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## Polypharmacy & the SLP during the COVID-19 Pandemic: Part 2

Recorded September 15th, 2020

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SpeechPathology.com Course #9466

- [Amy] Once again, welcome to our event today; Polypharmacy and the SLP during the COVID-19 Pandemic. This is part two of a four part series and our presenter today is Doctor Jeanna Winchester. Jeanna, I'm gonna hand over the mic to you now and I'd like to welcome you, thanks for being here.

- [Jeanna] Thank you so much, I've really enjoyed working with [speechpathology.com](https://www.speechpathology.com) and Continuing Ed and I'm excited to continue with our discussion today. Part two here, is really gonna focus on the neurological system, which is why we have such a dense amount of content to go through today. And then in part three, next week, we're gonna talk more about the cognitive components. And then in part four, week after, we're going to talk about the gastrointestinal system. Just to handle our disclosures here at the beginning and our learning objectives. I have a small LLC, I am a sole proprietor where I do a number of contract work. I am also an adjunct professor and then a professor of medicine as well and I do some other continuing education courses. All of this goes through my LLC, of which I am a sole proprietor but I don't have any other financial relationships to disclose of.

And then this content is not going to discuss any specific technique or medication, it's gonna be a much broader general discussion of polypharmacy. And I do not have anything else to disclose other than working with [speechpathology.com](https://www.speechpathology.com). As our learning objectives here, we hope that by the end of this course, you'll be able to describe the relationship between COVID-19 and the neurological system of dysphagia. As well as list those factors contributing to polypharmacy in the skilled nursing setting and specific to those residents during the pandemic. As well as describe the longterm effects of polypharmacy and mechanical ventilation in individuals recovering from COVID-19. There is a strong correlation between the use of mechanical ventilation, the type of individuals that require this type of respiratory

support and poly-pharmacy in general, now that we've added this new type of virus and just any sort of significant illness in general, we're gonna go over how those are related and what we can see in the population. Previously, we discussed our bodily systems that are affected by dysphagia and I just wanna go over them for just a second. In the previous part, we talked about the respiratory system of dysphagia and if you go ahead and swallow, you had to hold your breath for one to two seconds in order to execute the swallow. So there is a respiratory component to be able to execute the swallow safely. Here in this part, we're gonna talk a lot about the neurological components, which involve coordination of the neurological respiratory and motor systems. All of these interact in order to execute the swallow from the musculature of the head, the neck, face, chest cavity, even our abdominal structures, to be able to hold us in the right position and to execute that expiration, blowing out for example, if there was a coughing or anything else that were to happen while someone was attempting to swallow or during the eating experience.

And the next week, we're gonna talk a lot more about the cognitive components and the effects of different cognitive and psychotropic drugs as they relate to polypharmacy. And of course, as we talked about in respiratory part one, just the high probability that there's gonna be multiple medications involved in patients that are recovering from COVID-19. It's just likely it also happens in other forms of pneumonia and other viruses as well. It just presents a type of event that could have this type of situation happen, for a large set of the population, especially if they're elderly. And those are the patients that are likely to come across your caseload. In part four, we're gonna talk about the gastrointestinal system and specifically, reflux dysphagia. Movement from the elementary canal should go in only one direction, oral pharyngeal, pharyngeal esophageal and on-down. Anytime it comes back up, that is a breakdown in the systems of the swallow, therefore reflux is dysphagia. And as we said in part one, we don't go into an in-depth discussion of the muscular system because you guys are largely the experts in this realm. This is the group of individuals, whether it's speech or

PT, a little less OT but as far as speech therapists are concerned, this is what you learned even in your Master's degree. And so what we hope to do is broaden your understanding and help you understand how these other bodily systems relate to that musculature and together, having that systems level perspective can really help you treat your patients better and recognize those subtle signs and symptoms. In part one, we talked about the relationship with the respiratory system of dysphagia and how this could relate to polypharmacy, focusing quite a bit on the anatomy and physiology of the speech and hearing mechanisms, as well as how the primary and secondary muscles of respiration can contribute not only to the safe swallow but how it can also break down.

And then as it relates to COVID-19, how various medications in polypharmacy can affect these muscles. Positioning is very important there. And we're gonna continue with that understanding as we build on it with the neurological and cognitive systems of dysphagia. Just as a review, aspiration pneumonia in general is a misdirection of the oral pharyngeal or gastric contents, basically anything going into the lungs that shouldn't be there. Which is aspiration itself, the mechanism by which the swallow breaks down and the contents enter the lungs. But when enough of it begins to build up, we can end up with aspiration pneumonia.

