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Evaluation of the Implementation Effectiveness of a Standardized Nursing Protocol for Ambulatory Chemotherapy Pump Infusion in Home-Based Care Settings

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Abstract: ***Objective*:** To explore the implementation effect of a standardized nursing process for continuous infusion via home chemotherapy pumps in day chemotherapy patients, and to provide a reference for improving nursing quality. ***Methods*:** We studied 316 patients who got FOLFOX chemotherapy at our hospital's Day Chemotherapy Center between January and June 2025. We used a before-and-after design. Patients treated from January to March 2025 were the control group and got standard home nursing care for their chemotherapy pump. Patients treated from April to June 2025 were the experimental group. They received the standardized nursing process on top of the usual care. ***Results*:** In the experimental group, 94.30% (149/158) of patients got their chemotherapy on time, compared to 84.18% (133/158) in the control group. This difference was significant (χ^2=8.62, P<0.05). The experimental group also had higher nursing satisfaction scores [94.4 (89.0, 100.0)] and a higher satisfaction rate (98.10%) than the control group [88.8 (80.0, 100.0), 86.71%], and the difference was significant (Z=5.16, P<0.05). Adverse events were low in both groups: 3.8% (6/158) in the experimental group and 7.0% (11/158) in the control group, but this difference was not statistically significant (P>0.05). ***Conclusion*:** The application of the standardized nursing process in the management of continuous infusion via home chemotherapy pumps for day chemotherapy patients can significantly improve the on-time drug infusion rate and patient satisfaction, ensure the safety of home chemotherapy, and thus have clinical promotion value.

Keywords: Portable chemotherapy pump; Home chemotherapy; Standard operating procedure; Nursing quality; Day chemotherapy; 5-Fluorouracil

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1. Introduction

Gastrointestinal tumors are a group of heterogenous malignancies that occur in the digestive tract, such as esophageal cancer, gastric cancer, hepatocellular carcinoma, pancreatic cancer, colorectal cancer, etc. These malignancies collectively account for over 25% of all cancer incidences and approximately 35% of global cancer-related mortality rates [1]. According to data released in 2020, gastrointestinal malignancies comprised 38.8% of newly diagnosed cancer cases in China [2].

Chemotherapy has always been a key treatment for patients with advanced disease or metastasis after surgery [3]. In recent years, China has made significant improvements in the diagnosis and treatment of tumor diseases. Daytime chemotherapy has gradually become an important choice for the treatment of patients with gastrointestinal tumors. This treatment model can effectively shorten the hospitalization time of patients and reasonably reduce the economic burden of treatment [4]. The chemotherapy pump used at home occupies a very important position in the development of daytime chemotherapy. Whether the nursing staff can manage the relevant nursing process in place will be directly related to whether the effect of chemotherapy can reach the expectation, and will also affect the safety of patients in the treatment process. Can be guaranteed [5]. For such diseases as gastrointestinal tumors, chemotherapy is still one of the most important treatment methods, and FOLFOX regimen (oxaliplatin + calcium folinate + fluorouracil) is also a commonly used chemotherapy regimen in clinical practice [6]. 5-FU itself is a time-dependent drug. Only through continuous and stable infusion operation, the drug concentration in the patient's blood can be maintained in a stable state, so that the therapeutic effect of this drug can be brought to the best level [7]. In the actual diagnosis and treatment of the hospital, portable micro-infusion pumps are often used in the continuous chemotherapy infusion of patients at home [8]. In addition, 5-FU is also a cycle-specific drug, which has a relatively fast metabolic rate in the body and a relatively short half-life.

To get the best effect, current guidelines recommend keeping its plasma levels steady through extended infusion. This approach helps expose S-phase tumor cells more effectively and improves cytoreduction [9].

