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SYMPTOMS IN PATIENTS WITH SUPRAVENTRICULAR TACHYCARDIA: IMPACT ON QUALITY OF LIFE

by

KATHRYN A. WOOD

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

NURSING

in the

GRADUATE DIVISION

of the

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San Francisco

[redacted]

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Symptoms in Patients with Supraventricular Tachycardia:

Impact on Quality of Life

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Kathryn A. Wood

DEDICATION

This dissertation is dedicated to my family:

To my parents, Vera and Gilbert Wood

and my sister, Carol Wood

With gratitude for all of the love and support you have always so willingly shared.

ACKNOWLEDGEMENTS

Far from the accomplishment of one individual, numerous people have made this dissertation possible. Special thanks are owed to many people who have given their support and advice over the years. I welcome the opportunity to acknowledge their collective support.

During fifteen years of clinical practice, I have had the privilege of working with many knowledgeable, thoughtful, and inquisitive physicians, nurses, and patients. I learned a great deal from all of them. I was influenced perhaps the most by Dr. Albert Waldo, whom I met at the University of Alabama at Birmingham. It was not long after meeting Dr. Waldo that his enthusiasm and fascination with electrophysiology rubbed off on me. I will always be grateful to him for passing on to me, and so many others, his keen interest in people, his enthusiasm for learning, and his clinical expertise in caring for patients with arrhythmias. He continues to be a mentor to me, taking pride and interest in my accomplishments, and always taking the opportunity to introduce me to leaders in this field.

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grateful that she agreed to work with me, someone she had only talked to over the phone. I would be remiss if I did not also thank Barbara's husband, Dr. Denis Drew, for welcoming me to many enjoyable evenings at their homes, as well as his ongoing moral support and technical expertise with many an abstract and paper.

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proposal, actually gave me the confidence to go out and do it.

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low point in the last 17 years, and in spite of the distance between us, has always been there for me. Sue Walsh as well, has been a treasured friend, and provided immeasurable support and laughter, and frequent surprise packages and letters. Our weekly phone conversations and times together have provided perspective, diversion, and always entertainment. Mary Sullivan, whose friendship I have been grateful for since high school, has offered support and listened patiently over many a breakfast during my brief sojourns home. Margaret Balmes, Michael Bodziner, Robert Balsley, and Ed McDonald have all listened and encouraged me while providing many delicious meals and good company.

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patiently tolerated my questions and phone calls, and genuinely cared about providing information which would help other individuals with SVT.

To all of you, and the many others whose contributions I have not been able to mention individually here, I give grateful acknowledgement. I owe you all a great debt.

San Francisco, 30 August 1996

ABSTRACT

While the physiological and psychosocial symptoms in ventricular dysrhythmia patients are well appreciated, symptoms in supraventricular tachycardia (SVT) patients are less frequently investigated. Supraventricular tachycardia causes numerous symptoms ranging from palpitations to syncope which may make life difficult for patients with recurrent tachycardias. Often thought of as a benign dysrhythmia more commonly noted in females, the incidence of disabling symptoms or life threatening events is not well known for patients with SVT. For patients with SVT, radiofrequency ablation (RFA) currently offers a more effective treatment modality with lower morbidity than conventional therapies.

A prospective, descriptive study was undertaken: (1) to describe the clinical symptoms of patients with SVT and how these impact on quality of life (QoL); and (2) to determine whether symptoms and QoL change following treatment with radiofrequency ablation. Self administered questionnaires, with standardized generic measures (from the Medical Outcomes Study SF-36) incorporated with disease specific measures, were used to assess symptom distress & health related QoL pre-RFA and at one month post RFA.

The sample (n=52) was 65% female, with a mean age of 41 +/- 17 years. Types of SVT included were: atrioventricular nodal reentrant tachycardia, atrioventricular reciprocating tachycardia, and atrial tachycardia. A low incidence of associated heart disease was noted, with mean left ventricular ejection fraction 65%. Pre-ablation, patients reported having to cut down on activities due to symptoms of SVT a mean of 7 days/month. Pre-ablation, QoL scores showed significant impairment in physical functioning, health distress, mental health, and energy/fatigue. These scores were

significantly below normative values for patients with congestive heart failure and recent myocardial infarction. Statistically significant improvement ($p < 0.05$) was noted at one month post-RFA in virtually all QoL outcomes.

Managing the symptoms associated with recurrent episodes of SVT severely impacts the QoL of these patients. Radiofrequency ablation appears to have a dramatic effect in decreasing symptoms and improving QoL in patients with SVT.

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CHAPTER ONE: STUDY PROBLEM AND SIGNIFICANCE

I. Introduction

Supraventricular tachycardia (SVT) is a general classification of rapid heart rhythms originating in the atria or atrioventricular (AV) node. Supraventricular tachycardia encompasses the subclasses of: AV nodal re-entrant tachycardia, AV reciprocating tachycardia, atrial tachycardia, atrial flutter, and atrial fibrillation. With the exception of atrial ectopic tachyarrhythmias (ie., atrial fibrillation, atrial flutter, and atrial tachycardia), SVT patients typically have no structural heart disease, and for all practical purposes are healthy young to middle aged adults. Yet these patients are frequently disabled by the acute, episodic nature of the SVT events. Atrial fibrillation differs from the other types of SVT in regard to symptomatology and associated underlying pathophysiology. Patients with atrial fibrillation and some with atrial flutter have significantly lower cardiac function than other SVT patients. These types of patients' symptoms are thought to stem from both the associated cardiac and/or pulmonary dysfunction and tachycardia, rather than solely from the tachycardia itself.

Supraventricular tachycardias are clinically very common, yet the experiences of SVT patients have drawn little attention from nursing or medicine. This lack of attention could be multifactorial. The most common type of SVT is more frequently noted in women, a population traditionally under represented in clinical research. Dhala and colleagues (1995) reported 61% (358/589) of their SVT sample were female, and more women (73%) than men (27%) experienced syncope with their SVT

episodes. Additionally, SVT has been thought of as "more benign" than ventricular dysrhythmias. Although usually not as life-threatening as VT or VF, SVT often requires frequent hospital admissions and/or use of emergency room services. Epstein and colleagues (1994) reported on a series of SVT patients averaging over four hospital admissions or emergency department visits per year in the 1 to 2 years prior to radiofrequency ablation treatment. Especially in patients with limited cardiac reserve and advanced heart disease, SVT may significantly decrease cardiac function causing potentially fatal consequences. There has been no systematic way of reporting the actual incidence of death from SVT, so this information is not clearly known. Contrary to the popular notion that SVTs are usually benign, this author recently observed a 3% frequency of aborted sudden death in a sample of 167 SVT patients (Wood, Drew, & Scheinman, 1994). Others have also reported frequencies of 2%-4.5% for aborted sudden cardiac death in SVT patient samples (Hays, Lerman, & DiMarco, 1989; Klein, Bashore, Sellers, Pritchett, Smith, & Gallagher, 1979; Timmermans, Smeets, Rodriguez, Vroucchos, van den Dool, & Wellens, 1995; Wang, Scheinman, Chien, Cohen, Lesh, & Griffin, 1991).

Supraventricular tachycardia causes numerous symptoms which may make life difficult for these patients. The literature reports 15%-36% of all SVT patients experience syncope (Auricchio, Klein, Trappe, & Wenzlaff, 1991; Dhala et al., 1995; Paul, Guccione, & Garson, 1990; & Yee & Klein, 1984). A recent study noted 27% (24/90) of SVT patients had stopped driving because of symptoms of near syncope or syncope (Dhala et al., 1995). Patients' quality of life may be impacted tremendously

by these not only troublesome, but potentially life threatening symptoms. From clinical experience, symptoms of SVT may seem well understood, but these symptoms are not well documented in the literature. Also unclear from the literature is the nature of the SVT episodes and the severity/frequency/duration of these symptoms.

Episodes are described by patients as having a paroxysmal onset and termination, associated with symptoms of palpitations, dizziness, lightheadedness, nausea, anxiety, atypical chest pain, sweating, and sometimes fainting. These symptoms can range from an annoyance to rendering the patient incapacitated. The paroxysmal and unpredictable nature of the episodes, the severity, frequency, and duration of symptoms, as well as any necessary hospitalizations may detrimentally affect the patient's QoL. There has been little research addressing symptom distress and QoL before or after ablation treatment in these patients.

Research in the area of dysrhythmia patient care encompasses physiological, psychological, and sociocultural parameters. Numerous papers from a variety of disciplines have addressed these parameters in studies with ventricular dysrhythmia patients. Most of this research has pertained only to patients with ventricular dysrhythmias, and has been based on sudden cardiac death (SCD) survivors or internal cardioverter defibrillator patient populations (Arteaga, 1995; Bainger & Fernsler, 1995; Burke, Rodgers, & Jenkins, 1992; Cooper et al., 1986; Doering, 1991; Doolittle & Sauve, 1995; Dougherty, 1994; Dougherty, 1995; Druss & Kornfield, 1967; Dunbar, Warner, & Purcell, 1993; Dunnington et al., 1988; Finkelmeier, Kenwood, & Summers, 1984; Fricchione & Vlay, 1986; Haggerty,

Burkett, & Foster, 1983; Jenkins & Burke, 1991; Kalbfleisch et al., 1989; Keren, Aarons, & Veltri, 1991; Kolar & Dracup, 1990; Main, Woods, & Maynard, 1991; Pycha et al., 1986; Sauve' et al., 1993; Schron et al., 1991a; Schron et al., 1991b; Simons, Cunningham, & Catanzaro, 1992; Sneed & Finch, 1992; Tchou et al., 1989; Vlay et al., 1989; Willund et al., 1992). Most of these investigators have evaluated the psychosocial or psychological responses of these patients to their diagnosis, and/or medical, surgical, or device treatment, rather than physical symptoms and/or quality of life (Burke, Rodgers, & Jenkins, 1992; Cooper et al., 1986; Doering, 1991; Doolittle & Sauve, 1995; Dougherty, 1994; Dougherty, 1995; Druss & Kornfield, 1967; Dunbar, Warner, & Purcell, 1993; Dunnington et al., 1988; Finkelmeier, Kenwood, & Summers, 1984; Fricchione & Vlay, 1986; Haggerty, Burkett, & Foster, 1983; Jenkins & Burke, 1991; Kalbfliesch et al., 1989; Keren, Aarons, & Veltri, 1991; Kolar & Dracup, 1990; Main, Woods, & Maynard, 1991; Pycha et al., 1986; Sauve' et al., 1993; Simons, Cunningham, & Catanzaro, 1992; Sneed & Finch, 1992; Tchou et al., 1989; Vlay et al., 1989). None of these studies have included supraventricular tachycardia (SVT) patients in their samples. In the medical literature, researchers have examined physical symptoms in a variety of tachycardia patients (Bhandari et al., 1992; Dhala et al., 1995; Garratt et al., 1994; Levine, 1960; Luria, 1971; Morady et al., 1985; Saxon et al., 1989; Wolff, 1942). The majority of these studies have excluded SVT patients, or grouped them with ventricular tachycardia (VT) or ventricular fibrillation (VF) patients for analysis. Therefore, there is little in the literature addressing specifically SVT patients and their symptom

experiences.

II. Pathophysiological Background

A. Normal Conduction of Impulses through the Heart

To understand conduction abnormalities involved with SVT, an understanding of normal conduction through the heart is necessary. Specialized cells in the heart with unique action potentials have the capability to spontaneously depolarize in a repetitive fashion. This characteristic ability to self-excite and generate impulses is known as automaticity. Cells in the heart with this property are located in the sinoatrial (SA) node, atrioventricular (AV) junction, and the Purkinje system in the atria and ventricles. The heart's natural pacemaker, the SA node, possesses the highest degree of automaticity, normally producing a heart rate of between 60-90 beats per minute (bpm) at rest. The SA node is located near the junction of the superior vena cava and the right atrium (Figure 1).

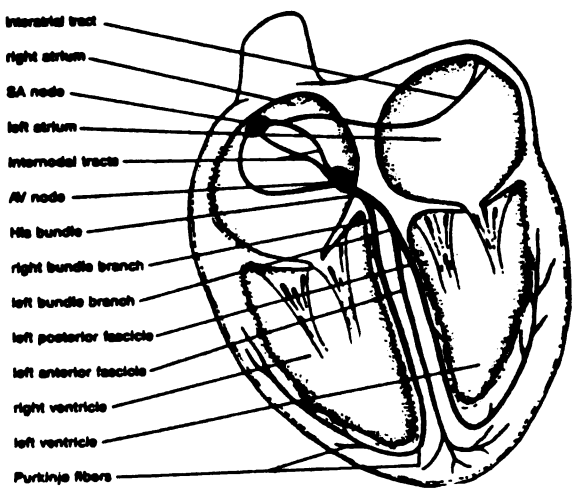

Figure 1. Normal Cardiac Conduction System. From: Arrhythmias: Detection, Treatment, and Cardiac Drugs (p. 2) by J.M. Patel, S.G. McGowan, & L.A. Moody, 1989, Philadelphia: W.B. Saunders. Copyright 1989 by W.B. Saunders Co. Reprinted with permission.

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Following depolarization, the cardiac muscle cell is said to be refractory as the membrane potential returns to baseline. There are four phases of cellular recovery: the absolute, effective, relative, and supernormal refractory periods (Figure 2).

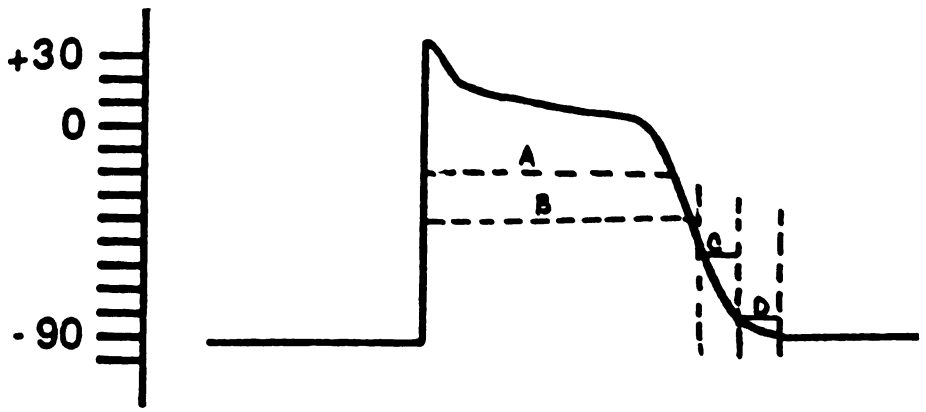

Figure 2. Action potential of cardiac muscle cell showing the four refractory periods: (A) absolute refractory period, (B) effective refractory period, (C) relative refractory period, and (D) supernormal refractory period.

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During the absolute refractory period, no stimuli of any strength will elicit a new depolarization. This is often difficult to measure in groups of cells due to the variety of recovery times of individual cells, so more frequently the effective refractory is determined. The effective refractory period refers to the time period in which a depolarization response can only be produced by a larger than normal stimulus. Depolarization of the membrane may occur during the effective refractory period, but the impulse cannot be propagated throughout the cell network. The cardiac muscle remains more difficult than normal to excite during the relative refractory period, yet

propagation of the impulse can occur with a larger than normal stimulus. Impulses generated during the relative refractory period will be propagated at a slower speed than a normal depolarization. During the supernormal refractory period, the cell is more excitable than normal, such that a weaker stimuli is capable of evoking a new depolarization. New impulses are normally propagated only after full cellular recovery, which occurs milliseconds after the membrane potential has returned to its baseline or resting state.

The SA node is under autonomic nervous system control. Parasympathetic control via the vagus nerve is accomplished by release of the neurotransmitter acetylcholine, which slows impulse formation, length of refractory period, and therefore decreases heart rate. Valsalva maneuvers, as well as carotid sinus massage, serve to stimulate the vagus nerve, slow impulse formation and decrease heart rate. Sympathetic innervation occurs via the release of catecholamines such as norepinephrine, which increase automaticity and shorten the refractory period of the cardiac cells. This increases heart rate by increasing the frequency of impulses generated as well as decreasing the amount of time necessary for cellular recovery between beats. Exogenous factors such as caffeine, nicotine, or physical exercise and endogenous factors such as emotional stress, fever, or dehydration also serve to increase catecholamine release and increase heart rate.

From the SA node, the impulse rapidly travels outward to the left atrium through specialized conduction fibers known as Bachmann's bundle, and downward to

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the atrioventricular (AV) node via internodal tracts (Figure 1). The wavefront of electrical activity spreads across the atria, causing the atrial muscle cells to contract. As the cell membrane is depolarized by the electrical impulse, the interstitial calcium rushes into the cell and triggers the release of intracellular calcium from the sarcoplasmic reticulum. The combined increased intracellular calcium acts as a catalyst to bring actin and myosin together. The two intracellular contractile proteins come together to form crossbridges, thereby causing shortening of the sarcomere and cardiac muscle contraction. The wavefront of electrical activity, followed by cardiac muscle contraction, spreads from atria to ventricles and from right to left.

