MEDS Public Health and Preventive Medicine (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/phpm.2024.040120
ISSN 2616-1915 Vol. 4 Num. 1

The application of risk prevention care in painless gastrointestinal endoscopy

Fan Yang[1], Yunhua Li[2,*], Wenzong Tian[1]

[1]School of Nursing, Dali University, Dali, Yunnan, 671000, China
[2]Nursing Department, NO.1 People's Hospital of Dali City, Dali, 671000, China
[*]Corresponding author: yunhua363@163.com

Keywords: Painless gastrointestinal endoscopy; risk prevention care; risk assessment

Abstract: With the continuous progress of modern medical technology, the clinical application of painless gastrointestinal endoscopy has become more widespread. Compared with traditional gastrointestinal endoscopy, painless gastrointestinal endoscopy can significantly reduce patient anxiety and discomfort, enhance patient tolerance, and improve endoscopic examination results. However, due to factors such as analgesics, patient factors, and operational factors, there are still certain safety hazards in the application of painless gastrointestinal endoscopy. It is extremely important to conduct risk assessment of painless gastrointestinal endoscopy and provide effective nursing interventions. This article summarizes the common adverse events of painless gastrointestinal endoscopy and the risk factors that lead to adverse events, and provides a review of nursing progress.

Painless gastrointestinal endoscopy technique refers to the examination in which anesthesia drugs are injected into the body intravenously, such as propofol, etomidate, dizocin, etc., so that the patient can fall asleep quickly, autonomous breathing still exists despite the loss of consciousness, and the muscles of the whole body are relaxed, resulting in an increase in tolerance and a pain-free sensation around the body [1]. Painless gastrointestinal endoscopy compared to ordinary gastrointestinal endoscopy patients will feel more comfortable, will not produce nervousness and anxiety, in addition to better cooperation with the examination, there will be no nausea, vomiting and other discomforts, at the same time, the examiner can do a more detailed examination of the patient, it is easier to find early lesions. At present, gastrointestinal endoscopy under anesthesia has solid clinical experience and is increasingly promoted by the public. However, anesthesia may cause anesthesia accidents and complications and other unpredictable situations due to patient factors, drug factors, or operation factors. Therefore, this article is intended to provide an overview of risk assessment and preventive measures for painless gastrointestinal endoscopy.

Risk-preventive care, which mainly consists of 2 parts, risk assessment and risk prevention, is a recently emerging form of care. Risk assessment refers to the identification of various adverse events faced before and after anesthesia, and an adequate risk factor analysis of the identified adverse events, which facilitates medical workers to make a correct assessment of the patient's condition. Risk prevention refers to the synthesis of all aspects of risk factors in the preoperative, intraoperative and postoperative period to propose solutions, so as to reduce the incidence of contradictory events, ensure the safety of patients and increase patient satisfaction [2].

1. Adverse events related to painless digestive endoscopy

1.1 Hypoxemia

The main mechanism by which propofol inhibits respiration involves: modulation of central chemoreceptor sensitivity, attenuation of the body's response to hypercapnia and hypoxic conditions, causing a slowing of respiratory rate and a decrease in tidal volume. Its effects on the cardiovascular system are reflected in the direct inhibition of myocardial contractility and peripheral vasodilatation, the dual action of which contributes to a decrease in blood pressure. Importantly, these inhibitory effects of propofol intensify with increasing dose, demonstrating dose-dependent characteristics [3]. Recently, Xin Huang et al. collected questionnaire data from physicians who participated in painless gastroenteroscopy, and the results showed that a total of 161 physicians encountered patients with oxygen saturations below 85% during painless gastroenteroscopy, which accounted for a certain percentage of the physicians who participated in the survey. In addition, 33 physicians reported unanticipated tracheal intubation events. More generally, 199 physicians reported experiencing respiratory depression during the examination. Further analysis revealed that the incidence of oxygen saturation below 85% and the incidence of respiratory depression were significantly higher in painless gastroenteroscopy performed under general anesthesia than in painless gastroenteroscopy performed under conscious sedation [4].