After patients return home to carry out infusion therapy, various problems are easy to appear one after another ; on the one hand, the home environment, the operating habits of the accompanying staff, and the patient's own compliance and other multiple conditions are likely to disrupt the original smooth infusion process [10]. The first problem that needs to be paid attention to is the disconnection between the content of hospital education and the actual operation at home. When some patients lack the ability to operate the chemotherapy pump independently, such problems will be more prominent. Patients may inadvertently pull the indwelling catheter if they do some ordinary physical activities daily. Once the catheter falls off and loosens, it will not only cause extravasation of chemotherapy liquid and damage the surrounding body tissue, but also directly interrupt the whole infusion work [11]. This kind of accidental fluctuation will make the blood concentration of 5-FU in patients rise and fall, which can not only weaken the pharmacological effect of the drug relying on time dependence, but also aggravate the psychological anxiety of patients themselves, and even lead to contradictions and differences between patients and caregivers [12]. In addition, the winding and knotting of the infusion pipeline, the fluctuation of the ambient temperature, or the failure of the relevant personnel to follow the standard steps, will also disrupt the original infusion rhythm, resulting in the early termination or delayed termination of the infusion, which can adversely affect the chemotherapy from the two levels of efficacy and treatment safety [13].

SOP is a standardized way of doing things. It lays out the steps and quality requirements clearly, so

everyone can work consistently and avoid mistakes. In healthcare, SOPs have been used in ECMO, surgical coordination, and nursing management, and they have indeed improved efficiency and care quality [14].

Quite a few studies have looked at nursing care for portable chemotherapy pumps. But for day-chemotherapy patients who need continuous 5-FU infusion at home, there really aren't any practical, ready-to-use SOPs. Without one, the whole infusion process has no standardized management, and it's hard to keep risks under control. That's a real challenge in clinical nursing, and it's exactly what this study set out to address.

So we developed an SOP specifically for home-based chemotherapy pump care, tried it out in clinical practice, and got good results. The outcomes are presented below.

2. Materials and methods

2.1. Study design

We used a before-and-after controlled design. Patients admitted between January and March 2025 were the control group. They received standard care. Patients admitted between April and June 2025 were the experimental group. They got the SOP on top of standard care.

2.2. Research subjects

We enrolled 316 cancer patients in total. All of them received FOLFOX chemotherapy at our hospital's daytime chemotherapy center between January 2025 and June 2025. They were discharged with a Baxter Infusor elastomeric pump for home infusion.

2.2.1. Inclusion criteria

(1) Pathologically confirmed diagnosis of [gastric cancer (ICD-10: C16), colorectal cancer (ICD-10: C18-C21), or esophageal cancer (ICD-10: C15)]; meeting the chemotherapy indications outlined in the Guidelines for the Diagnosis and Treatment of Gastrointestinal Cancer in China; and having initiated continuous home infusion therapy using an elastomeric portable chemotherapy pump.

(2) Successful establishment of a central venous catheter (PICC or port), with no catheter-related contraindications such as occlusion, damage, or infection.

(3) Aged ≥ 18 years, fully conscious, and possessing normal communication and comprehension abilities.

(4) First-time use of an elastomeric portable chemotherapy pump, with no prior operational or in-home usage experience.

2.2.2. Exclusion criteria

(1) Concurrent severe dysfunction of major organ systems (e.g., cardiac, hepatic, renal, hematopoietic) or presence of chemotherapy contraindications precluding tolerance to continuous chemotherapy.

(2) Diagnosis of psychiatric disorders, cognitive impairment, or language communication barriers that hinder cooperation with nursing procedures, data collection, or follow-up.

(3) The living environment of some patients at home can not meet the conditions required for the normal operation of the elastic portable chemotherapy pump.

(4) Subjects who had adverse events such as extravasation of chemotherapeutic drugs, catheter-related infections, or catheter shedding in the three months before entering the observation phase of this study

also need to be excluded.

2.2.3. Statistical Sample Estimation

Sample size estimation followed the dual-proportion equivalence formula: . With parameters set at (two-tailed,) and a power of 80%, calculations focused on home-based delayed drug infusion rates. Based on the pre-test survey data previously carried out by our hospital, we made a pre-conceived assumption that after the implementation of SOP interventions, the baseline infusion delay rate of 15 % could be reduced to 5 %. It can be calculated by the formula that each group needs to receive at least 142 subjects. Considering that there will be problems such as case shedding and data loss during the follow-up period of the study, the study set aside an additional 10 % of the sample loss space. The final research plan determined that 158 subjects were included in each group, and a total of 316 samples were collected.

