Table 2 Results of multivariable logistic regression analysis for occurrence of medical malpractice and patient disturbance

Impact factors	OR (95%CI)	P value
Length of experience in endoscopy	0.77 (0.75-0.78)	< 0.0001
Workload as weekly working hours	0.90 (0.86-0.94)	< 0.0001
Workload as weekly night shifts	0.96 (0.92-0.99)	0.0132
Workload as annual vacation days	1.02 (1.0-1.03)	0.0178
Job satisfaction	2.24 (2.12-2.36)	< 0.0001

Table 3 Results of regression analysis for incidence of endoscopic retrograde cholangiopancreatography-related complications

Impact factors	Linear regression analysis		Nonlinear (root) regression analysis		Nonlinear (square) regression analysis		Nonlinear (log) regression analysis	
	Coefficient	P value	Coefficient	P value	Coefficient	P value	Coefficient	P value
Intercept	0.0326	0.0000	0.0343	0.0022	0.0312	0.0000	0.0222	0.0888
Length of experience in endoscopy	0.0000	0.9895	0.0007	0.7124	-0.0000	0.5579	0.0029	0.4635
Ratio of endoscopists to nurses	-0.0018	0.1499	-0.0065	0.1307	-0.0001	0.3407	-0.0048	0.1389

Table 4 Results of regression analysis for incidence of gastroscopy/colonoscopy-related complications

Impact factor	Linear regression analysis		Nonlinear (root) regression analysis		Nonlinear (square) regression analysis		Nonlinear (log) regression analysis	
	Coefficient	P value	Coefficient	P value	Coefficient	P value	Coefficient	P value
Intercept	0.0064	0.0000	0.0075	0.0057	0.0059	0.0000	0.0070	0.0173
Length of experience in endoscopy	-0.0000	0.4461	-0.0003	0.5274	-0.0000	0.4250	-0.0006	0.5821
Ratio of endoscopists to nurses	-0.0000	0.8001	-0.0005	0.6422	-0.0000	0.8793	-0.0002	0.8611

ARTICLE HIGHLIGHTS

Research background

There are increasingly more gastrointestinal endoscopic procedures performed every year. However, there is significant variation in quality, and the causative factors are complex. Well-accepted predictive models have not been developed.

Research motivation

No related research has focused on this field in China before. However, the quality control of gastrointestinal endoscopy is an important issue. According to our national survey, we found that a number of adverse effects were related to gastrointestinal endoscopy. Therefore, we collected data from the National Database of Digestive Endoscopy of China, aiming to establish a model to measure and predict the quality of gastrointestinal endoscopy in mainland China.

Research objectives

Quality control is an important issue in gastrointestinal endoscopy. The primary objective of this study was to explore the feasibility of establishing a model to measure and predict the overall quality of endoscopic procedures in a system consisting of human resources as well as processes and equipment, rather than to measure the performance of specific endoscopic procedures.

Research methods

Related data were obtained from the nationwide survey in hospitals in all 31 provinces, autonomous regions and municipalities of mainland China in 2013. Multivariable logistic regression analyses were used to examine and identify the potential predictive variables for the occurrence of medical malpractice and patient disturbance.

Research results

In 2012, gastroscopy and colonoscopy-related complications included bleeding (0.02%) and perforation (0.003%). Endoscopic retrograde cholangiopancreatography (ERCP)-related complications included severe acute pancreatitis (0.3%), bleeding (1.10%), perforation (0.13%) and biliary infection (2.11%). Moreover, 5.0% of endoscopists encountered with medical

malpractice and 20.0% encountered with the disturbance from patients or their relatives. Multivariable logistic regression analyses showed that five workload-related factors, including length of endoscopy experience, weekly working hours, weekly night shifts, annual vacation days and job satisfaction, were predictors for medical malpractice and patient disturbance. However, the length of endoscopy experience and the ratio of endoscopists to nurses were not adequate to establish an effective predictive model for gastroscopy/colonoscopy or ERCP.

