

## Effect of Implementing Safety Recommendation on Outcomes of Patients Receiving Radioiodine Therapy

Hanan Abd El-Razik AbdEl-all<sup>1</sup>

Medical-Surgical Nursing Dept., Faculty of Nursing, Assiut University, Egypt.

### Abstract:

Radiation safety recommendations are an integral part of targeted radionuclide therapy. The current study aimed to assessment of knowledge for patients receiving radioactive iodine therapy, formulate radiation safety recommendations and evaluate the effect of safety recommendations on outcomes of patients receiving radioiodine therapy. **Design;** Quasi-experimental study was used in this study. **Setting:** The study was carried out in the Nuclear Medicine Department and Oncology Department at South Egypt Cancer Institute and Assiut University Hospital. **Sample:** Sample of (30) adult patients from both sex were participated at this study; their ages ranged from (18 – 65) years, having thyroid disorder not pregnant or lactating. **Tools:** (1) Patient interview assessment questionnaire sheet. **Tool (2):** Patient knowledge assessment questionnaire sheet (pre/post). **Result:** There was statistically significant difference between pre and post implementation of safety recommendations as regard total scores of knowledge and patient outcomes. **Conclusion:** Safety recommendations are effective in improves patient outcomes (minimize radiation hazard and improve knowledge for patients receiving radioiodine therapy).

**Recommendations:** Telenursing strategy application for patients' compliance with radiation safety recommendations after discharge.

### Keywords

Radioiodine Therapy, Safety Recommendation, Patients Outcomes

**Introduction:**

Radioiodine therapy is a nuclear medicine treatment for an overactive thyroid. Radioactive iodine (RAI)  $^{131}\text{I}$  is swallowed and absorbed into the blood stream then concentrated by the thyroid gland (**Wazir et al., 2009**). The main indications for RAI include non-toxic multi-nodular goiter, thyroid cancer and hyperthyroidism disorders (**Jonsson, and Mattsson, 2004**).

Radiation safety is an essential component in the treatment of patients with thyroid diseases by  $^{131}\text{I}$ . The American Thyroid Association created a task force to develop recommendations that would inform professional health team about attainment of radiation safety for patients, family members, and the public (**James et al., 2011**).

Patient outcomes in nursing are primarily about the results for the patient receiving nursing care. The attributes of patient outcomes include improving patient functional statuses, maintaining patient safety (protected or unharmed), and patient satisfaction (patient reporting of comfort and contentment) (**Ying et al., 2014**).

Safety preparation for patients undergoing radioiodine therapy include; discontinue use of iodine supplements in foods or drugs, thyroid hormones (**Jubbin, 2015**). And medications that could potentially affect the ability of thyroid tissue to accumulate iodide for a sufficient time before therapy. The professional nurse must explain the procedure, potential complications, side effects, written information should be provided to the patient to maintain compliance of safety recommendation and patient outcomes (**Donald et al., 2002**).

Safety precaution recommendations in relation to patient reproductive function for patient undergoing iodine therapy include; in women: issues about delaying pregnancy for 4–6 months after the last dose of iodine. In men: avoid fathering a child for a similar period of time (**Krassas & Perros 2003**). Pregnant women should never be treated with  $^{131}\text{I}$ , and a pregnancy test must be performed before the time (usually within 72 hours) of treatment in all women, from menarche to 2 years after menopause (**Sawka et al., 2008**). Also lactating women are advised by cessation of breast feeding for at least 3 -6 weeks before administration of  $^{131}\text{I}$  therapy (**Greenlee and Kloos, 2011**).

Post-therapy safety recommendations include; drinking sufficient fluids to ensure frequent urination and thereby reduce radioiodine in the bladder. Also the nurse should instruct the patient about the safety recommendation regarding to time and distance for family members direct contact and caregivers should remain (> 6) feet away from each treated patient as much as possible throughout the restricted period (**Siegel et al., 2007**).

