Multi-center Study on the Effectiveness and Safety of Artificial Intelligence Assisted System in the Clinical Application of Digestive Endoscopy

Subtopic 4: Study on the effectiveness of artificial intelligence assistant system in improving the training effect of advanced physicians' enteroscopy

Short Title:EndoAngel Study

NCT	-
Trial number	EA-21-005
Protocol version	1.0
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Country	China
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目录

1 Summary

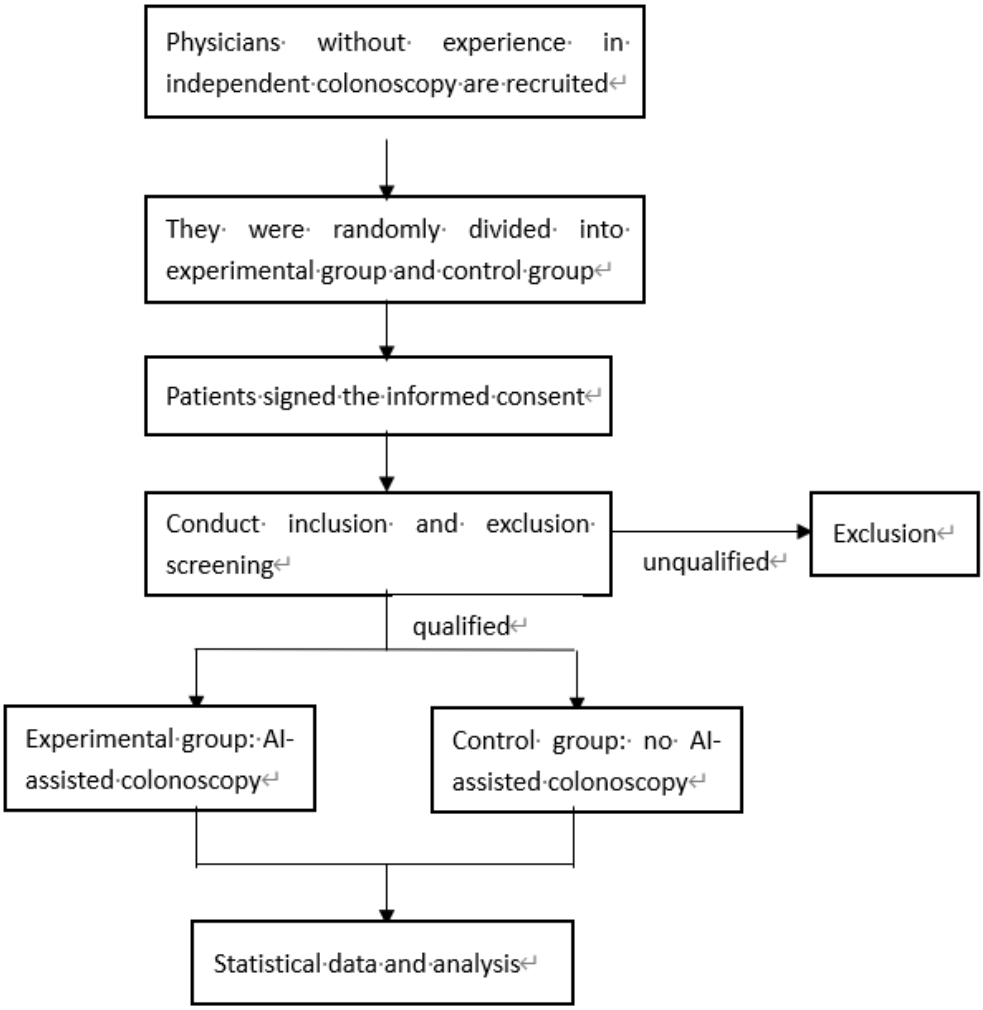
Title：	Multi-center Study on the Effectiveness and Safety of Artificial Intelligence Assisted System in the Clinical Application of Digestive Endoscopy Subtopic 4: Study on the effectiveness of artificial intelligence assistant system in improving the training effect of advanced physicians' enteroscopy
Short Title：	*EndoAngel Study*
Trial number：	EA-21-005
Research system	EndoAngel
Expected effect：	To explore whether the AI-assisted system(EndoAngel) can promote the operation training of beginners' colonoscopy.
Primary Endpoint：	1. CUSUM learning curve for colonoscopy (ACE scoring scale) 2. The difference in average test scores before and after the training
Secondary Endpoints:	1 Detection rate of advanced adenoma 2 Polyp Detection Rate, PDR 3 Average number of adenomas detected per patient 4 The detection rate of large, small and micro polyps 5 The average number of large, small and micro polyps detected 6 The detection rate of large, small and micro adenomas 7 The average number of large, small and micro adenomas detected 8 The detection rate of adenoma in different sites 9 The average number of adenomas detected in different sites Number of missed return of the sliding endoscopy/number of successful return of the sliding endoscopy 10 Real-time gut cleanliness score 11 Withdraw overspeed percentage 12 The withdraw time 13 Ratio of ileocecal reach
Trail design：	Prospective, randomized controlled, intervention, multi-center study
Participants：	Male and female subjects aged 50 years or older will require colonoscopy, and voluntarily provide imaging data ofcolonoscopy, and sign an informed consent form.
Sample size：	385 samples needed to be enrolled