1.2 Bradycardia

The application of remifentanil may exacerbate the spasmodic response of the bowel to endoscopic and insufflation stimuli, leading to vagal hyperexcitability, which in turn triggers symptoms such as decreased heart rate (HR). This effect is particularly significant in patients with pre-existing bradycardia and may constitute a potential hazard [5]. The incidence of bradycardia in patients during painless gastroenteroscopy is approximately 0.02% to 0.05%. With a heart rate ≥50 beats/min, patients are usually able to maintain a stable hemodynamic state. However, when a heart rate of <50 beats/min is detected, it is recommended that patients be given 0.3 to 0.5 mg of atropine therapy to ensure the stability and safety of their cardiovascular system, out of a desire to prevent potentially dramatic circulatory fluctuations [6].

1.3 Decrease in blood pressure

In phase II and III clinical trials for sedative or anesthetic drugs required during endoscopy, the incidence of blood pressure reduction in different groups of remazolam ranged from 0% to 30%. Especially during the induction and maintenance phases of general anesthesia, the hypotension induced by remazolam showed a significant positive correlation with its dose, i.e., the higher the dose, the corresponding increase in the incidence of hypotension. Therefore, during the use of remazolam, the patient's blood pressure must be closely monitored. Once the symptoms of hypotension are observed, antihypertensive drugs should be given at the right time and in the right amount according to the specific clinical condition of the patient to ensure the stability and safety of the patient's vital signs [7]. According to data from a previous study, the chance that remazolam triggered hypotension during sedation anesthesia for painless gastrointestinal endoscopy was 13.03%, whereas in comparison, the risk of hypotension caused by propofol was significantly higher, reaching 42.86% [8].

1.4 Hypoglycemic response

Sahn [9] et al. conducted a prospective study aimed at evaluating the safety of polyethylene glycol

powder for electrolyte changes during colonoscopy. By collecting and statistically analyzing pre- and postoperative serum electrolyte data from 155 patients, they found some noteworthy findings. In this group, 26 patients (16.7% of the total) presented with glucose levels below the normal reference range. Of particular note, five of these patients had glucose levels even lower than 70 mg/dL, a proportion that was more pronounced in children ≤7 years of age. These findings provide important information about the safety of electrolyte changes for the use of polyethylene glycol powder in colonoscopy.

1.5 Digestive Symptoms

Propofol has pharmacologic side effects such as inhibition of sympathetic nerves, reduction of sympathetic nerve impulse transmission, and excitation of the central vagus nerve, which cause abnormal reactions in the digestive, nervous, and respiratory systems, with complications such as myoclonus, respiratory depression, increased glandular secretion, coughing, vomiting, and eructation.

1.6 Central nervous system symptoms

In this group of cases, 68 patients experienced uncomfortable sensations such as dizziness, drowsiness, blurred vision, and even euphoria or restlessness in the initial period after waking up [10]. Falls and falls are common risk factors for painless gastrointestinal endoscopy, which can lead to skin lesions, dislocations, and fractures in mild cases, and can be life-threatening in severe cases. Patients who are unconscious, restless, or mentally abnormal must be closely observed, bed rails added, and restraining straps implemented for protective restraint if necessary.

2. Assessment of risk factors for adverse events associated with painless gastrointestinal endoscopy

2.1 Patient Factors

2.1.1 Age

In addition to physical discomfort, children face great psychological pressure when they visit the clinic. Facing the unfamiliar environment, the examination and treatment with pain and limited knowledge of the disease will produce fear. Forced separation from the mother during the examination and interruption of the process of trust that had begun to be established with the mother manifests a psychological disorder such as anxiety, depression, and defiance. Pediatric patients are prone to tongue retraction during anesthesia, due to the physiological characteristics of a short neck, hypertrophy of the tongue, and a narrow nasal cavity. In Prof. Bakewell's study, special attention was given to children undergoing painless colonoscopy procedures. He found that all children under 8 years of age and not in the 50th percentile of the WHO weight criteria showed signs of hypoglycemia, i.e., blood glucose values below 3 mmol/L. In contrast, children over 8 years of age and above the 50th percentile of the WHO weight criteria had blood glucose values that remained within the normal range. In addition, Professor Bakewell noted that for those children who are younger and have behavioral disorders that prevent them from following eating recommendations, they may be at risk for persistent hypoglycemia [11]. Older people are at risk of more serious complications due to their depressed physiology, slow metabolism, possible significant organ insufficiency, and the wide range of medications they take preoperatively, such as ACEIs and anticoagulants. Secondly, the elderly have a comprehensive reduction in neurological function and are unable to regulate blood pressure in a timely manner. With age, the patient's blood vessel wall will gradually lose its original elasticity, and the contraction capacity of the heart muscle will also decrease significantly. In medical practice, when

patients are given propofol anesthesia, this drug tends to significantly reduce cardiac output, thus making patients prone to compensatory imbalance of the body [12].