2.3. Intervention methods

2.3.1. Control group

The patients in the control group were treated with portable chemotherapy infusion pump at home routine nursing management ; after the docking of the portable chemotherapy infusion pump and the central venous catheter in the daytime chemotherapy center, the nursing staff of the department will carry out routine health education work, and explain the basic operation principle of the chemotherapy pump in detail to the ears of patients and accompanying family members. The related education content also includes various precautions for home use, which will involve the protection method of chemotherapy pump, catheter fixation operation, key points of position control during infusion, and health guidance content for high incidence of adverse reactions of chemotherapy.

2.3.2. Experimental group

The experimental group will be based on the original routine nursing of the control group, and then add the SOP standardized nursing management plan ; first of all, the standardized nursing procedures (SOP) implemented in this study are divided into five core implementation links. When each link is implemented on the ground, it is necessary to strictly follow the relevant guidelines of aseptic operation and the existing clinical nursing norms to promote. The specific operation content can be explained below.

(1) **Assessment**

Nursing staff need to check the patient's personal information, the name of the drug used, the dosage of the drug, the overall infusion time and the flow rate of the drug one by one ; at the same time, it is also necessary to check whether the remaining liquid volume in the chemotherapy pump can be consistent with the content of the doctor's advice, and the pipeline should be fully flushed to ensure that no bubbles will remain inside the pipeline. During the whole verification process, we should pay attention to the patient's venous access, and confirm that the infusion port or PICC pipeline is in a state of patency and no leakage, and there is no redness, pain or abnormal exudation at the puncture site.

(2) **Connection and fixation**

When carrying out the operation, it is necessary to follow the relevant specifications of aseptic operation, and use chlorhexidine or povidone iodine cotton sheet to wipe the infusion joint, and the duration of

wiping operation should be maintained at more than 15 seconds. After that, the chemotherapy pump pipeline is firmly connected to the patient's venous pathway. The operator can install the chemotherapy pump into the protective sleeve and fix it at the waist or shoulder of the patient, so as to avoid the pipeline being pulled and bent. Then the flow rate regulator is accurately debugged, and the anti-reflux clamp valve is adjusted to an open state. After the nursing staff completed the one-to-one home guidance and education, the nurses on duty needed to sign the observation sticker to confirm that the whole operation had been completed.

(3) **Health education**

Nursing staff need to explain the precautions during the home to the patient in detail ; on the one hand, the patient is advised not to carry out strenuous activities and carry heavy objects, which can easily cause the catheter to fall off ; on the other hand, the protection method of chemotherapy pump during bathing and bed rest is explained in detail, and the self-examination method of chemotherapy pump and catheter is demonstrated on the spot, so as to guide patients to pay attention to the abnormal changes of puncture position at any time. The nursing staff should also explain the abnormal manifestations that need urgent medical treatment clearly, sort out the corresponding disposal process of the emergency situation at the same time, leave the patients with all-weather consultation telephone and paper guidance instructions, and assist the patients to access the home intelligent follow-up system. This system contains the actual operation video of chemotherapy pump, the key points of basic nursing at home, and the online reporting function of abnormal situation. It is convenient for patients to consult relevant knowledge at any time and seek medical assistance in time when they encounter difficulties.

(4) **Infusion completion and disconnection**

When carrying out the extubation operation, the medical staff should first confirm that the liquid in the drug storage bag of the pump body has been completely infused, and the actual total dosage can be consistent with the requirements of the doctor's advice ; subsequently, the roller clamp was closed and the infusion pipeline was separated, and 10 mL of normal saline was used to flush the catheter in a pulsed manner [15]. The speed of flushing the catheter should be controlled at about 3–5 mL per second as far as possible [16]. Once you confirm the catheter is open and there's no resistance, lock it with 100 U/mL heparinized saline, again using a pulsatile positive-pressure technique [17]. Follow the rule of "clamp before needle removal". Pull the non-coring needle straight out, apply pressure until bleeding stops, and cover the site with a sterile dressing. Check that the needle tip is intact, then dispose of it according to standard protocols.

