Developing an Effective Treatment Algorithm for Synthetic Cathinone Reactions for the Antigo Fire Department

Lt. Mark McKinney

City of Antigo (WI) Fire Department, Antigo, WI

CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and appropriate credit is given where I have used language, ideas, expressions, or writings of another.

Signed: _____

Abstract

The problem was the Antigo fire Department (AFD) does not have a standardized treatment plan for the treatment of the acute synthetic cathinone (SC) reaction. The purpose of this research was to develop a treatment algorithm for the AFD to effectively treat the patient having an acute SC medication reaction.

Synthetic cathinones include: methylenedioxypyrovalerone (MDPV), mephedrone, and methylone. The abuse in Langlade County (LC) is mainly MDPV, which is commonly called "Bath Salts". LC and AFD have seen a marked increase in the misuse of SCs throughout the county. AFD used the combative patient protocols to treat to SC abuse patient and that protocol is a treatment that treats agitation and combativeness but is not seeded in vetted research.

AFD's treatment protocol contains diazepam to sedate. Using action research, this applied research project created a protocol for the EMTs of the AFD to treat a patient experiencing a SC reaction. Through questionnaires and interviews of medical directors, emergency room physicians, paramedic service directors, and synthetic cathinone users and their families the researcher will compare and contrast their input to answer the three research questions to identify the:

1. Signs and symptoms
2. Patient management cautions
3. Physical and pharmacological treatments of an SC adverse reaction

The Hypothesis of the project was: There is a more complete treatment protocol for treatment of SC abuse.

The results of the research project varied slightly from each research participant and having compared and contrasted their responses, a protocol with procedures for all levels of

Wisconsin emergency medical responders were created. This protocol includes three pharmacological treatment options. The first option for mild cases is sedation using benzodiazepines. The second option for more severe cases would include the use of ketamine. The third option is procedural paralysis and airway control.

Table of Contents

List of Tables

Table 1: Appendices List

Appendix	Name	Title
Appendix A	Questionnaire	ER Physicians …….
Appendix B	Questionnaire	Users\Family……
Appendix C	Questionnaire	Medical Control Physicians…….
Appendix D	Questionnaire	Law Enforcement……
Appendix E	Questionnaire	Service Directors……..……
Appendix F	Protocol	Agitated Reactions to……..

Introduction

The problem was the Antigo Fire Department (CAFD) does not have standardized treatment plan for the treatment of the acute synthetic cathinone medication reaction. The purpose was to develop a treatment algorithm for the Antigo fire Department to effectively treat the patient with an acute synthetic cathinone medication reaction.

The Hypothesis of the project was: There is a more complete treatment protocol for treatment of SC abuse

Action research will be used in this research project to assist in the development of a treatment protocol for the patient experiencing an acute synthetic cathinone medication reaction. Action research is to take action to solve an existing problem and/or to improve performance. Action research does include a product being produced ("Executive Fire Officer Program - Operational Policies and Procedures - Applied Research Guidelines," 2013, p. II-15).

This research will address the following research questions:

1. What are the signs and symptoms that are associated with acute synthetic cathinone medication reactions?
2. What are the cautions in dealing with the acute synthetic cathinone medication reaction patient?
3. What is the appropriate advanced life support care for a patient in an acute synthetic cathinone medication reaction?

To answer the research questions several interviews of law enforcement personnel, medical control positions, emergency room doctors, paramedic service directors, and synthetic cathinone users and their families will be completed. These interviews will then be compared, contrasted and then their answers will be compiled to determine the signs and symptoms, the

cautions, and the appropriate advanced life support care for a patient in acute synthetic cathinone medication reaction.

Being a pre-hospital paramedic is an inherently dangerous occupation that involves dealing with high stress calls involving medical and trauma patients. Every emergency medical services (EMS) call can involve a life-threatening situation for the patient, the family, or the pre-hospital EMS provider. These situations can involve unsafe trauma scenes, critical life-threatening medical scenes, hazardous materials, and environmental hazards, also can involve physical hazards from trips, falls, heavy lifting, traffic hazards, communicable diseases, and patient on provider violence. For most of its history EMS service has treated the job related dangers as a badge of honor and merely a part of the job. Pre-hospital EMS providers have often raved about these unsafe scenarios and share them amongst others as a badge of courage.

EMS providers continue to respond to emergencies that demand specific procedures to create a safe environment for the provider and also effectively treat the patient. Ems crews also have to adjust their attitude about the patient's well-being and the safety and well-being of the pre-hospital EMS provider crew that has changed drastically from the beginning of EMS. The Antigo fire Department has recognized the importance of prehospital care guidelines for specific illnesses and injuries. These protocols aid in the consistent delivery of services and also the reduction of stress felt by the paramedic when delivering prehospital services. The protocols range from the basic wound care all the way to paralyzation and rapid induction of a secured airway. These protocols cover both injuries and illnesses.

It is the mission of the Antigo fire Department is to deliver the best possible service to our customers, treating ourselves and our customers expect, patients, and consideration.

> We pledge to our community that we shall always strive continually improve our skills and our customer service performance. ("AFD Mission Statement," 2007, p. 1)

This mission is being accomplished by this research project by developing a protocol to ensure that the Antigo fire Department is continually improving our skills and our customer service performance.

Background and Significance

The research problem links with the Executive Analysis of Community Risk Reduction 2nd year course by identifying a community risk and using an applied research project (ARP) to reduce the impact of the specific hazard. This ARP addresses the third United States Fire Administration (USFA) strategic goal to "Improve the fire and emergency services' capability for response to and recovery from all hazards" ("USFA Strategic Plan," 2014, p. 13) by creating and preparing standardized treatment protocols to aid in the systemic and organized management of the SC abuse patient.

The city of Antigo is a rural city located in the Wisconsin River valley in the Northcentral section of Wisconsin. The city was incorporated in 1885 and the AFD was founded as a full-time paid organization in 1903. The City of Antigo was built upon two basic trades, timber and farming. Currently the city of Antigo has a population of 8,156 and 3,972 housing units according to the 2010 census. The city of Antigo also has 19.1% of its population over the age of 65, compared to the State of Wisconsin's 13.7%. The city of Antigo per capita income is $19,013 compared to the Wisconsin state average of $27,192 (Census.gov, 2013, p. 1).

AFD is a full service fire department that delivers fire protection service to the city of Antigo, and provides Critical Care Paramedic care transport and interfacility transport to the 432 square mile western half of Langlade County. The AFD also provides interfacility transport from

Langlade Hospital and several local nursing homes. The AFD has one station with three shifts with a total of 17 full time staff and 10 paid on call Emergency Medical Technicians (EMT). These EMTs range from the emergency medical technician basic to the emergency medical technician critical care paramedic. Two of the three shifts have six personnel consisting of one lieutenant and five firefighter\EMT's, the third shift had five personnel consisting of one lieutenant and four firefighter\EMT's. The normal shift size is six members, but due to budgetary problems one firefighter\EMT position was not filled and left open. The final two members of AFD are the fire chief and our administrative assistant. The AFD responds annually to over 2000 fire and EMS calls for service. In an average year of those 2000 calls 1900 runs are ems calls and 100 are fire calls, service call, false alarms, etc.

In the early 2000's AFD experienced a large amount of heroin overdoses and deaths in our community so much so that keeping Naloxone, an opiate antagonist, in stock became a challenge. As enforcement became more effective and heroin became harder and harder to acquire, our community like others, found synthetic designer drugs be an adequate and much more accessible replacement for heroin.

Like synthetic cathinones, a sister designer drug called synthetic cannabinoids which comes with a brand name of K2 became the initial replacement for the heroin users. K2 is a liquid synthetic cannabinoid that is added to a green leaf media and then like marijuana itself smoked to achieve the cannabis high user is trying to achieve. In the early years of K2 usage, K2 could be purchased over the counter at many gas stations and bars sold as safe replacement for marijuana. During the popularity of K2 the AFD did not experience very many K2 related overdose calls, when we did we found the patient to be experiencing extreme paranoia, agitated behavior, and often presented with physical aggression towards the family, law enforcement, and

the emergency medical staff. In 2012 K2 was made illegal in the United States which made K2 more difficult to acquire for the mainstream user. Even though synthetic cathinones and K2 are not in the same family of illegal drugs it is important to note that both synthetic cathinones and K2 are synthetic designer drugs and are created in the laboratory and not naturally derived.

The discussion of laboratory created synthetic designer drugs has to include the difficulty of prosecution. K2 as with synthetic cathinones offers law enforcement a significant challenge because the laws determining illegality move slower than the iterations that are being grown in nature. The designer drug dealing community have been able to stay ahead of law enforcement by subtly adjusting the chemical properties of both K2 and synthetic cathinones to ensure that the current version of the either stays in a legal form, or remains legal until the legislative bodies make the current version illegal. By the time the current versions of synthetic cathinone are made illegal there will be many other chemical structure adjustments to the synthetic cathinone chemical to make it easier for the designer drug delivery machine to not only promote synthetic cathinones as safe but also as a legal alternative other illegal illicit drugs.

Methylenedioxypyrovalerone (MDPV) which also goes by the slang name bath salts is considered to be a synthetic cathinone sold in crystalline form either under the names: bath salts, plant food and other less commonly used slang names. Like K2, MDPV was sold openly in many gas stations and bars in the Antigo and Langlade County community.

Interviewing law enforcement officers in the northern section of Wisconsin it became apparent that the bath salt problem is extensive in Langlade County but is uncommon in northern Wisconsin including counties that border Langlade County. It would be expected to see a drug issue in one county run over to the neighboring counties, but discussing this with law enforcement personnel it turned out to be false. According to Investigator Chad Collinsworth of

the Lincoln County Sheriff's Department (WI) he could not indicate any synthetic cathinone response either in the medical field or from the Lincoln County Sheriff's office (C. Collingsworth, personal communication, May 21, 2014). Speaking with Lieut. Gary Schneck from the Marathon County Sheriff's Department (WI), Lieut. Schneck echoed the same message given during the interview with Investigator Collingsworth (G. Schneck, personal communication, May 23, 2014). Both investigator Collingsworth and Lieut. Schneck both indicated that investigator Dan Bauknecht from the Langlade County Sheriff's Department (WI) would be the best reference in the state in regards to the use of synthetic cathinones. Both Lieut. Schneck and investigator Collingsworth both indicated that synthetic cathinone abuse is mainly a Langlade County problem, and moreover a city of Antigo problem.

Literature Review

Developing an Effective Treatment Algorithm for Synthetic Cathinone Reactions

It would be amiss in talking about synthetic cathinones if we did not discuss khat. Khat is a flowering plant that is native to the Horn of Africa and the Arabian Peninsula. For centuries the native population has cultivated, grown, and ingested khat as a way to achieve a stimulant high. Like marijuana and opium, khat is a naturally growing plant. The users of khat chew the leaves to achieve an amphetamine like high. When chewed khat releases a monoamines alkaloid called cathinone. "The main psychoactive ingredients in khat are cathinone and cathine. These chemicals are structurally similar to amphetamine and result in similar stimulant effects in the brain and body, although they are less potent" (National Institute of Drug Abuse [NIDA], 2014, p. 1).