Home safety recommendations including; patients should sleep alone and at least 6 feet away from any other individual throughout the nighttime restricted period. Use of a separate bedroom or sleeping area would be best **(Reinhardt et al., 2002)**. And for all co-workers must maintain at least 6 feet distance at all times **(Marriott et al., 2007)**.

Safety patient hygiene is meant to reduce not only external exposure but also ingestion of  $^{131}\text{I}$  from secretions and excretions of the patient. Urine is the primary excretion route for  $^{131}\text{I}$  and is maximal during the first (48) hours after treatment. So sufficient fluid (3–4 L/day) should be consumed to enable frequent urination. Also ensure a daily bowel movement; a laxative may be used and using excessive water flushing **(Michael and Thompson 2001)**.

Also special safety recommendation must be design to minimize contamination with radioactive therapy in the bathroom and kitchen caution as flushable clean-up. All items such as paper towels should be disposed of in the specified trash bag **(Ralph et al., 2016)**.

Also patient radioactive saliva can contaminate food utensils, beverages, tooth brushes, sinks, pillow cases, and telephone mouth pieces, so precautions apply to all of these items. However, disposable food utensils require special waste considerations. After eating, washing food utensils, glassware, and dishes in a dishwasher .If telephone mouthpieces are shared, they should be wiped carefully after use by the patient or covered with an easily removed plastic bag **(Siegel et al., 2007)**.

Also the following safety recommendations apply to the daytime periods of restrictions as blood from wounds, epistaxis, menstruation, vomiting perspiration and nasal mucus can also contain  $^{131}\text{I}$  and tissues, unless flushable, should be disposed of in the specified trash bag **(Williamson et al.,2007)**

Safety recommendations about the specified trash bags must be leak proof. These bags containing waste returned to the Nuclear Medicine department after 2 to 3 weeks. Otherwise the bags should be tightly closed and stored in a secure place at least 6 feet away from people and animals **(Kloos, 2011)**.

### **Significance of the study:**

From the researcher conservative standpoint it was observed that patients treated with a therapeutic dose of  $^{131}\text{I}$  for thyroid disorder treatment are potential sources of unacceptably

high radiation exposure to other individuals, particularly the patient's immediate family members. So pertinent written and verbal safety recommendation are required for those patients.

**Aims of the study:**

1. Assessment of knowledge for patients receiving radioactive iodine therapy.
2. Formulate radiation safety recommendations for patients receiving  $^{131}\text{I}$  therapy.
3. Evaluate the effect of safety recommendations on outcomes of patient receiving radioactive iodine therapy.

**Patient Outcomes including:**

Improve patient knowledge, alter patient behavior, and reduce radiation hazard.

**Research hypothesis:**

Patient who will receive safety recommendations about radioactive iodine therapy will show higher scores in knowledge level than pre implementation of safety recommendations

**Participants and methods:****Research design:**

A quasi-experimental study was conducted in the form of a pre/post-test with intervention.

**Setting of the study:**

The study was carried out in the Nuclear Medicine Department and Oncology Department at South Egypt cancer institute and Assiut University Hospital.

**Sample:**

A sample of (30) adult patients from both sex were participated in this study. With the following criteria: their ages ranged from (18 – 65) years, having thyroid disorder, not pregnant or lactating.

**Sample size:** the sample size was calculated using the epi-info program with confidence level at 95% and the flow rates of patients about (135) cases in 6 months this related to the building re-organization in the nuclear unit in the South Egypt cancer institute so the sample size was calculated to be (30) patients for the study.

**Tools for data collection:**

Two tools were used for data collection in this study.

**Tool 1: Patient interview assessment questionnaire sheet:** This tool was developed to identify demographic characteristics of the study sample and patient medical history included two parts;

**Part (1): Patient demographic data:**

Used to assess demographic data of the study sample; such as age group, sex, residence, marital status, level of education and occupation.

**Part (2): Assessment of patient's medical data:**

Used to assess past medical history of the study sample; as chronic diseases, current history, family history, smoking, previous thyroid therapy, hyperthyroid related symptoms and pregnancy or lactation status.