This can happen even in the young and even healthy individuals aspirate their oral secretions throughout a given day but this can also occur a little bit more while they sleep. But if the volume of that aspirate accumulates enough, that it begins to affect and cause inflammation of the lungs, we can end up with aspiration pneumonia. And we also discussed how nearly one in 25 older adults are experiencing polypharmacy. It is the highest prevalence among the oldest old but even individuals over the age of 50, 60 and 70 are likely to be taking many medications, some of which may not be appropriate anymore. And we have another course that we have recorded earlier on neurogenic dysphagia, which covers a lot about the neurological system of dysphagia

and specifically some case studies related to neurological dysphagia. So if you want to go further in your understanding, that recording is available, that other course is available. Here, we're not gonna focus quite so much on the anatomy and we're gonna continue to focus on the polypharmacy and its relationship to the current populations. The oral mechanism exam is particularly important when it comes to the neurological system. And I'm gonna go quickly through this slide because it comes up again with more elaboration in just a few more slides. But I wanted to show you this again from part one, we are focusing on the cranial nerves that are particularly important in the swallow examination. And so, you may perform that oral mech exam kind of regularly and think to yourself; well, this is just a standard.

What I want you to remember is that, although a technique may seem simple because it doesn't involve a very elaborate technological device, that doesn't mean it's not important. Interestingly enough, the penlight test, the oral mech exam, follow my finger with your eyes. Some of these quick and dirty, very simple tests that don't require technology are actually testing very sensitive neurological disorders, particularly with the cranial nerves and the brainstem and parts of the spinal cord. So they are very important and what we're gonna do here is review a few of those with the oral mech exam.

So we have the five cranial nerves that are essential to the swallowing mechanism; cranial nerves, five, seven, nine and 10 are among those that are the most important. And then in the previous discussion, we talked a little bit more about which ones are the most important. But here we get to the meat of the slide, the most important components, the real crux of what we're gonna talk about in this part. And that is how COVID-19, the neurological system of dysphagia and polypharmacy all relate to each other. We're gonna look at a few studies here, a few different studies from the research to show us how important it is to understand these relationships. So we looked at a study from the Lancet and this is a journal, this is an overseas journal where they did a

meta analysis between February and late April. And of the more than 2,000 patients evaluated, 153 cases were identified with unique COVID-19 specific neurological conditions. So that's what's important to note. The respiratory component of COVID-19 in adults, we distinguish that from children and teens a little bit more in the next part but in adults, the respiratory system is particularly important, this is where the inflammatory storm is happening. But among those individuals, especially the ones that are hospitalized, there is a neurological component for a subset of them. But the problem is, these studies are limited by distance, a lack of broader emphasis, the fact that we're in the middle of the pandemic right now. In America, we're barely halfway through it. We've got a solid chunk of time, months. Hopefully it's only months, but it may be a year and change more depending on how everything goes this winter, we don't know. It is an ongoing situation.

What we're doing is having as much caution as possible. So there provides some limitations to what these studies can tell us but it does it does still give us essential information that can help us in this fight. When they looked at the broader clinical syndromes associated with COVID-19, they saw that those that were related to neurological disorders often had a relationship to the cerebral vascular. So here it's not just an inflammation, it is actually a cerebral vascular event and that's defined as an acute ischemic, hemorrhagic or thrombotic vascular event, which involves the brain parenchyma or even the subarachnoid space. So the way that the cortex is able to utilize blood So the way that the cortex is able to utilize blood and the energy component and the blood brain barrier in order to bring energy to the cortex. This is under particular insult and it seems like there is a relationship there between the cerebral vasculature and the neurological system. What this means is that those patients had altered mental status defined as an acute alteration in personality, behavior, cognition or consciousness. Now that might sound kind of familiar to you because that's what you would expect in basically a TIA or a stroke. And any compromise of the blood brain barrier is gonna bring about certain speech, language

and other cognitive and neurological disorders. And this is very common when you look at these consequences of a cerebral vascular event. And so we are seeing that, it is new, it is not well understood but a small subset of the population is experiencing these symptoms. So they wanted to look further, they define six peripheral neurological factors. These are defining those that involve, say the spinal nerve roots, various nerve roots, the peripheral nerves, the neuromuscular junction, the muscle and some other neurological definition, some boxes that meet certain syndromes and presentations that are out there. So what they're doing is looking at these cerebrovascular events, these peripheral neurological events and then D, all the above, some of these other neurological symptoms that might be necessary.

Cerebrovascular events in patients with COVID-19 is documented in the literature and other places as well. But they needed to look at the larger group within this study's patient population. So they identified a large portion of cases of acute alteration in mental status, whether that's delirium personality, those features that we saw before. And what they're finding is that there's an encephalopathy and encephalitis and also some primary psychiatric syndrome diagnoses, even psychosis. We will go into this a little bit more in the cognitive section in part three.

So I really encourage you to watch all four parts because they're all related to each other and you'll get a broader understanding of dysphagia just in general. But particularly part two here and part three next week, the neurological and cognitive systems because they are so related to each other. And what they found was although cerebral vascular events and altered mental status were identified, what they were able to confirm was that it was predominantly in older patients. And that's a key feature because what they're seeing with COVID-19 is that the response is different if you're a child, it's different if you're a teen. Particularly children and teens, teens seem to have less of the respiratory component but they have other components, even in cognitive and neurological. But as you get to young adults and mature adults, we're going

anywhere from 20 to about 50, 60 years old. You may see in the typical respiratory events that we see but you may not see as many cerebrovascular neurological. But as you start to get into the longterm care, the aging and the elderly population, the population that has been just most affected by this disease and the ones likely to come across your case loads, we see the full spectrum. We see the systems of dysphagia are significantly affected and we're showing that it's predominantly in these older patients. But this data specifically identified that acute alterations in mental status were disproportionately overrepresented in younger patients. That point is gonna be a significant part of our cognitive system, of our cognitive component and something that we're gonna elaborate on here.

