American Brain Tumor Association Webinar

Metastatic Brain Tumors: What Patients Need to Know

>>Welcome to the American Brain Tumor Association's Free Educational Webinar Series. Thank you for participating in today's webinar. Today's Webinar is on Metastatic Brain Tumors: What Patients Need to Know. The webinar will be presented by: Michael Lim, MD. Please note that all lines during our webinar today are muted. If you have a question you would like to ask, type and submit it using the "Question" box in the control panel on the right-hand side of your screen. Dr. Lim will answer questions at the end of his presentation. In the next few days, you will receive an email asking you to take a brief survey to evaluate the webinar. Please take a few minutes to share your feedback, which is important to us as we plan for future webinars. Today's webinar is being recorded- the recording will post to the ABTA's website on the Anytime Learning page shortly. Registered participants will receive the webinar recording link in a follow-up email message once it is available. Let's pause for a moment so we can begin our webinar recording here.

>>The American Brain Tumor Association is pleased to welcome you back to our Webinar Series. Our webinar today will discuss: Metastatic Brain Tumors: What Patients Need to Know. My name is Antoinette Tiu, Program Manager here at the American Brain Tumor Association. I'm delighted to introduce our speaker today, Dr. Michael Lim. As an associate professor of neurosurgery in the Johns Hopkins Department of Neurosurgery in Baltimore, Michael Lim, M.D., focuses on the surgical treatment of primary and metastatic brain tumors, as well as pituitary and skull base tumors and trigeminal neuralgia. He uses the most advanced techniques in neurosurgery including image-guided surgery, radiosurgery, microsurgery, minimally invasive techniques, and endoscopic surgery, as well as immunotherapy. Thank you for joining us, Dr. Lim. You may now begin your presentation.

>>Thank you Antoinette. Welcome everybody to our presentation on metastatic brain tumors. My name is Dr. Michael Lim and I'm the director of the metastatic brain tumor Center at John Hopkins. These are my relevant disclosures. We have a group of oncologists who focus on taking care of patients who have metastatic brain tumors. With this afternoon session I would like to try to focus a little bit and breakdown my talk into three parts. First, the background for brain metastases and then I will talk about different forms of treatments that we have for patients who present with brain metastasis and then I will talk with the management algorithms that we use. How do we decide who to treat, when to treat, and with what modality do we treat. So to start up our talk it turns out we have known about brain metastases for a very long time. It was first described in 1898 by Dr. Bucholz. About 30% of patients with systemic cancers present with brain metastases. These numbers are going up because we're doing better and better at taking care of patients with systemic cancers and patients are living longer. Often times immediate things doctors have been doing to help people live longer is steroids and radiation. We will talk about that later especially in light of exciting therapy such as the immunotherapy, I think we will see more patients with brain metastases. In terms of what types of systemic cancers routinely for brain metastasis this is not a comprehensive list but certainly the most common types of tumors known to go into the brain are lung cancer, breast cancer, colon cancer, melanoma, and kidney cancers. Interestingly enough prostate cancer does not. That is

one of the most common types of tumors that are in the population. If they do go to the brain, it is often because the seed the skull on the head but they don't generally go into the brain itself.

When patients present with brain metastases the goals of what we think about when we encounter a patient with a metastasis is to first improve quality of life. That often means trying to improve neurologic symptoms with some sort of deficit -- for example speech and vision problems or weakness. Often times we think about when we think about taking care of patients with brain metastases we often think about the side effects of the therapies and weigh that against overall benefits for our patients which is quality of life and trying to improve survival. In addition, we have done quite well with the therapy for brain metastasis. We are trying to come up with strategies to minimize the risk of the deterioration for patient neurologically.

In terms of treatment modalities, it really boils down to three options. Observation, doing nothing, surgery, and/or radiation. In terms of surgery interestingly enough until the 1990s there was no uniformity and practice patterns. There were some centers that believed that all patients should get surgery and there were other centers who did not believe in that and recommended either radiation or palliative therapy. It wasn't until a paper came out in 1990 by Dr. Roy Patchell in the New England Journal where we began trying to distill patients who would benefit from surgery.