Study Process：	1.Subjects meeting all inclusion criteria and those failing all exclusion criteria were included in the study before colonoscopy; 2.Include qualified novice doctors for colonoscopy training 3. Patients who met the requirements were enrolled and randomly assigned as follows The experimental group: received painless colonoscopy training with the assistance of the artificial intelligence assistant system, which could prompt abnormal lesions and real-time withdrawal speed, and feedback the overspeed percentage. Control group: routine painless enteroscopy training, no special tips. 4.After colonoscopy, the teacher scored the colonoscopy using ACE scoring scale
Security	Safety incidents shall be evaluated and reported according to the quality management measures for clinical trials of medical devices

1.1 Time and Event Tables

Eents/visits	Screening period (d -30~-1)	The day of colonoscopy(d 0)	Follow-up(d 1-14)
Informed Consent	X		
Demographic information	X		
Urine/blood pregnancy test	X		
Medical history/surgical history	X		
physical examination	X		
Selection/exclusion criteria	X		
colonoscopy		X	
Accompanying therapy	X	X	
Accompanying medication	X	X	
Adverse events		X	X
Pathological findings			X
Research completed			X

1.2 Flow chart



2 Introduction

Endoscopic diagnosis and treatment play an important role in the discovery and treatment of digestive tract diseases. Common endoscopic examination includes gastroscopy, colonoscopy, enteroscopy, capsule endoscopy, ultrasound gastroscopy, endoscopic retrograde cholangiopancreatography and other related techniques, which can be used in the diagnosis and follow-up of early gastric cancer, peptic ulcer, esophageal varices, precancerous lesions, intestinal polyps, intestinal adenomas, bowel cancer lesions, inflammatory bowel diseases, pancreatic diseases, biliary diseases, etc. At present, digestive endoscopy almost covers the diagnosis of most diseases of the digestive tract, and the digestive system diseases that can not be seen in the direct visual field of endoscope can also be realized by the related techniques based on ultrasound endoscopy, ERCP and other endoscopy (we call endoscopy here), so as to achieve the coverage of the whole digestive system. It can be seen that digestive endoscopy is of great significance for the diagnosis and development of digestive system diseases. At present, the demand for endoscopic examination in China is high, and the supply of endoscopic surgery in hospitals is short of supply, which puts forward high requirements for the proficiency and accuracy of operation doctors.

In recent years, deep learning has developed rapidly in the field of medicine.Andre Esteva et al. used deep neural networks (DNN) to classify skin cancer to an expert level. Our previous experiments show that deep learning has high accuracy in endoscopic quality monitoring, which can effectively standardize the operation of doctors, reduce the blind area of examination, and improve the quality of endoscopic examination. At the same time, it can also monitor the doctor's withdrawal time and improve the detection rate of adenoma. in the previous work of our group, we have successfully developed a deep learning-based enteroscopy speed monitoring, intestinal cleanliness evaluation, and in clinical trials to verify the effectiveness of artificial intelligence model in improving the quality of gastroscopy, enteroscopy.

Based on the above rich foundation of preliminary work and the huge demand in the field of colonoscopy training, we intend to train beginners in colonoscopy operation by comparing the cases of EndolAngel assistance and no EndolAngel assistance. To explore whether AI can promote the training of colonoscopy for beginners.

3 Selection

The subjects in this study were divided into endoscopists and colonoscopy patients. The endoscopists were required to be beginners without independent experience in colonoscopy, and the colonoscopy patients were male or female ≥50 years old who needed to undergo colonoscopy screening, volunteered to provide endoscopic imaging data and signed informed consent, and such patients were included in the study.50 years of age is the recommended age for the first colonoscopy screening, so the investigation of subjects ≥50 years of age can better represent the quality of the colonoscopy test population。

3.1 Endoscopic physician

- Inclusion criteria

Novice colonoscopists without previous experience in independent colonoscopy;

- Exclusion criteria

1）The number of operating cases does not meet the requirement of sample size

2）could not provide informed consent

3.2 Patients

- Inclusion criteria

1) Male or female ≥50 years old;

