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Can Water Professionals Transform Pharmaceutical Disposal Practices of Hospice Nurses?

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Changing Behavior:
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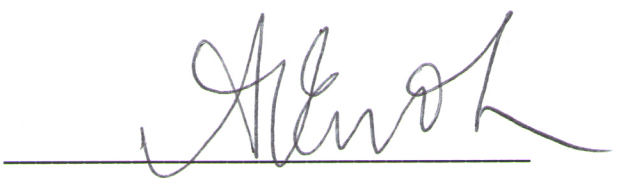

Andrew I.E. Ewoh, PhD

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Executive Summary

This project is an explanatory case study that illustrates the problems associated with pharmaceutical disposal in regard to water quality. The purpose of the study is to investigate the current pharmaceutical disposal practices of hospice nurses, the attitudes of hospice nurses regarding current pharmaceutical disposal practices, and explore ways to educate the hospice community about the concerns associated with flushing pharmaceuticals. The study consisted of reviewing secondary research, completing a survey, forming a focus group, implementing a pilot study, and developing an education plan and outreach materials.

The researchers partnered with two local nonprofit organizations, Georgia Association of Water Professionals (GAWP) and Georgia Hospice and Palliative Care Organization (GHPCO), in developing this project. GAWP sponsored participant incentives, provided meeting space, and endorsed the project deliverables. GHPCO facilitated the distribution of the survey to member organizations, assisted with the recruitment of focus group members, and provided feedback and guidance throughout the entire project. Our findings indicated that hospice providers are concerned about medication disposal practices and the potential harm hospice may be doing through current medication disposal methods. We also found that most nurses were receptive to changing current procedures. However, changing the existing policy does have some challenges. This study explores the issues facing both the hospice industry and the water industry in addressing the practice of flushing medications as a method for pharmaceutical disposal. Finally, it examines the utilization of tools such as advanced water treatment processes, legislation, and education to reduce the impact of this form of “nonpoint source pollution” in our water resources.

Acknowledgements

We would like to express our gratitude to Dr. Andrew Ewoh for his guidance on our project. We appreciate the time and effort he invested in helping us to refine our paper and produce scholarly work that will be pertinent to our industry.

We would like to acknowledge the support of this project by the Georgia Association of Water Professionals (GAWP) and the Georgia Hospice and Palliative Care Organization (GHPCO). These two organizations and their staff, Bryan Wagoner and Jennifer Hale respectively, were instrumental in the implementation of the survey and focus group. Participants in the focus group included Jennifer Hale, Jessica Blanton, Terri McHale, Brittany Dixon, and Tracy Jackson. Their input heightened our understanding of the hospice industry and their selfless service to patients.

Finally, we want to convey a special thanks to our colleagues Vicki Culbreth and Chris Johnson for their creative contributions to our education materials. We appreciate their help.

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Introduction

Pharmaceuticals and Personal Care Products (PPCPs) are a major concern and an emerging issue for professionals in the water and wastewater industry. Standard drinking water and wastewater treatment techniques are not designed to remove complex chemicals found in PPCPs from drinking water or wastewater. Pharmaceutical compounds that pass through the treatment process provide a mechanism for exposure to consumers and the environment. The elimination of source pathways in which pharmaceuticals enter water sources is an immediate measure to reduce the volume of PPCPs as pollutants. One such pathway is the disposal of medicines in the residential setting. In recent years, community outreach programs have been implemented on local levels to begin counteracting the issue of improper drug disposal. In addition to the typical resident, it has been learned that many hospice providers utilize flushing as a primary means of pharmaceutical disposal. As professionals in the water industry, we would like to address this practice and develop alternative best management practices (BMPs) for the disposal of pharmaceuticals by hospice providers.

The issue of water quality is relevant to every living organism on earth. It is of all resources, the most fundamental to survival. Water quality and quantity is taken for granted in much of the developed world because of the disinfection technology, affordability, and accessibility developed countries enjoy. Specifically, the United States is a nation privileged to have, “one of the cleanest drinking water supplies in the world” (U.S. Environmental Protection Agency 2003). Every morning, Americans can prepare meals, bathe, and drink straight from the tap without a second thought about the safety of the product they are consuming. Perhaps, it

would be shocking for many Americans and Westerners alike to know that globally there are 1.1 billion people who live without access to safe drinking water (Smolan and Erwitt 2007, 7). It is even more staggering to consider that each year 1.8 million children die from waterborne illnesses worldwide (Smolan and Erwitt 2007, 11). Elsewhere on the planet, people spend much of their day hauling water for daily use. This water is often contaminanted as a result of poor sanitation practices (Smolan and Erwitt 2007, 13). In developing countries, many water sources carry diseases such as cholera and typhoid; diseases that have been eradicated in the United States by the disinfection of drinking water.

By having the benefit of fundamental water treatment processes here in the United States, there is now a need to examine the impact of other emerging contaminants which may pose long term health concerns. Safe drinking water is a direct result of conventional water and wastewater disinfection techniques. However, there is now a concern that prolonged exposure from reminent contaminents such as PPCPs could pose health risks to humans and wildlife. The term "microconstituent" is used to describe compounds detected in the environment which may impact the health and development of living organisms (Virginia Department of Environmental Quality 2011). Microconstituents can be naturally occurring or man-made (Virginia Department of Environmental Quality 2011). PPCPs are classified as a type of microconstituents and may be described as such in this paper. Extensive studies are now being published documenting potential problems associated with exposure to microconstituents, including physical mutations in aquatic life (Hoffbuhr 2009; Ortner and McCullagh 2010; Virginia Department of Environmental Quality 2011). These studies call attention to the emerging issue of microconstituents and the need to pursue further research and funding regarding risk assessment, treatment processes, and regulatory controls.

The purpose of this project is to provide public awareness of microconstituents, specifically pharmaceuticals, as a "non-point source" of water pollution and introduce reduction measures. Within this research, reduction in pharmaceutical compounds entering water sources will be concentrated primarily to hospice providers to frame a manageable scope.

Public Values in Conflict

When considering the issue of pharmaceuticals in water, the hospice industry and the water industry emphasize different priorities to accomplish their service mission. Although both industries work towards ensuring public health, each also have a separate avenue to achieve their purpose. Hospice, utilizes medicine as a means to support the health of the general population. On the other hand, the water industry uses the protection of the environment as the instrument to support the health of the general population. Using different methods to accomplish the same goal can cause tension between interest groups.

The primary function of the water industry is to provide water and wastewater treatment, water distribution, wastewater collection, and storm water collection. Although the water industry is comprised primarily of municipal government utilities, it also includes consultants, contractors, manufacturers, and regulators. All these sectors of the industry work in tandem to provide water and wastewater service to consumers. Many also participate in industry specific professional organizations, the largest in the state being the Georgia Association of Water Professionals (GAWP). The mission of GAWP is to promote education, legislation, and "sound principles" as related to water resources, utilization, and protection thereof, which are exercised through industry professionals and the general public (Georgia Association of Water Professionals 2010). With a membership of over 4,000 water professionals, the GAWP is a

strong network of knowledge and sound communication group in the water industry. The authors deployed the resources available through GAWP for this research.

Similarly, the hospice industry has a state-wide organization called the Georgia Hospice and Palliative Care Organization (GHPCO). The GHPCO brings together hospice providers from across the state to "provide information, education, and advocacy" for members and people across the state who are interested in hospice medical care (Georgia Hospice and Palliative Care Organization 2009). Hospice is a type of medical care for those who are in the final stages of their lives as a result of terminal illness or chronic disease, when treatment is discontinued and the comfort of the patient becomes the primary goal (Hospice Foundation of America 2011). This care is characteristically available when a patient is expected to live less than six months (Hospice Foundation of America 2011). It is a concept that has become more prevalent since its inception in the early 1970s, most likely a result of extended life expectancy from advances in medicine (Hospice Foundation of America 2011). Hospice services, which are often covered under Medicare and other health insurance, can be provided at an in-care facility or in the patient's home. When provided in the home, hospice care includes counseling, encouragement services, and medical care (Hospice Foundation of America 2011). The medical aspect of hospice care is performed by registered nurses who help the patient and family with a variety of tasks such as pain management, bathing, administration of medications, and general guidance through the end of life process. When a patient passes away, the hospice nurse helps the family with necessary arrangements including transport of the patient's remains, removal of medical equipment, and the disposal of medications.

The nature of service that hospice specializes in is a delicate work. End-of-life as related specifically to the hospice care is a result of extended illness in which patients and their families

have endured physical and emotional suffering. Needless to say, it is a very difficult and stressful environment for hospice caregivers and the families they are assisting, especially upon the death of the patient. It is at this point that hospice nurses must manage many issues for the family, posthumously. One such issue is the disposal of medications administered to the patient during hospice care.

Patients under hospice care are often prescribed the most powerful medications available, making the safe disposal of these pharmaceuticals imperative. Prevention of accidental poisoning from pharmaceutical disposal is a concern for children and pets in the home and wildlife outside of the home. There is also concern about the diversion, which is the deliberate use of prescription medication by a person other than the patient it was prescribed to (Spartz and Shaw 2009, 19). Federal agencies now discourage flushing as a means of pharmaceutical disposal. However, the Food and Drug Administration (FDA), having authority over drug distribution, continues to recommend the flushing disposal method for a short list of specific pharmaceuticals (Food and Drug Administration 2010). These pharmaceuticals are comprised primarily of narcotic analgesics, including morphine and oxycotin in various forms (Food and Drug Administration 2010). In response to the gravity of the situation, the authors of this research presume that hospice nurses are disposing of the deceased's pharmaceuticals in the quickest and cleanest way possible in order to reduce any stress or endangerment for the family.

Professionals in any industry learn about their subject matter through education and experiential knowledge. This requires both time and interest on the part of the individual. Therefore, it is unreasonable to assume that people in the field of medicine, specifically hospice, associate behavior such as flushing medication with the resulting condition of polluted surface water. Most people outside the water industry do not know about, and are not interested in, the

removal of containments from wastewater. Moreover, for years, government agencies have promoted flushing as the most appropriate means of disposal (Ortner and McCullgah 2010, 15). Even today, the FDA continues to recommend flushing as the preferred method of some specific medications (Food and Drug Administration 2010). This recommendation seems to be an easy and effective way to remove the danger of pharmaceuticals from residential and commercial settings (Ortner and McCullgah 2010, 16). Therefore, it is logical that hospice organizations would practice this method of disposal.

Through the collaboration of the hospice and water industries, the ultimate goal for this project is to develop proactive alternatives for PPCP disposal and reinforce proper stewardship of our natural resources. The authors feel that a protocol can be put in place for hospice providers that would be simple, inexpensive, and safe for all parties involved. We hope to develop feasible protocols that can be implemented without adding additional financial or labor burdens to local hospice providers. These protocols will be shared with water and wastewater utilities and hospice agencies across the State of Georgia.

Literature Review

Pathways of Pollution

Wastewater effluent discharges are the largest contributor of pharmaceuticals in water sources (Snyder et al 2008, 10). However, it is important to remember that pharmacological compounds found in wastewater effluents originate from many sources. The most prevalent introduction of drugs to wastewater comes from the waste excretion by the drug consumer (Rodriguez-Mozaz and Weinberg 2010, 1016). The degree to which a pharmaceutical is metabolized by the human body is somewhat dependent upon the individual's overall health,

food intake, body composition, and age (Daughton 2007, 12). Additionally, the chemical structure of pharmaceuticals are wide-ranging, so different drugs will be metabolized and absorbed at differing rates. Therefore, they are also excreted at varied concentrations (Daughton 2007, 12). Analygesics, antibiotics, beta-blockers, lipid regulators, and hormones are classes of pharmaceutical compounds frequently detected in wastewater effluents (Snyder et al 2008, 68). The consumption and subsequent excretion of these classes of compounds makeup the foremost entryway for pharmaceuticals into wastewater effluents (Daughton 2007, 12) .

