



**Maddie's Fund**

## *An Analysis of Critical Spay-Neuter Literature*

Webcast Transcript

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*[Beginning of Audio]*

*Jessie Giglielmo:* Good evening, everyone. I am Jessie Giglielmo, Education Specialist at Maddie's Fund. Tonight we have a renowned speaker, Dr. Philip Bushby, who will address the confusing information about spay and neuter in the optimal time for spay and neuter and analysis of critical spay and neuter literature.

Dr. Bushby is a board certified veterinarian surgeon who served on the faculty at Mississippi State University College of Veterinary Medicine for 36 years.

His interest in shelter medicine and spay/neuter dates back to his internship and surgical residency at the Henry Bergh Memorial Hospital of the ASPCA in New York City.

He serves on the board of Mississippi Spay/Neuter and previously served on the board of PetSmart Charities, Inc., and the board of the Association of Shelter Veterinarians.

He received the ASPCA's Henry Bergh award in 2008, the AVMA's National Animal Welfare award in 2012 and the Association of Shelter Veterinarians Meritorious Service award in 2015.

Dr. Bushby is a strong advocate off spay/neuter including pediatric spay/neuter and speaks extensively nationally and internationally on the importance of spay/neuter, efficient spay/neuter techniques and pediatric spay/neuter.

Before we get started let's go over a few housekeeping items. Please take a look at the left side of your screen where you'll see a Q&A window. That's where you'll ask questions during the presentation. Please get your questions in early. Questions submitted late in the presentation may not be processed in time for a response.

Also, make sure to check out all the wonderful resources provided by Dr. Bushby in your resource tab at the bottom of your screen.

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Now, Dr. Bushby, thank you for being here tonight.

*Dr. Philip Bushby:* Well thank you, Jessie. I'm excited to be here. This is a really important topic and it's one that seems to get more confusing over time rather than less confusing.

We've seen in the past few years that the practice of spay/neuter, sterilizing pets, has been challenged to some extent. The research studies document beneficial effects of spay/neuter, but also document harmful effects.

Some in the profession argue for delay in performing these surgeries or abandonment all together, at least in dogs, while others argue for early age or pediatric spay/neuter.

On one end of the spectrum it seems the concerns are over the incidents of certain orthopedic conditions and certain cancers and on the other end of the spectrum concerns over pet overpopulation and the euthanasia of homeless pets in animal shelters.

So the question we're really going to try to analyze tonight is who's correct. Should dogs and cats be sterilized and if so, is there an optimal age to do the surgeries.

We're going to look at several different articles from the literature to try to help sort out the benefits and risks of ovarian hysterectomy and castration. Our goal really is that by the end of the session that each of you will have a better understanding of some of the important research and will be able to make more informed decisions when the clients ask you these questions. Should I spay my dog. Should I castrate my dog and if so, when should I do it.

But I want to start out with what I call the ugly truth. The current estimates are that between six and eight million dogs and cats enter the shelters in the United States every year and that close to 50 percent of them, or 3 to 4 million dogs and cats are euthanized in these shelters.

When I think of a number like that, we see a large number and it's really hard to put it in perspective. I watch the things on TV where the clock shows the national debt and it's a number that's so large that it's almost incomprehensible.

If the estimates are right, what does 4 million animals really need. If we consider an eight-hour work day in animal shelters five days a week, to euthanize four million animals one will have to be euthanized every two seconds. In the hour and a half that

we have scheduled for this presentation tonight, 3,000 dogs and cats would be purposely killed in shelters across the United States.

The sad reality is that many of them, if not most of them, are perfectly healthy, friendly, would make very good pets if there were enough homes, but there aren't enough homes.

It doesn't end there. What I'm about to say varies tremendously in regions of the country. I live in the Southeast. Overpopulation of dogs and cats in the Southeast is probably worse than in any area of the country. There are no estimates for how many of these animals are killed on the highways before they're ever picked up by animal control, how many of them die of disease, how many of them starve to death.

When we think about it, every one of these animals, every animal euthanized in a shelter or every homeless animal that dies out there somewhere is the off spring of a pet that was not spayed or neutered somewhere in its lineage.

Now a lot of people just consider this an emotional issue and it is an emotional issue. I'm one of these crazy people that will be driving down the highway and I'll slam on the brakes to try to avoid a butterfly. So I do get emotional about pet overpopulation and the numbers of animals euthanized, but it's much more than an emotional issue. It's a public health issue. It's a risk of the health to our own pets and it's also a financial issue.

The facts. The basic facts related to pet overpopulation are these. Number 1, there is an overpopulation issue in the United States and, of course, in lots of countries. There are animals euthanized in animal shelters in the United States each day. Homelessness is the number one cause of death in dogs and cats in the United States.

Then the estimates are that \$3 billion to \$4 billion are spent each year catching, caring for and killing unwanted dogs and cats. Think about it. If a new disease were discovered causing 3 to 4 million pet deaths in people's homes each year, the veterinary profession would absolutely mobilize to discover the cause and discover how to prevent and how to cure.

But we know the cause of pet overpopulation and we know the cure. The difference is these are not animals in people's homes. For the most part they're hidden away. The deaths occur in the back rooms of animal shelters or along the highways of rural Mississippi out of the public view, out of sight, out of mind.

So here's the debate. Should we spay/neuter animals, dogs and cats, and if we do, what age should we perform the surgeries. We've seen the recommendations for the age of spay/neuter change over the years.

I graduated from veterinary school in 1972. Now it's like almost a million years ago it seems, but at the time that I graduated, the most common recommendation was let them have one litter first.

Then it changed and it seems like most people were saying let them have one heat cycle first and then the profession seemed to settle on spay/neuter at six months of age or older.