2) Able to read, understand and sign informed consent

3) The investigator believes that the subjects can understand the process of the clinical study, are willing and able to complete all study procedures and follow-up visits, and

cooperate with the study procedures

4) Patients requiring colonoscopy

➢ Exclusion criteria

1) Have drug or alcohol abuse or mental disorder in the last 5 years

2) Pregnant or lactating women

3) Patients with known multiple polyp syndrome;

4) patients with known inflammatory bowel disease;

5) known intestinal stenosis or space-occupying tumor;

6) known colon obstruction or perforation;

7) patients with a history of colorectal surgery;

8) Patients with previous history of allergy to pre-used spasmolysis;

9) Unable to perform biopsy and polyp removal due to coagulation disorders or oral anticoagulants;

10) High risk diseases or other special conditions that the investigator considers the subject unsuitable for participation in the clinical trial

3.3 Definition of enrollment

After participants signed informed consent, they were randomized before colonoscopy. The randomization time was the enrollment time, and was recorded in CRF.

4 Endpoints

4.1 Primary Endpoint

1) CUSUM learning curve for colonoscopy (ACE scoring scale)

2) Average test score difference before and after training

4.2 Secondary Endpoints

1) Detection rate of advanced adenoma：the numerator is the number of patients diagnosed with advanced adenomas, and the denominator is the total number of patients undergoing colonoscopy,Advanced adenoma was defined as > 10mm adenoma, villous adenoma, tubular villous adenoma, high-grade intraepithelial neoplasia, and carcinoma.

2) Polyp Detection Rate, PDR：the numerator is the number of patients with polyps detected by colonoscopy, and the denominator is the total number of patients who underwent colonoscopy

3) Average number of adenomas detected per patient：the numerator is the total number of adenomas detected by colonoscopy, and the denominator is the total number of patients undergoing colonoscopy.

4) The detection rate of large, small and micro polyps:the numerator is the number of patients with large (≥10 mm), small (6-9 mm) and micro-small (≤5 mm) polyps detected by colonoscopy, and the denominator is the total number of patients receiving colonoscopy.

5) The average number of large, small and micro polyps detected:the numerator is the total number of large (≥10 mm), small (6-9 mm) and micro-small (≤5 mm) polyps detected by colonoscopy, and denominator is the total number of patients undergoing colonoscopy.

6) The detection rate of large, small and micro adenomas:the numerator is the number of patients with large (≥10 mm), small (6-9 mm) and micro-small (≤5 mm) adenomas detected by colonoscopy, and the denominator is the total number of patients receiving colonoscopy.

7) The average number of large, small and micro adenomas detected:the numerator is the total number of large (≥10 mm), small (6-9 mm) and micro-small (≤5 mm) adenomas detected by colonoscopy, and denominator is the total number of patients undergoing colonoscopy.

8) The detection rate of adenoma in different sites:the numerator is the number of patients with adenomas detected in the rectum, sigmoid colon, descending colon, transverse colon, ascending colon, ileocecal region and other sites during colonoscopy, and the denominator is the total number of patients receiving colonoscopy.

9) The average number of adenomas detected in different sites:the numerator is the total number of adenomas detected in the rectum, sigmoid colon, descending colon, transverse colon, ascending colon, ileocecal region and other sites during colonoscopy, and the denominator is the total number of patients undergoing colonoscopy.

10) Number of missed return of the sliding endoscopy/number of successful return of the sliding endoscopy:the numerator is the total number of sliding endoscopy during colonoscopy, and the denominator is the number of sliding endoscopy and successful return endoscopy during colonoscopy

11) Real-time gut cleanliness score:during colonoscopy, a real-time intestinal cleanliness score was given by EndoAngel based on the Boston-scale Boreal Preparation Score (BBPS).

12) withdraw overspeed percentage:the ratio of the overspeed duration to the total duration in the process of withdrawal.

13) The withdraw time:the time between colonoscopy arrival at ileocecal valve and colonoscopy exit from anus.

14) Ratio of ileocecal reach:for a period of time, the number of colonoscopies that failed to reach the ileocecal part accounted for the proportion of the total number of colonoscopies.

4.3 Safety evaluation endpoints and other secondary endpoints

Adverse events shall be determined according to the definition in the code for the quality management of adverse events of medical devices. The following types of adverse events should be recorded and calculated in the hospital history and CRF. According to the CRF table, the occurrence time, starting and ending time, intervention measures and treatment results should be filled in when recording. The severity should be referred to the previous literature and CTCAE 5.0 standard.

5 Purpose and overall design

5.1 Purpose

The purpose of this study is to explore whether the AI-assisted system(EndoAngel)can promote the operation training of beginners' colonoscopy.