>>In terms of deciding who would benefit from surgery, we think of multiple factors for our patients. This is the individualized therapy for our patients. Things that we take into consideration are things such as age, the performance status. I will talk about this a little later, is really just a measure of seeing how independent and functional a patient is. For example if someone is able to work and carry out their activities of daily living, they have a very good performance status compared to someone who is wheelchair-bound and very moribund they may be poor in terms of their performance status. And you can see how someone could benefit how surgery may be difficult for someone with a poor performance status. It turns out the number of metastases in the brain play an important role in deciding whether or not surgery is appropriate. In addition, the size of the lesions which often correlate to mass effect on the brain and or symptoms of the patient are very important in deciding for surgery. The location of the lesions: for example if it is in the middle speech it might not be something we can do and surgery may not benefit someone whose lesions are in the middle of speech. Of course the comorbidities, those that have had previous strokes or heart attacks, they are poor surgical candidates that need to be weighed against the benefits of surgery. So in terms of approach we all look at our brains and everybody's brain and even if we have these terms that we see are eloquent and non-eloquent in our brain we all consider every part of the brain critical. Just like when a sushi chef is trying to get into the puffer fish to get to the correct part to get the good sushi, there are many parts that are dangerous that we want to avoid. And because of technology, we are able to do wonderful things in the operating rooms for our patients. We are able to do image guided surgery. GPS devices for skulls and brains where we can know where we are in a person’s brain within a millimeter of accuracy. In addition, we can integrate into that GPS function. We can do things like functional MRIs in patients and figure out where the speech area is and the hand and foot areas of the brain are to try to help develop a roadmap for our surgeries. In addition, we can do intraoperative mapping for our patients and it can be anything from the awake craniotomy to stimulating various parts of the brain.

>>As a result we are able, patients can do very well from surgery. On average when I take a patient to surgery to take out a brain metastasis, when we choose the appropriate patients correctly, patients can often be out of the hospital in under 48 hours. Often times their neurologic deficits can be either stopped or even reversed within days. In terms of contraindications for surgery, these are what I call relative contraindications. Poor surgical candidates are patients who have significant core morbidity, advanced stage is not an absolute indication. I have patients who are 80 or 90 who look physiologically like they were 50 or 60 and

did well from surgery. A phenomenon called Leptomeningeal Spread. If the cancer cells have spread into the cerebral spinal fluid or the fluid that surrounds the brain, often time's surgery is not a good way to go. When we decide who to take to surgery as I alluded to earlier, we work very closely with our oncologist to decide what the overall best therapy is for each patient. We always need to keep in mind the systemic cancer and trying to get at the systemic cancer with systemic therapies. In the most expeditious manner. And this can only be done as a team. As I said earlier, surgery can have very minimal morbidity and patients can do extremely well and have reversals in their neurological deficits very quickly.

>>In terms of radiation, sometimes patients have a stigma that they think they will have terrible damage to the brain and it's a non-specific amount of toxic therapy to their brain like three-mile island. I tried to tell my patients that radiation is very, very elegant. Just like in Star Trek where Bones is able to do focused therapy without even having to touch the patient. This is where we are with radiation. So in terms of radiation, there are multiple types of treatments for patients that present with brain metastasis. There is conventional radiation which is what we call whole brain radiation. There's also IMRT. I will not discuss that today in the interest of time. And there's stereotactic radio surgery. In general patients who present with brain metastases get home brain radiation. In terms of whole brain radiation it is exactly as the term suggests. The entire brain gets radiated and often times it's over a span of two weeks. You are treating not only the visible tumors but you were treating the presumed microscopic metastases in the brain. Many people believe that you not only control the tumor, but you can prevent new tumors from arriving.

