PROTECTIVE FACTORS AGAINST RELAPSE FOR PRACTICING NURSE ANESTHETISTS IN RECOVERY FROM ANESTHETIC OPIATES

by

ELIZABETH LAURA WRIGHT

LINDA MONEYHAM, COMMITTEE CHAIR
TEENA MCGUINNESS
JOE SCHUMACHER
BETH STULLENBARGER
ART ZWERLING

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ELIZABETH LAURA WRIGHT

SCHOOL OF NURSING

ABSTRACT

Introduction: Addiction to anesthetic opiates is an occupational hazard for anesthesia providers, which includes nurse anesthetists. Several factors influence this hazard risk, including, genetic make-up, personality traits, and job stress. Also of great concern is the risk of relapse if an anesthesia provider returns to work, which can be as high as 40%. However, there are nurse anesthetists who have successfully returned to the practice of anesthesia while in recovery from addiction to anesthetic opiates. These nurse anesthetists have first-hand experience with the challenges of recovery when faced with continual access to opiates, and their experience can help others in similar situations and provide a deeper understanding about the process of recovery.

Article synthesis: The first article published in this dissertation, titled “Imaging the Addicted Brain (Wright, in press) provides a foundational background about the science of addiction. The second article published, titled “Opiate Abuse among Nurse Anesthetists and Anesthesiologists” (Wright, Stullenbarger, McGuinness, Moneyham, Schumacher, and Zwerling, in press) describes the scope of the problem among anesthesia providers. The third article titled, “Protective Factors against Relapse in Practicing Nurse Anesthetists in Recovery from Anesthetic Opiates” describes the findings from the investigator’s dissertation research that examined factors that prevent relapse in nurse anesthetists who have been in recovery from addiction to anesthetic opioids and are successfully practicing in their chosen field. Findings from this
qualitative study contribute to the body of knowledge about addiction, recovery, relapse, and relapse prevention, especially when faced with handling the drugs on a daily basis.

Key words: addiction, opioids, nurse anesthetist, recovery, relapse, relapse prevention.
DEDICATION

I dedicate this dissertation to my husband Erin. Without his never-ending support, this accomplishment would not have been possible.
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I extend my deepest thanks to my dissertation committee as their knowledge and guidance was invaluable. Dr. Beth Stullenbarger so willingly took over as my initial dissertation chair to get me on the right path, Dr. Teena McGuinness, provided quiet encouragement and support throughout, Dr. Joe Schumacher had high expectations, and helped me live up to them, and Dr. Art Zwerling whose energetic support was palpable in every email and conference call. To my dissertation chair, Dr. Moneyham I extend a warm appreciation for her exceptional mentorship.

My family has been instrumental in my success. Especially my daughter Rachel who has been gracious, supporting, and loving throughout my education in spite of the sacrifices we had to make. A special thanks to my father who showed me that once I set my mind on a goal, anything is possible. Through every paper of mine he has read and painstakingly critiqued every word and sentence, he taught me to have confidence in myself. My mother gave me the ability to approach challenges with a smile, and for that I am thankful.

Lastly, I want to thank my participants. I am humbled by their strength to overcome their dependency and their courage to speak with me in hopes of informing and helping others. They were truly inspirational.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Neurobiology of Addiction</td>
<td>2</td>
</tr>
<tr>
<td>Imaging the Addicted Brain</td>
<td>3</td>
</tr>
<tr>
<td>Substance Abuse among Nurse Anesthetists and Anesthesiologists</td>
<td>4</td>
</tr>
<tr>
<td>Factors that Influence Recovery, Re-entry, and Relapse</td>
<td>6</td>
</tr>
<tr>
<td>Article Synthesis</td>
<td>7</td>
</tr>
<tr>
<td>IMAGING THE ADDICTED BRAIN</td>
<td>8</td>
</tr>
<tr>
<td>SUBSTANCE ABUSE AMONG NURSE ANESTHETISTS AND ANESTHESIOLOGISTS</td>
<td>35</td>
</tr>
<tr>
<td>FACTORS THAT ARE PROTECTIVE AGAINST RELAPSE IN PRACTICING NURSE ANESTHETISTS IN RECOVERY FROM ANESTHETIC OPIATES</td>
<td>67</td>
</tr>
<tr>
<td>CONCLUSIONS</td>
<td>121</td>
</tr>
<tr>
<td>LIST OF REFERENCES</td>
<td>122</td>
</tr>
<tr>
<td>APPENDICES:</td>
<td></td>
</tr>
<tr>
<td>A. UNIVERSITY OF ALABAMA AT BIRMINGHAM INSTITUTIONAL REVIEW BOARD APPROVAL</td>
<td>126</td>
</tr>
<tr>
<td>B. INFORMED CONSENT FORM</td>
<td>129</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBSTANCE ABUSE AMONG NURSE ANESTHETISTS AND ANESTHESIOLOGISTS</td>
<td></td>
</tr>
<tr>
<td>1 The Major Factors Influencing the Development Of Substance Abuse and Dependency</td>
<td>58</td>
</tr>
<tr>
<td>PROTECTIVE FACTORS AGAINST RELAPSE IN PRACTICING NURSE ANESTHETISTS IN RECOVERY FROM ANESTHETIC OPIATES</td>
<td></td>
</tr>
<tr>
<td>1 Description of Sample</td>
<td>112</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>SUBSTANCE ABUSE AMONG NURSE ANESTHETISTS AND ANESTHESIOLOGISTS</strong></td>
</tr>
<tr>
<td>1</td>
<td>Most commonly used substances misused by CRNAs..................................</td>
</tr>
<tr>
<td>2</td>
<td>Patterns of Behavior and Consequences Associated with Substance Misuse and</td>
</tr>
<tr>
<td></td>
<td>Dependency</td>
</tr>
<tr>
<td>3</td>
<td>Retrospective 4 month average of use by anesthesiologist who died from an</td>
</tr>
<tr>
<td></td>
<td>overdose, compared to 4 month average use by 8 non-abusing anesthesiologists</td>
</tr>
<tr>
<td>4</td>
<td>Typical Characteristics of a Treatment Program for an Opioid-Dependent</td>
</tr>
<tr>
<td></td>
<td>Anesthesia Provider</td>
</tr>
<tr>
<td></td>
<td>**PROTECTIVE FACTORS AGAINST RELAPSE IN PRACTICING NURSE ANESTHETISTS IN</td>
</tr>
<tr>
<td></td>
<td>RECOVERY FROM ANESTHETIC OPIATES**</td>
</tr>
<tr>
<td>1</td>
<td>Interview Questions</td>
</tr>
<tr>
<td>2</td>
<td>Overview of the Content Analysis Process</td>
</tr>
<tr>
<td>3</td>
<td>Example of a Content Analysis</td>
</tr>
<tr>
<td>4</td>
<td>The Twelve Steps of Alcoholic Anonymous</td>
</tr>
</tbody>
</table>
INTRODUCTION

Addiction (i.e., chemical dependency, substance dependency) is a complex, multifactorial disease involving areas of the brain that govern pleasure and impulsivity. Neurobiological changes occur resulting in an overwhelming motivation to seek out the addictive substance in spite of negative consequences, the inability to control intake, and a negative mental and physical state when access to the substance is prohibited (Koob & Le Moal, 2008). The medical definition characterizes addiction as a chronic physical disease marked by specific and predictable neurobiological changes associated with periods of remission and exacerbation (Meyer, 1996). Psychological definitions describe both compulsive and impulsive behaviors associated with addiction; as a result, other psychological disorders such as compulsive gambling and overeating share similar characteristics with addiction (Le Moal & Koob, 2007).

The consequences of addiction are devastating to the individual and anyone involved; People die, finances are lost, families are emotionally destroyed. Even then, the addict feels powerless to change his or her behavior. When a health-care provider becomes addicted, there is the added issue of patient care that is affected. Addiction affects approximately 8-10% of the United State population (Substance Abuse & Mental Health Services Administration [SAMSHA], 2010, including health-providers.

Evidence indicates that anesthesia providers, (i.e., anesthesiologists and nurse anesthetists) are at increased risk for abuse of, and dependence on potent anesthetic opioids such as fentanyl, sufentanil, alfentanil and remifentanil (Booth et al., 2002;
Hughes, DeWitt, Baldwin, Sheehan, Conard, & Storr, 1992; Gallegos, Brown, Veit, & Talbott, 1988; Hughes, Storr, Brandenburg, Baldwin, Anthony, & Sheehan, 1999; Talbott, Gallegos, Wilson, & Porter, 1987). These drugs are potent synthetic opioids with high addictive properties to which anesthesia providers have easy access.

While several factors influence this risk, access to these medications likely plays a large role in the development of abuse and dependence (Baldesarri, 2007; Bryson & Silverstein 2008). Such access challenges the recovery process, especially if return to anesthesia practice is the goal, as it is impossible to avoid the use of opioids in anesthesia practice. Recovery is difficult and relapse is a grave concern.

**Neurobiology of Addiction**

Knowledge about the neurobiological process of addiction provides a foundation for understanding the challenges associated with treating addiction and preventing relapse. Although various drugs of abuse and compulsive behaviors modulate activity of various neurons, all substances of abuse eventually stimulate areas of the brain responsible for anticipation and sensation of pleasure through the release of the neurotransmitter dopamine (Bears, Connors, & Paradiso, 2007). Collectively, these areas constitute the “reward system”. Neuroplasticity and changes in dopamine concentrations in these areas are thought to be responsible for the behaviors associated with addiction (Bears, Connors, & Paradiso, 2007; Volkow et al., 2006).

The reward system is comprised of areas in the brain responsible for the feeling of pleasure and the memory connection between the behavior that resulted in the feeling of pleasure, as well as the motivational reinforcement to engage in that behavior again. The
areas of the brain responsible for deeming a behavior pleasurable are part of the mesolimbic and mesocortical systems; however, several other systems are also involved (Bowirrat & Oscar-Berman, 2005; Nestler, 2005; Stahl, 2008). The areas involved with reward include the ventral tegmental area, the hypothalamus, the amygdala, the hippocampus, the septal nuclei, the anterior cingulate gyrus, and the extended amygdala (Bowirrat & Oscar-Berman, 2005; Stahl, 2008). Other closely related structures include the nucleus accumbens, the caudate, the putamen, the substantia nigra, and the orbitofrontal cortex (Nestler, 2005; Stahl, 2008). Of considerable significance in addiction are neural pathways between the ventral tegmental area and nucleus accumbens.

**Imaging the Addicted Brain**

There are several methods for studying the parts of the brain responsible for particular behaviors. One method uses Positive Emission Tomography (PET) scanning, which involves the detection of a positron-emitting tracer. In this type of study, dopamine concentrations are measured with a radioactive tracer that is sensitive to endogenous dopamine. Another method used to measure brain activation is glucose metabolism.

When brain activity of an addict is compared to a non-addicted individual, several differences are noted. In certain areas responsible for the sense of craving, addicts respond with increased dopamine levels when shown visual or verbal cues of their drug of choice or drug paraphernalia. (Bjorklund & Dunnett, 2007; Goldstein et al., 2009; Volkow et al., 2008; Volkow et al., 2006). Dopamine is also responsible for inhibition behavior, such that increased levels of dopamine reduce impulsivity and the desire to
engage in a certain behavior. Researchers have demonstrated that compared to non-alcoholic counterparts, alcoholics exhibit lower dopamine levels after the administration of a medication that stimulates dopamine activity (Volkow et al., 2007).

Such research has significant implications in relapse prevention for recovering addicts. In particular, dealing with the aforementioned neurobiological changes presents challenges for preventing relapse when one is continually exposed to addictive cues. This issue is such a concern for anesthesia providers recovering from opioid addiction that controversy exists as to whether recovering opioid-dependent anesthesia providers should return to the anesthesia profession following recovery (Berge, Seppala, & Lanier, 2008), including nurse anesthetists, anesthesiologists, and even student nurse anesthetists as access and job responsibilities are similar (Balderesari, 2007). Understanding the scope of the issue provides insight into the challenges faced by anesthesia providers in recovery from opioid addiction who want to return to the practice of anesthesiology.

**Substance Abuse among Nurse Anesthetists and Anesthesiologists**

Much of the research about substance abuse among anesthesia providers comes from research of physicians. Researchers have demonstrated that when compared to other physician specialties, a disproportional number of anesthesiologists develop opioid dependency. Studies of physicians document greater intravenous opioid abuse among anesthesiologists, compared to other specialties, especially among anesthesiology residents (Booth et al., 2002; Gallegos, et al., 1988; Hughes et al., 1992; Hughes, Storr, Brandenburg, Baldwin, Anthony, & Sheehan, 1999; Paris & Canavan, 1999; Pelton & Ikeda, 1991; Talbott et al., 1987). Addiction has also long been recognized as an
occupational hazard among nurse anesthetists (Lundy & McQuillen, 1962), although little research has focused on this population. The American Nurses Association estimates that between six and 10% of nurses are substance abusers; however the rates for nursing specialties such as nurse anesthesia are not known (ANA, 1984).

This increased risk of addiction among anesthesia providers is influenced by several factors including genetics, personality traits, and occupational factors such as stress, access, and attitude. Access likely plays a large role, as anesthesia providers have a unique access to potent, addictive medications. This access also greatly influences the success of recovery when a recovering anesthesia provider returns to practice after treatment. Relapse is estimated to be about 40% for an opioid-dependent anesthesia provider (McClellan, 1990).

Once addiction is recognized, protection of the public, as well of the individual is critical. States have regulatory agencies that remove health-care providers from practice once a diagnosis of addiction is made. Due to the risk of relapse, health-care providers are not allowed to resume practice until deemed ready by an addiction specialist. For anesthesia providers, a period of 1 year is recommended as the minimum time away from practice. Even then, because relapse is of such concern, initial return to practice is associated with restrictions prohibiting the administration of opioids. After-care and drug monitoring also continues. In the case of anesthesia providers, the recommended period of monitoring is a minimum of 5 years.

Re-entry of a recovering opioid dependent anesthesia provider is complicated by the constant access of opioids and possibility of relapse. Bryson and Silverstein recently advocated cautious re-entry of anesthesia providers back into the practice of anesthesia,
supporting re-entry on an individual basis. An editorial by Berge et al. (2008) found in the journal *Anesthesiology*, in response to Bryson and Silverstein, suggested the development of a “One Strike You’re Out” policy in anesthesia, prohibiting re-entry of any opioid-addicted anesthesia provider.

**Factors that Influence Recovery, Re-entry, and Relapse**

Recovery is an individual process that is influenced by a multitude of factors. One of the primary outcomes of successful recovery is abstinence from any addictive substances, especially for the nurse anesthetist who wants to return to the practice of anesthesia. Therefore factors that promote recovery are protective against relapse. Several factors are purported to have a positive influence on recovery and prevention of relapse for chemically dependent persons.

Factors that have a positive influence on recovery identified in the literature include personal motivation, family and social support, drug treatment experiences, spirituality, employment (Flynn, George, Broome, Simpson, and Brown, 2003; Scherbaum & Specka, 2008). Among nurse anesthetists, a small-scale study indicated that commitment to community-based programs, both 12-step and nurse-support groups was identified as the most helpful factor.

Among physicians, Domino et al. (2005) determined relapse is more common if one is dependent on opioids, has a family history of substance abuse, and has an underlying psychological disorder, with family history being the strongest predictor.
The first article published in this dissertation titled, *Imaging the Addicted Brain* (Wright, in press) describes the neurobiology of addiction through PET imaging research. This article provides a foundation for understanding the areas of the brain involved in addiction and the challenges in treatment and recovery that arise from the changes that occur in the addiction brain. The second article titled Substance Abuse among Nurse Anesthetists and Anesthesiologists (Wright, McGuiness, Moneyham, Schumacher, Zwerling, & Stullenbarger, in press) describes the scope of the problem and provides the basis for the third article titled *Protective Factors against Relapse for Practicing Nurse Anesthetists in Recovery From Anesthetic Opiates* (Wright, McGuinness, Schumacher, Stullenbarger Zwerling, & Moneyham). This article reports the findings of the investigator’s dissertation research that used qualitative research methods to explore factors important to sustained recovery from opioid addiction in a sample of nurse anesthetists with sustained recovery for a period of five or more years.
IMAGING THE ADDICTED BRAIN

by

E. LAURA WRIGHT

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Introduction

Drug addiction is a multi-faceted disorder involving several areas of the brain and affecting many levels of emotion and behavior. The process of addiction involves an overwhelming motivation to seek out the addictive substance in spite of negative consequences, a loss of the ability to control intake of the substance, and the development of a negative mental and physical state when access to the substance is prohibited (Koob & Le Moal, 2008). The medical definition of addiction characterizes addiction as a chronic physical disease marked by specific and predictable neurobiological changes associated with periods of remission and exacerbation (Meyer, 1996). Psychological definitions describe both compulsive and impulsive behaviors associated with addiction; as a result, other psychological disorders such as compulsive gambling and overeating share similar characteristics with addiction (Le Moal & Koob, 2007).

Although various drugs of abuse and compulsive behaviors modulate activity of various neurons, all substances of abuse eventually stimulate areas of the brain responsible for anticipation and sensation of pleasure through the release of the neurotransmitter dopamine (Bears, Connors, & Paradiso, 2007). Collectively, these areas constitute the “reward system”. Neuroplasticity and changes in dopamine concentrations in these areas are thought to be responsible for the behaviors associated with addiction (Bears, Connors, & Paradiso, 2007; Volkow et al., 2006). Although several areas of the brain and neurotransmitter secretion are involved in addiction, this paper will focus primarily on those areas of the brain known to be responsible for the compulsive behavior and loss of inhibition associated with addiction. As well, although several
neurotransmitters are involved in the addictive process, the focus of this paper will be on the neurotransmitter, dopamine.

Imaging studies offer unique information about neural activity of the brain. However, it must be recognized that, although the imaging studies presented in this paper reveal differences between addicted and non-addicted brains, it is impossible to entertain all factors involved in the process of addition. This paper will attempt to provide evidence of alterations in neural functioning of the addicted brain through a review of imaging research that focuses on addiction or associated phenomena. In order to understand the significance of these studies, an overview of the reward system is provided, as well a description of common imaging techniques used to study the brain.