5.2 Overall design

This is a prospective, muti-center, randomized controlled trial study.

6 Study process

6.1 Summary of Study Process

• If the patient meets the inclusion criteria, the patient is invited to participate in the study and then the informed consent procedure for the clinical trial is applied.

• Assess patients' eligibility based on the inclusion/exclusion criteria.

• If the patient meets the inclusion/exclusion criteria, information prior to colonoscopy

will be collected

• If the patient is enrolled, he will be randomized

• colonoscopy is performed after informed consent. Any intraoperative adverse events are recorded on theCRF for submission and subsequent analysis.

• Follow-up will be performed from the postoperative to the study completion, as detailed in the time and event table.

6.2 Enrollment

Only after patients signed the informed consent, can the research-related procedures be conducted.

6.2.1Informed Consent

According to the Helsinki Declaration, patients are not allowed to participate in the study without adequate informed consent. The principal investigator is responsible for ensuring that no patient was enrolled in the study without adequate informed consent. Failure to obtain informed consent and failure to document this process is considered a violation of the Helsinki Declaration and the study protocol.

All informed consent documents (ICDs) must be approved by ethics. Patient's informed consent requires documentary record on the informed consent by himself in his primary language.

The investigator or trained designated person performs a preliminary screening to determine if the patient generally meets the eligibility criteria for the study. If yes, the investigator or trained designee should recommend the patient to participate in the study. If the patient agrees to participate, they will need to sign an informed consent document.

The investigator or trained designated person should confirm that the subject understands thefollowing points in the study:

- The purpose of research,
- Potential risks or adverse events,
- Potential risks or adverse events directly related to participating the research,
- The likelihood of failure,
- Research requirements include follow-up visits,
- All rights of the subject as a participant in the clinical study.

After explaining the purpose of the study, the investigator or trained designee should answer any questions from the subject. If the subject agrees to participate, his or her wishes must be recorded by signing and dated on the EC-approved ICF, and the document should be signed and dated by the patient receiving the informed consent.

After successful completion of the informed consent process, the investigator or trained designated person will assess the eligibility of patients based on the protocol.

6.2.2 Patient Selection

All endoscopists and patients who needed colonoscopy agreed to use their results for correlation analysis, were screened based on the inclusion/exclusion criteria. Patients who passed the screening were enrolled and recorded in the subject screening and enrollment tables. There is no bias in the choice of the enrolled subjects. The date of screening, the results (enrolled or not), and the primary reason for not selecting subjects (such as not meeting inclusion criteria, or notinterested in participating in the study) will be recorded.

After the patients are enrolled, the research center should complete the preoperative study data collection.

It is desirable to be able to collect complete data for all enrolled patients, without who withdrawal from the study.

6.2.3 Subject identification number

Each subject is numbered after obtaining informed consent.

The colonoscopist number starts with EAE as a fixed number and starts with 0001 according to the time of obtaining the informed consent.For example, subject No. 1 signed the informed consent was EAE0001, followed by subject No. 2, EAE0002.

The colonoscopy patients were numbered starting with EA as a fixed number and starting with 0001 according to the time of obtaining the informed consent.For example, the number of the first subject to sign the informed consent in Southern Medical was EA0001, followed by the second subject EA0002.

Once the subject identification number is assigned, the number is not reusable.

6.3 Treatment Description

This section applies to individuals who have signed an approved informed consent and

have been identified as eligible to participate in this study on the basis of the inclusion and exclusion criteria. This section introduces the preoperative, surgical and postoperative management of subjects in detail.

6.3.1 Patient Screening Assessments

1） History

2） Physical examination

3） Hematuria pregnancy test (if required)

6.3.2 Pre-Procedure Managements

1） Fasting for 6 hours and water deprivation for 2 hours before examination

2） Routine intestinal preparation.

3） Psychological counseling.

4） Performing routine anesthesia for painless colonoscopy patients.

6.3.3 Intraoperative Managements

1） Patient position: prone position with appropriate restraint.

2） Insertion route: according to the actual situation of the subject, usually through the anus

3） Patients in the control group received colonoscopy without AI assistance, and patients in the experimental group received colonoscopy with AI assistance.The advanced physician carries on the colonoscopy examination under the teacher's guidance.

4） After the examination, the teacher scored the colonoscopy according to the ACE scoring scale.