Chewing khat can leave the user in a state of euphoria and elation during the affected life of the drug. Generally, khat's effects last about 90 minutes to three hours but can last up to 24

hours on occasion. After the cathinone is reduced under its therapeutic dose the user may experience depressed mood, irritability, decrease in appetite, and prolonged difficulty sleeping. During khat's effects the user can also experience stimulant like problems include elevated heart rate, elevated respiratory rate, elevated blood pressure, and activation of the sympathetic nervous system. Like methamphetamine and synthetic cathinones, organic khat will cause periodontal disease along with tooth decay. Because of the sympathetic nervous system activation users of khat and synthetic cathinone will experience gastrointestinal problems such as ulcers, constipation, and irritable bowel syndrome (NIDA, 2014, p. 1).

In the United States khat is illegal not because of the plant itself but because the plant contains cathinone which is a Schedule I narcotic, meaning there is no medical use for the chemical and it has a propensity to be highly addictive.

Bath salts is a synthetic version of the cathinone found in khat. There are many versions of synthetic cathinones. The two main versions are mephedrone (MMC), and methylenedioxypyrovalerone (MDPV). This literature review will deal specifically the medication reactions in patients who have been using MMC and MDPV.

Synthetic cathinones are not new chemicals. The 1st synthetic cathinones were developed in France in the 1920s. After a relatively short use window the medication was held in obscurity until a chemist found and published the recipe for synthetic cathinones on the Internet in 2004. The webpage was subsequently removed, but the recipe and the technique was now on record again and many clandestine labs began creating synthetic cathinones.. The first version that was clandestinely created was called hagigat. Hagigat was considered a synthetic cathinone and had the chemical name of benzolethanamine. Production of MMC and MDPV slowly increased in scope and size over the next five years until the prevalence of MMC and

MDPV started showing up as overdoses in our emergency rooms settings and in the field by our ambulance crews.

Both the labs and the delivery agents named the synthetic cathinones a less dangerous sounding name like bath salts or plant food. Synthetic cathinones were not illegal in the United States until the drug enforcement agency listed certain version of synthetic cathinones on their list of Schedule I drugs. This listing was done on a temporary basis. During the synthetic cathinone problem the packaging of synthetic cathinones were directed as non-personal use as bath salts, plant food, and other warnings to use for nonhuman usage. These classifications were done to avoid enforcement issues with the Food and Drug Administration (FDA). To this day synthetic cathinones are still being package in small amounts and still being listed as not for human consumption.

The drug enforcement agency indicates that the packaging:

> Are sold in powder form in small plastic or foil packages of 200 and 500 mg under various brand names. Mephedrone is a fine white, off-white, or slightly yellow colored powder. It can also be found in capsule or tablet form. MDPV is a fine white or off-white powder. (Drug Enforcement Agency [DEA], 2014, p. 1)

One of the problems that emergency medical services have had with the treatment of synthetic cathinones is not only the relative newness of the product, but the difficulty of enforcement and overall knowledge of the scope of the problem. Even though the chemical was created in the 1920s the almost 85 year lag between invention and dissemination it has put enforcement in a constant struggle to remain ahead of the manufacturers. Unlike drugs like heroin and cocaine that are made with a natural process, synthetic cathinone are made in the laboratory and the illegalization of one chemical compound leads to a development of a similar

acting compound with a slightly different chemical structure. Even before a version of the synthetic cathinones can be made illegal there are already are other versions being produced and manufactured. When the law is written for a version of the synthetic cathinone that product is generally removed from the market and replaced with the slightly altered replacement version. The enforcement then starts again with the new chemical variation and the manufacturers again begin to modify strain of synthetic cathinone. The manufacturers have figured, and the law used to be on their side because the compounds that were not yet illegal, were still legal to produce and distribute. Cocaine is always cocaine; once it was illegal it was very easy for enforcement to keep it illegal. Synthetic cathinones often take 10 months for a specific compound to be rendered illegal. According to the DEA they have successfully placed three compounds on Schedule I drug list. Scientists at the DEA have identified more than 60 versions of synthetic cathinones that are being manufactured currently (NPR Staff [NPR], 2012, p. 1).

To help the DEA be more proactive in the enforcement of synthetic cathinone the DEA's lab has begun to create their own versions of synthetic cathinone to help quickly identify new synthetic cathinone compounds before they become prevalent in the street and allow a quicker return in the legality of compounds. The problem that the DEA has experienced is the chemicals that are being created in the lab beaker size, are being created by clandestine manufacturers by the vat full. Until DEA identifies a chemical compound version of synthetic cathinones and completes the legal process in place that compound on the schedule of illegal drugs the manufacturers are essentially using legal compounds and freely distributing different versions of synthetic cathinone.

As of June 2013 international law has banned 231 of the known 251 known synthetic cathinone compounds.

One of the major hurdles that the law enforcement, hospital, and prehospital providers have with treating the synthetic cathinone reaction patient is not only the effects on the body but also the unpredictability of the medication itself. Cathine and cathinone are both central nervous system stimulants and cathine and cathinone are in the same relative family as ecstasy and methamphetamine. Even though synthetic cathinone has the same physiological and pharmacological reactions in the body that methamphetamine has, cathinones reactions tend to be on a smaller scale. According to Coppola's and Modola's paper on synthetic cathinones they explain the pharmacology like this: "these alkaloids (cathine and cathinone) cause the release of catecholamines from the presynaptic storage sites in the central and peripheral nervous system (Coppola & Mondola, 2012, p. 145). There is also indication that cathine and cathinones has some monoamine oxidase inhibition effects. The inhibition of monoamines oxidase reuptake also aids in the euphoria felt by the user. Monoamines oxidase inhibitors have been used to combat depression for a multitude of years. The literature review also points to an increase in blood pressure and heart rate, psychomotor hyperactivity, alertness, and paranoia (Coppola & Mondola, 2012, p. 145) .

What makes the usage of synthetic cathinone attractive to the user are increase sociability, energy, libido, sexual performance and capacity of work, limited euphoria, and empathy. On the opposing side users also report negative effects such as: prolonged panic attacks, tremors, agitation, insomnia, nausea, headache, tinnitus, vertigo, muscle twitching, dizziness, increased heart rate, altered vision, confusion, short-term memory difficulties, anhedonia, suicidal thoughts, depression, psychosis, tolerance and dependence (Winstock, Mitcheson, DeLuca, & Marsden, 2010, p. 154).

Along with the short-term effects there are some deleterious short-term and long-term acute or chronic effects that a user of synthetic cathinone may experience during their use. Some of these long-term effects are: acute coronary vasospasm leading to a shunting of blood supply in the left, right, and circumflex coronary arteries. These acute coronary vasospasms could result in a premature acute myocardial infarction and could lead to sudden cardiac arrest and death. Also, a chronic user could experience chronic sympathetic nervous stimulation symptoms.

The autonomic nervous system is broken down into two different sections. The 1st section is called the sympathetic nervous system and colloquially named the fight or flight reaction. The 2nd section of the autonomic nervous system is called the parasympathetic nervous system. The parasympathetic nervous system is also called the feed and breed reaction. The sympathetic nervous system does exactly what it claims to do. It either provides the ability to fight or the ability to flee harm's way. This is the same reaction that a person would feel before stepping onto stage, participating in a sporting event, or even walking down a dark alley in a bad part of town. Some signs and symptoms of the sympathetic reaction include: pupil dilation, increase of rate and contraction, expanding of the bronchioles in the lungs, constriction of the gastrointestinal organs leading to removal of hunger, prevents peristalsis, increases renin secretion which in turn increases blood pressure, and also promotes ejaculation. As with khat this stimulation of the sympathetic nervous system on a habitual scope can lead to not only gastrointestinal problems including ulcers, constipation, and stomach upset, but can also lead to periodontal disease and dental caries. One of the side effects of the central nervous systems activation of the sympathetic nervous system is the reduction of the production of saliva. Because of the intent of the sympathetic nervous system to slow or halt the digestion of food the production of saliva is not of great import. This fight or flight reaction only lasts a short amount

of time and the saliva production resumes. In the mouth, one of the important things saliva does besides digestion is the prevention of dental caries. When a person is abusing stimulants that mimic the sympathetic nervous system like synthetic cathinones does the user experiences a prolonged sympathetic response which like the natural response slows or halts the digestive tract and reduces greatly the amount of saliva that is produced by the saliva glands. Without this saliva the body has an inability of protecting itself from the acids, the sugars, and the bacterial waste that causes tooth decay and periodontal disease.

Physiologically, long-term synthetic cathinone usage may induce abuse, body tolerance, and psychological and physical dependence. Synthetic cathinones tend to have the same reaction in the body as methamphetamine does but does not carry the strength of the methamphetamine reaction. The release of catecholamines, the activation of the sympathetic nervous system, and dependence are all present in synthetic cathinone usage but not to the extent that methamphetamine carries (Folton & Schuster, 1982, p. 146). The synthetic cathinone like methamphetamine releases catecholamines such as dopamine, serotonin, and norepinephrine. There are also concerns that usage of synthetic cathinone can exacerbate mental illnesses and provide some of the reactions that we have seen in the news for the last couple years. The stories range from the woman who urinated on a $30 million painting in a museum, a man skinning himself, and most famously, the brutal attack by a naked synthetic cathinone user on a homeless man where the attacker physically attacked the homeless man and chewed a large portion of the homeless man's face off. What studies have shown is that people that are mentally ill may have an exacerbation of the mental illness when under the influence of synthetic cathinones like MMC and MDPV.

Even acute usage of synthetic cathinone can inflict damage both transient and permanent on the user's body. According to Borek and Holstege these acute reactions can include: psychomotor agitation, motor automatisms, Parkinsonism, tremors, tachycardia, chest pain, ST segment changes, hypertension, hyperthermia, mydriasis, dizziness, delusions, paranoid psychosis, depression, panic attacks, and long-term changes in cognitive and emotional stability, rhabdomyolysis, abdominal pain, vomiting, kidney damage, hypernatremia, headache, cerebral edema and seizures (Borek & Holstege, 2012). There have also been reports of peripheral vasoconstriction leading to rashes, the coloration of the skin, and bruxism.

There have been several cases of fatalities with use of synthetic cathinones but in many cases the synthetic cathinone was not the only drug in the system (Coppola & Mondola, 2012, p. 146).

Because of the acute and chronic reactions for the synthetic cathinone user the ability for dependence and addiction is increased. Studies have shown that with increased usage of synthetic cathinone the user’s body becomes tolerant of the drug to the extent that a higher and higher dose must be administered to achieve the same result. Patients who experience a sudden stoppage of usage can experience craving and withdrawal symptoms that can include agitation, tremors, and delusions.

