Frequently Asked Questions

NUCLEAR MEDICINE DEPARTMENT
LIMASSOL GENERAL HOSPITAL

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WELCOME TO THE NUCLEAR MEDICINE DEPARTMENT OF LIMASSOL GENERAL HOSPITAL

We provide a clinical service for the Medical Services and Services of Public Health of the Ministry of Health of the Republic of Cyprus.

MISSION STATEMENT

- To promote Nuclear Medicine through clinical practice, through teaching and research.
- To provide Nuclear Medicine examination and therapy of the highest quality
- To act with integrity, to respect and wherever possible fulfill the needs of the patients, colleagues and students.
- To be committed to quality, excellence and cost effective practice.

In these pages we provide a source of information for patients who come for a Nuclear Medicine Investigation. We hope it may also be of assistance to relatives in helping them to understand the processes involved. Information about the frequently asked questions, clinical service and patient examinations is found in the next pages.
PREPARATION OF RADIOPHARMACEUTICALS

Γ-CAMERA

EXERCISE ROOM
FREQUENTLY ASKED QUESTIONS

LOCATION

- Where will I find the Nuclear Medicine Department? In the first floor of the Limassol General Hospital. Is located between the Operating theaters and Intensive Care Unit (ICU) Department.

TRANSPORT

- Is there any car park? Yes.
- Is there a bus stop nearby? Yes. Bus Number 15 from the City Center is coming to General Hospital.
- Is there hospital transport available? The Nuclear Medicine Department cannot book hospital transport. Transport can only be ordered through the Hospital Consultant or referring GP. If a patient requires transport it should be discussed with the doctor who orders the test. The patient must also inform the Doctor if a relative or friend is needed as an escort.
- Can an accompanying person also use hospital transport? No.
- Who will bring me if I am an in-patient in the hospital or at another hospital? Transport of in-patients in the Limassol General Hospital is arranged by the ward staff. Transport of in-patients at other hospitals/clinics should be arranged from the corresponding hospital/clinic.

PRIVATE PATIENT

Do I have to pay at the time of the test? If you are a Private Patient we expect you to settle your account at Admission Office of the Hospital, before you start the examination or eventually before you leave the hospital. The Hospital accepts cash and cheques (but not Travellers cheques) payable to Chief Medical Officer, LGH. Please bring your medical card or medical insurance details with you, if you have.
NUCLEAR MEDICINE RECEPTION

The department is open 7:30am - 15:00pm Monday – Friday

Phone: +357 25801592 (general enquiries)

All patients are given appointment times and we try to see you as close as possible to that time, however the nature of the investigations we provide means that we deal with each patient individually. This can cause delays but please be reassured that you will be seen as soon as possible. If you are unable to keep your appointment, please let us know as soon as you can so that we may offer it to someone else. If you feel unwell on the day, please contact us as early as possible so that a decision can be taken as to whether the investigation should be postponed.

We are happy for you to bring an accompanying person if you wish but as our patient waiting area has a limited number of seats, please do not bring more than one person. Also we do not have any crèche facilities so please do not bring children unless they are having an investigation. There is one toilet near the patient’s waiting area of the Department. There is a shop and a small canteen within the hospital where you may obtain sandwiches and snacks.

Mobile Phones must be switched off when you enter the hospital as they can interfere with patient support equipment. There is a public phone close the emergency stairs of the first floor. There are pay phones in the main Hospital as well.

The Hospital operates a No Smoking Policy.
What will I need to bring with me? The requisition for the examination, medical card/insurance/cash or cheque, all relevant medical documentation from previous examinations in conjunction with the problem you will be examined for. The rest depend on the individual examinations.

What is Nuclear Medicine scan? This is an investigation in which the distribution of a radioactive material administered to the patient is imaged to give information on organ function.

INJECTION

I am scared of needles, what should I do? Will I have an injection? The majority of investigations require an injection. It is similar to a having a blood test. If the patient is unable to tolerate this, a local anaesthetic cream called EMLA may be applied in advance.

What is involved? It usually involves an injection in the arm. Immediately or after during which you may be allowed to leave the Nuclear Medicine will be asked to lie on a table while a large camera scans your body.

Note: Approximately delays between injection and scan are 2-4 hours.

Will I be going through a tunnel? Yes and no. The camera used to take the images is quite large, and may be brought in quite close, in order to get the most accurate information possible.

Are you claustrophobic? Please inform the technologist if you are claustrophobic.

SIDE-EFFECTS OF THE TEST

Will the test make me feel sick? Not usually, though some heart tests require consumption of a small fatty meal.

Will the injection make me go to sleep? No.

What is radioactivity? Some substances emit radiation- this is known as radioactivity. Radiation is similar to light, or radio waves, but stronger, more powerful and invisible.

Is the injection dangerous? No the injection is not dangerous to you. The amount you receive is very small.
How long will the radioactivity stay in my body? Diagnostic Nuclear Medicine patients: it will almost all be gone by 24 hours. If it is expected to be any longer than this, the staff that give you the injection will advise you of this.