(5) Waste disposal

Medical staff need to wear disposable latex gloves and protective goggles during these operations. Put used needles into sharps containers right away. Tubing and pump parts that touched chemotherapy drugs go into leak-proof yellow medical waste bags. Seal the bags securely, then put them into designated chemotherapy waste containers for disposal. After all operations, wash your hands thoroughly following hand hygiene protocols.

2.4. Evaluation method

2.4.1. Medication on-time infusion rate

We used medication on-time infusion rate as the main outcome, and also looked at infusion time accuracy.

Through on-site checks, we recorded how much the actual infusion time differed from the scheduled time for patients in both groups. Based on the pharmacokinetic properties of 5-FU [18] and the 2024 edition of the Clinical Application Guidelines for Novel Antitumor Drugs [19], we set a deviation of 30 minutes or less as the standard for on-time infusion. This level of deviation does not noticeably affect blood drug concentration stability and still ensures chemotherapy effectiveness. We then calculated the on-time rate (deviation ≤ 30 min) and the off-time rate (deviation > 30 min), paying special attention to how the SOP intervention affected infusion accuracy.

2.4.2. Evaluation of home-based chemotherapy safety

We looked at three categories of adverse events.

(1) Catheter migration

The catheter tip moves 1 cm or more from where it should be, and needs to be adjusted or replaced [20].

(2) Drug extravasation

Chemo drugs leak out of the blood vessel during infusion, causing redness, swelling, and pain at the site [21].

(3) Catheter-related bloodstream infection (CRBSI)

Meeting the standard diagnosis for hospital-acquired infections, with the same bacteria found in both the blood and the catheter tip, and the patient has fever (38.5 ℃ or higher) or other signs of infection [22].

(4) Minor local redness at the puncture site

The red area is no more than 2 cm across, with no pain or fluid leaking out, and does not need special treatment—it is considered a minor event [23].

2.4.3. Patient satisfaction

We used patient satisfaction as a secondary outcome, measured with a self-designed nursing satisfaction scale. The scale has 10 items, each scored from 1 to 10, so total scores range from 10 to 100. Higher scores mean greater satisfaction. The scale showed good reliability and validity, with a Cronbach's α of 0.87 and a content validity index of 0.92.

We used the Shapiro-Wilk test to check the data distribution. The results showed that the total satisfaction scores were not normally distributed ($P < 0.05$). So we used the Wilcoxon rank-sum test to compare the two groups.

To make the results easier to understand clinically, we also calculated the satisfaction rate. The satisfaction rate was defined as (number of "highly satisfied" patients + number of "satisfied" patients) divided by the total number of patients, multiplied by 100%. We set the cutoffs as follows: scores of 90 or above were "highly satisfied", 70 to 89 were "satisfied", 60 to 69 were "neutral" and below 60 was "unsatisfied".

When the catheter pump was removed, nurses gave the questionnaire to patients, helped them fill it out, and collected the forms right away. Then they tallied the satisfaction data based on the completed scales.

2.5. Data collection and quality control

We reviewed patient records to collect demographic and clinical information from both groups, including gender, age, tumor type, number of chemotherapy cycles, and type of venous access.

When the pump was connected, the nurse in charge wrote down the start time and the expected

completion time (48 hours later) on the pump itself [24,25]. When the patient came back to have the pump removed, we checked the time written on the pump, asked the patient when it actually finished, and looked to see if any medication was left in the pump. If the difference between the actual and expected completion times was 30 minutes or less, we counted it as punctual. Then we calculated the punctual infusion rate based on that.

After the pump was removed, specialized nurses handed out the nursing satisfaction questionnaires. Patients filled them out on the spot, nurses collected them right away, and then they tallied the results.

When patients came back for follow-up, we asked about their home care experience and also did an on-site check. Based on that, we recorded any adverse events—such as problems at the puncture site, catheter issues, or drug leakage. We described these events for safety monitoring without doing further statistical analysis. Two researchers independently went through all the data and organized it. We used the Kappa statistic to see how much they agreed; a Kappa of 0.85 or higher meant good agreement. If they disagreed on anything, a third researcher made the final call.