The first section of the protocols will deal with the signs and symptoms that the Antigo fire Department will expect to see when dealing with a person either in acute, chronic, or withdrawal type symptoms. The concern with developing a protocol dealing with such a variety of symptoms is the fact that a document like a protocol needs to be concise and relatively easy to locate information. With that in mind the protocol will not be able to identify all possible signs and symptoms, but through the literature review and the interviews with emergency room

doctors, medical control physicians, law-enforcement, and paramedic medical service directors this report should be able to provide an adequate list of the most prevalent and apparent signs and symptoms that should be present during a synthetic cathinone medication reaction.

The most common modality of consumption of synthetic cathinones is snorting, and ingestion. Inhalation, sublingual, and rectal are also methods that users describe using to administer synthetic cathinone (Carhart-Harris, King, & Nutt, 2012, p. 20). Studies have found that using routes other than oral may provide a high that is shorter in duration that either insufflation or ingestion. Even though the non-oral routes might give a user a shorter duration high the effects on the body are identical no matter which route is utilized. Since synthetic cathinones have a relatively short duration it is very common for the user to redose to remain in the euphoric state that synthetic cathinones deliver.

Users have listed many other drugs that are administered along with the synthetic cathinone. It is very rare for a person to abuse just synthetic cathinone without any other legal or illegal substance. Users have claimed to use cocaine, amphetamines, methamphetamines, caffeine, hallucinogens, kratom, other synthetic cathinones, alcohol and beta blockers, GPL, zopiclone, pregabalin, famotidine, omeprazole, domperidone, opiates, cannabis, and benzodiazepines. Some of these medications are used to increase the euphoric state or to increase the amount of time between re-dosing, some are used to counteract side effects, and some medications are used to provide alternate intended effects. The alcohol and beta blockers are taken by synthetic cathinone users to help reduce the possibility of tachycardia with the administration of the synthetic cathinone. Zopiclone is often taken to produce visual hallucinations to aid in the euphoric state. Pregabalin, famotidine, omeprazole, domperidone are

all antiemetic and are used to combat the stomach pain and nausea that often accompanies synthetic cathinone usage ("Drug Forum," 2014).

When developing a protocol to combat the synthetic cathinone use the primary goal of emergency treatment was treating the signs and symptoms of synthetic cathinone abuse. These main signs symptoms are categorized as a sympathomimetic syndrome. Signs and symptoms of sympathomimetic syndrome include tachycardia, education, hypertension, help patients, chest pain, hallucinations, paranoia, violent behavior, and seizures (Spiller, Ryan, Weston, & Jansen, 2011, p. 500). Generally these treatments have targeted the combativeness and the hypertension of the patients suffering a synthetic cathinone adverse reaction case. According to Spiller, Ryan, Weston, and Jansen their study reported an increase in level of aggressive violent behavior, paranoia, and hallucinations in higher percentage of cases than reported in other studies (Spiller et al., 2011, p. 502).

Along with the myriad of symptoms of acute synthetic cathinone usage the prehospital provider must be aware of the occurrences of rhabdomyolysis and hyperkalemia. Rhabdomyolysis is initially managed by fluid administration and possible urine alkalinization with the use of sodium bicarbonate. The treatment with fluids is to ensure the health of the kidneys and preventing the interruption of fluid retention and absorption in the kidneys. Hyperkalemia can also be treated using standard advanced cardiac life support (ACLS) guidelines based on characteristic changes in electrocardiogram (EKG) (American College of Emergency Physicians [ACEP], 2009, p. 19).

The protocol for the Antigo fire Department will encompass three different levels of synthetic cathinone adverse reactions. The 1st level is used to calm the patient and reduce their anxiety. In the protocol the Antigo fire Department will be classifying this type of case as a level

I adverse reaction treatment protocol. According to Medscape, and Internet reference from the American Academy of Emergency Medicine, the treatment for a mild case of synthetic cathinone adverse reactions is mainly supportive care. Medscape suggests aggressive sedation with benzodiazepines helps alleviate patients were suffering through agitation, seizures, tachycardia, and hypertension (Cheng, Yeo, Brown, & Regan, 2012, para. 6). It is also recommended by the California poison control system that fluid resuscitation should be initiated to help with dehydration and cooling. Through the state of Wisconsin the Antigo fire Department paramedics can administer diazepam, lorazepam, and midazolam. Currently, the Antigo fire Department carries both diazepam and midazolam or treatment protocols for the paramedics.

Part of supportive care is managing hydration status. It recommended by the California poison control system that fluid resuscitation should be initiated to help with dehydration and cooling ("Bath Salts," 2011, p. 1).

After administration of aggressive benzodiazepines it may become necessary for the paramedic to proceed on to the level to adverse reaction treatment protocol. A patient that would fall into this level may have not responded appropriately to the aggressive benzodiazepines doses and/or may be exhibiting hypertension that is uncontrolled during the sympathomimetic syndrome. Patients who enter into this level 2 protocol can receive medications to help assist in the reduction of the hypertension and the aggressive violent behaviors that still may be present at this time. To help control the aggressive violent behavior that still may be present after aggressive benzodiazepines administration it is recommended to be able to give ketamine as a disassociative relaxant. Dr. Scott Weingart in the Emcrit podcast states: Ketamine at this time is an ideal candidate to aid in the sedation and relaxation of the patient. Medications like diazepam can have adverse effects on the patient like blunting patient respirations or reducing airway

reflexes. Ketamine on the other hand does not carry any respiratory depression (Weingart, 2011, para. 5). There are two different doses for ketamine, there is the correct dose, and an under dose. Unlike most medications that initiate a disassociative affect it is impossible to overdose ketamine.

If the patient is exhibiting extreme hyperthermia Cheng, Yeo, Brown, and Regan also recommend either passive or active cooling to reduce or control the hyperthermia caused by overactive body systems (Cheng et al., 2012, p. 6). Active cooling could include procedures like application of ice packs to the groin, armpits, and the posterior aspect of the knee. Applying cool sterile water to the patient may increase evaporative cooling. Cooled intravenous (IV) fluid or a cooling blanket could also be used to assist in managing the high levels of hyperthermia. Passive cooling can be as simple as turning on the air conditioning in the ambulance or removing layers of clothing. Level 2 patients should also receive either a 4 lead or a 12 lead electrocardiogram to help identify life-threatening arrhythmias (Cheng et al., 2012, para. 7).

Patients experiencing an acute synthetic cathinone adverse reaction may have hypertension that may venture into the dangerous range where stroke or other pressure related syndromes may begin to affect the patient's outcome. In speaking with Elaine Ernst from the Wisconsin Poison Control Center she stated the best treatments for hypertension in a synthetic cathinone adverse reaction case begins with sedation, mainly benzodiazepines. Ms. Ernst stated that generally with administration of benzodiazepines the hypertension usually is self-correcting. Although she continued to state that if the hypertension was refractory to the sedation than an ambulance may treat the hypertension with the available medications. In her experience she hasn't seen hypertension that was not corrected with benzodiazepine (E. Ernst, personal

communication, May 10, 2014). The Antigo fire Department carries sprayed nitroglycerin, intravenous nitroglycerin, and Metoprolol.

The patients that continue to show the signs and symptoms of sympathomimetic syndrome, especially agitation and violent behavior and were refractory to both level 1 and level 2 treatments may be a candidate for the 3rd and final level of treatment for the acute synthetic cathinone adverse reaction protocol. The 3rd level of treatment protocol is reserved for those who are still combative or greater control needs to be exerted onto the patient. At this point it is recommended that chemical restraint in the form of rapid sequence induction occurs to completely control the patient. Rapid sequence induction involves three distinct steps. The 1st step in rapid sequence induction is to provide sedation to the patient. If the patient has been treated by the Antigo fire Department paramedics, and if the paramedics have been using the 1st and 2nd level treatments then there should be adequate sedation already administered to the patient to continue on with the 2nd step. The 2nd step involves systemic paralyzation, which includes the arresting the respiratory muscles. There are two types of paralyzing agents that are common in rapid sequence induction: depolarizing and non-depolarizing. Succinylcholine is generally the standard depolarizing paralytic. Succinylcholine is used generally in all cases that require rapid sequence induction to the exclusion of patients with increased cerebral pressure. In the case of elevated cerebral pressure a non-depolarizing paralytic can be used. These medications are Vecuronium or Rocuronium. Both Vecuronium and Rocuronium provide the paralysis needed for induction but the paralysis time is greater than with succinylcholine. The concern with using Vecuronium or Rocuronium is the length of the paralysis; in contrast Succinylcholine's paralysis lasts five to eight minutes. Vecuronium and Rocuronium can last up to a half an hour. After sedation and paralysis the induction of the endotracheal tube is complete.

After confirmation of the tube placement the 3rd step in the induction process is continued paralysis and sedation. The medications used for the 3rd step are: midazolam, Fentanyl, and Vecuronium. These medications are re-administered to ensure paralysis and sedation of the patient (Ricker, 2011, p. 1).

The final portion of level three treatment would be physical restraint. Patients who are refractory to all treatments does far and are still paranoid, agitated, or violent should be physically restrained with soft restraints. The usage of soft restraints will be made as a collaborative effort between the paramedics on scene and the medical control physician. According to EB Medicine patients can be physically restrained if one or more of these indications are met ("The Violent Patient," 2014, p. 1).

1. To prevent imminent harm to others
2. To prevent imminent harm to the patient
3. To prevent serious disruption of the treatment program or significant damage to the environment
4. As part of an ongoing behavior treatment program

Table 2: Antigo Fire Department Standard Dose Chart

	Name	Dose	Re-dose
Benzodiazepines			
	Diazepam	5-10mg	Repeat as necessary
	Lorazepam	2-5mg	Repeat once
	Midazolam	2-5mg	Repeat as necessary
Disassociative Agents			
	Ketamine	1-4.5mg\kg	Repeat as necessary
	Etomidate	0.3mg\kg	Single dose
Paralytics			
	Succinylcholine	1.0-1.5mg\kg	Single Dose
	Vecuronium	0.1mg\kg	Repeat as necessary
Anti-Hypertensive			

	Nitroglycerin	0.4mg spray	Repeat twice
	Metoprolol	5mg	Repeat Twice
Analgesics			
	Fentanyl Citrate	50-100mcg	Repeat as necessary

Source: (Antigo Fire Department [AFD], 2014)

Pharmacology

When we look at the pharmacological goals of managing a patient experiencing a synthetic cathinone adverse reaction there are many different treatments that are available to the paramedic. In (Table 1) the available medications currently in protocol for the Antigo fire Department paramedics are listed along with their dose.