Another contamination pathway for pharmaceuticals in wastewater effluents come from the disposal of medication (Daughton 2007, 13). Disposal pathways originate from consumers, health care facilities, and professionals that administer pharmaceuticals that use flushing as a disposal method for unused drugs (Snyder et al 2008, 10). Again for years, it was considered best practices to use flushing as the disposal method for unused medications (Ortner and McCullagh 2010, 15). Imagine the volume of unused and expired medications held by hospitals, pharmacies, nursing homes, and doctors' offices. The Associated Press released data in 2008 that estimated over 250 million pounds of pharmaceutical waste were discarded by health care facilities (Hoffbuhr 2009, 15). It is unknown what percentage of this waste is flushed (Hoffbuhr 2009, 15). Then consider the typical household which has cabinet full of over-the-counter and prescription drugs (Spartz and Shaw 2009). Over-the-counter and prescription medications are more readily available and affordable today than ever before. In 2007 alone, more than 7 billion units of prescription and over-the-counter drugs were sold (Hoffbuhr 2009, 15).

Finally, industrial discharges and runoff also contribute to pharmaceuticals in water sources, albeit to a lesser degree (Snyder et al 2008, 10). Though not as significant in this research, it is interesting to note that industrial manufacturing waste can contain pharmaceuticals,

depending on the product they are manufacturing. Additionally, waste streams from agriculture, specifically livestock farming contribute to pharmaceutical contaminants in runoff and find their way to water sources (Hoffbuhr 2009, 17).

Emergence of the Issue

With the emergence of water issues as a principal environmental concern for the global community, it is evident that water is the most essential resource on the planet. There have been disputes over water rights throughout history and these issues continue today. As water becomes a sparse resource, people become more concerned with the quantity and quality of water available for consumption. Population growth, exponential rises in pharmaceutical consumption, and broader understanding of environmental issues have prompted concern that the flushing disposal method may have an unforseen impact on human and ecological health (Hoffbuhr 2009, 12).

Over the past forty years, various substances have been identified in water sources, including pharmaceutical compounds (Snyder et al 2008). As monitoring technology becomes more sophisticated than ever before, it is commonplace to find traceable concentrations of pharmaceuticals in raw water sources, treated drinking water, wastewater, and wastewater effluent (Ragain 2009). There have been tremendous advances in detection technology in the last few decades (Snyder 2008). Years ago, scientists could detect compounds at levels of parts-per-million; it is now common practice to utilize detection levels of parts-per-billion with more sensitive levels on the horizon (Snyder 2008, 2). Identifying trace microconstituents have raised concerns about water quality regarding the safety of consumption as well as environmental impact (Hoffbuhr 2009, 4). However, as Shane Snyder from the Southern

Nevada Water Authority points out, the detectability of minuscule concentrations of a microconstituent does not mean that it is harmful (Snyder 2008, 2). He reports that "the highest concentration of pharmaceutical level we detected in U.S. drinking water is approximately 5,000,000 times lower than the therapuetic dose" (Snyder 2008, 2). Since these tiny traces are difficult to comphrehend, Synder (2008) provides an analogy that this concentration level is equivalent to "one second in approximately 750 years" (2008, 2). Nonetheless, the effects of long term exposure to these pharmaceuticals is currently unknown (Snyder 2008).

In the United States, municipal drinking water must meet stringent standards which are set and enforced by the United States Environmental Protection Agency (USEPA) under the delegation of the Safe Drinking Water Act and the Clean Water Act (Hoffbuhr 2009, 8). For decades the USEPA has mandated that utilities perform comprehensive drinking water and source water monitoring. Utilities are currently required to monitor for 90 different contaminants that fall below the maximum contaminant level (MCL) for each one (Hoffbuhr 2009, 8). Many utilities test more extensively than what is mandated, however any contaminant that is found must be reported on the annual Water Quality Report distributed by the system. Additionally, the USEPA's list of regulated contaminants is dynamic because the Safe Drinking Water Act requires that a new list of potential contaminants be evaluated every five years, called the Contaminant Candidate List (Hoffbuhr 2009, 8). Substances on the Contmainant Candidate List will be scrutinized to determine if they should be added to the regulated contaminants under the Safe Drinking Water Act.

Likewise, the USEPA regulates contaminants released in wastewater effluents (Hoffbuhr 2009, 10). Wastewater effluent is the treated wastewater discharged from the treatment facility to surface water. The effluent is diluted with surface water and typically becomes a water supply

source for downstream populations. Although the significance of exposure to humans is still inconclusive, there is evidence that exposure to certain microconstituents found in waterways have a detrimental impact on aquatic wildlife (Hoffbuhr 2009, 22; Hunter et al 2008). While many questions remain unanswered regarding this issue, the uncertainty of this topic has caused an increased concern for water utilities in the provision of safe drinking water and protection of environmental health.

Impact of Microconstituents

Although it is generally accepted that there are microconstituents in water sources, questions remain concerning the overall health risks associated with these contaminants (Pritchard 2008; Pontius 2008). The long term health effects of chronic exposure to trace concentration of microconstituents are unknown (Snyder et al 2008, 123). Research has indicated that there is a link between microconstituent exposure and the endocrine mutations of some aquatic species (Virginia Department of Environmental Quality 2011; Hunter et al 2008). Fish and amphibians are continually exposed to traces of microconstituents throughout their entire life (Ruhoy and Kaye 2009-2010, 27). Reported effects include "dysfunctional growth and development, altered neurological physiology, and impaired mating and gender assignment" (Ruhoy and Kaye 2009-2010, 27). Many microconstituents are thought to disrupt the endocrine systems which regulate hormones in the body (Hoffbuhr 2009, 21). Reproduction, physical development, and behavior are elements which are managed by the endocrine system (Hoffbuhr 2009, 22). Therefore, chronic exposure to endocrine disrupting compounds (EDCs), like pharmaceuticals, could have disastrous effects on aquatic wildlife populations.

Humans are exposed to microconstituents in differing environments than aquatic wildlife. Although consuming water may expose humans to trace doses of microconstituents, one study reveals that a person could drink 50,000 eight-ounce glasses of water per day containing the highest levels of microconstituents ever detected and not experience any negative health effects (Hoffbuhr 2009, 21). It is also essential to remember that humans have pervasive exposure to microconstituents through just about every product we consume from meat and produce to personal care products and product packaging (Virginia Department of Environmental Quality 2011).

Currently, the overall effects of long term exposure to microconstituents are inconclusive. However, Ruhoy and Kaye (2009-2010, 27-28) discuss the complexity of this issue thusly:

> Health effects of any environmental contaminant are difficult to ascertain because people are exposed to multiple toxins over decades. Humans are not exposed to a single chemical or a single class of chemical. Rather, we are exposed to multiple combinations of environmental pollutants that may vary at different geographic locations. Not only to the pollutants to which we are exposed vary over a lifetime, but their effect will be different at different points in our development (fetus, neonate, adolescent, older adult).

On the basis of the foregoing discussion, the concern of microconstituents is multifaceted. Not only must researchers examine exposure, but specifically the type of exposure, point in the organism's development, and the combination of microconstituents and their potential by-products (Ruhoy and Kaye 2009-2010).

The Economy and Effectiveness of the Man-Made Water Cycle

Conventional water and wastewater treatment methods are primarily designed for biological disinfection and do not target removal of complex microconstituents (Rodriguez-Mozaz and Weinberg 2010, 1017; USEPA 2010c, 2). The treatment of drinking water is carried out in a succession of stages. Water is taken from a water source, for example, a river and is transported to a treatment facility. The first stage of treatment for drinking water is the flocculation/sedimentation stage which attracts particles and causes them to settle to the bottom of the tank (U.S. Enironmental Protection Agency 2010c; U.S. Environmental Protection Agency 2010d). In the second stage, the water goes through the filtration process which captures and removes smaller particles (U.S. Environmental Protection Agency 2010d). This is followed by the third stage, the disinfection process, which uses chlorine, chloramines, or chlorine dioxide to kill microscopic organisms (U.S. Environmental Protection Agency 2010d). Throughout the three stages, the water is monitored for quality assurance. After it completes the treatment process, the clean drinking water is distributed by utilities through a network of water pipes to reach consumers.

After the consumer has used the water, it then becomes classified as wastewater. If the consumer is on a public sewer system, the wastewater is collected by wastewater mains and transported to the wastewater treatment facility. The premise behind wastewater treatment was to sanitize dirty water so that it may be reintroduced into water sources for reuse. While many utilities have variations in treatment techniques, there is a conventional process practiced by most in the industry. The first steps in the treatment process are preliminary and primary stages which removes solids from the wastewater (Water Environment Federation 2009). Then secondary treatment step breaks down organic matter (Water Environment Federation 2009).

During the final stage, advanced treatment, nutrients are removed from the water, followed by disinfection using chlorine, ultraviolet light or ozone (Water Environment Federation 2009). After this entire process, the effluent is discharged back into source water, where it becomes diluted with the source water and will likely be treated and used by those who live downstream (Water Environment Federation 2009; USEPA 2010c, 2). The "man-made water cycle" or "water use cycle" as it is referred to, is an invaluable part of modern life.

Advanced Treatment Processes

There are several advanced treatment processes that can be added to supplement the conventional treatment process, however, there are cost and environmental impacts that would coincide with the implementation of these additional treatment methods. Each advanced process may be effective in the further reduction of microconstituents, with efficiencies dependent upon the specific conditions of treatment, specifically the type of water and contaminants being processed (USEPA 2010b, 25). The following describes a few of the advanced treatment methods that can be added to supplement the conventional treatment process, all of which can be used in water and/or wastewater treatment facilities.

Granular Activated Carbon: Granular activated carbon (GAC) is an adsorption process used in the form of "filter media" (AWWA Organic Contaminants Control Committee 2008, 20). The GAC media has a limited life span of a period of months up to a decade depending upon the type of water passing through, type of and exposure to microconstituents, and grade of GAC media (AWWA Organic Contaminants Control Committee 2008, 20).

Ozone Disinfection: Ozone is a robust oxidant and disinfectant process used for the effective removal of microconstituents (AWWA Organic Contaminants Control Committee 2008, 21). There are however, environmental considerations when using ozone. Surplus ozone must be properly disposed to avoid release into the environment. Additionally, some treatment scenarios may propagate bromate, which is a disinfection by-product (AWWA Organic Contaminants Control Committee 2008, 21).

Reverse Osmosis: Reverse osmosis (RO) is an intensive membrane filtration process that has been very successful in removing most microconstituents (AWWA Organic Contaminants Control Committee 2008, 21). RO is a process that uses high pressure to push water through the membrane filter trapping even dissolved contaminants (USEPA 2010c, 25). Arguably the most effective advanced treatment process, it is also the most expensive (Pritchard 2008). Furthermore, the residual contaminant removed by the RO process must be collected for proper disposal to ensure environmental protection (USEPA 2010c, 25).