The AV node is located in the floor of the right atrium, just above the intraventricular septum, and has a number of unique structural and functional properties. This is the only normal avenue for impulse conduction from the atria to the ventricles. If the SA node becomes diseased and fails to fire, the AV node is the backup pacemaker, capable of pacing the heart, albeit at a slower rate (40-60 bpm). The cardiac impulse slows as it travels through the AV node. This delay insures time for adequate ventricular filling and filtering of any excessively rapid atrial impulses, which provides two hemodynamic advantages. First, it allows additional time for more thorough emptying of the atria. The additional cardiac blood volume which is pumped into the ventricles during atrial contraction (during the AV node delay) can account for up to 25% of the total cardiac output (Guyton, 1991). Second, it limits the number of impulses that can traverse the AV node and thus provides a filter

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mechanism that limits heart rate during excessively rapid supraventricular arrhythmias such as atrial fibrillation.

From the AV node the impulse travels through the remainder of the AV junction with rapid conduction through the bundle of His and the infra-His system. The infra-His conduction system is comprised of the right and left bundle branches, fascicles of the left bundle branch, and the Purkinje network. The impulse travels down the right bundle branch to the right ventricle. The left bundle branch subsequently divides into the anterior and posterior fascicles, which serve as conduction pathways to the larger left ventricle. Both the right bundle and the two fascicles of the left bundle branch further subdivide into the Purkinje fibers. The Purkinje fibers are capable of the fastest conduction velocity in the heart, which results in rapid transmission of the impulse from the endocardial to epicardial surface, enabling coordinated ventricular muscle contraction. Should either the SA or AV nodal pacemakers fail, the Purkinje network is capable of pacing the heart at a very slow rate of < 40 bpm.

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B. Types of Supraventricular Tachycardia

(1) Atrioventricular Nodal Reentrant Tachycardia (AVNRT)

Mechanisms. During normal sinus rhythm, the impulse fades out after activation of the atria and ventricles. The conduction system needs a certain amount of time to recover, or repolarize. For further activation, a new impulse must begin again from the SA node, or from an ectopic focus. Fortunately, due to the uniform

conduction and repolarization of cardiac cells, the normal impulse is carried in one antegrade direction from atria to ventricle through the heart. However, cardiac cells do have the ability to conduct in a retrograde direction.

Mines (1913) was the first to describe a circus type of rhythm and suggested that this was a possible mechanism behind some paroxysmal tachycardias. Building upon Mines' classic paper, Iliescu and Sebastiani (1923) hypothesized that SVT could indeed be caused by reentry. Their conclusions were based on case studies involving administration of quinidine in two patients with atrial tachycardia. These researchers however, could not identify where the reentrant circuit may lie in the heart. Barker, Wilson, and Johnston (1943) were the first to suggest that the SA or AV node may be the sites of reentry in some forms of SVT. Atrioventricular nodal reentry was established when Moe and colleagues first demonstrated presence of two AV nodal pathways in animals in 1956 (Moe, Preston, & Burlington). All of these previous researchers however, felt that the atrium and the AV node were crucial parts of the reentrant circuit. The earliest published research on dual AV node physiology in humans included Goldreyer and Bigger's (1971) series of nine SVT patients, Rosen and associates' (1972) case report of one patient, and Denes and colleagues' (1973) study of two patients. These researchers' work led to the current belief that the AVNRT circuit is intranodal (within the AV node), and that the atrium plays a minor part, if any, in AVNRT.

Reentry describes a phenomenon in which a cardiac impulse does not die out

completely, but persists and reactivates a part of the myocardium. Most SVTs and VTs involve abnormal impulse conduction attributed to reentry. The underlying conditions necessary for reentry to occur include: (1) two or more distinct pathways that connect proximally and distally with differing conduction and recovery times, (2) an area of slow conduction, and (3) a unidirectional block.

Normally, there is only one pathway through which an impulse proceeds through the AV node. Some patients however, have abnormal dual AV nodal pathways. The setting of the AV node with two conduction pathways is ideal for reentrant tachycardias. Physiologically, one pathway has slow conduction, but fast recovery (alpha pathway) and the second has fast conduction and slower recovery (beta pathway) (Figure 3). During normal sinus rhythm, the impulse from the SA node is conducted down both pathways in the AV node as separate wavefronts. The impulse wavefront that traveled more slowly down the alpha pathway is blocked at the entrance to the bundle of His, because the wavefront traveling via the fast pathway has left an area refractory to further stimulation (Figure 3).

In the majority of AVNRT cases, a premature atrial contraction (PAC) typically initiates the tachycardia. This PAC, arriving in the AV nodal pathways earlier than expected, is blocked by the repolarizing fast pathway, therefore traveling down the slow pathway. The slowed pathway repolarizes more quickly and conducts the impulse down to the bundle of His. During this period of time the blocked (fast) pathway repolarizes, and thereby is able to conduct the impulse in a retrograde

fashion up the fast pathway to the atria, as well as downward through the bundle of His to the ventricles (Figure 3). Reexcitation of the blocked (fast) pathway completes the loop of activation, setting up the sustained tachycardia seen in typical AVNRT. Typical AVNRT, also called slow-fast AVNRT, is seen in about 90% of all AVNRT cases (Kadish & Goldberger, 1995). An atypical version of AVNRT has also been noted, although much less common. Instead of the antegrade slow/retrograde fast pathway conduction seen in typical AVNRT, atypical AVNRT utilizes either an antegrade fast/retrograde slow conduction pathway (fast-slow) or two slow pathways (slow-slow) (Kadish & Goldberger, 1995).

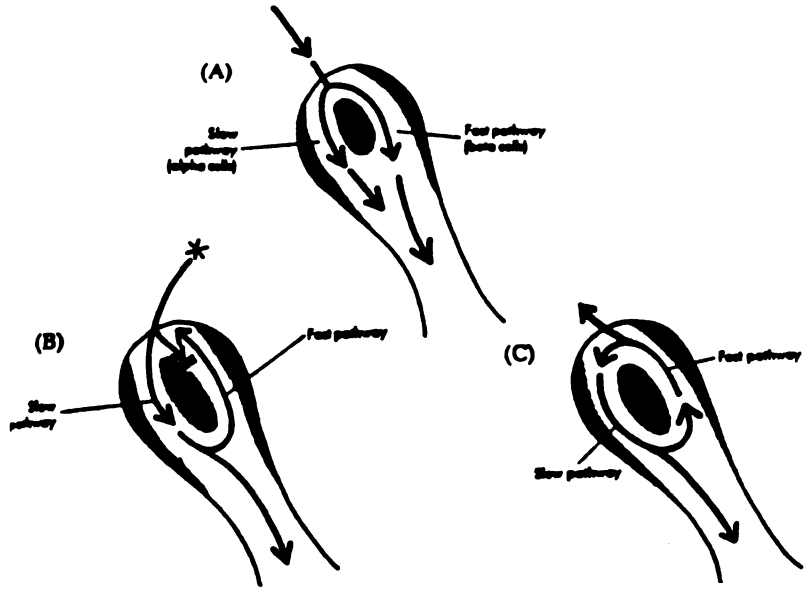

Figure 3. Conduction pathway in AVNRT. Diagrams show normal conduction in AV node, PAC beginning the reentrant loop in AVNRT, and conduction pathway involving simultaneous atrial and ventricular activation in sustained AVNRT. From: Advanced Concepts in Arrhythmias (2nd ed..) (pp. 121, 122, & 123) by H.J.L. Marriott & M.B. Conover, 1989, St. Louis: Mosby. Copyright 1989 by Mosby. Reprinted with permission.

Prevalence. Although the overall prevalence of AVNRT is unknown, reports range from 50% to 90% of all SVTs result from AVNRT (Akhtar et al., 1993; Josephson, Buxton, Marchlinski, 1991; Wu et al., 1978). A recent report of two major electrophysiology centers yielded an incidence of AVNRT in 50% of all hospitalized SVT patients (Josephson & Wellens, 1990). Although also noted in males, the AVNRT type of SVT is more typically seen in female patients in their mid thirties to forties with no evidence of underlying structural heart disease (Akhtar et al., 1993). In recent pilot study data, Wood et al. (1994) noted a 35% incidence of AVNRT in the sample of 183 consecutive SVT patients admitted for radiofrequency ablation. Of the AVNRT group of patients (64/183), 72% (46/64) were female (Wood et al., 1994).

Clinical Manifestations. Episodes are described as having a paroxysmal onset and termination, associated with symptoms of palpitations, dizziness, presyncope, nausea, anxiety, atypical chest pain, diaphoresis, and sometimes frank syncope. These symptoms can range from just an annoyance to rendering the patient incapacitated. The episodes are recurrent with frequency, duration, and severity of symptoms varying from patient to patient. Episodes of AVNRT may occur as rarely as once every two or three years to as frequently as several times each day (Bellet, 1966; Wood et al., 1994). These types of tachycardias are usually catecholamine sensitive, so patients may report increased episodes associated with physical exertion, emotional stress, or ingestion of caffeinated products.

The symptom of pounding in the neck in AVNRT patients has also been reported (Gursoy, Steurer, Brugada, Andries, & Brugada, 1992; Brugada, Gursoy, Brugada, & Andries, 1993). These patients described a regular, rapid, pounding in the neck with their episodes of AVNRT. This symptom was not noted to occur in patients with other tachycardias (Gursoy et al., 1992). During AVNRT, unlike other types of SVT, the atria and ventricles are activated simultaneously and therefore cause near simultaneous systole of both chambers. The right atrial cardiac output is then caused to flow in a retrograde fashion into the inferior and/or superior vena cava. Subjects with more than one type of tachycardia were able to distinguish between the types of tachycardia, because they only experienced neck pounding with AVNRT (Gursoy et al., 1992). The question of neck pounding as a clinical marker for AVNRT is an interesting symptom to be pursued with a larger sample.

(2) Atrioventricular Reciprocating Tachycardia (AVRT)

Mechanisms. The second most common type of SVT is atrioventricular reciprocating tachycardia (AVRT) which occurs in patients with preexcitation syndromes. Ventricular preexcitation occurs when one ventricle is activated by an impulse from the atria earlier than it would had the impulse traveled exclusively down the normal AV conduction system. Preexcitation involves conduction through an abnormal accessory pathway between atria and ventricles (Figure 4). An accessory pathway is a congenitally persistent bundle of muscle fibers that failed to separate during fetal development, continuing to electrically connect the atria and ventricles.

Wolff, Parkinson, and White were the first to report results as early as 1930 on their series of young healthy individuals experiencing palpitations and paroxysmal SVT with abnormal ECG findings of a bundle branch block pattern associated with a short P-R interval (Wolff, Parkinson, & White, 1930). These abnormal ECG findings, along with evidence of clinical arrhythmias, constitute what is known as the Wolff-Parkinson-White (WPW) syndrome. The WPW syndrome is the most common of several syndromes involving preexcitation (Gallagher, 1982; Gallagher et al., 1978; Josephson, 1993). The clinical arrhythmia seen in these patients most frequently is AVRT, but may also include atrial tachyarrhythmias such as atrial fibrillation.

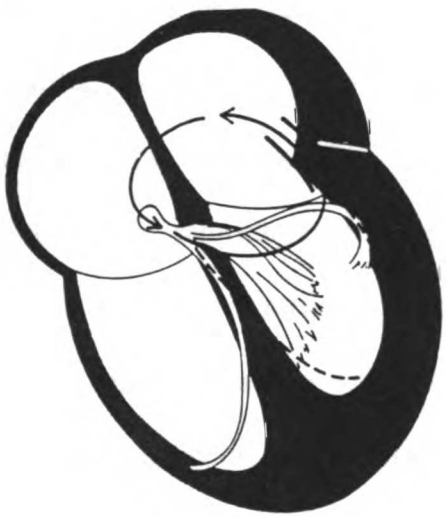

Figure 4. Conduction pathway in AVRT. Diagram shows the presence of an accessory pathway and conduction circuit of AVRT. From: Understanding Electrocardiography: Arrhythmias and the 12-lead ECG (6th ed.) (p. 119) by M.B. Conover, 1992, St. Louis: Mosby. Copyright 1992 by Mosby. Reprinted with permission.

The most common route for conduction in AVRT is in an antegrade fashion down the normal AV nodal conduction pathway of the heart, and retrogradely up the accessory pathway to return to the atria (Figure 4). Usually the AVRT is triggered by a premature atrial or ventricular contraction. The impulse is conducted down the normal route, at which time it is initially blocked in the accessory pathway. The normal AV nodal delay allows time for the accessory pathway to recover, so that from the terminal Purkinje fibers, the impulse is then able to be transmitted retrogradely back to the atrium via the accessory pathway (Gallagher, 1982; Josephson, 1993). The reentrant circuit is then set up, and if the right conditions exist, AVRT results. The type of AVRT seen in this conduction direction is referred to as orthodromic tachycardia, and because of the normal antegrade conduction through the AV node, has a narrow complex QRS. Antegrade conduction through the accessory pathway may also occur, returning in a retrograde fashion up the Purkinje system and back through the AV node. Antidromic tachycardia is the name used to describe this type of AVRT, which produces a wide, bizarre QRS complex on the ECG caused by the retrograde conduction from ventricles to atria (Josephson, 1993).

Since Wolff, Parkinson, and White's original paper, Gallagher et al. (1978) notes that there has been an increasing awareness of the potentially high morbidity and mortality associated with this disorder. These patients lose the AV node's protective mechanism of filtering rapid atrial rhythms, because impulses can bypass the AV node and enter the ventricle directly via the accessory pathway causing

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potentially extremely rapid ventricular rates. Therefore in these patients, rapid atrial rhythms such as atrial flutter or fibrillation, may potentially conduct 1:1 to the ventricles, causing ventricular rates in excess of 200 to 250 bpm or ventricular fibrillation. Atrial fibrillation has been noted to have a high incidence of occurrence in patients with preexcitation, thereby increasing the danger of cardiac arrest (Gallagher et al., 1978; Scheinman, 1994). The reason for this remains unclear.

Prevalence. The actual prevalence of WPW syndrome is not known. Josephson and Wellens note the incidence of AVRT in 31% to 38% of all hospitalized SVT patients at two major arrhythmia centers (1990). Wood et al. (1994) noted an incidence of 32% (59/183) of WPW in the sample of consecutive SVT patients referred to a tertiary center for RF ablation. Accessory pathways are seen in all age groups, but are much more common in young adults, and twice as frequent in males compared to females (Marriott, 1983). Accessory pathways are found in four major locations: (1) left atrial free wall to left ventricular free wall, (2) posterior intra-atrial septum to intraventricular septum, (3) right atrial free wall to right ventricular free wall, and (4) anterior intra-atrial septum to intraventricular septum. The left free wall is by far the most common location, accounting for up to 65% of all accessory pathways (Josephson, 1993; Scheinman, 1994). Approximately one third of all regular, paroxysmal SVTs are due to AVRT, making it the second most common type of SVT (Josephson, 1993). Orthodromic tachycardia makes up the largest proportion of cases of AVRT (Gallagher et al., 1978). Antidromic tachycardia is uncommon, accounting for less than 10% of all

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cases of AVRT (Josephson, 1993).

Clinical Manifestations. Usually, WPW patients are identified at an earlier age than are patients with AVNRT. The episodic nature and the paroxysmal start and stop of AVRT is similar to that of AVNRT. Often AVNRT and AVRT cannot be distinguished on a surface ECG, thereby an invasive electrophysiological study may be necessary for correct diagnosis. Because AVRT tends to involve slightly higher heart rates (150 to 250 bpm), and WPW patients have a higher incidence of atrial fibrillation than AVNRT patients, the incidence of cardiac arrest with AVRT is more frequent. Complaints of palpitations, presyncope, and dizziness are similar to those seen in AVNRT patients. There may be a higher incidence of frank syncope in AVRT than in AVNRT, but this is not known.

During AVRT, the right atrium may contract against a closed tricuspid valve due to very rapid rates. However, the symptom of pounding in the neck due to retrograde flow into the superior vena cava (as seen in AVNRT) is not typically seen. This is mainly because the longer ventriculoatrial conduction interval in AVRT allows slightly later atrial contraction, so the tricuspid valve will be open and less reflux should occur (Gursoy et al., 1992).

(3) Atrial Tachycardia

Mechanisms. Atrial tachycardia is a fairly rare type of SVT which results from enhanced automaticity or reentrant mechanisms usually from factors associated with overstretched atrial myocardium (Conover, 1992; Gallagher, 1982; Josephson, 1993). Cardiac cells which demonstrate automaticity outside of the sinus node are

called ectopic (Waldo & Wit, 1993). An ectopic focus in the atria whose automaticity is enhanced, takes over at a faster rate than the sinus node causing the tachycardia (Figure 5). In many cases of both automatic and reentrant atrial tachycardia, underlying congenital or ischemic heart disease is present, and the atrial tachycardia is related to a specific clinical condition or event (Goldberger et al., 1993; Josephson, 1993). The most frequent precipitating factors for the automatic type of atrial tachycardia are: exacerbation of chronic lung disease, myocardial infarction, hypoxia, alcohol ingestion, digoxin toxicity, metabolic abnormalities, increased catecholamine release, and drugs (such as cocaine, caffeine, amphetamines, theophylline) (Conover, 1992; Josephson, 1993).