**Overview of the Reward System of the Brain**

The reward system of the brain is found in the primitive part of most animal species’ brains. Its development has been crucial for survival of the species. Hence, those behaviors that promote survival and procreation are likely to be carried out. Making pleasurable such behaviors as sexual reproduction, feeding, nurturing, and receiving nurture, an animal is more likely to be motivated and seek out opportunities to engage in these behaviors. Being rewarded for such acts encourages approach behaviors which in turn promote survival. These behaviors are often referred to as those behaviors that produce ‘natural rewards’ as they are necessary for survival and are internally driven. Motivation is another key element of the reward system, since, even if performance of a behavior is pleasant, lacking underlying motivation or drive to perform the behavior, engagement in that behavior is unlikely.
The reward system is comprised of areas in the brain responsible for the feeling of pleasure and the memory connection between the behavior that resulted in the feeling of pleasure, as well as the motivational reinforcement to engage in that behavior again. This motivational reinforcement is referred to as “salience”, or “yearning” (Koob & Volkow, 2009). In fact, it is thought that the craving of an addictive substance is more an attribute of salience than it is the actual feeling of pleasure (Koob & Volkow, 2009). In other words, the anticipation of pleasure is greater than the actual sensation of pleasure, and it is craving that motivates drug seeking behavior. Pleasure does not always seem to be the motivating factor. While non-addicted individuals are more likely to spend time viewing pictures deemed pleasant, cocaine-addicted individuals are likely to spend more time viewing cocaine related pictures, even if these pictures are not deemed pleasant (Moeller et al., 2009).

The areas of the brain responsible for deeming a behavior pleasurable are part of the mesolimbic and mesocortical systems; however, several other systems are also involved (Bowirrat & Oscar-Berman, 2005; Nestler, 2005; Stahl, 2008). The areas involved with reward include the ventral tegmental area, the hypothalamus, the amygdala, the hippocampus, the septal nuclei, the anterior cingulate gyrus, and the extended amygdala (Bowirrat & Oscar-Berman, 2005; Stahl, 2008). Other closely related structures include the nucleus accumbens, the caudate, the putamen, the substantia nigra, and the orbitofrontal cortex (Nestler, 2005; Stahl, 2008). Of considerable significance in addiction are neural pathways between the ventral tegmental area and nucleus accumbens.
The neurotransmitter, dopamine, and its interaction with the Dopamine$_2$ (D$_2$) G-protein coupled receptor, appears to be the primary neurotransmitter responsible for reward system activation (Bowirrat & Oscar-Berman, 2005). These D$_2$ receptors are found throughout the brain and have several functions; however, those concentrated in the ventral tegmental area of the brain deal with the motivation factor of the reward system. The ventral tegmental area has dopamine neurons that project to various areas of the brain, especially to the nucleus accumbens. This pathway from the ventral tegmental area to the nucleus accumbens appears to be a significant pathway in the reward system, especially for drugs of abuse (Nestler, 2005). On some level, all drugs of abuse directly or indirectly stimulate this pathway, and do so more intensely (Nestler, 2005; Stahl, 2008). It is thought that stimulation of the ventral tegmental area with subsequent activation of the nucleus accumbens is responsible for the salience and the craving associated with addiction (Volkow, Fowler, Wang, Swanson, & Telang, 2007a).

Dopamine then codes for motivation associated with the reward more than the actual sense of pleasure of receiving the reward itself (Volkow et al., 2007a).

Some drugs of abuse, such as cocaine, directly stimulate dopamine release via the ventral tegmental-nucleus accumbens pathway, although there are several other neural connections which synapse onto the axons of ventral tegmental or nucleus accumbens neurons (Koob & Volkow, 2009). Other drugs of abuse directly or indirectly stimulate the ventral tegmental-nucleus accumbens pathway via these other connections. Even though this paper is not focusing on other neurotransmitter/receptor activity, understanding various classes of drug effects on dopamine concentrations in the nucleus accumbens may provide insight into why certain classes of drugs are more likely to be
abused. Drugs of abuse such as heroin, nicotine, and benzodiazepines are agonists for receptors found on ventral tegmental and nucleus accumbens neurons, which ultimately increase dopamine levels in the nucleus accumbens (Nestler, 2005).

There is a learned aspect to addiction involved with reward pathways as well. Stahl describes addiction as a “hijacked” reward system in which the normal reward neurocircuitry is replaced with connections that override the regulatory neural transmission, particularly between the amygdala and the nucleus accumbens (Stahl, 2008, p. 948). The amygdala plays a large role in emotional learning so that habitual use of a substance leads to the development of memory incentives. The brain remembers preceding events and experiences, and in the presence of a particular cue, the brain learns to anticipate a reward. The cue becomes a conditioned stimulus, and activation of the reward system is the conditioned response. That is, the reward system is stimulated by events recognized as actions preceding the actual administration of the substance itself. This process plays a large role in salience and craving associated with addiction, especially in regard to relapse (Koob & Volkow, 2009). When the amygdala is stimulated by a cue or memory, this modified circuitry also stimulates areas of the brain responsible for drug-seeking behavior. These connections are so powerful that inhibitory circuits are bypassed as the brain acts impulsively and immediately in order to obtain the anticipated reward (Stahl, 2008).
Imaging the Brain

There are several methods for studying what parts of the brain are responsible for particular behaviors. One method uses Positive Emission Tomography (PET) scanning, which involves the detection of a positron-emitting tracer. Dopamine concentrations are often measured with $[^{11}\text{C}]$raclopride, a D$_2$/D$_3$ positron-emitting radioactive tracer which is sensitive to endogenous dopamine (Volkow et al., 2007a). $[^{11}\text{C}]$raclopride competes with dopamine at D$_2$ receptors, which prevents binding of dopamine to its receptor, thereby increasing the amount of synaptic dopamine. The change in synaptic dopamine from baseline provides a relative assessment of endogenous dopamine concentration (Volkow et al., 2007a). Other indications of brain activation can be measured by looking at glucose metabolism. $[^{18}\text{F}]$fluorodeoxyglucose is a tracer used to measure glucose metabolism. Both of these tracers accumulate in areas of activation and are noted on the PET scan.

Frequently, researchers use the stimulant methylphenidate in order to mimic stronger drugs of abuse. This drug is a stimulant that works by inhibiting dopamine transporters, subsequently inhibiting the reuptake of dopamine and increasing synaptic dopamine (Volkow et al., 2007a). Its mechanism of action and effects are similar to those of cocaine, although it has much lower potential for abuse. In fact, it is approved by the Federal Drug Administration as treatment for Attention Deficit Hyperactivity Disorder in children (Volkow et al., 2007a).

Functional Magnetic Resonance Imaging (fMRI) is another common method used to indirectly measure brain activation. Regional blood flow increases in areas of activation, which can be visualized with blood oxygen-dependent level (BOLD)
responses by fMRI (Goldstein et al., 2009b). Most of the studies reviewed in this paper used one of the above mentioned methods to measure activation in the reward areas of the brain.

**Cues and Dopamine in Addiction**

Identifying areas of the brain activated in the presence of cue-related stimuli has been accomplished by several researchers. It appears that both the dorsal and ventral striatum play a role (Volkow et al., 2006). These researchers tested the hypothesis that increases in dopamine are responsible for the craving experienced by addicts when exposed to drug-related cues (Volkow et al., 2006). They measured dopamine levels via PET scans in 18 cocaine addicts during the presentation of neutral video images vs. drug-related video images (i.e., scenes of the preparation of crack cocaine for smoking). In this study, participants were asked about their experience; for example, whether videos triggered salience. In response to the cocaine cue videos, there was a significant positive correlation between dopamine levels in the dorsal striatum, especially the putamen ($r=0.47$, $p<0.05$) and the caudate nucleus ($r=.55$, $p<0.05$) and scores on various craving measurements. In contrast, only non-significant correlations were noted between the neutral video and craving scores (Volkow et al., 2006). It appears the dorsal striatum might be involved in habitual learning, and the correlation between the sense of craving and dopamine activation is associated with the automaticity of addictive behavior.

While the above study illustrates how dopamine increases in the striatum are associated with cue induced craving, Volkow et al. (2008) investigated whether striatal activation leads to craving or craving activates striatal dopamine. The investigators
hypothesized the latter. They studied striatal dopamine levels with $[^{11}\text{C}]$raclopride and PET scans, assessing craving scores of 20 active cocaine abusers who received methylphenidate in the presence and absence of cues. Not surprisingly, methylphenidate administration increased striatal dopamine levels in all participants; however, craving was not always associated with these increases. Craving was only induced when methylphenidate administration was associated with visual cues such as a video of people smoking cocaine, not during a neutral video (Volkow et al., 2008). These results differ from the previous work of Volkow et al. (2006), adding to the complexity when attempting to understand the neural processes in the reward system of addicted individuals. The authors explain the difference in dopamine levels in this study as being possibly related to the pharmacologic effects of methylphenidate as well as a function of cues, whereas in previous studies, dopamine increases were likely a function of cues alone (Volkow et al., 2008).

Goldstein et al. (2009b) performed a similar study, except instead of videos, the researchers measured responses to verbal drug cues in 15 control subjects compared to 15 cocaine addicts. It was hypothesized that drug words, but not neutral words, would enhance cue reactivity in the addicted individuals, but not the control subjects. Using the BOLD response from fMRI studies as a measurement of activation, the researchers demonstrated that learned verbal cues increased the BOLD responses to drug cue words in addicted individuals, primarily in the substantia nigra. These results provide evidence against the old view of the reward system in which it was thought that dopaminergic substantia nigra neurons projected only to the striatum and were involved motor activity (Bjorklund & Dunnett, 2007). It is clear the substantia nigra has projections into areas of
the reward system and their activation plays a role in habituation and motivation (Goldstein et al., 2009b).

Alterations in dopamine concentration and activation of the reward areas not only occur in response to drugs. These alterations have been noted also in response to other types of rewards as well, such as food. It is thought that mechanisms responsible for drug addiction are similar to those responsible for overeating. Early studies (e.g., Wang et al., 2001) revealed reduced D2 receptor availability as measured by [11C] raclopride and PET scanning in 10 obese men and women when compared to controls. This dopamine reduction was particularly notable in the striatum. It was thought that overeating could be a compensatory mechanism in response to a dopamine deficiency (Wang et al., 2001). Although this mechanism may be partly responsible for overeating, other mechanisms involving the reward systems also influence compulsive overeating behavior.

In particular, Stoekel, Weller, Cook, Tweig, Knowlton, & Cox (2008) demonstrated alterations in brain activity of obese women to high-calorie food cues when compared to non-obese counterparts. In this study, the researchers compared fMRI results of 12 fasting obese women to 12 fasting normal-weight women who were shown pictures of high calorie foods, as well as low calorie foods. Included in the high-calorie food pictures were sweet foods (e.g., cheesecake) and savory foods (e.g., cheese nachos). Examples of low calorie foods included foods such as steamed vegetables and broiled fish. Obese women rated high-calorie images as having significantly greater valence (i.e., pleasantness) than low calorie foods (p <0.05), while there was no difference between the two sets of images in the control group. In terms of the fMRI results, there was greater activation in the anterior cingulate gyrus, the amygdala, the hippocampus, the
lateral and medial orbitofrontal cortex, the ventral pallidum, and the putamen in response to high-calorie foods in the obese participants. In comparison, the only area showing greater activation to high calorie foods in the non-obese women was the dorsal caudate (Stoekel et al., 2008). The dorsal caudate may be partly responsible for placing value on rewards. This study illustrates that similar to drug addiction, food cues can act as an incentive and motivating factor in pathologic overeating.

**Loss of Inhibitory Control and Impulsivity**

Another feature of addiction is a person’s loss of control of substance intake; addicted individuals lose the ability to limit the use and the amount of their substance. There is evidence that the orbitofrontal cortex plays a role in the inhibitory control of behavior (Volkow et al., 2007b). In addicts, loss of inhibitory control results in impulsivity and the inability to abstain from their substance of choice. The orbitofrontal cortex is another system comprised of dopamine neurons which is involved with the reward system. It appears to modulate other dopamine changes in the ventral tegmental area; however, dopamine release plays an inhibitory role instead of an excitatory role. Volkow et al. (2007b) studied this regulatory system using PET imaging. The researchers measured brain activity via PET scans using \(^{11}\text{C}\) raclopride as the marker for measuring dopamine levels in 20 detoxified alcoholics and compared the results to 20 healthy subjects. Methylphenidate was used to stimulate dopamine activity and mimic drug activity. The goal was to evaluate dopamine release in the orbitofrontal cortex as an indicator of loss of control. Compared to healthy subjects, alcoholics had blunted increases in dopamine levels in the orbitofrontal cortex after methylphenidate
administration, indicating reduced activation. Alcoholics experienced less perception of a subjective “high” from the methylphenidate than did non-alcoholics. Interestingly, the alcoholics who smoked described a strong desire for tobacco after methylphenidate administration, indicating salience and craving. Considering that 16/20 of the alcoholics smoked, compared to 3/20 of the healthy subjects, this desire was significant (p< 0.002) (Volkow et al., 2007b). These results help illustrate differences in healthy and addicted brains in areas that influence impulse control and the ability to abstain during recovery. However, the incidental finding about smokers adds to the complexity of understanding the addicted brain in that it brings to question whether methylphenidate stimulated dopamine release in other areas of the brain resulted in the sense of craving or the blunted dopamine in the orbitofrontal cortex influence the craving.

There also appears to be gender differences in inhibitory control, at least in regard to food intake (Wang et al., 2009). When 13 fasting women and 10 fasting men were shown pictures of their favorite food, these food cues increased ratings of hunger in both sexes; however, when food cues were presented after participants were asked to mentally suppress their hunger, there was significantly less metabolism in the limbic system and surrounding connected areas in women and more in men. This activity was measured by PET scanning using glucose metabolism of $[^{18}F]$fluorodeoxyglucose. These areas included the left amygdala, the left hypothalamus, the cingulate gyrus, the parahippocampus, and the cerebellum. This reduction in activity can be interpreted as a subject having weaker cognitive inhibitory control over hunger (Wang et al., 2009). The authors suggest that these results help explain why women have greater difficulty
repressing desire for food and have higher obesity rates and more eating disorders than men (Wang et al., 2009).

It is unclear exactly how the orbitofrontal cortex modulates inhibitory behavior (van Eimeren, Ballanger, Pellecchia, Miyasaki, Lang, & Strafella, 2009). van Eimeren et al. (2009) propose that instead of excitatory dopamine neurotransmission in the orbitofrontal cortex being inhibitory, inhibitory control is related to pauses in dopamine transmission. They hypothesized that dopamine agonists prevent these pauses and therefore increase risk-taking behaviors and impulsivity (Van Emigrant et al., 2009). To test this hypothesis, the researchers studied eight men who were taking anti-Parkinson medications for Parkinson’s disease. These medications included the dopamine precursor, Levodopa, and the dopamine agonist, pramipexole. Although this study does not directly evaluate dopamine alterations in addiction, it provides some insight into the role of dopamine in risk-taking behaviors. Risk-taking behaviors were measured with the Balloon Analogue Risk-Taking Test (BART) in which each time participants added air to a computerized balloon, their monetary gain increased. The balloon would burst at unpredictable times, and when this occurred, all money for that task was lost. More attempts to add air equated with increased risk-taking. The other risk-taking measurement involved a roulette-like probability task in which participants guessed into which of the four color coded pockets a ball would land. Brain activation was measured during these activities using the BOLD fMRI response. Lastly, the researchers used a reward-prediction model to assess reward processing. This latter model computed differences between expected rewards and actual rewards. Positive errors occur when rewards were higher than expected, whereas negative errors occur when rewards were
lower than expected (Van Emigrant et al., 2009). Negative errors reflect negative reward processing and could be manifested by impulsive behavior.

Patients served as their own controls as they were tested in three separate sessions, one to three weeks apart, and each session occurred under a different drug condition (van Eimeren et al., 2009). In one session, the tasks took place 12 hours after the oral administration of the dopamine precursor Levodopa, at which time it was expected the majority of the Levodopa was metabolized. In the other two sessions, tasks took place about 40 minutes after administration of oral Levodopa, or the dopamine agonist, pramipexole. Results demonstrated that the dopamine precursor and dopamine agonist reduced reward processing (van Eimeren et al., 2009). There was an increase in negative reward errors after the administration of both Levodopa and pramipexole. BOLD response activation increased in the lateral orbitofrontal cortex and ventral striatum during negative reward processing. The authors suggest that continual dopamine signaling in the orbitofrontal cortex could play a role in exaggerated positive reinforcement (i.e., expecting greater rewards than actually received) that is associated with compulsive gambling and addiction (van Eimeren et al., 2009). These results appear to conflict with Volkow et al.’s (2007b) results in which blunted dopamine levels were noted in the orbitofrontal cortex; however, tasks performed by the participants were different within the two studies which may have influenced the difference.

In spite of negative consequences and future rewards with abstinence, addicts are frequently unable to put off larger rewards, instead choosing immediate gratification associated with their substance of abuse. It has been suggested that pathological alterations in the reward system mediate the inability of addicts to delay rewards in order
to obtain immediate gratification (Dom, Sabbe, Hylstijn, & Van Den Brink, 2009). This dysfunction is termed “delayed discounting”, in that one chooses smaller immediate rewards over larger delayed rewards (Beck et al., 2009). Delayed discounting plays a role in relapse. Beck et al. (2009) measured brain activity in detoxified alcoholics and matching healthy counterparts with fMRI during monetary delayed reward tasks. Impulsiveness was also measured with an impulsivity scale. Baseline impulsivity scores were significantly higher in the alcoholic group (p=0.03). In regard to anticipation of a monetary reward, fMRI studies revealed no differences between the alcoholic subjects and healthy subjects, except in the ventral striatum (particularly on the right). In and of itself, this finding was not significant (p = 0.80); however, when correlated with impulsivity scores, there was a significant negative correlation between activity in the ventral striatum and impulsivity score (p=0.001) (Beck et al., 2009). Greater impulsivity, which is associated with addiction, may be linked to alterations in the ventral striatum. Again, loss of inhibitory control in this area may be partly responsible for the inability to delay rewards.

Connectivity

Alterations in neuronal interaction between neurons, particularly the nucleus accumbens, amygdala, and orbitofrontal cortex, are thought to be responsible for the exaggerated value given to addictive substances (Stoekel, Kim, Weller, Cox, Cook, & Horowitz, 2009). While most fMRI studies measure the magnitude of activity, Stoekel et al. (2009) strove to analyze how the various areas of the reward system interact. Using the data from the previously mentioned study of obese women (i.e., Stoekel et al., 2008),
researchers utilized path analysis and a general linear model to determine whether there were differences in connections between obese and non-obese women in response to high and low calorie foods (Stoekel et al., 2009). The analysis revealed reduced connectivity from the amygdala to the nucleus accumbens and orbitofrontal cortex, and increased connectivity in another pathway going from the orbitofrontal cortex to the nucleus accumbens in the obese participants as compared to the controls (Stoekel et al., 2009). The authors concluded that the reduced connectivity between the amygdala, the nucleus accumbens, and the orbitofrontal cortex may indicate overeating is, in part, the result of impaired modulation of reward value placed on food. On the other hand, increased connectivity from the orbitofrontal cortex to the nucleus accumbens may enhance motivation to consume foods.