>>Whole brain radiation is beneficial. We have known this since the 1950s. There are trials that have shown that you can increase survival in patients who present with brain metastases by giving whole brain radiation. Since the 1950s it has established as a mainstay of therapy for patients. However since we have done this for probably over 60 years, we know a lot about whole brain radiation and its side effects. The more common toxicities are fatigue, hair loss, skin toxicity, loss of hearing or otitis media and sometimes patients need steroids because inflammation is so bad. There has been much debate on the phenomenon of dementia that occurs after whole brain radiation. There was a study in the late 1980s that showed that only about 10% of the patients who received whole brain radiation received developed dementia in 1 year. Many people argue that since the 1980s we have done much better and patients are living years after their whole brain radiation. Many are reconsidering that notion and many believe that the rate of dementia is much higher.

>>This was a clever study published. What he did was instead of asking the patient directly about their side effects, because we often find the patients minimize side effects to the doctors, he asked the loved ones of the patients what side effects the patients had after receiving radiation. Stereotactic radiation. They found that in addition to the expected hair loss, almost all patients experienced an excessive fatigue. The majority of patients have problems with short-term memory. One-third of the patients have problems with long-term memory and the majority of patients had impaired concentration and depression.

>>If you develop this sometimes it's hard to treat. Steroids can sometimes help. Some people think the VP shunt can help. Other people have tried stimulants. Like Methylphenidate, Modafinil (Provigil), Memantine(Namenda) and they are hoping that can increase mental activity but sometimes it is hard to reverse. With whole brain radiation it is considered the standard of care. It's not to treat the microscopic disease and it does improve survival. The side effects like fatigue and depression and dementia are all potential side effects from this therapy.

>>On the other side is a type of radiation treatment called stereotactic radiosurgery. The principle behind stereotactic radiosurgery is that if you can deliver a high dose of radiation in single fraction, one session to five sessions you could perhaps improve quality of life because the patients don't have to come in every day and you might be able to get better kill on tumors.

because melanoma is found to be a radio resistant tumor and the two weeks of radiation may not effectively kill the cancer. In addition, the radiation, this type of focused radiation seems to damage the plumbing to the tumors. Not only directly killing the tumor but also creating a hostile environment for the cancer cells. Lastly, an important concept to understand is that dose gradients are steep. Dose gradients, if you deliver radiation right to the tumor, at about one to two millimeters outside of the tumor in the brain that dose of radiation is very minimal. It essentially concentrates almost all the radiation to the tumor and minimizes radiation to the normal tissue. This is what I mean by dose gradients. On the left here, this is a spinal tumor. Basically this is the spine tumor. Whole brain radiation just like conventional radiation is where you deliver a lot of radiation, about two weeks of radiation over not only the tumor but the normal tissue around it. The stereotactic radiation delivers radiation only to the tumor and maybe with one or two millimeter margins. Nothing to the normal tissue itself. These are the devices that are most commonly used. That would be the gamma knife and the CyberKnife. For example, this is the helmet of a patient who is under the gamma knife. There a little holes punched into this metal helmet that are directed to specific direction. All of these holes are pushed out to converge upon one point and they create a spirit of radiation. What you can do is where these points all converge is what they call an iso-center. You bring the Persis tumor right to that iso-center to treat it. The CyberKnife works by shooting beams of radiation from different directions and where they intersect is the hotspot of radiation. Many little beams of radiation from different areas. Both are very elegant. Tumors are not perfectly circle. On the right you can see that in this a typical shape, the way you do this, the beams of radiation are different diameters so you can create different spheres of radiation and you're trying to pack them to fit the size of the tumor. With the CyberKnife you basically paint the beams of radiation to fall right into the tumor and crisscrossed that tumor area. The nice thing about this surgery is that it is safe. We have done this for a long time. It is very good at treating local disease. It is an outpatient therapy and as I said earlier, can be done in one to five sessions. There is very amenable -- very minimal disruption to chemotherapy patients. The disadvantages are that it can only treat what you see. If you have microscopic disease elsewhere in the brain are not treating that. It requires close monitoring for our practice patients come in every two to three months. Sometimes this radiation can cause even more swelling and the relief of the mass with the radiation is actually slower. What is treated may take weeks before the swelling goes down.