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Figure 5. An ectopic focus in atrial tachycardia. From: Understanding Electrocardiography: Arrhythmias and the 12-lead ECG (6th ed.) (p. 82) by M.B. Conover, 1992, St. Louis: Mosby. Copyright 1992 by Mosby. Reprinted with permission.

Typically the atrial rate in atrial tachycardia ranges from 160-250 bpm, with

ventricular heart rates from 100-175 bpm (Josephson, 1993; Waldo & Wit, 1993). The faster the atrial rate, the greater the block at the level of the AV node, allowing less and less atrial impulses through to the ventricles (Conover, 1992; Josephson, 1993). The heart rate seen is significantly affected by the levels of circulating catecholamines (Josephson, 1993).

Prevalence. Josephson and Wellens (1990) report that atrial tachycardia accounts for about 15% (range of 11%-19%) of admissions seen in their series of hospitalized patients admitted for regular, paroxysmal SVT. In a retrospective review of 183 consecutive SVT patients undergoing RF ablation, Wood et al. (1994) noted an incidence of atrial tachycardia of 12% (22/183). Hendry and colleagues (1990) state the incidence of automatic atrial tachycardia ranges from 2% to 3% in adults and 10% in children when considering all types of SVT (Hendry, Packer, Anstadt, Plunkett, & Lowe, 1990). Sustained atrial tachycardia is rare in the hospital setting, but when seen can be incessant and refractory to medical therapy (Josephson, 1993). Atrial tachycardia may present as incessant (likely due to automaticity) or paroxysmal (likely due to reentry) (Josephson & Wellens, 1990).

Clinical Manifestations. The age range with atrial tachycardia is broader than other SVTs. This tachycardia may be seen as commonly in children as is seen in middle age to older adults (Hendry et al., 1990; Josephson, 1993). However, most automatic atrial tachycardia rhythms are diagnosed in children (Scheinman, 1994). The clinical picture of atrial tachycardia patients is different depending on the

underlying cause and duration of the tachycardia. If the atrial tachycardia is incessant, the patient may present with symptoms of tachycardia induced cardiomyopathy and left ventricular dysfunction (Guiraudon et al., 1990; Hendry et al., 1990; Scheinman, 1994). If the atrial tachycardia is paroxysmal, then the symptoms may be similar to previously described SVTs. If underlying heart or pulmonary disease is present, then the atrial tachycardia may cause exacerbations of either of these problems. Hendry et al. (1990) notes symptoms of palpitations, pre-syncope, and congestive heart failure as typical in atrial tachycardia patients. Goldberger et al. (1993) notes that the symptoms in their group of 15 atrial tachycardia patients ranged from no symptoms in 2 patients to symptoms of palpitations, decreased exercise tolerance, pre-syncope, lightheadedness, dyspnea, and chest pain in 13 patients.

III. Current Treatment

Historically, treatment for SVT has included vagal maneuvers, surgery, low-energy cardioversion, or pharmaceutical therapies. Although verapamil has proven helpful in the past for supraventricular dysrhythmias, intravenous adenosine is currently the drug of choice for diagnosis and acute treatment of rapid SVTs in which the reentrant circuit involves the AV node. The administration of adenosine creates a transient block at the level of the AV node, thereby terminating the tachycardia. If the dysrhythmia is not due to reentry at the SA or AV node, then adenosine is not likely to terminate the rhythm, but can clarify the diagnosis of the atrial activity

through transient AV or ventriculoatrial block.

Long-term medical therapy has consisted of a variety of antiarrhythmic drugs which depress atrioventricular (AV) nodal conduction, such as beta blockers, type IA and IC antiarrhythmic agents, digoxin, and calcium channel blockers. Unfortunately all of these drugs are costly, may lead to unpleasant, if not potentially lethal side effects, and may not be efficacious for all patients.

Surgical treatment of the AV node has been attempted in a variety of techniques since the late 1970s. Surgical treatment however, requires cardiopulmonary bypass with the potential of increased morbidity and mortality, and has been associated with more diffuse, damaging lesions to the AV node area (Akhtar et al., 1993; Guiraudon, Klein, & Yee, 1993). Presently, surgical treatment for SVT has been replaced by more effective catheter ablation techniques requiring lower costs, fewer days of hospitalization, lower morbidity, and less cardiac damage (Scheinman, 1992).

Catheter ablation therapies have dramatically changed the treatment options for SVT patients. Successful catheter ablation treatment was introduced in 1982 using a direct current energy technique, but radiofrequency (RF) energy has become the preferred energy source since 1987. Limitations of direct current ablation included the need for general anesthesia as well as reports of hemodynamic compromise, cardiac perforation, and immediate and late sudden cardiac death (Evans et al., 1991; Scheinman, 1994). Radiofrequency energy has previously been used safely for years

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in a variety of neurosurgical procedures. Reports in the literature have shown RF energy to be as efficacious and actually safer than direct current energy for ablation (Evans, Huang, & CAR Investigators, 1990; Huang, Graham, Lee, Ring, Gorman, & Schiffman, 1991; Olgin & Scheinman, 1993). Recent clinical guidelines for catheter ablation have been published jointly with a task force from the American College of Cardiology, North American Society of Pacing and Electrophysiology, and the American Heart Association (ACC/AHA Task Force, 1995). The overall primary success rates for treatment of AVNRT range from 90%-99%, with late recurrence rates of 1%-10%, and complication rates of less than 1% to 5% (ACC/AHA Task Force, 1995; Kadish & Goldberger, 1995). For patients with WPW and AVRT, the overall primary success rates range from 82%-91%, with recurrence rates from 2%-5%, and a complication rate of approximately 2.1% (ACC/AHA Task Force, 1995; Plumb, 1995). The primary success rates for atrial tachycardia and atrial flutter are slightly lower at 75%-86%, with higher late recurrence rates up to 32%, and an average complication rate of 0.81% (ACC/AHA Task Force, 1995; Feld, 1995; Poty, Saoudi, Haissaguerre, Daou, Clementy, & Letac, 1996).

The North American Society of Pacing and Electrophysiology has closely monitored catheter ablation procedures since 1988, and established guidelines in 1992. Radiofrequency ablation must be performed by an electrophysiologist with one to two years of additional training in RF ablation procedures, with primary experience performing at least 30 such procedures in training and at least 20 per year thereafter

with a success rate of greater than 80% (Scheinman, 1992). Patients must undergo at least one electrophysiology test prior to the RF procedure, usually this is to establish the correct diagnosis. Radiofrequency energy is delivered through a specially designed catheter placed inside the heart in attempts to permanently destroy the area(s) of dysrhythmogenic tissue. Post RF ablation, the patient is monitored on telemetry for further dysrhythmias or any complications, kept on bed rest for four to six hours, then discharged the next morning. The patient is seen in follow up approximately one month post RF ablation.

Radiofrequency ablation is the current treatment of choice for curing most of the SVTs commonly seen. Radiofrequency ablation has clearly been demonstrated in the literature to have a higher efficacy and lower incidence of complications than medical or surgical treatment modalities (Calkins et al., 1991; Kalbfleisch et al., 1992; Lau, Tai, Lee, 1995). Many patients however, are managed on a variety of drugs for months to years before RF ablation is recommended. This has historically been the case because these patients have been managed long term by primary care practitioners before referral to a cardiologist or electrophysiologist occurs. Although many describe RF ablation as a curative procedure, some patients may have recurrent dysrhythmias requiring repeat RF ablation, or return visits to the emergency department and/or physicians' offices. Even if patients are noted to have no recurrent dysrhythmias, some note continued symptoms of palpitations. Evaluating the change in symptomatology and QoL, if any, in the SVT patient post drug therapy or RF

ablation is in the early stages (Bubien et al., in press; Fitzpatrick et al., 1996; Kay et al., 1988; Knotts et al., 1994; Lesh et al., 1994; Rosenqvist et al, 1990). Most of this research has had small sample sizes with various lengths of short-term follow up, included mainly endpoints such as morbidity and mortality, or used unreliable measures of QoL. Studying only limited outcomes is inadequate to fully understand and evaluate the effect of treatment strategies in any patient population.

IV. Statement of the Problem

Supraventricular dysrhythmias are more common than ventricular dysrhythmias, yet the experiences of SVT patients have drawn little attention from nursing or medicine. This lack of attention could be multifactorial. The majority of SVT patients are women, a population traditionally under represented in clinical research. In pilot work, Wood et al. (1994) noted that the sample of 183 consecutive SVT patients was 56% female. Additionally, SVT has been thought of as "more benign" than ventricular dysrhythmias. Although giving SVT patients a seemingly more appealing treatment option, little research has been done examining the cost effectiveness of RF ablation and how, or if, patients' symptoms and QoL change after this treatment.

V. Purpose of the Study

The purpose of this study is to examine the spectrum of symptoms and their impact on quality of life (QoL) in patients with supraventricular tachycardia. There is little in the literature that describes which symptoms, if any, are most troublesome for

supraventricular dysrhythmia patients; how, or if, these symptoms differ among types of SVT; what are the precipitating factors for the SVT episodes; what strategies SVT patients use in attempting to manage these symptoms; and how SVT patients' symptoms and QoL may change following radiofrequency ablation treatment.

VI. Significance of the Study

While the symptom profile for patients with ventricular arrhythmias has garnered much attention in the literature, characterization of symptoms in patients with supraventricular tachycardia (SVT) has been less frequently investigated. Conflicts exist in the literature about what symptoms are most frequently noted in SVT patients. There is a paucity of information available to health care providers as to what patients experience in regard to the severity/frequency/duration of SVT episodes, as well as to differences which exist between what patients expect and what actually happens in regard to treatment outcomes. The effects of radiofrequency ablation on QoL outcomes in patients with SVT have not been systematically studied. Documenting the positive effects of medical treatments on QoL is necessary to provide evidence of the value of these treatments. Evidence of improved QoL is becoming more frequently required by skeptical insurance companies, the Federal Drug Administration, as well as public consumers. This study will provide prospective data describing the typical SVT symptom experience, potential differences between groups of SVT patients, and QoL outcomes following RF ablation.

CHAPTER TWO:

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

I. Introduction

Dysrhythmia occurrence follows an acute, episodic pattern. The paroxysmal and unpredictable nature of SVT occurrence, the frequency, severity, and duration of symptoms, as well as any necessary hospitalizations can have considerable effects on the patient's QoL (Ganz & Friedman, 1995). In addition to the actual disability caused by the episodic symptoms themselves, QoL may be further impaired by activity, dietary, and/or job restrictions, as well as medication side effects. Recently the Federal Drug Administration has required QoL data on any new patient care treatments, drugs, or devices. This has increased interest in measurement of QoL outcomes. Although researchers have begun to investigate QoL in patients with SVT, most have defined (and therefore) measured QoL inadequately. Most of these researchers have defined QoL as merely mortality, morbidity, or physical functioning. Questionnaires have typically been investigator designed, with no standardization or reporting of psychometric properties of the tool. Radiofrequency ablation was previously used only in patients with atrial fibrillation and severe, refractory symptoms or those with AVRT having a high risk of sudden death. Radiofrequency ablation currently offers a more effective treatment modality with lower morbidity than conventional therapies for patients with any type of SVT, yet little research has examined how this procedure changes the patient's symptom experience and QoL.

II. Conceptual Framework of Symptom Management

The symptom management model described by Larson and colleagues (1994), provides a conceptual framework to approach further research in this area. This model has three main concepts represented by interacting circles (Figure 6). Interaction is depicted between the circles of symptom experience, symptom management strategies, and symptom outcomes allowing for further evaluation and changes, if necessary, to achieve the best patient outcome. Nursing's role is to assess this interaction, going beyond simply symptom assessment, to evaluation of symptom outcomes by manipulating the symptom management strategies to insure the highest level of outcome possible for patients.

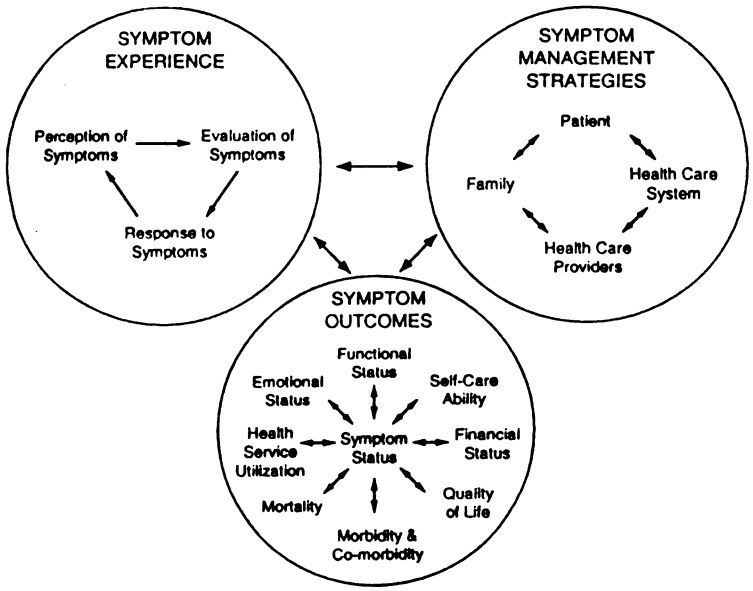

Figure 6. Symptom Management Model. From: Larson et al., (1994). A model for symptom management. Image, 26, 272-276. Copyright by Sigma Theta Tau International. Reprinted with permission.

Organizing the findings of previous research within the symptom management model elucidated the large gaps in our current knowledge about SVT patients. The resulting questions for future research are framed in the context of this model.

A. Definition of the Symptom Management Model

The concept of symptom management, as discussed by Larson and colleagues at the University of California, San Francisco (1994), will be the conceptual framework discussed in this paper. The three main concepts in this comprehensive model include the symptom experience, symptom management, and symptom outcomes. Each main concept is represented by a circle in the model, which also illustrates the interrelationships within and between the three circles by two way arrows (Figure 6). The symptom experience affects the symptom management strategies used, and both of these affect and are affected by the symptom outcomes.

The concept of symptom experience consists of how the patient perceives the symptoms, evaluates the symptoms, and responds to the symptoms (Larson et al., 1994). The three categories of variables which affect how the patient perceives symptoms include: person, environment, and health/illness (Larson et al., 1994). Personal variables can be further subdivided into demographic, psychological, sociological, and physiological variables. Divisions of the environmental category include: physical, social, ethnic, and cultural variables. The final category of health/illness includes risk factors, health status, and signs of illness, disease, or injury. Also included in the health/illness category are the signs of illness or injury (Larson et al., 1994). Patients' evaluation of the symptoms addresses the intensity,

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location, nature, frequency, severity of the symptom and the threat posed by the symptom. Symptom distress is not directly referred to in the model, however this author believes that indirectly through exploring the symptom experience variables, one could begin to determine the degree of symptom distress present. Physiological, psychological, and behavioral components would be included in the patient's responses to the symptom (Larson et al., 1994).

Once the symptom is assessed by the patient, strategies for coping and management may begin. The concept of symptom management strategies includes those interventions utilized and recommended by the patient, the family, and the health care provider (Larson et al., 1994). In order for symptom management to be successful, a cooperative and supportive partnership must develop between all of the parties involved in the symptom management. As symptom management interventions are implemented, potential outcomes are affected, which in turn influence the symptom experience (Larson et al., 1994).

The concept of symptom outcomes includes eight components of the patient's biopsychosocial status: morbidity and co-morbidity; mortality; health service utilization; emotional status; functional status; self-care ability; financial status; and QoL (Larson et al., 1994). Morbidity, co-morbidity, and mortality outcomes were addressed in the present study by collection of clinical variables from the medical record. The QoL instrument used in this study addressed emotional, physical, social functioning, as well as the impact the SVT has had on patients' lives. Self-care ability was indirectly measured through restricted activity scales and limitations in

physical functioning. In this study, attempts were made to measure health service utilization outcomes by number of emergency room and physician office visits, as well as hospitalizations following ablation treatment. The short, one month follow up limits the generalizability and comparability of these measures to the year prior to ablation. Financial status was not specifically addressed in this study.