6.3.4 Post-operative Managements

1） Postoperative routine nursing

2） The anesthetized subjects were observed until they woke up

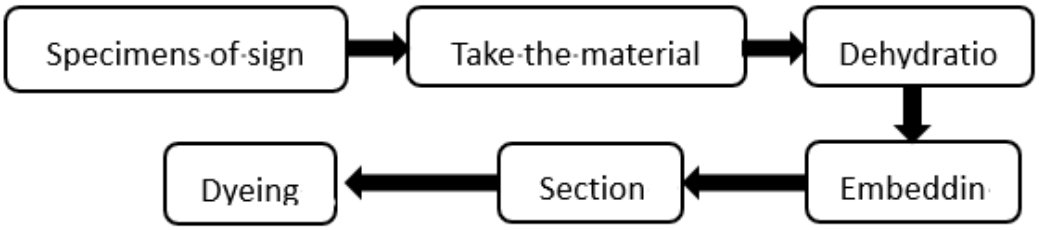
3） Patients with no lesions such as polyps were followed up until they woke up and left

the endoscopic room.

4） Clinical information such as the examining physician, duration of examination, sedation status, whether to ileocecal reach, bowel readiness, complications, polyp characteristics (number, location, size, color, and shape), and pathological results will be collected and recorded in a Web-based data management system.

5） The images and video data were collected for the functional evaluation of EndoAngel, such as the withdrawal speed , the number of sliding not returned/sliding returned, real-time intestinal preparation score, polyp detection and typing, etc.

6.3.5 Specimen Processing Procedures



6.4 Suspension and withdrawal

Patients who were screened and confirmed to be eligible for the study, signed the informed consent and completed the randomization were considered as enrolled. If serious program deviation, withdrawal, or death occurs, the subject study is considered to be suspended. If the subject discontinues the study after obtaining informed consent, the data before the discontinuation will still be included in the study-related analysis.

6.4.1 Pre-Procedure

In any time during the study period, even before Colonoscopy, participants could withdraw their informed consent whenever necessary. Researchers can withdraw participants before surgery according to safety considerations in the inclusion and exclusion criteria.

6.4.2 Intraprocedure

For safety reasons, the investigator may have the subject quit during the procedure. For example, the patient is not suitable for receiving the instrument for the study or the endoscopistsdo not use the specified instrument for any reason. If the following serious

cases occur, please withdraw during the operation:

a) perforation

b) bleeding

c) allergy to narcotic drugs

d) Intestinal cleanliness is very poor, endoscopic physicians can not smoothly advance: a single intestinal segment is less than 1 point

e) can not complete colonoscopy due to obstruction, intolerance, inflammatory bowel disease or colorectal resection

f) can not biopsy due to coagulation dysfunction or oral anticoagulants

6.4.2 Replacement

Subject will be deemed to have commenced the study upon completion of the informed consent process, and any subject who has been discontinued prior to or during the Colonoscopy will not subsequently be replaced by other subjects

6.5 Randomization and Blinding

6.5.1 Randomization Implementation

Randomization is conducted according to the study protocol, and the random contents are implemented in an electronic system block-randomized manner (n = 4; experimental group/control group = 1). Randomization prior to Colonoscopy to decide whether to use EndoAngel. The researchers randomized the random results generated by the electronic system, and the generated random results were stored in the research center. The random time (accurate to minute), random person, subject number and acronym were recorded in the corresponding positions of the electronic system.

6.5.2 Blinding Implementation and Protection

Subjects and evaluators are blinded according to the protocol.

Randomization results will be kept confidential to the subjects in general. Randomization results are not reflected in inpatient history and other subject access documents. During and after the examination, study personnel should take care not to talk to the subject about the results of the randomization to avoid unnecessary unblinding

The assessors are blinded, and the data analysis team and pathologists could not obtain the randomization results from the medical history data.

6.5.3 Unblinding

Uncovering or breaking the blindness means displaying the randomized results to the subjects or evaluators. Researchers should protect the blind method as far as possible. Uncovering the randomized results of a single subject may lead to the leakage of the randomized results of other subjects. Any leakage of the randomized results will have a significant impact on statistical analysis. In general, it is prudent to deal with the disclosure of blind law. In the following cases, it is possible to consider the disclosure of blind law:

1) endangering the safety of subjects: For example, in some serious adverse events, subjects needto know the randomized results to inform other physicians to take appropriate emergency treatment.

2) Threatening the safety of the assessor: When the assessor is facing potential safety hazards, he needs to know the randomization results.

3) Compliance: For reasons of partial compliance, in certain circumstances, if the research instruments and cases involved in unexpected adverse events are needed, the results of randomization should be made public to the relevant departments or the public.

5) Other management reasons.

6.6 Concomitant therapy and medication

The concomitant treatment and concomitant medication were recorded from the time the subject signed the informed consent to the time the study was completed. Concomitant treatment and concomitant medication should be recorded in the CRF, or a clear copy of the form available from the research center should be kept in the CRF as research data to identify other factors affecting the end of the study. When recording the concomitant treatment and concomitant medication, the indications and the starting and ending time of use should be clearly defined, and the corresponding types of adverse events should be indicated for the treatment measures to cope with adverse events. When using a copy of the study center form, the investigator should sign the copy and indicate the date of review to confirm that the document is a study document.