2.6. Statistical methods

We analyzed the data using SPSS 26.0. For continuous data, we used mean ± standard deviation and compared groups with the t-test. For categorical data, we used counts (percentages) and the χ^2 test. The significance level was set at $\alpha=0.05$, so $P<0.05$ was considered statistically significant. Because the total score of the Patient Care Satisfaction Scale did not follow a normal distribution (tested by the Shapiro-Wilk test), we compared groups using the Wilcoxon rank-sum test and reported results as median (interquartile range) [M(P25,P75)]. All statistical tests were two-sided, and $P<0.05$ was taken as significant.

3. Results

3.1. Comparison of on-time drug infusion rate

In the experimental group, 94.30% (149/158) of patients got their chemotherapy infusion on time at home, compared to 84.18% (133/158) in the control group. The experimental group demonstrated a statistically significant higher rate of timely infusion than the control group ($\chi^2 = 8.62$, $P < 0.05$). See **Table 1**.

Table 1. Comparison of on-time and non-on-time drug infusion rates between the two groups

Group	Total cases (n)	On-time infusion (n)	On-time infusion rate (%)	Non-on-time infusion (n)	Non-on-time infusion rate (%)	χ^2	P
Experimental group	158	149	94.30	9	5.70	8.62	<0.05
Control group	158	133	84.18	25	15.82		

3.2. Comparison of patient satisfaction

The data of patient satisfaction did not meet the test standard of normal distribution ($P < 0.05$). After the rank sum test was used to carry out the comparative analysis between the groups, it was found that the nursing satisfaction level of the experimental group was significantly higher than that of the control group ($P < 0.05$). See **Table 2**.

Table 2. Comparison of patient satisfaction between the two groups

Group	Total cases (n)	Total scale score [M (P25, P75)]	Very satisfied (n)	Satisfied (n)	General (n)	Dissatisfied (n)	Satisfaction rate (%)	Z	P
Experimental group	158	94.4 (89.0, 100.0)	102	53	2	1	98.10	5.16	<0.05
Control group	158	88.8 (80.0, 100.0)	78	59	17	4	86.71		

3.3. Comparison of adverse events

There were 6 cases of adverse events in the experimental group, accounting for 3.8% of the total number of the group, including 2 cases of mild catheter displacement and 4 cases of mild swelling at the puncture site. There were 11 cases of adverse events in the control group, with an incidence of 7.0%, including 2 cases of small amount of liquid extravasation, 4 cases of catheter displacement and 5 cases of redness and swelling at the puncture site. There were no cases of catheter-related bloodstream infection in both groups. The overall incidence of adverse events in the two groups was at a low level. After statistical comparison, the difference between the groups was not statistically significant ($\chi^2 = 1.58$, $P > 0.05$). On the one hand, the results may be related to the small sample size selected in this study. The limited sample size will restrict the ability of the data to detect the real differences between groups to a certain extent. On the other hand, the basic conditions of the subjects enrolled are not much different. The baseline data of each group also achieved a balanced ratio, which will also make it difficult for statistics to detect significant differences between groups.

After all patients with adverse events were treated in a timely manner, the related symptoms were improved, and no severe adverse related complications occurred throughout the course. See **Table 3**.

Table 3. Comparison of the incidence of adverse events between the two groups

Group	Total cases (n)	Number of adverse events (n)	Incidence of adverse events (%)	χ^2	P
Experimental group	158	6	3.80	1.58	>0.05
Control group	158	11	7.00		

4. Discussion

4.1. The implementation of SOP standardized nursing program can effectively improve the on-time infusion rate of patients, and can also play a corresponding role in ensuring the safety and overall treatment effect of home chemotherapy

From the data obtained from this study, it can be seen that the proportion of drug infusion on time in the

experimental group implementing the SOP nursing program will be significantly better than that in the control group of routine nursing. This means standardized nursing protocols can really improve timing accuracy for home-based 5-FU infusion.