III. Measurement Issues with Symptoms and Quality of Life

A. Symptom Frequency/Distress Measures in Supraventricular Tachycardia Patients

Even though not directly defined in the symptom management model (Larson et al., 1994), symptom distress involves several key constructs of the symptom experience portion of this model. Symptom distress has been defined in numerous ways, but is defined in McCorkle and Young's original paper as "the degree of discomfort reported by the patient in relation to his/her perceptions of the symptom being experienced" (1978, p. 373). Rhodes, Watson, and colleagues have also defined symptom distress as "the physical and mental anguish or suffering from the experience of symptom occurrence" (Rhodes & Watson, 1987, p. 243), and "perception of worry or upset from the experience of each symptom" (Rhodes, Watson, Johnson, Madsen, & Beck, 1987, p. 37). As noted by Berman, these definitions all focus on the human response to the symptom, not just the observable characteristics of the symptom (1993). The concept of symptom distress in other nursing literature however, remains vaguely and inconsistently defined. Although usually agreed upon that the patient's perception of the symptom experience is important, there is no one agreed upon instrument with which to measure this

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concept.

Researchers in the field of oncology nursing have continued to produce the major body of work in the area of symptom distress. McCorkle and Young (1978) were the first to attempt development of an instrument to measure symptom distress in oncology patients receiving chemotherapy and/or radiation therapy, and later in myocardial infarction patients. These researchers and others have incorporated a variety of changes into the current version, the Adapted Symptom Distress Scale (Form 2), and it continues to be one of the most popular and widely used symptom distress instruments (Berman, 1993; Ehlke, 1988; Holmes, 1989; McCorkle, Benoliel, & Georgiadou, 1989; McCorkle & Quint-Benoliel, 1983; O'Hare, Malone, Lusk & McCorkle, 1993; Rhodes et al., 1987; Sarna, 1993). Two research teams investigating symptom distress in cardiac transplant patients have also tested tools for that population (Grady, Jalowiec, Grusk, White-Williams, & Robinson, 1992; Lough, Lindsey, Shinn, & Stotts, 1987). Although the methods used by these researchers are helpful in future investigations of symptom distress, none of these instruments however, include symptoms applicable to dysrhythmia patients. This point is especially true for SVT patients because of their typical absence of underlying heart disease and the associated poor cardiac function.

Knotts and associates (1994) utilized a symptom frequency/distress questionnaire in their study of QoL in patients undergoing RF ablation. The Symptom Frequency and Distress Scale (Version 2) was utilized by Knotts et al., however Version 3 of this scale is the current revised version (L. Jenkins, personal

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communication, August 8, 1994). The Symptom Frequency and Distress Scale (V.3) is a checklist of frequently occurring symptoms, wherein subjects check if that symptom has been present within the last month and how distressing that symptom was (L. Jenkins, personal communication, August 8, 1994). Content validity was established by having clinicians expert in the care of atrial fibrillation patients review the tool. There is presently no reliability and validity data available for this instrument, although this checklist is currently being assessed in a large, multicenter study of atrial fibrillation patients undergoing AV junctional ablation.

The Symptom Frequency and Distress Scale (V.3) is formatted into two separate checklists: (a) symptom frequency, and (b) symptom severity. The symptom frequency section asks how often patients have had any of the symptoms listed, with five answer columns ranging from "never" to "always". The symptom severity section asks how severe that symptom was, with three columns including "mild", "moderate", and "severe". Each checklist is scored separately with frequency scores ranging from 0-64, and severity scores ranging from 0-48. The higher the score for each checklist, the more frequent/severe the symptom is. This instrument was designed for use with atrial fibrillation patients, and these patients typically have different symptom experiences from other SVT patients. There are however, some symptoms on the tool common to all SVT patients such as: fatigue, palpitations, dizziness, shortness of breath, diaphoresis, weakness, and nausea. The Symptom Frequency and Distress Scale (V.3) was adapted for use in this study in two ways. Three new symptoms more appropriate to patients with SVT, gathered from literature

reviews, clinical experience, pilot study data, and focus groups, were added, and the format of the tool was changed. The new version appears as the last question at the end of the QoL Questionnaire (Appendix B).

The Knotts et al. (1994) study is the first study to examine symptom distress and QoL in a variety of SVT patients before and after RF ablation. Despite a small sample size (n=10), and the lack of established psychometrics, the Knotts et al. study is important because these researchers have designated endpoints other than morbidity and mortality. The subjects were identified and questioned before and one month after RF ablation. The authors did not report what before RF ablation time interval was used. If this instrument was administered to patients on the morning of admission for the RF ablation procedure, the patient's anxiety or adverse environmental conditions could easily effect the results obtained.

B. Measures of Quality of Life in Supraventricular Tachycardia Patients

In 1947, the World Health Organization defined health as "not only the absence of infirmity and disease but also a state of physical, mental, and social well-being" (Spitzer, 1987). This definition "opened the door" for researchers to measure outcomes other than mortality and/or morbidity. Karnofsky (1948) developed his performance status scale, which was a radical departure from the typical approach of that time evaluating the progress of ill cancer patients. Other popular opinions of the time warned physicians to be concerned with more than just the absence of death, but also "with the wholeness of human life, with the spiritual quality of life that is unique to man" (Elkington, 1966, p. 712). Medicine has not traditionally been concerned

with measuring the effects the disease or treatment have on a person's everyday activities with friends and family, at home, work, or in the community. Although patients are considered the best sources of information regarding their own QoL, patient opinions have not routinely been collected in clinical or medical research. Yet returning patients to a normal QoL is really the whole purpose of medical care (Stewart & Ware, 1992). Thus adequate measures have been lacking in development and use in medical outcome research.

In the past decade, there has been great effort placed in evaluating clinical interventions, for cost containment reasons, through the measurement of patient outcomes. One of the most commonly measured outcomes has been QoL. There has been controversy among health care professionals however, about how to best conceptualize and measure QoL. This is not only due to the different perspectives of the disciplines, but also due to the complex nature of the concept of QoL. There have been many different terms used in the literature to describe the concept of QoL, such as satisfaction, happiness, and well-being (Packa, 1989a). Campbell and colleagues defined QoL as an individual's perception of well-being (1976). Packa (1989a) concludes that well-being should be considered to include one's state of happiness, as well as life satisfaction.

Ferrans (1992) states that conceptualizations of QoL in cardiovascular nursing have fallen into one or more of five categories: social utility, happiness/affect, life satisfaction, achievement of personal goals, and normal life. Other researchers suggest that a minimal set of dimensions in any QoL scale include: physical

functioning, psychological functioning, disease related/treatment related symptoms, and social functioning (Aaronson, 1991; Goodinson & Singleton, 1989; Holzemer & Wilson, in press; Spitzer, 1987; Varricchio, 1990). Unfortunately, past conceptualization of QoL in the United States has reflected only a single domain, whereas European and Canadian QoL research has included a much more multidimensional approach (Aaronson et al., 1991). There is presently general agreement among QoL scientists that QoL is a multidimensional concept which includes at least the dimensions of: health status, functional status, psychologic and social well-being, and disease or specific symptoms (Aaronson et al, 1991).

In cardiovascular patient research, a good QoL has been frequently conceptualized and measured as improved physical functioning, decreased morbidity or mortality, return to work, decreased symptomatology, decreased hospitalizations, decreased amounts of medications, and/or resumption of daily activities and hobbies (Faris & Stotts, 1990). These endpoints are often misleading. Not returning to work, for example, could mean a long awaited retirement and does not necessarily indicate a poor QoL. In addition, an increase in medications does not automatically demonstrate a poor QoL. The increased amount of medications could also be associated with reduced symptoms and an improved QoL. Furthermore, these conceptualizations of QoL ignore the importance of family, social support, and the client's perspective. Not only do researchers differ in how they define QoL, subjects differ greatly on how much importance they give to the varied facets of this concept.

The usefulness of one's life, or social utility category, is considered to include

aspects such as employment status, patients' perception of ability to work, income, and/or financial status (Ferrans, 1992). The concept of one's ability to live a normal life has been used by numerous researchers and in many measurement instruments as an indicator of QoL. This usually includes measures of the patient's actual and/or perceived physical functional status. Functional status is determined in many ways such as mobility, social activity, physical activity, presence/absence of symptoms, or comparisons between pre- and post-illness states (Ferrans, 1992).

Another controversy is whether the measurements should be objective or subjective in nature. In the past QoL has been defined by strictly objective, "hard" criteria such as mortality, days missed at work, or level of education achieved. In cardiovascular research, the New York Heart Association functional classification and life expectancy have frequently been used as objective measures of QoL. In current practice, conceptualization of QoL includes much more than just objective measures of income, housing, physical function, or morbidity and mortality statistics. Increasing numbers of both researchers and clinicians have come to appreciate the multidimensional aspects of the concept of QoL and have included both subjective and objective measures in their studies (Campbell et al., 1976; Jalowiec, 1992; Oleson, 1990; Packa, 1989a; Spitzer, 1987).

With the more recent widespread use of psychometric and statistical techniques of scale construction, health status surveys have vastly improved. The Health Insurance Experiment and the Medical Outcomes Study (MOS) demonstrated that scales constructed from self-administered surveys were reliable and valid tools for

assessing changes in health status or QoL. Standardized patient surveys of generic health related QoL concepts are important for many reasons. These generic concepts represent universally valued human concerns, are relevant to anyone's well-being and health status, and represent any age, disease, or treatment group (Stewart & Ware, 1992). Use of generic measures gives the researcher the opportunity to compare QoL scores to other groups of well or sick individuals. The comparisons also serve to test the validity of the scales in differing groups of patients, as well as facilitating understanding of how certain patient groups differ in functioning and well-being. There have been very few studies in the literature investigating QoL in an SVT patient population which have examined endpoints other than mortality and morbidity. These studies will be discussed in the Review of Literature which follows and are presented in Table 4.

Many QoL instruments have been used in studies with cardiac patients. Those which have been more commonly used with ventricular dysrhythmia patient samples were reviewed: Deragotis Psychosocial Adjustment to Illness Scale (PAIS), Quality of Life Scale, Ferrans and Powers' Quality of Life Index, Sickness Impact Profile, the McMaster Health Index, and the MOS SF-36. Most of these questionnaires have multiple limitations with a SVT population.

The Deragotis PAIS-SR instrument allows patients to make comparisons before and after the onset of their illness (ie., arrhythmic event) and measures adjustment to illness. The PAIS-SR is a 48 item questionnaire with each item scored on a 4-point scale (0-3), ranging from 0=complete adequacy to 3=marked inadequacy (Kolar &

Dracup, 1990). A poorer adjustment to illness is indicated by higher scores. The PAIS-SR is a self report version of the PAIS, and takes about 15 to 20 minutes to complete (Deragotis & Lopez, 1983). In addition to the Jenkins and Burke study (1991), the PAIS-SR instrument was also used by Kolar and Dracup (1990) to measure patients' psychological responses to living with refractory ventricular arrhythmias. The construct of QoL however, includes more complex variables than just psychosocial adjustment. This necessitates use of a tool which also examines physical function, social well-being, and physical as well as emotional symptoms.

Lough and colleagues (1987) used the QoL Scale (developed by Young & Longman, 1983) in their study of symptom distress and QoL in heart transplant recipients. There is no psychometric data provided about this instrument. This tool also uses parallel scales: QoL is ranked from "poor" to "excellent" (1 to 6), and satisfaction with current QoL from "not at all satisfied" to "highly satisfied" (1 to 6). Higher QoL scores were associated with less symptom frequency and distress. Although of the explained variance in QoL, symptom frequency and distress only accounted for 2% and 1.5% respectively. Satisfaction with QoL, however, accounted for 63% of the variance in QoL scores (Lough et al., 1987). Due to the small amount which symptom frequency and distress contributed to the variance in QoL scores, these findings suggest that factors besides symptom distress and frequency, play a larger part in perceived QoL of heart transplant recipients. Or perhaps this symptom checklist measured mostly physical symptom distress, rather than also addressing psychological symptom distress. The main disadvantage with this

instrument for the proposed study is that all of the symptoms are associated with cardiac transplants which would be inappropriate for use in SVT patients.

The Quality of Life Index (QLI) is a well known instrument that measures QoL and has several differing versions specific for the disease state of the sample. The Ferrans and Powers (1985) note that the QLI consists of two sections: the first measures patient satisfaction in the four domains, and the second measures the importance that the domain carries for that individual. Both sections have 32 items that evaluate a variety of areas such as physical functioning, marriage, family, friends, occupation, education, peace of mind, stress, personal faith, life goals, general happiness, and general satisfaction. Each item has a six point Likert-type scale with the satisfaction items ranging from "very satisfied" to "very dissatisfied", and the importance items ranging from "very important" to "very unimportant" (Ferrans & Powers, 1985). Final scores are achieved by combining the scores on each of the two sections, so that the total score reflects how satisfied subjects are with the aspects of life that matter most to them (Ferrans, 1992). The items are appropriate for a more general population of cardiac patients, not reflecting the more specific concerns of SVT population.

The Sickness Impact Profile (SIP) was another instrument reviewed for the proposed study. The SIP has 136 items which cover 12 specific areas of daily activity: sleep and rest, eating, home management, work, recreation and pastimes, body care and movement, ambulation, mobility, emotional behavior, affective behavior, social interaction, and communication (Bergner, Bobbitt, Carter, & Gilson,

1981). "The basis of the SIP is the measurement of sickness rather than disease" (Bergner, 1984, p. 153). The time to complete the questionnaire averages about 30-45 minutes. The SIP has been found to have good convergent and discriminant validity through comparisons with patient self-reports and clinical reports of severity of illness measurements. Reliability has been assessed through both internal consistency and test-retest procedures with results .92-.94 respectively (Bergner et al., 1981). This instrument has been used with a variety of patient populations: chronic diseases; critically ill, intensive care; myocardial infarction; cardiac rehabilitation; cancer; and cardiac arrest survivors.

The advantages of the SIP are: relevance to clinical practice, strength of assessing the impact of the illness on the chronically ill individual, and broad coverage of many dimensions (Bergner, 1984). Longer measures are typically more reliable and valid, however this instrument seems to be too long to be practical for this study and may increase respondent burden and data collection costs. Additionally for the proposed study, the questions asked on the SIP appear to be more appropriate in patients with a generalized chronic illness, which would not be appropriate for SVT patients. The SVT patient population is a relatively well group of younger to middle aged adults who have more of an acute, episodic condition, rather than a generalized chronic illness. By using the SIP in a SVT patient population, one would expect to see a floor effect of extremely low scores with little discrimination.

The McMaster Health Index Questionnaire (MHIQ) is a 59 item tool which covers three domains: physical, emotional and social functioning (Packa, 1989b).

This tool takes approximately 20 minutes to complete and is simple and inexpensive to administer (Chambers, 1984). Validity was established by comparing the MHIQ to four other methods of assessing function: physician and occupational therapist physical assessments, as well as the completion of the Lee Index of Functional Capacity, the Spitzer Quality of Life Index, and the Bradburn Psychological Well-Being Scale by the same two groups of professionals (Chambers et al., 1982). Although having reliability scores lower than the SIP, the MHIQ has acceptable reliability. The MHIQ is considered a global measure of QoL, therefore it potentially lacks the clinical specificity of symptoms in a SVT dysrhythmia population. The MHIQ should be supplemented with a more disease specific measure to obtain complete information (Chambers, 1984). The MHIQ evaluates physical functioning on the day that the tool is administered. This fact could be a potential drawback for using the MHIQ in the proposed study, because of the paroxysmal, episodic nature of the SVT events. The subjects may function well on that particular day, but three weeks prior to this (related to an SVT episode) may have felt weak and unable to perform daily activities.

The MOS SF-36 was developed as a comprehensive, generic survey, easier to administer than other QoL instruments commonly used. The MOS, started in the 1980s, was the first multicenter trial in which patients with different medical and psychiatric conditions completed the same measures of QoL. The MOS started a new approach to measurement of QoL, where standardization of generic health surveys across studies and populations was stressed (Stewart & Ware, 1992). The SF-36

takes 15-20 minutes to complete, and can be self-administered, or administered over the telephone or during a personal interview (Ware & Sherbourne, 1992). Internal consistency reliability scores for the MOS SF-36 subscales range from .85-.96 (Stewart et al., 1988). This tool, designed for use in both practice and research, has 36 items which assess limitations in 5 categories of health: physical functioning and well-being, mental functioning and well-being, social/role functioning and well-being, and general health perceptions. The SF-36, does however, include items regarding pain and some physical function limitations which are not appropriate for use in an SVT population. Therefore an adapted version of the MOS, adding items more valid in a SVT patient sample, was constructed for this study.

All of the instruments discussed share measurement problems common to other QoL tools. These include issues of how to best collect the data, when to measure QoL, how often to measure QoL, whether to measure just functional status or actual physical status, and whether to use a generic measurement instrument or a disease specific tool. Self-administered instruments are preferable for subject ease and the potential of obtaining more candid answers, however interviews may be beneficial for some types of questions or for less educated subjects (Jalowiec, 1992; Nunnally, 1978).

External threats to reliability include environment and subject related factors. Researchers must make certain that all respondents have ample time and space to complete the questionnaire, if administered in a clinic or hospital setting. Patients should also be made clearly aware of the deadline date to return the questionnaire if

completing the instrument on their own. Jalowiec (1992) suggests that ideally QoL be measured at four intervals: at baseline, during treatment when maximum side effects are expected, after treatment is completed, and six months later (to evaluate treatment effects over time). However, one must keep in mind the length of the instrument and types of questions asked, to avoid increasing respondent burden and/or attrition by added evaluations over time (Jalowiec, 1992; Nunnally, 1978).