Now there's many people promoting pediatric spay/neuter as young as six to eight weeks of age. As I said at the beginning, others are saying, "You better not or you better wait."

The reality is none of these recommendations have ever been based on a comprehensive analysis of sound research. In fact, until recently there hasn't been that much research. The effects of spay/neuter, the benefits and the risks of spay/neuter.

Up until now the recommendations have been based pretty much on people's opinions or on personal biases, but now there's enough research that perhaps we can start to answer the questions.

I'm going to start with several research studies that seem to support delaying spay/neuter or some people use as an argument against spay/neuter. Probably most of you are familiar with this series of publications that's come out of University of California Davis College of Veterinary Medicine.

These publications have caused a lot of people to question our current spay/neuter practices. The fact that they were published in open access journals, putting their findings directly into the public hands means it's not just veterinarians that are asking questions. Pet owners are as well. So veterinarians find themselves I think more today confronted with questions related to spay/neuter where the pet owner is actually citing a veterinary study that they read.

The first one I want to mention is the Golden Retriever study, Neutering Dogs Effects on Joint Disorders and Cancers in Golden Retrievers. This article was published in 2013. Some of the results from that article, from that study, hip dysplasia in male Golden Retrievers neutered under a year of age were double that of the incidence of hip dysplasia in intact dogs.

Cranial cruciate rupture was increased in dogs neutered under a year of age when compared to dogs neutered over a year of age. Incidents of lymphoma in early neutered males was three times that of intact males. Incidence of hemangiosarcoma in females spayed over a year of age was four times that of intact females.

Quite honestly, if people are reading this article, it would cause them to start questioning. Should we spay or neuter our dog.

In 2014 a second article in the series came out comparing Labradors with Golden Retrievers. Long-Term Effects of Neutering Dogs, Comparison of Labrador Retrievers with Golden Retrievers.

While the authors found increases in certain orthopedic conditions and certain cancers in Labradors, there were significant differences between the findings in Labs and Golden Retrievers so it starts to get a little bit confusing.

In 2015 neutering of German Shepherd dogs, associated joint disorders, cancers and urinary continence. In the conclusions of this article they stated, “The incidence of one joint disorder in dogs neutered less than six months of age was two to three times that of intact dogs.”

Now, I have to explain that a little bit. They weren't picking on one joint disorder. They weren't saying it was hip dysplasia or elbow dysplasia or cruciate rupture. They were saying when you consider all the possible joint disorders the incidence of a dog having one of those was increased if the dog was neutered at less than six months of age.

They found almost an identical finding though in dogs neutered between 6 and 11 months of age. Two to three times that of intact dogs, but in this article neutering was not associated with any increase in cancer as compared with intact dogs.

One of the pictures I want to start to paint or get you to start thinking about is there's enough differences between the results in Golden Retrievers and the results in Labradors and the results in German Shepherds to say, “Wait a minute. We really can't extrapolate from one breed to the next to the next and we certainly can't extrapolate from one species dogs to the next cats.”

So while these articles create some questions, we have to be careful about the conclusions we draw simply based upon these articles. We're going to get into that a little bit more as we go along.

Then in 2016 the 4<sup>th</sup> in this series, Gonadectomy Effects on the Risk of Immune Disorders in the Dog: A Retrospective Study, and this article reported on an increased incidence of certain immune disorders in neutered dogs versus intact dogs.

So we have four articles hitting the profession bam, bam, bam, bam of one a year from 2013 to 2016. All of those articles were retrospective studies at a referral level veterinary institution. In that type of study, Retrospective Studies at Referral Institutions, is by far the most common type of disease research currently done in veterinary medicine, but is that the best type of research.

If we start to look really closely and think about, gee, if I could design a perfect research study, in the best research all variables are controlled except the one that you're measuring. Retrospective studies can't do that. We have no idea from these

articles what the impact of diet, lifestyle, environment, frequency and quality of medical care, genetics.

We have no idea what the impact of any of those things were on the incidence of the orthopedic conditions or the incidence of the cancers that are mentioned in these articles. There is no way to know because those things aren't measured and none of it is controlled.

A second concern and believe me, my goal here is no to pick on the authors or the UC Davis Veterinary School. I'm picking on veterinary research in general when it's dominated by those studies that are retrospective studies at referral level institutions.

The second concern is cases at referral institutions are not necessarily representative of the general population. Now what do I mean by that. Cases managed by primary care clinics are not represented in studies done at referral level institutions.

A private practitioner might very well manage the dog with mammary neoplasia or the dog with pyometra or testicular cancer, but refer to cases with osteosarcoma, hemangiosarcoma or lymphoma. So the population of animals studied at a referral institution is skewed. It doesn't represent the entire population, but it gets even more confusing with orthopedic conditions.

What if an animal is neutered because they have an orthopedic condition or they have a confirmation that predisposes to an orthopedic condition as opposed to having an orthopedic condition because they were spayed or neutered. There's no way in a retrospective study to make that determination.

Now, if you really think about it on that one, maybe it's just a small number. We don't know. Maybe it's just a small number that the surgery was performed because of an orthopedic condition or because of putting an animal at risk of an orthopedic condition, but we don't know. We just don't know.

So let me complicate things a little bit more. The goal of this presentation is to try to eliminate some of the confusion and come to relatively logical decisions based upon the information that's available. So far it sounds like I'm making it more confusing. That's not my intent. We're going to work our way through this as we go through the hour and a half.

But at this point it is confusing. Studies conducted at referral institutions have an inherent bias that limit our ability to apply their conclusions to an entire population. Now it's not a purposeful bias. It's not an intended bias, but think about it. What is the most common reason that people do not have their pet spayed or neutered.