5-FU is a time-dependent drug, so its effectiveness against tumors really depends on how long you can keep blood levels in the right range [26]. Once the infusion time is deviated, it will directly interfere with the actual dose of the drug acting on the tumor lesion, which will adversely affect the therapeutic effect of the overall chemotherapy [27].

In the past, most of the published related studies have only explored the chemotherapy pump infusion nursing of hospitalized patients. On the one hand, we have not yet been able to form a set of standardized step-by-step operation procedures that can be implemented in clinical practice to guide outpatients to complete the pump body infusion at the home stage. On the other hand, the lack of such procedures will bring many practical problems. Patients are prone to inadequate implementation of steps when operating at home, and it is difficult to obtain adequate nursing supervision during the whole infusion process [28].

The SOP constructed in this study can build a closed-loop management system covering the whole process of infusion. This system will take into account the clinical operation content of medical staff and the home self-care behavior of patients. In the process of in-hospital nursing, the program will reduce the occurrence of various nursing errors from the root through double verification and evaluation, standardized pipeline connection and fixed operation mode [29] ; in the scene of home management, this scheme can also rely on systematic health education and intelligent follow-up system to help patients better complete self-care work.

This complete set of nursing operation process can effectively avoid the infusion interruption, infusion time deviation and other conditions caused by improper operation and catheter abnormality [30]. This improvement can significantly improve the qualified rate of on-time infusion of drugs in patients [31], and can further consolidate the overall safety guarantee basis of home chemotherapy mode.

4.2. SOP improves patient compliance and satisfaction with home-based chemotherapy nursing services

The data obtained in this study can also be intuitively reflected. The evaluation results of nursing satisfaction in the experimental group using SOP nursing program will be significantly better than those in the control group using routine nursing ($P < 0.05$). From this result, it can be seen that the standardized operation process can optimize the home medical experience of patients with daytime chemotherapy, which can not only improve the satisfaction of patients with various nursing services, but also help patients better comply with the whole set of chemotherapy diagnosis and treatment plan.

In the past, most of the traditional nursing care only relied on oral explanation to complete health education. The related propaganda content often has the problem of repeated repetition, and the arrangement of knowledge points is also scattered. Under such propaganda and education conditions, it is difficult for patients to fully understand the key contents of home care. When there is a lack of clear step-by-step operation norms, patients are prone to irregular operation behaviors, which in turn induces various infusion-related adverse problems, and also aggravates the patient's inner irritability and anxiety [32].

The SOP developed by us can properly resolve the various drawbacks mentioned above from a number of specific measures ; the first is to unify and standardize the guidance template used in health education.

The second is to open a supporting follow-up communication channel. The third is to paste the observation reminder stickers in the prominent position of the chemotherapy pump. These landing methods can bring clear and easy-to-implement home care guidance to patients, and can also help patients learn self-protection and home self-examination methods quickly.

Compared with the traditional way of education relying solely on oral advice, this new nursing mode can reduce the vague and general guidance content, and also reduce the probability of patients forgetting the nursing points [10]. The patient's home medical experience can therefore be truly improved. Even if they have left the hospital, they can feel the professional medical support that continues to follow up. This stable help can enhance the patient's own sense of security, alleviate their various concerns about sudden accidents, and then reduce many nursing-related problems that could have been avoided.

In summary, this systematic and standardized patient guidance model can effectively improve the patient's treatment compliance and nursing satisfaction ; at the same time, the model can also form a virtuous cycle relationship. After patients get a better medical experience, they will be more active in cooperating with the follow-up diagnosis and treatment work, which in turn can steadily improve the quality of nursing and further optimize the final chemotherapy effect.

4.3. The SOP helps fill a gap in specialist management and improves the standardized nursing system for home-based infusion in daytime chemotherapy

This study independently developed and validated a set of SOP specifications for home-based continuous chemotherapy pump infusion ; the operation standard can effectively fill the research gap in the special management of home infusion for daytime chemotherapy patients. On the one hand, it can provide a set of practical and available nursing work mode for clinical nursing staff, so that the nursing work related to home chemotherapy can become more standardized and unified. On the other hand, it can also help clinical nursing get rid of the traditional nursing mode which is scattered in the past and relies solely on personal experience, and promote the nursing work to gradually move towards a systematic and standardized standardized management system.