Under the Clean Water Act, the USEPA regulates wastewater discharge, requiring treated effluent to meet specific federal standards. The quality of the effluent is constantly monitored by utilities at the treatment facility prior to releasing it back into a water source. It is certainly possible to expand the parameters of the treatment processes to allow for the removal of microconstituents. However, this type of infrastructural expansion will be quite costly and there is little substantial evidence to quantify these large scale system upgrades (Hoffbuhr 2009, 24-25). Research has indicated that some microconstituents do respond to traditional wastewater treatment processes (Emerging Contaminants Workgroup of the Santa Clara Basin Watershed Management Initiative 2005, 2). Nevertheless, the Emerging Contaminants Workgroup from Santa Clara, California contend that the “removal efficiences of pharmaceuticals appear to be

chemical specific, especially since many synthetic compounds are designed to be resistent to biological degredation" (Emerging Contaminants Workgroup of the Santa Clara Basin Watershed Management Initiative 2005, 2). The effective removal of such a broad spectrum of pharmaceutical compounds will require the addition of multiple processes in the advanced treatment stage (Emerging Contaminants Workgroup of the Santa Clara Basin Watershed Management Initiative 2005, 2; AWWA Organic Contaminants Control Committee 2008, 20). Advanced treatment technologies can be used for microcroconstituent removal, however at this time, the cost-benefit to implement this type of infrastructure upgrade is unclear (Pontius 2008). More comprehensive research is required to adequately assess the need for advanced treatment processes since the impact of microconstituents and additional costs are not fully known.

Since the effects of traceable microconstituents in drinking water are unclear, the USEPA has not set standards on any pharmaceutical compounds (Snyder et al 2003, 453). It is simply not yet known if there are any negative effects from long term exposure of pharmaceuticals in small doses through drinking water (Daughton and Ternes 1999, 908). Therefore, government agencies are suggesting that the most effective means of reducing the concentration of pharmaceuticals in water sources is the prevention of entry into wastewater systems (Daughton and Ternes 1999, 911). This can be accomplished by a number of methods including take back programs, modification of drug distribution, and education regarding proper disposal techniques (Daughton and Ternes 1999, 911).

Preventive measures for the reduction of pharmaceuticals in wastewater streams are the most preferred mechanisms and can be approached in several ways. For example, pharmaceutical collection events through local utilities (Herring et al 2008, 341) and pharmaceutical mail-back programs (Ruhoy and Kaye 2009-2010, 28) have been successful in

many communities. Perhaps most importantly, a standardized procedure should be developed to direct proper disposal of unused pharmaceuticals (Herring et al 2008, 341). The broad dissemination of accurate information to the medical community and the general population is essential. Through all these solutions, education is the key component. It is crucial for the population to understand that the improper disposal of pharmaceuticals may have a negative impact on human and environmental health (Spartz and Shaw 2009, 22).

Regulations for Health Care Providers

Currently drinking water and wastewater effluent standards do not include removal of microconstituents. Because this issue is of an emerging nature, utilities are not regulated in relation to pharmaceutical compounds. However, health care providers are required to meet state and federal guidelines regarding the disposal of unused pharmaceuticals (U.S. Environmental Protection Agency 2010b). The dangers of poisoning and diversion have been primary drivers in the establishment of the federal regulations that are in place. Some of the regulations hospice providers must abide by include:

The Controlled Substances Act: This law is overseen by the Drug Enforcement Agency. The DEA "prohibits the return of controlled substances from end-users to DEA registrants" (U.S. Environmental Protection Agency 2010b, 9). These registrants include pharmacies and medical staff. Therefore, it is illegal for medical personnel, including hospice home-health care to take a controlled substance from a patient and dispose of it outside the home of the patient. This may encourage hospice providers to use the practice of flushing to dispose of a patient's unused pharmaceuticals (U.S. Environmental Protection Agency 2010b, 9).

The Resource Conservation and Recovery Act (RCRA): The USEPA is the agency in which governs hazardous waste from the "cradle to the grave" (U.S. Environmental Protection Agency 2010b, 10). Some pharmaceuticals are classified as hazardous waste once they are discarded, so health care providers, including hospice must adhere to the RCRA in regards to the distribution, transportation, storage, and disposal of pharmaceuticals which fall within the hazardous waste category (U.S. Environmental Protection Agency 2010b, 10).

The Centers for Medicare and Medicaid Services (CMS): The Department of Health and Human Services oversees the Medicare program. Requirements for activities performed under the provision of Medicare must comply with the rules administered through this act. Since a large portion of hospice patients are covered under Medicare and therefore, hospice care is paid for by the Medicare program and their procedures must abide by the standards set with this legislation. Additionally, Medicaid which is partially funded with federal dollars but administered through each state is regulated through this act. However, it gives the state the ability to manage certain aspects of pharmaceutical distribution and disposal through the state health departments and the state board of pharmacy (U.S. Environmental Protection Agency 2010b, 10).

Safe Drug Disposal Act of 2010: This legislation calls for the USEPA to study the impacts of pharmaceutical disposal. As a result of this study, the USEPA will make an assessment of the environmental impact of pharmaceutical disposal; make recommendations on potential disposal programs, as well as the legal and cost ramifications of their proposals. Furthermore, this act will give local agencies more leeway to operate pharmaceutical take-bake programs (Water Environment Federation 2010).

Care Provided by Hospice

One of the most difficult aspects of medical care is performed by Hospice. Hospice provides medical care for patients who are in their final stages of life as a result of terminal illness or those who must manage chronic disease (Hale 2010). Because of the function they provide in patient care, they must administer and ensure proper disposal of pharmaceuticals in a residential setting (Becker, Ortner and Tuallai-McGuinness 2010, 203). "The role of long-term care facilities and hospice may contribute substantially to pharmaceutical waste because of polypharmacy and frequent changes in patient medications as a result of multiple, degenerative conditions" (Becker, Ortner and Tuallai-McGuinness 2010, 203). After years of directives to flush unused pharmaceuticals, environmental concerns are calling for the change of that standard procedure (Ortner and McCullagh 2010, 15; U.S. Environmental Protection Agency 2010b).

The Georgia Hospice and Palliative Care Organization (GHPCO) graciously provided their support for this research project on pharmaceutical disposal methods. For the purposes of this project, a survey was distributed to the members of GHPCO to determine the perspective of hospice providers in the State of Georgia. Using the results of the survey, a focus group of water and hospice professionals developed a contemporary, standardized protocol for proper disposal of pharmaceuticals in hospice care. The updated protocol was used to develop a leading edge document of best management practices and an education program for GHPCO and GAWP. The motivation for this project was to develop best management practices so that hospice may use proper pharmaceutical disposal methods while protecting water resources.

Methodology

Several research methods were utilized in this investigation of pharmaceutical disposal practices of hospice nurses in a residential setting. As an explanatory case study focusing on the actions and attitudes of hospice nurses, we employed personal interviews, a survey, a focus group, implemented a pilot study, and conducted secondary research reviews. These methods served to verify current disposal practices, gain feedback on alternative methods, and provide an understanding of the logistics that needed to be considered to sucessfully develop alternative management practices to reduce water pollution. Specifically, our study addresses the following questions:

Question 1: Do hospice providers know that flushing has a negative impact on water quality?

Question 2: Can the authors develop an alternative flushing method that will not:

a) Increase operational costs?

b) Increase the providers' workload?

c) Disrupt the treatment process for the patient or grieving process for the family?

d) Interfere with legal or regulatory restrictions?

e) Compromise established safety protocols?

Question 3: Will hospice nurses change their pharmaceutical disposal practice?

We expected to gain a thorough understanding of the issues involved in pharmaceutical disposal by hospice providers in a residential setting, the pros and cons of various alternative disposal practices, and identify an improved alternative to flushing that will not impact cost, add burden, or reduce safety while eliminating this water pollutant source. We suspected many hospice

providers were flushing pharmaceuticals. It is easy and has been recommended by several government agencies including the U.S. Food and Drug Administration (2010) (see Appendix A). We were curious to learn if hospice providers were aware of PPCP contamination concerns, have received any training in disposal practices, and if there is a policy in their organization regarding what to do with left over pharmaceuticals.

To ensure active participation within the hospice community and the water industry, we established partnerships with the leadership of two key nonprofit organizations: The Georgia Hospice and Palliative Care Organization (GHPCO) and the Georgia Association of Water Professionals (GAWP). The GHPCO is a group of 102 member organizations that provides information, education, and advocacy to hospice and palliative care providers operating state-wide in Georgia. The GAWP is a member organization of water utilites, engineering and environmental consultants, and licensed professionals that serves to educate and assist with water resource protection and management.

Georgia Hospice and Palliative Care Organization

After contacting and meeting with GHPCO's Executive Director, Jennifer Hale, to learn more about hospice care, we explained our intention to investigate pharmaceutical disposal practices and asked if GHPCO would be interested in helping to facilitate this project. We brainstormed with her on how to implement the research and decided on forming a focus group and creating a survey instrument.

Georgia Association of Water Professionals

To recruit support for this project, we met with GAWP's Communications Director, Bryan Wagoner, and asked for GAWP's sponsorship in the form of meeting space and participant incentives. We also asked for feedback on documents and endorsement of any

project deliverables to ensure that member utilities would utilize the materials. It should be noted that both researchers are members of and active volunteers for GAWP. Participant incentives sponsored by GAWP included gift certificates for one dozen donuts to organizations with staff that submit completed surveys. The value of the certificate was approximately $7.00. GAWP also provided lunch at the four focus group meetings. Lunch was valued at approximately $8.00 per person.

Using individual nurses as our unit of analysis, respondents were selected through purposive sampling from their respective organizations. The focus group and survey subjects were provided with project background information and contact information to ensure informed consent was established as a condition for participation in this study (see Appendix B). With endorsement from GHPCO, Marietta-area member organizations were invited to participate in the focus group. All 102 GHPCO member organizations were e-mailed to solicit voluntary participation from their nursing staff in the survey (see Appendix C). Only survey responses from nurses who reported being responsible for medication disposal were included in the data analysis. To our knowledge there were no risks involved for study participants. We believe that the participants gained a better understanding of the environmental health problems associated with flushing pharmaceuticals.

Data Collection Procedures

By using several sources of evidence, we hope to ensure validity and produce reliable education products that will serve to effectively address residential disposal methods used by hospice providers. To further ensure our recommendations are practical as well as beneficial to the environment, we asked the focus group members to implement a pilot study using the proposed Best Management Practice (BMP) and provide critical feedback regarding their

experiences using the new protocol. Based on these recommendations, we developed a final BMP and education plan to be published by the GAWP for member utilities across the state, to reach local hospice providers in their area and address the impact of flushing pharmaceuticals.

Focus Group Formation

To bring together a group of hospice workers willing to openly talk about the realities, problems, and concerns associated with medication disposal, we needed to find people who would be willing to answer our questions frankly, provide critical feedback, and offer practical advice throughout the research process. Jennifer Hale agreed to introduce us to GHPCO members by contacting hospice organizations operating in the Marietta, Georgia area with our invitation and request for their assistance with the project. We successfully recruited participants from three local agencies who agreed to meet with us to learn more about the project. During our initial meeting, we introduced the project, asked for feedback on how best to develop a successful education campaign to reach hospice nurses with our pollution prevention message, shared our initial draft of the survey for feedback, and scheduled three future meeting dates.

Survey Development

In preparation for our Institutional Review Board approval request, we created several survey questions. Our initial plan was to utilize an online survey site to collect data. We intended to draft an e-mail, with the survey link embedded in the message, inviting hospice nurses to participate. Jennifer Hale committed to forwarding the message to member organizations, encouraging participation. Our focus group formation meeting provided us with an opportunity to get expert feedback in refining the survey questions and resolving implementation logistics. Several questions were revised and the question order restructured

based on their suggestions. We also learned from the focus group that most hospice nurses do not have access to an office computer but they do meet routinely, twice monthly in most cases, as a group and it was during these meetings that the nurses would most likely be approached to complete the survey. Based on their recommendation, we switched to a paper survey. The invitation was e-mailed with our message as planned but the survey was attached as a PDF with instructions to either fax or mail responses. In addition, the focus group recommended providing a small incentive to nurses that participate. In response, GAWP agreed to provide gift certificates for a dozen donuts to each organization with staff that participated. Once collected, the responses were coded and entered into an Excel spreadsheet and Number Crunching Statistical System (NCSS). Frequency tables and cross tabulation reports were run in the NCSS database. The results were graphed and shared with the focus group.