IV. Review of Literature

A. Literature Review of Clinical Symptoms of SVT Patients

In the past, diagnosis and differentiation of tachycardias depended mainly on clinical presentation and physical examination instead of ECG morphology. All of the literature studies reviewed in this area are reported in table format in Table 1. In 1942, Wolff published research describing the clinical aspects of patients with paroxysmal rapid heart action. Both SVT (n=116) and VT patients (n=9) were included in this retrospective study examining symptoms during tachycardia. The SVT diagnoses in this study included: atrial tachycardia (21%), atrial fibrillation (70%), and atrial flutter (9%) rhythms.

Patients were categorized as being asymptomatic (n=41; 33%), having palpitations (n=17; 14%), or other clinical conditions (ie., pulmonary congestion, angina, congestive failure, vascular collapse, central nervous system manifestations, or embolism) during their paroxysmal tachycardia. Also noted was the ECG heart rate and rhythm correlating with these symptoms. The asymptomatic and palpitation groups were found to have heart rates of $\leq$ 150 beats per minute (bpm) during the

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tachycardia and were free of any type of underlying heart disease. Those patients with symptoms of pulmonary congestion, angina, congestive failure, or embolism typically had associated valvular or cardiac disease and demonstrated heart rates during the tachycardias of $\geq$ 150 bpm. Patients experiencing vascular collapse and/or central nervous system manifestations were found to have heart rates $\geq$ 200 bpm with or without any underlying cardiac disease (Wolff, 1942). These findings are difficult to correlate with a specific tachycardia however, in that each symptom group (with the exception of palpitation and pulmonary congestion groups) included both SVT and VT patients.

Luria (1971) conducted a prospective, descriptive study of 120 consecutive paroxysmal dysrhythmia patients. Again, the sample included both SVT (n=93; 78%) and VT (n=8; 7%) patients, as well as those with uncertain diagnoses (n=19; 16%). The types of dysrhythmias represented included: atrial tachycardia (n=8; 7%), SVT (n=37; 31%), AVRT (n=1; 0.6%), atrial flutter (n=9; 8%), atrial fibrillation (n=35; 29%), AVNRT (n=2; 1.4%), VT (n=7; 6%), and uncertain diagnoses (n=21; 17%).

Luria also noted the age of onset, clinical symptoms, and methods patients used to halt the episodes of tachycardia (1971). The most frequent age group for onset of tachycardias was the 40-49 year old group (n=27; 23%), with the 20-29 year old group next (n=25; 21%). Of note is that the rheumatic and coronary heart disease groups experienced onset of their tachycardias much later, between ages 40 and 76 years old. The rheumatic heart disease group was composed of two atrial

Table 1. Review of Research Examing Clinical Symptoms in Patients with Dysrhythmias

Source	Sample Description	Method & Instrumentation	Findings
Wolff (1942)	125 VT & SVT pts (SVT = atach, afib, & aflutter)	prospective, descriptive (correlated symptoms w/ HR). sample divided into 8 groups based on symptoms	HR >150 = more severe symptoms. HR > 200 =syncope.
Luria (1971)	120 VT & SVT pts (VT=7 & SVT=113) (SVT = atach, AVNRT, AVRT, PAT, aflutter, afib)	prospective, descriptive. sample divided into 5 groups based on underlying patho.	most common age of onset=40-49 yrs. 88 pts had onset btwn 10-49 yrs. precipt. fxs = exercise & emotional stress. 93% freq of palpitations. 19% freq of tachycardia polyuria. Management strategies noted.
Morady et al. (1985)	113 VT pts	pts interviewed w/in 1 month after VT asked to remember symptoms. chart reviews for demographic data.	mean age 57 yrs. mean HR 179 bpm. HR > 200 = syncope. 57% freq of palpitations. Freq of other symptoms noted.
Bhandari et al. (1992)	113 SVT pts (49 SVT & 64 afib) (Pts must have episodes at least twice per month)	TTEM monitoring to correlate symptoms w/ SVT episodes. unit of analysis= # of calls. SVT defined as narrow, regular w/ HR >120 bpm.	mean SVT HR= 151 bpm. mean Afib HR=115 bpm. In SVT pts, 63% symptomatic calls associated w/ SVT. Afib pts 69% symp. calls w/ Afib. Freq of other symptoms noted.
Gursoy et al. (1992)	Phase 1: 244 pts w/ palpitations (54 AVNRT pts) Phase 2: N=23 SVT pts (12 AVNRT, 8 AVRT, 3 both)	Phase 1: pt interview & chart review. Phase 2: EP lab w/ intracardiac measurements.	Phase 1: neck pounding in 50/54 AVNRT pts during SVT, not seen in other SVT pts. Phase 2: higher RA pressures w/ AVNRT pts during SVT.
Wood et al. (1994)	167 SVT pts admitted for RFA* (AVNRT, AVRT, atach, & aflutter)	retrospective chart reviews	96% freq palpitations. HR > 170=syncope. symptom freq & duration, management strategies, & differences in groups noted.

*RFA = radiofrequency ablation; TTEM = transtelephonic EKG monitoring

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fibrillation patients, while the coronary heart disease group had a variety of both SVT and VT patients.

Also important in this paper are beginning descriptions of precipitating factors for SVT episodes. Twenty-six percent of the sample noted sudden movement (ie., bending over, standing up suddenly), 23% noted sustained exercise (ie., dancing, running, swimming), 21% reported intense emotion or excitement, 9% noted infection (ie., upper respiratory, urinary tract infections), 7% noted gastrointestinal upset (ie., bloating or following a large meal), as the major precipitating factors for all types of tachycardia (Luria, 1971). Of note is that only one patient related the onset of tachycardia to drinking coffee, and only two to smoking cigarettes.

Palpitations, noted to be the classic clinical feature of all the tachycardias, were found in 93% of the sample. However, Luria notes that this symptom is not specific for diagnosis, as eight patients (7%) had a tachycardia without experiencing any palpitations. The chest pain that frequently accompanies tachycardia was described as being a dull, vague aching sensation in the precordium.

Luria also discusses the symptom of tachycardia polyuria, first noted and named "urina spastica" by Wenckebach and Winterberg in 1927. This unusual renal response to any paroxysmal tachycardia typically begins 10-15 minutes after the tachycardia has started, wherein the patient passes large amounts of urine frequently, and may continue for one and a half hours after the tachycardia has stopped. The pathophysiological background surrounding this symptom is related to the release of atrial naturetic hormone from the right atrium. Atrial naturetic hormone is released

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as a protective factor when the atrium senses a fluid overload (ie., congestive failure). During SVT, the ventricles are unable to fill completely due to the rapid rate which decreases diastolic filling time. A situation of fluid overload is sensed due to the inability of the atria to empty properly into the ventricles, and atrial naturetic hormone is released. Luria found this symptom in 19.2% of the sample (1971). Although other centers have found this symptom to be much rarer, noted in only 5% of patients with regular, paroxysmal tachycardia (Brugada, Gursoy, Brugada, & Andries, 1993). Medical students are taught that the symptom of tachycardia polyuria is another classic symptom of tachycardias, but the true incidence of this is unknown.

Patients used a variety of methods for stopping the tachycardia. Some patients found resting in a supine position, Valsalva or carotid sinus massage maneuvers, eyeball pressure, or several deep breaths to be helpful. One consistent finding was that one method did not work at all times. Luria describes a crouching or squatting position with the head down which was found to be effective by 7 (6%) patients as a "hunkering down position" (1971, p.354).

As modern technology has rapidly developed, more and more dysrhythmia patients are diagnosed based on electrocardiographic (ECG) criteria, rather than symptoms. Medical research surrounding clinical symptoms has become less frequent, as technology becomes more important to physicians in the diagnosis and treatment of dysrhythmia patients. Only four recent studies have addressed the issue of symptomatology in dysrhythmia patients.

The first paper discusses a descriptive study of 113 patients with sustained VT

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of at least 30 minutes' duration (Morady, Shen, Bhandari, Schwartz, & Scheinman, 1985). Sudden cardiac death survivors or patients with VT in the setting of an acute myocardial infarction were excluded. The purpose of this study was to describe the clinical symptoms that prompted these VT patients to seek hospital treatment. Patients were interviewed within a month after the VT episode, and asked to recall their symptoms during the tachycardia. These patient reports were checked with the physician histories in the medical record to verify the findings. The mean age of patients in this sample was 57 $\pm$ 15 years. These researchers found 35% of the sample experienced no cerebral symptoms, 35% had mild lightheadedness, 15% had near syncope, and 15% had frank syncope (Morady et al., 1985). The mean heart rate was 179 $\pm$ 37 bpm (Morady et al., 1985). The patients who lost consciousness were more likely to have had pre-existing heart failure or experienced a heart rate of $\geq$ 200 bpm during the VT episode. This supports the earlier research findings of Wolff (1942).

Morady and associates also noted other symptoms: palpitations (57%), chest pain (27%), dyspnea (25%), weakness (6%), nausea (3%), diaphoresis (3%), and flushing (2%). In contrast to Luria's (1955) findings of palpitations in 93% of that sample, Morady and colleagues noted no palpitations in 33% of their VT subjects. This potentially could be explained by the fact that Luria included both SVT and VT patients in his study, therefore increasing the incidence of palpitations. The symptom of chest pain was found more likely to occur in patients with pre-existing coronary artery disease (Morady et al., 1985). Of the portion of the sample with mild

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lightheadedness or no cerebral symptoms (70%), almost half were falsely diagnosed initially as having SVT because of their mild symptoms. The researchers urge differential diagnosis between SVT and VT should be based solely on ECG criteria, and should not be influenced by clinical symptoms (Morady et al., 1985).

The second paper is one in which Bhandari and associates (1992) studied patients with either SVT (n=49) or atrial fibrillation (n=64). This is the first study to exclude VT patients and focus solely on the symptomatology of supraventricular dysrhythmia patients. This study included 113 patients on flecainide (a type IC antiarrhythmic drug), with symptomatic SVT or atrial fibrillation, who experienced episodes at least twice a month. The purpose of this study was to determine if symptoms correlated with episodes of either SVT or atrial fibrillation reported on a transtelephonic ECG monitoring device (TTEM). The unit of analysis reported by this study unfortunately is the number of TTEM calls, rather than the proportion of patients who called. Therefore, patients could be included multiple times, if they called in more than once, violating the assumption of statistical independence. In patients with SVT, 63% of the symptomatic TTEM calls were associated with documented SVT episodes. Similarly in the atrial fibrillation group, 69% of the symptomatic TTEM calls were associated with ECG documented atrial fibrillation events. A chi-square test was used to analyze the association between presence or absence of SVT or atrial fibrillation and the calls with or without symptoms. Chi-square was an appropriate test for this design. However, since statistical independence was not maintained, results are difficult to interpret.

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For the purposes of the Bhandari et al. study, SVT was defined as a regular tachycardia > 120 bpm (1992). The mean heart rate found during the symptomatic SVT calls was 151 $\pm$ 29. Atrial fibrillation was defined as an irregularly irregular rhythm with the presence of fine fibrillatory waves and having a ventricular rate averaging 80 bpm or more. The mean heart rate during the symptomatic atrial fibrillation calls was 115 $\pm$ 28 (Bhandari et al., 1992).

The frequency of symptoms reported during documented SVT episodes (n=314 calls) were as follows: nausea (78%), dyspnea (76%), diaphoresis (72%), dizziness (69%), fatigue (67%), and palpitations (63%). The frequency of symptoms reported with documented atrial fibrillation episodes (n=909 calls) were: diaphoresis (79%), palpitations (78%), dizziness (77%), dyspnea (76%), weakness (70%), and chest pain (66%). This study is important because it is one of the first to demonstrate a quantifiable relationship between presence of symptoms and ECG documented SVT or atrial fibrillation episodes. However, in about 27% (SVT group=14%; Atrial fibrillation group=13%) of calls where patients reported symptoms, there was no dysrhythmia detected (Bhandari et al., 1992).

The third paper explored the hemodynamic mechanisms underlying the symptom of pounding in the neck in AVNRT patients (Gursoy, Steurer, Brugada, Andries, & Brugada, 1992). This paper reported two distinct phases to their study. In the first phase, 244 consecutive patients referred for evaluation of palpitations were specifically asked if they had experienced pounding in the neck with their episodes of palpitations. These symptoms were then correlated with induction of an arrhythmia in

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the electrophysiology (EP) laboratory. Of the 244 patients, 190 (78%) with tachycardias other than AVNRT denied any sensations of pounding in the neck. Of the 54 subjects with induced AVNRT, 50 (93%) described a regular, rapid, pounding in the neck with their episodes of tachycardia. Although this symptom was not noted to occur in patients with other tachycardias, eight subjects with VT reported an irregular, slow neck pounding. The investigators attribute this symptom in the VT patients to the atrioventricular dissociation seen during VT (Gursoy et al., 1992).

In the second phase, the sample was reduced to 23 total patients, as the researchers excluded patients with any other cardiovascular or systemic disease. Of the 23 subjects, there were 12 patients with AVNRT, 8 with AVRT, and 3 with both (AVNRT and AVRT) types of tachycardia. Right atrial angiograms and hemodynamic measurements were obtained in both sinus rhythm and the tachycardia. During AVNRT, unlike other types of SVT, the atria and ventricles are activated simultaneously and therefore cause near simultaneous systole of both chambers. Higher mean right atrial pressures have been noted by other researchers as the atrium contracts against a closed tricuspid valve (Goldreyer, Kastor, & Kershbaum, 1976). During systole, the right atrial cardiac output is thought to flow in a retrograde fashion into the inferior and/or superior vena cava. The researchers were looking for angiographic evidence of reflux of right atrial cardiac output into the systemic venous system as hemodynamic evidence of the pounding symptom in the neck. The angiographic findings demonstrated a moderate to severe amount of reflux into the vena cava during AVNRT in 83% of AVNRT patients, zero to mild reflux in 89% of

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AVRT patients, and zero in any patient while in sinus rhythm.

With the exception of one AVNRT subject, all of the AVNRT group (11/12) experienced neck pounding. The one AVNRT subject who did not notice neck pounding had lower right atrial pressure measurements. Of the 3 subjects who were noted to have both types of tachycardias, higher right atrial pressures, more severe right atrial output reflux, and neck pounding were only noted when these patients were in the AVNRT rhythm. These subjects were able to distinguish between the types of tachycardia, because they only experienced neck pounding with AVNRT (Gursoy et al., 1992). The conclusions that the symptom of neck pounding in AVNRT must be attributed to the atrial and ventricular contraction timing, as well as the presence of higher right atrial pressures appears reasonable, but must be considered carefully in this study with a questionable amount of statistical power. The question of neck pounding as a clinical marker for AVNRT is an interesting symptom to be pursued with a larger sample. Gursoy and colleagues also noted a marked degree of right atrial reflux into the inferior vena cava with AVNRT, yet no subjects complained of pounding in the right upper quadrant or throughout the abdomen (1992).

Wood, Drew, and Scheinman (1994) conducted a retrospective, descriptive pilot study of 167 SVT patients admitted for radiofrequency ablation treatment, and noted the most frequent symptoms during SVT episodes were: palpitations (96%), dizziness (75%), shortness of breath (47%), and chest discomfort (35%). Other symptoms of note included: fatigue (23%), syncope (18%), diaphoresis (17%), nausea

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(13%), and blurred vision (4%) (Table 2) (Wood et al., 1994). Logistic regression analysis using variables of age, gender, left ventricular function, heart rate during SVT, type of SVT, and presence of heart disease demonstrated that heart rate > 170 was the only significant predictor of syncope ($p < .05$). The sample was divided into four groups based on the underlying mechanism of the SVT: AVNRT, AVRT, atrial tachycardia, and atrial flutter. One way ANOVA and chi-square analysis revealed that the first three groups differed significantly ($p < .05$) from the atrial flutter group in age, heart rate, gender, ejection fraction, palpitations, shortness of breath, fatigue, and the age of onset (Table 2). The atrial flutter patients tended to be older males with poorer cardiac function, and slower heart rates during SVT. Additionally, these subjects experienced less palpitations, but more shortness of breath and fatigue (Table 2). They were noted to be significantly older than the other subjects at age of onset of the SVT, as well as having significantly more ($p < .05$) underlying heart disease, hypertension, valvular disease, congestive heart failure, and cardiomyopathies than the other three groups (Table 3) (Wood et al., 1994). This indicates that perhaps atrial flutter patients are different in many ways from the typical SVT populations and should perhaps be studied separately.

