Dr. Lynn Wilson, An Overview of Radiation Therapy February 17, 2008Welcome to Yale Cancer Center Answers with Drs. Ed Chu and Ken Miller. I am Bruce Barber. Dr. Chu is Deputy Director and Chief of Medical Oncology at Yale Cancer Center and Dr. Miller is an oncologist specializing in pain and palliative care. If you would like to join the discussion, you can contact the doctors directly. The address is canceranswers@yale.edu and the phone number is 1-888-234-4YCC. This evening, Dr. Chu is joined by Dr. Lynn Wilson. Dr. Wilson is a Professor, Vice Chairman and Clinic Director of the Department of Therapeutic Radiology at Yale School of Medicine and is here to discuss the use of radiation therapy for cancer treatment.Chu Why don't we start off by discussing what radiation therapy is.Wilson Radiation therapy is the medical usage of radiation to treat cancer patients. There are some nonmalignant or noncancerous indications that would require the use of radiation treatment, but greater than 95% of the patients we treat have cancer of some sort. There are three different ways we provide radiation to such patients, it can be a part of a definitive cure, and it can be given adjuvantly, meaning after the primary treatment for a patient who may have had surgery as their primary treatment; we often use radiation after the surgical procedure. It can also be used in the palliative setting where we are trying to help a patient get relief from symptoms, whether it is bleeding or pain.Chu Let's hold off on that for a moment and start with the basics. When I think of radiation therapy, I think of some machine focusing x-rays at a particular spot. Is that correct, or are there other ways of giving radiation therapy?Wilson There are several ways. Thinking of the machine focusing on a particular spot is really the primary modality, and that machine is called a linear accelerator, which has been around for many years. Different generations of technology have improved our ability to focus, but these machines actually generate electrons that are accelerated several feet down a pathway at very-very high speeds. They impact a tungsten target usually, and that produces a photon, which is an x-ray that is aimed very precisely at the part of the body that we are interested in treating. A photon is really just a group of very energetic particles that can interact with cellular DNA to damage cancer cells. When the beam comes out of this linear accelerator device, it is highly focused and extremely precise. There are other ways of delivering radiation therapy though. Brachytherapy is a term that refers to the implantation of radioactive seeds, for example, to treat prostate cancer, cervical cancer and a variety of other tumors. There are some relatively new, systemically given agents, which have monoclonal antibodies that are targeted at certain types of cells. Those have radioactive molecules attached to them so that the radiation can be delivered very, very specifically.Chu Are there any instances in which you might think of combining the x-ray form of radiation therapy and the brachytherapy approach?3:24into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3Wilson Yeah. There are of a variety. That is sometimes done in prostate cancer. Here at Yale, we have extensive experience in brachytherapy and a variety of different organ systems, particularly for GYN cancers and for head and neck cancers, and quite often we combine brachytherapy, the implantation of radioactive

seeds into a tumor in the head and neck, with the patient receiving external beam radiation as a part of their treatment package. Chemotherapy is often an important part of that combination as well.Chu Now what about this term Gamma Knife, how is that involved in radiation therapy?Wilson Gamma Knife is a particular type of way to deliver radiation to a very, very pinpoint precision-based target. It is typically used for treatment of brain tumors and it's an array of cobalt sources that are radioactive that actually produced x-rays. Those are focused at a particular point in the brain with many, many of these sources converging on one very small pinpointed area. The advantage of something like Gamma Knife is that we can deliver very, very precise high doses of radiation to small places in the brain and minimize the amount of radiation to the other parts of the brain, which is very important.Chu Is that the preferred approach for treating patients with brain cancer?Wilson Well, it depends. It depends on the type of cancer and the size of the cancer itself. For some patients who have very, very small primary brain tumors, it may be a reasonable option. It is certainly commonly used for patients where their cancer has spread to the brain coming from the lung, for example, or breast cancer where it has deposited itself into the brain. It can be used very effectively to eradicate such lesions.Chu When we started off the show, you mentioned that radiation therapy can be used in three different settings. Let's get into that a little bit more.Wilson Sure. The primary setting that we use radiation for, and most of the cases that are treated, are for definitive treatment. What I mean by that is, taking something like prostate cancer for example, surgery is obviously one