The SOP developed in this study has fully covered the entire process of nursing work, from the patient's venous access verification work to the final medical waste disposal link ; each step of the whole process is set with a clear implementation standard and corresponding emergency treatment plan. The key point is that this set of SOP can build a complete closed-loop management system, which can effectively link the standardized operation in the hospital with the home follow-up and continuous quality control after discharge. This can not only provide specific and verifiable operation basis for nursing staff, but also make up for all kinds of weak links in the current home chemotherapy nursing management from the actual clinical work level.

This study completed the application verification of the SOP in a single-center clinical environment, and the construction process of the whole scheme also adopted a scientific and standardized step-by-step research method. First, the difficulty of starting this set of operation process is low, and it has a relatively perfect quality control system ; second, it can be adapted to different levels and different types of medical institutions. Thanks to the simple and clear overall design, the SOP has a very good promotion value and clinical reuse space, and can be widely used in hospitals at all levels. In the follow-up research work, researchers can also refine and optimize the scheme according to different tumor types and different types of infusion drugs, and can also complete the upgrade iteration with the intelligent nursing system, so that the

operation system has more abundant digital service functions.

In general, the SOP constructed in this study can effectively fill the gaps in the special nursing management of 5-FU home continuous infusion at this stage ; on the one hand, it can provide a set of practical reference templates for the optimization and improvement of domestic home chemotherapy nursing standards by relying on standardized process design, closed-loop management mode and perfect quality control system. On the other hand, it can also effectively improve the professional level of daytime chemotherapy nursing. It can provide a certain practical reference value for the standardized management of clinical tumor nursing.

5. Conclusion

The relevant results of this study can be found that the application of home continuous chemotherapy pump infusion SOP for patients with daytime chemotherapy will play a very positive intervention effect ; it can not only effectively improve the patient's on-time infusion rate of drugs, improve the overall nursing satisfaction, but also effectively enhance the overall safety of the home chemotherapy mode. The relevant conclusions obtained in this study can provide a reliable and practical clinical reference for the standardized management of home care for such patient groups.

The reason why this SOP has high clinical application value is mainly reflected in many aspects ; first, it can effectively guarantee the overall treatment effect of 5-FU chemotherapy. Second, it can steadily improve the quality of care for home chemotherapy. Third, it can effectively protect the patient's home treatment safety. Fourth, it can also provide a clear, standardized and directly referenced standardized working model for nursing staff in daytime chemotherapy positions.

For patients with gastrointestinal tumors receiving daytime chemotherapy, this study developed and verified a set of full-process SOP suitable for continuous infusion of 5-FU home pump for the first time. With the help of this standardized operation scheme, we can integrate the nursing work of home chemotherapy into the standardized and unified, whole-process closed-loop management mode, and effectively realize the standardization and homogenization control of home chemotherapy nursing.

The difficulty of implementing this standardized operation process is relatively low, and it can be applied to hospitals of different sizes at all levels. This also makes it have a very considerable application prospect in clinical scenarios.

It needs to be objectively explained that there are still some deficiencies in this study ; first, this study is a single-center clinical trial. The corresponding research results can not be directly extended to other clinical scenarios for the time being. The differences in the operation level of nursing staff and the patient's own compliance may also have a certain impact on the results of this research data. Second, the follow-up time set by the study is relatively limited, and there is no corresponding observation and evaluation of the long-term chemotherapy effect and recurrence of adverse events.

Follow-up studies can carry out multi-center, large-sample randomized controlled trials, while the overall follow-up period is appropriately extended ; on the one hand, it can further explore the actual impact of this SOP on the long-term treatment effect of patients. On the other hand, it can also develop a more personalized SOP version, which can make the nursing work of home chemotherapy more refined and efficient, and further improve the overall clinical nursing quality.

Disclosure statement

The authors declare no conflict of interest.

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