Can I drive a car after the injection/scan? Yes.

Will I take the radiation away with me? For a while after your test you will still have some radiation in your body, but you will receive special instructions about this, if necessary.

Are there long term effects from having a radioactive injection?

SAFETY

Any referral for a hospital test often induces anxiety in patients or relatives. This is recognized so we include information regarding the level of radiation exposure and have tried to express this in relation to other risks encountered in everyday life.

How safe is a Nuclear Medicine Scan?

Risk factors:

All Nuclear Medicine investigations involve having a small amount of radiation. This can be in the form of having a simple intravenous injection or breathing in a special gas or drinking a liquid or capsule. However this is balanced against the benefit from obtaining a diagnosis allowing a treatment to begin. There are well established rules (Radiation protection low of 2002), which we apply to all investigations to minimize any risks. Living entails risks: typically 1 person in 700 aged 40 years will die each year through natural causes alone. Even if we confine ourselves to the home, 1 person in 10,000 will still die as a result of an accident. Going out and working is also not without risk. The table below gives the magnitude of the risk associated with typical activities that appear to be generally accepted by society.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Ten cigarettes a day 1 in 200</td>
</tr>
<tr>
<td>Accidents</td>
<td>All road use 1 in 10,000</td>
</tr>
<tr>
<td>At home</td>
<td>1 in 10,000</td>
</tr>
<tr>
<td>Industrial Accidents</td>
<td>All kinds 1 in 50,000</td>
</tr>
<tr>
<td>Sea Fishing</td>
<td>1 in 500</td>
</tr>
<tr>
<td>Coal Mining</td>
<td>1 in 7,000</td>
</tr>
<tr>
<td>Textiles</td>
<td>1 in 10,000</td>
</tr>
</tbody>
</table>

Average Annual Dose of Radiation.
We are all exposed to radiation all the time. Most people receive their greatest exposure (50%) from the gas Radon arising from Uranium occurring in rock and soil. Cosmic radiation (10%) also occurs naturally and little can be done to reduce our exposure to it.

Data Source: NRPB- R263., 1993

This table shows the risk for patients having a Nuclear Medicine scan in relation to other every day activities.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Risk of:</th>
<th>Cases per million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Medicine scan</td>
<td>Genetic damage</td>
<td>4</td>
</tr>
<tr>
<td>Travel 1000 miles by air</td>
<td>Fatal accident</td>
<td>3</td>
</tr>
<tr>
<td>Nuclear Medicine scan</td>
<td>Fatal cancer or leukaemia</td>
<td>13</td>
</tr>
<tr>
<td>Travel 1000 miles by car</td>
<td>Fatal accident</td>
<td>20</td>
</tr>
<tr>
<td>Travel 1000 miles by motorcycle</td>
<td>Fatal accident</td>
<td>400</td>
</tr>
<tr>
<td>Working 10 years in a typical factory</td>
<td>Fatal accident</td>
<td>300</td>
</tr>
<tr>
<td>1 glass of wine a day for 10 years</td>
<td>Cirrhosis</td>
<td>1,000</td>
</tr>
<tr>
<td>1 cigarette a day for 10 years</td>
<td>Heart attack or lung cancer</td>
<td>2,500</td>
</tr>
<tr>
<td>Living for 1 year at age 30</td>
<td>Death from all causes</td>
<td>1,000</td>
</tr>
<tr>
<td>Living for 1 year at age 55</td>
<td>Death from all causes</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Data source: Shields and Lawson, Nuclear Medicine Communications, 8,851,1987

- If I am unwell can I still go ahead with the test? If you feel unwell on the day, please contact us as early as possible so that a decision can be taken as to whether the investigation should be postponed.

PREPARATION

- Can I eat and drink before and after the scan? It depends on the kind of scan- very few require fasting. Carry on as usual unless you are told otherwise.
- Please read the specific test instructions for your individual test

WHO CAN I BRING?

- Can I bring someone with me? We are happy for you to bring an accompanying person if you wish but as our Patient waiting area has a limited number of seats do not bring more than one person.
**Can I bring my small children?** We do not have any crèche facilities so please do not bring children unless they are having an investigation. In addition we do not like to expose to unnecessary radiation the children.

**WHAT DO I WEAR?**

- **What should I wear?** In general there are no special requirements regarding clothing when undergoing a Nuclear Medicine investigation.

- **Do I have to undress for the test?** Most tests do not require you to get undressed.

- **What about bras, shoes or jewelry?** Many scans involve the patient moving to and from a scanning couch, therefore it would be advisable to wear comfortable, loose-fitting clothing and flat-soled shoes. Avoid any clothing which has large metal zips or buttons, or has metal woven into the fabric, as these will interfere with the scan. The standard fly zip on trousers is acceptable, however do not wear jeans with metal fly buttons (as on Levi’s). Before the start of a scan a technologist will ask the patient to remove any metal objects, such as watches, jewelry, money, trouser belts and braces.