**Tool (2): Patient knowledge assessment questionnaire sheet (pre/post):** For assess of the exact knowledge level of patients about radioactive iodine therapy, this pre/ post-test questionnaire sheet was used prior to implementation of the safety recommendations .The same tool was used immediately after the implementation of the recommendations (immediate post-test).

This tool consists of (19) items covering general information about definition of iodine therapy , administration methods, indication and contraindications and safety precaution related to radioactive iodine therapy to maintain patient outcomes (minimize radiation hazard in the home ,environment ,etc.....)

#### **Scoring system:**

The total scores were (100%) those who obtained less than (70%) were considered have unsatisfactory level of knowledge. While those who obtained more than (70%) were considered have satisfactory level of knowledge.

**Safety recommendations for patient receiving radioactive iodine therapy:** These recommendations developed by the researchers based on the review of the relevant literature to provide knowledge on safety recommendation about radioactive iodine therapy included the international safety recommendations;

**- In the first 8 hours post therapy patient safety recommendations including ;** Drink one glass of water each hour and use the bathroom as soon as possible when the need to empty bladder. Men should sit on the toilet while urinating to decrease splashing. Use a tissue to wipe up any urine on the toilet bowl and flush twice. Wash hands and rinse the sink. Maintain a distance of at least 3 feet from all people. If possible, not use public transportation.

**- In the first two days: the patient recommended to the following;**

Do not share cups, glasses, plates or eating utensils. Wash items promptly after using. Do not share towels or washcloths. Flush the toilet twice and rinse the sink and tub after use. Wash the patient towels, bed linens, underwear, and any clothing stained with urine or sweat.

**-In the first week:** Arrangements should be made for others to provide childcare for infants and very young children. Sleep alone for 7 days unless otherwise instructed by the physician. Avoid kissing and physical contact with others, and maintain a distance of at least 3 feet from women who are pregnant and children under 18 years old. Avoid activities where may be close to others for more than 5 minutes.

**Nutritional safety recommendations for** minimizing iodine content in patient diet; as avoidance of iodized salt, avoiding cough mixtures and other over the counter medications without consulting the investigator, avoiding sea fish and egg yolk, avoiding chocolate and commercial bakery products, avoiding canned meat and vegetable products.

#### **Method:**

1. **Approval to conduct the study;** an official letters were obtained from the head of authorized administration in the Nuclear Medicine Department and Oncology Department at South Egypt cancer institute and Assiut University Hospital.
2. **Protection of the human rights;** each patient was informed about the purpose, and the nature of the study. The patient was informed that their participation is totally voluntary & the confidentiality and anonymity were assured.
3. **A pilot study** was conducted on 10% of the study sample (3 patients) in the selected setting to evaluate the applicability & clarity of the tools. According to this pilot study, the required modifications were made. Those patients who were involved in the pilot study were included in the study.
4. **Tools validity and reliability:** The tools were tested for content validity by (5) expertise in the nuclear medical and medical surgical nursing field to ascertain relevance of the tool & reliability was tested by using Cronbach's coefficient alpha.

#### **Three phases were followed to accomplish the study:**

1. **Preparatory phase (assessment and planning):**
  - An assessment of knowledge was carried out for each patient using (Tool II).
  - Thirty patients was evaluate regarding safety recommendation for radioactive iodine therapy in the morning and afternoon shifts in the Nuclear Medicine Department and Oncology Department at South Egypt cancer institute and Assiut University Hospital (Tool 1, II).

## 2. Implementation phase:

- Data were collected from the Nuclear Medicine Department and Oncology Department at South Egypt cancer institute and Assiut University Hospital during the period from (December 2017 - to August 2018)
- After explaining the study objectives to the patients who participate in the study; the demographic data questionnaire was filled through face-to-face interviews to attract the patient trust and cooperation.
- Implementation took place for (60) mints, by means of discussion.
- In addition, questions were answered, and the researcher used techniques of reinforcement and repetition of the information.