The Addicted Brain at Rest

As described above, PET scans and fMRI reveal that the brain of addicted individuals responds differently than the brain of non-addicted individual in terms of neurotransmission, blood flow, and metabolism during various experimental situations. One group of researchers was interested in whether the addicted brain differed from the non-addicted brain while at rest (Ma et al., 2009). They used BOLD responses in fMRI studies to evaluate connectivity between the areas associated with the reward system, including the nucleus accumbens, the ventral tegmental area, the anterior cingulate cortex, and the orbitofrontal cortex. In this study, 14 heroin abusers and 13 matched controls were included. Instead of performing tasks, participants were asked to remain quiet and relaxed with eyes closed during the scan. Results of the BOLD response
showed significantly stronger connectivity (p< .05) between the aforementioned areas including the nucleus accumbens, the ventral tegmental area, the anterior cingulate cortex, and the orbitofrontal cortex. This connectivity was evidenced by greater spontaneous activity, such that even at rest, neural connections in the areas involving reward, value, and impulsivity were primed in the addict (Ma et al., 2009). Still not clear are causality and whether the neural connectivity predisposed the individual to addiction, or the addiction changed the neural connections.

**Neuropsychological Impairment**

Using PET scans and $^{18}$F-flurodeoxyglucose, Goldstein et al. (2004) were able to demonstrate correlations between severity of cognitive impairment and metabolism in the prefrontal cortex in cocaine and alcohol addicts. The authors imaged glucose metabolism in the reward areas of the brain in 82 addicts (42 cocaine users and 40 alcohol users) and 72 controls while they performed several neurocognitive tasks. Factor analysis revealed four dimensions of neurocognitive functioning which included verbal knowledge, visual memory, verbal memory, and attention/executive activity (Goldstein, et al., 2004). According to Goldstein et al. (2004), the dorsolateral prefrontal cortex deals with working memory. Results of their study indicated that metabolism in this area predicted factors related to verbal and memory tasks. The authors also describe the role of the anterior cingulate gyrus as one which focuses on attention and self-monitoring, as activity in this area of the brain predicted factors related to attention/executive functioning. Compared to controls, neuropsychological impairments among addicts were noted in all four domains, although impairments were more severe in the alcoholics than
in cocaine addicts. It was thought that neurocognitive impairment in the prefrontal cortex played a role in decision making, motivation, and inhibitory control over addictive behaviors (Goldstein et al., 2004).

**Genetics**

Genetics play a role in the development of addiction. It is thought that genetics account for about 50% of alcohol addiction, although the biologic effects of genetic factors are less well understood (Renner, 2004). Early twin adoption studies reveal a 54% risk of an identical twin developing alcoholism if the other twin is alcoholic (Cloninger, Bohaman, & Sigvardsson, 1981). More recent research confirms the heritability of alcoholism, especially in men (Prescott, Caldwell, Carey, Vogler, Trumbetta, & Gottesman, 2005; Tabakoff et al., 2009). Although not as strong as alcoholism, similar twin studies indicate a genetic predisposition toward cocaine and opiate addictions (Matthews & Moylan, 2004). Some work has been done on the genetics of opiate addiction, and although the genetic component plays a role, a single causative gene has not been isolated (Mahajan et al., 2009). Other research finds genetic neuroelectric brain wave differences in sons of alcoholics, who are not alcoholics, which are identical to that in the alcoholic fathers. These brain wave alterations were not seen in the non-alcoholic control population (Beglitier & Porsjaz, 1999).

The combination of imaging genetically different brains is fairly new, but may play a larger role in the future as genetic research expands. In the area of addiction, investigators have studied genes that modulate dopamine in the reward system (Dreher, Kohn, Kolachanak, Weinberger, & Berman. 2009; Kirsch et al., 2006). This type of
research may help determine whether addiction causes neuroplasticity, or the genetic differences lead to the neuroplasticity associated with addiction.

Dopamine2 receptor polymorphism affects reward system processing. The presence of an A1 variant allele on post-synaptic D2 receptor results in less expression of D2 receptors in areas of the ventral striatum and putamen. These receptors are also associated with less dopamine binding. It is thought that decreased numbers of receptors and less dopamine binding lead to reduced dopamine release in the nucleus accumbens. In addicts, this reduced sensitivity to dopamine causes an urge to increase dopamine levels with their substance of choice; hence craving results. In a sense, this allele rewards substances that increase dopamine levels. Kirsch et al. (2006) demonstrated differences in BOLD activation on an fMRI in the nucleus accumbens between those with the A1 gene and those without. This difference was in response to the anticipation of a monetary reward after the administration of a dopamine agonist. Initially, participants with the A1 allele performed worse on a monetary reward task than the non-A1 participants (P <0.05), supporting genetically-altered reward system processing. After administration of a dopamine agonist, the A1 participants significantly increased their ability to obtain monetary rewards as well as activation of the striatum in response to reward anticipation (P <0.05) (Kirsch et al., 2006). This genetic difference may help explain the over-inflated anticipation associated with addiction.

On the other hand, van Eimeren et al.’s earlier described work demonstrated that increased dopamine activity in the lateral orbitofrontal and ventral striatum altered reward processing (van Eimeren et al., 2009). This phenomenon could have a genetic basis. Genetic influences on the reward system may also involve the modulation by the
enzymes responsible for catabolism of synaptic dopamine and its re-uptake into the presynaptic membrane in the prefrontal cortex and ventral striatum (Dreher, et al., 2009). Synaptic dopamine levels are maintained by catechol-O-methyltransferase (COMT), which catabolizes synaptic dopamine, and the dopamine transporter (DAT1) enzyme, which transports synaptic dopamine back into the presynaptic vesicle. COMT is very active in the prefrontal cortex, where little DAT1 is found and vice versa, although COMT likely plays some role in modulating dopamine in the ventral striatum via downstream neural connections. Specific variants of either of these genes cause reduced expression and activity of these enzymes, ultimately resulting in increased synaptic dopamine and increased activity in the prefrontal cortex and ventral striatum (Dreher et al., 2009). A genetic difference was demonstrated in brain activity with BOLD activation on an fMRI in response to reward anticipation and reward outcome. Participants with the COMT variant had a significant increase in activity of the lateral prefrontal in anticipation of reward (P < 0.001, uncorrected) and orbitofrontal cortex in response to reward (P < 0.005) (Dreher, et al.). Those with the DAT1 variant had increased activity in the caudate nucleus and the striatum. An interaction effect was also noted between the COMT and DAT1 genotypes in the ventral striatum, caudate nucleus, and lateral prefrontal cortex (P < 0.01) (Dreher et al.). These results support van Emerein and colleague’s work that revealed increased dopamine via administration of a dopamine agonist in the ventral striatum and lateral orbitofrontal cortex was associated with increased risk-taking behaviors (van Emerein et al.). It must be noted that neither of studies looked at the addicted brain, however, these results provide a foundation for
understanding how genetics plays a role in reward and risk-taking behaviors associated with addiction.

**Summary**

Functional neuroimaging techniques provide a deeper understanding about the intricacies of how the brain functions. Beyond research, these techniques are being used as diagnostic tools for disorders such as dementia, mood disorders, and schizophrenia (Menekse & Park, 2004). Their use as a diagnostic tool in addiction or predicting those at risk is promising. At this point in time, imaging studies clearly show differences between the addicted brain and the non-addicted brain. Most of these differences are in the areas that deal with reward. Reward processing is a complex function of the brain survival of a species; however, this processing becomes dysfunctional in addiction. Dopamine appears to be a major neurotransmitter involved, especially in areas involved with reward value, craving, motivation, and impulsivity. PET scans and fMRI studies reveal increased dopamine levels and metabolism in the ventral striatum of addicts, an area that plays a role in cue induced craving (Volkow et al., 2006; Volkow et al., 2009b). It has also been demonstrated that dopamine in the orbitofrontal cortex has inhibitory control over areas of the brain responsible for reward processing and that neurotransmission is altered in addicts (Dom et al., 2009; Dreher et al., 2009; van Eimeren et al., 2009). Similar alterations are also noted in obese women with overeating disorders (Stoekel et al., 2008, 2009).

Clearly, the reward system of the addicted brain is unlike the non-addicted brain; however, no study reviewed for this paper addressed direct causality. Determining
whether addiction causes neurological changes or underlying neurologic alterations predisposes one to the development of addiction would be a great research accomplishment; however, causality would be difficult to research as it would involve discovering whether alterations in the reward system are present early in life in those who become addicts later. Lack of longitudinal data of this type creates a large gap in the addiction research. Ultimately, genetic research may be key this discovery.

With the exception of compulsive eating behavior, all studies reviewed for this paper involved men. As it was illustrated by Wang et al. (2009), there are differences in cognitive inhibitory control over eating. This gender difference may be a factor in addiction to other substances as well. Research addressing this factor could reveal some interesting information about inhibitory control in the addictive process.

Finally, a good friend and speaker on addiction once told me that, “Once your brain becomes a pickle, it can never become a cucumber again,” referring to seemingly permanent changes in the neurological effects associated with addiction even after successful abstinence and recovery (Zwerling, 2009). Researching this facet of addiction would be fascinating. Imaging studies provide a wealth of information. It may be possible to study interventions and their effects on neuronal activity in the brain to determine if some changes can be reversed.
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SUBSTANCE ABUSE AMONG NURSE ANESTHETISTS AND ANESTHESIOLOGISTS

by

E. LAURA WRIGHT, BETH STULLENBARGER, TEENA MCGUINNESS, LINDA MONEYHAM, JOE SCHUMACHER, AND ART ZWERLING


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Introduction

It is no secret that some health-care providers have problems with substance abuse and chemical dependency. Nor is it surprising that certain health-care specialties, such as anesthesiology, are associated with increased risk for abuse of, and dependency on, certain classes of drugs. In particular, opioids and other potent anesthetics such as propofol are common drugs of abuse among anesthesia practitioners. Alarmingly, abuse is often not recognized until a fatal, or near fatal, overdose occur(Baldissari, 2007; Wischmeyer et al., 2007). Debate also surrounds the issue of re-entry to anesthesia for recovering opioid-dependent practitioners. Some practitioners feel the chance for relapse is too high to risk allowing return to anesthesia practice, while those that support re-entry believe it should be dealt with on an individual basis. This article reviews the research of substance abuse and dependency among anesthesiologists and nurse anesthetists, with a focus on opioid use.

Substance Abuse among Anesthesiologists

While the Substance Abuse and Mental Health Services Administration (SAMHSA), estimates that the overall rate for substance abuse in the general population has consistently remained 8% since 2002 (SAMHSA, 2008), determining the incidence of substance abuse and chemical dependency among anesthesia providers is particularly difficult. The sensitivity of the issue, legal issues associated with practice, and
implications for patient care are just some consequential factors discouraging disclosure, and it is likely that any reports underestimate the scope of the problem.

Early research mostly contains anecdotal reports of physician chemical dependency and abuse. Even as far back as the late 1800s, William Halstead, known as the “father of modern surgery,” was described as having a cocaine addiction related to experimentation with the anesthetic (Baldissari, 2007). Studies from the 1980s and early 1990s describe the prevalence of substance abuse among physicians and helped the medical community recognize the problem (Gallegos, Browne, Veit, & Talbott, 1988; Hughes, DeWitt, Baldwin, Sheehan, Conard, & Storr, 1992; Paris & Canavan, 1999; Talbott, Gallegos, Wilson, & Porter, 1987). In 1987, Talbott et al. reviewed specialties of the first 1,000 physicians to complete the Georgia Impaired Physician Program and noted that anesthesiologists were over-represented. At the time of the study anesthesiologists represented 4% of physicians in the United States, yet almost three times (12%) that of the program’s participants were anesthesiologists. Also over-represented were younger anesthesiologists; anesthesiology residents under the age of 35 accounted for more than one-third of the physician residents in the program (Talbott et al., 1987).

Among anesthesiologists, data from several studies support that abuse of potent opioids is greater than the general population and physicians in general. In 1988, Gallegos et al. re-examined Talbott et al.’s (1987) data and revealed differences in drugs of abuse and route of administration between anesthesiologists and other physician specialties; anesthesiologists were more likely to abuse opioids and abuse these medications intravenously. The authors also estimated that anesthesiologists are five times more likely to abuse opioids than the general public (Gallegos et al., 1988. Other
state physician programs also report higher opioid abuse among anesthesiologists and anesthesiology residents in treatment for substance abuse and dependency compared to other physician specialties (Paris & Canavan, 1999).

In the 1990s, surveys sent to 1,754 resident physicians from 11 medical specialties (Hughes et al., 1992) and to 5,426 physicians from 13 specialties (Hughes, Storr, Brandenburg, Baldwin, Anthony, & Sheehan, 1999) found that psychiatrists had the highest rate of overall substance abuse. In the 1992 study, anesthesiology residents demonstrated high rates of substance abuse for amphetamines, while the 1999 study revealed that anesthesiologists had the highest rate for abusing potent opioids such as fentanyl, alfentanil, and sufentanil. Consistent with other studies, Lutsky, Hopwood, Abram, Jacobson, Haddox, and Kampine, (1993) assessed the use of psychoactive substances among anesthesiologists over 30 years and identified drug impairment in 5.5% of the anesthesiologists who responded. In 2002, Booth et al. (2002) reported about a 1% incidence of controlled-substance abuse among residents and a 1.6% incidence among faculty ($P < 0.05$) in academic anesthesiology programs. Fentanyl was the most commonly abused controlled substance, followed by ketamine and thiopental ($P < 0.05$). Sadly, in 18% of those found to be abusing, death, or near death, due to an overdose was the initial indicator of abuse. Results from these studies only begin to illustrate the scope of the problem.

Being an anesthesia provider seems to be an independent risk for dying of drug-related causes. In 2000, Alexander, Checkoway, Nagahama, and Domino, compared mortality rates and causes of death between 2,458 anesthesiologists and 2,376 internists. Adjusting for age, race, and gender, an anesthesiologist was 2.79 times more likely to die
of drug-related causes than an internist, and 4.06 times more likely to die of viral hepatitis, which is likely due to the increased use of intravenous anesthetic medications. Interestingly, most drug-related deaths in anesthesiologists occurred within the first five years after graduation, substantiating an early development of a pattern of abuse (Alexander et al., 2000).

**Incidence of Substance Abuse among Nurse Anesthetists**

While research reveals fewer formal reports about the prevalence of substance abuse among nurse anesthetists compared to anesthesiologists, opioid addiction has long been recognized as a problem. As early as 1962, the *AANA Journal* published an article describing opioid dependency as an occupational hazard for nurse anesthetists (Lundy & McQuillen, 1961).

Nurse anesthetists are likely grouped into general nursing profession estimates of substance abuse, which is thought to be between 6 and 10% (Naegle, 2003). In 2002, Diane Quinlan of the AANA used these statistics when presenting to the American Nurse Association’s ANA Biennial Convention about the incidence of general substance abuse among nurses and nurse anesthetists. Quinlan also provided statistics from the National Council for State Boards of Nursing that reported more drug-related complaints and discipline actions taken on nurse anesthetists than other advanced-practice nurses.

A 1999 study by Bell, McDonough, Ellison, and Fitzhugh, was the first large-scale study that looked at the prevalence of substance abuse among nurse anesthetists. This seminal study revealed 10% of nurse anesthetists admitted to misusing powerful anesthetic medications during their career as a nurse anesthetist. The four most-common
medications abused were benzodiazepines, nitrous oxide, potent opioids, and propofol (Bell et al., 1999). With a grant from the AANA Foundation, Bell replicated this study in 2006 (Bell, Personal Communication, 2010). Unpublished reports revealed not much difference, except that opioid and propofol use increased overall. (See Figure 1) In both studies, most of the participants who admitted to misusing these drugs had been in practice between 10 and 20 years, which is an interesting contrast from the younger age associated with anesthesiologists. There was, however, a subset of participants in the second study who admitted misusing substances during their first 3-5 years of practice.

Even though little formal research exists, nurse anesthetists are recognized as sharing a risk for opioid abuse with anesthesiologists. In a recent American Society of Anesthesiologist Review on chemical dependency, the author acknowledged that abuse of anesthetic medications, “can occur in all groups of anesthesia professionals, including physicians in practice, residents in training, anesthetists (CRNAs [nurse anesthetists] and anesthesiology assistants), and student anesthetists” (Berry, 2005).

Editorials singling out anesthesia providers are noted in operating room nursing journals. For example, the *Journal of PeriAnesthesia Nursing*, published an article titled, “The Alarming Trend of Substance Abuse in Anesthesia Providers,” (Luck & Hedrick, 2004) and a recent issue of the *OR Manager* contains an editorial series about substance abuse in the operating room and discusses the increased risk for anesthesia personnel (Saver, 2008a; Saver 2008b).
**Etiology of Chemical Dependency**

The etiology of chemical dependency is multi-factorial. Understanding how neurobiological factors, genetic factors, psychological factors, personality factors, and occupational factors influence the development of addiction is important to understanding the increased risk for addiction in the anesthesia provider. (See Table 1 for overview)

**Biological Factors**

*Neurobiological.* A neurobiological basis for addiction involves several areas of the brain. In particular, alterations in neurotransmission of the reward system are noted. The reward system is responsible for the sense of pleasure and feeling of wanting whatever it was that brought that sense of pleasure (Koob & Volkow, 2010). This area of the brain comprises primarily the ventral tegmental area and nucleus accumbens and is modulated by several neurotransmitters, although the stimulation of dopamine receptors in the nucleus accumbens is ultimately responsible for the feeling of pleasure. Neuropathways between the ventral tegmental area and nucleus accumbens modulate the importance and salience (i.e., wanting) of that which resulted in pleasure. In addiction, the reward associated with the substance of abuse is inflated, as is the sense of salience associated with the substance (Koob & Volkow, 2010). The acquisition of the reward becomes top priority, compelling the individual to seek out the substance in spite of negative consequences associated with its use (Koob & Volkow, 2010). Salience can also be elicited by cues associated with the substance, such that events (cues) prior to the stimulation of the nucleus accumbens are also associated with exaggerated importance.
For example, during a 2004 AANA Peer Assistant Workshop a recovering fentanyl-dependent nurse anesthetist described the feeling of picking up and holding a fentanyl vial as a cue that triggered anticipation and craving. Managing triggers such as these are critical in preventing relapse.