option, but radiotherapy is another, and it is a bit of a complicated discussion to decide who, for example, would have the most benefit from surgery versus radiation. But both of those modalities would be used to completely eradicate the patient's cancer. In our program here at Yale, we use intensity modulated radiation therapy (IMRT) to treat all of our prostate cancer patients. In lung cancer, for example, we would use radiation perhaps in combination with chemotherapy for definitive treatment with the intention of completely eradicating the cancer. There are other examples, but those are the common ones. For a breast cancer patient, their primary treatment might be surgery and they may have had a lumpectomy, we would then provide radiation to that patient6:33into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3afterwards to ensure that they have the best local control of their cancer possible. The palliative setting would be for a patient who might have had a cancer spread to a bone, which can be painful. We could provide a relatively short course of treatment with radiation to alleviate their symptoms of pain. Those are the three primary settings. It is a very important modality in all three of those cases.Chu To further expand on the scenario you just mentioned in terms of using radiation therapy for bone pain, we find that to be a very effective way of relieving pain in most cases, almost instantly from the moment you shine that beam on the particular area of bone involvement.Wilson It is extremely effective and what is nice about the palliative treatment is often patients have courses of radiation that last 6 or 7 weeks, but in the palliative setting there

are several schedules that we can utilize. We decide on how many sessions are necessary based on the location in the body and how much soft tissue may be intervening. We take all that into account, but usually within a week or two, the patients can feel dramatic relief from their discomfort, and as you suggest, sometimes it can be appreciated after just one or two treatments, depending on the cancer cell type.Chu One of the real advances that we have seen over the years is that you are working in close concert with your other oncology colleagues. Can you let our listeners know a little bit more about that process?Wilson I am the primary radiation oncologist at Yale who works with the Thoracic Oncology Program. The patients that I typically see have malignancies of the chest, most commonly lung cancer, and there are three main advantages to what we call this multidisciplinary approach here at Yale. The primary one is that it is very convenient for patients, because we have a variety of different specialists; surgeons, medical oncologists and radiation oncologists, all seeing the patient together. Not necessarily all in the same room at the same time, but perhaps sequentially over an hour or two. It is really one-stop shopping for the patient, which is great instead of having to spread those appointments out over several weeks. One primary advantage is convenience. Another advantage in our program, within the department of radiation oncology at Yale, is that we have a variety of different specialists and we have a very large group. By having a large group, it affords us the opportunity to have one person specialized in one or two diseases, as opposed to a very small group where each physician would have to do a little bit of everything. With that we have tremendous expertise for each one of our physicians. When I have my clinical activity in the thoracic oncology group, most of the patients that I take care of have thoracic malignancies so I am able to specialize in that clinically with my research efforts and so on. The third advantage for the patient in this multidisciplinary clinical setting, is that since all of the physicians are together in that9:55into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3 clinic, the patients get information with regards to recommendations very rapidly instead of having to wait to see each of the doctors over several weeks. We're actually discussing the cases that day while the patient is there so that by the time the patient leaves at the end of their visit, they have the recommendations they need from all of the specialists who were involved. There is convenience, expertise and the patient is ready to embark on the treatment plan very efficiently and rapidly.Chu This is one of the hallmarks in advantages of so called designated comprehensive cancer centers, where you have specialists from different fields that have worked together to come up with a well-integrated, coordinated treatment plan for the patient.Wilson That is right.Chu Obviously it is something that we focus on at the Cancer Center. On average, how long are people treated with radiation therapy?Wilson It depends quite a bit on the clinical scenario, meaning the type of cancer that the patient has and whether we are treating someone with a curative approach, adjuvantly or palliatively. We talked a little bit about palliative treatment and that can be given relatively quickly anywhere from say 1 to 10 treatment visits. Treating