So we need to make a note. We need to make a note, we need to sort of break apart this neurological and cognitive component. The rates of neurological and psychiatric complications of COVID-19 can't really be extrapolated from mild patients or those patients that they call asymptomatic. Again, we're not quite sure if that's really a good term and especially those that are in the broader community that are staying home as opposed to the skilled community.

And it's important to remember, this particular study was conducted in Britain. So we have to imagine what this might be in the American population and how this might go further. What they specifically observed and what we're gonna pick apart more in part three is that there's a disproportionate number of what's called neuropsychiatric presentations in younger patients and what they call the dementia cerebral vascular events in older populations. Which might reflect an age related difference and it might reflect the state of the cerebral vasculature associated with risk factors that are exacerbated by critical illness in older patients. But there's a caveat. A large number of patients with altered mental status might reflect increased access to neuropsychiatry or psychiatry reviews in younger patients. And they might push older patients on the route. And they might push older patients on the route to altered mental status and delirium.

Meaning, it might be the clinicians. Clinicians may attribute the change to dementia or delirium simply because they're older and they might be attributing the changes to neuropsychiatric dysfunction because the patients are younger, is this implicit bias by the physicians to say that younger adults were having neuropsychiatric disorders but the older adults were having cognitive disorders? You know, it is hard to tell at this point. Again, because it's new, because we're in the middle of it. We don't have those longterm studies, we don't have those mass studies yet to really pick this apart and it's hard to know, is this truly neuropsychiatric, is more prevalent in 20 to 45 to 50, whereas older adults are experiencing true cognitive decline and delirium, is that even a good distinction? This part remains unknown. I am bringing this to you because you may be floating between both groups.

And especially if you're in the school system in part three, we're gonna talk a little bit about what happens in younger children and how you might have this confusion about what is a neuropsychiatric problem and what's a neurocognitive and speech problem. And what I say to you right now is that this is a little bit of a gray area and it will require, on your part, to continue to read that essential literature. Please go out there and educate yourselves as well, as this continues to become available. So there is some additional evidence about the relationship of COVID-19 and the neurological systems of dysphagia.

This novel coronavirus is primarily causing those respiratory, cardiovascular and pulmonary issues with the clinical manifestations, largely resembling what happens with other SARS viruses. But the neurological symptoms that are separate from neuropsychiatric or neurocognitive, pure neurological are kind of stemming around headaches, a loss of smell, a loss of taste, confusion, even seizures and encephalopathy that have been reported in other COVID-19 patients. And I will let you know that a loss of smell and a loss of taste has been reported in every single patient, even those that call themselves asymptomatic. That's why it's a gray term, because a

loss of taste and smell we attribute to not being a symptom. However, in this case, it might actually be a symptom. We don't know yet, that's where that gray area comes in and it's not a miscommunication, it is because more studies are needed and we're still in the middle of it so this has not been entirely determined. Other evidence has shown that in approximately 200 hospitalized COVID-19 patients in Wu-Han China, neurological findings were in about a third of patients. With severe infections though, those that go to the hospital that have the real severe versions, you can see some of those previous symptoms that we talked about; loss of taste, smell, the headaches, even in the cephalopathy and the seizures that is less prevalent but, neurological symptoms in general are found in nearly 45% of the population. Similarly, a study from France reported, granted it was a small population, it's only 58 patients but a large percentage of those populations that had COVID-19 that were admitted to the hospital, have those neurological findings as well.

So we have to take this, there are different size of studies, there's a different number of patients that are involved. Larger studies are gonna have a smaller percentage with neurological conditions because they will represent a broader range of the population. What you need to remember is that if they have the neurological, respiratory, cognitive and gastrointestinal systems affected, which this particular disease can affect, they are likely to come across your caseload and that is the take home point here. Importantly, a recent study in Germany demonstrated that the RNA, which is a molecular component, that's important because viruses only have RNA, they don't have DNA. They need our DNA, they need to hijack our DNA in order to make copies of themselves, they can't do it by themselves, that's the definition of a virus. So they only contain RNA, we have both of 'em. So they hijack us in order to copy ourselves. Germany did a study and they were looking at some of the biopsies of patients that passed from COVID-19 and they also found that approximately, a third demonstrated those headache, swelling, other related neurological symptoms that can be found, that we see with this virus and this can have some longterm effects. But other studies took

it further, they actually generated what are called, progenitor cells. Progenitor cells, in order to find direct links between the virus itself, the SARS Cov-II virus and neurological issues. This can happen because the nervous system has stem cells, they're nervous system stem cells. You have them in your tongue, this is how you make new taste buds even if you burn your tongue. You actually have them in your nasal epithelium and you generate new nasal epithelium regularly. You also have them in the hippocampus and the medial temporal lobe, as well as in the lining of the ventricles. The medial temporal lobe generates new neurons well into your 70's. So anyone that tells you that you can't teach an old dog new trick, well it really depends on how old that dog is because people well into their 70's, generate new neurons.

