Understanding your medical records is an essential part of patient empowerment. (For more on this subject, please see the 2010 PCRI Insights article titled “Making the System Work for You: Principles of Empowerment”.) In connection with the article on Alpharadin (Radium-223) on page 9, this piece will focus on understanding bone imaging better, with a primary focus on the conventional bone scan.

Without an understanding of your medical records, you are likely to research the term “prostate cancer” alone, which can lead to a bottomless well of impersonal information. With some understanding of your records, you will learn to research prostate cancer in context of your own biology – your own pathology, PSA pattern, imaging results, and prostate size, to name a few factors.

This research leads to the understanding you need to develop questions for your physician(s). The quality of your understanding will shape the quality of those questions, and the quality of your questions will determine the quality of your answers. Therein lies empowerment.

For years, PCRI has focused on the fact that no two prostate cancers are alike. Research has taught us that new science is likely to discover more and more diversity (1). Isolated characteristics may be the same, but many characteristics are different.

Medical records provide facts, details and specifics that illuminate the characteristics of your cancer. Imaging of the bone is one such medical record. The most common type of bone imaging is the standard bone scan, but F18 (and sometimes FDG18) PET scans have also seen more widespread use in recent years. In addition, CT, MRI and X-ray are occasionally used for supportive or backup imaging of bone.

Besides being common protocol, the bone scan is also the imaging utilized in Alpharadin clinical trials. It involves an injection made up of a “radionuclide” (low-dose radiation), plus a “pharmaceutical” – a simple definition for a “radiopharmaceutical” (2). The name of the radiopharmaceutical used in bone scans is Technetium 99m. This term is often seen in the title of the bone scan report.

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Bone Scans & PSA

There is ongoing debate over what a PSA level should be before ordering a bone scan, especially in context of health care costs. There have been studies, arguments and statistics on this topic, and despite variations in opinion, one thing remains clear: The patient should always be the most important consideration in the decision.

To editorialize for a moment, I personally believe that PSA alone should not determine whether a prostate cancer patient should have a bone scan. We know, for example, that higher Gleasons often make less PSA. NCCN guidelines support this by including both Gleason and clinical stage in the decision of whether or not to scan (3).

I know someone who is a terrific advocate, whose husband had a bone metastasis with a PSA of 1.5 at diagnosis. But his Gleason was 9 (5+4). The bone metastasis was validated with pathology from needle biopsy – so there was no question that imaging found a cancer metastasis. I was glad they did not make their decision to do scans based on PSA alone. The patient’s whole biology was taken into consideration.

I have a Helpline caller who chose prostatectomy as his initial treatment. His cancer was more widespread at surgery than originally thought, and his Gleason turned out to be 8 (4+4). His PSA crept up quickly after surgery, and with a PSA of 2.1 he had a positive bone scan. I was glad he did not make his decision to order a bone scan on PSA alone, and found his metastases early. He has become a very empowered patient who is now doing extremely well.

After 12 years of doing this with my own husband, and after 10 years of working for PCRI, I believe that making the decision to image – or not image – is more scientific and reasonable if the entire biology is taken into consideration, rather than the PSA alone.

Bone Scan vs. Bone Density Scan

It is important to note that a bone scan, which looks for bone metastases, is different from a bone mineral density scan, which looks for osteoporosis. These two are often confused (See Figure 1, Table A and Table B).

**FIGURE 1**

Bone Mineral Density Test – looks for osteoporosis

Bone Scan – looks for cancer in bone

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Who Interprets my Scans?

It is also important to understand that every medical imaging performed (BS, PET, CT, X-ray, MRI, etc.) is read by a physician, and a dictated written report is issued. This interpreting physician will be either a radiologist or a nuclear medicine physician.

So although the scan may be ordered by a urologist, medical oncologist or radiation oncologist, the physician who interprets the imaging is someone different. He or she is an M.D. trained in a different area of medicine (radiology or nuclear medicine), and does not see patients in a clinic. Their job is to read, decipher and translate imaging into a dictated written report, which they provide to your ordering clinical physician.

The difference between radiology and nuclear medicine is basically whether or not a radiopharmaceutical is used. These injections are designed to adhere to certain types of tissues (cancer being the most common), and reveal a spot or uptake in that area.

For example, the bone scan is nuclear medicine, and cancer in the bone is revealed as a “hot spot,” or excess uptake of the radiopharmaceutical. PET scans are also nuclear medicine, and there are many different types of radiopharmaceuticals used – which dictate the type of PET scan. F18 and FDG18 are currently utilized for bone imaging in the U.S. for prostate cancer.

A CT scan, on the other hand, may also involve an injection, but it is not a radiopharmaceutical, so CT is radiology, not nuclear medicine. MRI is radiology, even if an injection is used (gadolinium, feraheme, etc). Ultrasounds and X-rays are radiology.