Benzodiazepines

Benzodiazepines are the cornerstone of the treatment of combativeness and agitation in the pre-hospital setting. The three benzodiazepines that are available are: diazepam, lorazepam, and midazolam. (Table 1) Even though delirium tremens are generally not associated with acute synthetic cathinone reactions the treatments can mirror delirium tremens along with the contraindications and the expected side effects. In the original investigation *Management of Alcohol Withdrawal Delirium* the authors state "Control of agitation should be achieved using parenteral rapid-acting sedative-hypnotic agents that are cross tolerant with alcohol" (Mayo-Smith et al., 2004, p. 1405). The main side effect with benzodiazepines is the respiratory depression that can be associated with higher-level doses of either one or all of the benzodiazepines. Currently, the only reversal agent that is available in the prehospital setting is flumazenil. Even though flumazenil is available to EMS agencies it has become less and less a viable reversal agent due to the strict titration guidelines between achievement of respiratory stability and complete benzodiazepines blockade. Patients that receive flumazenil over and

above the level of respiratory stability can render the sedative properties of benzodiazepines inert and lower the threshold for persistent and temporarily irreversible seizure activity. Therefore the most effective management of a patient that develops a respiratory depressive state is to aggressively and competently manage the patient's airway by airway adjuncts and ventilations given by bag valve mask. Even though respiratory depression is an unwanted side effect, the sedative affect that a patient in that condition may be the exact mentation that is needed to control the agitation of the patient. Controlling this agitation may assist in keeping the hyperthermia at a manageable level, lowering the hypertensive state, and providing safety for the EMS crew and the patient.

Disassociative agents:

Ketamine and Etomidate are both in the class of disassociative agents. These agents cause a mental disconnect. According to the Excited Delirium Task Force ketamine is a viable agent to help reduce cases of excited delirium brought on by synthetic cathinone use. In their report they state "the disassociative agents ketamine can also be administered by the IV or intramuscular (IM) route and appears advantageous due to the very rapid onset (especially by the IM route when compared to other medications), and lack of significant respiratory and cardiovascular effects (American College of Emergency Physicians [ACEP], 2009, p. 12). Unlike benzodiazepines these disassociative agents help calm the agitated individual while supporting both the respiratory and cardiovascular systems of the body. Therefore the threat of respiratory depression is not present like benzodiazepines and the synthetic opioids present.

Paralytics:

The paralytics that the Antigo fire Department uses at this current time are used to facilitate intubation. Other than rapid sequence induction succinylcholine and Vecuronium are

not used to calm or sedate the patient in acute synthetic cathinone adverse reaction patient. In fact both succinylcholine and Vecuronium provide only muscle paralysis and provide no sedation or analgesia.

Antihypertensives:

Because of the catecholamine surge patients with an acute reaction to synthetic cathinones may exhibit higher than normal blood pressure. The treatment of an exceedingly high blood pressure may become a priority treatment. In treating hypertension the Antigo fire Department has both nitroglycerin spray and intravenous and also oral Metoprolol. It is a widely held belief that controlling the agitation with benzodiazepines or disassociative medications will have the side benefit of lessening the hypertension that can be associated with the acute adverse reaction to synthetic cathinone.

Analgesics:

Fentanyl citrate is the current analgesic that is commonly used within the protocols the city of Antigo fire Department. The paramedics have found that fentanyl is a powerful analgesic and can be used safely within normal ranges.

Antipsychotics:

Haloperidol is a medication that is being researched to be added within the protocols of the Antigo fire Department paramedic program. Haloperidol also known as Haldol is an antipsychotic medicine used for the sedation of agitated psychiatric patients, and can be administered by the IV or IM route (ACEP, 2009, p. 15). Haloperidol has not been a frontline pre-hospital EMS medication due to some significant cardiac side effects. According to the white paper on excited delirium haloperidol can cause QT segment prolongation which could precipitate ventricular dysrhythmias such as torsades de pointes. Along with the occurrences of

the ventricular dysrhythmias haloperidol also brings a slower onset of action than benzodiazepines and possibly carry some anti-cholinergic effects such as hyperthermia (ACEP, 2009, p. 15).

In Summary, the literature review started to show that there is more information regarding the treatment of SC abuse and moreover an agitated or combative patient than originally expected. The literature review allowed the researcher to tailor the follow up questions posed to the medical participants. Also the literature review revealed a link between methamphetamines, ecstasy, and bath salts and their relative common treatment modalities and signs and symptoms.

Procedures

This applied research project utilized the action research method for gathering information on the signs and symptoms of acute adverse synthetic cathinone reactions. This ARP also will attempt to develop a standardized protocol in which a patient with the signs and symptoms of an acute adverse synthetic cathinone reaction can be effectively treated. Action research is meant to solve an immediate problem and then produce guidelines for best practice. At the end of this research project the ARP shall produce a standardized protocol to aid in the assessment and treatment of synthetic cathinone adverse reaction patients.

The first part of this research project began with an expansive review of the existing research and literature dealing with the history of synthetic cathinones, the use and abuse techniques, reactions seen with use of synthetic cathinones, the threat to the prehospital provider, the signs and symptoms that are present in an adverse reaction synthetic cathinone patient, and accepted treatments. Doing this research it was apparent that not only would it be indicated to

include the signs and symptoms and treatments currently offered to patients experiencing synthetic cathinone adverse reaction but it was also appropriate to include the excited delirium patient in this action research. Excited delirium has been linked with both cocaine and methamphetamine use which both are closely linked with synthetic cathinone abuse. The reviewed materials consisted of a selection of textbooks, periodicals, Internet sources, interviews, podcasts, journal articles, and existing protocols. The literature searches were initially conducted at the National Fire Academy, Emmitsburg, Maryland. Additional searches were done through the Internet and the Antigo public library, Antigo, Wisconsin. The researcher use the catalogs at the National Fire Academy, Antigo public library, and that the Internet by using the search terms "synthetic cathinone", "excited delirium", "prehospital protocols", "catecholamine syndrome", "MDMA", and "MDPV" and various combinations of those search terms to locate journal articles and references.

A comprehensive search for other related information was conducted on the Internet using the above search terms using a variety of different search engines. Some of the search engines included Google.com, emedicine, Google scholar, drugs RX, and Medline. The articles that were used in this research were very helpful in describing the signs and symptoms and the potential treatments of both the synthetic cathinone adverse reaction patient and also patients experiencing excited delirium. These articles also provided an important resource for the indications, the contraindications, and the side effects of the different pharmacological treatments available to the prehospital EMS provider. The researcher did attempt to research specific cases that dealt with either prehospital care of the synthetic cathinone adverse reaction patient or emergency room care.

The 2nd part of this research was to identify medications that were available to the Wisconsin paramedic to assist in the treatment of the synthetic cathinone adverse reaction patient.

The research involves many interviews of different levels and occupations of interview candidates. The law enforcement and synthetic cathinone user interviews occurred at the Langlade County Sheriff's Department, the Langlade County jail, Lincoln County Sheriff's Department, and the Marathon County Sheriff's Department. The interviews of medical control physicians and emergency room physicians occurred at Langlade hospital, in Antigo Wisconsin, Aspirus medical Center in Wausau Wisconsin, St. Michael's Hospital in Stevens Point Wisconsin, and at the Antigo fire Department in Antigo Wisconsin. The interviews of paramedic service providers occurred at the Merrill fire Department in Merrill Wisconsin, the Wausau fire Department in Wausau Wisconsin, and the SAFER district located in Rib Mountain Wisconsin. Dr. Norrbom is the current medical director of the city of Antigo fire Department paramedic service and was included in the interview process. For a more detailed chart see “Table 3,4,5”.

The questionnaires are all listed in the appendixes in the back of this research project. The questionnaires include two different sections. The 1st section contains general questions that are specific to the interviewee. The 2nd section contains questions developed during the general question phase of the interview. These questions will be recorded and included in the appendixes. There will be some interviews that include the 2nd section and there will be some interviews that will not include the 2nd section. That will be determined on the effectiveness of the answers and whether the researcher needs to go more in depth with the interviewee.

Most of the research participants were members of law enforcement or the medical community. The others were members of the public that were either users themselves or family

of users. The user\family participants were given a release to sign to ensure the interviewees understood their responsibility as participants and possible liability that could occur due to their participation in the research project. This release was created using Internet resources with the aid of the city of Antigo police chief, Eric Roller.

There are some limitations to this research project. The treatments throughout the medical community for the patient experiencing an adverse reaction synthetic cathinone is poorly understood. From interviews and research it became apparent that there is very little specific treatment to synthetic cathinones. The treatments has generally been signs and symptoms related.

Results

Prevalence:

The biggest surprise this research paper revealed was the specificity of the bath salts problem. When I interviewed law enforcement, medical physicians, and service directors from the surrounding counties it became apparent that for the most part bath salts was a Langlade County problem. Doing a query into the patient demographics for the city of Antigo fire Department found on average two to three patients suspected of synthetic cathinone abuse per month. The law enforcement officers who work for the Antigo Police Department or the Langlade County Sheriff's Department indicated that their departments respond to at least one bath salt response each week. One of the research participants from Lincoln County stated that in the last three years he can only recall one case of synthetic cathinone (bath salt) possession or use call. Upon talking with the detective in charge of the Marathon County Sheriff's Department drug task force they echoed the same level of involvement that Lincoln County expressed. The detective stated that he could not remember dealing with any calls for synthetic cathinone use. He had indicated

that the majority of cases in Marathon County the problem surrounded methamphetamine use and cocaine use.

When speaking with the service directors from the Merrill fire Department, the South Area Fire and Emergency Rescue (SAFER), and Wausau fire Department they also indicated very little experience with synthetic cathinone abuse.

The results from the emergency room physician interviews basically indicated the same type of diversity, or lack thereof, which was shown in the interviews of the law enforcement officers and the service directors. The emergency room physicians from Wausau, WI Aspirus Hospital, St. Michael's Hospital in Stevens point, WI, Good Samaritan Hospital in Merrill, WI, and St. Claire's hospital in Weston, WI all stated having very little experience in seeing patients that were suspected of having synthetic cathinone involvement. It was becoming very apparent that the problem was centered in Langlade County. When the researcher spoke to the emergency room physicians at Langlade hospital they were able to recall several different patients that met the criteria for a patient suffering a synthetic cathinone reaction. This includes a patient that was released shortly before the interview of one of the emergency room physicians.

Each law enforcement agency the researcher spoke with directed the researcher back to Langlade County. Speaking with investigator Bauknecht he stated that bath salts is wreaking havoc on Langlade County and that a week does not go by when the Sheriff's Department is not dealing with someone in which the drug side effects are having a negative effect on their lives. Investigator Bauknecht also stated that coupled with ease of availability over the Internet, and the difficulty in enforcing a synthetic product it is very easy to procure. Investigator Bauknecht continued to reiterate that with new enforcement methods and developing laws the use, availability, and reach of synthetic cathinone will be lessened in the future. Speaking with law

enforcement officers the researcher wanted to know the basic methods that users and suppliers are using to both sell and buy synthetic cathinone. In Langlade County up until about one and one half years ago synthetic cathinone could be purchased at local gas stations or head shops legally over-the-counter. As it was stated above some of the products entering Langlade County were ordered over the Internet and shipped directly to the users or dealers home. This method of procurement was restricted over the last year by several laws that were created to combat the synthetic cathinone epidemic. Synthetic cathinones can still be purchased over the Internet, but it is illegal and the users and dealers are risking arrest and confinement. The selling of synthetic cathinones has been restricted to the same techniques as methamphetamine dealers used to distribute their product: hand-to-hand, word-of-mouth, and often in the dealers or sellers home.