This is how we form new memories. So in fact, your patients and their compensatory mechanisms really do work. Speech therapy is so important, especially in longterm care because individuals well into their 70's can learn a lot of new tricks. So we know that the nervous system has these special nervous system type stem cells and a study decided to look at these progenitor cells and see if they could grow in certain types of neural tissue and then see what the virus did. And it demonstrated some possible direct links between the virus and its ability to replicate in nervous system tissue and possibly some direct links between that neurological and neuropsychiatric dysfunction. Again, we're in the middle of this, this is brand new.

We don't have all the details but we just know there are some relationships there that will continue to be studied for years and years. Not only as we get this pandemic under control, but as we continue to look at other viruses that might affect the neurological system. So I wanna come back to this slide, although we're not going to focus too much on it because again, that's the topic of this other course. I do wanna remind you of where a few things are located, so I'm gonna take my pointer here. The corpus callosum is that structure that is gonna connect the right and left hemispheres. That is the most dense, white matter bundle in the cortex. We have our sensory and motor

systems that are gonna move through the thalamus, through the brainstem and on down the spinal cord, in order to connect our body to our cortex. Our sensation is gonna come in and our motored information is gonna come out. The memory systems, as I said those stem cells that can be generated well into our 70's as I said, very aged veteran dogs can learn many new tricks. That's because this area is forming new memories all the time and then it consolidates and sends those memories to the rest of the cortex. Our executive functions, our prefrontal cortex, our personality are gonna be here in this frontal lobe. And the cerebellum is gonna modulate our mover motor movement, so it doesn't make them happen, that's what the motor cortex does, the motor cortex says go. But the cerebellum is going to affect the fluidity of that movement, how accurate the movement is. And all of it has to go through the brain stem and the spinal cord in order to reach the rest of our body. It is from the brain stem that we are gonna see those essential cranial nerves that are not only important for the movement of the head and neck and the swallow, but the vagus nerve that is gonna affect everything below the neck.

So it's important to remember where you are and you can see again, how important those cranial nerves are going to be to the swallow. So here as we come back to the oral mech exam, let's take another look at those cranial nerves. So you have cranial nerves five, seven, nine and 10. These are some of the ones of the five that are the most important to the swallow. These four in particular, five, seven and nine are particularly important to functions of the swallow itself. And then cranial nerve 10 is everything below the hyoid bone, including that cough reflex. So don't forget, you need those primary and secondary muscles of respiration to be functioning, which is where the vagus nerve comes into play significantly. There has to be enough, I've exaggerated the respiratory component there. I really took a big breath, I held it. I executed the swallow and then I exasperated out or had that expiratory capacity. In order to do that, I have to sit in a largely upright position and I really have to engage my abdominal muscles, not only to hold me in place but then just squeeze the air back

out. So then all the function of the chest cavity works as it should. Chest wall capacity, any deficits to the lungs, the trachea, the bronchial tree that occurs with this particular virus, these can all affect the systems of the swallow. The trigeminal nerve specifically, is gonna be involved in mastication and in the oral pharyngeal phases of the swallow, making sure that all the structures come together as they're supposed to. The facial nerve is easy to remember, go ahead and just lower your face on your hands. I've gone ahead and slapped my face. If you slap your cheeks and you slap your face, you've slapped the facial nerve. It's really straightforward to remember the facial nerve. It has an obvious role but what we wanna point out here is saliva production.

Especially when we talk about mechanical ventilation, any sort of intubation, oxygenation, especially if this is invasive mechanical ventilation that we'll talk about, all of this can dry out the oral pharyngeal and tracheal components of respiration. When it comes to the swallow, it's gonna dry out the oral and pharyngeal phases of the swallow. And changes in saliva production, they can become crusty, they can become dry and if we have individuals that are already at risk of dysphagia, they can aspirate those contents. Their body can respond by over producing saliva, to compensate for the mechanical ventilation. What happens when that ventilation is removed?

These are some of the things that we're gonna talk about at the end end of this part. And then the glossopharyngeal move, we have to take into account that taste, the general sensation and don't forget that the entire mandibular portion of the jaw, especially the muscles of the tongue and those inferior mandibular muscles that you don't really think about. I always think about the digastric muscle, a muscle I never think about until I had my own dysphagia issues. These have to propel the tongue upward towards the pharynx, I'm sorry, towards the soft palate and it has to make contact with the soft palate, create that suction that essentially is gonna propel the bolus towards the pharynx. If these muscles are impaired, either in the cervical region, in the mandibular region, if they're impaired from neurological dysfunction, alterations

due to mechanical ventilation, like when they take the intubation out, is there any inflammation from that? These can all affect cranial nerve function. There can be other reasons why cranial nerve function is affected but when we think about cranial nerve function in the swallow, these are what we're looking for. So that oral mech exam that you perform can be very important. Even if you've been doing it forever and you haven't really thought about it, take a look at it again and break it down by its cranial nerves because it's a quick, dirty assessment that actually can tell you a lot and make an important referral back to a physician because some imaging or other testing might be required. So we can all relate this back to the effects of COVID-19. Because as we saw in part number one, an invasive respiratory-based virus has implications in other forms of infection, other forms of pneumonia and other viruses and bacterial infections.