**PREGNANCY:**

**Can I have the test if I am pregnant?** It is very important for patients to tell the staff if they think there is a possibility that they might be pregnant before undergoing a Nuclear Medicine investigation. The administration of a radiopharmaceutical will result in exposure of the fetus to radiation.

It is usual to delay most nuclear medicine investigations until the end of pregnancy.

If clinically indicated, tests can safely be carried out during pregnancy. You will be given specific instructions.

**BREAST FEEDING**

- **Is there any risk to the fetus?** When a radiopharmaceutical is administered to a breast-feeding mother, radioactivity may be secreted in her milk, and her infant may receive a dose from the ingested radioactivity.

  The radioactivity secreted in milk decreases rapidly with time after administration.

  It is recommended that breast feeding be discontinued for 12 hours after the examination. For some infrequently performed investigations a patient may need to cease breast-feeding. You will be warned in advance when this is the case.

- **You will be told at what time you may resume breast-feeding after completing the investigation.**
• **When will it be safe to get pregnant after the test?** For most of the diagnostic investigations performed, the tracer leaves the body soon after completion of the examination and it is not necessary to observe any special precautions.

• Special instructions will be given to the patient if any restrictions in normal activities must be observed.

• If a patient becomes pregnant after a Nuclear Medicine examination there will be no detrimental risk to the fetus from having the investigation.

• For therapeutic applications the patient will be given a written list of specific instructions when the dose is administered which must be followed. The patient will be given a date after which these restrictions no longer apply and will be advised of this when the test is booked.

• **What will happen if I do get pregnant, or if I was pregnant without knowing it during the test?** Please contact us in order to assist you.

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### SPECIAL NEEDS

**Disabled**

• **Is there disable access?** There is limited parking for disabled badge holders in Hospital parking.

• Wheel chair access is available. There is access via lifts to the 1st floor.

• **Can I still do the test if I am disabled?** (may need to be test specific especially with exercise stress) Yes, but please contact the Department in advance to talk through your individual concerns.

• **Do I need to inform the department if I am disabled (blind, deaf, mute or otherwise impaired)?** Yes, it is important to give us as much information as possible so that we can accommodate your needs.

  Please indicate to the clinic in advance if you have special needs or conditions. Our scanning beds are narrow and high. We may need to arrange to have a hoist available to lift you.

• **If I have an allergy can I proceed with the test?** In most cases the test can be performed but please ring the reception of our department to discuss any specific concerns.

**Cultural:**

• **Are there facilities that take into account my cultural or religious background?**

  At all times we try to be sensitive to your needs.

  Please indicate **when making the appointment** if there are any concerns.
MENTAL HEALTH PATIENTS:

- **Do I need an escort?** Yes, all mental health patients require an escort. The escort should have a knowledge of the patient's history, a current drug chart listing medications and any medication that might be required during the visit.

- **I am on special medication. Will that interfere with the test?**
  
  Patients will be supplied with written information about individual tests after an appointment has been made for them. This will include any specific instructions regarding medication. The information may be viewed in the *specific instructions* of the individual examinations.

  Unless specifically told otherwise, patients should maintain medication as normal.

  We may ask the patient for a list of current medication. Medication should be brought with the patient for this purpose on the day of the scan.

  If a patient requires medication throughout the day, supplies must come with the patient as it will not be available at the Department.

NON-GREEK SPEAKING:

- **Are there facilities available for people who do not speak Greek?** The hospital does not have interpreters available. Please let us know when making the appointment if interpreters are required so that arrangements can be made to assist during the test.

- **Do I have to arrange an interpreter?** Yes, if you don’t speak Greek, English, Czech or Slovak language. Let us know in advance if you need us to help.

- **Can a relative act as my interpreter?** Yes, we are happy for a member of your family to come with you as an interpreter.

DIET

- **Should I avoid any food or drink on the morning of the test?** No special dietary preparation is usually necessary except for some of the cardiac investigations.

  For each individual Nuclear Medicine investigation we will give you a specific list of instructions when the test is booked. You must read these instructions carefully before attending for your investigation.

- **Can I eat and drink between parts of the test or scans?** You will be told if you are required to fast between parts of any scan.

- **Can I eat if I am diabetic?** If you are diabetic and should not starve for a test please let us know.
• Are there any refreshment facilities available within the department? No, but there are within the hospital.

MEDICATIONS

• Should I take my medications the morning of the test? You will be supplied with written information about individual tests after an appointment has been made for you. This will include any specific instructions regarding medication. The information may be viewed in the specific instructions of the individual examinations.

  Unless specifically told otherwise, you should maintain medication as normal

• Should I bring my medications with me to the department? If a patient requires medication throughout the day, supplies must come with the patient as it will not be available at the department.

• Would a list of my medication be helpful? We may ask the patient for a list of current medication. The patients “Health Book” (Βιβλίαριο Υγείας) should be brought with the patient for this purpose on the day of the scan.

What happens to the result of the test? A Nuclear Medicine specialist will study your scan and send a written report to your doctor.

TEST SPECIFIC QUESTIONS

The answers to the following questions depend upon the particular test. Please look at the relevant page for each test.