### **Safety recommendations for patients receiving radioactive iodine therapy session:**

1. The nursing recommendation was developed by the researchers based on the review of relevant literature and available resources. There were a total on sessions were conducted for each patient, about one hours. The session usually started after taking demographic data and before the administration of the therapy.
2. At the end of the session the researcher discuss the important points in brief revision. Reinforcement of teaching was performed according to patient needs to ensure their understanding.
3. Each patient obtained a copy of the safety recommendation booklet. The researchers used pictures for illustrations.

### **Evaluation phase**

Patient were evaluated immediately by the researchers using (tool II)

### **Statistical analysis:**

The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (as descriptive statistics where continuous variables described by mean and standard deviation (Mean, SD). Chi-square test used to compare between categorical variables where compare between continuous variables by t-test \ and ANOVA TEST. A two-tailed  $p < 0.05$  was considered statistically significant. All analyses were performed with the computer program (SPSS) version (22) software.

**Results:**

**Part (1): Patient demographic data:**

**Table (1): Frequency distribution of demographic data for study sample (n=30)**

Items	No.(n=30)	%
<b>Age group:</b>		
18 - < 35 year.	17	56.7
35- <50 year.	13	43.3
50 - 65year.	0	0.00
<b>Mean ± SD(range)</b>	34.7±2.8(30-40)	
<b>Sex:</b>		
Male	3	10.0
Female	27	90.0
<b>Residence:</b>		
Rural	14	46.7
Urban	16	53.3
<b>Marital Status:</b>		
Single	4	13.3
Married	23	76.7
Divorced	1	3.3
Widow	2	6.6
<b>Education:</b>		
University	1	3.3
Secondary	11	36.7
Illiterate	18	60.0
<b>Occupation :</b>		
Employee	8	26.7
House wife	19	63.3
Free work	3	10.0

**Table (1):**The present study show that the majority of the patients were females (90.0%), married ( 76.7%) their age ranged from (18 - < 35 years) (56.7 %). more than half of them (53.3% ) were urban and (60.0%) were illiterate and house wife (63.3%).

**Part (II): Assessment patient medical data:**

**Table (2): Frequency distribution of the study sample according to patient medical data (n=30).**

Items	No.(n=30)	%
<b>Chronic disease history :</b>		
Diabetes mellitus	0	0.0
Hypertension	1	3.3
Cardiac disorder	1	3.3
Not present	28	93.4
<b>Thyroid history :</b>		
Normal thyroid function	0	0.0
Thyroid function disturbance	3	10.0
Thyroidectomy	27	90.0
<b>Thyroid family history :</b>		
Not present	29	97.7
Present	1	3.3

**Table (2):** The present study show that the majority of the patient had no medical history of chronic diseases (93.4%), and had a thyroidectomy surgery (90.0 %) while (10.0| %) complain from thyroid dysfunction with minimal family history of thyroid function disturbance (3.3%).

**Part (III): Patient knowledge assessment (pre/post):**

**Table (3): Frequency distribution of the studied patients regarding to general knowledge level before and post implementing safety recommendation (n=30)**

General patient information	Before (n=30)				After.(n=30)				P. value
	Incorrect		Correct		Incorrect		Correct		
	No	%	No	%	No	%	No	%	
Benefits of <sup>131</sup> I therapy	17	56.7	13	43.3	0	0.0	30	100.0	<0.001**
Preparation before therapy	14	46.7	16	53.3	3	10.0	27	90.0	0.002**
Indication of management with <sup>131</sup> I therapy	17	56.7	13	43.3	4	13.3	26	86.7	<0.001**
Minor discomfort for receiving <sup>131</sup> I therapy	16	53.3	14	46.7	3	10.0	27	90.0	<0.001**
Complication of Iodine <sup>131</sup> I therapy.	14	46.7	16	53.3	4	13.3	26	86.7	0.005**
Iodine therapy effect on the couple fertility	20	66.7	10	33.3	3	10.0	27	90.0	<0.001**
Menstrual change after receiving iodine therapy	15	50.0	15	50.0	11	36.7	19	63.3	0.297
Taking anti thyroid medication after receiving iodine therapy	22	73.3	8	26.7	2	6.7	28	93.3	<0.001**
Breast feeding avoid after receiving therapy	18	60.0	12	40.0	4	13.3	26	86.7	<0.001**
Sexual intercourse primates after therapy	18	60.0	12	40.0	5	16.7	25	83.3	0.001**
Thyroid function follow up	23	76.7	7	23.3	9	30.0	21	70.0	<0.001**