Protocol availability:

The research participants responded almost unanimously that there was no specific guidelines set for synthetic cathinone abuse. The majority of the respondents from the hospitals and all of the EMS service directors stated that if they would experience a patient that they suspected was having a synthetic cathinone abuse adverse reaction that they would default to their combative patient protocol. One of the service directors had expressed to the researcher that their current combative patient protocol was very restrictive and would not be able to control a patient was having an adverse reaction to synthetic cathinone usage. The only medication that they could use was lorazepam IV. The service director expressed the difficulty it would be for his paramedics to have to initiate an IV line or a saline lock to allow them to give their standard dose of lorazepam IV.

Most emergency rooms and EMS services rely heavily on benzodiazepines to control their agitated patients. These agitated patients would include patients who would come in with

cocaine, methamphetamine, synthetic cathinone, or a myriad of other medications that cause agitation. The service directors that the researcher interviewed all had combative patient protocols.

When interviewing the emergency room physician from St. Michael's hospital in Stevens Point, Wisconsin the researcher found their protocols to be more expansive than the other local hospitals or EMS services which includes the Antigo fire Department.

The protocols created for this ARP will be explained in detail later, use an expansive and option driven protocol to treat the agitated or combative patient which would include a patient having a synthetic cathinone abuse reaction.

Part of the interview with emergency room physicians and medical control physicians was to ascertain whether they actively treated the hypertension that is often seen in patients while in an agitated or combative state often seen in synthetic cathinone abuse reaction patients. Unanimously the physicians in all the hospitals that I interviewed expressed that they would not treat the hypertension directly but would expect a decrease in the blood pressure due to overall relaxation of the body due to the disassociative agents or benzodiazepines given to the patient. All of the physicians stated that the blood pressure was a manifestation of the agitation and that if you control the agitation the blood pressure will naturally fall back into relative normal ranges.

For the most part the results of the research project mirrored the original hypothesis on many fronts. For the most part there is no real specific protocol that medical control physicians, emergency room physicians, or paramedic services utilize to treat and manage the synthetic cathinone abuser who is having an adverse reaction. Most treatments suggested by the participants were related to direct treatment of the signs and symptoms.

Signs and symptoms:

The 1st question that needed to be answered in this research project was to identify the signs and symptoms that are associated with synthetic cathinone usage. For the most part the majority of the respondents including the families of synthetic cathinone users listed basically the same signs and symptoms that they have experienced in the field, in the home, and in the emergency room.

Interviewing the research participants they mention the following symptoms: combativeness, agitation, confusion, delusions and hallucinations. They also listed some physical manifestations such as increased heart rate, increased blood pressure, cardiac related chest pain, and muscle pains. A medical control physician also related signs and symptoms that mimic excited delirium. Some of the signs and symptoms that the physician listed included sweating, hyper aggression, disorientation, hyperthermia, and possible death.

Speaking with the families of synthetic cathinone abusers they were able to delve deeper into the day-to-day signs and symptoms that they experience living with a synthetic cathinone user. Interviewing the family members indicated a long term antisocial behavior, a short temper, altered sleeping patterns, and a decreasing importance on physical hygiene.

One of the concerns that this research project wanted to address and recognize is the early identification of a synthetic cathinone user before the agitation or combativeness sets in. In general the research participants with exclusion of law enforcement all echoed the same sentiment that by the time they see the patient that is having a synthetic cathinone abuse reaction the agitation and combativeness is already begun and the pre-agitated state is rarely seen. In contrast law enforcement and family members of synthetic cathinone users often deal with

patients prior to this agitated and combative state and provided the best insight on the proper way to handle the patient to reduce the chance that the user will disintegrate into the agitated and combative state. Speaking with family members of synthetic cathinone users they spoke of a type of "walking on eggshells state" where the patient shows verbal and physical cues that indicate a short temper or show traits of being an angry person waiting to explode. Asking the family members what type of personality is best used with the patient who is using synthetic cathinones the families had unanimously said a calm reassuring voice is the best way to maintain or improve that on the edge personality. The families also stated that a strong forceful voice will often push the angry user into the agitated and combative state.

The law enforcement officers that were interviewed for this research project stated that some of the ways they utilize to spot a potential synthetic cathinone user are:

1. Change in physical emotions
2. Inability to listen and understand basic commands
3. Appearance of excess energy (wringing of hands, etc...)
4. Uncontrolled movements
5. Resistance to suggestion

Cautions:

The cautions for dealing with a patient in a synthetic cathinone abuse reaction centers around safety of the responder, safety of the patient's family, and safety of the patient. When interviewing the respondents they were able to add different cautions for the paramedic when dealing with a patient who is using synthetic cathinones.

When interviewing the law enforcement officers their primary caution to responders is the superhuman like strength that can occur with use of synthetic cathinone. When a patient

enters into the agitated and combative state they can become very dangerous to the responder and to the family and may require a retreat until a safe environment can be provided. The law enforcement officers also stated that when dealing with a synthetic cathinone abuse patient in their home that a keen eye should be kept to ensure there are no weapons available for the user to utilize against the responder or the family. Late in 2013 he Langlade County Sheriff's office responded to a home in the county for a man who was holding his family hostage with a gun and trying to create a suicide by cop situation. After the arrest, the perpetrator stated that at the time of the hostage incident he was frequently using bath salts.

Interviewing the EMS service directors the researcher was able to expand the cautions available to the paramedic. The cautions identified by the service directors included sharps hazards, communicable diseases hazards, and blood-borne pathogens hazards. Often, like most illegal intravenous medications the incidences of the human immunodeficiency virus (HIV) and hepatitis increase in the using population. When speaking with Merrill fire Department their only option to sedate the patient was to give lorazepam IV. Therefore the Merrill paramedics are risking needle sticks and exposure to blood-borne pathogens each time they need to try it sedate an agitated or combative patient. Any time that a paramedic has to initiate an IV or give a medication intramuscularly they risk the needle stick.

Expounding on the cautions illustrated by the user's family, law enforcement officers, and EMS service directors the emergency room physicians also added cautions that involve the problem over sedation and the resultant respiratory depression. The physicians also indicated that the patients that are most at risk of dying in police custody are those that are agitated and combative and has either fought or is fighting with law enforcement.

Once a patient is subdued it is very important to place the patient in a proper position to allow proper airway management and ability to breathe. The occurrences of deaths and breathing impairments from Hog ties, hobble restraints, or sandwiching the patient between longboards has stressed the importance on proper positioning and airway management. Speaking with medical control physicians they add when using physical restraints that they should be used without impairment of breathing or circulation. In the case that an officer restrains a patient with handcuffs the officer with the key must be present to ensure the ability to remove restraints if the patient's condition warrants release of the restraint.

During discussions with the respondents from the hospital it was also stressed that synthetic cathinone abuse or drug abuse are not the only causes of agitation and combativeness. When dealing with a patient who is agitated and combative it is important for the paramedic to do a proper assessment to either rule in or rule out other causes of agitation and combativeness. These causes could include behavioral disturbances, alcohol or drug intoxication, alcohol or drug withdrawal, head injury, seizure disorders, and diabetic problems. These disturbances should be investigated before acceptance of an adverse reaction becomes the diagnosis.

The medical control physician also included a caution for the law enforcement officers who deal with agitated or combative patients. They are recommending that the proper transport vehicle for patient that is agitated or combative due to drug overdose should be transported via an ambulance and not a squad car. The medical control physicians believe that the life threat that is present from a patient in an agitated or combative state who has fought with the police and that is restrained warrants medical transport. The law enforcement officer should also do a complete search for weapons and sharps that could be used to harm other officers, medical responders, and hospital staff.

Treatments:

When interviewing the medical control physicians, emergency room physicians and EMS service directors on the appropriate treatments for a patient who is suffering an adverse reaction to synthetic cathinone abuse there were few different treatment modalities that were suggested. For the majority of the respondents it was clear that the dosing of benzodiazepines until control was made was the current treatment. This treatment came with a caveat though; all the respondents made it clear that they treat a combative patient with the same protocol and that each respondent does not have a specific protocol for synthetic cathinone abuse. The main differences between the respondent's treatments of a patient having an adverse reaction synthetic cathinone are the 2nd and 3rd level treatments available to paramedic.

Upon interviewing EMS service directors and medical control physicians there were a few standard protocols that they seem was appropriate to include in any protocol that deals with a combative or agitated patient. The first addition is some reminders to ensure scene safety by making sure that law enforcement has control of the situation before entry is made. If the scene becomes unsafe the medical technicians should retreat to a safe distance and await control of the scene. It's important also to remind the emergency medical responder that is important to approach this patient carefully and to utilize a calming voice to help diffuse the situation. Some respondents also indicated that a spit net may be indicated to help protect the responder from the patient's spit.

At this point the respondents that did not have a specific protocol were different in treatment from those who had a developed protocol to deal with agitated and combative patients. The attached protocol dealt with the treatment of the synthetic cathinone abuse patient in an" if this, than that" type procedure. Most hospitals and EMS services basically treated combative

patients by giving benzodiazepines until either control is had or patient becomes unconscious. The respondents from St. Michaels hospital in Stevens Point utilizes a combative and agitated patient continuum that includes not only an intermediary step that includes ketamine, Haldol, Geodon, or other disassociative but also continues on to give the paramedic a choice to fully paralyze and immobilize the patient using rapid sequence airway procedure. The respondents from St. Michaels stated the importance of this protocol set up in this manner gives the emergency medical technicians the flexibility to decide which level of control and sedation is most appropriate for the patient.

Discussion

Research Question #1. What are the signs and symptoms that are associated with acute synthetic cathinone medication reactions?

As supported in the literature review and confirmed in the research conducted for this Applied Research Project the signs and symptoms and the cautions present with a patient who is experiencing a synthetic cathinone abuse adverse reaction have little deviation. Users also report negative effects such as: prolonged panic attacks, tremors, agitation, insomnia, nausea, headache, tinnitus, vertigo, muscle twitching, dizziness, increased heart rate, altered vision, confusion, short-term memory difficulties, anhedonia, suicidal thoughts, depression, psychosis, tolerance and dependence (Winstock, Mitcheson, DeLuca, & Marsden, 2010, p. 154). During the interviews with the hospital and pre-hospital respondents it was a full agreement that the symptoms listed in the literature review was an adequate list detailing how the synthetic cathinone abuse reaction patient will present. The one deviation was identified by a respondent from St. Claire's hospital which was the possibility of an excited delirium type reaction that could manifest itself after fighting with police and ingesting a stimulant like bath salts.