• Who gets the results and when?
• How long will I be required for the test?
• How long does each part of the test take?
• What is the test aiming to achieve?
• Can I go outside the department in between parts of the test?
• Will I be able to go back to work after the test?
• Do I have to avoid being around other people?
• Can I go on public transport?
• Can I go to the toilet before and after the test?
• How long will I be radioactive for?
• I had a scan two days ago, will I still be radioactive?

• I am having another scan today; will that affect this one?
  Are there any restrictions on activities at home after the test?

**RELATIVES and CHILDREN**

**Will the fact that I am radioactive affect infants, children or adults?** Until tomorrow when everything can return to normal, you should not have babies or children sitting on your lap or close to you for long periods. Continue as usual regarding contact with adults. (Note: for some patients more stringent precautions will be applicable but, if this is the case, they will receive detailed advice and written instructions.)

- **Relatives**
  If you do not wish to come to the clinic on your own, a relative or friend may accompany you. The relative or friend may be required to sit in the waiting room outside the department while you are actually having the test. It is advisable not to bring a relative or friend who is pregnant.

- **Children**
  It is recommended that children should not attend the clinic, unless it is the child having the test. We do not have the facilities to child mind while the test is being performed.
Children having an injection

Parents will be given specific instructions about the investigation when it is booked. However the test may sometimes take longer than predicted so please allow extra time. We encourage children to bring their favourite toys and books. Drinks and snacks will also help comfort and distract. We have a special cream called 'EMLA' which is put on a patients arm to numb the skin so that they will not feel the injection. This is painless and we apply a little to both arms over the site of a vein. It takes one hour to work and the patient does not feel the injection. Parents will be able to stay with their child during the investigation. While the scan is being performed the child will be required to remain perfectly still lying on a bed for about 30 minutes. Most children are able to comply and it is rare for sedation to be used. A favourite cuddly toy or story can be useful here.
CATALOGUE OF SERVICES

**NMD, LGH** is a Nuclear Medicine department in Limassol General Hospital that was opened in January 2006. **NMD, LGH** offers the latest in nuclear medicine technology to diagnose disease earlier and more accurately.

Nearly 40 nuclear medicine imaging procedures are used to diagnose a variety of illnesses including, coronary artery disease, stroke, Alzheimer’s disease, and blood cell disorders; evaluate gallbladder, thyroid and heart function; and measure the effectiveness of bypass surgery, extent of tumors, etc. Children often undergo nuclear medicine procedures to evaluate bone pain, injuries, infection, kidney and bladder function.

The main examinations and therapies performed are:

<table>
<thead>
<tr>
<th>A/A</th>
<th>Code</th>
<th>Examinations / Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PG-03_XX</td>
<td>DMSA SCAN</td>
</tr>
<tr>
<td>2.</td>
<td>PG-04_XX</td>
<td>WHOLE BODY BONE SCAN</td>
</tr>
<tr>
<td>3.</td>
<td>PG-04_XX</td>
<td>3PHASE BONE SCAN</td>
</tr>
<tr>
<td>4.</td>
<td>PG-04_XX</td>
<td>3PHASE/ WB BONE SCAN</td>
</tr>
<tr>
<td>5.</td>
<td>PG-05_XX</td>
<td>DTPA RENOGRAM</td>
</tr>
<tr>
<td>6.</td>
<td>PG-05_XX</td>
<td>DTPA RENOGRAM WITH LASIX</td>
</tr>
<tr>
<td>7.</td>
<td>PG-05_XX</td>
<td>DTPA RENOGRAM / POST CAPTOPRIL</td>
</tr>
<tr>
<td>8.</td>
<td>PG-05_XX</td>
<td>EC RENOGRAM</td>
</tr>
<tr>
<td>9.</td>
<td>PG-05_XX</td>
<td>EC RENOGRAM WITH LASIX</td>
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<tr>
<td>10.</td>
<td>PG-06_XX</td>
<td>LUNG VENTILATION / PERFUSION SCAN</td>
</tr>
<tr>
<td>11.</td>
<td>PG-07_XX</td>
<td>DIRECT RADIOLUMIDE CYSTOGRAPHY</td>
</tr>
<tr>
<td>12.</td>
<td>PG-08_XX</td>
<td>INDIRECT RADIOLUMIDE CYSTOGRAPHY</td>
</tr>
<tr>
<td>13.</td>
<td>PG-09_XX</td>
<td>LYMPHOSCINTIGRAPHY / SENTINEL NODE LOCALIZATION</td>
</tr>
<tr>
<td>14.</td>
<td>PG-10_XX</td>
<td>IN -111 OCTREOSCAN SCAN</td>
</tr>
<tr>
<td>15.</td>
<td>PG-11_XX</td>
<td>GALLIUM-67 CITRATE SCAN (NOT AVAILABLE IN YEARS 2014-17)</td>
</tr>
<tr>
<td>A/A</td>
<td>Code</td>
<td>Examinations / Therapy</td>
</tr>
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<td>---------------------------------------------</td>
</tr>
<tr>
<td>16</td>
<td>PG-12_XX</td>
<td>PARATHYROID ADENOMAS SCAN</td>
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<td>17</td>
<td>PG-13_XX</td>
<td>PERTECHNETATE THYROID SCAN</td>
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<td>18</td>
<td>PG-13_XX</td>
<td>THYROID UPTAKE Tc99m PERTECHNETATE</td>
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<tr>
<td>19</td>
<td>PG-14_XX</td>
<td>GASTROINTESTINAL BLEEDING</td>
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<td>20</td>
<td>PG-15_XX</td>
<td>MAMMOSCINTIGRAPHY</td>
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<td>21</td>
<td>PG-16_XX</td>
<td>MECKEL SCAN</td>
</tr>
<tr>
<td>22</td>
<td>PG-17_XX</td>
<td>IDA SCAN (HEPATOBILIARY)</td>
</tr>
<tr>
<td>23</td>
<td>PG-18_XX</td>
<td>MYOCARDIAL PERFUSION IMAGING (MYOVIEW MPI)</td>
</tr>
<tr>
<td>24</td>
<td>PG-19_XX</td>
<td>MUGA SCAN</td>
</tr>
<tr>
<td>25</td>
<td>PG-20_XX</td>
<td>IODINE 131 WB SCAN</td>
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<td>26</td>
<td>PG-21_XX</td>
<td>I131 MIBG SCAN</td>
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<td>27</td>
<td>PG-22_XX</td>
<td>LIVER HAEMANGIOMA</td>
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<td>28</td>
<td>PG-23_XX</td>
<td>BONE INFECTION IMAGING (LEUCOSCAN)</td>
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<td>29</td>
<td>PG-01T_XX</td>
<td>THYROID CA TREATMENT</td>
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<tr>
<td>30</td>
<td>PG-01T_XX</td>
<td>THYROTOXICOSIS TREATMENT</td>
</tr>
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</table>
THYROID SCAN