Research conclusions

In this study, we found for the first time that the workload and job satisfaction of endoscopists are valuable predictors for medical malpractice or patient disturbance. These findings suggest that in the clinical practice, decreasing the workload and increasing the welfare of endoscopists may improve the quality of gastrointestinal endoscopy.

Research perspectives

This study cannot build an ideal model for predicting the quality of gastrointestinal endoscopy. In the future, more comprehensive data are needed to establish quality-predictive models for endoscopic complications. The optimal method would be a multicenter prospective structured study.

REFERENCES

- 1 **Raftopoulos SC**, Segarajasingam DS, Burke V, Ee HC, Yusoff IF. A cohort study of missed and new cancers after esophagogastroduodenoscopy. *Am J Gastroenterol* 2010; **105**: 1292-1297 [PMID: 20068557 DOI: 10.1038/ajg.2009.736]
- 2 **Cohen J**, Safdi MA, Deal SE, Baron TH, Chak A, Hoffman B, Jacobson BC, Mergener K, Petersen BT, Petrini JL, Rex DK, Faigel DO, Pike IM; ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for esophagogastroduodenoscopy. *Am J Gastroenterol* 2006; **101**: 886-891 [PMID: 16635232 DOI: 10.1111/j.1572-0241.2006.00676.x]
- 3 **Faigel DO**, Pike IM, Baron TH, Chak A, Cohen J, Deal SE, Hoffman B, Jacobson BC, Mergener K, Petersen BT, Petrini JL, Rex DK, Safdi MA; ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for gastrointestinal endoscopic procedures: an introduction. *Am J Gastroenterol* 2006; **101**: 866-872 [PMID: 16635230 DOI: 10.1111/j.1572-0241.2006.00677.x]
- 4 **Hu LH**, Xin L, Liao Z, Pan J, Qian W, Wang LW, Li ZS; Endoscopy Audit of the Chinese Society of Digestive Endoscopy. ERCP development in the largest developing country: a national survey from China in 2013. *Gastrointest Endosc* 2016; **84**: 659-666 [PMID: 26996289 DOI: 10.1016/j.gie.2016.03.1328]
- 5 **Gavin DR**, Valori RM, Anderson JT, Donnelly MT, Williams JG, Swarbrick ET. The national colonoscopy audit: a nationwide assessment of the quality and safety of colonoscopy in the UK. *Gut* 2013; **62**: 242-249 [PMID: 22661458 DOI: 10.1136/gutjnl-2011-301848]
- 6 **Enochsson L**, Swahn F, Arnelo U, Nilsson M, Löhr M, Persson G. Nationwide, population-based data from 11,074 ERCP procedures from the Swedish Registry for Gallstone Surgery and ERCP. *Gastrointest Endosc* 2010; **72**: 1175-1184, 1184.e1-1184.e3 [PMID: 20970787 DOI: 10.1016/j.gie.2010.07.047]
- 7 **Baron TH**, Petersen BT, Mergener K, Chak A, Cohen J, Deal SE, Hoffman B, Jacobson BC, Petrini JL, Safdi MA, Faigel DO, Pike IM; ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for endoscopic retrograde cholangiopancreatography. *Am J Gastroenterol* 2006; **101**: 892-897 [PMID: 16635233 DOI: 10.1111/j.1572-0241.2006.00675.x]
