

Thyroid Uptake and Scan (I-123, I-131, ^{99m}TcO₄)
UPDATED: June 2020

CPT CODE: Uptake (Single or Multiple) only 78012
Uptake (Single or Multiple) & Scan 78014
Scan only 78013

Indications:

Uptake and/or Scan:

- Assessment of lab results suggestive of abnormal thyroid function (hyperthyroidism or hypothyroidism)
- Differentiate hyperthyroidism from other forms of thyrotoxicosis (thyroiditis or thyrotoxicosis factitia)
- Determine function of thyroid nodules shown on other diagnostic imaging and/or clinical examination
- Before RAI treatment, confirmation of hyperthyroidism and used to calculate RAI ablative therapy
- Note faculty to determine when uptake is a single 24-hour uptake vs 4-6 & 24 hour uptake.
- Evaluation of size and location of thyroid tissue
- Visualization of suspected focal masses or thyroid disease
- Congenital thyroid abnormalities (ectopia)

Uptake Only:

- If Hyperthyroid Therapy is desired and the previous uptake was performed greater than 3 months earlier or if the uptake is from an outside institution.

Patient Prep (adult & pediatric):

- Patient to complete a thyroid questionnaire upon arrival in Nuclear Medicine Department.
- For women 55 years of age and younger, should have a negative (either urine or serum is ok) pregnancy lab result within 24 hours of first appointment time, unless otherwise indicated by faculty of the day. (12 to 55 and if 54 and no period for a year) Reference UW Health Policy 3.5., Screening of Possibly Pregnant, or Pregnant Patients Prior to Diagnostic Radiological Exam.
- For women, ensure patient is not producing milk for 6 weeks prior uptake/scan (and stop breastfeed completely if therapy is anticipated).
- Patient should be on a low iodine diet for 7-14 days prior to first appointment. Quick list of items to avoid below, otherwise see the Low Iodine Diet Health Facts for You (#485) or <https://www.thyroid.org/wp-content/uploads/patients/brochures/LowIodineDietFAQ.pdf> for a most comprehensive list. Consult with faculty if the patient did not follow any low iodine restrictions/diet.
 - No iodized salt
 - No dairy products or foods containing dairy products
 - No foods from the sea
 - Limit grain products (ie. noodles, pasta, pastries) - 1 slice bread, ½ cup pasta daily
 - Limit amounts of beef, chicken, and turkey
- Patient to be off medications affecting thyroid function. Consult with faculty of the day if patient has not withheld required medications. It is up to the faculty whether to proceed or reschedule. Below is a quick list of medications and duration to withhold.

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Drug Category	Examples/Other Names	Time to Withhold
Methimazole	Tapazole, Northyx	1 week
Propylthiouracil	PTU	1 week
Cytomel	Triostat, Liothyronine	2 weeks
Synthroid	Levoxyl, Levothyroxine, Unithroid	4 weeks
Amiodarone	Cordarone, Nexterone	6 months
Salicylates topical	Aspercreme, Canasa, Compound W, Salicylic Acid, Bengay, Oil of Wintergreen,	1 week
Salicylates (large doses) Oral	>2000 mg Aspirin or Salsalate, Mesalamine, Pepto-Bismol, Magnesium Salicylate, Choline Magnesium Trisalicylate (Trilisate)	1 week
Sulfonamides	Bactrim, SMZ-TMP, Sulfazine, Sulfamethoxazole/Trimethoprim	1 week
Iodine containing multivitamins, supplemental iodine, and cough medications	Pima Syrup, SSKI, One-A-Day, Centrum, Ensure, Oscal Forte, Fish Oil	4 weeks
Iodine solutions	Lugol's or SSKI	3 weeks
Iodine containing topical agents	Betadine, Povidex, Povidone Iodine/Iodide, PVP Swabs	3 weeks
Kelp	Seaweed Tablets, Miso Soup, Sushi, Seafood, Seaweed	4 weeks
IV iodinated contrast	Iohexol, Omnipaque, Isovue, Ultravist, Vsopaque	4 weeks
Uncommon Medications Below ↓		
Bromides	Atrovent, Combivent, Guaifenesin DM, Ipratropium, Vecuronium	1 week
Nitrates	Nitroglycerin, Nitrostat, NitroBid	1 week
Perchlorate	Potassium Perchlorate, Peritoid	1 week