Statistics show the most common reason that people don't have their pets spayed and neutered is because they don't believe they can afford it. So someone who can't afford

the price of a spay/neuter is probably not going to show up at a referral institution because their dog is limping or their dog is coughing. So there's an inherent bias.

Let's keep going. Association does not prove cause and effect. One of the difficulties in veterinary research is we have very few studies that really can pinpoint here is the cause of this specific condition.

The absurd example I'll use that association doesn't prove cause and effect is that in the last ten years in people the incidence of diabetes has significantly increased and so has the number of people practicing yoga. It does not mean that yoga causes diabetes or that diabetes causes people to want to do yoga. There may be an association, but there's no cause and effect.

We have to be careful when we review the veterinary literature and see that X seems to be associated with Y when we don't know if X causes Y. We just have to be cautious.

Then the last point related to these articles is if all of their findings in the Golden Retriever, in the German Shepherd, in the Labrador article are eventually proven to be valid, you still cannot extrapolate from one breed to all breeds or from one species to other species.

It's one of the things that makes research in veterinary medicine really, really difficult because you got to do all the studies in dogs and then you got to do all the studies in cats, but wait a minute. How many breeds of dogs are there.

It's easy to see why the quality of our research may not give us the quality of answers we wish we had.

So with all of that, what really is the value of that series of articles from Davis. It's a huge value. It points to the absolute need for more research, preferably prospective studies in which case criteria and data collection standards are defined in advance and other variables are controlled. That's the value of those studies, but these studies do not at this point warrant a wholesale changes in spay/neuter decisions or timings.

So let's look and see more studies. Now we're going into a category of studies which tend to support spay/neuter. One out of the University of Georgia looking at longevity of dogs published the same month as the Davis Golden Retriever study. Then the Benfield's health report. A couple studies out of Texas A&M looking at early age spay/neuter and one out of Cornell looking at early age spay/neuter. So let's talk about those a little bit.

This article, Reproductive Capability is Associated with Life Span and Cause of Death in Companion Animals was published out of the University of Georgia, referral institution, retrospective study back in April 2013.

They were looking at records of 80,958 dogs. When they eliminated juvenile dogs or dogs that they didn't know the sterilization status, they were down to 70,574 dogs representing 185 breeds. Of those, just over 30,000 dogs were intact and just over 39,000 dogs had been sterilized.

What they looked at was the cause and age of death and compared it with gender and sterilization status. What they found is that sterilization was associated. They're not saying it caused. I can't say it causes, but it's associated with an increased longevity in both males and female dogs. Sterilized dogs lived on average one and a half years longer than intact dogs.

Now, again, none of the variables are controlled. We can't say that sterilization absolutely caused that. We just know there's an association.

The life expectancy was greater in sterilized males, by 13.8 percent and in sterilized females by 26.3 percent.

Now some other results from that study. Intact dogs were dramatically more likely to die from infectious disease, trauma, vascular disease, degenerative disease. Sterilized dogs were more likely to die from neoplasia or immune mediated disease.

I have to wonder and this is some of my bias coming through so just recognize that and forgive me for that, but should the fact that sterilized dogs were more likely to die from neoplasia, should that really surprise us.

If sterilized dogs live longer and neoplasia seems to be more commonly associated with old age, it makes quite a bit of sense that perhaps – well gee, they're not dying from infectious diseases. They're not dying from trauma. They're not dying from vascular diseases. Something's going to get them. Neoplasia finally does. I know that's an oversimplification so let's continue.

This Georgia study says that transitional cell carcinomas, osteosarcomas, lymphomas and mass cell tumors were increased in sterilized dogs and mammary cancer significantly decreased.

When we look at statistics like that or results like that from the literature, we have to go one step further than just saying, osteosarcoma is increased in sterilized dogs.

We have to be willing to say what is the overall incidence of osteosarcoma and what is the increase. Doubling or tripling the incidence of a tumor that is relatively rare may still leave that tumor relatively rare.

It sounds so dramatic that one statistic that sterilized dogs had four times the incidence of hemangiosarcoma. I think it actually said cardiac hemangiosarcoma. What's the incidence of cardiac hemangiosarcoma. It is so small that four times increase is still real small.

Now, hey, for that animal that has it, it certainly is serious, but if we're looking at it from the standpoint of potential impact on the population, we have to be careful about simply making judgments on the fact that something is increased without knowing where did it start and what did it increase to. What is the ultimate incidence if the incidence is doubled or tripled.

Now I think I've already said this, but that Georgia study was a retrospective study at a referral institution. So some of the same concerns can be expressed about their results as we expressed about the Davis results.

The Georgia study did not have data on the age of sterilization. They didn't have data on whether animals that had been sterilized had ever reproduced or the number of times they had reproduced. They had no information on the intact dogs. How many litters of puppies did those dogs have.

So while this study certainly seems to support the practice of spay/neuter, it doesn't answer all the questions and it certainly doesn't answer the question of at what age should you spay or neuter.

So let's move on. Banfield operates over 1,000 veterinary hospitals across the United States. One of the interesting things about the Banfield hospitals is they use a common computerized record system allowing them to access and analyze cumulative data across their entire system.

Each year they put together a report on some aspect of pet health based upon an analysis of their records across their system. So in 2013 the same year as the Davis Golden Retriever study, the same year as the Georgia longevity study, Banfield produced a report on the state of pet health that looked at longevity.

They analyzed the data from 2.2 million dogs and 460,000 cats. Certainly numbers of animals in their study is not an issue. It is a retrospective study and analysis. It's not perfect, but what did that report say.

When they compared the life expectancy, if you will, of sterilized dogs with intact dogs and sterilized cats with intact cats in all categories, dog and cat, male and female, life expectancy of the sterilized animal was increased over the life expectancy of the intact animal. The life expectancy of spayed dogs was 23 percent greater than that of intact. I think the Georgia study, the number was even a little bit higher.