- 8 **Cotton PB**, Garrow DA, Gallagher J, Romagnuolo J. Risk factors for complications after ERCP: a multivariate analysis of 11,497 procedures over 12 years. *Gastrointest Endosc* 2009; **70**: 80-88 [PMID: 19286178 DOI: 10.1016/j.gie.2008.10.039]
- 9 **Rutter MD**, Senore C, Bisschops R, Domagk D, Valori R, Kaminski MF, Spada C, Bretthauer M, Bennett C, Bellisario C, Minozzi S, Hassan C, Rees C, Dinis-Ribeiro M, Hucl T, Ponchon T, Aabakken L, Fockens P. The European Society of Gastrointestinal Endoscopy Quality Improvement Initiative: developing performance measures. *United European Gastroenterol J* 2016; **4**: 30-41 [PMID: 26966520 DOI: 10.1177/2050640615624631]
- 10 **Bisschops R**, Areia M, Coron E, Dobru D, Kaskas B, Kuvaev R, Pech O, Ragunath K, Weusten B, Familiari P, Domagk D, Valori R, Kaminski MF, Spada C, Bretthauer M, Bennett C, Senore C, Dinis-Ribeiro M, Rutter MD. Performance measures for upper gastrointestinal endoscopy: A European Society of Gastrointestinal Endoscopy quality improvement initiative. *United European Gastroenterol J* 2016; **4**: 629-656 [PMID: 27733906 DOI: 10.1177/2050640616664843]
- 11 **Chang JJ**, Xu J, Fan D. A comparative method of evaluating quality of international clinical studies in China: Analysis of site visit reports of the Clinical Research Operations and Monitoring Center. *Contemp Clin Trials* 2008; **29**: 654-662 [PMID: 18450522 DOI: 10.1016/j.cct.2008.03.002]
- 12 **Feurer ME**, Draganov PV. Training for advanced endoscopic procedures. *Best Pract Res Clin Gastroenterol* 2016; **30**: 397-408 [PMID: 27345648 DOI: 10.1016/j.bpg.2016.04.005]
- 13 **Williams EJ**, Taylor S, Fairclough P, Hamlyn A, Logan RF, Martin D, Riley SA, Veitch P, Wilkinson ML, Williamson PR, Lombard M. Risk factors for complication following ERCP; results of a large-scale, prospective multicenter study. *Endoscopy* 2007; **39**: 793-801 [PMID: 17703388 DOI: 10.1055/s-2007-966723]
- 14 **Hu LH**, Xin L, Wang LW, Qian W, Liao Z, Li ZS. ERCP practitioners in China: results from national surveys in 2007 and 2013. *Endoscopy* 2016; **48**: 358-363 [PMID: 26760603 DOI: 10.1055/s-0035-1563805]
- 15 **ASGE Quality Assurance in Endoscopy Committee**; Calderwood AH, Day LW, Muthusamy VR, Collins J, Hambrick RD 3rd, Brock AS, Guda NM, Buscaglia JM, Petersen BT, Buttar NS, Khanna LG, Kushnir VM, Repaka A, Villa NA, Eisen GM. ASGE guideline for infection control during GI endoscopy. *Gastrointest Endosc* 2018; **87**: 1167-1179 [PMID: 29573782 DOI: 10.1016/j.gie.2017.12.009]
- 16 **Pullens HJ**, Siersema PD. Quality indicators for colonoscopy: Current insights and caveats. *World J Gastrointest Endosc* 2014; **6**: 571-583 [PMID: 25512766 DOI: 10.4253/wjge.v6.i12.571]
- 17 **Lachter J**, Bluen B, Waxman I, Bellan W. Establishing a quality indicator format for endoscopic