>>Now we've discussed the different modalities that are available for patients who present with brain metastasis, how do we put this all together? I will talk a little bit about the different algorithms that we use and considerations we do for patients with brain metastases.

I'm creating a hypothetical situation: This is a patient, a typical scenario that I would have is a patient who present for seizures and mild weakness. In this situation for example this patient has a melanoma on the right side of his brain here. And we get called to see him in the emergency room. What do we think about when we are recommending which treatment to give? And so we think about the pathology. For example, small cell lung cancer is known to have microscopic disease so even if you see one big spot, most of the times patients with small cell lung cancer get whole brain radiation. The number of legions also plays a role in the therapy to give. This patient only had one spot. The performance status of the patient is also important. This patient was very functional. He was working until he presented with the seizure and then noticed weakness right after the seizure. The core morbidities, this patient was very low because this patient was very healthy otherwise. The size of the lesion is pretty large. It’s close to 2.5 centimeters. The symptoms were seizures for this patient.

>>The performance status is measured in different ways. There’s something called a Karnofsky Performance Status Scare. Basically the higher the score the better you are. Generally patients from 80 to 100 are excellent. Anything on the ECOG is exactly the opposite.

For this particular patient as we discussed earlier they either had the option for surgery or radiation. In reality this patient had both options. Because he was young and symptomatic and there was only one spot, we elected to do aggressive therapy and did surgery for him. He did great from surgery and left within 48 hours. We got a gross total resection on this patient.

>>It turns out that in patients that present with a solitary metastasis there is very good data that suggested being aggressive for these patients can help. So Dr. Patchell did a randomized study where we basically took one set of patients and gave them surgery plus whole brain radiation and another group they did a biopsy and whole brain radiation. They basically measured recurrence rates, survival and functional independence.

>>This is a summary of their results. The survival was dramatically improved if we were aggressive with these patients by giving surgery. The local recurrence rate was better. Less than half compared to just giving radiation alone. Functional independence: Patients had a better quality of life if we were aggressive. The risk of new spots in the brain was not any worse by giving surgery. We concluded from the study that relieving the mass can be of benefit and it extrapolates to better survival and improve quality of life. Interestingly enough it's important to making the diagnoses. About 10% of the patients who underwent surgery had had pathologies that were not metastases. If we are aggressive with patients with a single spot we can improve their chances for survival. Aggressive therapy in this particular study was also defined as giving surgery with radiation.

>>Here is another case of another patient who presented with leg weakness. Another healthy individual who presented with no known history of cancer. And this patient presented with weakness. Again factors for deciding treatment are the same factors. In this situation we did not know the pathology. This patient only had one lesion and was symptomatic. The patient could have benefited from surgery however, when we came down to deciding surgery versus radiation, it became clear -- this is a classic case of us needing to work with our radiation oncologists. When we did a scan of the entire body this patient had a very large lung lesion. It was near a major vessel called Edina cava and our oncologist felt this person needed to be started on chemotherapy right away. The patient was admitted and had a biopsy. If we had done surgery, the patient would have required a couple of weeks of recovery before they could even start to chemotherapy. In the situation we recommended stereotactic radiation. The patient got stereotactic radiation and did very well from his treatment. The swelling went right down in this situation. The patient was able to come into the clinic a few months later with the ability to walk. In this situation, while we might have traditionally done in surgery if we were all in our isolated silos, this is a great case of when we need to work with the medical oncologist or radiology oncologist. The tumor in the long run responded nicely to the radiation.