Scheduling:

Standard Protocol Uptake (single routine / multiple uncommon) and Scan I-131 NaI & ^{99m}TcO₄

- Appointment 1: Allow 30 minutes for explanation of exam, thyroid questionnaire, and patient dosing.
- Appointment 2: Scheduled 24-28 hours post appointment 1, allow 30 minutes for uptake measurement. For pediatric patients, schedule with AFCH Campground for IV placement prior to Nuclear Medicine Appointment 2.
- Appointment 3: Scheduled to immediately follow appointment 2, allow 45 minutes for imaging.
- If uptake multiple is ordered, schedule the single first and then use the Tech Worklist in Health Link to add a 30-minute appointment 4-6 hours after the dosing appointment.
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Uptake Only I-131 NaI (single routine / multiple uncommon)

- Appointment 1: Allow 30 minutes for explanation of exam, thyroid questionnaire, and patient dosing.
- Appointment 2: Scheduled 24-28 hours post appointment 1, allow 30 minutes for uptake measurement. No AFCH Campground appointment needed for pediatric patients.
- If uptake multiple is ordered, schedule the single first and then use the Tech Worklist in Health Link to add a 30-minute appointment 4-6 hours after the dosing appointment.

Scan Only ^{99m}TcO₄

- Appointment 1: Allow 45 minutes for explanation of exam, thyroid questionnaire, patient dosing and imaging. For pediatric patients, schedule with AFCH Campground for IV placement prior to Nuclear Medicine appointment.

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Uptake (single routine / multiple uncommon) and Scan I-123 NaI

- Appointment 1: Allow 30 minutes for explanation of exam, thyroid questionnaire, and patient dosing.
- Appointment 2: Scheduled approximately 24 hours post appointment 1, allow 30 minutes for the uptake measurement.
- Possible variations: Early uptake and/or Scan
 - Early uptake: After the typical appointments are made use the Tech Worklist in Health Link to add a 30-minute appointment 4-6 hours after the dosing appointment.
 - Early Scan: After the typical appointments are made use the Tech Worklist in Health Link to add a 45-minute appointment 4-6 hours after the dosing appointment or immediately following the early uptake.
- Note: For pediatrics, only the AFCH Pavilion arrival appointments are needed for each of the appointments.

Radiopharmaceutical and Dose:

See order protocol for radiopharmaceutical.

Uptake Only

- I-131 NaI: 2-4 uCi +/- 20% capsule given orally.
- I-123 NaI: The prescribed dose is 200 uCi +/- 20% capsule given orally, however, based in how I-123 capsules are prepared 100-400 uCi range is allowed. NPO 1-hour post dose administration. I-123 NaI is not for routine use and should only be used after approval by nuclear medicine physician.

Uptake and Scan:

- I-131 NaI: 2-4 uCi +/- 20% capsule given orally. (Day 1)
- Tc-99m0₄: 5-15 mCi is allowed but our prescribed dose is 10 mCi +/- 20% given IV, weight based per the current nuclear medicine weight nomogram. (Day 2)
-OR-
- I-123 NaI: The prescribed dose is 200 uCi +/- 20% capsule given orally, however, based in how I-123 capsules are prepared 200-400 uCi range is allowed. I-123 NaI is not for routine use and should only be used after approval by nuclear medicine physician.

Note: Patient should be NPO for a minimum of one hour after taking radioiodine to ensure optimal absorption.

Data Acquisition:

Uptake

- Captus 3000 Uptake Probe peaked appropriately for the nuclide being used, I-123 or I-131.
- Each of the following measurements to be taken using uptake probe at distance of 25 cm for 240 seconds (4 minutes):
 1. **Appointment 1:**
 - Room Background
 - Capsule Measurement (Capsule in neck phantom)
 - Patient Background (for patients previously given RAI)
 2. **Appointment 2:**
 - Room Background
 - Patient Thigh
 - Patient Neck