**Genetic Factors.** There is also strong evidence for genetic susceptibility to addictive behavior, especially in the transition from substance abuse to substance dependency (Hiroi & Agatsuma, 2005). When exposed to addictive substances, a genetically susceptible individual is more likely to develop a pattern of dependency than someone who is not genetically susceptible. Indeed, a family history of addiction is one of the strongest predictors for the relapse of opioid abuse among anesthesia providers (Domino et al., 2008). It is thought that genetics account for about 50% of alcohol addiction (Prescott, Caldwell, Carey, Vogler, Trumbetta, & Gottesman, 2005). Although not as strong as alcoholism, there is also likely a genetic predisposition toward cocaine and opioid addiction (Matthews & Moylan, 2005).

**Psychological Factors**

There is thought that the use of mood-altering substances begins as a method of self-treatment for underlying psychological disorders (Baldessari, 2007; Darbro, 2005). Evidence supports that many nurses and anesthesiologists with a chemical dependency have co-morbid psychiatric disorders (Bryson & Silverstein, 2008; Darbro, 2005; Domino et al., 2008;). As well, those with abuse and dependency issues frequently relate some form of traumatic or emotional event at a young age, and reports of childhood
physical and emotional abuse are common (Bryson & Silverstein, 2008; Darbro, 2005; Domino et al., 2008;).

**Personality Factors**

Sensation-seeking and impulsivity personality traits have been associated with substance abuse and addiction (Acton, 2003; McDonough, 1990). It has been demonstrated that nurses with substance impairment are more likely to have higher sensation-seeking scales compared to non-impaired nurses (Acton, 2003). McDonough (1990) assessed sensation-seeking traits in nursing students obtaining a Master’s degree in nurse anesthesia or another nursing field. He correlated sensation-seeking scores with a tool designed to detect alcohol abuse and even predict those who may become symptomatic at a later date. Results revealed that more nurse anesthesia students had a great number of positive alcohol abuse scores than students in other nursing fields (22.2% and 5.7% respectively). As well, nurse anesthesia students with positive alcohol scores tended to score higher on excitement seeking trait scales than students without positive alcohol scores ($P = 0.000$) (McDonough, 1990).

**Occupational Factors**

Common to all health-care professionals, factors influencing the development of substance abuse can be grouped into three major occupational hazards: stress, access, and attitude. (Acton, 2003; Baldisarri, 2007; Darbro, 2005; Hornbein, 2003; McDonough, 1990; Talbert, 2009; Trinkoff & Storr, 1998; Trinkoff, Zhou, Storr, & Soeken, 2000; Wilgust, 1986). There also may be a unique environmental factor associated with the
handling of opioids that is specific to anesthesia providers (Gold, Byars, & Frost-Pineda, 2004; Gold et al., 2006).

**Stress.** Stress appears to play a large role in the development of substance abuse. The substance is perceived as a mechanism for coping with stressful situations and relieving the anxiety associated with the stressor. Although stressors outside the workplace influence substance-abuse behavior, the stress of working as an anesthesia provider or nurse is an occupational risk for the development of substance abuse. Working long hours or nights, strained working relationships, responsibility to patients, and high acuity of patients are common stressors described by substance-abusing or addicted nurses and anesthesiologists (Bryson & Silverstein, 2008; Hornbein, 2003; Talbert, 2009; Trinkoff et al., 2000; Trinkoff & Storr, 1998). Stress among nurse anesthesia students has been studied and it has been noted that the stress of nurse anesthesia education may contribute to the development of substance abuse (Wildgust, 1986).

**Access.** Access to major opioids is a powerful factor influencing the development of substance abuse among health-care professionals in general. This factor may even play a instigating role for anesthesia providers in the evolution of opioid or other anesthetic medication abuse or dependency (Gallegos et al., 1988; Trinkoff & Storr, 1998). Anesthesia providers have unique access to medications, especially controlled substances. Unlike the handling of most controlled substances, in which a physician writes a prescription for the medication and a nurse administers what is ordered, anesthesia providers decide upon the dose, obtain the medication from the pharmacy or medication administration system, and administer the medication directly to the patient,
often in large quantities. Although the controlled medications must be accounted for and excess medication wasted or returned to the pharmacy, it is not difficult to divert these powerful medications from the hospital.

Research supports a link to access and abuse. Trinkoff et al. (2000) demonstrated that increasing access to medication, increases potential for abuse. A recent study by Wischmeyer et al. (2007) revealed that propofol abuse among anesthesia personnel has increased in the past 10 years. One explanation for this increase is the fact that propofol is not a controlled substance, and therefore, anesthesia providers are not accountable for its use.

**Attitude.** Health-care professionals, including anesthesia providers, are trained to relieve pain with the medication. This training includes in depth pharmacological education of the medications they administer. As well, anesthesia providers are comfortable controlling minute-to-minute changes in their patient’s vital organs with medications. Trinkoff et al. (2000) describe this knowledge of and comfort with medications as “pharmacological optimism,” which promotes an attitude of invincibility regarding self-medication and a feeling of immunity against untoward effects of medications.

**Occupational Exposure.** Gold et al. (2004) and Gold et al. (2006) hypothesize that secondhand exposure to opioids in the operating room alters the reward pathway, predisposing anesthesia providers to the development of opioid dependency. This hypothesis stems from case reports of practicing anesthesiologists with no family history of abuse and no personal history of abuse who experimented with opioids in the operating room one time and quickly became addicted (Gold et al., 2004). Gold et al. (2006)
developed an assay for measuring airborne fentanyl and propofol levels in cardiovascular operating rooms where large amounts of opioids are used frequently. Both fentanyl and propofol were detected in the air, with the highest levels near the patient’s head, where anesthesia providers typically spend most of their time. More research is needed for validation; however, the theory is interesting and may hold some promise in explaining some of the increased risk of abuse among anesthesia providers.

**Identification of Substance-Abusing Anesthesia Providers**

Early identification of substance-abusing anesthesia providers prevents harm to both the abuser and the patients they might care for while impaired. No review of addiction among health-care providers is complete without identifying signs and symptoms of impairment, such as changes in work habits, personal appearance, and interaction with co-workers (AANA, 2010). (See Figure 2) Once abuse of potent opioids begins, tolerance and dependence can develop quickly, and use can rapidly escalate out of control to the point of discovery. The typical time frame for discovery is within 1 to 1½ years (Hughes et al., 1992).

Diversion of substances from the workplace is often detected because complaints of pain increase by patients in whom pain medication was documented but never administered. By developing systems for stricter supervision of controlled substances in the workplace, hospitals play a role in early identification of diversion. Large hospitals are transitioning to computerized dispensing systems and charting systems that provide more accountability for obtaining, documenting, and wasting controlled substances. The Mayo Clinic instituted random quantitative assays of controlled substances returned to
the pharmacy and Berge, Seppala and Schipper (2009) noted an anecdotal reduction in diversions from one per year to one in seven years. Epstein, Gratch, & Grunwald (2007) found distinctive drug-removal patterns of diversion by tracking records of a medication administration system. The authors noted anesthesia providers who diverted were likely to sign out medications to their patient within one hour of transferring him or her to the post-anesthesia care unit. They also noted diversion happened at remote, less-commonly used dispensing sites (Epstein et al., 2007).

Tracking controlled-substance use reveals frequent discrepancies and increased drug removal by those diverting medications from the workplace. A retrospective comparison of opioid use over time of an anesthesiologist who died from an overdose and the use of eight non-abusing anesthesiologists showed a distinctive increase by the addicted anesthesiologist (Chisolm & Harrison, 2009). The eight anesthesiologists’ opioid use was tracked for four months and compared to a four month retrospective review of the one opioid-using anesthesiologist that began from the date of his death. Interestingly, the overall use by the opioid-using anesthesiologist did not exceed the average overall use in a four month period for the eight non-abusing anesthesiologists which was calculated as 0.8 and 1.02 units per hour (U/hr), respectively. It is likely that differences in anesthesia technique influenced the overall use. Further examination of the deceased anesthesiologist showed a definite trend of increase in use that began at day 60 until his death (Chisolm & Harrison, 2009). (See Figure 3) This trend illustrates the rapid progression of tolerance and dependence.
Treatment and Prevention of Relapse among Anesthesia Providers

The road to recovery in addiction is difficult, although apparently, recovery is even more difficult for those addicted to potent opioids. Domino et al. (2008) calculated hazard risks for physician relapse during the first five years after treatment. A physician with a family history of substance abuse, co-existing psychological disorders, and who used a major opioid was 5.79 times more likely to relapse than one without any of these added factors.

Even with these hazard risks, treatment programs are successful. McLellan, Skipper, Campbell, and DuPont’s (2009) longitudinal review assessed outcomes of substance-abuse treatment for 904 physicians from 16 physicians’ health programs after five years. Of all 904 physicians, 802 were followed and of these, 36% had a contract extension or failed to complete their contract; however, in spite of these statistics, 80% of the physicians ultimately completed the program and were actively practicing medicine. If a drug screen found positive for mood-altering substances is used as an indicator of relapse, 19% of those who completed the program had at least one positive drug screen during the monitoring period. Although anesthesiologists tended to have more intense monitoring programs, and be monitored longer, relapse was not significantly different from that of other specialties (McLellan et al., 2008).

Characteristics of the recovery program contribute to success (see Figure 4) for an overview of typical program characteristics). Their programs are holistic in nature and often designed such that successful completion protects the individual’s license. Successful programs begin with a thorough chemical dependency evaluation and
treatment recommendation by an addiction specialist. Treatment programs for nurses and physicians are abstinence-based to include all mood-altering substances for the duration of the contract (DuPont, McLellan, White, Merlo, & Gold, 2009; Trossman, 2003). Initial treatment typically involves 30 to 90 days in a residential or an intensive outpatient care setting. This setting is designed specifically for physicians and higher-educated health-care providers as health-care providers have specific needs such as concern for anonymity, which are better dealt with among those with similar circumstances (DuPont et al., 2009; Hughes et al., 1992; Trossman, 2003). Advanced-practice nurses, including nurse anesthetists, fall into this category as do pharmacists, dentists, veterinarians, and physician’s assistants (Domino et al., 2008).

Most treatment programs are based on the Alcoholics Anonymous (AA) 12-step recovery program. After initial treatment, less-intense outpatient follow-up therapy involves attending community-based meetings such as AA or Narcotics Anonymous plus meetings designed for recovering health-care providers (e.g., Caduceus meetings) and family involvement is encouraged. After initial treatment, participants may go back to work in a supervised setting. Although with the high rate of relapse associated with opioid abuse, more time away from the workplace may be needed to reduce the risk of relapse. Bryson and Silverstein (2008) and DuPont et al. (2008) recommend at least one year away from anesthesiology. Random drug testing continues throughout this entire process and continues for a significant period, often five years or more after treatment.

Pharmacological treatment for addiction among physicians in the form of opioid agonist-antagonists or antagonists is an option. Although only one physician out of 904 of the physicians in McLellan el al’s (2008) study was placed on the opioid agonist-
antagonist methadone for continued opioid dependence and 46 (6%) were treated with the opioid antagonist naltrexone, pharmacological therapy, especially in the form of naltrexone, is a recommended treatment option for recovering opioid-dependent health-care providers. In particular, naltrexone competes for opioids at the receptor, preventing the euphoria associated with receptor agonism. In one study, 20 opioid-dependent health care professionals, including nurses, two of whom were nurse anesthetists, and one pharmacist, were placed on a common dose of naltrexone 350 milligrams per week for an average of 9.4 months (Roth, Hogan, & Farren, 1997). While three of the participants abruptly dropped out of the program, presumably due to relapse, 17/18 of the participants remained abstinent during follow up for an average of 34.8 months.

**Re-Entry into the Workforce**

Re-entry of a recovering opioid dependent anesthesia provider is complicated by the constant access of opioids and possibility of relapse. Bryson and Silverstein (2008) recently advocated cautious re-entry of anesthesia providers back into the practice of anesthesia, supporting re-entry on an individual basis. An editorial by Berge et al. (2008) found in the journal *Anesthesiology*, in response to Bryson and Silverstein, suggested the development of a “One Strike You’re Out” policy in anesthesia, prohibiting re-entry of any opioid-addicted anesthesia provider. This suggestion spurred debate among the anesthesia community. Letters to the editor quickly appeared after this editorial supporting Berge et al.’s view (Letters to the Editor, 2009). There were also contrasting opinions that felt this view represented a step back to earlier times when actions against substance-abusing health-care providers were more punitive. Proponents of such a policy
cite low success rates of opioid-addicted anesthesia residents returning to anesthesia (Letters to the Editor, 2009). These findings were from Menk, Baumgarten, Kingsley, Culling, and Middaugh’s 1990 study evaluating the success of reentry into training by recovering anesthesiology residents as reported by Program Directors. Program Directors of Anesthesiology resident programs responded to surveys documenting that 180 out of 8,810 anesthesiology residents had a substance abuse problem. Not surprisingly, the drug of choice was parenteral fentanyl (132/180). All residents were followed by program directors for about 2-½ years after reentry, and of opioid abusers, only 34% were successful during the follow-up period. In contrast, 70% of non-opioid abusers were successful (Menk et al., 1990).

Data for the above study were collected in the late 1980s and since then, McLellan et al. (2008) have shown that although anesthesiologists addicted to opioids have more-intense monitoring programs, their relapse rate is not significantly different from other specialties. As well, Paris and Canavan (1999) performed a retrospective case control study looking at relapse rates among 32 anesthesiologists and 36 other physicians from the New Jersey Health Program. While opioid dependence was more common among anesthesiologists, 13 anesthesiologists (40%) relapsed and 16 (44%) other physicians relapsed. There was no significant difference among relapse rate between the two groups, nor was there a difference in those who changed specialties among the two groups (Paris & Canavan, 1999). Although this study illustrates no difference in relapse rates between anesthesiologists, a relapse rate of 40% is concerning. Consequently, high relapse rates are the argument against re-entry. While there have been some instances of harm to patients by an impaired provider, fortunately, the numbers are low (Domino et
al., 2008; Skipper, Campbell, & DuPont, 2009). However, the ethical dilemma exists that a relapsed, impaired provider likely is not providing care according to Standards of Care set by the profession, and a profession dedicated to protecting patients should not risk patient care by allowing such providers to practice.

Skipper et al. (2009) used the data set from McLellan et al.’s (2008) data of 904 physicians treated in Physician Health Programs. Residents were excluded, and some physicians were lost to follow-up. Therefore a total of 780 physicians were counted: 83 anesthesiologists and 697 non-anesthesiologists. Of the 102 lost to follow-up, 78 transferred their contract to a different state while in good standing, and 24 left care without referral. This study evaluated their occupation at five years in addition to their success (or failure) of treatment as measured by the number of positive drug screens during the monitoring stage, reports to state licensing boards, and completion of contract. Not surprisingly, anesthesiologists were more likely to have a history of opioid abuse and intravenous drug use. There was no difference in number of drug screens positive mood-altering substances, revoked licenses, contract completion rate, or occupational status. Among those studied, 76% of the anesthesiologists and 73% of the non-anesthesiologists were licensed and practicing medicine at the end of the five-year follow-up, although it was not determined whether physicians were practicing in their original specialty or had changed to another specialty (Skipper et al., 2009).

Sixty-two recovering nurse anesthetists responded to a survey sent to 250 nurse anesthetists in recovery (Sibert & Demenes, 1996). The goal of the study was to evaluate components of re-entry. Of these 62 nurse anesthetists, 63% were practicing anesthesia. They identified the most helpful factor for successful re-entry was their commitment to
community-based programs, both 12-step and nurse-support groups. The next most helpful factor was random drug screens. The most difficult factors were dealing with states’ boards of nursing and finding employment (Sibert & Demenes, 1996). The low response rate in this study limits the usefulness of the results, although this study does help illustrate some facilitators and barriers to recovery.

Some legal issues accompany re-entry. It should be noted that opioid-addicted health-care providers in treatment or recovery have some protection by the Federal Americans with Disabilities Act (ADA). Those actively using illicit psychoactive drugs are not protected. This differs for those with an alcohol dependency. As the use of alcohol is not a crime, even alcoholics who are actively drinking have protection (ADA, 2010).

**Prevention**

In the literature, prevention traditionally begins with education, although the nature and extent of education is inconsistent. Even today, no standard for substance-abuse education in medical schools or nurse anesthesia programs exist; and what is there varies. Research on this topic is in the information-gathering stage, finding out how programs educate their students about substance abuse and chemical dependency. Booth et al. (2002) revealed formal substance-abuse education increased in 123 anesthesiology resident programs by 47% since 1990. Much of this education is mandatory. The AANA provides a model curriculum for educating nurse anesthesia students about substance abuse, although data on the implementation of this curriculum are not available (Clark, 1994).
Most institutions have pre-employment drug screening as well as policies that allow drug screening of workers whose behavior is suspicious. There is consideration for routine random drug screening for all anesthesia providers. In fact, the AANA’s model policy for random drug and alcohol screening recommends not only pre-employment drug screening, but random urine drug screening of small numbers of employees frequently.50

**Recommendations for Future Research**

Research provides evidence of a risk of opioid abuse that is unique to anesthesia providers and that the prevalence is difficult to assess. While Bell et al’s (1999) study targeted nurse anesthetists in the United States, many of the large-scale physician research projects targeted only academic institutions, or those physicians already in treatment for substance abuse or chemical dependency. Incorporating all anesthesia caregivers in research projects would provide generalizable results about the practice of anesthesia.

Easy drug access, family history of substance abuse, and co-existing psychological disorders are key factors related to this risk of developing a chemical dependency problem. Most reports are retrospective in nature. An interesting research question might ask how the presence of these factors in anesthesiology residents and nurse anesthesia students influence development of substance abuse during their professional careers. Results could provide the foundation for a program of research involving the development of risk identification and substance-abuse prevention
strategies during anesthesia education. The program could include identification of and counseling for high-risk individuals.

Would-be anesthesia providers must be aware they are entering a profession associated with potential risk for the development of substance abuse. Increasing awareness of the risks through substance-abuse education for students is another research avenue. Developing, implementing, and evaluating such programs might result in the establishment of national standards regarding substance abuse education among anesthesia students and residents.

While evidence supports successful re-entry of recovering anesthesia providers, some feel the possibility of relapse is not worth the risk, especially if opioids were the drug of choice. Treatment plans include trigger management. Trigger management in the form of simulation may warrant investigation. Desensitization of the trigger response through controlled introduction in a simulated operating room might be one such avenue. Developing, implementing, and evaluating this type of innovative simulation technology provides interesting opportunities for research.

