ORIGINAL RESEARCH

A Study on the Effectiveness of a Nursing Intervention Based on Objectives and Key Results Goal Management in Bowel Preparation before Colonoscopy

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ABSTRACT

Objective • This study aimed to evaluate the effectiveness of an Objectives and Key Results (OKR)-based nursing intervention in enhancing the quality of bowel preparation for colonoscopy.

Methods • Between July and December 2021, 180 inpatients who attended the Department of Gastroenterology, Dongtai Hospital, Nantong University, had their first colonoscopy and were able to complete bowel preparation and perform colonoscopy, and met the inclusion criteria of this study, were selected as study subjects. The 180 inpatients were divided into a control group (n=90, receiving conventional care) and a research group (n=90, managed with specialist care quality standards in addition to conventional care) using a random number table to compare the pass rate of bowel preparation cecum insertion rate, compliance rate, patient satisfaction and incidence of adverse reactions.

Results • The research group had higher rates of successful bowel preparation, appendiceal intubation, adenoma detection, compliance, and patient satisfaction than the control group ($P < .05$). The incidence of adverse reactions in the research group was lower than in the control group ($P < .05$).

Conclusion • Implementing OKR-based nursing interventions in bowel preparation protocols significantly enhances patient outcomes and satisfaction, suggesting its widespread adoption in gastroenterology practices. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Colorectal cancer (CRC) remains a formidable health challenge globally, accounting for nearly 900 000 deaths in 2020 alone. Good screening for CRC and timely detection of precancerous lesions are crucial in managing CRC. Colonoscopy supplemented by mucosal biopsy is the accepted gold standard for diagnosing colon disease and is an important tool for CRC screening and treatment. Colonoscopy is an endoscopic examination inserted through the anus to observe colonic lesions from the mucosal side. It not only clearly diagnoses intestinal lesions, but also treats certain intestinal lesions such as intestinal polyps, and has become the most common and effective method of diagnostic evaluation and therapeutic intervention. Adequate bowel preparation is essential for a successful colonoscopy and can increase the detection rate of colorectal tumors, precancerous lesions, and other bowel diseases. However, inadequate bowel preparation is a common and important clinical problem, such as errors in the quality of patient self-reported bowel preparation and variations in the palatability of solutions required for bowel preparation, which can lead to inadequate bowel preparation before colonoscopy.

A large amount of fluid, undigested food residue or fecal residue in the intestinal cavity will lead to a lower quality of intestinal preparation, making it more difficult for the operator to access the scope, increasing the chance of the colonic mucosa being covered up, which is not conducive to the examination physician's observation of the mucosa and may lead to missed diagnoses or inability to complete the examination, and may even lead to serious complications such as intestinal perforation and intestinal bleeding;[4] some patients need to be re-examined within a short period of time, which increases the patient's pain and also increases the cost of the examination. Numerous studies have shown[5,6,7] that active and effective nursing interventions can significantly improve the quality of bowel preparation and patient compliance. With the improvement of public health awareness and patients' demand for higher and higher level of medical services, the traditional nursing interventions for

bowel preparation before colonoscopy, which mainly consist of informing patients to take bowel preparation solution and informing patients of bowel preparation matters, lead to poor compliance with precautions and low motivation of patients to participate in bowel preparation, which is not in line with the hospital's goal of continuously improving the quality of nursing care. Therefore, there is an urgent need to explore quality and efficient nursing interventions that can be applied to the bowel preparation before colonoscopy.

OKR, originally from Intel Corporation, is a goal management method and a best practice tool for companies, teams, and individual members to set goals and communicate with each other. It can be used to improve individual self-efficacy, increase motivation, stimulate individual potential, and help users improve their own performance to achieve certain corporate, team, and individual goals.[8] In recent years, the OKR method has been adopted by more and more companies as an effective management method, which fully proves the effectiveness of the application of this method. At the same time, with the gradual development of clinical nursing in China, a variety of new nursing models have been applied in clinical nursing, not the least of which is the PDCA (Plan, Do, Check, and Act) cycle model, a nursing model borrowed from management. Still, there has been no research on the role of nursing interventions based on OKR goal management in colonoscopy nursing. The OKR approach is applicable to nursing interventions because of its focus on clear, achievable goals and measurable outcomes, which can be used directly to improve the effectiveness of bowel preparation.