Scan

- **Camera:**
GE MPS camera, with pinhole collimator and thyroid aperture. Position patient supine and with neck fully extended.
 1. Tc-99m: Use the Tc-99m thyroid acquisition template
 2. I-123: Use the I-123 thyroid acquisition template
- **Anterior Marker Image:**
Image from patient's salivary glands to mid chest. Place Co-57 point source on the patient's suprasternal notch (SSN) to identify this location on processed image.
 1. Tc-99m: 30 seconds, 128x128 matrix, zoom 1.0
 2. I-123: 1 minute, 128x128 matrix, zoom 1.0
- **Static Images:**
Acquire Anterior (Ant), Right Anterior Oblique (RAO), and Left Anterior Oblique (LAO) views. Adjust camera distance so the thyroid gland nearly fills the entire field of view.
 1. Tc-99m: 100K or 10 min, 128x128 matrix, zoom 1.0
 2. I-123: 50K or 10 min, 128x128 matrix, zoom 1.0

Procedures:

Uptake

- Enter patient info into Captus computer including patient name, DOB, MRN, sex, physician, appropriate protocol selection, lot number, dose in microcuries, dose calibration time and technologist initials.
- Perform uptake for Appointment 1 including Room Background, Capsule Measurement, and Patient Background if needed. For step-by-step thyroid uptake instructions, 'Captus 3000 Owner's Manual' is saved on the Captus computer desktop (Section '07-Thyroid Uptake').
- Verify 2 forms of identification with the patient (i.e. DOB, spelling the name, MR #). Give the patient a brief description of the test including what to expect upon return for following appointments.
- Review thyroid questionnaire with patient and verify the patient has followed the patient prep guidelines. If there are questions, please consult with nuclear medicine staff or resident before administering the patient dose.
- Have patient take the radioiodine capsule orally. **Patient should be NPO for a minimum of one hour after taking radioiodine to ensure optimal absorption.**
- Administer dose in Captus computer, by entering time the capsule was given. Save report. Print out report by using the "shortcut to reports" icon on Captus computer desktop.
- The patient will be instructed return at appropriate interval for uptake measurement.
- Perform uptake for Appointment 2 including Room Background, Patient Thigh, and Patient Neck. For step-by-step thyroid uptake instructions, 'Captus 3000 Owner's Manual' is saved on the Captus computer desktop (Section '07-Thyroid Uptake').
- Print out results and consult with nuclear medicine staff or resident to verify imaging is indicated. Scan cut off: any uptake 2% or greater => scan. For <2% => check with the faculty.
- If imaging is required with Tc-99m pertechnetate, verify two forms of identification with patient, inject radiopharmaceutical, and wait 15 minutes before imaging.

Scan

- Wait 15 minutes post Tc-99m pertechnetate before imaging. Instruct the patient to remove all metal objects from neck and chest and lay supine on the imaging table. Position patient so their neck is fully extended.
- Acquire Anterior Marker (supra-sternal notch), Anterior, RAO and LAO static images labeled accordingly.
- Check images with a nuclear medicine staff or resident physician to see if any additional imaging or if 24 hour uptake measurement is indicated for I-123 uptake and scan only.

Image Processing/PACS:

- Select all static images of the patient and click on Thyroid Display. Thyroid display labels images automatically; check annotations to ensure each image is labeled correctly.
- Adjust the intensities of the images so that the thyroid gland can be seen clearly and label suprasternal notch (SSN).
- Screen capture (DatabaseStudy1024BW)
- Send all raw data and the screen capture(s) to the ALIArchive station.
- Scan and send thyroid questionnaire and thyroid uptake documents to ALIArchive using PACS scanner.

Interpretation:

- Normal uptake is 10-30% for 24 hours. Near zero or zero uptake suggests iodine contamination (kelp tablets, IV contrast, large iodine or iodide ingestion, amiodarone etc.) subacute thyroiditis or replacement suppression therapy.
- The scan seeks to identify “cold” nodules. There is a 15% chance of malignancy for cold nodules, 5% chance for Multi Nodular Goiter, and 1% for “hot” nodules. Cold nodules occur with carcinoma, colloid nodules, adenomas, cysts and regions of inflammation or thyroiditis.
- Note: Discordant Iodine and $^{99m}\text{TcO}_4$ scans indicate regions that trap, but not organify (“hot” $^{99m}\text{TcO}_4$, “cold” radioiodine).
- If the $^{99m}\text{TcO}_4$ scan shows a “cold” region that is “warm” or “hot” on radioiodine (I-123) scan, then an organification defect is not present.
- Appropriate use of I-123 NaI rather than $^{99m}\text{TcO}_4$ is to differentiate organification defect from trapping defect in conjunction with $^{99m}\text{TcO}_4$. When the lesser uptake of $^{99m}\text{TcO}_4$ (2.2% vs 33% with iodide) may compromise the study (detection of retrosternal masses, evaluation of thyroid remnants or thyroglossal duct tissue etc) because of adjacent blood pool areas.