Anesthesia providers have an increased risk of opioid dependency. Fortunately, the medical, nursing, and nurse anesthesia communities recognize this risk and have taken steps to improve prevention, early identification, and treatment of the problem. In order to accomplish these goals, continued dedication from these professions is crucial. Improving practitioners’ health can only improve patient care. Future research that keeps this goal in mind will no doubt result in helpful information.
Figure 1

Most commonly used substances misused by CRNAs

Compiled from Bell et al. (1999) and unpublished data by Bell (Personal Communication, 2010).
### Figure 2

**Patterns of Behavior and Consequences Associated with Substance Misuse and Dependency**

- Comes to work during scheduled time off and loiters around departmental drug supply
- Isolates and withdraws from peers
- Expresses desire to take extra call
- Increasing or unexplained tardiness or absenteeism
- Gradual decline in work performance
- Consistently signs out more narcotics than peers
- Displays patterns of inappropriate drug choices and dosages
- Increasing mood lability with frequent, unexplained anger and overreaction to criticism
- Increasing difficulty with authority
- Becomes forgetful, unpredictable, confused, and lacks concentration
- Suffers from frequent illnesses or physical complaints
- Exhibits dishonesty, often over trivial or unimportant matters
- Makes elaborate excuses
- Suffers from tremors or “Monday morning shakes”
- Is discovered comatose or dead
- Appears intoxicated at social functions
- Reveals evidence of alcohol or drug use, such as odor of alcohol on breath, heavy perfume or mouthwash, wearing long sleeves

Adapted from the AANA Peer Assistance Website (AANA, 2010).
Table 1

The major factors influencing the development of substance abuse and dependency among anesthesiologists and nurse anesthetists

<table>
<thead>
<tr>
<th>Biological</th>
<th>Psychological</th>
<th>Occupational</th>
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<tbody>
<tr>
<td>Neurobiological</td>
<td>Co-morbid psychiatric disorders</td>
<td>Stress</td>
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<td>Genetics</td>
<td>Sensation/excitement seeking personality traits</td>
<td>Medication Access</td>
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<td>Pharmacologic Knowledge</td>
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<td>Occupational Exposure</td>
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Adapted from: Acton, 2003; Baldissari, 2007; Bryson & Silverstein, 2008; Darbro, 2005; Domino et al., 2008; Gallegos, et al., 1988; Gold et al., 2004; Gold et al., 2006; Hiroi & Agatsuma, 2005; Hornbein, 2003; Koob & Volkow, 2010; Matthews & Moylan, 2005; McDonough, 1990; Prescott et al., 2005; Talbert, 2009; Trinkoff et al., 2000; Trinkoff & Storr, 1998; Wildgust, 1986; Wischmeyer et al, 2007.
Figure 3

Retrospective 4 month average of use by anesthesiologist who died from an overdose, compared to 4 month average use by 8 non-abusing anesthesiologists

Extrapolated from Chisolm et al. (2009).
Figure 4

**Typical characteristics of a treatment program for an opioid-dependent anesthesia provider**

- Chemical dependency and psychological evaluation by licensed provider who has experience treating substance abuse and dependency
- 30 to 90 days inpatient treatment in a facility designed for health care providers
- Abstinence from the practice of anesthesiology for a minimum of one year
- Initial return to practice with no narcotic privileges followed by incremental return of privileges
- Abstinence from alcohol and non-prescribed use of mood-altering medications
- Intensive outpatient treatment and follow-up
  - Weekly appointments with addictionologist
  - Attendance of 12 step support groups from one to three times per week
  - Family involvement with program
  - Monitoring with random drug screens once every couple of weeks to once a month for a minimum of 5 years
- Completion of program requires documented compliance with all aspects of program

Adapted from Talbott et al (1987), Dupont et al. (2009), and Trossman (2003).
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Due to the *AANA Journal'*s limit of 50 citations, additional reference sources can be obtained by contacting the author directly.
PROTECTIVE FACTORS AGAINST RELAPSE FOR PRACTICING NURSE ANESTHETISTS IN RECOVERY FROM ANESTHETIC OPIATES

BY

ELIZABETH LAURA WRIGHT, LINDA MONEYHAM, TEENA MCGUINESS, JOSEPH SCHUMACHER, BETH STULLENBARGER, ART ZWERLING

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Abstract

This qualitative inquiry explored factors that protect recovering anesthetic opioid-dependent nurse anesthetists from relapse following their return to anesthesia practice. Practicing nurse anesthetists in recovery from potent opioids were recruited through online advertising and individually interviewed over the phone. The interview consisted of open-ended questions that aided description of personal experience of individual factors. Content analysis of the interviews revealed an overarching theme of commitment to the recovery process provided the foundational protective factor against relapse. Within this context, two major thematic factors emerged: personal factors and external factors. Personal factors came from within the individual and included such factors as removing the obsession to use, self-realization, inner strength, and seeing the future. External factors were external to the individual and described as time away from practice, state regulatory agency involvement, the use of naltrexone, and talking with others.

While the Twelve-Step process was not a factor per se, it was credited by all participants as the structure on which their recovery was built. This process provided mechanisms for developing the motivation, and learning the tools necessary to maintain their sobriety.

Key words: opioid-dependency, recovery, relapse, anesthesia providers, nurse anesthetist
Introduction

Health-care providers are not exempt from having problems with substance abuse and chemical dependency. In fact, certain health-care specialties such as anesthesia have increased risk for abuse of, and dependence on, certain classes of drugs. In particular, anesthesia providers are at risk for abuse of, and dependence on, potent anesthetic opioids such as fentanyl, sufentanil, alfentanil and remifentanil (Booth et al., 2002; Hughes, DeWill, Baldwin, Sheehan, Conard, & Storr, 1992; Hughes, Storr, Brandenburg, Baldwin, Anthony, & Sheehan, 1999; Gallegos, Brown, Veit, & Talbott, 1988; Talbott, Gallegos, Wilson, & Porter, 1987). These drugs are potent synthetic opioids with high addictive properties to which anesthesia providers have easy access. While several factors influence this risk, access to such potent anesthetic opioids likely plays a key role in the development of abuse and dependence (Baldesarri, 2007; Bryson & Siverstein 2008). Having access to opioids presents a challenge to the recovery process, especially if return to anesthesia practice is the goal, as it is impossible to avoid the use of opioids when providing anesthesia care. Thus, recovery is difficult and relapse is a grave concern.

Relapse of anesthesia providers with renewed exposure to opioids is such a concern that controversy exists as to whether recovering opioid-dependent anesthesia providers should even return to the anesthesia profession (Berge, Seppala, & Lanier, 2008) Available evidence indicates that relapse is twice as common among anesthesiologists with opioid dependence than in physicians with addiction problems in other specialties (Menk, Baumgarten, Kingsley, Culling, & Middaugh, 1990). Imagine a
recovering alcoholic working in a bar, constantly surrounded by the temptation to take a
drink. Other evidence demonstrates that rates for recovery among anesthesiologists are
similar to physicians in recovery from other substances, and that re-entry into the practice
of anesthesia should be dealt with on an individual basis (Skipper, Campbell, & DuPont,
2009).

In spite of the challenges, many recovering anesthesia providers successfully
return to anesthesia. However, others are not so successful. Some return to the practice of
anesthesia and subsequently relapse and many eventually find it necessary to change
specialties or professions. Some are not as fortunate. According to Alexander,
Checkoway, Nagahama, & Domino (2000) 1 in 5 anesthesia providers in recovery from
opioid addiction relapse within 5 years and of those, 3 out of 5 will die from addictive
drug related issues. Vulnerability to relapse exists for all those in recovery from opioid
dependency, yet some are more resilient than others in resisting the temptation to relapse.
What is it about some anesthesia providers that lead them to change specialties because
the risk of relapse is so great, while others have successfully returned to the practice of
anesthesia? The answer to this question is not forthcoming because of the lack of research
in this area.

**Background**

*Prevalence of Substance Abuse among Anesthesia Providers*

The Substance Abuse and Mental Health Services Administration (SAMSHA)
estimates that approximately 8% of the general population has problems with alcohol or
illicit substances (SAMSHA, 2008). While there is no data to show that the overall
incidence of alcohol and substance abuse and or dependency among physicians is greater than that of the general population, researchers have demonstrated anesthesiologists and anesthesia residents have a greater incidence of intravenous opioid abuse. This is especially noted evident when compared to other physician specialties as a disproportional number of anesthesiologists develop opioid dependency (Booth et al., 2002; Gallegos, et al., 1988; Hughes et al., 1992; Hughes, Storr, Brandenburg, Baldwin, Anthony, & Sheehan, 1999; Paris & Canavan, 1999; Pelton & Ikeda, 1991; Talbott et al., 1987). Anesthesiologists are also more likely to die from addictive drug-related issues than other physician specialties (Alexander et al., 2000).

The true prevalence of substance abuse among nurse anesthetists is not known. In the general nurse population, the American Nurses Association (ANA) estimates the rate of substance abuse to be between 6 to 10% (ANA, 1984). There is evidence from the National Council for State Boards of Nursing reports that more drug-related complaints and discipline actions are taken on nurse anesthetists than other advanced-practice nurses (Quinlin, 2002). Along a similar vein, personal review of the Alabama Board of Nursing Voluntary Disciplinary Alternative Program (VDAP) revealed nurse anesthetists made up 75% of advanced-practice nurses who are currently enrolled in or had been enrolled in VDAP since its inception in the 1990s. This over-representation mirrors that seen in physician substance abuse programs.

A 1999 study by Bell, McDonough, Ellison, and Fitzhugh revealed 10% of nurse anesthetists admitted to misusing powerful anesthetic medications during their career as a nurse anesthetist. The three most-commonly abused medications were (in order of most to least abused) benzodiazepines, nitrous oxide, and potent opioids (Bell et al., 1999).
Although not yet published, Bell replicated this study in 2006 and found that anesthetic opioids (i.e., fentanyl and sufentanil) were the most abused substances, followed by propofol, then nitrous oxide (Bell, Personal Communication). Such evidence, though limited, supports that nurse anesthetists are at risk for potent opioid abuse, and it is probable that access to opioids plays a large role in its development.

**Recovery and Re-Entry into Anesthesia Practice**

If return to the practice of anesthesia is the goal of an opioid-dependent provider, demonstration of successful recovery through during the initial stages of the process is critical. Regulatory agencies play a large role in the accomplishment of this goal, as they regulate the ability to practice through licensure, and states have established a process by which a recovering anesthesia provider can return to practice.

Once an impaired anesthesia provider is recognized, either by self-report or other discovery, and the appropriate regulatory agency is notified, the practitioner ceases to practice. A regulatory board imposes either a disciplinary action resulting in suspension of professional license or a non-disciplinary action requiring voluntary cessation of practice. Both actions also require that the practitioner undergo a chemical dependency evaluation by an addiction specialist. The practitioner is then required to comply with all treatment recommendations put forth by the treatment provider, and are not allowed to practice until recommended by his or her treatment provider. Treatment programs often include intensive inpatient treatment for 30 to 90 days in a program designed specifically for health care providers, commitment to a 12-step recovery program, after-care follow-up, and monitoring with random urine drug screens for a minimum of 5 years. Most
treatment programs require that anesthesia providers avoid the practice of anesthesiology for at least a year, followed by a period of supervised practice, initially with no narcotic privileges. As the anesthesia provider progresses in his or her recovery, narcotic privileges are returned incrementally (DuPont et al., 2009; Talbott et al., 1987).

Methodological issues make it difficult to accurately discern the success rate of recovery programs for anesthesia providers. Different approaches are used to determine success, including review of medical records of those who have been treated for a substance dependency issue, or surveys of academic institutions. Measures of recovery that have been used include number of positive drug screens, length of treatment, disciplinary action on licensure, and return to practice. However, it is often not clear when the individual returns to practice if they in fact are practicing in anesthesia.

As noted above, “successful recovery” can be defined in many ways. The Betty Ford Foundation Panel defines recovery in terms of duration of sobriety (McLellan, 2010). Sobriety for 1 to 12 months indicates “early” sobriety, sobriety for 1 to 5 years indicates “sustained” sobriety, and sobriety for greater than five years indicates “stable” recovery. Others define recovery in terms of abstinence for at least one year and reduced criminal activity related to drug use (Sheerbaum & Specka 2008). Menk et al., (1990) on the other hand relied on the historical knowledge of medical program directors to determine successful recovery (e.g., knowledge of whether an anesthesiologist or resident had relapsed).

The return to practice poses an ethical dilemma due to the risk of a relapsed, impaired provider putting patients at risk. Concern about relapse has created debate in the anesthesia community as to whether anesthesia providers in recovery from opioid
addiction should return to anesthesia. Estimated relapse rates for opioid-dependent anesthesiologists are around 40% (McClellan et al., 2008; Paris & Caravan, 1999; Skipper et al., 2009), although one study reported a 63% relapse rate (Menk et al., 1990). While these numbers appear alarmingly high, there is some evidence that a 40% relapse rates is similar to that reported for other physician specialties (McClellan et al., 2008; Paris & Caravan, 1999).

The sensitivity of the subject of nurse anesthetist addiction makes it difficult to conduct research in this area. Only one study has examined the re-entry to anesthesia practice of recovering nurse anesthetists, however, the low response rate of 25% limits the validity of the findings (Sibert & Demenes, 1996). Available evidence indicates that there can be successful re-entry to the practice of anesthesia, but little is known about what factors may facilitate successful recovery and return to anesthesia practice. Along these lines, barriers to successful re-entry have not been identified; also of interest are those factors that challenge successful recovery and re-entry into practice.

**Factors that Influence Recovery, Re-Entry, and Relapse**

Recovery is an individual process that is influenced by a multitude of factors. One of the primary outcomes of successful recovery is abstinence from any addictive substances, especially for the nurse anesthetist who wants to return to the practice of anesthesia. Therefore factors that promote recovery are protective against relapse. Several factors have been identified as having a positive influence on recovery and prevention of relapse for chemically dependent persons.
Flynn, George, Broome, Simpson, and Brown (2003) compared the recovery of heroin addicts among those who were in successful recovery (n=119) and those who were not successful (n=312). Recovery measures were evidenced by self-report responses on a questionnaire of heroin or other opioid use, alcohol use, and criminal activity for the past year, as well as results of any drug screening. Success was defined as no drug use or criminal repercussion related to drug use in the past year. Factors identified as influential on recovery by those who were successful in recovery indicated that personal motivation had the most favorable influence on their recovery (Flynn et al., 2003). Other factors identified as having a positive influence on recovery included family support, drug treatment experiences, and religion/spirituality. One third of the participants entered the initial treatment program as the result of a legal order, although the authors did not delineate between those in recovery and those not in recovery, nor did the authors describe whether legal action acted as a motivating factor. While this study reveals information about factors influencing recovery, it is difficult to generalize the results to anesthesia providers because about half of the participants in the study were on methadone maintenance, which is not common among recovering opioid-dependent anesthesia providers. Additionally, regulatory issues associated with the practice of anesthesia and the risk of losing their license to practice could be an important motivating factor in recovery of nurse anesthetists that may not be a factor among the general population of drug abusers. The use of self-report questionnaires also limits the validity of the results, particularly when the subject is so sensitive.

Scherbaum and Specka (2008) reviewed the literature for factors that influence the course of opiate addiction. For those who received treatment for their addiction,
success and abstinence could be moderately predicted by psychosocial factors such as peer-group relationships, social support, and employment. The most important factors that contributed to success were a positive social environment, social life, and structured daily activities. The authors concluded that a meaningful, conventional, and structured lifestyle provides a solid foundation for promoting successful recovery in those with opioid addiction (Scherbaum & Speck, 2008).

Some study findings indicate that recovery factors differ depending on duration of sobriety. For example, helping others is part of the AA philosophy (AAWS, 2010) and early in recovery, AA participants report more involvement in helping others with their immediate recovery needs while those in stable recovery report more community oriented help, such as community volunteer work (Zemore, 2007). There is also evidence supporting a positive relationship between helping others and recovery outcomes, including abstinence. (Zemore, 2007; Kaskutas, Ammon, Oberste, & Polcin, 2007).

Spirituality has also been identified as playing a protective role in recovery (Laudet & White, 2008). As a cornerstone of Alcoholics Anonymous (AA), admitting powerlessness and relying on a higher power to help overcome addiction are the first two steps of the recovery process (AA World Wide Services, 2001). Higher levels of spirituality have been shown to increase one’s resistance to stress, improve coping skills and have a positive influence on overall health outcomes (Pardini, Plante, Sherman, & Stump, 2000; Park & Folkman, 1997). Laudet and White (2008) found that spirituality was most influential during the initial recovery phase and may help individuals as they recognize their inability to stop drug use on his or her own. However, little is known of the role that spirituality may play in sustained recovery. In a recent qualitative study of
the sustained sobriety of alcoholic women (McLeod, 2011), spirituality was identified as an important factor both in initial and sustained sobriety.

The research of protective factors is limited and there are likely a number of such factors at work in recovery from substance abuse and relapse prevention. Unique to recovering anesthesia providers is the challenge of maintaining sobriety when return to practice means exposure to their drug of choice.

Risk factors for relapse are well documented. Domino et al. (2005) determined physician relapse is more common if one is dependent on opioids, has a family history of substance abuse, and has an underlying psychological disorder, with family history being the strongest predictor. The one study that examined risk and protective factors for recovery among nurses anesthetists (Siebert, 1996) found that commitment to community-based programs, both 12-step and nurse-support groups was identified as the most helpful factor, followed by random drug screens. The least helpful factors identified were dealing with states’ boards of nursing and finding employment (Sibert, 1996). However, the poor response rate of the study (25%) limits interpretation of these findings.

Defining Successful Recovery

For the purpose of this study, recovery will be defined in terms of duration of abstinence, practice privileges as a nurse anesthetist, and conditions associated with licensure as a nurse anesthetist. While there is no absolute number of years indicating success, 5 years without relapse is a common time frame described by treatment providers as the period after which, he or she is likely not to relapse (McClellan, 2010;
Talbot et al., 1987). Return to practice must also be granted by the appropriate regulatory agency based on the recommendations of the treatment provider and assesses compliance with the nurse anesthetist’s participation in the contract. Once the nurse anesthetist reaches the point at which narcotic privileges are returned, a solid record of recovery has been established, even though monitoring continues for several years. Consequently, nurse anesthetists who have been abstinent for 5 years, and are actively practicing in anesthesia with narcotic privileges will be recruited for participation. These nurse anesthetists are recognized as progressing well in the recovery process and are actively dealing with their substance abuse on a daily basis.