Frequency of SVT episodes ranged from once every six months to 12 times a day, with a median value of 4 times per month. The duration of episodes ranged from 30 seconds to greater than 24 hours in length, with a median value of 30 minutes. It is noteworthy to report the observation in four cases of increased symptom frequency occurring at the time of menses (Wood et al., 1994). Whether

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Table 2. Symptom Frequency in Patients with SVT (Wood et al., 1994)

Symptom	Total Sample N=167	AVNRT n=64	AVRT/WPW n=59	ATACH n=22	AFLUTTER n=22	p
Palpitations	160 (96%)	63 (98%)	58 (98%)	21 (95%)	18 (82%)	0.005*
Dizziness	125 (75%)	50 (78%)	47 (80%)	15 (68%)	13 (59%)	NS
Dyspnea	78 (47%)	30 (47%)	23 (39%)	10 (45%)	15 (68%)	NS
Syncope	33 (20%)	10 (16%)	16 (27%)	5 (23%)	2 (9%)	NS
Fatigue	38 (23%)	12 (19%)	11 (19%)	7 (32%)	8 (36%)	NS
Chest Pain	58 (35%)	24 (38%)	22 (37%)	6 (27%)	6 (27%)	NS
Diaphoresis	29 (17%)	15 (23%)	8 (14%)	4 (14%)	2 (9%)	NS
Nausea	22 (13%)	9 (14%)	8 (14%)	3 (14%)	2 (9%)	NS
Blurred Vision	7 (4%)	4 (6%)	3 (5%)	0	0	NS

Table 3. Associated Heart Disease and Left Ventricular Function (Wood et al., 1994)

Heart Disease History	Total Sample N=167	AVNRT n=64	AVRT n=59	ATACH n=22	AFLUTTER n=22	p
CAD	15 (9%)	5 (8%)	0	2 (10%)	8 (38%)	0.000*
HTN	29 (18%)	13 (20%)	6 (10%)	2 (10%)	8 (38%)	0.03*
Valvular Disease	10 (6%)	1 (2%)	2 (3%)	3 (15%)	4 (19%)	0.009*
CHF	14 (9%)	4 (6%)	1 (2%)	1 (5%)	8 (38%)	0.000*
Congenital Disease	7 (4%)	2 (3%)	1 (2%)	2 (10%)	2 (10%)	NS

AVNRT = atrioventricular nodal reentrant tachycardia; AVRT = atrioventricular reciprocating tachycardia; ATACH = atrial tachycardia; AFLUTTER = atrial flutter; CAD = coronary artery disease; HTN = hypertension; CHF = congestive heart failure; * AFLUTTER group vs. other 3 groups. There was no significant difference between the first 3 groups.

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this is a chance observation or a true relationship remains to be determined and requires further study.

B. Quality of Life after Treatment for SVT

To date there are twelve published studies in the literature investigating QoL in an SVT patient population which have defined QoL as more than just mortality and morbidity. Information on these studies is provided in table format in Table 4. Two studies from the medical literature have explored long term follow up post direct current ablation (Kay, Bubien, Epstein, & Plumb, 1988; Rosenqvist et al., 1990). Direct current (DC) ablation is no longer the treatment of choice in these patients, having been replaced by RF ablation since 1985. These researchers have stated that they measured QoL, but each has defined QoL differently.

Rosenqvist and colleagues (1990) operationalized QoL as the presence/absence of symptoms, or number of repeat hospitalizations. This study included 47 SVT patients with a mean follow up time of 41 $\pm$ 23 months post DC ablation. Patients and their physicians were asked to compare the patient's current functional status (including presence of any cardiac symptoms), and repeat hospitalizations with that from before the ablation treatment. Patients were divided into those who physicians judged had undergone successful ablation versus unsuccessful ablation. All seven of the unsuccessfully ablated patients had recurrent palpitations that were found on Holter monitor to be episodes of SVT. Eleven of the 42 successfully ablated patients reported palpitations that could not be attributed to any dysrhythmia. Despite the continued use of antiarrhythmic drugs in 14 patients, no mention is made by the

investigators of side effects experienced by these patients post ablation. An improvement in activity was noted by 83% of the 42 patients having successful ablation procedures (Rosenqvist et al., 1990). There is no mention of how early these improvements were noted and if any activity changes were noted in the unsuccessfully ablated group. Hospital admissions per year also showed a significant decrease from the year before to the year after ablation for the whole sample (Rosenqvist et al., 1990).

Kay and associates (1988) also examined QoL, but defined QoL as only physical and psychological functioning. These researchers included only atrial fibrillation (AF) patients (n=12) having experienced DC ablation. Patients with AF, as previously discussed, typically have more structural heart disease and poorer cardiac function than other types of SVT patients. Physical and psychological function were evaluated on the day before ablation treatment and again at six weeks post ablation. Treadmill exercise testing, as well as the physical dimension subscale of the McMaster Health Index and the Psychological General Well-Being Index were completed by the subjects on the day before ablation treatment and again at six weeks post ablation. The changes in functional capacity (measured by physical dimension scores) correlated strongly (r = .70) with increases in treadmill exercise duration, which improved from 6.4 $\pm$ 4.6 minutes to 9.9 $\pm$ 2.6 minutes (Kay et al., 1988). Psychometric data about the two questionnaires with cardiac populations are reported as highly reliable and valid, but no mention is made of how this was achieved. This was a well designed, prospective study but with such a small sample (n=12), no

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Table 4. Review of Research Examining QoL in Patients with SVT

Source	Sample Description	Method & Instrumentation	Findings
Kay et al. (1988)	12 Afib pts undergoing D/C ablation of AVJ#	Prospective evaluation of physical & psychological function (using phys function scale of McMaster, Psych Well-Being Scale, & treadmill) measured 1 day pre- & 6 weeks post D/C ablation	improved function after ablation.
Rosenqvist et al. (1990)	47 Afib pts undergoing D/C ablation of AVJ#	pt & MD followup interviews @ mean of 41 mths post D/C ablation. Defined good QoL as symptoms & hospitalization	11/42 pts reported palpitations after D/C ablation. 83% reported improved activity & ↓ hospitalizations.
Olgin & Scheinman, (1993)	54 Afib pts undergoing RFA* compared to 49 Afib pts with D/C ablation of AVJ#	38 RFA* pts interviewed at mean of 24 mths, compared to interview data from 10 D/C pts followed for a mean of 41 mths. Phone interviews. Also measured number of ER or Hospital visits.	32/38 RFA* pts reported improvement after RFA*, 2/38 remained the same, 4/38 were worse. 8/10 D/C pts were improved, 2/10 no change. In RFA* group, ER or hospital visits ↓ from 4/yr to 0.7/yr.
Fitzpatrick et al. (1996)	90 Afib pts w/ *RFA of AVJ# (61% female, mean age=60)	pt or MD telephone interviews evaluating pt's functional status post *RFA at mean follow up time of 2.3 yrs. Pt or MD asked to recall data over prior 3 yrs. QoL was ranked on 1-5 scale. Activity on 1-3 scale.	significantly improved QoL & activity tolerance post *RFA. MD & ER visits, & AA drug use ↓ significantly ($p < .03$).
Jenkins et al., (1994)	151 pts w/ afib undergoing AVJ RFA* (57% male w/ median age=68)	prospective, only baseline measures reported. used MOS SF-36, Quality of Life Index-Cardiac Version, Symptom Frequency & Severity Checklist	lower QoL scores in sample than norms for CHF, MI, and other cardiac groups.
Brignole et al., (1994)	23 pts w/ chronic afib or flutter in 12 groups. 12 pts w/ AVJ RFA* & 11 pts w/ just pacer (52% male w/ mean age=67)	physical functioning measured by GXT, & MD score on NYHA class, & echo LV function. Symptoms measured post RFA* at 15 days & then at 3 mths on 0=absence to 10=maximum scale. Pts asked to recall data for scale.	QoL, LV functioning, & physical functioning improves after AVJ RFA*. Symptoms ↓ after AVJ RFA*.

*RFA = radiofrequency ablation D/C = direct current ablation

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Table 4. Review of Research Examining QoL in Patients with SVT (cont'd)

Source	Sample Description	Method & Instrumentation	Findings
Hamer et al., (1994)	69 pts w/ medically mangaged afib (n=26) or SVT (n=43) (52% female w/ mean age=53)	cross-sectional study using standardized tools: Health Locus of Control, PAIS, Stait/Trait Anxiety Inventory, McGill Pain Inventory, Coping Strategies Questionnaire, Symptom Checklist-90. 2 groups combined for analysis.	QoL scores w/in 1 SD of all norms. most pts well-adjusted w/ at least moderate diruption due to SVT/afib.
Jensen et al., (1995)	50 pts w/ afib/flutter undergoing AVJ RFA* (47 RFA successful, 3 not)(54% male w/ mean age=67)	standardized RN interview at a mean of 17 mths after RFA*, health care utilization for 12 mths prior to and post RFA also followed.	88% noted subjective improvement. Hospital days went from 17/yr to 7/yr. Use of AA drugs reduced by 75%. AVJ RFA* cost effective.
Lau et al., (1995)	55 pts w/AVRT. 2 groups: 46 pts RFA*, 9 pts drug therapy.	measured at 3 mth post RFA*. Severity of SVT measured by frequency & duration of episodes, hemodynamic disturbance, presence of preexcited afib. Physical functioning measured by GXT. QoL measured by General Health Questionnaire, Bradford Somatic Inventory, Sickness Impact Profile & subjective RN interviews.	Five main concerns due to SVT: fear of strenuous activities, fear of travel, psychological burden, fear of having tea, coffee, and other stimulants, & potential adverse impact of SVT on job, were alleviated after successful RFA*. Significant improvement in total scores on instruments & exercise capacity. No improvement for pts on medical therapy.
Lesh et al. (1994)	360 pts w/ RFA* (113 AVNRT, 196 AVRT, 51 AVJ RFA*)	prospective pt interviews at pre-RFA* and 1, 3, 6, 12, 18, & 24 mths post RFA*. Evaluated symptoms and QoL on 7 item questionnaire.	significantly improved QoL & ↓ symptoms. No further improvement noted after 6 mths.
Knotts et al. (1994)	10 SVT pts w/ RFA* (4 AVRT, 4 AVNRT, & 2 Afib)	prospective. Used 3 subscales of MOS (health, physical function, & well-being) & symptom checklist	significant improvement post RFA* in QoL. Noted that improved QoL highly correlated w/ ↓ symptomatic SVT episodes.
Bubien et al., (in press)	159 SVT pts w/ RFA* (46 AVRT, 59 AVNRT, 22 Afib, 22 aflutter or atach, 10 VT) (58% female w/ mean age=49)	prospective. Used MOS SF-36, ADL Scale, & Symptom Frequency & Severity Checklist at baseline, & 1 & 6 mths post RFA*. Health care utilization data also collected.	sample had very low baseline scores. significant improvement post RFA* in QoL. Noted ↑ QoL highly correlated w/ ↓ symptomatic SVT episodes. ↓ visits to MD & ER 6 mths post RFA* as compared to 6 mths pre-RFA*.

*RFA = radiofrequency ablation D/C = direct current ablation

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widely generalizable conclusions should be drawn. These studies have both evaluated a procedure that is no longer used in clinical practice since RF ablation therapy has become available.

Olgin and Scheinman (1993) compared long term follow up in patients undergoing RF ablation to those having undergone direct current ablation. While the focus of the paper was not QoL, these researchers did interview a subset of patients in each group as to their QoL. Quality of life in this study, though not directly stated, was conceptualized as patient perspective on overall improvement post ablation. Phone interviews were conducted at a mean of 24 +/- 8.4 months post ablation in the subset of 38 RF ablation patients, and at a mean of 41 +/- 23 months in 10 of the direct current patients. Improvement was noted by at least 80% of all of the patients interviewed. These researchers also note a decrease in health care utilization post RF ablation. Defined as number of emergency room visits or hospital admissions per year, this decreased from 4.0 +/- 3.7 to 0.7 +/- 1.4 visits post ablation treatment (Olgin & Scheinman, 1993).

Two papers at recent national cardiology meetings have examined QoL in SVT patients post radiofrequency ablation treatment. These studies did have larger sample sizes, but again, both have operationalized QoL as only functional capacity or presence/absence of cardiac symptoms (Fitzpatrick et al., 1996; Lesh, Tracy, Cooperman, & Langberg, 1994). The authors report a significantly improved QoL and activity tolerance by these patients post ablation (Fitzpatrick et al., 1996; Lesh et al., 1994). Both of these papers used investigator developed "customized" QoL

questionnaires of five to seven questions. Fitzpatrick and associates asked 90 atrial fibrillation patients who underwent AV junctional ablation and subsequent permanent pacemaker implantation, or their physicians (if patients were unable to be contacted), to rate their QoL post ablation to before ablation on a five point (1=poor to 5=excellent) scale during a telephone interview (1994). Also measured was ability to carry out daily activities on a three point (1=very limited to 3=not limited) scale. Patients or physicians were contacted at a mean follow up time period of 2.3 $\pm$ 1.2 years post ablation procedure. Also measured were frequency of symptom intrusion, impact of atrial fibrillation on QoL, activity limitations, health care consumption. No time point was reported as to when the interview and questionnaire administration was conducted before the ablation procedure.

Lesh et al. (1994) prospectively questioned a variety of types of SVT patients (n=360) to determine QoL before and after RF ablation. The investigator designed QoL instrument addressed overall health, physical condition, whether work, exercise, and driving were limited due to their cardiac condition, and whether the patient felt better since the ablation. The time intervals before RF ablation are not clear, but patients were questioned at 1, 3, 6, 12, 18, and 24 months after RF ablation. The investigators note that no further changes occurred after the 6 month time interval. Dramatic improvement in all areas after RF ablation was found by these researchers.

Brignole and colleagues (1994) examined QoL in 23 consecutive atrial fibrillation patients. The sample was 50% male with a mean age of 67 years. The design was confusing, but involved randomization of patients to either AV junctional

ablation plus pacemaker (n=12) or pacemaker alone (n=11) during the short-term (15 days) phase of this study. After 15 days, the control group patients (n=11) underwent AV junctional ablation, and all patients were evaluated at 3 months post ablation procedure. Symptom frequency was measured by a 0=absence to 10=maximum score scale at the end of the time periods. Patients were asked to compare how they felt during the most recent time period as compared to how they felt before enrollment. At the end of both the short and longer term phases, patients undergoing AV junctional ablation were significantly improved in all areas.

Jensen and colleagues (1995) followed 50 patients after AV junctional ablation for resistant atrial fibrillation and flutter. Quality of life and health care utilization were evaluated by interviews with 2 nurses at a mean of 17 months post procedure. The "standardized" interviews were described as addressing patients' symptoms, degree of disability, medication, and subjective changes in QoL. All patients having an unsuccessful ablation (n=3) reported a worsening of their QoL. The majority of patients (88%) having a successful ablation reported improvements, although 5% reported no change. These authors also discussed the costs per patient in the year prior to and following the ablation, and concluded that AV junctional ablation is a cost effective procedure.

Jenkins and colleagues (1995) examined QoL also in a sample of 151 patients with atrial fibrillation prior to AV junctional ablation and permanent pacemaker implantation. The sample was mostly male (57%) with a median age of 68 years. These researchers found QoL scores at baseline to be significantly lower than

normative scores for patients with congestive heart failure, recent myocardial infarction, and other cardiac groups. They concluded that QoL in atrial fibrillation patients before AV junctional ablation is poor with significant functional limitations. These investigators plan to continue measuring QoL in these patients at 3 and 12 months after ablation and pacer implantation.

Hamer and associates (1994) studied 69 patients with either atrial fibrillation (n=26; 38%) or SVT (n=43; 62%) who were being medically managed. These researchers defined QoL only in dimensions of functional capacity and coping strategies. The atrial fibrillation group was 62% male with a mean age of 60 +/- 14 years. Unfortunately, the groups of SVT and atrial fibrillation patients were combined for analysis. The SVT group was 60% female with a mean age of 49 +/- 14 years. Standardized instruments were used in this study and included: Health Locus of Control Scale, Psychosocial Adjustment to Illness Scale, State Trait Anxiety Scale, McGill Pain Inventory, Coping Strategies Questionnaire, and the Symptom Checklist-90. Conclusions suggest that the subjects in this study were basically well-adjusted and considered their symptoms to be only moderately disruptive.

Knotts and colleagues (1994) attempted to quantify QoL and symptom frequency/distress in ten SVT patients post RF ablation. Although having a small sample size, this study also included patients with a variety of SVT diagnoses: Wolff-Parkinson-White syndrome (n=4), atrioventricular nodal reentrant tachycardia (n=4), and atrial fibrillation (n=2). Investigators noted improvement in all areas from baseline to one month after RF ablation. The small sample size and short follow up

time limits this study's applicability, but serves as an important beginning in determining how symptoms affect QoL in these patients.