someone for prostate cancer definitively, may take as many as 7 to 8 weeks. And that is daily treatment, typically 5 days a week. The treatment itself only takes 5 minutes or so and the patient is in our department only for about 20 minutes. Once the visits in the treatment program are underway, it is highly efficient and we try to make it as convenient as possible for patients so that they can go about doing their other activities, but generally, I would say the average course of definitive radiation treatment is going to run somewhere between 5 and 7 weeks on average, daily.Chu One of the real advantages of radiation therapy, as you say, is that it is actually a very short period of time that the patient needs to be in the clinic.Wilson An extremely short period of time. Some of the very modern and specialized treatments, such as Gamma Knife or stereotactic radiosurgery, do take a little bit longer because there are many beams being utilized to give highly focused radiation on one particular spot. Sometimes those treatments tend to only be a single treatment session, or they may be several. Although the day may be longer, a patient who is getting stereotactic radiosurgery may only have three treatment visits total. It may seem like a very long time, but within a week or so over those three visits given every other day, treatment is complete.12:51into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3Chu Before you begin the radiation treatments, there is very careful planning that goes into deciding how to give it and what doses and all of that.Wilson Absolutely, obviously delivering the treatment is critically important, but the planning and the design of the treatment are essential to have it done under the most modern standards with great quality assurance. We have an entire section within our department called dosimetry, and have quite a few individuals whose full-time position is to assist the physician staff with design of safe and clinically appropriate treatment field design. 15-20 years ago, we would typically treat a patient with maybe two beams, one from the front and one from the back, to very large fields because we did not have the diagnostic capabilities with high-quality CAT scanning and MRI scanning as we do now, and we certainly did not have PET scans back then. We integrate all of this information into the treatment planning for our patients so that we can make it as accurate and as appropriate as possible. Those planning sessions take quite a long time and typically a new patient who comes to our department will have a consultation where they meet with the physician, we take their history, of course we would have reviewed the records prior to the visit, perform a physical examination and spend a fair amount of time with the patient and discuss the options and the treatment plan. Once we embark on an actual plan, the patient will come back for what we call a radiation simulation; in our department that typically involves getting a CAT scan. We use the information from that CAT scan to start designing, with our dosimetry team, the appropriate treatment fields, angles of the beams, how many beams to use, are we are going to use IMRT? It is a complicated process that takes many, many hours of work. We also have a large cadre of PhD level physicists who are in another section within our department who are also involved in helping us do this treatment planning. When that planning is complete and the physician has signed off

on the best plan and we are ready to go, the patient is contacted and we make arrangements for them to come in and start the therapy.Chu Great, there is a very well coordinated team effort behind the initial multidisciplinary team approach.Wilson That is right, and sometimes after that consultation we could literally start the patient the next day. In some cases that are more complicated, say for example a very technically complicated IMRT plan for the head and neck, that may take a week or so before we are ready to actually start that patient's treatment. That can be very disconcerting for patients, of course, because everybody is anxious to get the treatment program underway, but I cannot stress how essential it is to take the time and integrate all of these expert team members into devising a plan. Another thing that we have not talked about yet is that most of our treatments these days are highly coordinated with physicians from your staff in medical oncology. We spend a lot of time ensuring the coordination of radiation and chemotherapy on the drugs and the doses of radiation that we use. These treatments are16:05into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3 highly coordinated and not ad hoc in any way. It is important to have radiation given after chemotherapy in some settings. There are quite a few behind the scenes activities that go on after that consultation.Chu At this point we would like to remind you to e-mail your questions to canceranswers@yale.edu, or call 1-888-234-4YCC. We are going to take a short break for medical minute. Please stay tuned to learn more information about radiation therapy with our special guest expert, Dr. Lynn Wilson.Chu Welcome back to Yale Cancer Center Answers. This is Dr. Ed Chu and I am here in the studio this evening with Dr. Lynn Wilson talking about the use of radiation therapy for cancer treatment. Lynn, before