2.1.2 Body mass index

A study of risk factors for the development of hypoxemia among 80 patients with ASA class I and II concluded that body mass index is strongly associated with the development of hypoxemia, and that an increase in body weight is associated with a corresponding increase in blood pressure [13]. One study showed that the incidence of respiratory depression was significantly higher in obese patients than in non-obese patients [14].

2.1.3 ASA grading

ASA classification is positively correlated with the occurrence of anesthesia risk.The incidence of hypoxemia in patients with ASA class III or above is significantly higher than that in patients with ASA class I and II, and more attention should be paid to patients who have reached the age of 60 or above. Once respiratory depression occurs, an oropharyngeal ventilation tube, mask-assisted respiration or discontinuation of intubation should be placed immediately [15].

2.1.4 Underlying diseases

Patients with liver cirrhosis are often malnourished, and the serum serum protein content is lower than normal causing generalized edema and ascites, and a large amount of ascites compresses the diaphragm, so that the lungs can not be sufficiently expanded during inspiration, and ventilation is insufficient, resulting in the symptoms of respiratory distress and shortness of breath in patients [16]. In the anesthesia of hypertensive patients, attention should be paid to controlling the dosage and injection speed of isoproterenol, otherwise it will cause a significant drop in heart rate and blood pressure and severe respiratory depression.

2.2 Operational factors

2.2.1 Diagnosis and treatment method

For endoscopic procedures with greater operational difficulty and longer examination time, such as endoscopic mucosal resection (EMR), endoscopic submucosal dissection (ESD), ultrasound endoscopy (EUS), retrograde cholangiopancreatography (ERCP), small bowel microscopy and other special digestive endoscopic treatments, deep anesthesia is required due to the long examination time. Retrograde cholangiopancreatography is performed on mostly elderly patients, who often have multiple complications and are prone to anxiety, and whose respiration is severely affected by the prone or semi-prone position of the patient during the procedure, which limits the function of chest and abdominal movement. Ultrasonic gastroscopy, when examining the fundus of the stomach, the middle and upper part of the stomach body and the surrounding neighboring organs, needs to pump out the air inside the stomach, and then deliver 300-500 ml of air-free water, so that the lesion is submerged in the water, but due to the excessive injection of water into the stomach, coupled with the patient's ergonomics or agitation, it triggers the risk of reflux and aspiration, or even asphyxiation.

2.2.2 Drug selection

The adverse effects of isoproterenol in anesthetic dose are respiratory depression and circulatory depression, the faster the injection rate, the more obvious the drop in arterial pressure and peripheral resistance, which can cause asphyxia, slow heartbeat and life-threatening in serious cases. During

induction of anesthesia, a decrease in systolic, diastolic, and mean arterial pressure and transient apnea may occur due to the dose, preoperative application of the drug. Patients may experience gastrointestinal symptoms such as nausea, vomiting and involuntary muscle tremors all over the body after the use of etomidate, occasionally throat irritation such as coughing, eructation and systemic symptoms such as chills, which are contraindicated for patients with combined hyperkalemia, adrenocortical dysfunction, and allergy to fat emulsion.

2.2.3 Operation time

In the study of risk factors for anesthesia-related adverse events of ERCP, the incidence of adverse events increased by 3% for every 1-minute extension of time, and longer operation time may increase the time that the patient is under pressure, leading to enhanced physiological stress response, which may cause circulatory instability such as fluctuations in blood pressure, increased heart rate, etc., and increase the risk of cardiovascular events. At the same time, long ERCP operation time and excessive gas injection may also increase respiratory complications such as hypoxemia, especially when the depth of anesthesia is not managed properly, which affects the respiratory drive and pulmonary ventilation function [17].