Focus Group Meeting One

After sharing the frequency tables of the survey results with the group and reviewing the findings, we discussed the merits of the disposal methods reported by the survey respondents. The focus group quickly came to consensus on the protocol it preferred to promote as a BMP. All three focus group organizations agreed to pilot this new method for one month. To support the pilot project, we created a written protocol, a disposal method feedback form, and a fact sheet explaining water quality concerns as related to the flushing of pharmaceuticals. We also discussed what should be developed for the education campaign including creating a how-to video that demonstrates the BMP, a presentation for utilities to use in reaching out to hospice providers, and educational articles for GHCPO's and GAWP's newsletters. In addition, we asked the focus group participants to share their organization's written disposal policies to supplement our secondary research.

Focus Group Meeting Two

After reviewing the cross tabulation reports of the survey results and the findings, we shared the draft materials and solicited feedback to finalize the documents (protocol, feedback form, fact sheet) for printing. GHPCO and GAWP both approved the final draft for publication and distribution. We also shared the draft video script and obtained the endorsement of the concept and scheduled the filming as one of the activities to be completed during the third meeting. For the pilot study, the focus group asked us to provide a disposal kit for each nurse in case the patient's household did not have the required supplies on-hand. We created and delivered 30 disposal kits, 10 kits were provided per organization.

Focus Group Meeting Three

After receiving nurse feedback from the pilot study and reviewing disposal protocol, we discussed how to move forward with changing disposal practices. We filmed the educational and how-to video and discussed the logistics of establishing partnerships between water utilities and hospice providers. We decided two presentations needed to be developed to assist water utilities in reaching out to local hospice organizations. One would be an internal document that explains the relationship and logistics to be considered in establishing a partnership. The second is an educational presentation that utilities can share with hospice staff regarding the pollution concerns associated with flushing pharmaceuticals. It is pertinent to note here that two of the three hospice organizations participating in the pilot were not able to attend this meeting. We followed up individually with staff from the two organizations to obtain pilot study feedback.

Variables and Definitions

Through the survey, we examined several aspects of nurses' attitudes regarding concern for the environment including perceived patient concerns and reported participant concern over proper disposal, harm by hospice, and impact to drinking water quality, aquatic wildlife, and source water. We should note here that study participants were self selected and we acknowledge this potential bias inherent in our process. In addition, convenience sampling was used to select the focus group participants.

The survey responses were compared to several dependent variables including gender, age, medical experience, and hospice experience. The survey also provided descriptions of both the methods of pharmaceutical disposal training being given to nurses and the type of disposal procedures being conducted by hospice providers. This information provided the basis for focus group discussion on the development of an alternate BMP and education plan.

To facilitate clarity and understanding, the following industry-specific terms are defined, providing descriptions in greater detail of terms we use in this paper:

Hospice Care: "Care designed to give supportive care to people in the final phase of a terminal illness and focus on comfort and quality of life, rather than cure. The goal is to enable patients to be comfortable and free of pain, so that they live each day as fully as possible. Aggressive methods of pain control may be used. Hospice programs generally are home-based…The philosophy of hospice is to provide support for the patient's emotional, social, and spiritual needs as well as medical symptoms as part of treating the whole person" (Medicinenet 2003).

Palliative Care: "Palliative care (pronounced pal-lee-uh-tiv) is the medical specialty focused on improving the quality of life of people facing serious illness. Emphasis is placed on pain and symptom management, communication and coordinated care. Palliative care relieves symptoms

such as pain, shortness of breath, fatigue, constipation, nausea, loss of appetite and difficulty sleeping. It helps you gain the strength to carry on with daily life. It improves your ability to tolerate medical treatments. And it helps you to better understand your choices for care. Palliative care is not end-of-life care and is not the same as hospice. Hospice is focused on providing quality care to people in the last months of life who have decided to stop treatments meant to cure them. Palliative care on the other hand can be provided from the time of diagnosis. You can have palliative care at the same time as curative treatment" (Get Palliative Care 2011).

Diversion: The DEA defines the diversion of medications as "the redirection of narcotic drugs and psychotropic substances from the legitimate distribution chain of medical and scientific use into illicit channels" (Herring et al 2008, 338; Spartz and Shaw 2009).

Best Management Practice (BMP): This term is used in the U.S. Clean Water Act to describe a type of water pollution control including procedures for controlling toxic pollutants associated with industrial discharges and nonpoint source pollutant management (U.S. Environmental Protection Agency 2007).

Nonpoint Source Pollution (NPSP): As defined by EPA, "nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. The term 'nonpoint source' is defined to mean any source of water pollution that does not meet the legal definition of 'point source' in section 502(14) of the Clean Water Act. That definition states:

> The term 'point source' means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other

floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture. Unlike pollution from industrial and sewage treatment plants, NPSP comes from many diffuse sources. NPSP pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water" (U.S. Environmental Protection Agency 2010e).

Pharmaceuticals: Also referred to as drugs, medicine, and medication. The authors use these terms unchangeably.

Pharmaceuticals and Personal Care Products (PPCP): According to EPA, pharmaceuticals and personal care products (PPCPs) are being discovered in our nation's waters at very low concentrations. Pharmaceuticals refer to prescription and over-the-counter therapeutic drugs and veterinary drugs. Personal care products refer to products used for personal and cosmetic reasons such as soaps, fragrances, and cosmetics (U.S. Environmental Protection Agency 2010a).

Microconstituent: Naturally occurring or man-made compounds detected in the environment which may impact the health and development of living organisms (Virginia Department of Environmental Quality 2011; Hunter et al 2008).

Source Water: Referring to where drinking water supplies are pulled from prior to treatment, source water can be ground water (aquifers) or surface water (rivers, lakes, streams, wetlands).

Drinking Water: Also known as potable water, drinking water refers to water that has been treated to ensure it is safe for consumption.

Disinfection: "Water disinfection means the removal, deactivation or killing of pathogenic microorganisms...The process of inactivating harmful and objectionable bacteria, cysts and other

microorganisms by various agents such as chemicals, heat, ultraviolet light, ultrasonic waves, or radiation…When microorganisms are not removed...water usage will cause people to fall ill" (Lenntech 2011).

Wastewater: Also known as sewage, wastewater refers to water that has been contaminated by human waste or commercial and/or industrial processes.

Using the research collected during this study, we have developed a comprehensive education program. Deliverables include a piloted alternate disposal BMP (see Appendix D), an educational fact sheet (see Appendix E), newsletter articles targeting education at both hospice and water professionals, PowerPoint presentations targeting both hospice and water professional, an educational how-to video demonstrating the BMP, and an online presentation of our survey results. Our research is also scheduled to be shared at GAWP's annual conference in July of 2011. In addition, we discussed solicitation for product donations to supply free coupons for disposal supplies (liquid dish soap and zip-locking bags) to hospice providers for the supplies needed to perform the BMP. Any donations received would be provided to GHPCO for distribution to member organizations. With these resources in place, we have provided water professionals with the tools needed to help Georgia's hospice providers to standardize their medication disposal methods and reduce water pollution.

Findings

Three data sets were generated during this study. Initial data collection was focused on demographic information of hospice nurses and their industry attitude regarding pharmaceutical disposal practices. The collection instrument was in the format of a survey. This information was used in conjunction with direct feedback from hospice practitioners who agreed to serve as

advisors in a focus group. The focus group members helped develop strategies to reach out to their colleagues and advise on the content of education materials. The third data set consisted of a pilot project that tested an alternate pharmaceutical disposal method recommended by the focus group members and tested by colleagues at their organizations.

The Survey

The survey invitation was e-mailed in early December 2010 to 102 GHPCO member organizations with the incentive of a gift certificate for dozen donuts to each organization with nurses that participate in the study. We allowed three weeks for surveys to be returned by either mail or fax. In total, we received 137 completed surveys from 33 organizations. Of these, 15 surveys were eliminated from the study as the respondents indicated they were not responsible for pharmaceutical handling and/or disposal in their job duties. The research analysis was performed on the 122 remaining surveys.

The initial analysis was compiled using the frequency of responses from each question. In terms of demographics, the survey participants were mostly female, with more than 10 years of medical experience, and less than 5 years of hospice experience. Most were familiar with their organization's pharmaceutical disposal policy, had received some training in this area, and felt their organization was very concerned about pharmaceutical disposal methods. Most were also personally concerned about pharmaceutical disposal methods and indicated receptiveness to procedural changes.

Several questions about pharmaceutical disposal practices were focused on the respondents' level of concern over harm by hospice, impact on drinking water quality, impact on aquatic wildlife, and impact on water sources. We were interested in knowing if any demographic variables contributed to the participants' responses. We created cross tabulation

reports looking at these responses in relation to age, gender, medical experience, and hospice experience. No statistically significant differences were found when looking at participants' responses and age or hospice experience. There were some differences observed when looking at gender and medical experience.

As our survey utilizes feedback from all hospice nurses that self-selected to participate, the representativeness of our findings cannot be assured and we have to acknowledge the resulting concern over external validity inherent in the research design. Nurses from 33 of 102 possible organizations participated in this study. Due to time constraints, it was not possible to utilize random selection of subjects or to replicate our data collection. This is a limitation of our study that we openly recognize and hope to resolve in future projects. However, our subject demographics do mirror studies conducted by other researchers and we are optimistic that this threat to our external validity is minimal. We also utilized multiple sources of evidence, clearly defined our unit of analysis in this study, and adopted a holistic approach to our investigation in an attempt to ensure any threats to operational validity, internal validity, or reliability are adequately addressed.

Gender Differences

Probability levels indicate a significant difference in response for gender when answering three questions. However, of the 122 respondents only 9 (7 percent) were male. This disparity is typical of the field. "Approximately 5.4% of the 2.1 million R.N.s employed in nursing in the United States are men, according to the National Sample Survey of Registered Nurses conducted in March 1996 by the Health Resources and Services Administration" (Chung 2011). In addition, of the 9 males that participated, one failed to respond on two of the three questions

where statistical differences were noted. Despite the small sample size and problem of external validity, we note the responses to the three questions below as potential gender disparity.

1. How concerned are your patients and/or their families regarding the drug disposal methods of their unused medications? (see Figure 1).
2. Indicate your level of concern for impact of pharmaceuticals on water sources such as lakes and rivers (see Figure 2).
3. Would you be receptive to procedural changes regarding disposal of patients' unused drugs? (see Figure 3).

Figure 1.