the break you mentioned that radiation therapy in some cases is combined with chemotherapy, which obviously is in the realm of the medical oncologist, could you tell our listeners what diseases you typically think about combining radiation with chemotherapy for, and what might some of the potential symptoms and side effects be.Wilson There are a variety of diseases where we do institute the combination of chemotherapy and radiation. We often integrate chemotherapy with radiation into the treatment package for very locally advanced head and neck cancer. The reason we do that is because, although combining the two treatments sometimes can be a little bit more toxic for patients, we know that the clinical outcomes of local control, and in many cases the overall survival of the patient, can be significantly enhanced. Lung cancer is another possible combination of said therapies. Not early stage lung cancer, but in a stage III lung cancer for example, where the patient has a tumor and lymph nodes in the middle of the chest that we can see are involved by the cancer. This is all based on data, not just based on what we think is best. It is based on many, many years of clinical trials that have been completed. Our approach is very19:10into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3 evidence based here at Yale. But lung cancer is another excellent example where the best outcomes have been seen when we do a combination of radiation and chemotherapy. Then of course there is a whole other discussion that can be

opened up about which are the best drugs, what combination of drugs to use with the radiation, what sort of schedule should we use, and there are various options there. That is another advantage of the multidisciplinary team, getting back to that. We have these various schedules and combinations I work with my colleague, Scott Gettinger, who is an expert in medical oncology on the thoracic oncology team. Not only is Scott an excellent clinical investigator and clinician, but he is an expert at devising the treatment regimens for patients that he thinks will drive the best clinical outcomes. It is obviously important for patients to have a regimen that they can tolerate well.Chu And I know that Scott in your group is trying to develop a clinical study that combines some of these newer targeted therapies with radiation therapy.Wilson Right. Yes. We are always trying to remain on the cutting edge, and as I mentioned before, the basis for most of the work that we do in the clinic today has directly come out of clinical trial work that has been done, some clinical trial work here at Yale, but also around the world. It serves as the basis for what the best treatment for cancer is going to be in tomorrow's clinic.Chu What are some short-term side effects of radiation therapy, either alone or in combination with chemotherapy?Wilson They can be various. It depends on the part of the body that we are treating. It depends on the radiation schedule and what size radiation dose we are giving on a daily basis. Speaking in general terms, the patients can have some fatigue from radiation treatment. Sometimes there can be some skin irritation. Generally when we do a combination therapy of radiation and chemotherapy the side effects discussed can be a bit worse than chemotherapy or radiation alone. The whole concept behind that dose is to try to be aggressive so that we can have the best chance of curing the cancer or eradicating the problem. So fatigue, skin changes, decrease in blood counts, depending on how much bone marrow we have to cover with the radiation field, some irritation of the swallowing tube or the esophagus if we are treating a tumor in the chest. That can come in the form of discomfort on swallowing, or for a patient being treated for head and neck cancer, a sore throat. We know what to expect because we have a lot of experience, and when we know to expect it, we are in a better position to be prepared to counteract the side effects. We counsel the patients on the first day regarding what to expect and what might happen, and we are comprehensive about that because I would much rather have a patient be prepared about all of the potential possibilities as opposed to not having a thorough discussion and then having something come up that they have never heard of. That would cause a lot of anxiety.22:16into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3Chu One thing to emphasize to the listeners out there is that they should feel free to ask any questions of their physicians.Wilson Absolutely, that is what we are there for. In addition we have an on-call service for our patients who are undergoing treatment, and it is actually utilized by patient's who are no longer in the treatment program. We provide that 24 hour and weekend service to our patients. This of course is especially important for patient's who are on the active treatment program now, who may be doing fine during the day, but develop a problem in the middle of the night.Chu Lynn, is there anything that