The life expectancy of castrated dogs was 18 percent greater than that of intact dogs. The life expectancy of spayed cats was 39 percent greater than intact cats, females obviously. The life expectancy of castrated male cats was 62 percent greater than intact male cats.

So let's pause to reflect. What conclusions can we draw from the articles we've looked at so far. There's a lot of conclusions we can't draw, but what can we draw.

Well, the first is for whatever reason sterilized dogs and cats appear to live longer than intact dogs and cats. For whatever reason, sterilized dog appear to have a higher incidence of certain cancers than intact and a lower incidence of other cancers. So far, the issue with cancers only relates so far to dogs.

Sterilized dogs may have a higher incidence of some immune diseases. Intact dogs are more likely to die from infectious diseases or trauma. In some breeds sterilized dogs appear to have a greater incidence of certain orthopedic conditions.

It would be so nice if it was simple. It would be so nice if we could sit down and read a stack of articles and at the end of that say, "The appropriate time to spay and neuter dogs and cats is this." But it's not quite that simple.

So let's continue. If we look at age of spay/neuter there's not been a whole lot of studies that have tried to look long-term, if you will, at the impact of early – and by early I mean earlier than six months. If the profession is, for a few decades at least, settled on that six-month old or older, there's just a small handful of studies that have said let's look at what happens when we do early age or pediatric spay/neuter.

A couple of those studies come out of Texas A&M by Lisa Howe where she did two prospective studies. One was a four-year follow-up on dogs spayed or neutered less than six months of age. Another one was a three-year follow-up on cats spayed or neutered less than six months of age.

A group out of Cornell in 2004 published a study. It was a retrospective study looking at 1,500 cats and 1,800 dogs that had been spayed or neutered at an age less than six months of age. All these of those articles essentially came to the same conclusion. That there were no serious long-term medical or behavioral effects associated with early age sterilization in cats and dogs.

Now the Howe studies, Lisa Howe's studies, three years and four years, I don't know. Can we really call that long-term. So you spay or neuter a dog or cat when it's four months of age and you follow it until it's three and a half or four and a half years of age and it still has ten more years to live or more. It would be nice if those were 14 year follow-ups and 13-year follow-ups, but we're not there yet. We don't have that.

The spaying articles, even though it's a retrospective study, did have follow-up for as long as 10 or 11 years in some of the animals. So some strength there, but that's three articles in the literature that have basically said no serious long-term medical or behavioral effects associated with early age sterilization and they include both cats and dogs.

Now let's switch gears for a little bit. I want to talk about an article written by Margaret Root Kustritz in 2007. Now the first thing you have to recognize was this wasn't a research project. It was an exhaustive review of the spay/neuter literature to-date, 2007; to that date. It was written before the Davis studies we talked about. It was written before the Georgia study we talked about. It was written before the Banfield report on longevity.

She looked at many, if not all, the known relationships at that time between the presence and absence of prenatal hormones and the incidence of diseases in dogs and cats.

I'm going to put up a chart which I have to explain to you. The first column lists various medical or orthopedic conditions. The second column is an effort based upon incidence figures that were available in 2007.

Every one of these conditions was categorized as either one that had a high frequency, a low frequency or a moderate frequency and then either a very serious or moderately serious or not very serious, high, moderate or low. Then what was the change. Was the condition more likely to occur in a spayed animal or castrated animal or more likely to occur in an intact animal.

Here's the key, I wish. If we could see in the future, for each animal we could determine which animals were going to develop osteosarcoma if they were sterilized and which were going to develop mammary neoplasia or pyometra they were not. Then we could make the best decision for each animal. All we need is that crystal ball, right?

Lacking that ability we've got to make our recommendations based upon population dynamics. In the US it's estimated that nearly 80 percent of adult female dogs are spayed, but the incidence of mammary neoplasia reported in Dr. Kustritz study is 4 percent, but that is almost exclusively in intact dogs. It's nearly zero in spayed dogs making the incidence of mammary neoplasia in intact dogs nearly 20 percent.

The incidence of osteosarcoma documented in that article is 0.2 percent. Some of the articles that we talked about say that sterilization doubles the risk of osteosarcoma, but again, if 80 percent of the animals in the United States are sterilized that doubling effect has already represented in the 0.2 percent statistic.

Sweden, a country that does not promote spay/neuter, in fact, I think it's illegal in Sweden unless there's a medical reason, seven percent of the female dogs in Sweden are spayed, but the incidence of pyometra in female dogs is 24 to 25 percent by the time the animals are 10 years of age.

I've reorganized the chart. I've simply taken all of those conditions where spay/neuter seems to be associated with an increase in the condition. They're in red. Then the

conditions that spay/neuter seems to be associated with a decrease in the condition, but look at the incidence of these.

Mammary neoplasia, high incidence, but decreased if spay/neuter. Pyrometra, high incidence, but decreased with spay/neuter. Benign prostatic hyperplasia, high incidence, decreased with spay/neuter. Testicular tumor, low incidence, decreased with spay/neuter. Transitional cell, rare. Prostatic tumors, low. Osteosarcoma, low. Hemangiosarcoma, low. With one exception, urinary incontinence, all of the conditions where spay/neuter seems to be associated with an increase are rare or very low incidence.

If you simply total the incidence of all of these conditions that are shown in red that either have high or moderate seriousness, the total of all of these combined together is three percent versus the chances of an intact female dog getting mammary neoplasia at 20 percent or pyrometra at 24 percent.