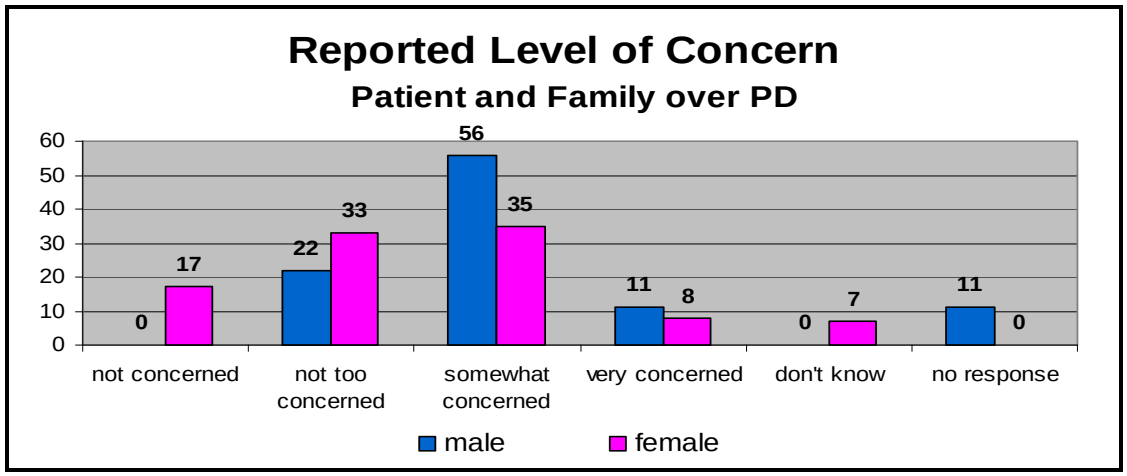


Figure 2.

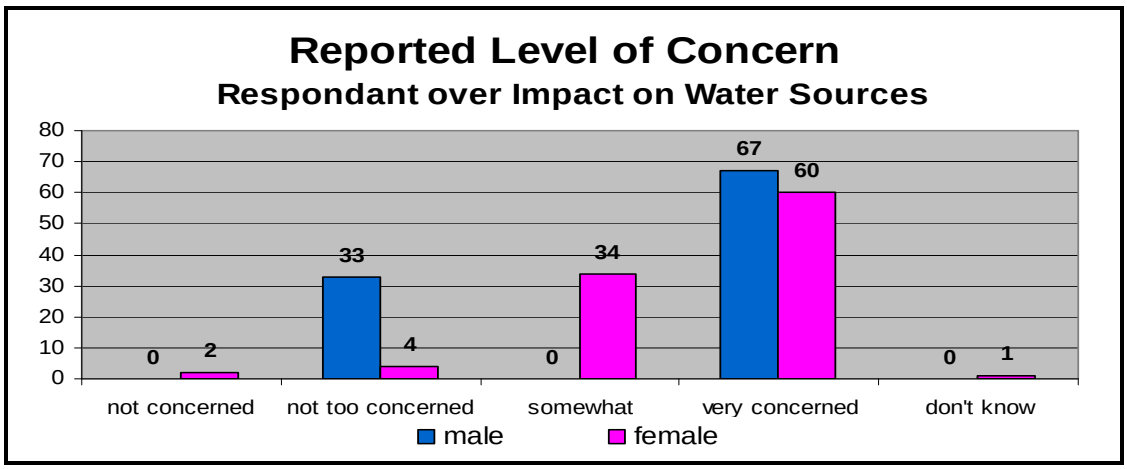
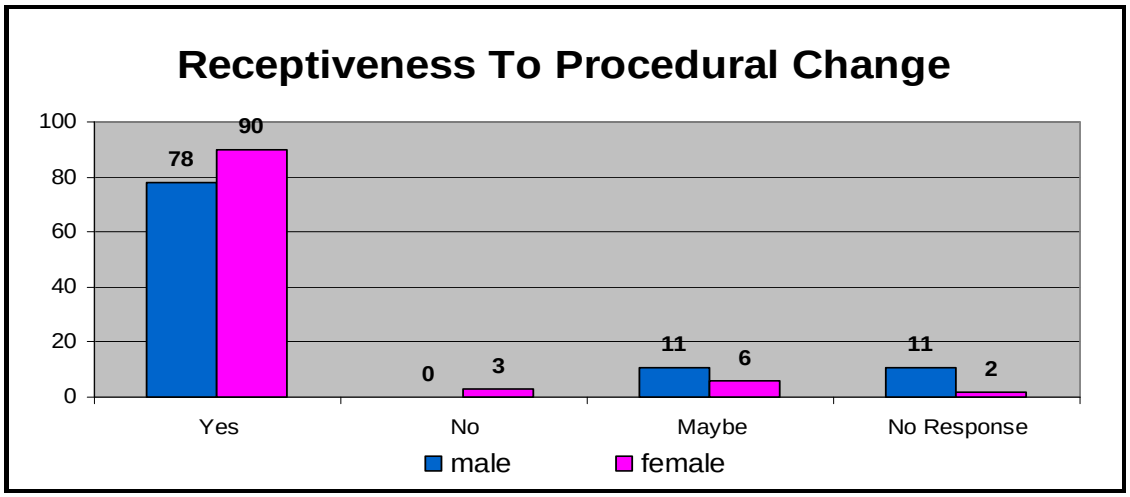


Figure 3.



The receptiveness to procedural change answers included several qualifying elaborations submitted by those that responded with maybe. Responses included dependence on reviewing the new procedure, who and what would be effected by the change, costs, regulatory/legal compliance, and eco-friendliness. Our results indicate that hospice nurses are quite conscience about pharmaceutical disposal practices. This is to be expected as they are handling controlled substances.

Medical Experience

Probability levels indicate a significant difference in responses when looking at years of experience in the medical field and two areas:

1. Concern over the potential harm from drug disposal methods by hospice (see Figure 4).
2. Concern over the impact of pharmaceuticals to aquatic life (see Figure 5).

As you would expect, those with the most nursing experience are older. However, we learned from our focus group that hospice has a high turnover rate. Figure 6 shows that medical experience and hospice experience can differ greatly. One might expect there to be a higher rate of employee retention in this field. However, as indicated in Table 1, we found that 86 percent of our participants had less than 10 years of experience working in hospice. This is pertinent when considering education efforts targeted at hospice providers. High turnover rates indicate that water utilities should establish ongoing education partnerships to ensure that our pollution prevention message reaches incoming staff.

Table 1.

Breakdown of Hospice Experience Reported by Nurses Providing Care in Georgia		
	Count	Percentage
Less Than 5 years with Hospice	66	54
6-10 years with Hospice	39	32
11-20 years with Hospice	16	12
20+ years with Hospice	1	1
Total	122	100

Figure 4.

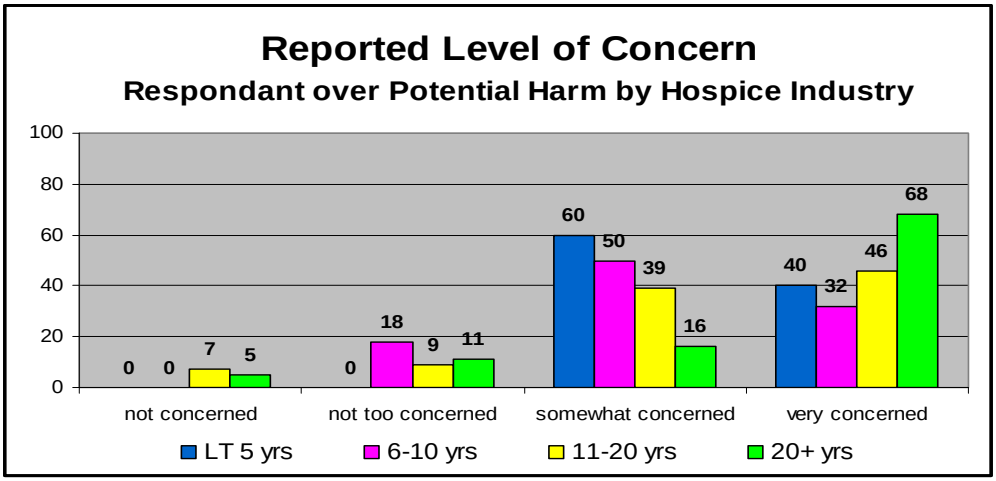


Figure 5.

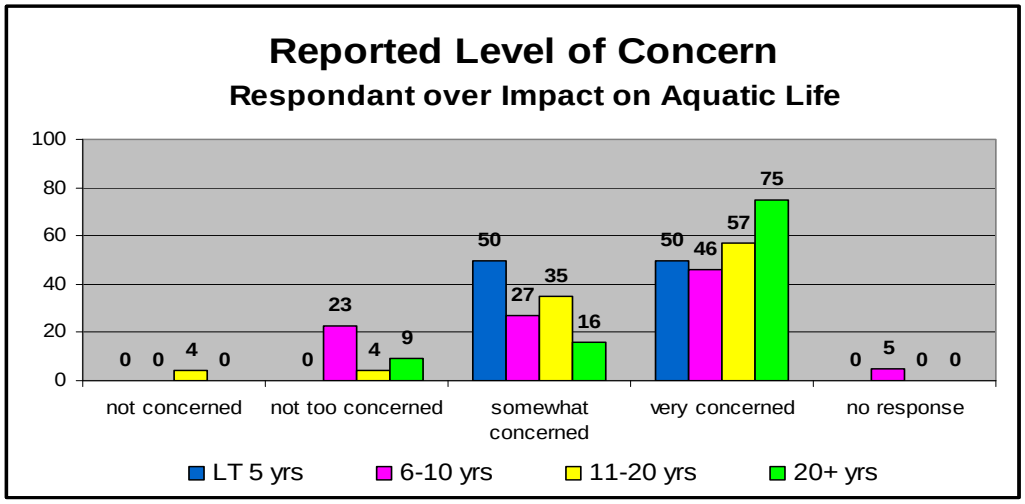
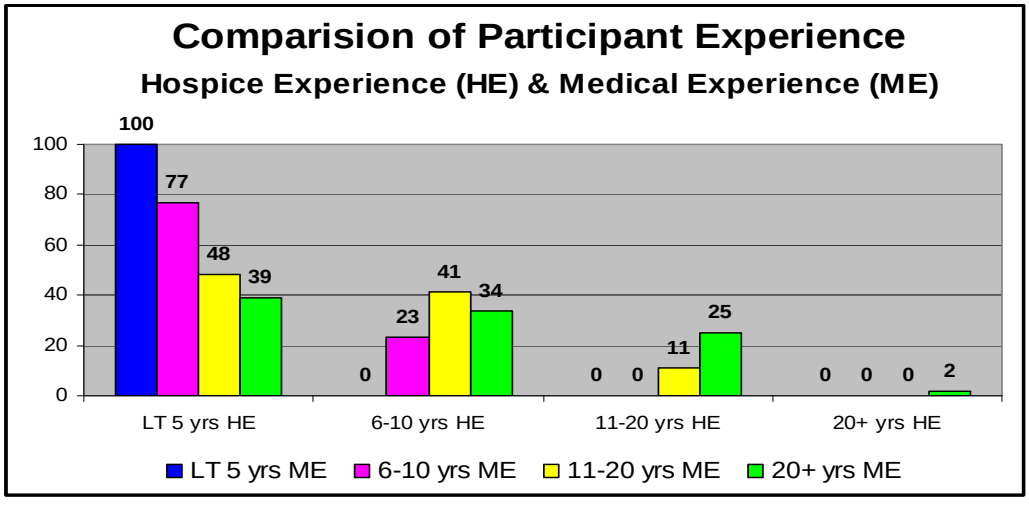


Figure 6.



Disposal Methods

Our survey shows that 28 percent of the respondents report flushing patient's unused pharmaceuticals. This is consistent with published data on hospice practices (Spartz and Shaw 2009). Having established the flushing method is being used in Georgia by hospice providers, we can conclude that a pollution problem needs to be addressed in Georgia. Table 2 is a breakdown on reported disposal methods.

Table 2.