>>Because of this example one might think that's an impressive response to stereotactic radiation and why would anyone not want to do radiation over surgery. There was a study that compared the two surgeries and most of these studies have found that it's equivalent. You can get pretty effective control rates in patients who gets stereotactic radiation compared to patients who get surgery. Interestingly enough because you don't need to do whole brain surgery after stereotactic radiation, the recurrence rates were lower. However, there are some caveats. As I alluded to earlier, and that other situation the patient did it get immediately better after the gamma knife. It took weeks and the patient had to be on steroids. Many of us believe the steroids can also potentially be counterproductive to immunotherapy given the fact that immunotherapy are quite prevalent with patients with multiple types of systemic cancers and that might be a negative. On the other hand the pluses of stereotactic radiation can be that the patient can get on to chemotherapy quicker. So it's important that we individualize the therapy and with these two patients it was important to know that both are aggressive but both have an important role.

>>There was a supplement published in the Journal of Neurosurgery and they basically made some recommendations for managing patients who present with brain metastasis. One of the algorithms they developed is based on the number of lesions. This is a complex table but basically anybody who presents with this solitary lesion they generally recommend aggressive therapy. What's interesting if you look they did not take into consideration how much or how the disease burden of the patients, how many spots, were active in the brain. Because based on Patchell's study and other studies that have been since then you can improve survival.

>>This patient has multiple brain metastases. Again you go through the same algorithms. The pathology, the number of lesions, the performance status, the size and symptoms. In general when you see a fair number of metastases the odds are they probably have more than what you see on the MRI. And so if you go in there and try to treat it was stereotactic radiosurgery you will find additional spots and you will have to interrupt the systemic chemotherapy. And so if you are trying to decide between surgery and radiation, in general we recommend conventional radiation or whole brain radiation in our patients. The chances are high there are other spots that may block them and we may be chasing her tales and delaying ultimate chemotherapy. But that's not an absolute algorithm. As I said, I have patients who present with multiple brain metastasis and they take into consideration the same factors as I do for all other patients. And sometimes patients can have multiple metastases but they have a very large one causing mass effect and you're trying to improve survival and improve the quality of life and sometimes taking out the larger lesion can help improve the quality of life for the patient.

>>This is a different case. This is a patient who presents with more than one spots but not a ton of spots. In this situation there's question about show we put everybody who presents with two, three, four spots, so we give them hope rain radiation or can we do focal therapy for these patients. We go through the same algorithm. This patient had weakness, actually some difficulty with handwriting. After we discussed the different options with the oncologist who felt we had time to do surgery, we recommended surgery for this patient and we took out both spots. And then we did focal therapy on this patient. This patient did well and her handwriting improved. This subgroup of patients with several spots on their brain fit in a category we created called oligo metastatic disease. People traditionally are treated with whole brain radiation. People have tried surgery or stereotactic surgery or surgery with stereotactic radiation or whole brain radiation; basically every combination that you can think of. This is summary provided by one of my partners. This is a summary of some of the trials that were done. Some looked at some combinations and others have looked at whole brain radiation combined with stereotactic radiosurgery and at the end of the day, it turns out that the survival of patients or your chances for survival aren't necessarily lower depending on which combo you choose. If that is indeed the case and quality of life is important and so many people have got to recommending focal therapy and using the whole brain radiation as an ace in your pocket for later if you have problems because you're not necessarily compromising your survival.

>>One other concept that wanted to talk about was stereotactic radiosurgery after having surgery. Traditionally patients who got surgery all went to whole brain radiation. However this concept of doing what's called a boost or a coating in the hospital bed rather than radiating the entire brain has gained great popularity. It's based on a couple of studies and there have been many studies that have verified this. If you do focused radiation just at the surgical bed you can improve tumor control and depending on studies that you read it's anywhere from 70 to 90% controlled in those areas. So many people have gone on to get stereotactic boost, and that's what I did for that patient. She did not develop any further spots and she had a great quality of life.