The most common nuclear medicine examination performed for possible dysfunction of the endocrine system is a thyroid scan.

A thyroid scan investigates the function of the thyroid gland and gives information about its size, shape and position within the neck.

To perform this test the patient is given a small and simple injection. The patient will wait about 10-20 minutes and then is taken to a camera room by a technologist and asked to lie on a couch as in the picture below. In order to obtain a good view of the thyroid it will be necessary to lie with the head tilted slightly downwards. A gamma camera is positioned close to the neck and a scan of the thyroid is taken. This scan takes approximately 20-30 minutes. When this has finished a second, shorter scan is taken, during which the technologist will feel the neck to check the position of the thyroid gland and take a scan with a marker at the sternal notch. It is important to lie very still throughout the procedure. There are no side effects and the patient may resume normal activities on leaving the department.

Special Instructions
If you are taking thyroid medication such as thyroxine or T3 you will have to stop it 3 weeks before coming for the investigation.

Results: The policy is to provide results directly and only to the referring consultant.
KIDNEY SCANS

DYNAMIC RENAL SCAN (RENOGRAM, Mag3/EC or DTPA scan).

This investigation gives information about the blood flow to the kidneys and how well each kidney is functioning for the production of urine. The test also shows if there are any obstructions in urine output.

The patient will be taken to a scanning room by a technologist and asked to lie on a scanning couch. It is not necessary to undress for the investigation. A gamma camera is positioned beneath the couch and above the patient as seen in the picture on the left. The patient is given a small and simple intravenous injection and a series of images taken of the kidneys.

STATIC RENAL SCAN (DMSA SCAN)

This scan gives information about the size, shape and position of the kidneys, and whether there are scars on the kidney from a previous infection. The patient is given a small and simple injection into a vein. After this the patient may leave but will be given a time to return about three hours later. The patient will then be required to lie on a scanning table similar to the one in the picture above. It is not necessary to undress for the investigation. A gamma camera will be positioned beneath or and above the patient and a number of images taken of the kidneys.

Specific Instructions for Kidney Scans

Renogram, EC or DTPA

This test studies the function of your kidneys.

Before you attend for your appointment please drink plenty of fluids

A dynamic renal scan involves you lying on a couch for the period of the study. Once the camera is positioned you will be given a small and simple injection. A series of scans will be taken lasting 30-60 minutes. It is important that you remain still during this time.

Further pictures may be required after this first study is reviewed by a doctor. Any further injections will be given through the needle already inserted. We would ask that you continue to drink plenty of fluids for the rest of the day.

After the test you will be free to leave the department.

Duration: 30–60 minutes. If your kidneys are slow to empty, we may wish to take another image.
later in the day.

**Results:** The policy is to provide results directly and only to the referring consultant.

### Static Renal Scan

The Renal Scan (often known as a DMSA scan) looks at the kidney structure.

**Before you attend for your appointment please drink plenty of fluids**

This test requires a small and simple injection in a vein followed by a scan approximately **3 hours** later. You will be advised of the time that you should return to the department. During this waiting time you are free to leave the department and you may eat and drink normally. When you return please report to the reception again. A series of scans will be taken on your return taking approximately 30 minutes. You may resume normal activities after leaving the clinic.