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PATIENT THYROID QUESTIONNAIRE

UPDATED: August 2019

NAME _____ EXAM _____

MR # _____ DATE _____

PLEASE ANSWER THE FOLLOWING QUESTIONNAIRE.

A technologist will be able to help answer any questions if necessary.

1. Have you recently taken the following medications? If so, please include dose and when last taken.

- | | | |
|--|--|---|
| <input type="checkbox"/> Methimazole (1 week)
• (Tapazole, Northyx) | <input type="checkbox"/> Propylthiouracil (1 week)
• (PTU) | <input type="checkbox"/> Kelp Supplement |
| <input type="checkbox"/> Synthroid (4 weeks)
• (Levothyroxine, Levoxyl, Unithyroid) | <input type="checkbox"/> Cytomel (2 weeks)
• (Triostat, Liothyronine) | <input type="checkbox"/> Iodine Supplement |
| <input type="checkbox"/> Amiodarone (6 months) | | <input type="checkbox"/> SSKI Drops |
| | | <input type="checkbox"/> Seaweed Supplement |

Dose and date last taken: _____

2. Have you eaten any of the following items? If, so please include when last consumed.

- | | | |
|------------------------------------|--------------------------------|------------------------------------|
| <input type="checkbox"/> Miso Soup | <input type="checkbox"/> Sushi | <input type="checkbox"/> Fish |
| <input type="checkbox"/> Seaweed | <input type="checkbox"/> Kelp | <input type="checkbox"/> Shellfish |

Date last consumed: _____

3. Have you recently undergone the following: If so, please indicate when?

- Medical Imaging with Contrast
- Radiation Therapy to the head, neck or chest
- Thyroid Surgery
- Thyroid Radioactive Iodine Treatment

Date of Exam: _____

4. Did your ordering physician place you on a Low Iodine Diet? If so, for how long? YES NO _____ Days

- Low Iodine Diet:
- No iodized salt
 - No foods from the sea
 - Limit amounts of beefs, chicken, and turkey
 - No dairy products or foods containing dairy
 - Limit grain products (i.e. noodles, pasta, pastries) - 1 slice bread, 1/2 cup pasta daily

FOR WOMEN ONLY:

Date of onset of first day of last menstrual cycle: _____

Usual length of cycle: _____ days

I am pregnant: YES NO ATTEMPTING

Is there any reason you could not possibly be pregnant? _____

I am currently breast-feeding: YES NO

PATIENT SIGNATURE DATE

TECHNOLOGIST SIGNATURE DATE

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References:

- American Thyroid Association, comp. "Hyperthyroidism." Hyperthyroidism Brochure (2014): 1-3. American Thyroid Association. American Thyroid Association, 2014. Web. 2 May 2016.
- Balon, Helena R., MD, Edward B. Silberstein, MD, Donald A. Meier, MD, N. David Charkes, MD, Henry D. Royal, MD, Salil D. Sarkar, MD, and Kevin J. Donohoe. "SNMMI Procedure Standard for Thyroid Uptake Measurement 3.0." Society of Nuclear Medicine Procedure Guideline for Thyroid Uptake Measurement 3.0 (2006): 1-4. Society of Nuclear Medicine and Molecular Imaging. SNMMI, 5 Sept. 2006. Web. 2 May 2016.
- Guidelines and Standards Committee - Nuclear Medicine, comp. "ACR-SNMMI-SPR Practice Guideline for the Performance of Thyroid Scintigraphy and Uptake Measurements." ACR-SNMMI-SPR Practice Guideline for the Performance of Thyroid Scintigraphy and Uptake Measurements 17 (2009): 1-6. Society of Nuclear Medicine and Molecular Imaging. American College of Radiology, 1 Oct. 2009. Web. 2 May 2016. Thyroid Cancer Survivors' Association, Inc. "Low Iodine Diet." ThyCa. Thyroid Cancer Survivors' Association, Inc., 2015. Web. 02 May 2016.

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