Bubien and associates (in press) measured QoL in 159 patients undergoing curative RF ablation. A variety of dysrhythmia patients were included in this prospective, descriptive study: 59 patients with AVNRT, 46 with AVRT, 22 with atrial fibrillation, 22 with atrial flutter, and 10 with VT. Of note is that most of the VT patients in this study suffered right ventricular outflow track tachycardia. This type of VT, which differs greatly from the typical VT, occurs more often in otherwise healthy young to middle aged adults and is quite amenable to ablation treatment. These researchers used both generic and disease specific measures: the Medical Outcomes Study Short Form-36, the Symptom Frequency and Severity Checklist, and an activities of daily living scale. The pre-ablation scores demonstrated that these patients were quite symptomatic and their lives were severely affected by the dysrhythmia. These patients had QoL scores comparable to patients with congestive heart failure and recent myocardial infarctions. At six months post-ablation, the data demonstrates a dramatic, statistically significant improvement in QoL scores and symptomatology. The authors conclude that RF ablation therapy improves the health-related QoL for patients with a variety of cardiac dysrhythmias.

The QoL of patients with AVRT undergoing either ablation or medical therapy was examined by Lau and associates (1995). A total of 55 patients with AVRT on stable medical therapy for at least three months, were "randomized" to either ablation treatment (n=46) or continuation of medical therapy (n=9). Patients were diagnosed

by EP study and at this time, baseline measures of QoL were collected. Severity of SVT was measured by frequency and duration of SVT episodes, hemodynamic stability, and presence of pre-excited atrial fibrillation. Physical functioning was measured by treadmill testing, and QoL questionnaire and interview at baseline and at 3, 6, 9, 12 months after the ablation. Medical therapy control group patients were measured once at three months post randomization. Questionnaires used in this study were: General Health Questionnaire, Somatic symptoms Inventory, and the Sickness Impact Profile. Patients reported five major concerns due to SVT: (1) fear of strenuous activities, (2) fear of long distance travel, (3) psychological burden, (4) fear of having tea, coffee, and other stimulants, and (5) the potential adverse impact on their job. These were all alleviated after a successful ablation. The ablation patients had significant improvement in total scores on all instruments and in maximum exercise capacity. No improvement was noted for those receiving medical therapy.

V. Review of Literature Summary

Measurement of symptom frequency/severity and QoL in patients with SVT has been carried out by a variety of researchers defining QoL in multiple, unidimensional ways, using many different inadequate, non-standardized measures. Measures have been typically investigator-designed, non-standardized, with no psychometric information reported. Symptoms have been reported as the percentage of patients having only palpitations or presyncope, presence/absence of any symptoms, or number and severity of symptoms on a checklist. Many of these researchers have used physician evaluation of the patient's physical functioning as the

sole indicator of patient QoL. Only one study (Bubien et al., in press) has defined and measured QoL in a multidimensional fashion, using patients' subjective evaluation, and incorporating generic and disease-specific measures. Definitions of QoL in this literature have included: patient's interpretation of whether they were feeling better, physical functioning on treadmill testing, physician rated New York Heart Association Classification of patient, or decrease in visits to emergency rooms or physicians. The researchers which have had large samples with adequate statistical power have used inadequate measures, and those who have used more appropriate measures have had sample sizes of 10-23. Samples have mostly included only patients with atrial fibrillation, but more recently have included all types of arrhythmia patients, not limiting the sample to solely patients with SVT.

In addition to the methodological flaws of most of these studies, results have also been conflicting. The symptoms in patients with VT and SVT have been analyzed together, yielding no information about either group separately. Results ranging from very normal QoL results (demonstrating that patients with SVT have adjusted well to the disruptions which SVT episodes cause), to significant impairment pre-RF ablation have been reported. The majority of studies which have continued analysis post-RF ablation have been following an AV junctional ablation. This particular procedure, as previously noted, leaves patients pacemaker dependent with potentially different problems than those which occur following other types of RF ablation. Most studies which followed patients post ablation noted a range of improvement in the variety of areas measured, but used inadequate measures to come

to this conclusion.

VI. Utility of Symptom Management Model for SVT Population

The symptom management model as described was an excellent framework to use in investigating symptom distress in SVT patients. Due to the dearth of research about the SVT population in general, this model was used as a practical framework for beginning descriptive studies of symptom distress upon which a symptom management interpretation could be developed for the SVT patient.

What little is known about the symptom experience portion of the model in this population gives us a beginning picture of how these patients may perceive, evaluate, and respond to the symptoms associated with SVT. Person and health/illness variables which have been identified include information that the SVT patient is typically a younger to middle aged adult. Patients with AVNRT seem to present in their mid-twenties to thirties, whereas AVRT patients tend to first present in teenage years to mid-twenties. The most common type of SVT has a prevalence in women, other SVTs are seen more frequently in men.

In clinical practice, SVT patients frequently appear anxious, frustrated, frightened, or depressed from the uncertainty regarding the paroxysmal episodes of SVT. However, Wood et al. (1994) found anxiety to be an infrequently noted symptom in the medical record. The sudden change in their state of usual good health to one of uncertainty and perceived loss of control could be emotionally taxing over time. Emotional status, therefore, would be an important part of evaluation of the symptom experience, as well as symptom outcomes. From this author's clinical

experience, these symptomatic episodes may require the patient to change jobs and driving habits and/or stop leisure activities, often affecting personal relationships and self-esteem. These symptoms however, have not been addressed in prior studies with this population.

Most of the SVT patients have a better overall health status, with less structural cardiac disease than the typical VT patient. Sociologically, the SVT patient is more apt to be married and more are employed than seen in the older VT population (Wood et al., 1994). Anecdotal reports reveal patients may have to stop working, driving, or leisure activities because of the SVT episodes. Seventy-eight percent of the sample in the Wood et al. (1994) study were Caucasian, however SVT may occur in any ethnic group. More culturally diverse samples should be included in future SVT research, to examine how, or if, the symptom experience differs across ethnicities. Conducting research in a multiethnic environment such as the Bay area makes addressing this issue easier.

After placing the previously discussed research findings into the symptom management model, gaps in our current knowledge are more clearly seen. The concept of symptom experience and the areas of evaluation and response to symptoms in SVT patients needs further investigation. There is only beginning information about the evaluation of symptoms of SVT, and very little specifically addressing symptom distress. The frequency of SVT episodes and symptoms is variable, ranging from less than twice a year to 12 times per day (Wood et al., 1994). Some patients have frequent short episodes, while others have been noted to have relatively

infrequent episodes lasting longer periods of time (Brugada et al., 1993).

There is some data to suggest typical signs and symptoms, but information on severity, intensity, precipitating factors, and the meaning of the symptoms has not been obtained. Traditionally, SVT episodes have been thought to be precipitated by either endogenous or exogenous factors triggering the underlying mechanism of the SVT. Brugada et al. (1993) reported clinically seeing patients with endogenous precipitating factors some of the time and exogenous factors at other times, more of a "mixed" pattern.

Some researchers noted increased severity of symptoms and syncope with heart rates > 200 (Wolff, 1942; Morady et al., 1985), while Wood et al. (1994) noted the sole predictor of syncope was a heart rate > 170, not 200. Luria (1971) noted a post SVT episode polyuria in one-fifth of his sample, while others have noted that symptom to occur clinically much less frequently (Brugada et al., 1993). Wood et al. (1994) also noted fatigue in 19% to 36% of the sample during, as well as after, the SVT episode. Clinically, this author has noted several SVT patients complain of a post-ictal type of state after some SVT episodes. The symptoms and sensations of the post-episode period have not been explored. Physiological responses to SVT symptoms are beginning to be understood, however psychological and behavioral responses remain to be defined.

Wood et al. (1994) collected incidental information on patient management strategies (ie. lying down, standing on head, squatting, or carotid sinus massage), but this is incomplete and should be addressed in further research. Patients are often

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told little about managing their symptoms at home, and it would be helpful to define what strategies patients find most useful.

Additionally, there is much to be learned about the multidimensional concept of symptom outcomes in the SVT population. No descriptions exist of outcome variables except isolated case reports of mortality and morbidity, very little data about co-morbidity, and QoL. As has been discussed in the previous paper, RF ablation is the current treatment of choice for curing most of the SVTs commonly seen. Antiarrhythmic drugs have traditionally been the mainstay of treatment for SVT patients, and many are managed on a variety of drugs before RF ablation is recommended. This has historically been the case because these patients can be managed long term by primary care practitioners before referral to a cardiologist or electrophysiologist occurs. Drugs however, have many limitations including adverse side effects, questionable efficacy, and high costs. Although many describe RF ablation as a curative procedure, it is unclear how many patients have recurrent dysrhythmias requiring repeat RF ablation. Even if patients are noted to have no recurrent dysrhythmias, some note continued symptoms of palpitations. Evaluating the change in symptomatology, if any, in the SVT patient post drug therapy or RF ablation is in the early stages. Most of this research has had small sample sizes with various lengths of short-term follow up, and has only included endpoints such as morbidity and mortality. These outcomes are inadequate to fully understand and evaluate the effect of management strategies in any patient population.

Some patients continue to complain of symptoms of palpitations, even after no

SVT can be induced in the electrophysiology lab. These patients may need two or three further electrophysiology tests to verify that the dysrhythmia has been cured, but continue to feel palpitations. Other patients may require several RF ablation procedures before the SVT is totally abolished. We know nothing or very little about the emotional status, functional status, symptom status, health service utilization and QoL of SVT patients before and if, or how, this changes after RF ablation.

Additionally, we need to pursue how the concepts in the symptom management model interact. What variables change and how after RF ablation treatment? Patients have verbalized some similar symptom experiences, but few have had documented evidence of how the SVT symptoms change after this procedure. This is important as the changes (or lack thereof) in turn effects the symptom experience, management strategies, and outcomes. The model's scope is so comprehensive, that to explore in detail all of the concepts may take a long period of time over a very large number of studies. The purpose of this proposed study is to further describe the symptom experience of SVT patients before and after RF ablation, and how the symptom outcomes change after this treatment. Much more could be learned about symptoms and their management in the SVT patient by using this framework.

VII. Summary

As previously discussed, measuring the symptom experience and symptom outcomes for SVT patients is in the early stages and has been carried out in an inconsistent, fragmented fashion. Some of the studies have attempted to define the clinical symptoms noted by dysrhythmia patients. Yet these studies have included

mixed samples of both supraventricular and ventricular dysrhythmia patients, which has made interpretation of the findings problematic.

As noted earlier, little research has been carried out describing symptom frequency, symptom distress, and/or management in strictly an SVT sample. Although there have been merely four studies in the medical literature that have described clinical symptoms in SVT patients, few of these have limited the sample solely to SVT patients. Only one recent, as yet unpublished, study which included measurement of symptom frequency/severity addressed how these symptoms influence QoL. Most of the researchers have investigated symptom frequency, and not the impact of symptom severity, or have used instruments with questionable reliability and validity information in small sample sizes. These factors have made generalizability of the findings difficult. Therefore nurses are forced to extrapolate from the literature written about ventricular dysrhythmia subjects in order to draw conclusions regarding the symptomatology and QoL of SVT patients.

In the cardiac arrhythmia population, as well as other clinical groups, QoL has been conceptualized and measured in many different ways. Many of these researchers have used the term QoL, but all have conceptualized QoL through a variety of frequently used, yet fragmented, unidimensional concepts: psychosocial responses, occupational and/or physical functioning, coping, psychological adjustment, and the specific emotions of anxiety and anger. Quality of life is a multidimensional and complex construct, which must first be clearly conceptualized in order to choose an appropriate measurement tool so that the findings will be meaningful.

The only QoL studies done in an SVT population have utilized mainly atrial fibrillation patients with decreased cardiac function. This is different from the typical SVT patient. Of the QoL measures commonly used in cardiac populations, none is appropriate for SVT subjects. The MOS SF-36 is appealing due to its ease of administration, generic comparisons to other patient groups, and good psychometric properties. Even this instrument however, must be adapted with disease specific measures for use in a SVT population.

Utilizing the symptom management model discussed earlier in this paper would assist researchers in building a conceptual framework of symptom management in SVT patients. The information obtained would give nurses much to offer these SVT patients and their families in the future. Drawing from the small number of papers discussed relating to SVT patients, results suggest that SVT patients' symptoms may be more interruptive and disabling than previously thought and deserve further investigation.

VIII. Research Questions

The following questions were addressed in this study: (1) What is the frequency and severity of physical and emotional symptoms experienced by patients who have SVT? (2) Do these symptoms differ among the three groups (based on the underlying mechanisms) of patients with SVT? (3) What are the average QoL scores of SVT patients and how do these scores compare to other groups of general and patient populations? (4) Do symptoms and other aspects of QoL change after RF ablation treatment?

CHAPTER THREE: METHODS

I. Study Design

This study utilized a pre-post design. Data were collected at the time of and at one month following RF ablation treatment. Outcomes were measured the day of RF ablation to establish a baseline and again at one month post-RF ablation to detect any changes which may have occurred following the ablation treatment. Baseline questionnaires assessed the subject's QoL in the four weeks prior to the procedure, and post-RF questionnaires assessed the four week period following the ablation. Baseline data provided the basis for conducting measurement studies on the QoL instrument.

II. Sample

Pre-Post Study Sample

All consecutive patients meeting the inclusion criteria admitted to either the University of California, San Francisco Medical Center or Alta Bates Medical Center for RF ablation from May 1995 through February 1996, and who agreed to participate were included in the study. This study focused specifically on patients with regular, narrow complex tachycardias, generally referred to as SVT rhythms. Inclusion criteria for this study were as follows: (1) adolescents or adults > 12 years old who speak, read, and understand English; (2) confirmed diagnosis through electrophysiological testing of a SVT dysrhythmia of AVNRT, AVRT, or ATACH; (3) have undergone successful RF ablation treatment of the SVT as reported on the electrophysiology laboratory records; (4) physically and mentally able to participate;

and (5) willing to participate.

Measurement Sample

The same inclusion criteria were used for the measurement sample as were used for the pre-post study, with the exception of tachycardia mechanism (criteria #2). Whereas the pre-post portion of this study was limited to patients with AVNRT, AVRT, or atrial tachycardia, for the purposes of instrument development, subjects who had other types of SVT, such as inappropriate sinus tachycardia (n=10) and atrial flutter (n=28), were allowed to complete the baseline questionnaire. Patients with these other types of tachycardia were included in this portion of the study because they have similar symptom profiles as patients with AVNRT, AVRT, and atrial tachycardia. They were not included as part of the pre-post study because their outcomes and illness trajectory are somewhat different than patients with AVNRT, AVRT, and atrial tachycardia. Data from baseline questionnaires of patients with any of these types of SVT were included and analyzed for the evaluation of the QoL instrument (n=107).

III. Measures

Instrument Development

Using the symptom management model (Figure 6, p. 28), the main concepts of symptom experience were examined. A QoL tool was used to explore general levels of functioning and well-being as well as how the symptoms of SVT impacted areas of the subject's physical, emotional, and social functioning. The QoL questionnaire was developed to include both generic and disease specific items, targeting the range of

symptoms and outcomes relevant to patients with SVT. The generic items were included in order that the scores of patients in this sample could be compared to previously reported values of other patient groups. To more accurately describe symptoms and concerns specific to patients with SVT, disease specific measures were designed as part of the questionnaire.

The generic portions of the QoL instrument utilized for this study were adapted from the Medical Outcomes Study (MOS) set of general measures (Stewart et al., 1988; Stewart & Ware, 1992). The generic measures adapted for this study, along with the disease specific measures and symptom checklist, were called the QoL Questionnaire (Appendix B). This questionnaire addressed the concepts of current health perceptions, overall life satisfaction, health distress, physical functioning, psychological distress/well-being, energy/fatigue, and impact of SVT on activities of daily life. A list of variables measured in this study is presented in Table 5.

For multi-item scales, reliability is demonstrated by internal consistency measures. Cronbach's alpha was the internal consistency measure used in this study. Nunnally (1978) suggests that for group comparisons (ie., AVNRT vs AVRT vs ATACH), alpha coefficients of .50-.60 are adequate, and for individual comparisons, internal consistency scores of .80-.90 are appropriate. The MOS scales have been found to achieve internal consistency of between .70-.80 (Stewart & Ware, 1992).