**Duration:** approx. 4 hours

**Results:** The policy is to provide results directly and only to the referring consultant.

### Additional Information

**Kidney**

Nuclear Medicine techniques are routinely used to image and quantify the function of the kidneys in adults, children and infants with acquired or congenital nephrourological problems. Renal scanning is indicated as a screening test, as the diagnostic procedure of choice or as a complementary imaging modality in many clinical presentations. Important decisions regarding further work-up, mode of therapy, duration of treatment, follow-up visits and prognosis can be influenced by nuclear medicine techniques. Because of its unique sensitivity to functional changes, renal imaging has been accepted as the test of choice for the evaluation of diseases which induce focal or generalised alteration in renal function. Some of the common reasons for renal studies are

1. obstruction of the drainage system,
2. urinary tract infection
3. evaluation in renal failure,
4. renovascular problems,
5. assessment of renal transplants
6. evaluation of global renal function.

Particularly important is the fact that the studies are cost-effective, relatively non-operator dependent, and non-invasive with minimal discomfort and no known risk factor.
HEART SCAN

There are two main types of heart studies performed at the Nuclear Medicine Department of Limassol General Hospital. A myocardial perfusion scan to look at blood flow within the heart muscle and a MUGA scan to investigate the pumping efficiency of the heart.

Myocardial Perfusion (also called THALLIUM, MIBI or MYOVIEW scan)
This test investigates the heart during exercise and also at rest. The patient will be linked up to an E.C.G and asked to cycle on an exercise bicycle, similar to the one in the picture below. If the patient is unable to pedal the bike, the test may still be performed using medication to stress the heart. After the exercise test the scan will either be performed immediately (THALLIUM scan), or after a wait of approximately forty five minutes (MIBI or MYOVIEW scan). A technologist takes the patient to a scanning room, where they will be required to lie on a couch. All metal objects such as jewelry must be removed. The patient will be linked up to an E.C.G again. Cardiac pacemakers will not interfere with the study. To allow an unobstructed view of the chest, the arms are placed above the head. A gamma camera, similar to the one in the picture above, will rotate slowly across the chest for approximately 20 minutes, during which time it is important not to move. The patient will be asked to return to the department after one to three hours for a resting study to be performed.

MUGA Scan (also called Ventricular Function Study)

Two injections are necessary for this scan; the second one given twenty minutes after the first. After the second injection a technologist will take the patient to a scanning room. The patient will be asked to lie on a couch. An ECG will be set up and a gamma camera, similar to the one in the picture above, will be positioned over the chest to record images of the heart for approximately 20-30 minutes. During the scan it is important for the patient to remain still. There are no side effects and normal activities may be resumed on leaving the department.

Specific Instructions for patients having Cardiac Scans.
THALLIUM HEART SCAN (Myocardial Perfusion Scan)

Do not have tea, coffee or any caffeine containing drink (including colas and chocolate) for the last 24 hours before the scan as caffeine interferes with the test. It is important that you have a light breakfast (without caffeine) on the morning of the test as you will be fasting the rest of the day. Stop Persantin tablets and B-blockers if you are taking them. You may take all your other medication. Please bring your medications with you. You may be required to exercise on a bicycle so wear comfortable, loose clothing and flat shoes. The test is in 3 parts:

Part 1: Stress/Exercise - It is necessary for us to increase the work that your heart has to do. This is normally achieved by a physical exercise on a bicycle and or using medication. A small injection line is inserted at the start of the exercise and your progress is monitored throughout by a cardiologist and NM Technologist. Towards the end of the stress the tracer is given, by the Nuclear Medicine doctor, through the same injection line and that allows us to obtain scans of your heart.

Part 2: Stress/Exercise Imaging - You will be taken immediately to another room where you will be required to lie on a couch and a gamma camera will rotate about your chest, scanning your heart over about 20-30 minutes. You will be asked to return to the department approximately 3 hours later. You are free to leave the hospital during this time and you will be told about any special dietary requirements.

Part 3: Rest Imaging - This will be a repeat of part 2 but now your heart will be rested allowing us to study the differences between the two studies. You will be free to leave when this is finished.

Duration: This test is in three parts and will take most of the day to complete

Results: The policy is to provide results directly and only to the referring consultant.
MUGA SCAN

A MUGA Scan will provide information about how your heart works as a pump. In order to perform this scan, 2 injections are necessary. The first will be given soon after you arrive. This injection prepares your blood cells for the second injection, which will contain a small amount of radioactive tracer. There will be a 20 minute wait between the two injections. You will be required to lie on a couch while ECG leads are positioned on your chest to give us a trace of your heart beat. The gamma camera will then be placed over your heart and a scan will be taken for approximately 20-30 minutes. You will have to wait a short time while the data is analyzed to ensure a satisfactory study has been obtained. After this you will be free to leave. You should allow a total of about 60 minutes for the whole procedure.