**Significance**

Recovery from opioid dependency is difficult. Returning to the practice of anesthesia in the face of opioid dependency is even more challenging. While the incidence of successful re-entry of an opioid dependent anesthesia provider to the practice of anesthesia may be difficult to obtain, those who have been successful offer a unique perspective on factors that have helped and hindered the process. Research on recovery and relapse does not address the added challenge of continual exposure to opioids during the recovery process or those factors that successful re-entry into the practice of anesthesia possible. Gathering information from nurse anesthetists who have experienced addiction to potent anesthetic opioids, had regulatory issues with their license, were unable to work as a nurse anesthetist for at least a year and have been successful returning to the practice of anesthesia can provide key information about what factors protect against relapse.
Self-report questionnaires are able to target large populations, but do not provide a mechanism for in depth exploration of complex issues (Waltz, Strickland, & Lenz, 2005). This proposal will use a qualitative interview approach to gain a richer understanding of successful re-entry by those who have experienced than can be obtained through traditional surveys and chart reviews. The results of this study will help validate current treatment strategies and provide guidance for the development of future strategies.

Purpose

Research in the area of recovery and re-entry into anesthesia practice is incomplete. Most research in this area has focused on the incidence of relapse and the risk of relapse, not on the success of those who have re-entered practice. Outcome measures for successful recovery and re-entry often include the use of objective variables such as number of positive drugs tests during the monitoring phase, status of license after a period of time, and whether the person is practicing in his or her specialty. Researchers have relied primarily on anonymous mailed surveys and chart reviews to obtain their data. While this information has helped develop present treatment guidelines, the methods used to obtain this information do not capture the depth of understanding described in personal experiences of recovery. Investigating the experiences of successful, recovering nurse anesthetists represents an innovative strategy that can potentially offer a unique perspective about factors that are helpful in their recovery. This information can also assist in enhancing and updating professional guidelines for prevention, treatment, and re-entry of recovering nurse anesthetists.
The purpose of this qualitative research proposal is to explore and identify factors are associated with return to work and successful recovery from opioid dependency among nurse anesthetists. Systematic qualitative strategies will be used to identify these factors. This will be accomplished through recruitment and individual interview of nurse anesthetists who have experienced opioid dependency, have had regulatory sanctions on their license to practice in which they were not allowed to practice for a period of time, have been treated for their addiction, and are currently practicing as a nurse anesthetist for participation in this research. The findings from this study will be used to revise prevention and intervention strategies and re-entry policies.

**Research Question**

What factors are associated with successful recovery in nurse anesthetists who have experienced opioid dependency, have had regulatory sanctions on their license to practice in which they were not allowed to practice for a period of time, have been treated for their addiction, and are currently practicing as a nurse anesthetist?

**Design**

*Conceptual Approach*

Qualitative descriptive inquiry was used to identify and gain a deeper understanding of those factors that protect recovering nurse anesthetists who have successfully returned to practice from relapse. This method provides a mechanism for understanding through the subjective experience as told in individual stories of recovery. This type of exploration is based on philosophical beliefs that a phenomenon is best
understood by those who experience it (Coyne, 2007; Marshall & Rossman, 2006). In a sense, qualitative research approaches provide an understanding of a phenomenon from the insider’s perspective, which help to understand human behaviors and motivations, and explore phenomenon that would be difficult to research quantitatively (Sandelowski, 2000). It also helps establish a foundation for quantitative research by uncovering variables that can be further explored.

Descriptive inquiry relies on methodical categorization of subjective narratives into groups. The goal with this qualitative method is to accurately categorize data in a manner that would be agreed upon by most who observe the same phenomenon, which allows for little interpretation (Sandelowski, 2000). Researchers “stay close” to their data, in that the goal with the analysis is to let the data provide the description. This is in contrast to some qualitative approaches in which the researchers tend to “move away” from the data through interpretation of underlying messages and theorization about causes (Sandelowski, 2000).

**Methods**

For this research study, qualitative data was collected through semi-structured individual interviews, which are more like a conversation with guidance from the researcher (Marshall & Rossman, 2006). This type of interview process encouraged open conversation between the participant and researcher, with some direction from the researcher. Individual interviews helped addressed the issue regarding the sensitivity of the subject and confidentiality (Opdenhakker, 2006).
Setting and Sample

There are approximately 35,000 practicing nurse anesthetists in the United States (AANA, 2010). Basing estimates on statistics from physician research, about 700 (2%) of these nurse anesthetists are dependent on opioids. The sample for this study was selected from those nurse anesthetists who become dependent on anesthetic opioids, underwent treatment, had regulatory sanctions placed on their license, which included not practicing in anesthesia for at least 8 months, and who had successfully returned to the practice of anesthesiology while in recovery from potent opioids, and had been abstinent for at least 5 years.

Determining sample size in qualitative research is guided by the method and goal of the research project (Sandelowski, 1995). For this project, the qualitative sampling technique of “purposive” sampling was used for recruitment of participants because it provided a mechanism for gaining insight in to a very specific phenomenon. This sampling method involves seeking out those with the richest experience who can tell their story (Coyne, 2007; Laverty, 2003; Pollit & Beck, 2008). In particular, the sample was derived from the population of nurse anesthetists who have experienced anesthetic opioid dependency, have undergone treatment, have had regulatory sanctions against their license which resulted in not practicing for at least a year, and have successfully returned to the practice of anesthesiology.

There is not an a priori number of participants determined in purposive sampling. Instead sampling continues until the research question is answered. For this study, the initial analysis guided further recruitment of participants to find more patterns, or the need to conduct a second interview in order to clarify and enrich the data (Coyne, 2007,
Sandelowski, 1995). Data from each participant was analyzed and sampling continued as new information emerged from the analysis. While a total of 7 participants were interviewed for this study, the data from the first participant was used as pilot and not included in the final analysis. Sampling stopped when analysis of the data from the last participant revealed no new information, At this point the data had reached “saturation” as no new information could be gathered by more interviewing more nurse anesthetists (Sandelowksi, 1995). Saturation was reached at 6 participants.

**Inclusion criteria.** In order to be included in the study, the potential participant had to: 1) be a nurse anesthetist, 2) have experienced anesthetic opioid dependence [i.e., morphine, fentanyl, sufentanil, alfentanil, hydromorphone, or remifentanil], 3) have been treated for opioid dependence, 4) have treatment include abstinence from practice for at least 8 months 5) have had regulatory sanctions on their license until treatment completed 6) be currently practicing as a nurse anesthetist with narcotic privileges.

It was recognized that the need for confidentiality and anonymity was paramount for success of this protocol. Precautions were taken to ensure that participants were fully informed of the nature of participation and the safeguards that would be implemented to protect their privacy. The participant chose when and where the interview took place. This was done to increase participant comfort and allow him or her to ensure as much privacy as he or she needs. Audio-recordings and all digital information were kept on a UAB secure password-protected server, to which only the researcher had access. All audio recording were de-identified before transcription and anonymity maintained. Participant names were not used. When deciding upon an interview time, participants were encouraged to choose an interview time in which distractions were minimal (e.g., a
time when children were in school, or when not at work) and to be aware of his or her surroundings during the interview.

Procedures

Protection of Research Participants

This study was approved by the University of Alabama at Birmingham Institutional Review Board and informed consent was obtained from all participants.

Recruitment

Participants were recruited through online and email advertising. An advertisement was placed on the Anesthetists in Recovery (AIR) website, which is a national organization dedicated to the support of nurse anesthetists with substance abuse issues. Email advertisements were also sent to the AANA State Peer Assistant Advisors, as these advisors have contact with nurse anesthetists who have substance dependency issues and could pass the study information to those who might be interested.

Screening was accomplished either through email or phone. Once contacted by a potential participant, the PI emailed a form fillable questionnaire to the potential participant or called the individual on the phone. Participants emailed the form back to the PI or answered the screening questions over the phone. If eligible, the consent was delivered by email or through a secure UAB drop box to which the participant was able to return the consent. If ineligible, potential participants were told in the manner in which they were screened (i.e., via email or at the end of the screening phone call). Reasons for ineligibility were explained as well.
Individual interviews were conducted by telephone. With participant permission, the phone calls were audio-recorded. While valuable non-verbal information is gained through face-to-face interviews and are ideal for qualitative interviews, phone interviews allowed access to a much wider population (Opdenakker, 2006). This was especially appropriate in this study as nurse anesthetists from a variety of states were recruited. It was recognized that the need for confidentiality and anonymity was paramount for success of this protocol. Precautions were taken to ensure that participants were fully informed of the nature of participation and the safeguards that would be implemented to protect their privacy. The participant chose when and where the interview took place. This was done to increase participant comfort and allow him or her to ensure as much privacy as he or she needs. Audio-recordings and all digital information were kept on a UAB secure password-protected server, to which only the researcher had access. All audio recording were de-identified before transcription and anonymity maintained. Participant names were not used. When deciding upon an interview time, participants were encouraged to choose an interview time in which distractions were minimal (e.g., a time when children were in school, or when not at work) and to be aware of his or her surroundings during the interview.

Phone interviews, although not ideal, have been successful in collecting stories about chemical dependency and nurse anesthetists. In a recent book, “Unbecoming a Nurse: Overcoming Addiction” by Paula Scimeca (2010), the author interviewed several nurses, including nurse anesthetists with chemical dependencies, through phone interviews. When asked, Scimeca felt the process was “enlightening in ways she never imagined” (Scimeca, Personal Communication, 2010). While she anticipated she would
receive more candid portrayals with face-to-face interviews, in some ways she felt more was revealed over the phone. In this study, this type of interview reinforced the sense of anonymity and made nurse anesthetist’s decision to participate easier.

A major limitation of this method of data collection is that participants may not have felt comfortable being open and, because of the sensitivity of this research topic, may have felt the need to withhold information (Marshall & Rossman, 2006); however, all participants were very frank in their interviews and all verbalized a desire to tell their story if it would prevent someone else from travelling a similar path. Even though the topic is sensitive, participants appreciated the positive focus of the research question.

A total of 24 potential participants contacted the investigator. Of those, 11 met all eligibility criteria. Of the 11 eligible potential participants who were sent consent forms, 7 returned completed forms.

**Data Collection Guide**

A brief sociodemographic questionnaire consisting of five questions was used to collect information about the participants and included: 1) age, 2) length of time as a nurse anesthetist, 3) history of substance abuse prior to using anesthetic opioids, 4) when he or she began using potent opioids, and 5) length of time prior to being caught or admitting they had a problem. The least sensitive demographic questions were asked first in order to initiate the conversation and establish a rapport with the participant. An item was included about substance dependency history. Not only was this information helpful in describing the sample, it revealed valuable background during the analysis of the data. The interview questions, shown in Figure 1, were designed to elicit individual subjective
experiences of their recovery from substance abuse and those factors they attributed to
the success of their recovery. Probes were used to guide eliciting in-depth descriptions of
participant experiences and perceptions. Examples of probes included statements such as,
“That is very interesting, tell me more about that,” or, “You mentioned X, could you
expand on that topic?” Silence served as a good probe as well (Opdendakker, 2006). It
allowed a participant to gather thoughts without distraction and helped prevent
interviewer influence.

Interview Protocol

Each participant was contacted by the investigator at the time and date decided
upon at the time of consent. After introductions, eligibility was re-confirmed and the
participant asked if he or she had any questions. After these questions were answered, the
digital audio-recording of the interview began. The interview was transcribed verbatim
and any identifying data was removed.

Data Analysis

Content analysis was used to systematically and objectively categorize what the
participants termed as factors that helped prevent them from relapsing. This type of
analysis can be applied to several varieties of communication such as media, written
words, and in this case, verbal narrative (Neuendorf, 2002), and it is a preferred technique
for analyzing qualitative data (Sandelowski, 2000). The fundamental basis for analysis is
termed a message “unit,” which is an identifiable message or part of a message which
identifies the population from which the sample is taken (Neuendorf, 2002). (See Figure
2 for an Overview of the Content Analysis Process). Units are analyzed for similarities and then categorized, or coded, into thematic groups. For this study, the interview was considered the unit, and phrases or words from the interview were considered “message units.” The interviews were examined for any phrase, term, or word that had an impact on a participant’s recovery. These messages units were extracted and categorized into groups for similarity in words or meaning that defined the overall meaning of the message unit. The categories were further analyzed and condensed into more focused codes that ultimately became the descriptive factors associated with successful recovery and return to work of nurse anesthetists with opioid dependency. Finally the codes were examined and synthesized into general themes of factors that are protective against relapse in practicing nurse anesthetists who are in recovery from opioid dependency. (See Figure 3 for an Example of a Content Analysis)

Results

Participant Characteristics

The demographic characteristics of participants are described in Table 1. The mean age of participants was 55.8 years (range 45-62). Three were female, and three were male. The males described a substance abuse history that began early. The males all drank alcohol and experimented with various drugs during the 1960s and 1970s. One of the female participants described a similar history, while the other two rarely drank alcohol and did not abuse any substance until they were in their 40s. One began abusing after recovering from an injury. At that time she injected herself intravenously with a non-steroidal anti-inflammatory medication, ketoralac. She quickly progressed to injecting
Fentanyl was the primary drug of abuse for five of the participants, although some used several opioids and anesthetic medications, depending on the availability. One participant used sufentanil exclusively. The average number of years of sobriety for the participants was 10.7 years (range 8-16.4 years). Two participants described co-existing mental disorders such as major depression and bipolar disorder. These participants also experienced at least one relapse early in their recovery and were treated with naltrexone at some point in their recovery.

The average time of opioid use before the participants entered recovery was 2.1 years (range 6 months to 5 years). In the case of the participant who concealed abuse for 5 years, buccal administration of sufentanil was used. This method is very similar to sublingual administration, in that the liquid medication is placed directly in the buccal area of the mouth and absorbed very quickly. This type of administration enabled the participant to covertly use while in the operating room, avoiding the need for frequent breaks. Five of the participants were caught at work, while one admitted use and sought help.

The results revealed an overarching topic of a complete commitment to the recovery process was necessary to prevent relapse. Within this major topic, participants indicated several factors that protected them from relapse and provided them the motivation to remain clean and sober. These factors were ultimately grouped into two major themes: personal factors and external factors. Personal factors were those in which...
the participant described something from within that prevented relapse, whereas external factors were described as factors that were found outside the participant that prevented relapse.

While not coded per se, the Twelve Step Process, either through AA or Narcotics Anonymous (NA) was credited by all as providing the foundation on which recovery was built. Participants found, learned, and developed their individual personal and external factors through the process of recovery. This was termed “working” their recovery steps and all participants felt they could not have been successful without this work. An example of not working through the steps was given by one participant who, although she had not been caught at the time, she knew she had a problem and so attended AA meetings with a family member. During this time, however, she also lied about her sobriety at the meetings. She had quit drinking alcohol and taking other drugs, but continued using sufentanil every three to four hours on a daily basis. When finally caught at work for diversion, she “got honest” with her AA group and “dove” into AA, and remains active and sober today. For the two participants who told of their relapses, early recovery attempts were not associated with a Twelve Step Program, and as described by one who did not use opioids for over one year, “hungrily, angrily, lonely, and tired, (I) started again.” After his relapse, he credited his successful recovery to his “total surrender” to the Twelve Step process. It was “the only thing that worked.”
**Personal Factors**

Personal factors came from within a participant, although often were discovered or learned through the Twelve Step process or counseling. These factors provided the structure that kept the participant on the path of recovery. These factors protected the participant from relapse, especially when dealing with stress or faced with a trigger situation. Factors identified included, removing the obsession with the drug(s) of choice, self-realization, seeing the future, and inner strength.

**Removing the obsession.** One of the participants said that through AA/NA, “the obsession (to use) can go away.” This is extremely difficult to learn if not in a Twelve-Step Program, as recounted one of the participants,

> The first 18 months of my sobriety … I wasn’t in AA. I was just doing group therapy and on a little Zoloft, and it was just that obsession, it was so overwhelming. Even after 18 months of being dry, I couldn’t figure out how to live without using [how not to obsess over the drug].

Though he had not relapsed, it was not until he became fully involved in AA that the obsession subsided. None of the participants could completely explain how AA/NA removed the obsession. However, they all credited AA/NA for relieving it. Someone summed it up by saying, “I really can’t put a finger on how the obsession goes away. It just does….I really have to credit my Twelve Step Program.” Someone else felt that by staying close to his program, “the obsession is not there anymore.” Another revealed that by working his Twelve Step Program, “the obsession just got lifted on its own through [his] realization that, you know, this [using] isn’t good for me.”
For some, recognizing and treating underlying mental illness removed the need, or obsession, to self-medicate. While not exempt from the need to continue the other necessary work required for recovery, controlling underlying illness was crucial for successful recovery. This sentiment was conveyed in the statement made by one participant who said, “Now, I'm not saying I'm any different from any other addict out there, but with me I have to be on medication [for depression] and as long as I take the medication like they say and I do the things they say, and I go to work, I don't feel the need to [self] medicate myself. I am very fortunate…”

One participant learned to not act on his first thought or impulse, especially when these thoughts/impulses were about drugs: “Maybe I need to go with my third or fourth thought on something before I act…I think that is how my obsession went away.” Another felt that once she got caught and the choice was taken away from her, the obsession was lifted and has never returned.

**Self-realization.** Participants portrayed self-realization as a deep understanding of where they were before recovery and who they are currently. Most expressed how happy they were to be sober and working. For the most part, participants felt they had, “the best job ever”, and they “loved their career.” Keeping this realization forefront in their thoughts was key to maintaining their recovery, not only while at work, but outside the workplace as well. Statements such as “It’s absolutely essential to remember who I am and where I come from, because in a heartbeat, I could go right back there (abusing drugs)” was a common thread when discussing questions about preventing relapse. One person said about not relapsing, “…Because every time I go to a meeting I see somebody
come through that door and the desperation and hopelessness that I see in their eyes and, when they share, I don’t want to be that person ever again.”

Realization also came from a humbling sense that addiction is a leveling disease; it affects all races, ages, and social classes. This awareness helped put things in perspective and helped prevent the egocentric thoughts of being able to handle everything if he or she began using again. The participants described a humility that kept their arrogance in check; they recognized they were no better or worse than anyone else. Participants understood and accepted themselves. This understanding and acceptance removed their fear of not meeting everyone’s (including their own) expectations. For example, it became all right to say, “No” to working extra time, and to realizing everyone makes mistakes.