7 Basis of study protocol and risk/benefit analysis

EndoAngel is used to provide assistant to monitor the operation of endoscopists, which will not provide diagnosis. Doctors make their own diagnosis on the basis of EndoAngel's results. The security of the software and the improvement of endoscopic physician's diagnosis and treatment level have also been confirmed in the previous feasibility study. And the patients in this study carry out the diagnosis and treatment according to the conventional treatment measures, which are formulated in accordance with the standard medical treatment procedures and do not increase the risk of the subjects.

7.1 Selection of endpoints

The primary endpoints are:1) the CUSUM learning curve for colonoscopy (ACE scoring scale); 2) the average test score difference before and after training.

The secondary endpoints are: 1)Detection rate of advanced adenoma;2)Polyp Detection Rate, PDR;3)Average number of adenomas detected per patient;4)The detection rate of large, small and micro polyps;5)The average number of large, small and micro polyps detected;

6)The detection rate of large, small and micro adenomas;7)The average number of large, small and micro adenomas detected;8)The detection rate of adenoma in different sites;9)The average number of adenomas detected in different sites;10)Number of missed return of the sliding endoscopy/number of successful return of the sliding endoscopy;11)Real-time gut cleanliness score;12)Withdraw overspeed percentage;13)The withdraw time;14)Ratio of ileocecal reach

Adverse events in safety indicators shall be judged in accordance with relevant regulations, and serious adverse events shall be recorded and reported in accordance with regulations.

Other evaluations are detailed in the Case Report Form (CRF).

7.2 Definition of participants

Patients were included according to the indications and contraindications described in the use plan. Because of practical reasons (such as younger patients, participation in a number of clinical studies, alcohol/drug dependence patients, and other factors that may affect the completion and/or reliability of gastroscopy) and ethical reasons (whether informed consent can be completed, etc.), the entry and discharge criteria have been reduced.

7.3 Adverse events

The relevant definitions of adverse events are as follows:

Adverse Events (AE): Any adverse medical event, unexpected disease or injury, or adverse clinical manifestations (including abnormal laboratory findings) that occur in a subject, user or other person, whether or not associated with medical devices.

Serious Adverse Events (SAE): Adverse Events with the following information:

- causing death.
- leading to severe deterioration of the health of the subjects, including
- leading to life-threatening diseases or injuries,
- Causing impairment of body structure or function.
- Need hospitalization or extended hospitalization
- lead to hospitalization and preventive medical or surgical intervention
- Permanent damage to body structure or function
- Fetal distress, fetal death or congenital abnormalities or congenital defects.

Note: Hospitalization for existing conditions, or surgery required in the program, without serious deterioration of health status, is not considered a serious adverse event. Purposeful hospitalization, such as economic or reimbursement reasons, is not considered a serious adverse event.

Unexpected adverse device response (UADE): refers to adverse events related to medical devices that were not previously identified in the current version of the risk analysis report in terms of nature, severity or incidence. The definition includes any event caused by insufficient or inadequate description of the use or deployment of the device. This definition includes any event caused by a user's error.

7.4 Expected and trial-related adverse events

Previous studies have shown that the expected adverse events are basically the same as the complications of conventional endoscopic diagnosis and treatment.

The instrument used in this experiment is a medical software which is not in contact with human body. There is no difference between the experimental operation and the routine operation. The intervention measures (such as randomized process) in the experiment may slightly increase the incidents of diagnosis and treatment.

7.5 Risk minimization

In this study, when there are bugs in the software, doctors can still operate under their own judgment without affecting conventional diagnostic and treatment measures, greatly reducing the risk of the test.

7.6 Related benefits

According to the results of previous multi-center randomized controlled trials, it has been proved that EndoAngel can improve the examination quality of colonoscopists. In this observational study, subjects receiving EndoAngel assisted colonoscopy may obtain higher quality colonoscopy due to the subject effect of colonoscopists.

7.7 Overall feasibility analysis

EndoAngel is an independent system including both software and computer hardware, which can monitor image data 24 hours a day. The system is not invasive. The overall operability is strong.

8 Statistical Analysis

8.1 Statistical Analysis Plan

Data management and statistical analysis were implemented by Renmin Hospital of Wuhan University.

8.2 Methods

Continuous variables should be described by number of subjects, mean, standard deviation, median, minimum and maximum. The classification variables are summarized by frequency and percentage.

Spearman rank correlation analysis was used to analyze the correlation between endoscopic overspeed percentage / intestinal preparation score and adenoma detection rate / advanced adenoma detection rate / polyp detection rate.