Research Question #2. What are the cautions in dealing with the acute synthetic cathinone medication reaction patient?

Even though the literature review covered some of the cautions that should be noted to help protect the safety of the paramedic responders the interviews with law enforcement, families of users, emergency room doctors, and medical control physicians identified several other concerns that are important for the responder to understand to ensure the safety of the patient, the patient's family, bystanders, and emergency responders.

There have been many papers written upon the lethality of excited delirium. Generally, excited delirium was mostly seen in patients who were using cocaine or methamphetamine and then placed in police custody with or without an exhaustive fight. The respondents noted that the symptomatic relationship between cocaine, methamphetamine, and synthetic cathinone are reasonably similar enough to warrant caution of a patient developing excited delirium. Some of the signs and symptoms of excited delirium include many that involve the synthetic cathinone adverse reaction patient. The additional signs and symptoms of excited delirium include hyperthermia and possible cardiac arrest.

One of the items that were repeatedly addressed by the respondents was the use of restraints. These restraints included soft restraints, handcuffs, other physical restraints, or chemical restraints. The history of in custody deaths due to improper restraints made it appropriate to include the cautions regarding not transporting agitated and combative patients in squad cars and to have a police officer present with the appropriate keys inside the transporting ambulance. According to the respondents the procedure of a police officer handcuffing the patient and then letting the ambulance transport the restrained patient and then meeting the ambulance at the hospital is a dangerous but common procedure.

During the research it became apparent for the possible need to apply restraints but the respondents were adamant in their agreement in their concern for the patient's well-being while restrained. Several of the emergency room physicians responded reported that once a patient is restrained it is critical that the emergency medical responder position this patient appropriately to maintain airway, breathing, and circulation. The respondents mentioned placing the patient in a sitting position or the recovery position to facilitate the airway, breathing, and circulation.

Research Question #3. What is the appropriate advanced life support care for a patient in acute synthetic cathinone medication reactions?

As supported in the literature review and confirmed in the research conducted for this applied research project the treatments for various signs and symptoms of synthetic cathinone abuse are in agreement albeit fragmented. The protocol that was developed has taken many different sections from the literature review and the research and has combined them into a cohesive procedure utilizing the treatments stated within the paper. The physical treatment which includes safety aspects and restraint procedures has been covered in the signs and symptoms and the cautions portion of the discussion. During the discussion of this research question the researcher will be discussing the pharmacological treatments for the patient who is experiencing an adverse reaction to synthetic cathinone which may include agitation and combativeness.

Treating the semi-aggressive patient:

Benzodiazepines:

According to the literature review and sustained in the research benzodiazepines seem to be the cornerstone of treatment for synthetic cathinone abuse reaction patients. The use of benzodiazepines to originally control the combativeness seen in these patients generally has

enough potency to control the patient to the extent that they EMS system can transport the patient safely. One respondent explained his opposition to how emergency rooms and EMS system utilize diazepam, lorazepam, and midazolam for the sedation of the agitated patient. The respondents stated that not only is it difficult to give enough diazepam intramuscularly to sedate a patient it often does not control a patient who is severely agitated. The respondent was in favor of allowing benzodiazepines to be used as long as it was targeted to a patient that was not yet extremely agitated or combative.

Both diazepam and lorazepam can have potent sedative effects. The 3rd member of the benzodiazepine family that is found commonly in combative patient protocols is midazolam. Like diazepam and lorazepam, midazolam is an effective sedative. Midazolam does also involve a type of disassociative state where the patient may have little to no memory of the event from the application of the midazolam.

The concerns brought up by both the literature and the research was the dangerous aspect of needle sticks and blood-borne pathogens. The difficulty of starting an intravenous line or utilizing an intramuscular injection poses risk to the responder and the patient. The question about intranasal administration was posed to the respondents and most believe that because of the combative state the intranasal administration is problematic and unreliable. The recommendation from the research participants for the 1st stage of pharmacological management was benzodiazepines given the intramuscular route.

Treating the aggressive patient:

Antipsychotics:

After attempting to control a semi-aggressive patient who is refractory to benzodiazepines or encountering a patient who is aggressive or extremely combative the next step in the treatment protocol involves the use of ziprasidone, or haloperidol.

Haloperidol is an antipsychotic that has shown to be an effective method of chemical restraint due to its rapid tranquilization and availability to give via the intramuscular route. The concern with using haloperidol alone is the 10 to 30 minute onset time generally seen with the use of haloperidol. Even with the slow onset the literature review and confirmed from the research haloperidol's main concern is the onset of extrapyramidal symptoms. Extrapyramidal symptoms are a dystonic reaction, characterized by involuntary twisting movements seen in the neck, back, and eyes (EBmedicine.net, 2014).

The other antipsychotic that is growing in popularity is ziprasidone. The common name for ziprasidone is Geodon. Geodon like haloperidol is an antipsychotic. Where ziprasidone and haloperidol differ is in two different areas. Ziprasidone tends to have more of a QT prolongation effect on the heart rate which could develop into life-threatening arrhythmias such as torsades de pointes. Conversely, ziprasidone tends to control the patient better without the respiratory depression and unresponsiveness sometimes seen when using haloperidol. When speaking to the respondents many were wary on using these antipsychotics due to the QT elongation that is commonly seen in these products.

The 3rd antipsychotic that was mentioned during interviews with the semi aggressive patients was olanzapine. Olanzapine sometimes goes by the trade name Zyprexa. Olanzapine is an atypical antipsychotic medication used to treat combative patients. When Discussing

olanzapine with the emergency staff at Langlade hospital the researcher found that olanzapine was their recommended antipsychotic medication. Olanzapine does have a possibility of extrapyramidal symptoms like haloperidol.

Disassociatives:

The next medication that was indicated not only by the literature review but by many emergency room physicians and medical control doctors was ketamine. Like midazolam ketamine is a potent sedative. Ketamine is fast acting and can be given intravenously, intramuscularly, and intranasal. The strength of ketamine is the sedation it provides the patient thus providing calming and reduction of hypertension plus it does not have the adverse side effects that midazolam create such as respiratory depression and hypotension. Ketamine is safe to give to patients because it is almost impossible to overdose a patient on ketamine. The other concern that is given for ketamine is the possibility of reemergence phenomenon. Reemergence phenomenon is the presence of vivid dreams when awakening of the ketamine induced patient. These dreams can be a pleasant nature or a nightmarish nature. The respondents indicated that use of benzodiazepines during the ketamine induced tranquility may lessen the reemergence phenomenon.

Treating the refractory patient:

After attempting verbal control measures, benzodiazepines, antipsychotics, or sedatives and without achieving the desired effect it may be necessary to control the patient using procedural paralyzation. Depending on patient's condition and presentation procedural paralyzation and intubation may be the initial treatment or it may be done after all other available treatments are completed. Rapid sequence intubation is the procedural paralyzation and intubation technique most commonly used in prehospital EMS. According to the research

participants it is not uncommon for a patient in a combative or agitated state often seen with patients using synthetic cathinone to be refractory to the benzodiazepines or the sedatives and have to be paralyzed to maintain both their airway and their safety.

Recommendations

The research in this applied research project has clearly demonstrated the need for a systematic approach on the treatment of a patient suffering from an adverse reaction to the use of synthetic cathinones. Based on the literature review it is clear that synthetic cathinones can be hazardous to the patient, the patient's family, and emergency responders. The research also demonstrated that there is no cohesive systematic procedure set forth to treat a patient who is having an adverse reaction to synthetic cathinone or even a systemic procedure to deal with a patient who is agitated and combative. This research through its action-based research developed a protocol for the city of Antigo fire Department to allow its emergency medical technicians to effectively treat synthetic cathinone adverse reaction patients.

Protocol signs and symptoms include:

Chief Complaint	Synthetic cathinones related violent behavior.
LOPQRST	Determine onset, duration and progression, triggering events or perception of severity by bystanders. Patient reports: feeling detached or unreal, feeling of losing control or going crazy, feeling faint or light headed.
Other related Problems	Alcohol or drug intoxication, Head trauma Psychiatric medications? Noncompliance? History of schizophrenia or bipolar disorder? History of drug or alcohol abuse?
Initial Exam	Check ABCs and correct immediately life-threatening problems.
Detailed Focused Exam	**General Appearance:** **Agitated/ Combative:** Bizarre behavior, violent, aggressive, combative, loud, obnoxious, agitated; partial or complete undressing? **Uncooperative:** Does not respond to verbal commands to stop harmful behavior to self or others; Resisting against restraint? **Skin:** Diaphoresis? Cool, moist and pale? Warm, dry and flushed? **Respiratory Effort**: Labored breathing? Heavy breathing?

	Lung Sounds: Wheezes, rales, rhonchi or stridor? Decreased lung sounds?
	Cardiovascular: Hypertensive and tachycardia **Extremities:** Trauma? **Neuro:** Excited, agitated, increased activity and increased intensity of activity? **Psych:** Bizarre thoughts and actions; Paranoia, delusional, confused, clouded consciousness?

Cautions for all levels of emergency medical responders include:

- Ensuring the safety of EMS personnel is the first priority. Request and allow law enforcement to secure the scene and patient before attempting to provide medical care to a suspected synthetic cathinone abuse patient.
- Patients most at-risk of dying in police custody are those who violently resist and struggle against restraints.
- If law enforcement restrains the patient with handcuffs, an officer with a key must accompany the patient during transport.
- Physical restraints can be used when the patient is potentially dangerous to self or others.
- Never apply physical restraints for punishment, or in a manner that impairs breathing and circulation, or apply in places or positions that restrict access for monitoring the patient.
- Behavioral disturbances are often the result of underlying medical conditions that require immediate medical attention, including alcohol or drug intoxication, head trauma, psychiatric disorders and metabolic disease.
- Patients in need of medical attention must be transported in an ambulance, not a police vehicle.
- Have law enforcement search the patient for weapons

As this levels of responsibility and the level of emergency care increase so does the cautions that the emergency medical responder need to be cognizant about. In addition to the general cautions for all medical responders the emergency medical technicians and above need to be cautious about:

- Do not approach a patient you suspect is agitated due to a synthetic cathinone reaction.
- Notify and allow law enforcement to gain control of the patient
- Utilize verbal reassurance and calming voice to interact with the patient.
- If verbal reassurance is not working, discontinue
- First responders are not allowed to use physical restraints, but they can treat a patient who has been restrained by law enforcement. Only Consider physical restraints when verbal control is ineffective
- Soft Restraints are the preferred method of physical restraints by EMS personnel

- No sandwiching with long boards, hog tying, or hobble restraints allowed.
- Once retrained the patient should be placed in the sitting or recovery position
- Do not place the patient in the prone position
- A spit net may be applied to the patient.