Additional information about Heart Studies

Myocardial Perfusion Scan

The main indications for a thallium scan include:
2. Assessment of prognosis after a heart attack and in stable coronary artery disease.
3. Assessment of the effect on blood flow of narrowing in the heart arteries seen on coronary angiography.
4. Assessment before and after angioplasty (balloon procedure) and bypass surgery.
5. Risk stratification before major surgery.

MUGA Scan

The main indications for a MUGA scan include:
1. Assessment before and after chemotherapy drugs, that may affect the heart muscle.
2. Serial assessment after inflammation of the heart (myocarditis) or where the heart is enlarged with reduced pump function (cardiomyopathy).
3. Assessment of patients in whom echocardiography (ultrasound) is unhelpful.
4. Risk stratification before major surgery.
5. Assessment before heart transplantation.
LUNG SCAN

Two parts: Ventilation and Perfusion. The ventilation scan studies the distribution of air through the lungs and the perfusion scan studies the blood supply to and within the lungs. The image above and to the right shows a patient undergoing a ventilation scan.

Special Instructions for patients booked for a Lung Scan

Bring with you recent chest X-rays (of the same day or previous day)

The Lung Perfusion studies the blood supply to and within the lungs. This part of the test requires you to have a small and simple injection in a vein. After you have been administered the injection of radioactive tracer, the camera will take scans of your lungs. This part of the procedure will last approximately 25 minutes. You can resume normal activity after leaving the department.

When the first set of images are complete, are examined by the NM Specialist, and if indicated, we proceed later in the same day or the next day with the ventilation study.

The Lung Ventilation studies the distribution of air through the lungs

You will be taken by the technologist to a scanning room and you will be required to breathe in a small amount of radioactive gas then asked to breathe at a normal rate for approximately 8-10 minutes. At the end of this time scans will be taken at various angles to show the distribution of gas in your lungs.

Duration of Perfusion and ventilation studies is approx. 1-1.5 hours

Preparation: You may eat and drink normally.

Results: The policy is to provide results directly and only to the referring consultant.

Additional Information

Lung Studies

The lungs exchange gas between the air in the environment and the blood. Their main function is to introduce oxygen from the inspired air into the blood and expel carbon dioxide (a waste product gas from the body metabolism) from the blood into the atmospheric air. To work out this function the lungs have to be: 1) ventilated, receive and expire air; and 2) supplied by blood. Thin membranes within the lungs separate air spaces (alveoli at the end of small air pipes) from the blood circulating.
through capillaries (small blood vessels) and enable the exchange of oxygen and carbon dioxide. The ventilated air spaces can be studied with radioactive gases (xenon and krypton) and aerosols of different sizes, some of them made of very small particles and administered by nebulisers. The blood supply to the lungs may be studied by injecting intravenously (in a peripheral vein) a small amount of very fine particles made of human albumin also radioactively labelled. This way a non-invasive test is made available to study the two aspects of lung function, ventilation (air exchange) and perfusion (blood supply). The most important uses of lung ventilation and perfusion studies are:

1. Detection of blood clots in the blood vessels of the lungs (pulmonary embolism);

2. Measurement of residual function after lung surgery, for instance in tumour cases) or other diseases (congenital abnormalities from birth, as well as trauma).

3. Measurement and assessment of lung areas with inadequate ventilation, so called air dead spaces in patients with chronic diseases of the bronchial tree (air pipes) like for instance asthma and infectious bronchitis.

4. Measurement of blood shunts where there is no contact between blood and air spaces - therefore gas exchange is either absent or deficient at the shunt site.
A bone scan is the most sensitive method for demonstrating disease in bone, often providing an early diagnosis or demonstrating pathology not seen on an X-ray film. On arrival the patient is given a small intravenous injection. The main set of scans are acquired 2-4 hours later. The patient is taken by a technologist to a scanning room and is asked to lie on a special couch, in-between of a gamma camera like the one in the picture above. In order to get good pictures the gamma camera must be positioned as close as possible to the patient.

Specific Instructions for patients booked for a bone scan

Primarily the bone scan is useful in assessing any condition affecting the skeleton.

This test requires that you have a small and simple intravenous injection. The main set of scans are acquired between 2 and 4 hours later. You will be advised of the time you should return. During this interval you are free to leave the department. **It is important that you drink plenty of fluids**, (about 1-1.5 liters) in between. There is no need to have a full bladder for this test and you are asked to go to the toilet as often as possible. You may eat normally and there are no other special requirements.

When you return please report to the reception desk again. You will be taken by a technologist into a scanning room, where you will be asked to lie down on a couch in-between of gamma camera heads, similar to the camera in the picture. In order to get good pictures the gamma camera must be as close as possible to you, apart from this you will feel nothing. The test will take about 30 minutes to complete following your return. You can resume normal activity after leaving the Department.