>>Just like doing stereotactic radiosurgery, you still risk having metastases so patients still need to be monitored with routine scans. Overall, the management algorithm for patients who develop a metastasis is complex and it is tailored. One of the algorithms the people user based on the

number of patients. If you have one lesion doctors have an aggressive approach. Patients with lots of lesions will receive whole brain radiation. If you have two to five metastases, in general, people of tried all different gambits. Many doctors are trying make a recovery plan based on quality of life. The quality of life issue has been discussed in detail and there was a nice study by Dr. Chang who basically compared patients who received stereotactic radiation compared to stereotactic radiation plus whole brain radiation and it turns out your ability for memory, total recall delayed recall and recognition, were all better and patients who receive stereotactic radiation alone. There've executive functions were also better.

>>It turns out that you have very good local control of your tumor if you get stereotactic radiation plus whole brain radiation. So in conclusion patients who have solitary Mets usually want aggressive therapies. Multiple Metastases can warrant aggressive therapies based on quality of life. Patients who present with lots of lesions in their brain and I usually defined that is 10 or more, usually want some palliative approach such as whole brain radiation. The oligo metastases can be a combination. The take-home point from today is that if patients present with metastases there are a lot of different approaches that can be taken. There are good tools that can be given. It should be individual and tailored to each based on some of the things I've mentioned today.

>>I want to talk about immunotherapy for the next five minutes. As you know immunotherapy has gained a great deal of popularity and probably the most well-known immunotherapy is something called checkpoint inhibitors. It turns out that checkpoint inhibitors are based on a phenomenon where when you're immune cell, called T cells, bind to an antigen presenting cell or tumor cell, these T cells have a receptor that is specifically recognized as a target. Once a latch on they require second signal which can turn the T cell on or off. You would ask yourself why would you want to have something that turns the T cells off. In a situation such as soft antigens you don't want the T cells to start attacking your soft antigens. That is how autoimmune diseases arise. They have created a natural break to prevent your immune system from going uncontrolled or unchecked. Tumors have taken advantage of this. If you happen immune cell that can recognize cancer cells they offset molecules in turn off the T cells. We have found there have been major developments where there are antibodies that block this interaction. There are drugs are called anti-PD one it is been revolutionary and this is a list of the FDA approvals for these checkpoint inhibitors. Since 2014 melanoma, lung cancer, bladder cancer, Hodgkins' lymphoma, head and neck cancer are all getting approved. These are all patients that are responding to immunotherapy. As many as 20-30% of these patients are showing durable responses to immunotherapy. So some of the things are done in our laboratory that were excited about is trying to combine radiation with these checkpoint inhibitors. In our clinics we've noticed that patients develop swelling after radiation. That is a sign of inflammation. We thought that perhaps giving radiation could augment some of these immunotherapy strategies. As I alluded to earlier, perhaps this radiation given with these checkpoint inhibitors could act synergistically to kill cancer cells. I used GBM but we have done this wiht other types of cancers also. Essentially the checkpoint inhibitors prevent these T cells from being turned off and they go on gobble up to tumor. We have been doing this with mice and publish this picture showing that we can deliver focused radiation to these mice just like stereotactic radiation and humans. It is interesting. It turns out that if you give the animals anti-PD1 alone you've got to approve survival. If you give radiation you approve survival but if you'd combine them you get cures and that happened with these animals 40% of the time. These checkpoint inhibitors we think have application to the brain. They have shown responses to the brain and has a picture of a tumor that one away after treatment. Many people have been excited about this concept of combining radiation with these checkpoint inhibitors. There was a nice paper that shows that improve survival in patients and I'm sure if you've been watching the news, Jimmy Carter actually got this algorithm of combined radiation with checkpoint inhibitors.