It can tell us a lot about some of these other diseases and what our patients might be experiencing, especially patients that are coming across your caseload that are either COVID-19 positive but also, maybe they have something else going on, like COPD, emphysema, chronic bronchitis, they've had pneumonia several times, other respiratory infections. There's a lot that we can learn by looking at this from a broader view, a systems view.

So let's take one more look at that COVID-19 and delirium. We are likely gonna see an altered cognitive status while the patient is infected, especially if they're over the age of 60 years and they have a COVID-19 positive diagnosis, why is that? Well, delirium is not only found in a postoperative situation, just in the process of healing, this is well documented. There are so many studies demonstrating how delirium can happen after surgery and how delirium can happen just in any sort of impaired state because the process of inflammation of the trauma of the insult can affect this very delicate, complex, highly active system. When you have a severe respiratory infection of any kind, this is also true and this is particularly true if it's a virus or something that the body has not encountered before. Because with COVID-19, there is what's called a

cytokine storm, there's an inflammatory storm. How the body reacts is severe and this can cause delirium, particularly while it's going on but possibly lingering for days, weeks, if not a few months later. And those numbers come from what we know of anesthesia and other postoperative investigations in delirium. The older you are, the longer the delirium can continue. This may affect consent. This may affect care. This may affect compliance. It is very important that if possible, work with your patient to establish an advocate. An advocate that maybe you have to communicate, either in person if you're going into the facility or even via telehealth. There are concerns that can make this possible to have the patients work with an advocate, especially if they're over the age of 60, they're not giving up any power of attorney or anything like that. But they're saying, this person, you can talk to this person about my care because I just need a second set of ears, for example.

That's the type of situation we're talking about and then I can talk to that person as well and together, we can sort of make sure that I'm doing okay because the person going through it has to actually heal. And that can take a lot of energy and we know from other components of health care and other investigations, especially in individuals over the age of 60, that that temporary delirium can occur. This can be mild and it can be severe. What's the difference between delirium and dementia? Dementia is progressive, degenerative and kind of constant, it doesn't go away and it continues to decline. Delirium is generally, it can range from mild to severe. It's less severe than the dementia but importantly, delirium is not degenerative and it's generally not lasting, it's generally temporary. But again, I encourage you to look at some of the literature of postoperative delirium in the aging population. This will give you a general idea of what we talk about and why we see that, in some of those hospitalizations. So what can you do? This means that when you're speaking with these patients, what you wanna be on the lookout for, this is not a designated COVID-19 assessment, this is what you may see. I encourage you again, continue to read that literature but you likely, based on other assessments of delirium and hospitalization and aging, will need to assess

memory. We're gonna talk about that more in part three, especially as it relates to polypharmacy. When they have a number of medications, memory is very difficult to keep sharp and intact because a lot of things can affect the memory. But also attention, they may have shorter attention spans because again, they're going through such a significant psychological, cognitive, neurological and physical trauma. Specifically though, you're gonna wanna break apart both lexical recall and thematic comprehension and recall. Because I have found, this is after doing 15 years of memory tests, that a lot of aging patients have learned tricks to memory. They've gone out of their way to try to beat the memory tests because they know the memory tests are coming and they know that that is a part of their care. But there's a lot of different lexical recalls but pure rote word recall like the rereading the 10 words and you do the short delay. I tell you, the aging population is getting really good at those tests because they know that they're coming and if they took 'em, their friends took them and they talk about them at dinner and they try to beat the tests.

There are ways to do what's called a delayed recall. You can try to distract them for 20 minutes by doing something else and then test them again. See if they remember those words, called a longterm delay, that could be very helpful. But also thematic comprehension and broader comprehensive recall, because it's not just about spitting out words but do you have any idea how those words relate to each other? Does that mean anything to you? This is another component that can really draw out, not only delirium, but also mild cognitive impairment and dementia will be very obvious when you begin to look at thematic comprehension and that associative memory. Neuro motor functions are kind of intuitive and again, I yield to you guys as experts, this is your bread and butter. Right away, I'm sure many of you are thinking about this right now but I want to bring it back to taste and smell. And you're probably thinking to yourself; well, how does that even relate? Well, particularly smell. Smell is the first cranial sense. It's the first sensation that ever showed up in an organism, single-celled organisms, to begin to detect the chemistry in their water environment and they began

to form memories. So smell in human smell, is the olfactory bulb, directly projects to the hippocampus. It's the only part of the body that has a direct link to the memory system. So it doesn't matter how long it was since you had your grandmother's cookies, the smell of your grandmother's cookies will elicit the memory of your grandmother. It is because smell is one of the most important senses, it relates to social interaction, bonding, the family experience. It is a very important memory skill. We know that it is impaired. We know that this is found and that you can even turn this into a memory task especially when, if you're doing telehealth, you can have the advocate, not the patient but the advocate, let's say that they're recovering and you're doing the rehab.