Why reading and understanding the basics of your bone scan report can be empowering:

- Correlating your imaging with PSA or CTC can help you understand your disease better. Does your imaging improve when your PSA or CTC improves? (PSA improvement usually precedes imaging improvement.) This may help you develop better questions moving forward in your treatments.

- Correlating imaging with pain can help you understand whether or not your pain is cancer-related. One fear many cancer patients have is that every new pain may be new cancer. If you know what your imaging says (and doesn’t say), then you have something objective to help you face those fears. Fear turns into understanding, and the new pain is often not cancer, but something else.

- How do you know if you are eligible for some treatments, such as Alpharadin? Or perhaps another clinical trial you are considering? Knowing what your bone scan says will give you the knowledge you need. Of course, this also needs to be discussed with your physician(s).

The idea here is not to know all the answers, but to develop better questions, which should lead to better answers.

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To help you understand what your bone scan report means – and doesn’t mean – here are some explanations of what can be found on a typical report.

Sections of a Bone Scan Report

Title

The title of the bone scan document can have different terms.

In fact, sometimes it doesn’t even say “bone scan”, so this can be confusing. You may often see “Whole Body”; or WB. You will usually see a reference to the injection used (Technetium 99m), and may also see the term “Nuclear Medicine”. These are all common words in the title of a bone scan report, and no two titles are exactly the same. It seems odd, but it’s true.

Table A

<table>
<thead>
<tr>
<th>Different TITLES found on Bone Scan (test for cancer in bone)</th>
<th>Different TITLES found on Bone Mineral Density Test (test for osteoporosis)</th>
<th>Different TITLES found on F18 PET Scan (test for cancer in bone)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Body or WB</td>
<td>DEXA or DXA (Dual Energy X-ray Absorptiometry)</td>
<td>Positron Emission Tomography</td>
</tr>
<tr>
<td>Nuclear or Nuclear Medicine</td>
<td>qCT (quantitative CT scan)</td>
<td>Nuclear or Nuclear Medicine</td>
</tr>
<tr>
<td>Technitium 99 or Tc 99; MDP or HDP</td>
<td>qUS (quantitative ultrasound)</td>
<td>Na-18F or F-18 or NaF</td>
</tr>
<tr>
<td>Bone Scintigraphy</td>
<td>Bone Densitometry</td>
<td>Sodium Flouride</td>
</tr>
<tr>
<td>SPECT (sometimes fused with this type of CT imaging)</td>
<td>Bone Density</td>
<td>PET/CT (often fused with CT imaging)</td>
</tr>
</tbody>
</table>

Date

Always make sure you circle the date that your imaging was performed. This may sound simple and obvious, but it is often overlooked. If you can’t quickly find the date on a medical report, you can’t use it effectively. Remember, you will keep your medical records now, but try to come back to them later. What important points do you want to access quickly?

Comparison

It is always important to have any imaging compared to previous similar imaging.

Bone scans should be compared to previous bone scans, because the change between two scans can tell you more than a single report can. If a previous bone scan was done at a different location, the current radiologist reading your images may not have access to the previous bone scan, or even know it exists - unless you (the patient or advocate) show them. Make sure your bone scan, PET and any other imaging is compared to previous scans. This is usually indicated on the report, just under the title.

Findings

This is where the radiologist or nuclear medicine physician dictates everything he sees in paragraph form. There will be mention of unremarkable (normal) findings, suspicious findings and definitive findings.
A critical point to remember here is that no medical imaging is perfect. They all have different strengths and weaknesses, depending on (1) what the imaging is looking for, and (2) what part of the body the imaging is looking at. In the case of the bone scan, there will be “uptake” anywhere there is new bone formation. This is not always 100% cancer.

Uptake will also show where there is degenerative disease, previous fractures and sometimes arthritis. A good example of this is bone scan uptake in the knees or feet that are common arthritic changes, but negligible for cancer metastases. All of this will be discussed in the section on your report called “Findings”. Read it carefully, and research anything you don’t understand before you ask your physician(s).

One of the most important statements in this section can be if something on the bone scan looks suspicious, but not definitive. If so, follow-up imaging such as MRI or X-ray is usually suggested. If follow-up imaging was suggested, but somehow not carried out, this is an important question to ask your physician(s) about. I have seen this happen more than once.

Impression

This is where the radiologist or nuclear medicine physician dictates what he sees in an abbreviated summary, and basically consists of the significant conclusions.

Here are some common words you will find (See Figure 2 and Table B):

Cervical, or C1 – C7. These are the 7 spinal vertebrae in the neck.

Thoracic (also Thorasic) or T1 – T12. These are the 12 spinal vertebrae in the middle/main part of the back.