Therefore, this study innovatively introduces OKR goal management into pre-colonoscopy bowel preparation nursing care and studies the effectiveness of OKR goal management-based nursing interventions in pre-colonoscopy bowel preparation through a group-controlled approach. The OKR approach is applicable to nursing interventions because of its focus on clear, achievable goals and measurable outcomes, which can be used directly to improve the effectiveness of bowel preparation, expecting to provide novel, effective, and reliable references for nursing interventions in pre-colonoscopy bowel preparation.

Experimental preparation

Between July and December 2021, 180 inpatients who attended the Department of Gastroenterology of Dongtai Hospital of Nantong University, had their first colonoscopy, were able to complete bowel preparation and perform colonoscopy, and met the inclusion criteria for this study were selected as study subjects. The patients were divided into a control group (n=90, receiving conventional care) and a research group (n=90, managed with specialist care quality standards on top of conventional care) using a random number table. The Medical Ethics Committee of Dongtai Hospital, Nantong University approved the study, and all study subjects signed an informed consent form.

Inclusion and exclusion criteria

Inclusion criteria: patients between the ages of 18 and 70; patients who were examined to assess the function of all organs and could tolerate the study drug bowel cleansing and colonoscopy. Exclusion criteria: patients with a combination of cognitive or psychiatric impairment and non-cooperation; patients with a history of recto colonic surgery or other abdominopelvic surgery resulting in abdominal adhesions, intestinal obstruction or perforation; patients with recto colonic strictures due to various factors, or patients with malformations and intestinal fistulas; patients in the acute phase of atopic or non-atopic bowel disease who are not suitable for examination.

Methods

The control group underwent the usual nursing interventions, the main elements of which were: (1) The nursing staff collects basic information about the patients' patients based on a self-designed questionnaire. (2) Individualized bowel preparation protocols are selected for patients according to guidelines, including bowel cleansers, dosing regimen, and use of effervescent agents. (3) The nurse-in-charge informs the patient in detail about the importance of bowel preparation, the specific procedure and method of bowel preparation, as well as the possible side effects during preparation and how to deal with them, and gives the patient a detailed information sheet. (4) Patients should be advised to eat only a lightly cured diet 1 day before the colonoscopy and to fast for breakfast and lunch on the examination day. (5) Patients were informed of the specific dosage regimen for the compounded polyethylene glycol electrolyte dispersion, either as a single dose or in divided doses of 250 ml every 10-15 minutes for 2 h, depending on the patient's condition. (6) Patients are instructed to move around: "exercise - rest and laxative - exercise", walking slowly for 5-8 minutes between each dose and massaging the abdomen clockwise to promote gastrointestinal peristalsis and speed up the elimination of feces from the intestinal cavity. (7) On the day of the examination, no water is allowed after 11:00 AM Preliminary judgment of bowel preparation is made against the visual bowel preparation effect chart, and prompt remedy of bowel uncleanliness is given, with clear stools being passed as the end point of bowel preparation.

The research group added to the control group a nursing intervention based on OKR goal management with the following main components: (1) Objectives: team objectives must be precise and measurable while taking care to be challenging, ambitious, inspiring, difficult to accomplish, not easily achievable, and time-bound; personal objectives: tied to the team's OKRs, expressing what they want to change and challenge. (2) Key Results: Key Results must be quantified, and team members vote on them with KR weighting; all members of the team write OKRs and put them in a document that any member can see. (3) Execution of OKRs: The OKRs are scored, and the scoring scale vertebrae are controlled between 0 and 1, set in four grades: 1: the result is