>>We think that there is a lot of potential and exciting advancements coming down the pipe for patients with brain metastases. With that, I would like to thank you for your time. As Antoinette said earlier, this has been recorded and it's available on the ABTA website. I would like to recognize our team here at John Hopkins. The research has been done with many different collaborators and I apologize but by oncologists are integral and again I apologize their acknowledgments fell off the slide. I work with wonderful and talented oncologists here to help our patients improve survival and improve their quality of life. Thanks Dr. Lim! I would like to thank you for your time and we will take questions. If you have a question you would like to ask, please type and submit it using the question box in the webinar control panel on the right hand side of your screen.

>>>>We do have a question here I think you had briefly touched on it. What role does chemotherapy play in treating brain metastases?

That's a great question. In general chemotherapy is known to not reach the brain. Is something called the blood-brain barrier and the chemotherapy does that get into the brain very well. There are a few different chemotherapy drugs that seem to be doing that and there are some clinical trials. Immunotherapy can but not chemotherapy drugs.

Thank you.

>>We have another question here. Can radiation be given more than once to someone with a brain metastasis?

In general, yes. There are multiple factors that are taken into account when deciding to reradiate a patient. For example someone had whole brain radiation and the spot is growing they can get stereotactic radiation safely. If a patient has stereotactic radiation and spots have grown they can get whole brain radiation later but if you want to repeat the stereotactic radiation, again, you want to take into consideration the amount of radiation they received and how far out they were from their previous radiation

Thank you. That's a great answer.

>>I have another question. If I have a brain metastases, what type of doctor should I see and should I continue to see my current oncologist?

Your oncologist in my opinion should be the quarterback for your care. At the end of the day the original tumor is the one that's throwing the seeds in your body you want to make sure you're on top of keeping the systemic control. In terms of what type of doctor to see when you develop a brain metastasis, it's a radiation oncologist or a neurosurgeon or both. In general, I would recommend trying to see both if you see one of the other just so you can get both opinions. It is nice to be in a multidisciplinary setting. Many centers do that now with a neurosurgeon's oncologist and the radiation oncologist talk together.

Thank you.

>>What happens at the metastatic tumor is found before the primary cancer site?

The patients present with a spot in the brain the suspicious for metastases they often go for an extensive workup which includes pet scans and CT scans. You can often find the primary lesion. If not, the brain surgery can actually be very helpful because you can help get the diagnosis and potentially alleviate any neurologic deficits for the patient.

Okay. Thank you.

>>I think that's all the time we have for questions today. Thank you all for joining us and thanks once again to Dr. Lim for his wonderful webinar presentation. Besides our free educational webinars, ABTA has a variety programs available to help connect patients and caregivers with information and resources to help support them in their brain tumor journey as well as publications and resources for health care professionals. For more information visit ABTA

website at www.abta.org or call the ABTA CareLine, which is staffed by caring professionals, at 800-886-2282.

>>We invite you all to continue to check back at our website, www.abta.org for ABTA's Anytime Learning page, a library of free on-demand webinars that feature renowned experts addressing a wide range of brain tumor topics from treatment options and tumor types, to quality of life and symptom management. Our next webinar will be on Beyond the Standard of Care: The Role of Clinical Trials on Tuesday, November 9, from 12:00 pm - 1:00 pm CST. Research studies, or clinical trials, are used to develop new treatments for brain tumors. They are particularly important to brain tumor patients because they may offer treatment options that would otherwise not be available. Join Julian Bailes, MD, Chairman of Neurosurgery and Ryan Merrell, MD, Director, Neuro-Oncology Program, NorthShore Neurological Institute, who will present an overview of what patients need to know about clinical trials. They will focus on who should consider trials, the various trial phases and what patients can expect including those required to have surgery in advance of participation. They will discuss clinical trials focused on immunotherapy treatments as well as others being offered for brain tumor patients. Webinar participants will have the opportunity to ask Dr. Bailes and Dr. Merrell questions in an interactive question and answer session. To register please visit our website www.abta.org, click on Brain Tumor Information and then Upcoming Webinars. This concludes our webinar. Thank you for joining us and please be sure to complete the evaluation survey you will receive by email tomorrow. You may now disconnect.