



# Effect of Predictive Nursing Intervention on the Gastrointestinal Side Effects of I-131 Re-treatment in Patients with Differentiated Thyroid Cancer (DTC)

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**Abstract:** Objective: The aim of this study was to explore the effect of predictive nursing intervention on the gastrointestinal side effects of I-131 re-treatment in patients with differentiated thyroid cancer (DTC). Methods: From January 2017 to August 2018, we invited patient with DTC who received I-131 re-treatment to enroll in this study. The participants were randomly assigned to control or predictive nursing intervention groups using a random number table. The primary outcomes were the incidence of gastrointestinal side effects and degree of patient satisfaction with respect to nursing. Patients in the intervention group received predictive nursing intervention, and patients in the control group received common nursing intervention. Result: A total of 69 patients were enrolled in the study. In patient characteristic, the gender, age and disease status were no significantly different for the participants in two groups. In addition, intervention group participants had less gastrointestinal side effect events, including nausea, vomiting and anorexia (10 vs 3, 8 vs 1, 12 vs 2). In nursing satisfaction assessment, intervention group participants provided better outcome in nursing satisfaction assessment compared with control group, that they provided most very satisfied assessment to predictive nursing intervention. Conclusion: Predictive nursing helped decrease the incidence of gastrointestinal side effects and improved patient satisfaction with nursing. Predictive nursing may be effective in DTC patients receiving I-131 re-treatment.

**Keywords:** Differentiated Thyroid Cancer, Radioiodine Re-treatment, Predictive Nursing, Gastrointestinal Side Effects

## 1. Introduction

Differentiated thyroid cancer is one of the most prevalent cancers of the endocrine system. Base on the reports, it accounts for approximately 1% of all neoplasms, with an annual incidence of up to 20 per 100,000 people [1-3]. In addition, iodine-131 (I-131) therapy is one of the conventional approaches for treatment of patients with DTC [4]. Base on the report, I-131 reduces the mortality and recurrence rate of patients with DTC by clearing the remaining cancer cells after surgery [5]. However, I-131 tends to accumulate in the stomach as it is orally administered and excreted by the urinary system [6]. Unfortunately, I-131 causes the destruction of thyroid cells through beta particles after the

radioiodine is absorbed by the body fluids [7-9].

In I-131 treatment, the dosage prescribed for thyroid cancer is approximately 3,000 MBq, and the dosage may be increased to 8,000 MBq in patients with metastatic lesions [7-9]. As for patients are injected with large amounts of I-131, patients may have gastrointestinal adverse effects, including dose-dependent, presenting as nausea, anorexia, and vomiting [10, 11]. These side effects adversely affect the mental health and the recovery of patients with DTC. Therefore, development of nursing interventions to ameliorate the gastrointestinal adverse effects of I-131 therapy is worth studying.

The aim of this study was to investigate the effect of predictive nursing intervention on the gastrointestinal side

effects of I-131 re-treatment in patients with DTC. We report our experience for the purpose of highlighting the problem and emphasizing the importance of early intervention to address this issue.

## 2. Methods

### 2.1. Participants

We enrolled patients with DTC who had had I-131 re-treatment to participate in this trial from January 2017 to August 2018. The diagnostic criteria for DTC were qualified by the patients based on an expert consensus in 2017 [12]. They also supplied written informed consent by agreeing to participate in this study. Patients getting I-131 treatment for the first time, patients requiring surgery, and patients with unstable illness were all excluded.

### 2.2. Study Design

All subjects received oral I-131 therapy at a dose of 125 mCi–200 mCi. Patients in the control group received common nursing intervention. The common nursing intervention included the following elements: (1) admission guidance for cessation of euthyrox therapy for 3–4 weeks prior to radiotherapy and low-iodine diet for 4 weeks; (2) evaluation of the history of gastric diseases, such as gastritis or gastric ulcer, at admission; (3) health education pertaining to diet, medication, examination, and radiation protection; (4) early use of mucosal protective agents; (5) video observation of the occurrence of gastrointestinal side effects; (6) guidance pertaining to diet, medication, subsequent visits, and radiation protection at discharge.

Predictive nursing intervention was provided to patients in the intervention group.