Table 1. Overview of OKR management in this study

Objective		Development of Key Results (Key Results)				Review Evaluation	Continuous improvement
Objective (O)	OKR Final Score	Key Results (KRs)	KR weights	Marking	Implementing OKR		
Quality of bowel preparation improved significantly this quarter		KR1:88% pass rate for bowel preparation	50%		Week 1 Standardised bowel preparation procedures		
		KR2: 100% knowledge of bowel preparedness among healthcare professionals	20%		Week 2 completion of training and assessment of healthcare staff on bowel preparation		
		KR3: 95% patient compliance	30%		Implementation of measures based on individual OKRs from week 3		

far beyond expectations and almost unattainable; 0.7: this is what we hope to achieve, it is difficult but attainable; 0.3: we can definitely achieve it, with little or no help; 0: no progress at all. Optimal scores between 0.6 and 0.7; (4) Retrospective evaluation: develop OKR appraisal forms; follow up in real-time, and make timely adjustments; the principle of adjustment is that the objectives (Objectives) remain the same, and only key results are allowed to be adjusted; (5) Continuous improvement: analysis of the reasons for non-completion and continuous improvement.

This can be summarised as follows: Develop team OKRs - Determine quarterly OKRs - Develop and share individual OKRs - Implement OKRs - Review and evaluate - Continuous improvement. Throughout the intervention, patients are engaged in the process of bowel preparation using visual aids, digital apps, or personalized counseling sessions.

An overview of OKR management in this study is shown in Table 1.

Observation indicators

Bowel preparation pass rate:[9] The internationally accepted BBPS (Boston bowel preparation scale) scale, which was developed by Lai et al, was Chineseized by experts and tested for reliability, and the intra-group correlation coefficient of the Chineseized scale was 0.891 with good reliability. The scale divided the whole colon into three parts: the right hemicolon (blind and ascending colon), the transverse colon (including the liver and splenic flexure), and the left hemicolon (descending, sigmoid, and rectum), and scored each part according to its bowel cleanliness, with the total score being the sum of the scores of the three bowel segments. The scoring criteria for intestinal cleanliness are as follows: 0: solid faeces are present in the intestinal lumen, or the mucosa of the intestinal lumen is covered with pasty feces and cannot be observed; 1: only part of the colonic mucosa is visible, and the other parts are blurred due to more fecal residue; 2: most of the colonic segments are clearly visible, and some of the mucosa remains opaque fecal water; 3: the view of the colonic mucosa is clear, or the intestinal wall is covered with a small amount of intestinal fluid, but it does not affect the observation. The higher the score, the better the bowel cleansing effect; the standard for passing bowel preparation is no less than 2 points per bowel segment; the standard for failing bowel preparation is a total score of less than 6 points or less than 2 points for any bowel segment. The rate of passing bowel preparation is the proportion of cases that passed bowel preparation to the total number of cases.

Cecum insertion rate:[10] When the front end of the colonoscope crosses the ileocecal valve into the cecum so that the medial wall of the cecum proximal to the ileocecal valve enters the observation field, this is used as an indication of whether the colonoscopy is complete. The cecum insertion rate is the proportion of cases in which cecum insertion is completed to the total number of cases.

Adenoma detection rate: The proportion of all patients undergoing colonoscopy in which at least one histopathologically confirmed adenoma (including tubular adenomas, villous adenomas, and mixed adenomas) is found.

Compliance rate: Patients were considered to be non-compliant when one of the following behaviors was observed: non-compliance with dietary requirements during bowel preparation; walking <30 min during dosing or not accompanied by abdominal massage during dosing; dosing <80% of the total dose and dosing >2 h from the prescribed time; compliance rate was defined as the proportion of compliant cases.

Patient satisfaction: The Liker 5-point scale was used to evaluate the health care staff's preaching in bowel preparation, and the scores were rated according to the degree of satisfaction of the examinees with the nursing staff's preaching. The higher the score, the better the patient satisfaction.

Incidence of adverse reactions: Observe the occurrence of seven adverse reactions: nausea, vomiting, abdominal pain, abdominal distension, headache, dizziness, and weakness; the incidence of adverse reactions is the proportion of cases with adverse reactions to the total number of cases.