**Chi-square test \*\*Statistically Significant difference At P. value<0.01**

**Table (3):** This table mentioned that there was statistically significant difference as regarding to general knowledge level for patient undergoing iodine therapy before and post implementing safety recommendation

**Table (4): Relationship between patients knowledge before and post recommendations as regarding safety precaution for <sup>131</sup>I therapy (n=30)**

Patient knowledge	Pre (n=30)						Post (n=30)						P. value
	Don't Know		incomplete correct		Complete correct		Don't Know		incomplete correct		Complete correct		
	No	%	No	%	No	%	No	%	No	%	No	%	
Safety precaution before receiving <sup>131</sup> I therapy	12	40.0	18	60.0	0	0.0	0	0.0	12	40.0	18	60.0	<0.001**
Recommendation after receiving <sup>131</sup> I therapy	15	50.0	13	43.3	2	6.7	0	0.0	10	33.3	20	66.7	<0.001**
Safety precaution to minimizing radiation in the first week	9	30.0	21	70.0	0	0.0	0	0.0	8	26.7	22	73.3	<0.001**
Environment safety recommendation after therapy <sup>131</sup> I	14	46.7	15	50.0	1	3.3	0	0.0	6	20.0	24	80.0	<0.001**
Home safety after receiving iodine <sup>131</sup> I therapy	12	40.0	16	53.3	2	6.7	0	0.0	7	23.3	23	76.7	<0.001**
Work safety recommendation	10	33.3	20	66.7	0	0.0	0	0.0	4	13.3	26	86.7	<0.001**
Nutritional safety precaution for patient receiving 131I therapy.	4	13.3	26	86.7	0	0.0	0	0.0	4	13.3	26	86.7	<0.001**
Post discharge safety recommendation	5	16.7	25	83.3	0	0	0	0	2	6.7	28	93.3	<0.001**

Chi-square test      \*\*Statistically Significant difference At P. value<0.01

**Table (4):** this table illustrated that there was statistically significant difference between before and post implementing the recommendations items as regarding patient knowledge level according to radioiodine<sup>131</sup>I safety precaution (environment, home ,work, nutritional , discharge from hospital )

**Table (5): Comparison between total score of knowledge level before and after safety recommendations (n=30)**

	Before recommendations.(n=30)		After recommendations.(n=30)		P.value
	No	%	No	%	
<b>Total Knowledge Level</b>					
Unsatisfactory	27	90.0	2	6.7	<0.001**
Satisfactory	3	10.0	28	93.3	
Mean±SD	14.5±4.04		32.87±3.88		<0.001**

**Table (5):** Revealed that; there was a highly statistically significant difference between total score of knowledge pre and post-test for the study sample after safety recommendations (p. value=0.001).

**Discussion:**

Radioiodine has long been a safe, effective and widely used treatment in the management of differentiated thyroid disorder, this study aimed to evaluate the effect of safety recommendations on outcomes of patient receiving radioactive iodine therapy.

According to demographic characteristics of patients; the present study show that the majority of patients were female; their ages ranged from twenty to thirty five years. These study findings were supported by **(Saccani et al., 2005)**; who mentioned that thyroid gland disorders are more common in females' patient than male.