3. Nursing coping strategies for painless gastrointestinal endoscopy-related adverse events

3.1 Enhance nurses' risk awareness

Strengthening nurses' awareness of safety precautions requires regular organization of nurses to participate in professional training and learning activities aimed at enhancing their knowledge of medical risks and their ability to prevent them. The training will cover key systems such as medical incident handling regulations, infection management standards, hand hygiene inspection standards, and surgical safety norms to ensure that every nurse can deeply understand and comply with the relevant regulations. At the same time, the importance of risk prevention and control will be emphasized, and the effective implementation of the regulations will be ensured through enhanced safety management supervision and assessment. To incentivize nurses to actively participate in safety management, rewards and punishments can be formulated according to the actual situation. For nurses with excellent performance in safety management assessment, performance incentives will be given to recognize their efforts and contributions; while for nurses with unsatisfactory assessment results, targeted training will be provided and re-assessment will be arranged to ensure that they are able to meet the appropriate standards. In addition, regular meetings of the departmental safety team should be convened with the aim of discussing and analyzing the current or potential safety problems in the department, summarizing the inadequacies in the safety management of the department, and brainstorming on effective improvement measures. Through this approach, we expect to achieve continuous improvement in departmental safety management and provide patients with safer and higher quality nursing services [18].

3.2 Adequate preoperative preparation

3.2.1 Risk assessment

Patients were carefully asked whether they had a history of major underlying diseases, such as heart disease, hypertension, myocardial infarction, etc., and whether they had a history of drug allergy, such as anesthesia drug allergy or other allergies. Whether they have recently caught a cold or not, and whether they have fasted and abstained from food and drink before the operation as required for gastrointestinal preparation. In the process of deepening the clinical assessment, we need to further

refine the laboratory tests, which includes, but is not limited to, the assessment of coagulation function, routine blood tests, and ECG monitoring. In addition, we must make detailed inquiries and records about the patient's medication history, especially whether he or she has recently taken medications with antiplatelet aggregation effects, such as aspirin and clopidogrel [19].

3.2.2 Comfort care

Environmental care: the examination room should be spacious and clean, with soft light, fresh air, good ventilation, minimize noise, ensure that the guideline signs and health education bulletin boards are clear, set up a special preparation room, and provide examination pants and slippers to protect patients' privacy and bring convenience [20].

3.3 Intraoperative monitoring

3.3.1 Respiratory symptoms

When the patient has a retroverted tongue, the patient's head should be tilted to one side, then the jaw should be gently supported, and a nasopharyngeal or oropharyngeal ventilation tube may be placed to increase the flow of oxygen inhalation. If the patient's oxygen saturation is persistently below 90%, assisted respiration should be given, and positive pressure ventilation with a special mask for gastroscopy should be used, and the doctor should be instructed to withdraw the endoscope and pause the operation if necessary. In preparation for nasopharyngeal ventilation tube placement, liquid paraffin will first be applied evenly over the entire surface of the tube with the aim of minimizing any resistance that may be encountered during placement. Subsequently, the nurse will ensure that the ventilation tube is placed perpendicular to the patient's face in a pen-like position for accurate placement [21]. In case of emergencies such as gastrointestinal perforation and intestinal obstruction, gastrointestinal hemorrhage, etc., once reflux and malaspiration occurs, the secretions or vomitus in the oropharyngeal cavity should be aspirated immediately, the patient's body position should be changed to a head-high-feet-low position, and at the same time, the right lateral recumbent position should be selected, so as to ensure the normal ventilation and drainage of the left lungs and the thick venous blood vessels should be selected for rapid rehydration, and the tracheal tube should be inserted if necessary to suction the secretions from the trachea under the direct visualization of the ciliopathoscope. If necessary, tracheal intubation should be performed, and the secretions in the trachea should be aspirated under the visualization of cilioscope.

3.3.2 Circulatory symptoms

Continuous monitoring of vital signs: use multi-parameter monitor to continuously monitor the patient's heart rate, blood pressure, oxygen saturation, respiratory rate and electrocardiogram. Patients with bradycardia and hypotension should be more closely observed for changes in these indicators. Heart rate management: If bradycardia interferes with hemodynamic stability, be prepared to elevate the heart rate with medications such as atropine or isoprenaline. Blood pressure control: For a drop in blood pressure, it is first necessary to confirm whether it is due to the direct effect of anesthetic drugs or to hypovolemia or cardiac suppression. Blood pressure can be stabilized by fluid replacement and the use of antihypertensive drugs such as norepinephrine. Hemodynamic support: infusion pumps or vasoactive medications may be needed to maintain effective blood volume and tissue perfusion, especially in patients with cardiac disease. Temperature management: patients under general anesthesia are prone to a drop in body temperature, and hypothermia can further reduce heart rate and blood pressure, so insulation measures should be taken to maintain normal body temperature.