Statistical processing

The data were processed with SPSS 21.0, and statistical descriptions were completed using ($\bar{x} \pm s$) for count data that conformed to a normal distribution. The hypothesis test for comparison between the two groups for the above measurement data was an independent samples t test; the count data were described by applying the number of cases (percentage), and the χ^2 test was used for comparative analysis between the two groups. $P < .05$ indicated that the statistical differences were significant.

RESULTS

Clinical Information

The basic data, such as age and gender, were collected for comparison between the two groups, and the differences were not statistically significant ($P > .05$, Table 2).

The pass rate for bowel preparation

Eighty-six patients in the research group passed the bowel preparation, with a pass rate of 95.56%; 77 patients in the

Table 2. Basic information of the two groups

Group	n	Age(year)	M/F	Education level		body mass index	Number of colonoscopies (time)
				High School and below	Bachelor's degree and above		
Research Group	90	40.36±3.22	48 (96.00)/42 (84.00)	47 (52.22)	43 (47.78)	19.87±1.20	1.24±0.29
Control group	90	40.39±3.26	47 (52.22)/43 (47.78)	45 (50.00)	45 (50.00)	19.91±1.23	1.26±0.31
χ^2 or t	-	0.062	0.022	0.089		0.221	0.447
P value	-	.951	.881	.766		.826	.655

Abbreviations: M, Male; F, Female.

Table 3. Adenoma detection rate in both groups [n(%)]

Group	n	Tubular adenoma	Ductal adenoma of the chorionic villi	Mixed adenoma	Total
Research Group	90	11 (12.22)	7 (7.78)	5 (5.56)	23 (25.56)
Control group	90	6 (6.67)	4 (4.44)	2 (2.22)	12 (13.33)
χ^2	-	-	-	-	4.292
P value	-	-	-	-	.038

Table 4. Incidence of adverse reactions in the two groups [n(%)]

Group	n	Nauseating	Vomiting	Abdominal pain	Bloating	Headaches	dizzy	Lack of power	Total
Research Group	90	2 (2.22)	2 (2.22)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (4.44)
Control group	90	4 (4.44)	3 (3.33)	1 (1.10)	1 (1.10)	1 (1.10)	2 (2.22)	1 (1.10)	13 (14.44)
χ^2	-	-	-	-	-	-	-	-	5.262
P value	-	-	-	-	-	-	-	-	.022

control group passed the bowel preparation, with a pass rate of 85.56%. The pass rate of bowel preparation was higher in the research group than in the control group (χ^2 =5.262, P = .022).

Rate of appendicular intubation

Cecum intubation was completed in 88 patients in the research group, with an intubation rate of 97.78%, and in 80 patients in the control group, with an intubation rate of 88.89%. The cecum intubation rate was higher in the research group than in the control group (χ^2 =5.714, P = .017).

Adenoma detection rate

The adenoma detection rate was higher in the research group than in the control group (P < .05, Table 3).

Compliance rate

Eighty-five patients in the research group were compliant, with an adherence rate of 94.44%; 73 patients in the control group were compliant, with an adherence rate of 81.11%. The compliance rate of the research group was higher than that of the control group (χ^2=7.457, P = .006).

Patient Satisfaction

The satisfaction score for the research group was (4.32±0.32) and the control group was (3.08±0.46). The satisfaction score of the research group was higher than that of the control group (t =17.607, P = .000).

Incidence of adverse reactions

The incidence of adverse reactions was lower in the research group than in the control group (P < .05, Table 4).

DISCUSSION

Our study demonstrated that nursing intervention based on OKR goal management is a very effective nursing model, and applying this nursing model to colonoscopy significantly improves bowel preparation pass rates, cecum intubation rates, adenoma detection rates, patient compliance, and patient care satisfaction.