The intervention consisted of three main components: (1) a comprehensive evaluation at admission, particularly a history of gastrointestinal side effects caused by I-131 treatment; (2) a mental health intervention, which included health education about therapy and adverse effects, listening and comforting, music therapy, and diverting attention to relieve anxiety [6]; and (3) improving patients' self-care skills, including teaching them how to deal with vomiting (collection of data). (4) After obtaining permission, personal predictive intervention for vomiting with intravenous injection of tropisetron hydrochloride 5 mg in 20 mL saline solution administered 30 minutes before I-131 therapy; the patient was checked every

two hours. (5) Tropisetron hydrochloride was administered again in case of vomiting, and the radio contaminated waste was disposed according to the regulations pertaining to radioactive waste management. (6) Safe nursing practices were adopted by video monitoring of patients and instructing patients to stay in bed and avoid falls in case of nausea, vomiting, or dizziness. (7) Nutritional support by providing balanced diet, family support by encouraging and comforting patient; (8) guidance by the personal nurse at discharge with consistent instructions and telephonic follow-up once a week for 1–2 weeks.

### 2.3. Outcome

The impact of predictive nursing intervention was measured by the occurrence of gastrointestinal side effects and the level of patient satisfaction with nursing. The severity of vomiting was determined by the number of times it occurred, which was classified as mild (1–2 times), moderate (3–4 times), or severe ( $> 4$  times) [13]. We also used a questionnaire to obtain patient satisfaction data. Very satisfied, satisfied, and dissatisfied were the three levels of satisfaction. The total number of highly pleased patients plus the number of satisfied patients was multiplied by 100 percent and then divided by the total number of patients to determine the degree of satisfaction with nursing care.

### 2.4. Statistical Analysis

SPSS 22.0 was used for statistical analysis. The categorical variables are described as frequency (n) and percentage (%) and the between-group differences assessed using the Chi-squared test. The rank sum test was used to analyze the ranked data. P values  $< 0.05$  were considered indicative of statistical significance.

## 3. Result

The research included a total of 69 patients (intervention group consisted of 35 patients with DTC and control group consisted of 34 patients with DTC). Gender, age, and illness state were not substantially different between the two groups in terms of patient characteristics ( $p > 0.05$ ). Participants in the intervention group were 20 girls and 15 men, with an average age of 33.76  $\pm$  14.28 years. In 2 instances, 12 cases, and 21 cases of low risk, moderate risk, and high risk, their illness status was present.

*Table 1. Patient characteristic.*

Group	Cases	Gender (female) (n)	Age (year) (mean $\pm$ SD)	papillary thyroid cancer (n)	low risk (n)	moderate risk (n)	high risk (n)
Control	34	17	33.09 $\pm$ 14.85	33	2	19	13
Intervention	35	20	33.76 $\pm$ 14.28	33	2	12	21
P value	-	$P > 0.05$	$P > 0.05$	$P > 0.05$	$P > 0.05$	$P > 0.05$	$P > 0.05$

Table 2 shown that incidence of gastrointestinal side effects between the two groups. Compared with control group, intervention group participants had less gastrointestinal side

effect events, including nausea, vomiting and anorexia (10 vs 3, 8 vs 1, 12 vs 2). In addition, their results were significantly different between two groups ( $p < 0.05$ ).

**Table 2.** Incidence of gastrointestinal side effects between the two groups [n, (%)].

Group	Cases	Nausea	Vomiting	Anorexia
Control	34	10 (29.4)	8 (23.5)	12 (35.3)
Intervention	35	3 (8.6)	1 (2.9)	2 (5.7)
$\chi^2$		4.8986	6.4980	9.3303
P value		0.026	0.010	0.002

We collected the nursing satisfaction assessment after carry out nursing intervention. Compared with control group, intervention group participants provided better outcome in nursing satisfaction assessment, that they

provided most very satisfied assessment to predictive nursing intervention. And nursing satisfaction assessment for two group were significantly different (76.4% vs 100%), as shown in Table 3.