Let me make a key point here. It's dangerous to make spay/neuter decisions based on the perceived impact of spay/neuter on just one or two or a small handful of diseases. We have to look at the entirety. We have to look at the overall health and the overall longevity of the animal.

So when you're reading the literature look for those things. Are we're only talking about a few things or are we talking about overall health and longevity.

Now Dr. Kustritz wrote a follow-up article in 2017, *Determining Optimum Age for Gonadectomy in Dogs: A Critical Review of the Literature to Guide Decision Making*. She makes a very key point right at the start of that article. She said, "The question about impact of gonadectomy on health is one of causation. Does gonadectomy at certain ages cause or prevent specific health issues. Defining an association is not enough. What is cause and effect?"

Then she goes on and says, "There are the things that are necessary to determine cause and effect. Randomized clinical trials, unbiased subject selection, adequate sample size, adequate and precise measurement of the factors of interest, adequate control of confounding factors and cautious and critical assessment of the results."

When you read the scientific literature, watch for these things. When any of them are compromised, so too are the results. Unfortunately in veterinary medicine very little of the spay/neuter literature meets all of these requirements. The bottom line, I think I've said this before already, is not only do we need more research, but we need higher quality research.

Most of the articles so far we've talked about have dealt with dogs. Let's talk about cats for a little while. A few years ago a veterinary task force was put together on feline sterilization looking at the literature and talking to experts trying to make

recommendations related to this whole issue of what's the appropriate time, age to spay or neuter a cat.

What they found was that cats spayed before their first heat cycle had a significantly decreased risk for mammary neoplasia obviously eliminated the risk of reproductive emergency such as pyometra or dystocia. Obviously prevented unintended pregnancies that can occur in cats as early as four months of age and potentially decreased behavioral problems that were associated with cat relinquishment and in their review of the literature they found no evidence of adverse effects of pediatric or juvenile spay/neuter.

The articles that exist in the literature that talk about potential for certain cancers occurring, being increased with spay/neuter or certain orthopedic conditions are all about dogs. There are none that document those similar concerns in cats.

This task force came to a conclusion. This is a statement. I'm going to read a statement from their report. "Given the known benefits of sterilization and the lack of evidence for harm related to age at which the procedure is performed, the veterinary task force on feline sterilization calls for veterinary practitioners and professional associations to recommend sterilization of cats by five months of age."

This provides veterinary practitioners with a consistent message that may increase veterinary visits and spay/neuter compliance while reducing the risk of pet relinquishment and unwanted offspring.

In June of 2017, the AVMA officially endorsed the recommendations in that concept paper produced by the Veterinary Task Force on Feline Sterilization. The American Animal Hospital Association, the American Association of Feline Practitioners, the Association of Shelter Veterinarians and numerous humane organizations have all made the same endorsement of recommending spay/neuter of cats prior to five months of age.

Are there medical benefits in cats. Well, a couple epidemiological studies, one of them as early as 1981 and one in 2005, documented a significantly lower incidence of mammary neoplasia in cats if spayed prior to their first heat.

They go on to talk about that given that the median survival time of cats with mammary neoplasia is generally less than a year and that up to 96 percent of mammary tumors in cats are malignant, the reduction in mammary neoplasia is very significant. Obviously diseases of the uterus, ovaries and testes are eliminated with ovariectomy and castration.

Bouncing back to Lisa Howe's studies briefly. Her study published in the year 2000 is one of the earliest articles that support sterilization of cats as young as five months of age. They followed 263 cats for a period of 3 years and found no increase in infectious

disease, no increase in behavioral problems, no problems associated with any body system when compared to cats that were sterilized at six months' age or older.

The article that we mentioned earlier from Cornell, Victor Spains' article, a retrospective study followed 1,660 cases for animals for up to 11 years. What they discovered was gonadectomy, their cutoff age was 5 ½ months, was NOT associated with increased rate of death or relinquishment or occurrence of any serious medical or behavioral condition.

Well, what about urethral obstruction. I promote pediatric or early age spay/neuter and I'm constantly hit with this question of well, if you castrate a cat that young doesn't it predispose it to urethral obstruction. The answer is no. In a 1996 study, Dr. Margaret Kustritz and Shirley and Gary Johnson demonstrated absolutely no difference in urethral diameters between cats that were castrated at seven weeks or seven months or left intact.

None of the studies, there's not a single study out there that's looked at castration of male cats under six months of age that's shown any increase in urinary obstruction in neutered male cats.

So what about orthopedic issues? The Davis studies raised all these questions about orthopedic conditions in dogs. The key point you have to realize is those studies were specific breeds of dogs and that you cannot extrapolate, even from one breed of dog to the next, you certainly can't extrapolate to cats. There are no similar studies describing a relationship between spay/neuter and orthopedic conditions in cats. There are none.

What about behavioral effects? A 2014 study looked at 800 kittens between 8 and 12 weeks of age. They divided them into groups where some were sterilized between 8 and 12 weeks of age and others were sterilized between 6 and 9 months of age.

They tracked them for undesirable behaviors immediately after adoption, 2 months after adoption, 6 months, 12 months, 18 months and 24 months after adoption and found absolutely no evidence that age at the time of sterilization had any effect on the number or occurrence of undesirable behaviors. Meaning no difference.

Did some of them have undesirable behaviors. Yes. Were there any differences between the ones sterilized between 8 and 12 weeks of age or those between 6 and 9 months of age. No differences.

Let's move briefly to my world and then we're going to start to try to wind some things down here. We obtained a mobile veterinary clinic in 2007 and a second mobile clinic in 2013. Since 2007 we've performed over 70,000 spay/neuter surgeries. Nearly 50 percent of these surgeries are pediatric; under 5 months of age. We currently serve 26 animal shelters and humane groups across north Mississippi.