The OKR management model directly contributes to improving the quality of healthcare delivery by emphasizing goal clarity, quantifiable results and teamwork. This management model helps to ensure that healthcare teams have a clear understanding of what needs to be achieved and evaluate their performance against quantifiable results. At the same time, OKRs facilitate communication and collaboration between healthcare teams, making the whole team closer and more efficient. Together, these benefits work to provide better and more efficient healthcare for patients in the healthcare service sector. Studies have reported that 20-25% of patients undergoing colonoscopy have inadequate bowel preparation, and the American Society for Gastrointestinal Endoscopy recommends an 85% bowel preparation rate for inpatients.[11] Good bowel preparation is essential for smooth insertion, visualization of the colonic mucosa, accurate biopsy of tissue specimens, and removal of polyps via colonoscopy, and can effectively reduce the incidence of local infection in the postoperative period, which is essential during colonoscopy. The bowel preparation process is complex and requires close nursing support to achieve the desired goals. Although the existing routine nursing interventions can meet the requirements of bowel cleansing before colonoscopy, there are problems such as too simple precautions for bowel preparation, bowel preparation methods are not tailored to the individual, and preventing complications during bowel preparation is neglected to achieve optimal results.

The OKR management method originated from management scientist Peter Drucker's Objective Management method, which was popularised by Intel Corporation and is well known to the public. An objective concisely describes a qualitative pursuit that drives an organisation in a desired direction. Key results are a quantitative description used to

measure the achievement of specified objectives.[12,13] OKR goal setting is based on a vision and mission that sets objectives over time and identifies a number of key results to be accomplished to achieve objectives. There are several principles of OKR goal setting: clear objectives, a time frame, independent individuals to carry out the objectives; quantifiable key results; and objectives that are accepted by both the team and the individual.[14] OKR encourages employees to set and achieve their own challenging objectives. A combination of bottom-up and top-down horizontal synergy, so that there is no overlap and no omission of goals and efforts to support the achievement of the organization's overall goals.[15] In recent years, OKR has become familiar as a revolutionary and alternative to goal management tools. In foreign companies such as Intel and China's Byte Dance, OKR goal management has proven effective in internal management. The introduction of OKR into clinical nursing can strengthen the nursing staff's awareness of goals, improve their self-efficacy and initiative, promote nurse-patient communication, standardize key nursing processes, improve the standardization of nursing measures, help the whole nursing team focus on the same goal, improve the sense of teamwork, and is expected to have high application value in clinical nursing. Applying OKR target management to bowel preparation for colonoscopy, with clear bowel preparation targets such as "90% of patients achieve watery stools," ensures that both the healthcare team and the patient clearly understand the desired outcome. At the same time, the results can be quantified, for example, by recording the number of bowel movements, the nature of bowel movements and other quantitative indicators, so that it is easy to accurately assess the effectiveness of bowel preparation, and facilitate timely adjustment of the strategy; OKR can promote close cooperation between the health care team, and work together to achieve the goals set for bowel preparation. Compared with the traditional care model, it demonstrates higher goal clarity, quantifiable results, teamwork and feedback learning ability, which is more advantageous.

We investigated the effect of OKR goal management-based nursing intervention in bowel preparation before colonoscopy. The results showed that the pass rate of bowel preparation, cecum intubation rate, and adenoma detection rate of the research group was higher than those of the control group. The incidence of adverse reactions was lower than those of the control group, confirming that OKR goal-based management helps to improve the quality of bowel preparation before colonoscopy, increase the success rate of colonoscopy. It was confirmed that OKR-based goal management helped to improve the quality of bowel preparation before colonoscopy, the success rate, and the efficiency of colonoscopy. In the OKR goal-based management nursing intervention, all nursing staff had a strict awareness of the goal of improving the quality of bowel preparation and the goal was challenging; this was coupled with three key outcomes with significant quantitative characteristics of 88% bowel preparation pass rate, 95% patient compliance and 95% healthcare staff knowledge of bowel preparation. It helps to generate practical nursing solutions, such as personalized bowel preparation instructions for different patients; psychological support for patients to reduce anxiety and other psychological aspects of bowel preparation and improve compliance; and guidance on abdominal massage which improves the overall motivation to accomplish nursing goals. In the process of OKR implementation, assessment of health care workers' knowledge mastery, training, and learning and assessment are carried out in time slots. Measures are implemented according to individual OKRs, while quantitative scoring of implementation is carried out, which helps to keep an eye on the implementation progress and make appropriate adjustments to inappropriate areas. The review and evaluation and continuous improvement session is a process to summarize the experience of bowel preparation and to continuously improve the quality of bowel preparation. By completing the individual OKRs, the nursing staff can progress to the overall OKRs, thus effectively improving the quality of bowel preparation before colonoscopy, increasing the pass rate of bowel preparation, facilitating the smooth conduct of colonoscopy, and improving the efficiency of the examination. The results of this study are consistent with those of previous similar studies.[16]