This humility was, for some, translated into helping others in similar situations. Giving of themselves fortified this self-realization. About one-half of the participants sponsored others or worked in their community helping other addicts in some way. Those who did give of themselves not only expressed a desire to prevent anyone else from going through what they did, it also kept them keenly cognizant of where they did not want to be.

**Seeing the future.** Another protective personal factor was the ability to use the trigger management technique described by several participants as ‘playing out the scenario.’ This technique was characterized on some level by every participant. It involves having a clear understanding of where one is, where one was, and where one wants to be. When confronted with a trigger or cue to use, one is encouraged to think about the consequences if the impulse is acted on. As described by one participant,
I’m not going to deny that sometimes when I open up an ampule of fentanyl now, I don’t think about, ‘Oh, I remember this, I’d like to do this, but [if I do,] this is going to happen, and this is going to happen, and this is going to happen, and I don’t want that to happen.

Another participant described that she “romanced” drug use in her mind, but was able to recall her intervention, rehab, and job loss. This recollection enabled her to step back from the situation and take a different path.

When confronted with a trigger, one participant realized what he did not want to feel:

…I don't want to feel that way anymore. I don't want to feel guilty. I don't want to feel like I've hurt somebody…whether it's me, patients, or my kids. I don't want to get up in the morning dreading going to work for fear of what I might do. I don’t want to feel like every time somebody looks at me funny I have to worry because they might want me to test today. I don't want to feel that way.

**Inner Strength.** Inner strength comprises all factors related to an internal sense that one is confident that he or she has the ability to avoid relapse and is closely integrated with the final step of the Twelve Step process termed “Spirituality.” According to the Twelve Step process, this final step is the culmination of total surrender to a higher being, and involves the integration of all other steps into a strength that often provided what is termed by AA as “spiritual fitness.” For some, this inner strength, or fitness, was described as an internal honesty, which if not maintained, would result in relapse.

Spirituality cannot be visualized by others, as it is the personal gut level sense of, “I have
the tools and I am Okay. Because of this, I go into any environment and handle the situation.” One person was told, “you are the only one that is going to know whether or not you are spiritually fit because you are the only one that knows what is going on in the inside.” Another participant noted that “Being honest with myself keeps me sober” and similar statements were common throughout all interviews. Another person noted that God provided her with this inner strength. She described a “God-shaped hole” in her soul that was filled with God, and she took a daily check on her spiritual maintenance. If she deemed herself spiritually fit, she then could go anywhere and do anything without being afraid of drugs or anything else.

**External Factors**

Aspects of one’s external environment were credited with supporting their recovery. Such factors included getting a chance, time, use of naltrexone, state regulatory agency involvement, work environment, and talking with others.

**Getting a Chance.** Every participant expressed that their success was dependent on, at least partially, someone willing to take a chance on them by allowing them to work. Either the hospital administration or an individual provided participants the opportunity to work in anesthesia again. Three out of the six participants were not fired or forced to resign from their job as a result of their abuse. Their jobs were modified to accommodate contracts with the State Agency; they were able to function as a nurse, performing pre-operative assessments or monitoring patient care in the post-anesthesia care units. Neither of these responsibilities required direct patient care or administration of any medications. These three participants were also able to transition back to the
operating room once permitted by their State Contract. Others struggled finding someone caring enough, or desperate enough because of staffing issues, who was willing to “take a chance” on them. One person credits his ability to find a job to the fact that after looking in several places for a job, he found one in which the Chairman of the Department of Anesthesiology had a father who was an alcoholic and active in AA.

One woman felt that her chance was the number one reason she was successful in returning to work. When her contract allowed her to return to practice, she was initially turned down by her previous anesthesia group. She had done what she had to do to get herself recovered and was working in the preoperative clinic, but had to come to terms with the fact that returning to practice might not be an option. However, there was another anesthesiologist in the same system, but who worked for a different anesthesia group, who offered her a job telling her that, “everyone deserves a second chance.” She feels that without this opportunity, she would not have been able to return.

All participants expressed humility and gratitude at being given the opportunity to return to practice. They felt “fortunate,” “blessed,” and lucky to be working. This gratitude also made them “fiercely loyal” to their employers, which provided protective motivation not to relapse. They did not want to let their employer down.

**Time.** Several participants expressed that time away from contact with anesthesia drugs helped them to overcome the addiction. One participant who was away from the practice of anesthesia for 3 years felt this time-frame helped reduce the obsession to use. He recognized that he worked on his recovery program during that time, so that when he went back, he was armed with other tools to handle triggers. One who began abusing after she was 45 years old worked in a pre-operative clinic for 8 months during her initial
recovery. She was invited by one of the anesthesiologists to work for nurse anesthetists taking vacations and this was her re-entry into anesthesia practice. For her, this time-frame felt appropriate to be able to avoid relapse.

The participants in this study had been in recovery for several years, and they all iterated that the strength of feelings associated with triggers had decreased over time. Most described a sense of amusement or interest when presented with a trigger today. One participant noted:

…but I got through it, after the first year or two year cycle [dealing with triggers]. But I have to tell you, that we got a new doc six months ago, you know. And, and he decided he liked Dilaudid [i.e., hydromorphone, used to treat surgical pain for patients], you know. He had Dilaudid in his little boxes now and my first thought was, “Huh, I never did this before”, but now I don’t even notice it [Dilaudid]. It’s just kind of interesting how that works out…I just chuckled.

Another laughed when telling how he realized that he had not used a restroom in the operating suite for years. This was not a conscious choice; he had just avoided them since his recovery and he did not discover this fact until he was talking with others about triggers. This avoidance was an unconscious desire to prevent a trigger situation.

Use of Naltrexone. Two participants received naltrexone at some point in their recovery process. Both had undiagnosed mental illnesses during their drug use and were the only two who related at least one relapse early on. They were successful after receiving medical treatment for their illnesses and naltrexone for relapse prevention.
**State Regulatory Agency Involvement.** Agreements and contracts mandated by state regulatory agencies were most influential factors during the first few years of recovery. Everyone’s contracts varied, but all 6 participants were mandated to attend AA and/or other meetings, report to their agency routinely through paperwork or face-to-face meetings, and undergo random urine drug screens for a specified period. Early in the recovery process, contracts with the Board of Nursing were protective against relapse, if for no other reason than fear. “The Board of Nursing will sober you up,” one person described. While these contracts “didn’t come close to an actual Twelve-Step Program [in preventing relapse],” if remaining a nurse anesthetist was the goal, “crossing your T’s and dotting your I’s” was a big factor. “They were definitely the fear factor.”

Accepting the contract and recognizing the need to “jump through the hoops” played a role in successful completion of the contract, but also fostered internal motivation on the part of the person to stay sober. One participant has sponsored several young women in her Board of Nursing Diversion Program and has witnessed their anger and defiance directed at doing what is required of them (i.e., complying with their contract). Her response to their defiance was, “Oh my God, you know, do you want your life back? Then shut up and do what they say!”

Fear was not the only preventive factor provided by these agencies, however. It was also recognized in early recovery, that trusting one’s own ability to control his or her life had not been successful to this point, so it was helpful to rely on something or someone who knew more. It was recognized that the regulatory agencies provided a mechanism for success, even if the process was not completely understood. One person completed her State Peer Assistant Group agreement after two years, just as her Board of
Nursing increased the agreement time for nurse anesthetists (and all Advance Practice Nurses) to three years. She figured this was done to increase the chance of success in recovery, so even though she was not required by the state to attend meetings etc…, she was “suspicious” that her third year was going to be difficult. Taking the lead from her State Board of Nursing, she made very few changes to her program during that third year, and acted as if she still had an agreement.

When talking about fulfilling the requirements for his contract agreement, another participant said,

I went to the meetings … I did what people told me to do because I obviously couldn't control my own life, so I relied on somebody else that was obviously much more successful than myself.

**Work Environment.** Whether the staff and operating room team knew about the participant’s history varied. No one hid the fact he or she was in recovery, but in many instances, the information was given on a need to know basis. However, for some, putting their history out on the table helped keep them” honest.” Whichever environment someone was in, he or she was comfortable with the arrangement and it had a positive impact on their ability to remain successful with their recovery. However, this was not identified to be a major factor.

**Talking with Others.** Talking with others helped some when they were faced with a trigger situation. Even recently, one woman described going to the restroom immediately after getting her patient settled in the post-care unit, and realized she had some leftover Demerol (a commonly used opioid to treat pain after surgery) in her pocket. Being in the restroom when she realized this was a trigger for her, and her way of
dealing with it was to immediately leave the restroom, find a close co-worker and tell her the story; just talking about the trigger made it subside. Others, especially early on, would call someone such as their AA/NA sponsor when something along these lines happened. They realized they were not thinking rationally and needed to listen to someone who knew better. Another person was working in a pre-operative clinic performing assessments when she was told the anesthesia group she had worked for would not allow her to return to their practice. She was devastated, and her way of dealing with the situation was to attend an AA meeting during lunch that day and share her disappointment. Doing this helped her accept the choice made by her employer.

Discussion

Returning to the operating room after recovery from opiate dependency is challenging at the very least. The results of this study provide a snapshot of some of the factors that protect recovering nurse anesthetist from relapse when they return to practice. It is clear that relapse prevention cannot be attributed to one particular factor; rather the successful return to anesthesia practice requires a deep commitment to the entire recovery process that encompasses a desire to change, plus the tools to make and maintain that change. Protective factors described in this study provided the motivation and tools necessary to maintain that commitment. This commitment comes from within and results not only a change in behavior, but a change in thinking. This process reflects the process described in the Transtheoretical Model (TTM) of behavior change.

Although this theory was not operationalized in this study, elements of the process emerged in the analysis. The TTM proposes that the process of recovery involves
the transition through five cyclical stages (Prochaska & Velicer, 1997). These stages include the precontemplation stage, the contemplation stage, the preparation stage, the action stage, and finally the maintenance stage. During the precontemplation stages, the individual does not recognize or desire change. During the contemplation stage, the individual recognizes a need for change, but the barriers to making the change seem too overwhelming; the pros of using drugs outweigh the pros of abstinence. The preparation stage involves the intent to make a behavior change, and often an attempt to make a behavior change. The action stage is identified by some change in behavior that lasts up to 6 months. In this stage, the pros of abstinence outweigh the pros of drug use and a change is visible. If this stage lasts 6 months, the individual moves to the maintenance stage, during which the ability to remain abstinent is strong. The inner strength is present (Prochaska & Velicer, 1997).

Participants in this study generally fell into the contemplation stage or preparation stage at time they were caught or admitted their dependency. Most everyone recognized a problem and had made attempts to abstain; however, getting caught provided the mechanism for moving them to the action stage. During their initial recovery evidence of the action stage was noted as they complied with their contract, attended meetings, and maintained abstinence. While the maintenance stage generally begins after 6 months of being in the action phase, the real test of a behavior change for these participants occurred when they returned to work. Participants were away from practice for a minimum of 1 year, with the exception of one participant who was away from practice for 8 months. Their behavior had changed and they had the inner strength to recognize
that they could maintain their sobriety. While it is not unusual to cycle between stages, these participants were solidly in a maintenance stage.

The Twelve Step process provided the structure through which these changes were made. In general, the Twelve Step Program provides a step-by-step process which, if followed, can result in sustained recovery. (See Figure 4 for a description of the 12 steps). Almost all participants articulated that continued involvement in a 12 step program was crucial in their recovery. It was clear that successful recovery was more than attending meetings, however. It meant painstakingly working through the 12 steps continually. Someone stated, “AA is the steps, not the meetings.” This involved embracing their addiction, their desire to change, and realizing it could not be done alone.

Self-realization is a personal inventory of where one is and it provides the motivation to stay there. The self-realization of not wanting to hurt others anymore, keeping his or her job, wanting the best for their children, and not wanting to feel guilty are just some of the motivational influences described by participants. This personal factor provided motivation for accepting the recovery process and the willingness to work the Twelve Steps. Self-realization was manifested as an awareness of where the individual came from and the strong commitment to never return to that place. Removing the obsession was another of the most common protective personal factors described in this study. Eliminating the desire to use allowed participants to work on the Twelve Steps and make the necessary changes so the obsession did not return.

These results are comparable to Flynn et al.’s 2003 study that identified personal motivation as the most influential factor on successful recovery for heroin addicts. In their study the belief that individual motivation was a major influence in achieving
recovery. While several factors were identified in this study, similar to Flynn et al.’s results, personal factors were the strongest motivating factors and of those, self-realization was a major protective factor as all participants described this on some level.

Impulsivity plays a large role in relapse and as a result, some form of trigger management was described by all participants. As demonstrated by imaging the addicted brain, the presence of a trigger can stimulate a craving (Volkow et al., 2008). If not armed with the proper tools and inner strength to control this desire, the ability to just say, “no” is gone. Figuring out how to deal with these situations is crucial with any recovery program, but is especially important when one will be facing these triggers on a daily basis. The Twelve-Step approach and counseling include teaching a variety of strategies to deal with triggers. These strategies are tools that can be employed when confronted with a trigger situation. Some of these techniques are internal in nature while others are external. For example, Playing out the scenario is an internal trigger management tool, which talking with others is an external trigger management tool.

Spiritually is often considered a major influencing factor in sobriety (Laudet & White, 2008). While it was noted in this study, spirituality was more integrated into the factor of ‘inner strength’ than standing out on its own. Some talked about surrendering to a higher being and trusting that higher being to guide them; although more often than not, spirituality was subtly described when they talked about looking inward and feeling a sense of fitness brought about by conquering the Twelve Steps and, if necessary, treating their underlying mental disorders. Similar to Flynn et al.’s 2008 results, participant belief in his or her ability to maintain sobriety was extremely important. The understanding of a
power greater than life was not as protective against relapse in the workplace as it was for providing the foundation on which recovery began.

External factors were those factors over which the participant had less control. Of these, having someone take a chance on them was particularly important. No one could be working, if no one got a chance. This was described by most of the participants, and while one participant credited this factor as the most influential factor, getting a chance did not appear to be protective as much as a means by which they were able to get a foot back in the door and prove themselves. That being said, many of the participants described a loyalty that developed from that chance, which was protective against relapse. Not wanting to let that person or group down was very important.

The other external factors seemed more protective early on in their recovery, when participants were still figuring out the recovery process. Participants had little control of factors such as the conditions set forth by their state contract, including how much time was spend away from practice. For some this time was longer because of difficulties finding someone to take a chance on them. Whether the participant agreed with their contract stipulations did not matter, all participants accepted them and complied with their contracts. None described their interaction with their regulatory agency as adversarial; in fact the importance of diplomatic compliance was stressed. Whether this interaction was thought of as protective varied among the participants, although random urine drug screening was definitely a deterrent to using. Many statements from participants indicated they were only doing what was required, which reflect results from Siberts and Demene’s 1996 study in which Boards of Nursing were
considered the least helpful factor when returning to work while in recovery from chemical dependency.

Talking with others was a factor that was especially protective when first returning to work, although some described recent circumstances in which talking with others helped them through a trigger situation. The participants recognized the importance of bouncing thoughts off others for confirmation of appropriate thinking or for a re-direction of inappropriate thoughts.

Data from this study support Domino et al.’s (2008) findings that underlying mental disorders are a risk factor for relapse. Even with the small number of participants in this study, the two who had relapsed were those who also had a co-existing mental disorder. Treating this disorder was an important protective factor for both of them. While the use of naloxone was only described by these two participants, its use was a protective factor as well.

This study illustrates the strength of the commitment that must be made in order to prevent relapse. It was the hope of the participants that others in similar situations find something that could help prevent relapse. The results from this study also help inform those who do not have chemical dependency. If the work environment is such that co-workers are informed of the situation, awareness about the challenges faced by a recovering nurse anesthetist can broaden a support system when he or she returns to work.

These results add to the growing research on chemical dependency, especially for nurse anesthetists, who are at a risk for the development of abuse and dependency on potent opioids to which they have unique access. The information may provide some
guidance for recovering nurse anesthetists looking to return to practice. It also informs colleagues about some of the challenges faced by a recovering co-worker.

**Limitations**

Six participants is a small number of participants, although these six participants share a very similar experience. While their stories vary, commonalities were quickly established, and increasing the number might have provided more data about the established factors, it would not have provided new factors. Due to the focused nature of the selection of the participants for their focused experience, findings from this study are not generalizable past practicing nurse anesthetists who are in recovery from opioid dependency. For example, several other non-controlled anesthetic medications are abused by anesthesia providers creating another level of access not addressed by this study. As demonstrated by Bell et al. (1999) and Bell (2006), opioids are the most common medications of abuse, although anesthesia providers also have access to, and abuse, medications such as propofol and inhalational agents that are not tightly controlled. Interestingly, logic would lead one to think that the increased accessibility of non-controlled medications would lead to increased use over opioids, which are tightly controlled. However, the data from Bell et al. (1999) and Bell (2006) suggest otherwise. It is possible drug affects are different and their use is associated with less euphoria.

Missing from this study is a comparison to those who have not been successful in returning to work. This comparison could provide a more in depth picture of factors that are protective against relapse, as well as those factors that prohibit successful return to practice. However, recruiting this population could be even more difficult than recruiting
those who are successful, as it would entail locating former nurse anesthetists who have changed professions. While AIR provided a direct link to nurse anesthetists in various stages of recovery, there is less likelihood that a nurse anesthetist who has changed professions would participate in this organization.

Face-to-face contact has been described as the ideal method for conducting interviews, although the use of phone calls did not hinder the data collection process for this study. Participants were very open throughout the interview process and no one reported being uncomfortable at any time. In retrospect, similar to what Paula Scimecca described, the use of phone interviews for this study seemed to provide an anonymity that encouraged an honest discourse.

**Lessons Learned**

Recruitment for this study was difficult due to the sensitivity of the topic, although more people contacted the PI than expected ($n = 24$). Participants were nationally recruited, initially via email. One of the concerns with email contact containing sensitive information is the potential for a breach of confidentiality. This concern is illustrated in this study through such a situation during the early stages of recruitment. An identifying email of one potential participant was unintentionally sent to another potential participant. Once this breach was recognized, immediate steps were taken to rectify the issue. The Chair of the investigator’s committee and the IRB were notified. Both parties were contacted per the recommendation of the IRB and sincere apologies made, which were accepted. A new protocol was initiated and approved by the IRB that avoided email contact on all levels. New advertisements were placed on AIR and sent to the Peer
Assistant Advisors that contained no email contact information. It was recognized that
the investigator’s email was likely seen and saved by potential participants. However, if
contacted by email after the new protocol, the PI made every effort to obtain phone
contact information as quickly as possible. While the outcome for this incident was
positive, it could have ended very differently, emphasizing the need to carefully select
recruitment methods. The danger of unintentional distribution of sensitive material must
be weighed very heavily against the benefits of email communication.