In 2007 the shelters we worked with collectively had greater than a 60 percent euthanasia rate. Greater than 6 out of every 10 animals admitted to those shelters were euthanized in those shelters.

In 2016, the euthanasia rate in these shelters of dogs was 20 percent and of cats 34 percent. Was access to spay/neuter the only thing that changed in those shelters. No, we didn't control the variables, but the euthanasia rate of the animals we spayed and neutered was nearly zero. So spay/neuter had an impact, but, we admit, so did other things have an impact, but there was a positive impact associated with spay/neuter.

Humane Alliance, which I think now has changed its name to ASPCA Spay/Neuter Alliance. I think that's what it's called now. But I consider them the mother ship of high volume spay/neuter clinics. They were established in 1994 in Asheville, North Carolina.

Since 1994 they've sterilized more than 400,000 dogs and cats. In a community where the human population has exploded in the last 20 years, shelter intake is down 56 percent and euthanasia down 88 percent from 1994. Is spay/neuter the only thing that's changed. No. Has spay/neuter played a role in the change in shelter intake and euthanasia. Certainly. We just don't know how much of a role.

So how do you decide. Now someone is walking into your clinic and saying, "Here's my puppy." Or, "Here's my kitten. Should I have it spayed or neutered and if so, when?"

The first thing you have to consider is what's the life situation of the animal. Is the animal in a home or is it in homeless and in a shelter. That will play a role in the decision.

The second consideration then needs to be an assessment of all known relationships between reproductive status and health and longevity; not just a few.

If an animal is in a shelter and its chances of adoption is significantly greater if it's sterilized and its chances of euthanasia is significantly greater if it's intact, there really isn't a question. Should the animal be sterilized or when. It should be sterilized and it should be sterilized before it ever leaves the shelter regardless of its age. If it's going to be adopted at six weeks of age or eight weeks of age, sterilize it before it's adopted.

If an animal is in a home, we can't take just a couple articles that discuss just a few conditions and make generalized decisions. That is the danger of what some people did based upon the Golden Retriever article. There were people that were advocating for waiting until the animals have stopped growing after the Golden Retriever article. It wasn't they were saying that in Golden Retrievers. They were saying that in everything and some people were even saying that in cats.

We've got to be more analytical than that. We can't just look at a couple articles and can't just look at a couple conditions. When making decisions related to increase or decrease in incidence of a condition, we also have to consider what is the overall incidence and what is the change. Doubling something that is rare is probably still rare.

It's not just on whether or not ovariohysterectomy or castration is associated with an increase in the incidence of condition, but what is the overall incidence and what's the change.

A significant increase in an article could mean that the incidence has been increased from 0.1 percent to 0.2 percent or 0.3 percent. A five-fold increase in something that's extremely rare is probably still extremely rare and could be outweighed by protection against something with a much higher incidence. Think incidence of osteosarcoma versus incidents of mammary neoplasia and pyrometra.

What do we really know. We know that in shelters sterilization increases adoptions, reduces shelter intake and reduces euthanasia. Overall what do we know. We know sterilization is associated with an increase in several conditions that have a low incidence, prostatic cancer, transitional cell carcinoma, osteosarcoma, diabetes, hypothyroidism and that sterilization is associated with a decrease in incidence or elimination of several conditions that have a high incidence; mammary cancer, testicular cancer, pyrometra, benign prostatic hypertrophy.

Mammary neoplasia and pyrometra have an incidence of 20 percent or more in intact dogs, almost zero in spayed dogs and if I can back up a second, none of the conditions here on this list that are increased have an incidence of greater than 1 percent. Don't think osteosarcoma is a terrible, terrible, terrible, disease. We can't spay/neuter an animal because it might get osteosarcoma and then let it get mammary cancer or pyrometra. We just can't do that.

Another thing we know. Sterilization appears to be associated with an increased incidence of cranial cruciate, ligament rupture and hip dysplasia in some breeds, but not in others and we can't extrapolate to everybody.

We know that sterilization is associated with significant increases in life expectancies in both dogs and cats. So we're going to ask you to decide. We're going to go through several poll questions and we're going to try to see, based upon our discussion tonight and the knowledge you walked into this webinar with what your recommendations are and then we'll finish up with mine.

Here's the first poll question. Jessie, I think I turn it over to you for a second.

*Jessie Giglielmo:* Yeah. Thank you so much, Dr. Bushby. Our first poll question for everybody is based on the discussion of spay/neuter research, what do you believe is the most appropriate age to spay/neuter cats? You'll see the answers on your screen. Please

remember to answer on your screen and not in the Q&A box. I'll give you a few seconds here to go through those answers and submit them.

I also want to remind everybody to go ahead and get any questions you may have for Dr. Bushby in as soon as you can so that we have enough time to process it. Hopefully Dr. Bushby can get a couple questions here at the end of the presentation.

I'm going to go to our results slide now. It looks like we have some results, Dr. Bushby. What are you thinking?

*Dr. Philip Bushby:* Well, I like these results. I certainly agree with the majority of people that either based upon the knowledge they walked into the webinar with or add to that the discussion we've had that nearly 85 percent believe that it's appropriate to spay or neuter prior to 5 months of age.

When we get to the end you're going to discover that I totally agree with that conclusion. I guess we can go to the next poll.

*Jessie Giglielmo:* Thank you so much, Dr. Bushby. Our next poll question is based on the discussion of spay/neuter research what do you believe is the most appropriate age to spay/neuter a small breed dog? Again, remember to answer this question on your screen and not in your Q&A box.

Also remember that at the bottom of your screen there is a resource tab and in that resource tab Dr. Bushby has put together a lot of amazing resources for you all to go over. So don't hesitate to go check that out.