3.4 Observation and care of postoperative adverse reactions

3.4.1 Digestive tract symptoms

Injection of scopolamine at the Hegu point plus acupressure can quickly relieve eructation during painless gastroscopy [22].

3.4.2 Central nervous system symptoms

In the early period after awakening, some patients have disorientation, the nurse should ask the patient to rest, and those who have dizziness and discomfort should be prolonged to stay under observation. In the period of waking up from anesthesia, nurses must watch closely, if agitation occurs, they should place the restraining belt appropriately to prevent the patient from falling out of bed, observe the patient's blood flow of limbs, skin temperature, etc., and create a quiet and comfortable environment to reduce stimulation.

3.4.3 Criteria for transferring out of anesthesia observation area

①Central nervous system: consciousness is fully awake, orientation is fully restored, and answers are correct. The muscle tone returns to normal, the fist is strong, and the head is raised for more than 30 seconds when lying down. ② Respiratory system: smooth respiration, pulse oximetry not less than 96% when taking in air. ③ Circulatory system: stable circulation, blood pressure and heart rate not more than ±20% of the preoperative value and stable for more than 30 minutes; ECG is basically normal. ④ Outpatients were evaluated whether the patient could leave the hospital using the Sedation/Post-Anesthesia Discharge Rating Scale, which was evaluated by a full-time doctor and nurse with a score of 9 on this scale, accompanied by an adult family member and signed to confirm that the patient could leave [23]. ⑤ In the case of hospitalized patients, the Steward score was performed, and the patients were allowed to leave only if they reached a score of 6, accompanied by a family member or a chaperone and signed to confirm the score [24].

4. Prospect

In summary, strengthening the analysis of risk factors and making timely and effective interventions are the most important methods and bases for anesthesia management in digestive endoscopy. However, in the reality of clinical work, the nursing intervention mode is often relatively single, and risk-preventive nursing, as an emerging nursing model, is still at an early stage in painless digestive endoscopy technology. Therefore, in order to improve the quality of examination and provide high-quality and orderly service, nursing staff need to synthesize various factors and take reasonable measures to reduce the incidence of risky events, which is of great significance to guarantee the safety of patients, improve the nurse-patient relationship and enhance the quality of care.

References

[1] Hu S, Wang M, Li S, et al. Intravenous Lidocaine Significantly Reduces the Propofol Dose in Elderly Patients Undergoing Gastroscopy: A Randomized Controlled Trial [J]. Drug Des Devel Ther, 2022, 16: 2695-2705.
[2] Liu Yuting, Gao Mimi, Shen Jinguang. Effect of nursing management model based on 4R crisis management theory on emergency response ability and risk awareness of operating room nurses [J]. Clinical Medicine Research and Practice, 2024, 9(2): 171-174,194.
[3] Wang Qian, Wang Maohua, Yang Tianshuang, et al. Effects of different doses of remazolam combined with propofol on painless gastroscopy [J]. Journal of Clinical Anesthesiology, 2022, 38(2): 163-166.