The treatment recommendations are set forth in the appendix F. These recommendations are form of a suggested protocol. Not all the medications recommended in the research were utilized in the standardized protocol.

1. Lorazepam-this medication was not placed in the protocol as a direct medication due to the overlap of indications and results that are achieved by using a more versatile diazepam. It is used in the protocol to assist with the effect of ketamine.

2. Haloperidol-this medication was not placed in the protocol due to the QT elongation that is seen in this class of antipsychotics. The QT elongation is as not prevalent in haloperidol as compared to ziprasidone. The relatively long onset time also help preclude haloperidol from this protocol.

3. Ziprasidone-this medication was not placed in the protocol due to the QT elongation that is seen in this class of antipsychotics. Even though ziprasidone has a lower risk of "snowing" a patient, the greater risk of QT elongation and the associated arrhythmias preclude the on from being part of this protocol.

4. Olanzapine-this medication was not placed in the protocol due to its slow onset and overlap results that can be achieved with ketamine.

Below is the recommended overview of the treatment protocol for the patient experiencing an adverse reaction to synthetic cathinones.

Treatments:

The following recommendations are an overview of the contents of the treatment section of the new protocol for agitated reactions to synthetic cathinone usage. Like all protocols there are several features that are built-in each protocol to ensure a good patient assessment and a reminder to concentrate on the airway, breathing, and circulation of the patient. The recommendations for the treatment protocols are going to be reduced to physical and pharmacological treatments not normally seen in basic patient assessment. The 1st recommendation for a patient being treated by an intravenous technician is the application and initiation of an intravenous line with 0.9% normal saline. With the initiation of the intravenous line intravenous technician has to understand the inherent dangers of her venous line administration. If the patient's agitated state makes it unsafe to initiate the intravenous line the emergency medical technician should just control the scene keep the emergency medical technicians, bystanders, and patient safe.

Moving on to the intermediate 99' (I 99) level the treatments include intravenous or intramuscular diazepam. In the totality of the protocol diazepam is generally utilize control a semi-agitated patient. At the I 99 level diazepam is the only sedative that is available for use. Even though the diazepam at a given amount is often inefficient for a highly combative patient the I 99 can administer diazepam if they feel the procedure can be safely initiated. One of the positives of the diazepam is that it can be administered either IV or IM.

The next treatment level that the protocol lists is the treatments that are available to the paramedic. After the optional diazepam the paramedic can administer ketamine IM or ketamine IV. The sedative can be assisted with either midazolam or lorazepam IM or IV.

The final treatment in the paramedics treatment protocol is the application of rapid sequence airway. Rapid sequence airway allows the paramedic to take a highly combative

patient who is either refractory to previous pharmacological restraint or at an agitated level that would require the systematic paralyzation and incubation protect the patient and the persons around them from harm. The procedure that is used for rapid sequence airway is listed in another section of the Antigo fire Department protocols. Pharmacologically, the rapid sequence airway protocol allows the paramedics to utilize Etomidate or midazolam as a sedative, succinylcholine or vecuronium as a paralytic, and midazolam and fentanyl to continue sedation.

The power of this protocol would be the options given to the emergency medical responder to allow them tailor treatment to the responses and the level of agitation of the patient who is experiencing an adverse reaction synthetic cathinone abuse.

References

American College of Emergency Physicians. (2009). White Paper Report on Excited Delirium Syndrome. Retrieved from www.academia.edu/113168/acep_excited_delirium_white_paper_-_contribution_via_ca_hall_md_frcpc

Antigo Fire Department. (2014). Antigo Fire Department 911 Protocols. In M. McKinney (Ed.), *Antigo Fire Department Protocols - 2014 edition* . : .

Antigo Fire Department Mission Statement. (2007, n.d.). *Antigo Fire Department*, pp. p. . Retrieved from

"Bath Salts" Synthetic Cathinones. (2011). Retrieved from www.calpoison.org/hcp/2011/callusvol9no4.htm

Borek, H. A., & Holstege, C. P. (2012). Hyperthermia and multiorgan failure after abuse of bath salts containing 3,4-methlenedioxypyrovalerone. *Ann. Emerg. Med, doi:10.1016.*

Carhart-Harris, R. L., King, L. A., & Nutt, D. J. (2012). A web based survey on Mephedrone. *Drug, Alcohol, and Depend*., *118*, 19-22.

Cheng, S., Yeo, J., Brown, E., & Regan, A. (2012). Bath Salts and Synthetic Cannabinoids: A Review. Retrieved from www.medscape.com/viewarticle/765892_3

Coppola, M., & Mondola, R. (2012, March 21, 2012). Synthetic cathinone: Chemistry, pharmacology and toxicology of a new class of designer drugs of abuse marketed as "bath salts" or "plant food". *Toxicology Letter*, *211*(211), 144-149.

Drug Enforcement Agency. (2014). Drug Fact Sheet. Retrieved from www.justice.gov/dea/druginfo/drug_data_sheets/bath_salts.pdf

Drug Forum: Synthetic Cathinones. (2014). Retrieved from www.drug-forum.com

Executive Fire Officer Program - Operational Policies and Procedures - Applied Research Guidelines. (2013). Retrieved from www.usfa.fema.gov/downloads/pdf/efop_guidelines.pdf

Folton, R. W., & Schuster, C. R. (1982). Behavioral tolerance and cross tolerance to dl-cathinone and d-methamphetamine in rats. *J. Pharmocol*, *222*(126-131).

Mayo-Smith, M. E., Beecher, L. H., Fischer, T. L., Gorelick, D. A., Guillaume, J. L., Hill, A., ... Melbourne, J. (2004, July 12). Management of Alcohol Withdrawal Delirium. *Arch Inter Med*, *164*, 1405-1412.

NPR Staff. (2012). Synthetic 'Bath Salts' An Evolving Problem For DEA. Retrieved from www.npr.org/2012/06/30/156048262/synthetic-bath-salts-an-evolving-problem-for-dea

National Institute of Drug Abuse. (2014). Drug Facts: Khat. Retrieved from http://www.drugabuse.gov/publications/drugfacts/khat

Ricker, N. (2011). EMMC developed bath salts protocol by trial and error. Retrieved from hhtps:/bangordailynews.com/2012/01/06/health/emmc-developed-bath-salts-protocol-by-trial-and-error/

Spiller, H. A., Ryan, M. L., Weston, R. G., & Jansen, J. (2011, October 1 2011). Clinical experience with and analytical confirmation of "bath salts" and "legal highs" (synthetic cathinones) in the United States. *Clinical Toxicology*, *49*, 499-505.

Strategic Plan Fiscal Years 2010 – 2014. (2014). Retrieved from www.fema.gov

The Violent Patient: Clinical Management, Use of Physical and Chemical Restraint, and Medicolegal Concerns. (2014). Retrieved from www.ebmedicine.net/topics.php?paction=showtopic_id=109&seg_id=2089

Weingart, S. (2011). EMCrit Podcast 40 - Delayed Sequence Intubation (DSI). Retrieved from emcrit.org/dsi/

Winstock, A. R., Mitcheson, L. R., DeLuca, P., & Marsden, J. (2010). Mephedrone: still available and twice the price. *Lancet, 376,* 154-161.

Appendices

Appendix A: ER Physicians

Interview Date: _____

Interviewee: _____

Interviewer: _____

Questions for Emergency Room Physicians

1. Have you treated a MDPV overdose\reaction
2. Is there stages to the reaction
3. Any physical signs that indicate MDPV use
4. Certain days or times that overdoses tend to occur
5. Signs and symptoms of Inhalation use
6. Signs and symptoms of Ingestion use
7. Signs and symptoms of Intravenous use
8. What are the treatment priorities for a combative patient
9. What are the treatment priorities for a paranoid patient
10. Do you treat the hypertensive properties of MDPV use
11. What medication are used for the combative patients
12. What medication are used for the paranoid patients
13. What medication are used for the hypertensive patients
14. DO you use physical restraints
15. Do you use chemical restraints
16. Any reasons to consider RSA
17. Length of Stay for the hospital
18. What treatment would you like done prior to the patients arrival
19. Does MDPV abuse have any associated problems that are common in those patients

Appendix B: Users\Family

Interview Date: _____

Interviewee: _____

Interviewer: _____

Interview with Users\Family of Synthetic Cathinones

1. How long have you been using synthetic cathinones?
2. How many times per time period do you use synthetic cathinones?
3. What is the normal dose of synthetic cathinones?
4. Do you take less or more than the normal dose of synthetic cathinones?
5. Is synthetic cathinones your first drug use?
6. What drugs did you use prior to using synthetic cathinones?
7. How do you use synthetic cathinones?
8. When you use synthetic cathinones what effects do you use?
9. Are there any symptoms when having an adverse reaction?
10. Does your family notice any changes in your personality?
11. How do you store synthetic cathinones?
12. What paraphernalia do you need to use synthetic cathinones?
13. What clues do users of synthetic cathinones leave for responders to notice?
14. How do you acquire your synthetic cathinones?
15. How easy is it to acquire synthetic cathinones?
16. What stages to you go through when using synthetic cathinones?
17. What does your family say your personality is like before, during and after use?
18. Do you take anything with synthetic cathinones?
19. What are the effects with each additional substance?
20. What do you need from responders when you’re having an adverse reaction to synthetic cathinones?