you can do for the fatigue issue?Wilson That is a tough one. We do a lot of counseling right up front regarding nutrition, exercise and curtailing certain activities that we know will be strenuous for the patient during the treatment course. We try to predict what we can do, but probably the best thing we can do is tailor the treatment as accurately and specifically as possible to try to avoid as much normal tissue as possible. But even through the use of very, very small radiation fields, there is typically always some degree of fatigue, although in most cases usually it is pretty minor.Chu And the skin rash or skin toxicity, is that like a sunburn?Wilson Well, it kind of feels and looks like a sunburn, it can be red, itchy, irritating and sometimes uncomfortable for the patient, but again, we are pretty good at predicting when we think this is going to happen. There is not too much you can really do prophylactically to prevent it, but there are a lot of things that we can do once it happens in terms of certain emollient creams, soaks and different schedules that we recommend to patients. It is different depending on the part of the body or the size of the radiation field, but getting back to the importance of the treatment planning, we take a lot of care in designing these radiation treatment beams. When we use our computers and the simulation CAT scan, we can actually see the dose distribution in the area of the tumor, and we are looking at all the normal tissues as well. Evaluating the dose of radiation to the skin is an important part of that quality assurance package so we can try to minimize that sunburn effect, because obviously that is very uncomfortable.Chu Are there any long-term consequences of radiation therapy?Wilson Unfortunately there are. Some of the more common ones are that sometimes there can be scar tissue formation. Long-term side effects of radiation are almost directly proportional to the size of radiation we give each day. This is the reason for these protracted fractionation or treatment courses that take many, many weeks. A common question I get from patients is, "Why do I have to come for 724:57 into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3 weeks for the treatment, why can't we do this in a few days?" I could certainly give a dose of radiation say in 5 days, instead of 7 weeks, and that might be effective at eradicating the cancer, but the problem with that is that there might be tremendous long-term complications from that treatment in terms of skin changes and scar tissue. If we were treating the esophagus, scarring of the esophagus might cause long-term swallowing problems, in treating a breast cancer patient, there might be long-term scar tissue in the breast and the cosmetic outcome may be very inferior compared to fractionating the treatment over a longer period of time. The same holds true for prostate cancer. Prostate treatment is one of our longer treatment courses, but if we did the treatment very quickly, there might be significant long-term bowel, rectum and bladder toxicity which could lead to frequent urination, incontinence and those sorts of problems.Chu What type of clinical trials are you and your group here at Yale doing for patients?Wilson We have a variety of clinical trials for various organ systems. We have two clinical trials for breast cancer patients. For one of them we are participating in a national trial evaluating standard whole breast radiation versus only treating part of the breast with radiation. That

trial is ongoing and our department participates in that trial. In fact, Dr. Joanne Weidhaas is the principal investigator here at Yale and is the Yale representative nationally running that trial. We are one of the top accruers nationally to that trial, so we are extremely vested in trying to answer the question of, is there an advantage to partial breast radiation? MammoSite, a term patients or our listeners have probably heard, is one option for partial breast treatment. There is also a phase II MammoSite trial, which Dr. Weidhaas designed, which is also ongoing and open at Yale.Chu Any other trials?Wilson There are several others. We have a head and neck trial in combination with chemotherapy, from your colleagues, for patients with very advanced head and neck cancers. We participate in an RTOG trial, which is the radiation therapy oncology group, for patients with stage III lung cancer investigating higher doses of radiation with chemotherapy followed by surgery. We have a vested interest in that, and there is also a cervix trial for patients with cervix cancer in combination with chemotherapy. We have a variety of trials and a variety of different organ systems, specifically lung cancer, breast cancer, head and neck cancer, and cervical cancer.Chu Great. Lynn, it has been great having you on this show. The time has flown by. We look forward to having you on a future show to hear more about what is going on in the Radiation Oncology Group here at the Yale Cancer Center.27:46 into mp3 file http://www.yalecancercenter.org/podcast/Answers_Feb-17-08.mp3Wilson Thank you very much.Chu Until next week, this is Dr. Ed Chu from the Yale Cancer Center wishing you a safe and healthy week.If you have questions, comments, or would like to subscribe to our Podcast go to www.yalecancercenter.org where you will also find transcripts of past broadcast in written form. Next week, we will meet Dr. Peter Schwartz, a leading expert on cervical cancer.