**Table 3.** Comparison of nursing satisfaction between the two groups [n, (%)].

Group	Cases	Very satisfied	Satisfied	Dissatisfied	Nursing Satisfaction
Control	34	14 (41.2)	12 (35.3)	8 (23.5)	76.4%
Intervention	35	29 (82.9)	6 (17.1)	0 (0)	100%
Z/ $\chi^2$			-3.798		9.3153
P value			0.000		0.002

## 4. Discussion

Thyroid cancer has been on the rise in terms of incidence and death in recent years [14, 15].

Patients with DTC who are treated by complete or partial thyroidectomy and I-131 therapy have a similar life expectancy to the general population; however, patients who are not cured have a life expectancy of just 60% of the general population [16]. Distant metastasis affects 12–19% of DTC patients, and 6–21% of them had partial recrudescence [17]. Despite the fact that I-131 therapy may raise the incidence of subsequent malignancies, no studies have proven that patients' lives are cut short as a result of the treatment. DTC therapy that is aggressive has been demonstrated to reduce tumor development and extend overall survival [18]. Therefore, I-131 therapy is still one of the best options for DTC patients with metastasis or patients with non-operable tumors.

Table 2 shows that the intervention group had less gastrointestinal side effects than the control group. This finding showed that predictive nurse intervention reduced the occurrence of gastrointestinal side effects, which is excellent news for treatment effectiveness and nursing satisfaction. The explanation for this might be that because the predictive nursing intervention provided individualized measures depending on the patients' state, we were able to lessen the elements that led to gastrointestinal side effects. Table 3 shows that the intervention group outperformed the control group in terms of nurse satisfaction. According to the results of the nurse satisfaction survey, predictive nursing intervention enhanced the image of patients with DTC.

Higher dosage of I-131 therapy (150–250 mci) is commonly used in DTC patients with metastasis to clear the micro metastatic lesions. The cumulative dose of I-131 shows a positive correlation with gastrointestinal side effects; this may be attributable to the intense gastric irritation caused by higher dosage of I-131 or to aggravation of mucosal damage

by repeated treatments. Anxiety and depression are commonly seen in cancer patients [19]. Gastrointestinal side effects caused by I-131 therapy have a negative impact on the mental health of cancer patients. Predictive nursing intervention may offer potential benefits for DTC patients with gastrointestinal side effects [20].

In a previous study, occurrence of vomiting was still high after high-dose I-131 therapy even with predictive intervention [21]. The common gastrointestinal side effects are anorexia, abdominal distension, nausea, and vomiting, leading to electrolyte disturbance and weakness [22]. Predictive nursing intervention includes comprehensive evaluation at admission, personal vomiting intervention, and timely psychological counseling; this approach is of great significance in the management of gastrointestinal side effects. In this study, predictive nursing intervention helped decrease the incidence of gastrointestinal side effects and improve the patient satisfaction with respect to nursing.

In limitation, our subjects were patient with DTC who received I-131 re-treatment, so it is not known whether our results are application to other disease or patients with other treatment. Also, because we examined only 69 patients, the result of this study may have been due to chance. The results must be confirmed in a large study.

The safety and patient satisfaction with nursing are important indicators for successful treatment. The National Radiation Protection Act mandates closed-off management of patients receiving I-131 treatment because of the high radioactivity of I-131. The patients were nursed under video monitoring, and there's potential risk of safety once gastrointestinal side effects occurred. Predictive nursing intervention aims to improve the compliance and awareness of patients by teaching self-management skills to the patients. Post-discharge follow-up plays an important role in developing a harmonious nurse-patient relationship. Social and nutritional support helps promote the mental health of DTC patients and is an important element of predictive nursing.

## 5. Conclusion

In conclusion, we findings that predictive nursing intervention was effective in DTC patients receiving I-131 re-treatment. we investigated the effect of predictive nursing intervention on the gastrointestinal side effects of I-131 re-treatment in patients with DTC. Predictive nursing intervention helped decrease the incidence of gastrointestinal side effects and improved nursing satisfaction.

## Funding

The experimental protocol of the present study complied with the principles outlined in the Declaration of Helsinki and was approved by the Ethics Committee of First Affiliated hospital of Jinan university (KY-2020-018). All subjects provided a signed informed consent. This trial was registered at Chinese Clinical Trial Registry on July 26th 2020 (ID: ChiCTR2000034994).

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