Lumbar or L1 – L5. These are the 5 spinal vertebrae in the lower back.

Sacrum or S1 – S5. These are the 5 spinal vertebrae in the tailbone.

Other bones mentioned may be the ilium (pelvic bones), femur (thigh bone) and humerus (upper arm bone).

Obviously there are more, but they are too many to mention. All can be researched online.

Osseous – another word for bone.

Blastic/Sclerotic – the type of bone metastasis that looks like a buildup of bone, or a bump. The overwhelming majority of prostate cancer bone metastases are blastic (or sclerotic). This is the type of metastasis that Alpharadin can treat.

Lytic – the type of bone metastasis that looks like a loss of bone, or a dent or hole. Most other cancers have bone metastases that are lytic. This is the type of metastasis that Alpharadin cannot treat effectively.

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The radiologist or nuclear medicine physician will sign the report. Also look for page numbers – it may say “page 1 of 2” or “page 1 of 1”, etc. Make sure you have all the pages to your dictated written report from your bone scan.

Table B

<table>
<thead>
<tr>
<th>Different TERMS found in Bone Scan Report</th>
<th>Different TERMS found in Bone Mineral Density Report</th>
<th>Different TERMS found in F18 PET Scan Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>uptake</td>
<td>T-score and Z-score (T-score is more important)</td>
<td>uptake or SUV (standard uptake value)</td>
</tr>
<tr>
<td>osseous (of the bone)</td>
<td>BMD</td>
<td>osseous (of the bone)</td>
</tr>
<tr>
<td>blastic or sclerotic</td>
<td>bone mass</td>
<td>blastic or sclerotic</td>
</tr>
<tr>
<td>lytic</td>
<td>osteoporosis</td>
<td>lytic</td>
</tr>
<tr>
<td>metastatic</td>
<td>osteopenia</td>
<td>metastatic</td>
</tr>
</tbody>
</table>

PET Scan for Bone

In recent years, PET imaging and PET/CT-fused imaging have become more commonplace for imaging bone metastases for prostate cancer. In some clinics, it has replaced the bone scan.

This may be temporary, as the future of insurance reimbursement is uncertain. Currently, Medicare has been paying in most areas of the United States because of a National Oncologic PET Registry (NOPR) for F18 (or FDG 18) PET scans which started in January 2011. (4,5)

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To date, the wording in the NOPR coverage for PET in prostate cancer reads like this (6):

**NOPR Medicare Reimbursement for PET in Prostate Cancer (subject to change)**

<table>
<thead>
<tr>
<th>Indications</th>
<th>Initial Treatment Strategy (formerly Diagnosis and initial Staging)</th>
<th>Subsequent Treatment Strategy (includes Treatment Monitoring, Restaging and Detection of Suspected Recurrence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>NC (non-covered nationally – Not eligible for entry in the NOPR)</td>
<td>NOPR (covered only with entry in the NOPR)</td>
</tr>
</tbody>
</table>

There are many different types of PET scans, because the type of scan depends on the type of radiopharmaceutical administered. In other words, an F18 PET scan is different from an FDG 18 PET scan, because the injection used is a different radiopharmaceutical. These are the two types of PET covered in the NOPR. If you had a PET, it is likely one of these 2 types.

Studies show that F18 and/or FDG18 PET scans have better accuracy than traditional bone scan in finding bone metastases in prostate cancer. (6)

**Follow-Up & Additional Bone Imaging**

If the physician who read and signed your bone scan report found something that he thought to be suspicious, but not definitive, he may suggest ordering additional imaging to rule out cancer metastasis. You will probably find different clinical opinions on what type of imaging is most useful, or even on when follow-up imaging is necessary. But here are some pointers that can help in your understanding.

**CT Scans** – CT or CAT scans can also read bone. In years past, a CT used to image a prostate cancer patient often made no mention of bone findings, and simply commented on soft tissue and lymph nodes.

It does seem there is a pattern of more radiologists reading what they see in bone on a CT than in previous years. This can be a helpful correlation with the bone scan. If the CT was performed on the same day as the bone scan, it is a good question to discuss. This is probably common. If a PET scan is used to image bone, a CT is often used in conjunction with the PET.

**MRI** – Magnetic Resonance Imaging (MRI) is sometimes suggested for follow-up imaging. Since MRI can visualize bone marrow well, it is sometimes ordered to image suspicious findings in the spine.

**X-ray** – Also called “plain films” or AP, X-rays are occasionally ordered as follow-up imaging if a bone scan finding is suspicious but not definitive for cancer.

You may never understand your bone scan report like a physician – I don’t. But you can certainly understand it as an empowered patient – I do.

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Don’t be intimidated by large words that look like another language, because they’re not. They change from foreign to familiar when you find the definition.