We analyzed the impact of the OKR-based nursing intervention on patients' perception of bowel preparation before colonoscopy. The results showed that the compliance rate and satisfaction with nursing care in the research group were higher than those in the control group, indicating that the OKR-based nursing intervention helped to improve patients' personal perception of colonoscopy. In the OKR-based goal management nursing intervention, led by a strong sense of purpose, especially the goal of improving patient compliance, nursing staff not only focus on whether the bowel preparation is correct and in accordance with procedures and regulations but also pay more attention to the patient's feelings during the bowel preparation process. Nursing staff should understand the patient's personal situation and psychological state and take measures to ease the situation by communicating with the patient to eliminate fear and answering the patient's questions. At the same time, nursing staff improved patients' compliance with nursing measures and strengthened adherence by communicating with patients to eliminate fear, answering patients' questions to alleviate anxiety, focusing on nursing attitudes, and softening nursing behaviors. In the OKR-based goal management nursing intervention, the nursing staff, led by a strong sense of goal, especially the goal of improving patient compliance, not only paid attention to whether the bowel preparation was correct and in accordance with the procedures and regulations but also paid more attention to the patient's feelings during the bowel preparation process by understanding the patient's personal situation and psychological state, adopting measures such as communicating with the patients to eliminate their fears, answering their questions to relieve By understanding the patient's personal situation and psychological state, we can improve the patient's compliance with nursing measures and strengthen

compliance by communicating with the patient to allay his or her fears, answering his or her questions to relieve anxiety, paying attention to nursing attitudes and softening nursing behaviors. On the other hand, in the current situation where the relationship between doctors and patients and nurses is tense, the patient satisfaction rate is not only related to the harmony of the relationship between doctors and patients and nurses but also to the overall reputation of hospital care and the image of the hospital. OKR-based goal management, while strengthening patient compliance and quality care, can reduce the probability of patients undergoing secondary examinations and facilitate the smooth conduct of the entire colonoscopy, helping to improve patient satisfaction rates and promote a harmonious doctor-patient relationship.

However, the implementation of OKR in nursing practice has some potential challenges, such as the resistance of some patients to methodological innovations in bowel preparation and the need for some cost to train nursing staff. These challenges will be gradually resolved in the future as OKRs penetrate into nursing practice.

Limilition

There are some limitations in this study, such as the small number of cases included leads to some limitations in the results of the study; there is a lack of specific criteria for the implementation of nursing interventions. In the next step of the study, we will further expand the number of cases and refine the implementation criteria of nursing interventions to further explore the effectiveness of the nursing model guided by the OKR goal management model in bowel preparatio.

CONCLUSION

Nursing interventions based on OKR goal management can significantly improve the quality of bowel preparation for colonoscopy, which can facilitate the smooth performance of colonoscopy and have greater value for clinical application. It can be widely used in a number of care management areas such as chronic disease management and postpartum management. At the same time, OKRs can be integrated into nursing education, nursing policy development, and clinical guidelines to foster a culture of continuous improvement and goal-directed care in healthcare settings.

CONFLICTS OF INTEREST

The authors report no conflict of interest.

AVAILABILITY OF DATA AND MATERIALS

The data supporting this study's findings are available from the corresponding author upon reasonable request.

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