Reported Pharmaceutical Disposal Methods Being Used by Hospice Nurses in Georgia	
Mix with undesirable then garbage	68%
Flush	28%
Garbage	3%
Take Back Program	1%

Many variations of undesirable substances were reportedly being mixed with medications to render them unusable. Products including sand, cat litter, detergent, coffee grounds were specifically noted. Eighteen percent of our respondents reported flushing as their only disposal method. This is likely in response to the FDA's list of medicines recommended for disposal by flushing. This is a recommendation, not a regulation. However, as some providers are likely to follow this procedure, they are probably flushing everything to ensure compliance with this recommendation. There is an added burden if a second disposal method is utilized. These barriers, of compliance and added workload, may discourage nurses from adopting a new disposal method.

The Focus Group

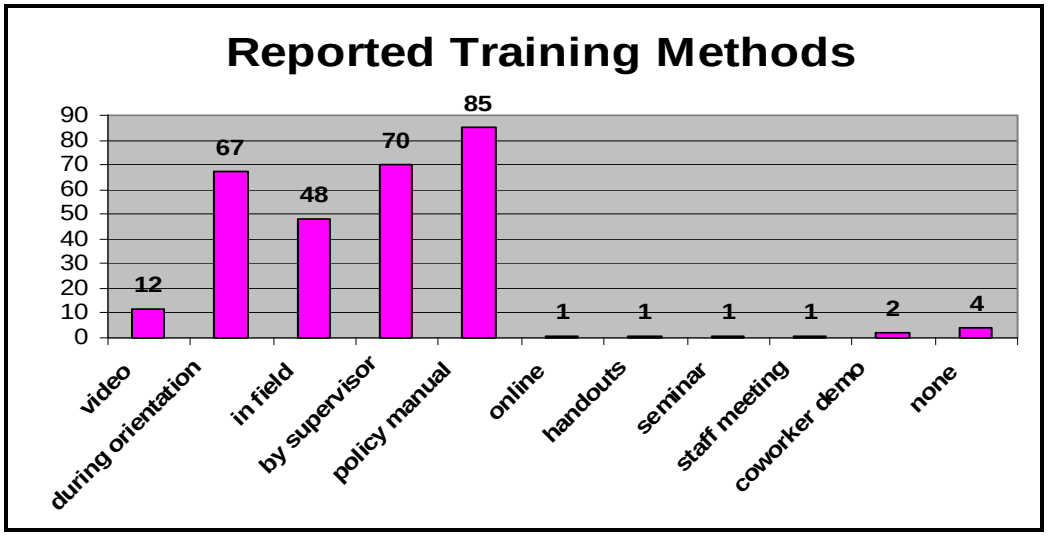
The survey data served as a starting point for exploring how to effectively reach out to hospice providers, what needs to be said, and what tools are required to convey the message

effectively. The focus group meetings provided an opportunity to talk directly with hospice nurses about our survey findings and obtain their expert guidance in developing an education plan to address our concerns and change pharmaceutical disposal practices.

Prior to launching the survey, we met with GHPCO and three local hospice organizations to introduce the project and establish the ground rules for our working group. Participants shared feedback on the draft survey, helping us validate the questions, and discussed the disposal methods used by their organizations. We asked each organization to share their disposal policies and received several for review. Additionally, we later learned that hospice providers are required to review these policies with patients and their families. This mandate ensures the method is explained routinely. Pharmaceutical disposal methods are also reviewed by state surveyors during recertification for each organization's license renewal. Therefore, discussion regarding our proposed change should not be difficult to initiate.

After closing the survey, we facilitated three focus sessions. Initial discussions focused on reviewing the survey findings. Of the respondents, 93 percent reported receiving some training on disposal of pharmaceuticals. We looked closely at the type of pharmaceutical training participants reported receiving. Over 30 training combinations were noted. Once organized, we compiled frequency responses for ten methods as illustrated in Figure 7.

Figure 7.



Based on the data, there is room for innovation as well as opportunity to utilize traditional methods to reach nurses with our educational message. We also noted that 93 percent of the respondents reported that they have never worked with their local water utility. Clearly there is an opportunity to develop a partnership between the two industries. We asked the focus group to consider what a partnership between the two industries would look like and what materials would need to be developed to assist in building this relationship.

The Education Plan

Both GAWP and GHPCO have several mechanisms in place to facilitate our outreach efforts. Newsletters, websites, and conference presentations will be used to communicate our education message to members. Beyond using these traditional methods, we tried to learn if there were other ways water utilities could reach out to hospice providers.

During the focus group meetings, we learned that hospice nurses were really only focused on the disposal of controlled substances. Other medications, those not of concern for diversion

or accidental poisoning, are left with the family. Considering this, we decided our BMP needed to reach beyond the hospice and water industry. It should be a method the entire community could use for disposal of expired and unwanted medications. The idea of creating a video was explored. A video is appealing because it could be used to showcase the disposal protocol and explain the pollution concerns associated with pharmaceuticals in our waterways. It could also be designed to speak to a broad audience. The focus group decided the video should be part of the education plan and agreed on a humorous approach with several "we used to believe" scenarios discussed as a way to show how we have learned through history and have changed our beliefs and behaviors. With this concept, we developed a script and filmed the video during the final focus group meeting.

Our education plan, initially designed for use by water utilities to facilitate communication with hospice organizations regarding water industry concerns over flushing as a pharmaceutical disposal practice, expanded to include outreach to the general public. In addition to the video, we created an education fact sheet that provides background and context to the pharmaceutical disposal issue and recommends an alternative practice to flushing. These education materials are appropriate for a community audience and can be used for public education programs.

The final component of the education plan is the development of outreach tools for water utilities to use in reaching hospice organizations. Based on focus group feedback, two presentations were needed. One is an internal presentation with a water industry perspective, designed to provide GAWP member organizations with what they need to consider before contacting a potential hospice partner. Components include how to find local hospice providers, who to contact within the organization, and what service to offer the organization once you make

contact. The second is a pharmaceutical disposal how-to presentation using a hospice perspective. We learned that hospice providers are required to offer education to staff on proper drug disposal. Water utilities will have the ability to provide the service of pharmaceutical disposal training sessions to hospice organizations using the materials developed during this project.

Beyond offering hospice providers free mandated staff training, hospice also has an ongoing need for volunteers that water utilities can help promote to employees and customers. Through our focus group we learned that hospice providers are mandated by law to have a minimum of 5 percent of patient care hours provided by volunteers. Volunteer care includes visiting or providing a service such as walking dogs, yard work, reading, or crafting for patients. Providers are specifically looking for veterans to visit with veterans receiving hospice care. They also need administrative help at hospice offices. With this ongoing need for volunteers, water utilities have an opportunity to partner with hospice organizations to encourage water protection practices and provide support for the needs of the community.

Formal Endorsement of the BMP

To become incorporated into the formal messaging of the organization, we needed to understand how a new disposal method could be adopted as official policy. Our focus group advised that for large organization, corporate endorsement is needed for a policy to be implemented. It is apparently not a difficult procedure but it does take time. The first step is to get local support, then regional leadership reviews the policy, and finally national management would need to approve the change. New policy must demonstrate potential outcomes and explain why the company should make the change. The focus group noted that cost is always an

important consideration. They also recommended submitting our policy and education materials to the Georgia Board of Pharmacy (GBP) for their official endorsement. Upon completion of this project, all materials will be submitted to GBP for feedback and approval

In discussing the logistics of obtaining endorsement, we asked what was needed to gain GHPCO's official recommendation and encourage member organizations to adopt our BMP. We learned that the project would need to be presented to the GHPCO Board of Directors for support. With the Board's agreement, the BMP could be published on GHPCO's website as a Georgia-specific practice endorsed by GAWP (and hopefully by GBP). GAWP approved the education materials and proposed BMP prior to the implementation of the pilot study.

Although we will not be able to obtain a measurement of project impact through this study, we do have an opportunity to establish a benchmark on how many organizations use flushing as a pharmaceutical disposal practice. GHPCO is willing to put a question in their annual membership survey, conducted every September, about the type of disposal method used by the organization. We plan to work with GHPCO on the exact working of this question so we can obtain an accurate picture of pharmaceutical disposal practices in order to target further education efforts as needed.

The Pilot Project

During the initial meeting of the focus group, we discussed conducting a pilot study using a method developed by the focus group. One of the nurses recommended using liquid dishwashing soap as an undesirable substance that could be mixed with the medication to render them un-consumable. We examined several options and discussed the alternative options with the members of the focus group prior to making a final decision. The focus group decided to test

the initial recommendation, using liquid dishwashing soap as the undesirable substance, with everything sealed in a plastic bag. These materials are inexpensive items that can be found in most homes. The nurses agreed to try out different soaps and various amounts of added water and share their recommendations via e-mail to finalize the proposed method for our pilot study. Each organization agreed to pilot the proposed method for one month and report back their findings. To support the pilot, we created a fact sheet, a written disposal procedure, and a comment card for protocol feedback (see Appendix D and E). Attention was given to ensure that the wording did not conflict with the federal guidelines published by the Office of National Drug Control Policy (2009).

In discussing the implementation of pilot project, the focus group asked for disposal kits to ensure the nurses had the necessary supplies on hand. We discussed what was needed in each kit and decided to include:

- 5 sandwich sized zip-sealing bags,
- 5 gallon sized zip-sealing bags,
- 1 small bottle of liquid dishwashing soap,
- 1 Pharmaceutical Disposal Factsheet, and
- 1 Pharmaceutical Disposal Method Sheet.

Each hospice provider had 10 nurses on staff so 30 kits were assembled. Each provider was also given 15 feedback forms. One member from each organization agreed to be the study representative who would ensure that the pilot materials were distributed and feedback forms were collected. The kits were delivered to each organization shortly after the second meeting to ensure that the pilot study was given a full month for implementation.

The proposed disposal method was implemented with ten hospice patients during the pilot study. Only one participant reported that the proposed method was more expensive than the method usually used. This specific provider instructs nurses to mix medications with kitty litter or coffee grounds. The focus group did not agree with the nurse. The group felt that the operational costs would be the same or even slightly less. The current method is to purchase a large bag of inexpensive cat litter. Each nurse carries a large zip-sealing plastic bag of cat litter in case the home they are working in does not have coffee grounds or cat litter to mix with the medication. The focus group felt that since the hospice provider is already purchasing zip-sealing plastic bags and the expense of liquid dishwashing soap is minimal, then operational costs would not increase using the proposed method.

We had previously considered soliciting donations for free product coupons for supplies to offset the cost of switching pharmaceutical disposal methods. We asked the group if utilities could help by providing supplies or whether we should pursue requesting coupon donations for materials. Since there is little to no cost associated with this protocol, they did not think it was necessary to request for assistance.

Hospice nurses participating in the pilot study were the initial audience receiving our message. We wanted to make certain that the reader understands the issue and is empowered to act responsibly. With pilot study participants' feedback, we will be refining the education materials for submission and official endorsement.

Regarding the logistics of the pilot study, we found it difficult to obtain feedback from the hospice providers who assisted with data collection. Due to the lack of predictability regarding when medication disposal practices were implemented in the field there was limited opportunity for data collection during the initial study period. We extended the pilot three more

weeks in an attempt to collect additional feedback and did obtain four more responses. However, we had hoped to achieve more diversity in the responses including aspects such as the number of nurses using the proposed method, the number of occurrences where the proposed methods was used in the home, and more extensive detail in terms of critical feedback from those who participated.