- ultrasound. *World J Gastrointest Endosc* 2013; **5**: 574-580 [PMID: [24255750](#) DOI: [10.4253/wjge.v5.i11.574](#)]
- 18 **Denis B**, Sauleau EA, Gendre I, Piette C, Bretagne JF, Perrin P. Measurement of adenoma detection and discrimination during colonoscopy in routine practice: an exploratory study. *Gastrointest Endosc* 2011; **74**: 1325-1336 [PMID: [21958899](#) DOI: [10.1016/j.gie.2011.07.038](#)]
- 19 **Cha JM**, Moon JS, Chung IK, Kim JO, Im JP, Cho YK, Kim HG, Lee SK, Lee HL, Jang JY, Kim ES, Jung Y, Moon CM, Kim Y, Park BY. National Endoscopy Quality Improvement Program Remains Suboptimal in Korea. *Gut Liver* 2016; **10**: 699-705 [PMID: [27282270](#) DOI: [10.5009/gnl15623](#)]
- 20 **Kastenberg D**, Bertiger G, Brogadir S. Bowel preparation quality scales for colonoscopy. *World J Gastroenterol* 2018; **24**: 2833-2843 [PMID: [30018478](#) DOI: [10.3748/wjg.v24.i26.2833](#)]
- 21 **Gkolfakis P**, Tziatzios G, Dimitriadis GD, Triantafyllou K. New endoscopes and add-on devices to improve colonoscopy performance. *World J Gastroenterol* 2017; **23**: 3784-3796 [PMID: [28638218](#) DOI: [10.3748/wjg.v23.i21.3784](#)]
- 22 **Rutter MD**, Rees CJ. Quality in gastrointestinal endoscopy. *Endoscopy* 2014; **46**: 526-528 [PMID: [24788539](#) DOI: [10.1055/s-0034-1365738](#)]
- 23 **Graham DG**, Banks MR. Advances in upper gastrointestinal endoscopy. *F1000Res* 2015; **4** [PMID: [26918137](#) DOI: [10.12688/f1000research.6961.1](#)]
- 24 **Bretthauer M**, Aabakken L, Dekker E, Kaminski MF, Rösch T, Hultcrantz R, Suchanek S, Jover R, Kuipers EJ, Bisschops R, Spada C, Valori R, Domagk D, Rees C, Rutter MD; ESGE Quality Improvement Committee. Reporting systems in gastrointestinal endoscopy: Requirements and standards facilitating quality improvement: European Society of Gastrointestinal Endoscopy position statement. *United European Gastroenterol J* 2016; **4**: 172-176 [PMID: [27087943](#) DOI: [10.1177/2050640616629079](#)]
- 25 **Bretthauer M**, Aabakken L, Dekker E, Kaminski MF, Rösch T, Hultcrantz R, Suchanek S, Jover R, Kuipers EJ, Bisschops R, Spada C, Valori R, Domagk D, Rees C, Rutter MD; ESGE Quality Improvement Committee. Requirements and standards facilitating quality improvement for reporting systems in gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement. *Endoscopy* 2016; **48**: 291-294 [PMID: [26841269](#) DOI: [10.1055/s-0042-100186](#)]
- 26 **Denzer UW**. Quality Assurance in Endoscopy: Which Parameters? *Visc Med* 2016; **32**: 42-51 [PMID: [27588295](#) DOI: [10.1159/000443653](#)]
- 27 **Cho YK**. How to Improve the Quality of Screening Endoscopy in Korea: National Endoscopy Quality Improvement Program. *Clin Endosc* 2016; **49**: 312-317 [PMID: [27484810](#) DOI: [10.5946/ce.2016.084](#)]
- 28 **Baillie J**, Testoni PA. Are we meeting the standards set for ERCP? *Gut* 2007; **56**: 744-746 [PMID: [17519478](#) DOI: [10.1136/gut.2006.113456](#)]
- 29 **Zhao L**, Zhang XY, Bai GY, Wang YG. Violence against doctors in China. *Lancet* 2014; **384**: 744 [PMID: [25176545](#) DOI: [10.1016/S0140-6736\(14\)61436-7](#)]

P- Reviewer: Chamberlain MC, Ciezki JP, Jones G

S- Editor: Ma RY **L- Editor:** Filipodia **E- Editor:** Yin SY





Published By Baishideng Publishing Group Inc
7901 Stoneridge Drive, Suite 501, Pleasanton, CA 94588, USA
Telephone: +1-925-2238242
Fax: +1-925-2238243
E-mail: bpgoffice@wjgnet.com
Help Desk: <http://www.f6publishing.com/helpdesk>
<http://www.wjgnet.com>