The advocate could set up items that are important to the patient, that evokes certain events like a birthday cake. Again, make sure they're dysphagia friendly and the right level of consistency, don't let them choke. But let's say that they're all the right consistency and they have a certain association, they really love a certain cookie or a certain brand of soda makes them think of whatever. You can have that conversation, determine what they are and then turn this into a memory task, even from telehealth, asking them to recall that memory and tell you about it.

That's thematic comprehension. I'm sure that there's a lot of ways that you guys can come up with not only in-person, dysphagia friendly versions of that but also via telehealth because really, you're just assessing the memory, not so much the food. If you wanna turn it into a dysphagia evaluation as well, that is also possible but again, I believe you have to do the speech and language evaluation separately. You might wanna do them on different days. And then executive functions are really, that is again, you're experts on this already. It's important to remember that with the delirium, that you're going to have those issues with executive function and this may be a key component in the rehabilitation of this population. Because overall, this is a use it or lose it situation, so you wanna assess these patients early and treat them early to

facilitate the maintenance of these functions while that patient recovers. You're more likely to have positive patient outcomes, though this may not alter the destruction of other bodily systems. If you can maintain that neurological and that cognitive specifically and you can maintain the health of the bodily systems related to dysphagia, you can keep them nourished. It's also more likely to improve the patient's quality of life as they go through this difficult time. The eating experience psychologically, is very important to quality of life and it's something that a lot of research has been done relating quality of life to dysphagia. And how among everything that a patient goes through, even in ALF, IL, home health or skilled nursing, when the eating experience has been interrupted, it significantly relates to quality of life.

Being able to find just one thing, just that one thing that makes it just a little better can be key to the quality of life of your patient and can also increase that patient compliance. So there's clear roles here for speech evaluations in therapy and COVID-19 itself, just the infection. It is important to make those respiratory and physical therapy referrals, to talk with the PT and the RT and teams together. You're really gonna help these patients because it does span all the systems related to dysphagia, these broad range of bodily systems and really requires the incorporation, the interdisciplinary team.

And I highly recommend that you continue and even expand your interaction if possible, depending on your area, depending on your facility, depending on their insurance, those referrals to OT. Because that individual now has to go back to their home life after a very difficult situation during an extremely difficult time for everyone. So OT has an expanded role here. There are other regulatory complications there but remember, that's not the OT's fault, that is healthcare trying to figure out the role of the OT. But if it's available in your area, in your buildings, if there are OT referrals out there for you in your area, really try to coordinate with them for your patients because there is a clear issue with activities of daily living and other occupational components that

these patients will have as they go back to their home lives. So as we finish up here, we have about six more slides and then we can take some questions here. Let's bring it back to polypharmacy. Because as we talked about in part number one, this particular virus and this population in general is at a high risk of polypharmacy, where being in the skilled setting also increases the likelihood for polypharmacy, this is just the perfect storm. Because a multi morbidity can have an impact on disease management burden. It can cause increased levels of care complexity and increase the risk of experiencing that fragmented care. If they go from AL or IL to the Sniff, now they're bounced back to the home and they're on home health.

They have a repeat hospital admission, now they're back at the sniff, then they're discharged maybe to the subacute. Now they're back at home, depending on insurance you know, many of you have experienced this with your patients, that the fragmented care could be very difficult. Well, the therapy team can be the glue that helps it come together. Reach out to your other colleagues, that interdisciplinary care, working with the nursing coordinator and the discharge coordinator, making sure patients have discharge instructions and some idea of what they're supposed to do when they go home. Or if you work in telehealth or home health, you can have that interaction even at the home.

Fragmented care can really exacerbate the situation and now we add the pandemic on top of it, we see an increase in fragmented care and we just see these individuals can have an increased risk of not only aspiration, but aspiration pneumonia and repeat hospital events. Generally multi morbidity has been found to be associated with decline in functional status and subsequent frailty. And so the presence of multi morbidity might predict that return to hospital admissions. It really depends on the study, a lot of this has been going on. You've seen this the last five years, CMS had a major revision to the payment model back in October. We know that return to hospital admissions is a key component of our healthcare system right now and it will continue to be a key

component in the years to come. But it also might be an indicator of wider issues such as complexity, the instability of disease management, that fragmented care that we just talked about and then overall burden of the disease itself. So some previous studies were looking at the relationship to return to hospital admissions but the intervention components in that fragmented care included in these studies can vary. It can make it difficult to assess the effectiveness of the individual components. So for example, the post discharge followup at home, having rehab services in place, does that make a difference? Is rehab important? Some of these studies are starting to look at that because they see that the rehab team can be the glue that keeps it all together. And now that telehealth is becoming more used, even after this pandemic is over, telehealth might be the key in post discharge and that followup that the therapist might be able to continue care to facilitate them going back to the home and have that transition be much smoother and have less fragmented care.