**Duration:** After the initial consultation you will be required to return 2-4 hours later (for approx. 1 hour)

**Preparation:** Please drink plenty of fluids between injection and imaging time.

**Results:** The policy is to provide results directly and only to the referring consultant.

**Additional Information**

Nuclear Medicine bone scans, provide the physician with physiological insights that cannot be obtained from conventional radiological imaging techniques. The most common test performed is a bone scan and in orthopaedic practice the applications are multiple. Bone scan are often used to
localise disease and identify areas of focal increased physiological activity and to evaluate pain. They are particularly useful in patients with sports injuries. Imaging also helps in depicting and localizing small benign tumors and evaluating the significance of an abnormality noted on X-ray. When infection of the bone is suspected Nuclear Medicine scans help in early detection of the site and extent of bone involved. A variety of fractures can be evaluated using this technique especially those of the scaphoid (small bone in wrist joint) fractures and also stress fractures seen in athletes. Less commonly this test is used for evaluating non-union of a fracture and assessing the condition of a bone graft. Orthopedic surgeons frequently use this technique to evaluate prosthetic loosening and managing cancer, which has spread to the bones. In the field of rheumatology, nuclear medicine techniques especially the bone scan provides the ability to perform a joint survey in various arthritides. The bone scan technique is an objective method of demonstrating and assessing joint inflammation. Accumulation of bone seeking agents reflects metabolic activity of bone and blood pooling in the joint. Bone scan is a more selective method for the detection of joint inflammation than X-rays and more sensitive than clinical evaluation. In certain arthritides the bone scan abnormalities precede the development of X-ray abnormalities. A recent development is radiation synovitis, which is used for the treatment of patients with persistent rheumatoid synovitis.
**BRAIN SCANS**

**General Information**

This scan is usually performed to give functional information about your brain. In order to highlight different areas of the brain you will be given a small and simple injection before the scan. The injection will not effect you in any way and you will be safe to resume normal activities as soon as the investigation is finished. The camera used is shown in the picture on the left. As you can see, the process does not involve going into an enclosed tunnel but the head will be within a gantry around which a special camera moves. The image on the right has been obtained by this camera and shows the blood flow through a section of the brain. The brain is viewed from below, with the front of the head at the top of the image and the section taken about the level of the mid-forehead.

**Special Instructions for patients who have been booked for a scan**

**Brain Scan**

There are no special requirements for this test.

This test requires you to have a small and simple intravenous injection, which enables us to take a scan of the brain. The scan will take place approximately 2 hours after the injection. During this interval you are free to leave the Department. You will be advised of the time you should return.

When you return please report to the reception desk again. A technologist will then take you to a room where your scan will be obtained. Whilst you are lying on the scanning table, a camera will rotate slowly around your head. Apart from the awareness of the camera, you will feel nothing. The scan takes approximately 45 minutes.

You can resume normal activity after leaving the Department. You may eat and drink normally. We ask that you drink up to two pints of liquid following the test.

**Duration:** After the initial consultation you will be required to return for a scan in approx. 2 hours. This scan will take approx. 45 min.

**Preparation:** You may eat and drink normally.

**Results:** The policy is to provide results directly and only to the referring consultant.

**Brain Blood Flow Study (Cerebral Blood flow study)**
There are no special requirements for this test. You may eat and drink normally. We ask that you drink up to two pints of liquid following the test.

This test requires you to have a small and simple injection, which enables us to obtain a scan of the blood supply to the brain. **Please report promptly to the reception desk as we can only prepare the injection upon your arrival.** This preparation will take approximately 30 minutes. The injection will be given into a vein in your arm. The scan will usually be taken **within 15 minutes** of the injection. Whilst you are lying on the scanning table, a camera will rotate slowly around your head. The complete procedure takes approximately 45 minutes.

You should usually be able to leave the department within 90 minutes of your appointment time. You can resume normal activity after leaving the department.

**Duration:** Approximately 90mins  
**Preparation:** You may eat and drink normally.

**Results:** The policy is to provide results directly and only to the referring consultant.

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**Additional Information**

The brain uses oxygen, sugars (mainly glucose) and other molecules to maintain a complicated communications network (like a super world wide WEB network) between multiple regions that helps us to think, learn, memorise (recall experiences) and communicate with the world around us. This is done through locomotion (movement), speech, hearing, touch, affection and many other functions. In order to carry out all these complex activities the brain needs to have a competent blood supply (perfusion, also known as cerebral blood flow) and be able to utilize the metabolic substrate offered by glucose (sugars) and oxygen. Brain cells can also communicate with each other by the action of internal substances called transmitters (of information from cell to cell).

Nowadays it is possible to study:
1. Blood supply to the brain
2. Utilisation of glucose by the neurons (cells of the brain)
3. Reaction of drugs with specific sites in the brain called receptors.

These studies help in the diagnosis of:
1. Depression
2. Different types of dementia
3. Site of epilepsy
4. Site, size and severity of stroke lesions
5. Brain death
6. Chronic fatigue syndrome
7. Infections (abscesses, AIDS - toxoplasma) and tumours (lymphomas, gliomas), herpes encephalitis
8. Parkinson’s disease

and to study the effects of some drugs utilised in the treatment of:
1. Schizophrenia
2. Dementia
3. Stroke
4. Drug addiction