But according to the education aspect more than half of the study sample was illiterate; this may be considered as barrier in compliance with the radioactive safety recommendations .In this regard; **(Winslow, 2004)** reported that patient with low level of reading or writing skills may lead to lake in following health care provider's instructions and causes lack knowledge of self-care. In the same line these findings are supported by **(Backman et al., 2001)** who found that patient with low educational levels were less experienced than who with higher level of educational and this affect negatively on the knowledge and practices levels .

According to patient residence the present study represented that more than half of the sample were from rural area; this from researcher opinion related to the water sources in the rural area that cane affect in the thyroid function. This finding was in the same line with **(Miller et al., 2009)** and **(Makris, et al ., 2013)**; who support this study finding that carried out a study entitled "Comparison of Thyroid Disease Mortality between Urban and Rural Populations in Southwest Georgia" that determined that water source was a potential risk factor for thyroid disease disorders occurrence.

According to patients medical history; the present study showed that more than half of patients had thyroidectomy this comes in the same lines with **(Rosemary, 2005)**; who reported that total or subtotal thyroidectomy is the usual procedure for patients with a history of thyrotoxicosis. As a portion of the patient's thyroid gland is left to allow releasing thyroid hormone production.

As regard patient's diagnosis; the present study revealed that the majority of the studied sample was hyperactive thyroid mostly in women , this result agree with **(Pelletier et al., 2018)** who found that; radioiodine is used in diagnostic tests as well as in radiotherapy of

a hyperactive thyroid gland , hyperthyroidism most often due to Graves' disease (GD). And in the line of the study that was conducted by **(Weetman, 2000)** his results revealed that hyperactive thyroid is more common in women than in men by (5–10 times) and is associated with a firm diffuse goiter and the treatment options for GD include RAI therapy.

Patient's preparation ensures efficacy of RAI and reduces the potential radiation hazard. Important issues like the consent of procedure, pregnancy issues and timing of stopping thyroid medication, restarting therapy and possible complications of therapy should be discussed with the patients and certain medications and other substances such as radiographic contrast materials can interfere with RAI uptake then patient outcomes. **(Meier et al., 2002)**.

As regard the assessment of knowledge for patients receiving iodine therapy. The results show that there was statistically significant difference between before and after implementing safety recommendations. This result from the researcher opinion is related to the effect of implementing safety recommendations and this is on line with the study of **(Thompson ,2001)** who demonstrates that radiation safety precautions for the patient that given by the professional nursing staff is the key to promote patient outcomes after  $^{131}\text{I}$  therapy by minimize radiation hazard to patient family and environment , patient recommendation should include basic topics such as the explain procedure, actions of radioactive iodine, effect, minor discomfort after receiving the therapy.

The results in the present study revealed that; improvement in the knowledge score levels obtained by patients after the implementation of the recommendations as regarding assessment of knowledge level for patients receiving iodine therapy. That results agree with **(Cynthia, 2000)** who reported that patient information is intended to provide health professionals with information to share with their patients to help them better understand their health needs and their diagnose disorders by providing access to this patient information.

From the researcher opinion the patient knowledge should be derived and prepared from a guidelines for health care professionals included original guidelines about what is the problem , how to treated, what about if not treated, methods of protection from hazard .

Also health-care professionals who assist in the administration of radioiodine therapy to patients, such as the professional nurses usually provide safety recommendations to the

patient prior to radioiodine therapy administration and again before discharge from the hospital to improve patient outcomes. These recommendations include the minimum distance at which the patient should stand from others, instructions on washing clothes, instructions on toilet using, patient daring disposing ( urine ,stool, vomiting blood , saliva, and wound exudate) (**Shackett, 2009** ).

Regarding the effect of the nursing recommendations on minimizing the environmental hazard the present study proved that after applying the recommendations there was a significant differences between the patients total knowledge score pre and post recommendations. From the researcher's point of view this may be due to containment of the nursing recommendations on the all needed information that helps in promote and maintain patient outcomes.

**Conclusion:** There was statistically significant difference between pre and post implementation of safety precautions recommendations as regard total scores of patients knowledge.

**Recommendations:**

-Telenursing strategy application for patients' compliance with radiation safety recommendations after discharge.

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