Univariate analysis was used to analyze the correlation between the number of unreturned slides/returned slides and the detection rate of adenoma/late adenoma/polyp.

Chi-square analysis was used to analyze the detection rate of adenomas in different scores of intestinal segments.

8.3 Sample Size Calculation

The main evaluation focus of this project plan is to evaluate whether there is a significant difference in ACE scores of colonoscopy training for endoscopic physicians by using EndoAngel.This project plans to carry out clinical trials in 3 hospitals. According to the literature, we assume that the cognitive score of endoscopists can be increased from 2.5 to 2.8 after intervention, then 126 cases of colonoscopy need to be enrolled, and if the motor score of endoscopists is increased from 2.38 to 2.59, then 350 cases need to be enrolled.Considering the experimental abscission rate of 10%, a total of 385 cases of colonoscopy should be included.

8.4 Statistical analysis set

All patients who met the inclusion and exclusion criteria were considered eligible for recruitment.

The two analysis sets in this study are defined as follows:

- The full analysis set (FAS) population analysis set will contain all eligible cases and shedding cases, but does not include culling cases.

- The Compliance (PP) population analysis set will include all subjects in the FAS analysis set with no significant deviation from the program.

Intention-to-treat and conformity analysis sets should be used to analyze the primary efficacy endpoints. The main analysis will be based on the PP analysis set. FAS analysis was regarded as supportive analysis.

9 Device Description

EndoAngel

Version:EA2301

10 Abbreviations

Abbreviations	Full Name	Chinese
AE	Adverse Event	不良事件
CFDA	China Food and Drug Administration	国家食品药品监督管理总局
CNDA	China National Drug Administration	国家食品药品监督管理总局
CRF	Clinical Record File	病例报告表
CTCAE	Common Terminology Criteria for Adverse Events	不良事件常规评价标准
EC	Ethical Committee	伦理委员会
ICD	Informed Consent Document	知情同意文件
ICF	Informed Consent Form	知情同意书
ITT	Intention to Treat	意向治疗分析集
PP	Per Protocol	符合方案集
SAE	Serious Adverse Event	严重不良事件

Informed Consent Form

"Study on the effectiveness of artificial intelligence assistant system in improving the training effect of advanced physicians' enteroscopy"

Informed Consent Form for clinical study subjects

Informed Consent Form: Information page

Release date: 1.0,18 May 2021

Principal investigator: Yu Honggang

Dear sir / Madam,

We will invite you to participate in a clinical study "Study on the effectiveness of artificial intelligence assistant system in improving the training effect of advanced physicians' enteroscopy". During this study, we will use a AI-assisted system which do not interfere the physician's original observations and procedures.

Before you decide whether to participate in the study, please read the following as carefully as possible to help you understand the study and why it was conducted, the procedure and duration of the study, the potential benefits or risks of participating in the study. If you wish, you can discuss it with your family or friends, or ask your doctor for an explanation to help you make a decision

1. Background and Purpose

Colonoscopy is a key technique for detecting and diagnosing lesions of the lower digestive tract.High-quality endoscopy results in better disease outcomes.However, at present, the demand for endoscopic examination is high in China, and the hospital endoscopic surgery is in short supply.Shortening the colonoscopy learning cycle of endoscopists is of great significance to solve the problems of the lack and uneven distribution of digestive endoscopists and the substandard quality of endoscopy in China.

EndoAngel is a multi-functional intelligent digestive endoscopy assistant system integrating lesion auxiliary diagnosis and examination quality control, which has the characteristics of intelligence and less time consumption. The real-time assistance of

EndoAngel in the examination process can indicate the endoscopic physician's arrival at the ilocecal part, the time of withdrawal, the speed of withdrawal, whether the endoscope slides, and the polyps in the field of vision. At present, the clinical verification of various functions of EndoAngel, an endoscopic assistant system based on artificial intelligence, has been carried out in our center. This project plans to conduct a prospective, multi-center clinical trial to verify the functions of EndoAngel, so as to prove that EndoAngel can improve the colonoscopy ability of novice physicians and shorten the training cycle of colonoscopes.