And it's also possible that those selected for supported discharge have been identified by extreme events and exacerbations, which might return to normal without any active intervention. So this might be a onetime thing, maybe when they go home, they're just better. It's hard to know, studies have not been significant in this area. But those that have been done are starting to focus on the importance of the rehab services and again, now that telehealth is a little bit more prevalent, it will be interesting to see in the next number of years, how that transition may improve for those patients that do have issues when they go home or when they bounce from setting to setting to setting. But specifically related to polypharmacy, they wanted to look at; well, are there certain medications that actually make somebody worse? Are there certain medications that are associated with the polypharmacy more than others? What they found was, specifically medication related risks are not found to be strongly associated with future return to hospital events. What they did is they use what's called a multi-variable logistic regression, which is a higher level analysis and they're trying to find; was it the anesthesia? Was it the Tylenol? Was it the PPIs? Was it a certain thing that really

affected those return to hospital admissions? And although previous studies have found that polypharmacy and high risk medications are associated with return to hospital admissions, they also focus a lot on whether diuretics were used. So in general, although they haven't identified very specific medications that say; well, if you give this medication, you're gonna go back to the hospital. What they're showing was polypharmacy in general, taking multiple medications can really affect the return to hospital admission rates. So having multiple medications, multiple comorbidities, having that aging diagnosis as we've shown in part one and now in part two, there's a number of factors that can contribute to those return to hospital admissions and this is ongoing. Those studies in general, did not take into account the number of comorbidities, the supported discharge rates and these deprivation indexes, meaning; were they deprived of services?

But what they found in general, when they did this high level analysis, was that the number of comorbidities in this context may be driving return to hospital admissions, and that's intuitive. Due to its complexity and instability, as well as the management burden, it kind of makes sense. If your patient has COVID-19 plus COPD, plus they are in their 90's, they've had a history of depression, they previously had heart disease, maybe they had a fall 10 years ago, they had cancer one point and they had a bad back and so they were quite sedentary.

Multiple morbidities, multiple factors, likely multiple medications taken in order to treat that individual. Together, this could be driving return to hospital admissions. It's also going to increase the likelihood that this patient crosses your caseload. So taking this fundamental information and then incorporating it into the number of elderly residents that were affected by COVID-19 just between February and now. In general, the likelihood that return to hospital admissions, plus multi morbidity, plus taking lots of medications, could instigate a new wave of skilled nursing admission rates and chronically ill patients. But this is a big question mark, we don't know. The shift from

sniff to AL/IL, to home health took about 15, 20 years and the most recent 15, 20 years. But home health and telehealth have improved. There's also been quite a bit of innovation. Will they need to go back to the sniff? It's a big question mark. Will home health begin to utilize rehab disciplines more? I really hope so. I hope more home health companies expand speech, PT and OT, because a lot of home health companies only use nursing. But if home health expanded the rehab disciplines, maybe those patients could stay at home longer where we know they do better because of a community acquired infections. Or telehealth and having that discharge, they're still working with the speech therapist that was at the facility but now via telehealth in a more outpatient scenario, could that be the next innovation? What effect could this have in longterm care?

Are we gonna see that reverse happened in the 2020's? Are we gonna see the innovation? Big question mark, we don't know but it's exciting for you guys because regardless, this is a population that could really need your help. When we look at mechanical ventilation, we were gonna discuss this anyway with polypharmacy but now with COVID-19, there's an even additional component of mechanical ventilation. Meta analyses have evaluated the role of mechanical ventilation in patients who did and did not survive COVID-19.

Some of those studies in the meta analysis, group patients based on age. Some of them grouped 'em based on survival rate and a few of them grouped patients based on how long they were in the hospital. In general, the study showed that between December 2019 and June 2020, that individuals with the more severe, critical forms of COVID-19 that were older than 50 years, had a 40 to 75% likelihood of requiring invasive mechanical ventilation and again, that should be intuitive. They were more severe. They have that cytokine storm, they have those respiratory components. They require a more invasive version of mechanical ventilation as opposed to a nasal cannula or oxygen delivered by the oxygen mask, which is considered noninvasive

mechanical ventilation. And these meta analyses were reviewed from studies across the globe, many countries, lots of situations and many different types of patient populations. And across all cases of COVID-19 that were hospitalized, these patients were less likely to survive COVID-19 and they have that 50 to 75% greater likelihood of having that invasive mechanical ventilation, because they had a more severe form of the disease. What I wanna point out here is the opposite. What about those individuals that survived? That 25 to say, 50%, 60% here, That 25 to say, 50%, 60% here, 25 to 60% of individuals that had the severe form of the disease, that were over 50 years and had the invasive mechanical ventilation and survived. How might you be important in their rehabilitation? That's what we've been talking about today. So overall, as we finish up here on our last two slides and we do have time to take questions.