Discussion

The Overarching Issue

Although seemingly an emerging issue, traces of pharmaceuticals and Personal Care Products (PPCPs) have been present in drinking water since they were first used by the consumer (Snyder et al 2008, 67). The largest pathway of pharmaceuticals in water sources originate from wastewater effluents. Pharmaceutical compounds in water are categorized as "non-point source pollution" because they do not originate from one discernable source, but from a multitude of homes and businesses (U.S. Environmental Protection Agency 2010e). Chemical compounds from pharmaceuticals, referred to as microconstituents, are contributed to wastewater streams largely through excretion of the consumer (Rodriguez-Mozaz and Weinberg 2010), by disposal of medication (Daughton 2007), and sometimes industrial discharges or runoff (Snyder et al 2008). Some may perceive microconstituents in water sources as a new occurrence; however the detection of these compounds is the result of tremendous strides in analytical technology (Snyder et al 2008). Decades ago, monitoring instrumentation measured concentrations of parts-per-million but today it is possible to measure microconstituents to the level of parts-per-trillion (Snyder et al 2008, 67). While it is difficult to conceptualize the difference between these analytical levels, they represent incredible technological advances in water monitoring.

Societal Behavior

Finding effective solutions to the complex issue of pharmaceutical compounds in water sources will require a broad focus (Daughton 2010). Pharmaceutical disposal methods are only a small part of the larger issue of the increasing dispersion and utilization of pharmaceuticals. The rapid increase in consumption of pharmaceuticals results in higher concentrations of microconstituents in water, whether attributed through disposal methods or as a by-product of excretion. Trends in societal behaviors have led to the prolific distribution of medications by pharmaceutical manufacturers, pharmaceutical sales representatives, physicians, pharmacists as well as the consumption of the medications by the consumer (Daughton 2010). Dr. Christian Daughton, an expert in PPCPs for the USEPA, reminds us that "the focus of efforts addressing the issue of drug waste needs to be on solutions for minimizing the generation of waste at the outset rather than on how to handle it once generated" (Daughton 2010, 29). In other words, reducing demand will reduce supply and subsequently the inventory that will need to be discarded. This is definitely true. However, from the perspective of the water industry, there should be more concise and deliberate approach to determine the extent of the problem and what steps need to be taken to resolve it. The water industry is responsible for the public health of its consumers and as a collective group should work to ensure the quality of the product we deliver.

Advanced Treatment

As previously outlined, both the wastewater and the water treatment process traditionally include a series of standardized stages. Water and wastewater treatment has two vital steps, filtration and disinfection (Pontius 2008, 20). The filtration and disinfection of water and wastewater dramatically changed the quality of life in the United States since it was first

implemented in the early 1900s (Pontius 2008). Many other countries in the world continue to battle waterborne diseases like typhoid or cholera, diseases that have been eradicated in the United States through water and wastewater treatment processes. Conventional treatment techniques have been extremely successful in protecting the public and environmental health over the last 100 years. While conventional treatment methods remove microorganisms, these techniques are not as effective in the removal of microconstituents (Snyder 2008). In order to effectively remove the majority of microconstituents from water, the utilization of advanced treatment methods will be necessary (Hunter et al 2008).

Advanced treatment supplements the conventional treatment processes by removing a broader spectrum of microconstituents. Some of these advanced treatment processes include granular activated carbon (GAC), ozone disinfection, and reverse osmosis (RO). The effectiveness of each type of advanced process is based on the type of process used, the specific microconstituent to be removed, and the type of water to be treated, water or wastewater (Hunter et al 2008, 48). For example, ozone disinfection is more effective at removing Ibuprofen from wastewater than the granular activated carbon process is at removing the same compound from drinking water (USEPA 2010c, A-12, A-22). It is important to remember that a process that removes one microconstituent does not necessarily remove all of them (Snyder et al 2003). Therefore, to remove a complex assortment of microconstituents may require multiple advanced treatment processes (Snyder et al 2008). Furthermore, the implementation of advanced processes to a treatment facility is a large infrastructure upgrade. This improvement will result in a significant financial investment by water utilities, inevitably trickling the expense down to customers. Advanced treatment is effective at microconstituent removal, however, the feasibility of adding this type of infrastructure expansion is questionable when considering the lack of

evidence linked to negative human health effects. Further research on the effects of microconstituents will be crucial to determine the cost benefit of implementing any advanced treatment processes in public infrastructure.

Legislation

Technological advances in detection methods have increased exponentially in recent decades, quickly outpacing advances in water treatment processes (Snyder et al 2008, 19). Modern detection methods provide sensitivity analysis of parts-per-billion and parts-per-trillion (Hoffbuhr 2009, 10). This measures the concentration of a chemical by unit volume of water. To grasp the sensitvity of this type of detection, consider that one part-per-billion is the equivalent to "one-half an inch in the distance between the earth and the moon" (Snyder 2008, 1). These concentration limits are so tiny that they are difficult to comprehend. It is also important to remember that just because a compound can be detected does not necessarily mean it is harmful (Pontius 2008). Although some may call for regulatory action to set limits on microconstituents, in water sources, this may not be the most suitable resolution. It would better serve the public to have more clarity on the effects of exposure levels before implementing regulatory limits.

However, legislation is a powerful measure that can be used in the reduction of pharmaceuticals in water sources. There are currently no federal regulations regarding the concentrations of pharmaceuticals in water (Rodriguez-Mozaz and Weinberg 2010). Would it be prudent to enact legislation on drinking water standards since the effects of microconstitutents are still unclear? Regulation of microconstituents concentration limits would result in dramatic increases for the cost of the water that is used in every component of life. Because water is used

in the manufacturing and use of every conceivable product from food processing to car production, increases in water cost would impact the overall economy much like that of the cost of oil. Therefore, new regulation should be carefully considered because additional mandates on water treatment will have broad implications on the economy at large. The response of federal agencies and local utilities will be distilled down to public values. Do people want to pay more for their water in order to remove microconstituents or will the public prefer to have more substantial findings from research before further legislation is enacted?

The Drug Disposal Act of 2010 is a judicious step on the part of the federal government to determine the environmental impact of pharmaceuticals in water sources (Water Environment Federation 2010). The Drug Disposal Act may provide clarity for federal agencies to synchronize their directives regarding pharmaceutical disposal. This legislation prompts federal agencies to investigate the health effects of microconstituents, develop an education plan, and provide more flexibility for local take-back programs. This act will also provide funding for research and educational outreach programs. As a result, the findings from the USEPA's research may determine the steps, if any, that utilities should take to treat microconstituents in water sources.

Public Administration Principles

This project is a sound demonstration of public administration principles at work. With the on-going concern about the preservation of our water resources here in Georgia, it is more important than ever to protect the quality of accessible water sources. A public administrator working in the water industry has the task of managing water resources shared by the community. Therefore, one must take a holistic approach to confront challenges so that adequate quantity and quality of our water supplies may be ensured for the future. Although often taken

for granted, clean water is the engine for our economy. Every industry imaginable relies on water to function, from manufacturing airplanes to poultry farming and recreational parks to restaurants. There is a significant relationship between the health of our economy and the health of our water resources.

Much like oil, the price of water will have a great impact on the price of goods and services and consequently the overall economy. When contemplating pharmaceuticals in our water resources, some may feel that legislation and/or advanced treatment processes will be a simple solution to this problem. However, the enactment of legislation and/or the implementation of advanced treatment processes will inevitably result in higher water rates. The public administrator must evaluate the need to respond to this issue. Since the effects of pharmaceuticals in water are not yet known, it may not be prudent to pursue a reduction in their concentrations. Further research is needed to clarify negative health effects on humans, if they do indeed exist. Perhaps enacting legislation and advanced water treatment may be effective in removing microconstutients but these actions may be an exaggerated response to the problem. An overreaction will reduce the efficiency in the current treatment process.

Finally, the public administrator must consider equity when determining an appropriate response to the challenge of emerging contaminants. Actions that will increase water rates will impact social equity. Rate increases may be more obtrusive on low-income families, placing a disproportionate burden on this segment of the population. The public administrator should determine the public value placed on removing microconstitutents from water. Will people be willing to pay more for water when long term effects of microconstituents on human health are unclear? Are the negative effects on aquatic life motivation enough for the public to support large scale changes to the water system infrastructure? Currently, these questions cannot be

answered but future research regarding the public's value of water will direct the approach of public administration practitioners. Public support will help public administrators to manage the quality and cost-effectiveness of our most valuable natural resource.

Conclusions

Education and Outreach

For decades, we have been taught that flushing was the most suitable form of pharmaceutical disposal. However, with the impacts of this practice coming to light, experts have determined that this practice is no longer appropriate. It will be necessary to re-educate the general public so that their medication disposal practice transitions from the flushing to a method such as the one suggested in this study. It will take a concerted effort by federal, state, and local agencies to thoroughly promote a revised message for disposal practices. A large scale promotion of this kind will require a significant investment of time and money.

Additionally, the absence of a standardized disposal infrastructure prohibits proper pharmaceutical disposal. Some local utilities, law enforcement agencies, and pharmacies have established take-back programs but the cost and legal requirements are considerable. In order to facilitate a disposal infrastructure, it is important that local agencies have the flexibility and resources necessary to make cost-effective collection stations. There is hope that the new Drug Disposal Act of 2010 may provide leeway for local agencies to put such a system in place.

Project Partnership

This research has provided the opportunity to partner with hospice professionals through the Georgia Hospice and Palliative Care Organization (GHPCO) to form a focus group and get

their candid perspective about disposal practices. The GHPCO membership participated in our state-wide survey which concentrated on disposal practices and pollution impact perception by hospice professionals. The findings of our survey illustrate that hospice nurses are concerned about potential harm from pharmaceutical disposal by their industry. This answers the first question posed in our research, do hospice providers know that flushing has a negative impact on water quality? Hospice providers are aware that flushing has a negative impact on water quality. In the second question, we considered whether an alternative to the flushing method could be established that would not increase operational costs, workload, disrupt the grieving process of the family, interfere with legal restrictions, or comprise safety protocols. We were successful in the development of a disposal protocol that would fall within these parameters. Finally, our research was designed to determine if hospice nurses would be willing to change their pharmaceutical disposal practices. Over 90 percent responded that they would be receptive to possible change in their disposal method. With the survey results, we were encouraged to find that 93 percent of respondents had received training from their company regarding disposal methods. Additionally 68 percent were already using a similar protocol to the method we are proposing, which is to put all unused medications in a zip-sealing bag and mix with an undesirable substance such as liquid dishwashing soap.

Being Part of the Solution

The enormity of the issue of pharmaceuticals in water sources will require education and modification of many current social norms. However, the "journey of a thousand miles begins with the first step." Therefore, this research has been framed around a manageable scope, with the collaboration of two statewide professional organizations, the Georgia Association of Water

Professionals (GAWP) and the Georgia Hospice and Palliative Care Organization (GHPCO). In bringing these two associations together, we hope to establish a partnership between professionals in the water industry and those in the hospice sector to increase awareness of the contribution of "nonpoint source pollution" through flushing pharmaceuticals. With the support of the GAWP and GHPCO, we have created education tools that will enable water utilities to reach out to their local hospice providers and establish a pharmaceutical disposal protocol. The survey, focus group, BMP protocol, video, fact sheet, articles, and presentations that were developed through this project can be used in outreach efforts for hospice professionals, water professionals, as well as the general public. Of all the possible actions to achieve reduced microconstituents in water sources, education is the most essential. We need to understand that our own actions, however large or small, have consequences for the world around us. Ultimately it will take the support of everyone to protect and preserve our water resources for the next generation.

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Appendices

Appendix A

MEDICINES RECOMMENDED FOR DISPOSAL BY FLUSHING

This list from FDA tells you what expired, unwanted, or unused medicines you should flush down the sink or toilet to help prevent danger to people and pets in the home. Flushing these medicines will get rid of them right away and help keep your family and pets safe.