Appendix C: Medical Control Physicians

Interview Date: _____

Interviewee: _____

Interviewer: _____

Questions for Medical Control Physicians

1. Have you treated a MDPV overdose\reaction
2. Is there stages to the reaction
3. Any physical signs that indicate MDPV use
4. Certain days or times that overdoses tend to occur
5. Signs and symptoms of Inhalation use
6. Signs and symptoms of Ingestion use
7. Signs and symptoms of Intravenous use
8. What are the treatment priorities for a combative patient
9. What are the treatment priorities for a paranoid patient
10. Do you treat the hypertensive properties of MDPV use
11. What medication are used for the combative patients
12. What medication are used for the paranoid patients
13. What medication are used for the hypertensive patients
14. DO you use physical restraints
15. Do you use chemical restraints
16. Any reasons to consider RSA
17. Length of Stay for the hospital
18. What treatment would you like done prior to the patients arrival
19. Does MDPV abuse have any associated problems that are common in those patients
20. Medical Control Add-Ons
21. As a MC doctor how do you prefer paramedic units treat MDPV patients
22. The first treatment modality
23. Benzodiapems for its anxiouslytic properties?
24. Ativan or Haloperidol?
25. Clonidine?
26. RSA usage
27. Other chemical restraints
28. IS there any differences in treatment for different types of usage

Appendix D: Law Enforcement

Interviewee: _____

Interviewer: _____

Law Enforcement Questionnaire:

1. How many incidences of (SC) abuse has the sheriffs dept been called for
2. Is there still public places that sell (SC)
3. What is the current method for the user to buy (SC)
4. Where does the supply of (SC) come from
5. Can a normal person make (SC)
6. Is it brought in bulk and they packaged or is it prepackaged
7. Is there tells that law enforcement use to identify a (SC) user before they react
8. When encountering local dealers how much product do they normally have on hand
9. What is the dealers view of the danger posed by (SC)
10. What is the dealers view of the legality of (SC)
11. What is the users view of the danger posed by (SC)
12. What is the users view of the legality of (SC)
13. How it the product used
14. It the symptoms different with the method of ingestion
15. What is the age group most consistent with (SC) use?
16. What is the appearance of most (SC) users
17. How addictive is (SC)
18. Are there outward signs of (SC) use?
19. Is there signs in the home for (SC) use

Appendix E: Service Directors

Interview Date: _____

Interviewee: _____

Interviewer: _____

Questions for Service directors

1. Has your department ever treated a MDPV overdose\reaction
2. Have your paramedics noticed any physical signs that indicate MDPV use
3. Do you have a specific protocol dealing with MDPV overdose
4. Do you have a physical or chemical restraint protocol
5. What are your treatment priorities for a combative patient
6. Do you treat the hypertensive properties of MDPV use
7. What medications does your department use for combative patients
8. What medication does your department use for paranoid patients
9. What medication does your department use for hypertensive patients
10. Do you use physical restraints
11. Do you use chemical restraints
12. Have your paramedics considered RSA
13. What treatment would you like done prior by first responders
14. Does MDPV abuse have any associated problems that are common in those patients
15. IS there any differences in treatment for different types of usage

Appendix F: Agitated Reactions to Synthetic Cathinones Protocol

Agitated Reactions to Synthetic Cathinone Use (SC)

Note: Action Research: Agitated Reactions to Synthetic Cathinone Use Protocol

- Ensuring the safety of EMS personnel is the first priority. Request and allow law enforcement to secure the scene and patient before attempting to provide medical care to a suspected synthetic cathinone abuse patient.
- Patients most at-risk of dying in police custody are those who violently resist and struggle against restraints.
- If law enforcement restrains the patient with handcuffs, an officer with a key must accompany the patient during transport.
- Physical restraints can be used when the patient is potentially dangerous to self or others.
- Never apply physical restraints for punishment, or in a manner that impairs breathing and circulation, or apply in places or positions that restrict access for monitoring the patient.
- Behavioral disturbances are often the result of underlying medical conditions that require immediate medical attention, including alcohol or drug intoxication, head trauma, psychiatric disorders and metabolic disease.
- Patients in need of medical attention must be transported in an ambulance, not a police vehicle.
- Have law enforcement search the patient for weapons

Signs and Symptoms	
Priorities	**Assessment Findings**
Chief Complaint	Synthetic cathinones related violent behavior.
LOPQRST	Determine onset, duration and progression, triggering events or perception of severity by bystanders. Patient reports: feeling detached or unreal, feeling of losing control or going crazy, feeling faint or light headed.
Other related Problems	Alcohol or drug intoxication, Head trauma Psychiatric medications? Noncompliance? History of schizophrenia or bipolar disorder? History of drug or alcohol abuse?
Initial Exam	Check ABCs and correct immediately life-threatening problems.
Detailed Focused Exam	**General Appearance:** **Agitated/ Combative:** Bizarre behavior, violent, aggressive, combative, loud, obnoxious, agitated; partial or complete undressing? **Uncooperative:** Does not respond to verbal commands to stop harmful behavior to self or others; Resisting against restraint? **Skin:** Diaphoresis? Cool, moist and pale? Warm, dry and flushed? **Respiratory Effort**: Labored breathing? Heavy breathing? **Lung Sounds:** Wheezes, rales, rhonchi or stridor? Decreased lung

	sounds?
	Cardiovascular: Hypertensive and tachycardia **Extremities:** Trauma? **Neuro:** Excited, agitated, increased activity and increased intensity of activity? **Psych:** Bizarre thoughts and actions; Paranoia, delusional, confused, clouded consciousness?
Data	SpO2 on all patients (continuous or re-checks every 5 minutes); 12-lead EKG as soon as it becomes practical to obtain one; Blood glucose to rule out hypoglycemia as a cause of the behavioral disturbance.
Goals of Therapy	• Reduce the threat of further harm to the patient and others, especially emergency responders (law enforcement and EMS)
	• Achieve IV access

Emergency Medical Responder

- Scene Size up
- Do not approach a patient you suspect is agitated due to a synthetic cathinone reaction.
- Notify and allow law enforcement to gain control of the patient
- Utilize verbal reassurance and calming voice to interact with the patient.
- If verbal reassurance is not working, discontinue
- First responders are not allowed to use physical restraints, but they can treat a patient who has been restrained by law enforcement.
- Begin basic medical care
    - Check blood glucose level when it is safe to do so.
- Contact incoming medical units to report patient condition

Emergency Medical Technician

- Only Consider physical restraints when verbal control is ineffective
- Soft Restraints are the preferred method of physical restraints by EMS personnel
- No sandwiching with long boards, hog tying, or hobble restraints allowed.
- Once retrained the patient should be placed in the sitting or recovery position
- Do not place the patient in the prone position
- A spit net may be applied to the patient.
- Give a status report to the ambulance crew by radio ASAP.

Advanced Emergency Medical Technician \ IV Tech

- Do not attempt an IV unless the patient is compliant enough to safely initiate.
    - IV normal saline @ TKO.
    - If sign and symptoms of hyperthermia or hypovolemia are present, administer IV fluids at wide open.
- Consider a second IV.
- Consider additional fluid bolus.

Emergency Medical Technician I99

- If the patient is reasonable complaint or is showing minor signs of agitation or combativeness then:
- Consider **diazepam** 5-10mg IM may repeat once
    - Provide enough restraint to deliver diazepam dose
    - Once diazepam is administered restraint can be discontinued
- Consider IV of normal saline at TKO

Paramedic \ Critical Care Paramedic

- Care for an adverse MDPV reaction patient that is exhibiting agitation and combativeness that includes:
        - Law enforcement attempting to restrain or intends to restrain
        - Police may have used force upon the patient (OC spray, Electronic Control Device, impact weapons)
        - Is struggling or struggling is imminent. This includes recent struggling before or during restraint.
    - Consider **ketamine** 5 mg/kg IM.
        - Provide enough restraint to deliver ketamine dose
        - Once ketamine effect is achieved, restraint may be discontinued
        - (Consider removal of hand-cuffs or hard restraints and placement of soft restraints).
    - Monitor for respiratory depression and EKG changes.
    - Continue sedation, if needed, with **midazolam** 1 – 2 mg IV/IO/IM/IN
        - Titrate to effect with repeat doses of 1 – 2 mg **midazolam** every 2 min. to a max dose of 10 mg.
    - Externally cool patient as needed
    - Obtain a 12-lead EKG and transmit to receiving facility
    - Reassess patient including vital signs every 5 minutes
    - *Contact Medical Control for the following:*
        - Adding **lorazepam** (1 mg – 2 mg IM/IV) in addition to midazolam if patients do not respond to a max dose of midazolam
        - Additional doses of midazolam, lorazepam, or ketamine

- If the patient continues with agitation and combativeness after administration of ketamine, diazepam, midazolam, or Lorazepam the paramedic can initiate to **Rapid Sequence Airway procedure** (RSA).
- RSA should only be used when the threat to the patient, public, or responders are to a level where the use of procedural paralysis is the only way to safely transport.

Footnotes

- Required Restraint Documentation:
    - Why restraints were use
    - What time were restraints applied and removal time
    - Who applied the restraints
    - What type of restraints
    - Vital Signs and patient status every 5 minutes

- Consider dose ranges for patients with:
    - Alcohol or drug intoxication
    - Alcohol withdrawal
    - Elderly patients
    - Psychiatric disorders

- RSA requires 2 qualified paramedics at the patients side

Table 2: List of Participants

Participant	Type	Number
1	Emergency Room Physicians	4
2	Medical Control Physicians	4
3	EMS Service Directors	3
4	Law Enforcement Officers	5
5	Medical Providers	2
6	SC users	3

Table 3: Types of Agencies interviewed

Participant	Type	Type
1	Langlade County Sheriff	Law Enforcement
2	Antigo Police Department	Law Enforcement
3	Lincoln County Sheriff	Law Enforcement
4	Marathon County Sheriff	Law Enforcement
5	Merrill Police Department	Law Enforcement
6	Froedert Hospital	Hospital
7	Langlade Memorial Hospital	Hospital
8	Aspirus Hospital, Wausau	Hospital
9	St. Claire's Hospital, Weston	Hospital
10	Good Samaritan, Merrill	Hospital
11	St. Michaels Hospital, Stevens Point, WI	Hospital
12	Antigo Fire Medical Control	Medical Control
13	Pickerel EMS Medical Control	Medical Control
14	SAFER district Medical control	Medical Control
15	Marathon Control Medical Control	Medical Control
16	Stevens Point Medical Control	Medical Control
17	Antigo Fire Department	EMS Directors
18	Wausau Fire Department	EMS Directors
19	SAFER District	EMS Directors
20	Merrill Fire Department	EMS Directors

Table 4: Interview List

Date	Name	Agency	Time	Questionaire
5/14/14	Dan Bauknecht	Law Enforcement	2 Hours	Law Enforcement
5/14/14	Kyle Rustick	Law Enforcement	2 Hours	Law Enforcement
5/6/14	Eric Roller	Law Enforcement	1 Hour	Development
4/23/14	Gary Schneck	Law Enforcement	1 Hour	Law Enforcement
4/21/14	Chad Collinsworth	Law Enforcement	1 Hour	Law Enforcement
7/5/14	Dr. Scott Moore	Medical Control	1 Hour	Medical Control
5/10/14	Elaine Ernst	Medical Control	1 Hour	Telephone
7/5/14	Dr. Scott Moore	ER Physician	1 Hour	ER Physician
5/16/14	Anonymous	SC User	1 Hour	Family and User
8/8/14	Scott Tatro	Sc User Family	3 Hours	Family and User
8/8/14	Ann Tatro	Sc User Family	3 Hours	Family and User
8/13/14	Dr. Lee Ping	ER Physician	1 Hour	ER Physician
8/11/14	Dr. Mike Curtis	Medical Control	2 Hours	Medical Control
8/11/14	Dr. Mike Curtis	ER Physician	2 Hours	ER Physician
8/17/14	Scott Krause	EMS Service Director	1 Hour	Service Director
8/4/14	Andrew Schlagel	EMS Service Director	1 Hour	Service Director
4/4/14	Dr. Corina Norrbom	Medical Control	1 Hour	Medical Control
6/16/14	Josh Finke	EMS Service Director	1 Hour	Service Director
6/16/14	Dr. Radke	Medical Control	1 Hour	Medical Control
6/16/14	Dr. Radke	ER Physician	1	ER Physician