[4] Yuan-Yuan X, Hua-Wei L I , Endoscopy D O ,et al.Application Effect of Nursing Risk Management in Painless Gastrointestinal Endoscopy[J].Guide of China Medicine, 2018.
[5] Liang Hansheng, Sun Hongwei, Tian Xue, et al. Scopolamine reversal of remifentanil adverse events in painless colonoscopy in patients with bradycardia [J]. Chongqing Medicine, 2015, (2): 204-206.
[6] Shang Zekai, Liu Xin, Gao Ju. Progress in the study of sedation-related adverse events in patients undergoing painless gastroenteroscopy [J]. International Journal of Anesthesiology and Resuscitation, 2021, 42(12): 1330-1334.
[7] Ling, Zhang. Clinical Application Analysis of Painless Gastrointestinal Endoscopy in Gastroenterology[C]//2018.
[8] Chen S H, Yuan T M, Zhang J, et al. Remimazolam tosilate in upper gastrointestinal endoscopy: a multicenter, randomized, non-inferiority, phase III trial [J]. J Gastroenterol Hepatol, 2021, 36(2): 474-481.
[9] Sahn B, Chen-Lim M L, Ciavardone D, et al. Safety of a 1-Day Polyethylene Glycol 3350 Bowel Preparation for Colonoscopy in Children [J]. J Pediatr Gastroenterol Nutr, 2016, 63(1): 19-24.
[10] Wu XY, Huang XY. Observation and treatment countermeasures of adverse reactions during resuscitation in patients after painless gastroscopy [J]. Smart Health, 2018, 4(20): 123-124,126.
[11] Bakewell C, Howarth L J, Rodrigues A, et al. Hypoglycaemia: a hidden risk in paediatric colonoscopy [J]. Arch Dis Child, 2021, 106(1): 102-103.
[12] Li A-Mei, Yang F, Yin Q-Steady, et al. The effect of age on propofol dosage in painless gastroscopy [J]. Chinese Journal of Endoscopy, 2024, 30(2): 49-55.
[13] Qadeer M A, Rocio Lopez A, Dumot J A, et al. Risk factors for hypoxemia during ambulatory gastrointestinal endoscopy in ASA I-II patients [J]. Dig Dis Sci, 2009, 54(5): 1035-1040.
[14] Berzin T M, Sanaka S, Barnett S R, et al. A prospective assessment of sedation-related adverse events and patient and endoscopist satisfaction in ERCP with anesthesiologist-administered sedation [J]. Gastrointest Endosc, 2011, 73(4): 710-717.
[15] Wehrmann T, Riphaus A. Sedation with propofol for interventional endoscopic procedures: a risk factor analysis [J]. Scand J Gastroenterol, 2008, 43(3): 368-374.
[16] Zheng Fengping, Lai Jiayan, Guo Yunwei, et al. Propofol combined with fentanyl as a sedative for painless gastroscopy in cirrhotic patients [J]. Chinese Journal of Gastrointestinal Endoscopy, 2012, 29(6): 311-315.
[17] Liu J, Liu X, Peng L P, et al. Efficacy and safety of intravenous lidocaine in propofol-based sedation for ERCP procedures: a prospective, randomized, double-blinded, controlled trial [J]. , double-blinded, controlled trial [J]. Gastrointest Endosc, 2020, 92(2): 293-300.
[18] Chen J. The application of whole-perspective risk precontrol management in the operating room nursing of radical mastectomy [J]. Contemporary Nurses, 2023, 30(15): 78-81.
[19] Liu Zhaoyuan, Tao Rong, Zou Feng, et al. Application of anticipatory nursing care under the Pygmalion effect in patients undergoing gastrointestinal endoscopy [J]. Qilu Nursing Journal, 2023, 29(21): 77-80.
[20] PAN Xueyan, PAN Mingfang, CHEN Yaping. Analysis of the application effect of quality nursing intervention in anesthetized patients undergoing painless gastroenteroscopy [J]. China Medical Guide, 2023, 21(12): 157-159.
[21] Wang Yiting, Zou Shengqiang, Wei Yanjun, et al. Nasopharyngeal ventilator-guided fiberoptic bronchoscopy for diagnosing the causes of hoarseness and its effect evaluation [J]. Nursing Research, 2018, 32(18): 2940-2942.
[22] Han Baojiang. Clinical observation of hegu injection of scopolamine to relieve painless gastroscopy intraoperative ergotism [J]. Journal of Jiangxi University of Traditional Chinese Medicine, 2018, 30(2): 53-55.
[23] National Center for Quality Control of Gastrointestinal Endoscopy, National Center for Quality Control of Anesthesia. Chinese technical specification of sedation/anesthesia operation for gastrointestinal endoscopy diagnosis and treatment [J]. Journal of Clinical Anesthesiology, 2019, 35(1): 81-84.
[24] Chinese Medical Association Anesthesiology Branch. Expert consensus on postanesthesia monitoring and treatment [J]. Journal of Clinical Anesthesiology, 2021, 37(1): 89-94.