We'll be going to our results slide. We have our next set of results, Dr. Bushby.

*Dr. Philip Bushby:* I'm still happy.

*Jessie Giglielmo:* That's good. So our next poll question is based on the discussion of spay/neuter research, what do you believe is the most appropriate age to spay/neuter a large breed dog? You again have the answers before you. Answer on your screen; not in the Q&A box. I'll give you a few more seconds to answer.

We're going to move on to the answers. There you go, Dr. Bushby.

*Dr. Philip Bushby:* This is the interesting one because the large breed dog is the one where probably there is the most confusion about. I'm still happy, but we're going to talk about this one a little bit more as we get near the end here.

*Jessie Giglielmo:* Interesting. With that we're going to go to our next poll question. For animals, dogs and cats, in shelters spay/neuter should be performed. Answer that on your screen. Give you a few more seconds.

Let's move onto the answer slide. We have a unanimous response here.

*Dr. Philip Bushby:* I love this group. This is an amazing group.

*Jessie Giglielmo:* That's good to hear. I'll take that as positive feedback. Let's move to our last poll question for this evening. Then Dr. Bushby will go on with his presentation.

So our last poll question is has this webinar changed your mind about the appropriate age to spay/neuter dogs and cats? That is a yes or no question. Answer on your screen.

As this is a little bit shorter of a question I'm going to go ahead and move onto the results slide. Here we go, Dr. Bushby.

*Dr. Philip Bushby:* My interpretation of that, almost 30 percent have said that they have changed their mind a little bit and just over 70 percent said no. So what my interpretation of that is that a lot of the people that came into this webinar are pretty knowledgeable about the literature related to spay/neuter to start with.

Let's put it all together. You were unanimous is saying animals in shelters should be spayed or neutered prior to adoption regardless of age. Perfect.

You were not quite unanimous. Eighty-five percent I think was the number who said cats should be done before five months of age. The bottom line: cats can get pregnant at 4 ½ to 5 months of age. If we spay or castrate cats before five months of age we prevent all those unintended accidental litters that supply shelters with kittens constantly and we seem to have virtually no harmful effects from spay/neuter at that age.

We get to dogs. It gets more complex. This is where the owner has to play perhaps more of a role. If the owners had a dog die of osteosarcoma they're probably going to be much more concerned about osteosarcoma than they are mammary neoplasia, but if they've had an animal that's had to have surgery or die from mammary neoplasia, then that's going to be their concern.

I think in dogs it's very important to be able to sit down with the owner and have the conversation of risk/benefit. In cats, the pendulum swings all the way towards benefit with very little, if any, risks. With shelter animals it swings all the way towards benefits with very little risk.

In dogs, especially larger breed dogs, there needs to be a little bit more discussion and the owner needs to be able to play a role in that decision.

But having said that, having been in private practice before I came to the university and then being in the in university clinical medicine for decades, a very common question when you've presented the information to the owner and the owner has to

make a decision, almost every owner then says, “Well, doc, what would you do if it was your animal?”

If it was my animal, in female dogs regardless of size, in female dogs, I believe the mammary neoplasia and the pyometra and the life expectancy data outweighs all other factors and I would spay them prior to their first heat cycle.

For dogs, shelter animals before adoptions. Cats before five months of age. Female dogs before five months of age.

I have two mixed Dobermans. They were both spayed at six weeks of age; personal dogs.

For male dogs, for individually owned male dogs, small dogs, there is no evidence at this point in time for orthopedic issues, again I would castrate prior to sexual maturity.

For large dogs, now I’ll probably step on some people’s toes with this one and I’ve never been known to be completely politically correct, but I would try to make a decision. Is this a irresponsible owner or a responsible owner.

An irresponsible owner is me. My dogs come inside when it’s cold and the rest of the time they wander. We live in the middle of nowhere. There are houses around, but our dogs terrorize the neighborhood. An intact male dog terrorizing the neighborhood should not be allowed. So if the owner’s going to allow their dog to terrorize the neighborhood, I’m going to opt for the population control argument and recommend castration by five months of age.

For the responsible owner, the responsible owner being the one that fenced in backyard or they only take the dog out on a leash or whatever, I’d be a little bit more inclined, large breed male dog, a little bit more inclined to allow that animal to stop growing before the castration.

There’s enough evidence, enough association of some of these orthopedic conditions that I think give us some pause.

I’m about to end and we’re going to have ten minutes or maybe even a little bit more for your questions. I’ll try to answer as many of them as fast as I can.

The bottom line is there’s still a lot we don’t know. We need more research and better research. As professionals we have to be willing to remain open to new information as it’s discovered, but we always need to be willing to look at the information in the literature critically and determine if the conclusions that the authors come are valid conclusions based upon the data that they present.

I believe we have time for questions. I guess I turn it over to somebody for those questions.

*Jessie Giglielmo:* Thank you so much, Dr. Bushby, for all that amazing information. We do have some time for some questions so we're going to be starting that shortly here.

I'm going to push the first question to your screen. So our first question is could the increase in longevity in sterilized animals be due to better healthcare provided by owners?

*Dr. Philip Bushby:* Absolutely. We don't know the answer other than certainly. If an animal is sterilized, then the chances of that animal being one that has routine veterinary care is much greater than the intact animal.

This gets back to the issue I've mentioned several times. The difficulty when you can't control variables, but yes. The absolute answer to a very good question, certainly. The increase in longevity could simply be associated with better care, better healthcare, better veterinary care provided to that animal.

*Jessie Giglielmo:* Thank you very much. Here's our second question. "I volunteer at a local shelter. I help coordinate spay/neuter surgeries with local vet clinics. We work with 14 veterinarians at 7 different vet clinics. All have a different criteria for pediatric spay/neuter. How can we come to unified agreement on pediatric spay/neuter without alienating our doctors?"