FDA continually evaluates medicines for safety risks and will update the list as needed.

Medicine	***Active Ingredient***
Actiq, oral transmucosal lozenge *****	Fentanyl Citrate
Avinza, capsules (extended release)	Morphine Sulfate
Daytrana, transdermal patch system	Methylphenidate
Demerol, tablets *****	Meperidine Hydrochloride
Demerol, oral solution *****	Meperidine Hydrochloride
Diastat/Diastat AcuDial, rectal gel	Diazepam
Dilaudid, tablets *****	Hydromorphone Hydrochloride
Dilaudid, oral liquid *****	Hydromorphone Hydrochloride
Dolophine Hydrochloride, tablets *****	Methadone Hydrochloride
Duragesic, patch (extended release) *****	Fentanyl
Embeda, capsules (extended release)	Morphine Sulfate; Naltrexone Hydrochloride
Exalgo, tablets (extended release)	Hydromorphone Hydrochloride
Fentora, tablets (buccal)	Fentanyl Citrate
Kadian, capsules (extended release)	Morphine Sulfate
Methadone Hydrochloride, oral solution *****	Methadone Hydrochloride
Methadose, tablets *****	Methadone Hydrochloride
Morphine Sulfate, tablets (immediate release) *****	Morphine Sulfate
Morphine Sulfate, oral solution *****	Morphine Sulfate
MS Contin, tablets (extended release) *****	Morphine Sulfate
Onsolis, soluble film (buccal)	Fentanyl Citrate
Opana, tablets (immediate release)	Oxymorphone Hydrochloride
Opana ER, tablets (extended release)	Oxymorphone Hydrochloride
Oramorph SR, tablets (sustained release)	Morphine Sulfate
Oxycontin, tablets (extended release) *	Oxycodone Hydrochloride
Percocet, tablets *****	Acetaminophen; Oxycodone Hydrochloride
Percodan, tablets *****	Aspirin; Oxycodone Hydrochloride
Xyrem, oral solution	Sodium Oxybate

*****These medicines have generic versions available or are only available in generic formulations.
List revised: March 2010

Appendix B

IRB Consent Documents

December 1, 2010

Kimberly P. Holland and Jennifer L. McCoy,
Georgia Association of Water Professionals

Re: Focus Group for Kennesaw State University, MPA Program, Public Service Practicum
Changing Behavior: Can Water Professionals Transform Pharmaceutical Disposal Practices of Hospice Workers?

To GHPCO Members:

As part of our graduate work, we are conducting research that will provide public awareness of pharmaceuticals as a non-point source of water pollution and introduce reduction measures. We are conveying a focus group in January 2010 and are asking for your help in gathering data. We will hold a series of focus group meetings in Marietta to discuss secondary research findings, survey results, and brainstorm alternative practices and education strategies. We anticipate a maximum of 4 focus group meetings to be held January – March 2011. Each focus group meeting will last approximately 2 hours. Lunch will be provided by the Georgia Association of Water Professionals at each focus group meeting to thank participants for their assistance.

Focus group participants should be at least 21 years old. Discussions during the meetings along with participants' contact information and GHPCO member affiliations will be completely confidential. Results will be used to help develop an alternative pharmaceutical disposal protocol and education program. Our project results will be shared with participants at www.gawp.org.

This study is being conducted under the supervision of our faculty advisor, Dr. Andrew Ewoh. Questions can be directed to Kim at 770-794-5227 or kholland@mariettaga.gov, Jennifer at 770-528-8215 or Jennifer.mccoy@cobbcounty.org or to Dr. Ewoh at aewoh@kennesaw.edu.

Sincerely,

Kimberly P. Holland
Marietta Water
627 North Marietta Pkwy
Marietta, GA 30060

Jennifer L. McCoy
Cobb County Water System
662 South Cobb Drive
Marietta, GA 30060

The purpose of this research has been explained and my participation is voluntary. I have the right to stop participation at any time without penalty. I understand that the research has no known risks, and I will not be identified. By completing this survey, I am agreeing to participate in this research project.

THIS PAGE MAY BE REMOVED AND KEPT BY EACH PARTICIPANT

Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 1000 Chastain Road, #0112, Kennesaw, GA 30144-5591, (678) 797-2268.

December 1, 2010

Kimberly P. Holland and Jennifer L. McCoy,
Georgia Association of Water Professionals

Re: Survey for Kennesaw State University, MPA Program, Public Service Practicum
Changing Behavior: Can Water Professionals Transform Pharmaceutical Disposal Practices of Hospice Workers?

To GHPCO Members:

As part of our graduate work, we are conducting research that will provide public awareness of pharmaceuticals as a non-point source of water pollution and introduce reduction measures. We have created a research design and are asking for your help in gathering data. The 16 question anonymous survey will take approximately 10 minutes to complete. Results will be used to help develop an alternative pharmaceutical disposal protocol and education program. Our project results will be shared with membership at www.gawp.org Again, your answers are completely anonymous.

We are asking member organizations to have their nursing staff. Participants in the survey should be at least 21 years old. Organizations that submit completed surveys will receive a gift certificate from the Georgia Association for Water Professionals for a dozen donuts to thank you for your assistance. Please mail or fax the completed documents to Kim Holland at the Marietta Water address below or fax them to 770-794-5225.

This study is being conducted under the supervision of our faculty advisor, Dr. Andrew Ewoh. Questions can be directed to Kim at 770-794-5227 or kholland@mariettaga.gov, Jennifer at 770-528-8215 or Jennifer.mccoy@cobbcounty.org or to Dr. Ewoh at aewoh@kennesaw.edu.

Sincerely,

Kimberly P. Holland	Jennifer L. McCoy
Marietta Water	Cobb County Water System
627 North Marietta Pkwy	662 South Cobb Drive
Marietta, GA 30060	Marietta, GA 30060

The purpose of this research has been explained and my participation is voluntary. I have the right to stop participation at any time without penalty. I understand that the research has no known risks, and I will not be identified. By completing this survey, I am agreeing to participate in this research project.

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Appendix C

Survey of Pharmaceutical Disposal Practices of Hospice Workers

1. Gender:
   - □ Male
   - □ Female
2. Age:
   - □ 18-29
   - □ 30-39
   - □ 40-49
   - □ 50-59
   - □ 60+
3. Are you responsible for handling and/or disposing of pharmaceuticals in your job duties?
   - □ Yes
   - □ No
4. How long have you worked in the medical field?
   - □ Less than 5 yrs
   - □ 6-10 yrs
   - □ 11-20 yrs
   - □ 20+ yrs
5. How long have you worked in the Hospice industry?
   - □ Less than 5 yrs
   - □ 6-10 yrs
   - □ 11-20 yrs
   - □ 20+ yrs
6. Have you worked with your local water utility in any of the following ways?
   - □ Pharmaceutical take-back program
   - □ Education (about pharmaceuticals in water)
   - □ Proper pharmaceutical disposal methods
   - □ No, I have not worked with my local water utility
   - □ Other - please describe:
7. Does your organization have a pharmaceutical disposal policy?
   - □ Yes
   - □ No
   - □ Don't Know

8. How do you dispose of a patient's unused pharmaceuticals?
   - Kitty litter & garbage
   - Crush & flush
   - Take-back program
   - Dump into garbage
   - Donation
   - Other - please describe:

9. Have you received any training on how to dispose of unused pharmaceuticals?
   - Yes
   - No
   - Don't know

10. Check all types of pharmaceutical disposal training you have received.
   - Video
   - During orientation
   - In field
   - By supervisor
   - Policy manual
   - None
   - Other - please describe:

11. In your opinion, how concerned is your organization regarding proper disposal methods of patients' unused medication?
   - Not concerned at all
   - Not too concerned
   - Somewhat concerned
   - Very concerned
   - Don't know

12. In what area are your patients are primarily located?
   - Urban
   - Suburban
   - Rural

13. What type of wastewater system are your patients are primarily on?
   - Septic system
   - Public sewer
   - Don't know

14. How concerned are your patients and/or their families regarding the drug disposal methods of their unused medications?
    - ☐ Not concerned at all
    - ☐ Not too concerned
    - ☐ Somewhat concerned
    - ☐ Very concerned
    - ☐ Don't know

15. Indicate <u>your</u> level of concern for the following:

	Not concerned at all	**Not too concerned**	**Somewhat concerned**	**Very concerned**
Proper methods for disposal of patients' unused medications	☐	☐	☐	☐
Potential harm from drug disposal methods by Hospice industry	☐	☐	☐	☐
Impact of pharmaceuticals on drinking water quality	☐	☐	☐	☐
Impact of pharmaceuticals to aquatic wildlife	☐	☐	☐	☐
Impact of pharmaceuticals on water sources (lakes & rivers)	☐	☐	☐	☐

16. Would you be receptive to procedure changes regarding disposal of patients' unused drugs?
    - ☐ Yes
    - ☐ No
    - ☐ Maybe - elaborate on maybe response:

Appendix D

Best Management Practices Developed by Authors

Pharmaceutical Disposal Methods

Supplies needed:

Zip-sealing bag(s)
Liquid Dishwashing Soap

Procedure:

1. Collect all medications
2. Remove all medications from their original containers, emptying all bottles, blister packs, syringes, suppositories, pills, tablets, liquids, etc. into the zip-sealing bag(s).
3. Dispense liquid dishwashing soap over the medication. Use a sufficient quantity of soap to completely coat the contents of the bag(s).
4. Seal the bag(s).
5. Manipulate the outside of the bag(s) by hand to ensure everything inside is fully covered in soap.
6. Dispose of bag(s) in household garbage.

Appendix E

Pharmaceutical Disposal Fact Sheet Developed by Authors

Pharmaceutical Disposal

and their impact on our waterways

For decades, we have been told the proper disposal method for pharmaceuticals was to flush. However, traces of chemical compounds from medications are now being detected in our water sources. Although the effects of long-term exposure to humans is currently unknown, there is increasing evidence of compromised endocrine and reproductive systems in aquatic life resulting from environmental exposure to these chemical compounds. The FDA has a guideline for pharmeceutical disposal practices. This fact sheet is designed to address these concerns as well as water pollution prevention.

Did you know?

- In 2002, scientists from the United States Geological Survey detected pharmaceuticals in 80% of the waterways they sampled.
- 3.7 billion prescriptions were filled and 3.3 billion units of over-the-counter medications were sold in 2007.
- 250 million pounds of unused pharmaceuticals and packaging are disposed of by hospitals and health care providers annually.

GEORGIA Hospice & Palliative Care ORGANIZATION

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Should it be flushed?

- Approximately 30% of Hospice Professionals report flushing unused pharmaceuticals as their current disposal method.
- Wastewater treatment facilities are designed to disinfect wastewater from bacteria and viruses. They are typically not equipped to remove pharmaceutical compounds from wastewater.
- Septic tank systems do not remove chemical compounds found in pharmaceuticals; therefore they have the potential to contaminate the surrounding soils, surface water and ground water.

Georgia Association of Water Professionals

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How can we limit pharmeceuticals entering our waterways?

- Use the "mix and toss" method on any pharmaceuticals. Mix pharmaceuticals with liquid soap, coffee grounds, or kitty litter and dispose of them in a sealed plastic bag.
- Be mindful of pharmaceutical quantities. The best solution is to avoid pharmaceutical waste of any kind.
- Do not flush unless specifically instructed to do so.

Sources:
United States Environmental Protection Agency
United States Geological Survey
United States Food and Drug Administration
University of Wisconsin
Associated Press