**Implications for Future Research**

While prevention of substance abuse is ideal, reducing the incidence has been
relatively unsuccessful in the general population as statistics from SAMSHA (2010) have
remained generally unchanged over the years. Tighter accountability of medication use in
the hospital provides a means for early identification of those with opioid dependency.
This protects the individual as well as potential patients cared for by the impaired
provider. However, it does not address the root cause of addiction. Continued research
unveiling the cause and effect of the neurobiological changes associated with addiction is
essential for developing successful treatments. Genetic research and imaging studies are
moving in that direction. Research has guided the development of treatment plans that
provide the best chance for successful recovery and return to anesthesia practice for
chemically dependent nurse anesthetists. Research involving nurse anesthetist who were
not successful returning to practice could provide important insight for relapse
prevention.
As many anesthesia providers are not aware of the risk, early education about the risks, signs and symptoms and consequences of this type of abuse has the potential for reducing the risk and identifying problems earlier. The development and evaluation of such programs could prove vital to the profession.
Interview Questions

1. How long have you been a nurse anesthetist?
2. What is your age?
3. Tell me about your substance abuse history before beginning to use opioids.
4. When did you first begin abusing potent opioids?
5. How long did you use before you were caught or admitted your problem?
6. To what do you attribute your recovery and ability to return to work?
7. There are/were several aspects to your treatment plan, such as your initial treatment, follow-up treatment. Were any of them influential in your ability to return to work, and if so, which ones, and how did they contribute to your recovery?
8. How would you describe your compliance with the initial treatment plan?
   o What about when you returned to work?
9. Describe how your work environment affected your ability to return to work?
10. How have you been able to balance your recovery with the stressors of work as they don’t change?
11. What would you say has been the most influential factor impacting your ability to avoid relapse and why?
12. Is there anything else you would like to share with me?
Figure 2

Overview of the Content Analysis Process

Examples of Initial Message Units  | Grouped by Meaning  | Meanings Converted to Codes  | Codes Categorized into Thematic Groups
--- | --- | --- | ---
So, I immediately went and told one of my friends, one of my CRNA friends. I was like, “look, this just happened to me.”  | The desire to use is gone  | Removing the Obsession  | 
I wasn’t made to face the temptation over the three years.  | Recognizing where one was when using and not wanting to go back  | Self-Realization  | 
My hospital actually made a place for me working in the pre-op clinic just seeing pre-op patients  | Technique to prevent impulsive behavior when a trigger is experienced  | Seeing the Future  | 
You are the only one that is going to know whether or not you are spiritually fit because you are the only one that knows what is going on in the inside  | Development of an inner strength  | Inner Strength  | 
I know where that path will take me  | Trigger management by talking to someone  | Talking to others  | 
It’s absolutely essential to remember who I am and where I come from, because in a heartbeat, I could to right back there  | State Regulatory Involvement  | State Agency Involvement  | 
Just have an attitude of humility, that I know that I’m a good CRNA. I know that I take good care of my patients. I’m not perfect. I’m okay  | Someone willing to give them an opportunity to work  | Getting a Chance  | 
People at work knowing about recovery  | Work Environment  |  | 
Time away from the practicing as a nurse anesthetist  | Time  | 

Table 1:

Description of Sample

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<th>Age</th>
<th>Time as CRNA yrs</th>
<th>Length of time before caught yrs/m</th>
<th>Opioid of Choice</th>
<th>Gender</th>
<th>Length of sobriety yrs/m</th>
<th>Use of Naltrexone Y/N</th>
<th>Co-existing disease Y/N</th>
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</table>
Example of a Content Analysis:
Theme/Code/ Message Meaning/ and Examples of Initial Message Units

Theme: Internal Factors

Code: Self-realization

Message Meaning Unit:
Recognizing where one was when using and not wanting to go back

Examples of Initial Message Units:

- I made the decision to change my life and I did
- I don’t ever want to be that person again
- I think as much as anything, I just didn’t want to be like that anymore
- I don’t want to feel that way anymore. I don’t want to feel guilty. I don’t want to feel like I’ve hurt somebody…whether it’s me, patients, or my kids. I don’t want to get up in the morning dreading going to work for fear of what I might do. I don’t want to feel like every time somebody looks at me funny I have to worry because they might want me to test today. I don’t want to feel that way.
- It’s absolutely essential to remember who I am and where I come from, because in a heartbeat, I could to right back there
- No, I don’t want that life again
- Because every time I go to a meeting I see somebody come through that door and the desperation and hopelessness that I see in their eyes and, when they share, I don’t want to be that person ever again.
- All I have to do is remember what happened last time I used it, you know. And, I’m at a point in my life now where I can’t relapse. You know, I’m looking at the end of my career. I’m looking at retiring. And, this is, this part of my career is when I start poking that money away real hard and fast.
- Just have an attitude of humility, that I know that I’m a good CRNA. I know that I take good care of my patients. I’m not perfect. I’m okay.
- Well, the only thing I would say is, always remember what it felt like when you were finally at the end of your run, and you were caught, or you decided you needed help. And never forget that. Because that is the big inspiration for me not to ever use again. I never, ever, ever, want to feel that way again.
Figure 4

The Twelve Steps of Alcoholics Anonymous

1. Admit that you are powerless over alcohol— that your life has become unmanageable.

2. Come to believe that a Power greater than yourself could restore you to sanity.

3. Make a decision to turn your will and your life over to the care of God as you understand him.

4. Make a searching and fearless moral inventory of yourself.

5. Admit to God, to yourself and to another human being the exact nature of your wrongs.

6. Are entirely ready to have God remove all these defects of character.

7. Humbly asked Him to remove your shortcomings.

8. Make a list of all persons you had harmed, and become willing to make amends to them all.

9. Make direct amends to such people where possible, except when to do so would injure them or others.

10. Continue to take personal inventory and when you are wrong promptly admit it.

11. Seek, through prayer and meditation, to improve our conscious contact with God as you understand Him, praying only for knowledge of His will for you and the power to carry that out.

12. Experience a spiritual awakening as the result of these steps, try to carry this message to alcoholics and to practice these principles in all your affairs.

The Twelve Steps are reprinted with permission of Alcoholics Anonymous World Services, Inc. (“AAWS”) Permission to reprint the Twelve Steps does not mean that AAWS has reviewed or approved the contents of this publication, or that AAWS necessarily agrees with the views expressed herein. A.A. is a program of recovery from alcoholism only - use of the Twelve Steps in connection with programs and activities which are patterned after A.A., but which address other problems, or in any other non-A.A. context, does not imply otherwise.
References


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*Anesthesiology*, 109(5), 905-917.


SAMSHA. Results from the 2008 National Survey on drug use and health; national findings. Retrieved April 16, 2010 from

http://oas.samhsa.gov/nsduh/2k8nsduh/2k8Results.cfm#Fig2-2


CONCLUSIONS

Returning to the practice of anesthesia while in recovery from opioid dependence is extremely difficult. The altered neurobiological reward processing in their brains creates significant challenges (Volkow et al., 2006; Volkow et al., 2007; Volkow et al., 2008). These individuals must overcome some very strong neuropathways that control reward, and in a sense they need to reconnect normal pathways that have been hi-jacked by their addictive substance. Successful recovery requires more than a desire to change; it requires a complete change of thinking. Individuals must learn to think that a life without drugs is better than one with drugs.

The return to the practice of anesthesia may not been appropriate for all those who become addicted to the potent anesthetic opioids dealt with on a daily basis; although, success is possible. Ultimately, only the person experiencing the addiction can determine the motivation to change and sustain that change. This change develops gradually through continual work on the part of the individual. Colleagues, friends, regulatory agencies, and family can provide motivation, support, and accountability to assist with successful return to work.
REFERENCES


Authors.


SAMSHA. Results from the 2008 National Survey on drug use and health; national findings. Retrieved April 16, 2010 from [http://oas.samhsa.gov/nsduh/2k8nsduh/2k8Results.cfm#Fig2-2](http://oas.samhsa.gov/nsduh/2k8nsduh/2k8Results.cfm#Fig2-2)


APPENDIX A

UNIVERSITY OF ALABAMA AT BIRMINGHAM
INSTITUTIONAL REVIEW BOARD APPROVAL
UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on September 29, 2013. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: WRIGHT, ELIZABETH L
Co-Investigator(s):
Protocol Number: F101028006
Protocol Title: Protective Factors Against Relapse for Practicing Nurse Anesthetists in Recovery from Anesthetic Opiates

The IRB reviewed and approved the above named project on 1/5/2011. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received FULL COMMITTEE review.

IRB Approval Date: 1/5/2011
Date IRB Approval Issued: 1-13-11
Identification Number: IRB00000726

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.
MEMORANDUM

TO: Elizabeth Laura Wright
Principal Investigator

FROM: Leslie Cooper, CIP
On behalf of IRB 02

DATE: March 30, 2011

RE: IRB Review of Problem Report F101280096 - Protective Factors Against Relapse for Practicing Nurse Anesthetists in Recovery From Anesthetic Opiates

The IRB 02 met on March 30, 2011 and reviewed the Problem Report dated February 17, 2011, for the protocol referenced above. The IRB-acknowledged Problem Report and IRB stamped consent form are enclosed.

- The IRB approved the Corrective Action Plan, the changes to the protocol, and the revised consent form.
- The IRB determined the reported breach of confidentiality represents an unanticipated problem involving risk to subjects or others.
- The IRB is required by the Policies and Procedures of the UAB Human Research Protection Program to report the unanticipated problem to the Institutional Official (Dr. Richard Marchase), the Principal Investigator's dean, and the Principal Investigator’s academic advisor. Separate memoranda are being sent to Dr. Marchase, Dr. Harper, and Dr. Stullenbarger for this purpose.

cc: Doreen C. Harper, PhD, RN; Dean, School of Nursing
Norma Elizabeth Stullenbarger, DSN, RN; Associate Dean for Academic Affairs, School of Nursing
Richard Marchase, PhD; Vice President of Research and Economic Development
Lauretta W. Gerrity, PhD; Associate Vice President of Research Operations/Compliance
Sheila D. Moore, Director, IRB

enclosures

LC/abh
APPENDIX B

INFORMED CONSENT FORM
Consent Form

TITLE OF RESEARCH: Protective Factors against Relapse for Practicing Nurse Anesthetists in Recovery from Anesthetic Opiates
IRB PROTOCOL NUMBER: F101028006
INVESTIGATOR: Elizabeth Laura Wright MNA, BSN
SPONSOR: None

Explanation of Procedures

You are being asked to participate in a research project that involves your experience as a nurse anesthetist and your recovery from opioid dependency. The primary goal of this project is to find factors that have helped you successfully return to work as a nurse anesthetist while in recovery. It is expected that between 10 and 15 nurse anesthetists will be interviewed. If you choose to participate you will be asked a series of questions through a one on one phone interview with the principal investigator (PI).

The interview will probably take about 60 minutes. It will be recorded and the interviewer will take notes. There may be a second interview that will occur as the data are analyzed, which will provide you the opportunity for the PI to discuss the analysis with you and allow you to review the analysis for accuracy and anonymity. The entire project is expected to take between 6 and 9 months. You can expect that the PI will contact you within a month after your initial interview to schedule a second interview if needed.

The initial questions you will be asked are as follows:

- What is your age and gender?
- How long have you been a nurse anesthetist?
- When did you first begin abusing opioids?
- Tell me about your substance abuse history before beginning to use opioids.
- How long did you use before you were caught or admitted your problem?
- Tell me about those factors that have successfully helped you return to work.
- There are/were several aspects to your treatment plan, such as your initial treatment and follow-up treatment. Were any of them influential in your success, and if so, which ones, and how did they contribute to your success?
- Please rank the top three factors that were the most influential in your returning to the practice of anesthesia.
- How would you describe your compliance with the treatment plan?
- What would you say has been the most influential factor impacting your successful return to work?

Rev 2/23/11
The PI will conduct the phone interview in a private office. When scheduling your interview, you are encouraged to schedule a time during in which there are few distractions, such as children or co-workers, and in a place where you are comfortable with the privacy of your surroundings.

All phone calls will take place in the PI’s office, with the door closed and a “Do Not Disturb” sign placed on the door.

The information you share with the PI is confidential. However, if you live in the state of Alabama, and reveal that you have relapsed or are actively abusing, the PI is legally obligated to report you to the Alabama State Board of Nursing. This only applies to nurses living in Alabama, as the PI resides and practices as a CRNA in the state of Alabama.

**Refusal or Withdrawal without Penalty**

It is your choice whether you choose to participate. There is no penalty if you choose not to participate. You may withdraw from this research study at anytime.

**What if you are a UAB Employee?** Taking part in this research is not a part of your UAB duties, and refusing will not affect your job or relationship with UAB. You will not be offered or receive any special job-related consideration if you take part in this research.

**Cost of Participation**

If there will be no cost to you from taking part in this study.

**Payment for Participation in Research**

There is no payment for participating in this research project.

**Payment for Research-Related Injuries**

UAB has not provided for any payment if you are harmed as a result of taking part in this study.

**Significant New Findings**

Although not expected, you will be told by the principal investigator if new information becomes available that might affect your choice to stay in the study.

**Questions**

If you have any questions, concerns, or complaints about the research or a research-related injury including available treatments, please contact Laura Wright. She will be glad to answer any of your questions. Laura Wright’s number is 205-975-5700 and her email is wrightel@uab.edu.

If you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact Ms. Sheila Moore. Ms. Moore is the Director of the Office of the Institutional Review Board for Human Use (OIRB). Ms. Moore may be reached at (205) 934-3789 or 1-800-822-8816. If calling the toll-free number, press the option for “all other calls” or for an operator/attendant and ask for extension 4-3789. Regular hours for the Office of the IRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday. You may also call this number in the event the research staff cannot be reached or you wish to talk to someone else.
The PI will conduct the phone interview in a private office. When scheduling your interview, you are encouraged to schedule a time during in which there are few distractions, such as children or co-workers, and in a place where you are comfortable with the privacy of your surroundings.

All phone calls will take place in the PI's office, with the door closed and a "Do Not Disturb" sign placed on the door.

The information you share with the PI is confidential. However, if you live in the state of Alabama, and reveal that you have relapsed or are actively abusing, the PI is legally obligated to report you to the Alabama State Board of Nursing. This only applies to nurses living in Alabama, as the PI resides and practices as a CRNA in the state of Alabama.

**Refusal or Withdrawal without Penalty**

It is your choice whether you choose to participate. There is no penalty if you choose not to participate. You may withdraw from this research study at anytime.

**What if you are a UAB Employee?** Taking part in this research is not a part of your UAB duties, and refusing will not affect your job or relationship with UAB. You will not be offered or receive any special job-related consideration if you take part in this research.

**Cost of Participation**

If there will be no cost to you from taking part in this study.

**Payment for Participation in Research**

There is no payment for participating in this research project.

**Payment for Research-Related Injuries**

UAB has not provided for any payment if you are harmed as a result of taking part in this study.

**Significant New Findings**

Although not expected, you will be told by the principal investigator if new information becomes available that might affect your choice to stay in the study.

**Questions**

If you have any questions, concerns, or complaints about the research or a research-related injury including available treatments, please contact Laura Wright. She will be glad to answer any of your questions. Laura Wright’s number is 205-975-5700 and her email is wrightl@uab.edu.

If you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact Ms. Sheila Moore. Ms. Moore is the Director of the Office of the Institutional Review Board for Human Use (OIRB). Ms. Moore may be reached at (205) 934-3789 or 1-800-822-8816. If calling the toll-free number, press the option for “all other calls” or for an operator/attendant and ask for extension 4-3789. Regular hours for the Office of the IRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday. You may also call this number in the event the research staff cannot be reached or you wish to talk to someone else.

Rev 2/23/11

Participant Initials
Legal Rights
You are not waiving any of your legal rights by signing this informed consent document.

Signatures
Your signature below indicates that you agree to participate in this study. You will receive a copy of this signed document.

Signature of Participant __________________________ Date ____________

Signature of Principal Investigator __________________________ Date ____________
University of Alabama at Birmingham

AUTHORIZATION FOR USE/DISCLOSURE OF HEALTH INFORMATION FOR RESEARCH

What is the purpose of this form? You are being asked to sign this form so that UAB may use and release your health information for research. Participation in research is voluntary. If you choose to participate in the research, you must sign this form so that your health information may be used for the research.

Participant name: _____________________________

Research Protocol: Protective Factors against Relapse for Practicing Nurse Anesthetists in Recovery from Anesthetic Opiates

UAB IRB Protocol Number: F101028006
Principal Investigator: Elizabeth Laura Wright
Sponsor: NA

What health information do the researchers want to use? All medical information and personal identifiers including past, present, and future history, examinations, laboratory reports and treatments of whatever kind related to or collected for use in the research protocol.

Why do the researchers want my health information? The researchers want to use your health information as part of the research protocol listed above and described to you in the Informed Consent document.

Who will disclose, use and/or receive my health information? The physicians, nurses and staff working on the research protocol (whether at UAB or elsewhere); other operating units of UAB, HSF, UAB Highlands, The Children's Hospital of Alabama, Callahan Eye Foundation Hospital and the Jefferson County Department of Public Health, as necessary for their operations; the IRB and its staff; the sponsor of the research and its employee; and outside regulatory agencies, such as the Food and Drug Administration.

How will my health information be protected once it is given to others? Your health information that is given to the study sponsor will remain private to the extent possible, even though the study sponsor is not required to follow the federal privacy laws. However, once your information is given to other organizations that are not required to follow federal privacy laws, we cannot assure that the information will remain protected.

How long will this Authorization last? Your authorization for the uses and disclosures described in this Authorization does not have an expiration date.

Can I cancel the Authorization? You may cancel this Authorization at any time by notifying the Director of the IRB, in writing, referencing the Research Protocol and IRB Protocol Number. If you cancel this Authorization, the study doctor and staff will not use any new health information for research. However, researchers may continue to use the health information that was provided before you cancelled your authorization.

Can I see my health information? You have a right to request to see your health information. However, to ensure the scientific integrity of the research, you will not be able to review the research information until after the research protocol has been completed.

Signature of participant: _____________________________ Date: ____________
or participant's legally authorized representative: _____________________________ Date: ____________

Printed Name of participant's representative: _____________________________
Relationship to the participant: ____________________________________________

Rev 2/23/11 Page 5 of 5