2. Who can participate in the study

1） Male or female ≥50 years old;

2） Able to read, understand and sign informed consent

3） The investigator believes that the subjects can understand the process of the clinical study, are willing and able to complete all study procedures and follow-up visits, and cooperate with the study procedures

4） Patients requiring colonoscopy

3. Who can not participate in the study

1） Have drug or alcohol abuse or mental disorder in the last 5 years

2） Pregnant or lactating women

3） Patients with known multiple polyp syndrome;

4） patients with known inflammatory bowel disease;

5） known intestinal stenosis or space-occupying tumor;

6） known colon obstruction or perforation;

7） patients with a history of colorectal surgery;

8） Patients with previous history of allergy to pre-used spasmolysis;

9） Unable to perform biopsy and polyp removal due to coagulation disorders or oral anticoagulants;

10） High risk diseases or other special conditions that the investigator considers the subject unsuitable for participation in the clinical trial

4. What would you need to do

Patients need to prepare for Colonoscopy routinely, fasting for at least 6 hours and water deprivationfor at least 2 hours before the procedure. Patients undergoing painless operation receive general anesthesia, If you areassigned to the experimental group, the endoscopists will be assisted by EndoAngel, which can be used for colonoscopy quality monitoring and lesion indication in real time. If you are assigned to the control group, the

endoscopist performs conoloscopy routinely without specialprompts.You are equally likely to be in the above two groups.

5. Benefits

You will be randomized into the experimental group and the control group. The endoscopistsin the experimental group will be assisted by EndoAngel, which can can be used for colonoscopy quality monitoring and lesion indication in real time. Patients who receive EndoAngel-assisted colonoscopy are likely to have higher quality and more comprehensive information about their disease.and lower incidences of adverse events.

6. Adverse events

The adverse events are basically the same as the complications of conventional endoscopicdiagnosis and treatment. Participants in this study do not increase other additional risks.

7. Related fees

In this study, patients only need to bear the cost of routine colonoscopy without additional costs.

8. Personal Information

During colonoscopy, your endoscopic electronic image and case information will be collected and stored in the hospital.Your doctor, the researcher, will be given access to this electronic information for scientific research and the development of new medical technologies.Any public reporting of relevant research and development results will not disclose your personal identity.

When the study is over, we will analyze the data.You will have the opportunity to be informed of the study results.You can ask your research physician about the study results and ask for an explanation.The results of this study may also be published in journals and may be reported at conferences, but will not contain any information that might identify you.To ensure privacy, records or samples released for research purposes will not be accompanied by your name and other identifying information.Instead, your information will be identified only by a code.Only the research physician and authorized personnel will be able to associate this code with your name through a checklist that will be securely kept at the research center.It may be that in order to ensure that the research is conducted in a regulated way in the research center, the sponsor, the ethics review committee, and the governmental authorities may have access to your data as required. They are bound by the obligation of confidentiality and will not violate

your privacy.

9. For more information

You can ask any question about this study at any time.

Your doctor will give you his or her phone number so that he or she can answer yourquestions

Your doctor will keep you informed if there is any important new information during the course of the study that may affect your willingness to continue participating in the study.

10. Participation and withdrawal are voluntary

Participation in the study is entirely up to you. You may refuse to participate in the study orwithdraw from the study at any time during the course of the study. You will not be discriminatedagainst or retaliated against for refusing to participate in the study. Your medical treatment and entitlements will not be affected.

Your doctor or researcher may suspend your participation at any time in the best interest of you

If you withdraw from the study for any reason, you may also be required to undergo a laboratory and physical examination if your doctor deems it necessary.

If you choose to participate in this study, we hope that you can adhere to the completion of the entire research process

11. Others

Participating in this study is up to you. You can discuss it with your family or friends before making a decision.

Before you decide to participate in the study, ask your doctor as many questions as you can about the study until you have a complete understanding of it.

Thank you for reading this. If you decide to participate in the study, please tell your doctor, he or she will arrange for you to participate in all matters related to the study.

Please keep this information

Informed Consent Form: Information page

Name of Clinical Research Project: Study on the effectiveness of artificial intelligence assistant system in improving the training effect of advanced physicians' enteroscopy.

Research physician commitment:

As a research physician, I confirmed that I had clearly explained to the subject the details of this trial, including their rights and possible benefits and risks, and gavethem a signed copy of my informed consent.

Name：_____ Date: _____

Contact：_____

Subject commitment:

I have read and understood the introduction to this study on the informed consentpage, and have had the opportunity to ask questions. I understand the research physician's explanation.

I am aware of the risks and benefits of participating in this study. I am aware thatparticipation in the study is voluntary, and I am sure that there has sufficient time to consider and volunteer for the trial. I can always ask my doctor for more information,and I can always withdraw from the study without discrimination or retaliation, and without prejudice to medical benefits and entitlements.

I also knew that if I dropped out of the study, I would tell my doctor and complete the physical and chemical tests. If I need to take any other medication formy illness, I will consult with my doctor in advance or tell him the truth afterwards.

I agree□ or refuse□ Use my medical records for any other study.

I agree to participate in the study and promised to follow the doctor's advice to the best of my ability. I will receive a signed and dated copy of the Informed Consent Form.

Name：_____ Date: _____

Contact：_____