Remember that empowerment lies within these records, because that’s where your biology lies. Keep in mind that the quality of your answers depends on the quality of your questions. Remind yourself that you’ve done greater things than learning to understand medical records – so you can do this too. Remind yourself that empowerment quenches fear, and understanding is the road to empowerment.

References:

(2) Nuclear Medicine - Society of Nuclear Medicine glossary
(4) Segall G., NaF PET/CT Bone Scans, Presentation 2011
(5) National Oncologic PET Registry: Information for Patients,
(6) National Oncologic PET Registry: FCG Indications: Cancer and Indications Eligible for Entry in the NOPR
More on Alpharadin Treatment

Alpharadin (Radium 223) is a low-dose radiation injection. It is a radiopharmaceutical, as discussed on page 19. The treatment is given in a clinic or hospital by a radiation oncologist or medical oncologist (or their administering nurse). The experience will be very similar to receiving a bone scan injection, which is a different type of radiopharmaceutical. Alpharadin is not an IV drip or an intramuscular shot.

Treatments are given once every four weeks. Patients are allowed to have up to six treatments. In the phase 3 ALSYMPCA trial, about 50% of patients received all six. (1)

Patients in the Alpharadin trial remained on secondary hormonal treatments of various type. They also continued treatment with Zometa or Xgeva if they were already receiving these therapies, but did not receive them on the same day as Alpharadin. Patients in the Alpharadin trials did NOT receive Zometa or Xgeva the same day of Alpharadin treatment.

Researchers will have to decide on the timing and sequencing, but since both treatments are often given in approximately one-month intervals, it should be easy to schedule with weeks in between Alpharadin and Zometa – or Alpharadin and Xgeva. As always, discuss with your administering physician(s).

Hydration

Patients who receive Alpharadin are asked to hydrate before treatment. Drinking plenty of water is the easiest way to hydrate, but certain foods can also help. For example, lettuce is 95% water, watermelon is 92% water and broccoli is 91% water. Other foods with high water content include soups & popsicles (2). Yogurt has a high water content and may have multiple benefits, since Alpharadin is excreted through the gut, or small intestines (3)(not the kidneys, like Quadramet), and diarrhea or nausea are possible side effects.

In contrast, some foods actually contribute to loss of fluids. Foods and drinks that contain salt, sugar, caffeine, or alcohol will cause loss of fluid – not hydration (4). And surprisingly, some healthy foods such as celery, asparagus, artichokes, and melons have a diuretic effect – so they also can add to loss of fluids.

Simple water consumption is probably the best remedy. Also, keep in mind that you can ask your medical oncologist for fluids, which can be administered by IV drip in most oncology clinics. A full bag of fluids may take 90 minutes, but a half bag can take less than an hour. Insurance usually pays, and it is relatively inexpensive. Ask your oncologist about this option, and consider working it into your treatment regimen or office visits. Fluids given by IV can make you feel better quickly, but the benefits also wear off quickly. Fluids consumed by drinking last longer in the body, but don’t have the immediate benefit of feeling better quickly.

Side Effects

Side effects are often listed without percentages. This leaves a person wondering whether the side effect happened to 5% of people or 95%. Clearly this is an important difference. Make it a habit to ask.

With Alpharadin, some gastrointestinal side effects were documented, but most were mild. Diarrhea was experienced in 22% - but also in 13% of men who receive placebo (difference – 9%). There was also a 2% increase in nausea (compared to placebo) and a 4% increase in vomiting.

White blood cell drop (leucopenia) was only documented in 4% of men, and low platelets (thrombocytopenia) in 8%. This is dramatically less than what has been seen with Quadramet* (Samarium 153), where leukopenia was seen in 59% and thrombocytopenia was seen in 69% of patients (5). In addition, low hemoglobin (HGB), or anemia, was no different between the placebo group and the Alpharadin group. Again, this is an improvement over Quadramet, where a drop in HGB was documented in 17% more patients than the placebo group.

Overall, Alpharadin looks promising. The Expanded Access program will create some availability for patients (many will have to travel) while waiting for FDA ruling, expected before the end of 2012. As always, research Alpharadin personally, then check with your physician(s) to see if this treatment is right for you.

References:

(1) C. Parker, et. al., Overall Survival Benefit of Radium-223 Chloride (Alpharadin) in the Treatment of Patients With Symptomatic Bone Metastases in Castration-Resistant Prostate Cancer (CRPC): A Phase III Randomised Trial (ALSYMPCA)
(2) The Importance of Hydration. ASCO, www.cancer.net
(3) Algeta Products. Alpharadin.
(4) S. Lundman. What foods make you feel dehydrated? June 2011 LiveStrong
(5) Daily Med. U.S. National Library of Medicine, NIH. Quadramet (Samarium SM 153 Lexidronam) injection, suspension