That is so great, I tried to time it so you'd have time for some questions. Overall, the multi morbidity, the comorbidities that were associated not only with polypharmacy but COVID-19 fall into hypertension, diabetes and other cardiovascular diseases. Populations that you're likely to see, patients who have cardiovascular disease, diabetes and other forms of hypertension, which can lead to myocardial infarction and heart attacks or ischemia. These patients take a lot of medications anyway, especially diabetes but as heart disease begins to progress into that cerebral vascular disease as well and even end-stage renal disease, these patients are likely to be taking five or more medications.

And those individuals, we know are the most at risk of COVID-19, catching it, needing to go to the hospital because their immune systems are compromised just from having these comorbidities, they're more likely to catch it, they're high risk. They're more likely to go to the hospital, they're more likely to have lots of medications to begin with and just the act of being sick, even if they survive can be quite a physically traumatic experience. The rehab disciplines are vital in these populations. Patients on the noninvasive or the invasive, even in the absence of COVID-19 are likely to have multi

morbidities and polypharmacy. So we previously discussed that inpatients that were at risk of COPD, so you can extrapolate that here and see in the part one, what we talked about. You can take that even further here in part two with the neurological system, how we can see a perfect situation where aspirating is likely. Remember that mechanical ventilation, and I will finish that up here on our last slide before we get into the summary, mechanical ventilation dries out the oral and pharyngeal cavities. I said that about halfway through this talk. So when it's dry, when the person has issues possibly with generating saliva, the balance of the oral and pharyngeal cavities is off. With the virus, there might be those secondary infections we talked about in part number, part one other bacterial and microbial issues especially if they have dentures. All of these can create a situation where this patient might be aspirating and this can increase the likelihood of aspiration pneumonia. So they can have those possible other concomitant oral and pharyngeal infections.

Again, these are very important things for you to keep in your head as you are evaluating 'em. It helps you put on that investigator cap, open your eyes, open your ears and just look a little further at your patient to see, is this patient at risk of dysphagia, aspiration and aspiration pneumonia? If the answer's yes, what might I be able to do? And these are questions for you, what does mechanical ventilation do to that respiratory neurological system in aging patients? I've sort of alluded to some of that here. This is what I hope you ask yourself and you continue to look at in the literature. What is the role of the interdisciplinary care team in longterm care in that next five to 10 years? Again, it could be returned to skilled setting. It could be expansion of home health, where home health uses rehab more or it could be that outpatient telehealth scenario where you facilitate that transition. And how will this overall impact health care in the next decade? So there exists a definitive relationship between the neurological effects of COVID-19 and dysphagia and there exists a definitive relationship between neurological dysphagia and polypharmacy. What we've shown you here is that there is a definitive relationship among; elderly patients with

neurological dysphagia, the likelihood that they're taking lots of medications anyway and especially if they're survivors of COVID-19. So I've included the references here. What I want you to look at as a clinical community, it's upon us to imagine those longterm effects and what we can expect coming in the next number of years as this virus has a pervasive impact on the community. And we can reimagine the roles of the rehab team and how will this impact the trend towards home health and away from skilled care? Will there be that reversal of some sort? So I've included these references here and I really hope you take a look at them and continue to read for yourselves as this pandemic continues. So we see here that your slide mentions there are five cranial nerves that are essential but I only see four.

So, we previously discussed, well, there are 12 cranial nerves. Those four, you see three of them plus the vagus nerve, those three cranial nerves are specifically related to dysphagia. The vagus nerve is secondarily related and we talk about the fifth one in the previous part, these are more peripherally related. And I wanna point that out, the vagus nerve. Again, you wanna remember things like breath rate and the primary and secondary muscles of respiration positioning, and some of those secondary ancillary effects that actually can come back in that evolving way and have a significant effect on the swallow. But there's three cranial nerves, particularly the trigeminal nerve, the facial nerve and the glossopharyngeal nerve. Those three specifically control very specific components of the swallow. And if you're gonna focus on any, please focus on those three but there are additional cranial nerves that you can look at. And again, secondarily, I would definitely look at the vagus nerve. Are there any other questions as we finish up here?

- [Amy] I'm gonna give it just a minute to see if anybody else wants to put a question in but I did want to let our audience know that excuse me, parts three and four will be, I believe on the 24th and 29th of this month, does that sound right Jeanna?

- [Jeanna] Yes, it should be next Thursday and then the following Tuesday, we put them on Tuesdays and Thursdays.

- [Amy] Exactly and I also wanted to let you all know that the recordings will be held, or will be made available after part four. So if you need to catch up on part one, I'm afraid you're gonna have to wait a little while until we've gotten parts one, two, three and four all done and then we'll release all those recordings at one time. So I am not seeing any more questions come in. Jeanna, thanks so much. I enjoyed being able to sit in for this part two and I'm really looking forward to parts three and four to complete our series. It's very timely information.

- [Jeanna] Thank you so much, this has really been great and I just wanna say again, this is the key. You guys are on the ground, you're the frontline. Clinicians, that can really make a difference, not only now but as the future unfolds here in the next number of years, because the longterm care community really needs you and the aging community really needs you. So thank you so much for letting me be here and to speak with you today.

- [Amy] All right everybody, well have a good day and be safe out there and we'll see you next time. Bye everybody.