*Dr. Philip Bushby:* So you give me an easy question first and then you give me the impossible question second.

Try to get 14 veterinarians to all agree to the same thing. That's a huge, huge challenge. You especially have to consider the fact that until about ten years ago none of the veterinary schools were teaching pediatric spay/neuter. Now I think most of them are, but I could envision in these 14 veterinarians you having some that have been out three or four years that are very attune to pediatric spay/neuter and some that have been out 15 years are scared to death of it.

Gee, we could do another webinar just on pediatric spay/neuter and go through some more research related to how easy the surgeries are, how there's research out there that shows that animals spayed and neutered under 12 weeks of age have fewer complications than animals spayed at the more traditional age.

I'm going to do something really, really dangerous here. I think. At the bottom of this slide is my email address. If you email me, and my God if I get 1,000 emails I'm in trouble, but if you email me I can send you some additional information related to how easy the surgeries are and how there's fewer surgical complications, fewer anesthetic complications, fewer post-operative complications in the pediatric ones.

Perhaps having used the literature to try to convince those veterinarians that it's safe, it's easy and get them all in a room and get them talking to each other and stress the

importance. The national statistics show that if a shelter has some other plan for sterilization of animals after adoption, the compliance rate is often as low or lower than 40 percent. So if that animal walks out of that shelter into someone's home intact, all you're doing is increasing the pet overpopulation problem. You're not decreasing it and somehow we've got to get the veterinarians to understand that.

I know that was not a very good answer because it was an impossible question. Get two veterinarians in a room and get them to agree and you've done a remarkable job. Let's see if I do better on the next question.

*Jessie Giglielmo:* I think you did great. Thank you very much, Dr. Bushby. Here's the next question and a little bit along the same line of thought, but more towards the pet owners. It's going to come to our screen.

“If you run a low income spay/neuter program for the community, how do you provide them guidance if they ask about the appropriate age to spay/neuter their dogs?”

*Dr. Philip Bushby:* I think you go back to the conclusions of this webinar and the oversimplified, take an hour and a half webinar and you condense it to 30 seconds. For small breed dogs male and female and for large breed females, the most appropriate age to spay or neuter them is before 5 months of age.

For large breed male dogs, that's the one that gets, in my opinion, gets difficult. Now you're not going to have John Q. Public walk in and listen to an hour and a half worth of analysis of articles, but I think you can simplify it down saying, “In a detailed analysis of the veterinarian literature the benefits of spay/neuter for small breed dogs and for large breed female dogs all weigh in favor of spay/neuter prior to five months of age.”

And simply say, “It's a little bit more confusing for large breed male dogs. Let's sit down and talk about that for a few minutes.” Every other category other than large breed male dogs you can focus in on that before five months of age. Next question.

*Jessie Giglielmo:* Thank you very much. I have our next question ready for you. “Could you talk about the hypothesis that early castration of male dogs with aggressive or fearful behaviors might lead to increased fear or aggression due to the castration experience? Some behaviors seem to advocate waiting until these dogs are more mature as their behavior might improve with age and this might reduce the risk of worsening behavior problems.”

*Dr. Philip Bushby:* I can't talk about that very much. I certainly do not consider myself a behaviorist or nowhere near an expert in animal behavior, but I do believe that there is conflicting literature out there. That there are some studies that show that early castration tends to increase aggressive or fearful behaviors, but there are other studies that show that it doesn't.

I think this is one of these areas that we've had a tendency lots of times to make decisions based upon our own opinions and I think this is one of those areas that until we have more research we're going to continue to base it on our own opinions. Beyond that I really can't comment just because I'm not that familiar with all the behavioral literature. I wish I could help you more.

*Jessie Giglielmo:* Thank you, Dr. Bushby. This is going to be our last question for the evening. We'll push it to the slide area right now.

“In our mobile clinics we use injectable anesthesia. What is the minimum age or weight you would prudently recommend for pediatric spay/neuter using this type of sedation?”

*Dr. Philip Bushby:* In our mobile units we use injectable anesthesia. I don't have the percentage in front of me, but it's like 98 percent of the animals we do are shelter animals. I'm more willing to spay and neuter a shelter puppy or kitten at six to eight weeks of age than I am an owned puppy or kitten.

In the question, what I don't see is, we have a mobile clinic, but I don't know whether you service a shelter or you service the general public. If you're servicing the shelter then I would say I violate, we violate, common in the high volume spay/neuter world is two pounds at eight weeks. We will violate that. We will go to six weeks and we will go less than two pounds if the animal is in good body condition and appears to be perfectly healthy.

Now, we won't go under six weeks of age and I don't think we've ever gone under a pound. Probably never even approached a pound, but a good general rule is two pounds to eight weeks, but in the real healthy animal that's in great condition in a shelter, it's okay to fudge that a little bit and go lower; both age and weight.

For an owned animal I would prefer them get their vaccination series and do them between four and five months of age.

I've tried to answer it two different ways based upon the life situation of the animal.

*Jessie Giglielmo:* Thank you so much, Dr. Bushby. That was our last question for the evening. With that, this will be the end of our presentation. Thank you, Dr. Bushby, and all of you for sharing your evening with us.

Your opinion is important to us so please take a moment to fill out the evaluation survey by clicking on the link on the screen.

Mark your calendars for the first four Thursdays in March at 9 PM Eastern when we will present a series on fostering aimed at helping shelters expand and grow fostering opportunities by engaging the community. For more information go to [www.maddiesfund.org](http://www.maddiesfund.org) and be sure to register.

Again, thanks for your participation in our webcast tonight. Have a great evening.  
Good night.

*[End of Audio]*