Items for the QoL tool were established through literature reviews, clinical experience, and a retrospective pilot study. Based on earlier pilot work (Wood et al., 1994; Wood, Drew, & Scheinman, in press), and interviews with electrophysiology

Table 5: Variable List

Clinical Variables (12)
- Mechanism of SVT*
- History of MI, HTN, CHF, CMP, CONG, or MVP*
- Comorbidity
- Ejection Fraction
- Heart Rate during SVT* (from EP lab records)

Demographics (4)
- Gender
- Age
- Race
- Marital Status

QoL Questionnaire Scores (25 variables)

A. Generic Measures: (16 variables)
- Self-rated health (1 item)
- General life satisfaction (1 item)
- Physical function (10 items)
- Current health perception (5 items)
- Energy/fatigue (5 items)
- Vitality (4 items)
- Health distress (6 items)
- Mental health index (17 items)
  - -mental health index (5 items)
  - -depression (8 items)
    - -depression (6 items)
    - -behavioral/emotional (2 items)
  - -likely depressive disorder (1 items)
  - -anxiety (3 items)
  - -positive affect (4 items)

B. Disease Specific Measures (9 variables)
- Restricted activity days due to symptoms (2 items)
  - -workdays missed due to SVT (1)
  - -days cutdown on activity due to SVT (1)
- Impact of SVT* on activities of daily life [including sexual activity] (10 items)
- Impact of SVT* on activities of daily life [excluding sexual activity] (9 items)
- Average Frequency of SVT* episodes in prior month (1 items)
- Average Duration of SVT* episodes in prior month (1 items)
- Symptom Scores (3 variables)
  - Symptom [sum of all symptoms marked yes {0-18}] (1 variable)
  - Bothersomeness [mean of all bothersome items {0-5} (1 variable)
  - Total symptom severity [symptom X bothersome scores {0-90}] (1 variable)

Table 5: Variable List (cont'd)

Heart flutters	Fatigue/no energy
Heart skipping	Loss of appetite
Blurred vision	Trouble sleeping
Neck pounding	Trouble concentrating
Dizziness/lightheadedness	Passing out
Headache	Hard to catch breath
Passing a lot of urine	Feeling warm/flushed
Sweating	Chest pressure
Nausea	Heart racing

* SVT=supraventricular tachycardia
HTN=hypertension
CONG=congenital heart disease
MVP=mitral valve prolapse
MI=myocardial infarction
CHF=congestive heart failure
CMP=cardiomyopathy

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physicians, nurses, and patients, a symptom checklist was developed. Clinical situations and concepts pertinent to the patient with SVT were noted to be missing in other commonly used versions of symptom checklists and QoL instruments.

Measurement of symptoms asked the patient to respond to a series of symptoms that were typical of an SVT episode. The symptom checklist asked if they had experienced any of the symptoms in the past four weeks ("No/Yes"). In addition, if they reported yes, they were asked to report the extent to which the symptom was bothersome (ranging from 0="not at all bothersome" to 5="extremely bothersome"). The total number of symptoms marked "yes" on the symptom checklist comprised the symptom score (0=no symptoms marked and 18=all symptoms marked). For the ordinal scale of severity of symptoms, items for questions where symptoms were

marked "yes" were averaged to comprise the bothersome score. The total symptom severity score consisted of multiplying the symptom score by the bothersomeness score. The total symptom severity score (range of 0 =no symptoms/low severity to 90=all symptoms/high severity) gave an overall indication of both the number of symptoms as well as how bothersome these symptoms were.

An additional disease specific measure was developed for this QoL instrument, called the Impact of SVT, this measure assessed the extent to which having SVT interfered with or limited patients' physical, social, and sexual activities, as well as the ability to drive. Because it was hypothesized that some patients either may not wish to answer questions regarding sexual activity, or may not be in a sexual relationship at this time, two versions of this measure were developed. A 10-item measure including the sexual relationship item, is called Impact of SVT (with sex), and the 9-item measure is called Impact of SVT (without sex). Factor analysis on data from all patients who completed the baseline QoL questionnaire (n=107) was carried out to examine the factor structure of these new measures.

Pilot testing of the QoL Questionnaire for validity purposes was necessary because many of the scales were newly designed for this study. Content validity of the symptom checklist was established by having patients with SVT, expert nurses and physicians list symptoms commonly thought of as associated with SVT. These symptoms were compared to those noted in the literature review and compiled into the list of symptoms on the symptom checklist. The entire QoL questionnaire was given to patients with SVT (N=30) as a pilot test of the instrument. Patients were asked to

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judge the clarity of instructions and difficulty of items, as well as the appropriateness of questions. The subjects were asked to complete the instrument for the purposes of establishing face validity and evaluating respondent burden. These patients had no problems understanding the instructions, or marking their answers on the instrument. There was good variability in the range of scores. Therefore, no changes were made in the symptom checklist for the pre-post study.

IV. Procedure

Recruitment

The participants were outpatients accessed through referral to UCSF electrophysiologists for RF ablation treatment. Participants were identified the day before hospital admission for the radiofrequency ablation procedure. The nurse researcher obtained a listing of patients from the research nurse in the Department of Electrophysiology, and day to day patient lists were updated via Email. All UCSF electrophysiologists approved of this project and allowed their patients to be approached for participation in this study.

Because subjects were identified only the day before or morning of the procedure, the subjects were initially approached by the nurse researcher in their hospital room the evening of the RF ablation procedure. The nurse researcher explained the nature and purpose of the study and invited them to participate. Informed consent was obtained as approved by the UCSF and Alta Bates Medical Center Committees on Human Research (Appendix A).

Data Collection

The data collection procedure is presented in Table 6. Once the subject agreed to participate, a questionnaire packet was given to them in their hospital room (following the ablation procedure but before discharge), including a cover letter which explained the study purposes, questions, and basic elements of consent to the subject (Appendix C). Subjects were asked to complete the questionnaire packet at home and return the completed questionnaire in the postage paid envelope within one week. The nurse researcher's telephone number was printed on the cover letter for the patient to keep and refer to if necessary. Patients were encouraged to call with questions they had about the study.

Table 6: Data Collection Procedure

Variable	Baseline collected day of procedure	After RFA at one month after RFA
Demographic Variables (4)	*	
Clinical Variables (12)	*	
QoL Questionnaire (25)	*	*

The questionnaire packet included a six page QoL instrument (Appendix B). Completion of the questionnaire packet took approximately 20-30 minutes. The nurse researcher completed a data form for each subject including demographic information gathered from the physician as well as the medical record. The identity of the

participants was kept confidential.

Additionally, data were gathered on subjects following the radiofrequency ablation treatment. Approximately one month after the procedure, the patients were mailed a post-ablation questionnaire identical to the baseline questionnaire. The subjects were again asked to complete the forms at home and return the questionnaire packet through the mail in the pre-stamped envelope. The response rate from mailing out surveys or questionnaires is generally considered to be about one-third or 30% of the total mailed. Strategies to increase the response rate in this study included phone call reminders (two weeks after the questionnaire was given or mailed to the subjects) followed by mailing of additional questionnaires, if necessary.

VI. Methods of Data Analysis

Main Study Questions

Following development of a valid and reliable questionnaire, the following questions were addressed: (1) Which physical and emotional symptoms are more frequently experienced by supraventricular (SVT) arrhythmia patients? (2) Do these symptoms differ based on the underlying mechanism of SVT? (3) What are the average QoL scores of patients with SVT and how do these scores compare to other general and patient populations? (4) Do the symptoms and other aspects of QoL change after RF ablation treatment?

Power analysis and statistical methods are specifically addressed below. Desired power was .80 and significance was set at 0.05 for each question. In questions where there were multiple comparisons involved, the alpha was restricted to

0.01.

Question 1: *What is the frequency and severity of physical and emotional symptoms experienced by patients with supraventricular tachycardia (SVT) arrhythmias*? The data for this question were measured by the frequency and severity of any symptoms which were marked on the symptom checklist. Statistical analysis included descriptive statistics using frequencies to report the results in each category.

Question 2: *Do these symptoms, as well as demographics, differ among the three groups (based on the underlying mechanisms) of patients with SVT*? The sample was next analyzed according to the specific responses of the three groups based on the mechanism of the SVT: AVNRT, AVRT, and ATACH. Differences in frequencies between the groups were addressed through chi-square testing for dichotomous variables and ANOVA with continuous variables. For this question, because of the multiple comparisons, significance was set at $p < 0.01$.

Question 3: *What are the average QoL scores of patients with SVT and how do these scores compare to other general and patient populations?* The QoL Questionnaire has several generic subscales (Stewart et al., 1988; Stewart & Ware, 1992). The subscale scores obtained from subjects in the measurement sample were compared to previously established subscale norms and other previously reported subscale scores for chronically ill patients for MOS measures (Stewart et al., 1989; Stewart & Ware, 1992; Ware, Snow, Kosinski, & Gandek, 1993). This provided assistance in interpretation of the meaning of scores for this sample against other well and chronically ill populations (ie., hypertensives, diabetics, congestive heart failure,

depression, and recent myocardial infarction).

Question 4: Do the symptoms as well as QoL change after RF ablation treatment? This question was analyzed by the responses of the pre-post sample. Matched pair *t*-tests were used to compare subscale scores from QoL tool before and after RF ablation. For this question, because of the multiple comparisons, significance was set at $p < 0.01$.

VI. Committee on Human Research Concerns

Possible risks to the subjects included: inconvenience of taking 20-30 minutes to fill out the questionnaire; psychological discomfort of answering personal questions on the questionnaire; and/or possible loss of privacy. Methods to minimize these risks included: allowing the patient to complete the questionnaire packet in the privacy of his/her home; giving the patient a self-addressed envelope to return the questionnaire; maintaining confidentiality of data so that the participant cannot be identified; informing the participants that they could discontinue participation at any time, or leave any items which they found discomforting blank; and informing the patients that if they chose not to participate, their medical care would not be affected by their decision.

There were no direct benefits to the participant from completing the questionnaires for this project. However, the participant may have felt that he/she was contributing to scientific research that could further help persons like themselves to benefit from the knowledge gained in better treating cardiac dysrhythmia patients.

CHAPTER FOUR: RESULTS

I. Description of the Sample

Table 7 presents a detailed explanation of subjects who did and did not meet inclusion criteria for both measurement and pre-post studies. The final measurement study sample consisted of 107 subjects (93 from UCSF and 14 from Alta Bates Medical Center) who completed baseline questionnaires. The response rate for baseline questionnaires was approximately 68% (107/158). The final pre-post study sample consisted of 52 patients (44 from UCSF and 8 from Alta Bates) who returned both baseline and post-RF ablation questionnaires. Response rates overall for completion of the second questionnaires was 75% (52/69).

Table 7. Study Sample

	UCSF	Alta Bates	Total
Total Ablation Admissions	211	29	240
Patients Seen	196	27	223
Ineligible	-59	-6	-65
Non-inducible	-19	-1	-20
Atrial fibrillation	-22	0	-22
Unsuccessful ablation	-5	-1	-6
Non-English speaking	-2	-0	-2
< 12 years old	-11	-0	-11
Co-existing illness	-0	-4	-4

Table 7. Study Sample (cont'd)

	UCSF	Alta Bates	Total
Eligible for baseline	137	21	158
Refused	-2	-1	-3
Agreed to complete baseline	135	20	155
Completed Baseline	93 (69%)	14 (70%)	107 (68%)
Patients excluded: flutter/IST*	-33	-5	-38
Eligible for pre-post	60	9	69
Completed Pre & Post	44 (73%)	8 (88%)	52 (75%)

* IST = inappropriate sinus tachycardia

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Responders versus Non-responders: In order to generalize results of the pre-post study, it must be demonstrated that the eligible subjects who returned both questionnaires and comprised the pre-post sample, are not significantly different from those who returned only the baseline. That analysis was carried out in the present study using t-tests and chi-square statistics to compare baseline variables from those subjects eligible for the pre-post study who filled out only a baseline questionnaire with subjects who completed both questionnaires. Those results are presented in Table 8.

There was no significant difference between the groups in age, gender, presence of heart disease, hypertension, symptoms or other QoL scores, with the exception of workdays missed and Impact of SVT. The non-responders missed a

mean of 6.7 days due to SVT, whereas the responders only reported missing a mean of .68 days. This could perhaps indicate that the non-responders were more ill than

Table 8. Responders Compared to Non-responders (N=69)

Variable	Responders (n=52)	Non-responders (n=17)	p
Age	41 +/- 19 yrs	41 +/-17 yrs	.892
Gender	18 male/34 female	7 male/10 female	.448
Coronary Disease	2% yes, 98% no	0% yes, 100% no	.574
Hypertension	2% yes, 98% no	7% yes, 93% no	.374
Self Rated Health	71.0 +/- 20	56.3 +/- 37	.061
Life Satisfaction	57.7 +/- 24	56.3 +/- 27	.929
Physical Function	74.7 +/- 25	65.0 +/- 31	.270
Current Health	59.8 +/- 24	58.1 +/- 30	.833
Energy/Fatigue	46.2 +/- 24	45.5 +/- 24	.920
Health Distress	63.1 +/- 25	60.6 +/- 30	.767
Mental Health (17)	69.8 +/- 16	62.9 +/- 17	.203
Depression (8)	74.5 +/- 18	71.7 +/- 17	.599
Impact of SVT (9)	71.5 +/- 23	49.7 +/- 34	.012
Workdays missed	.68 +/- 2.0	6.7 +/- 12	.001
Days cutdown	6.7 +/- 10.0	9.0 +/- 12	.579
Number of Symptoms	8.4 +/- 4	9.0 +/- 3	.442
Total Symptom Severity	27.3 +/- 16	29.9 +/- 14	.505

the responders. Additionally, the Impact of SVT scores demonstrated that SVT had

a significantly worse impact on the lives of the non-responders than the responders ($p=.012$). This finding also suggests that the non-responders were more limited in their activities due to the severity of the SVT than the non-responders. These conclusions however, are also not supported by any other findings in this group comparison. Overall, the two groups do not significantly differ.

Patient Characteristics: The sample as a whole consisted of 34 females (65%), with a mean age of 41 +/- 17 years. Twenty-eight (54%) patients had AVNRT, 16 (31%) had AVRT, 6 (12%) had atrial tachycardia, and 2 patients had two or more types of SVT (Table 9). These two patients had AVNRT as their primary tachycardia, and underwent RF ablation for this condition. One also had atrial tachycardia, the other also had sinus node reentry tachycardia. Both of these subjects underwent successful ablation for the secondary tachycardias at the same time. In both of these cases, because AVNRT was their primary tachycardia, the subjects are grouped for analysis with other AVNRT patients.

Seventy-five percent of the sample was Caucasian, with other ethnic groups as follows: 20% Asian, 2% African-American, 2% Hispanic, and 1% of American Indian heritage. The majority (60%) of subjects were married, with 23% single, 8% divorced, 4% widowed, 2% living together, and 2% separated. Less than half of the subjects (47%) were employed on a full-time basis, 21% were full-time students, 11% were retired, 11% were housewives, 6% unemployed, 2% worked part-time, and 2% reported being disabled.

Clinical Description: Overall, five patients (10%) had structural heart disease. The mean left ventricular ejection fraction of 65%. Coronary artery disease was noted in one patient (2%), hypertension in one (2%), congenital heart disease in one (2%), and mitral valve prolapse in one patient (2%). Other valvular diseases, congestive heart failure, or cardiomyopathy were not noted in any subjects. Subjects reported prior antiarrhythmic medication use as a mean of 1.5 +/- 1.3 drugs. Number of visits to the emergency room because of symptoms of the SVT in the year prior to ablation were reported as a mean of 1.5 +/- 2.0 visits (range of 0-10).

II. Instrument Development Results

Analysis of baseline questionnaires (N=107) was carried out for the purpose of instrument development. In Table 9 the descriptive statistics for the QoL instrument are presented. Indicated in this table are the measures, definitions, number of subject responses analyzed, the number of items in each scale, the item number corresponding to the QoL instrument, mean scores and standard deviations, the observed range and possible range of values, and the alpha coefficients. The QoL subscale scores were transformed on a 100 point scale, so that 0 = poor QoL and 100 = high QoL. Negatively coded items were recoded to obtain these scores. The full range of scores was noted for most of the scales, and nearly the full range for the remaining scales. The means and standard deviations also demonstrate a wide variability of scores for this instrument. Cronbach's alpha analysis demonstrated good reliability of the subscales. Reliability coefficients ranged from .6862 to .9426.

Table 9. Descriptive Statistics: Baseline QoL Measures for Patients with SVT (N=107)

Measure	Definition	N	# items	item #	Mean (SD)	Obs Range	Poss. Range	alpha
Self-rated Health (SRHLTH1)	overall rating of general health (+)	104	1	1	63.2 (27.2)	0-100	0-100	-----
Life Satisfaction (LIFESAT1)	overall satisfaction w/personal life (+)	106	1	2	58.5 (24.5)	0-100	0-100	-----
Physical function (PHYS10)	extent to which health limits moderate & vigorous physical activities such as self-care, walking, climbing stairs, bending, lifting, (+)	105	10	3-12	69.5 (28.9)	0-100	0-100	.9343 n=105
Current Health (CURHLTH5)	overall ratings of current health (+)	106	5	1, 13-16	56.2 (25.7)	0-85	0-100	.8344 n=102
Energy/ Fatigue (ENFT5)	amount of time in past month felt full of pep, energetic, worn out, tired, & had enough energy to do the things wanted to do (+)	106	5	17,21, 23,26, 34	45.3 (24.4)	4-88	0-100	.8911 n=104
Vitality (VITAL4)	amount of time felt full of pep, energetic, worn out, tired, (+)	106	4	17,21, 23,26	43.5 (24.3)	5-85	0-100	.8721 n=104
Health Distress (HLTHDS6)	amount of time in past month felt distressed about health, discouraged by health, worry about health (+)	106	6	22,24, 31,33, 35,46	61.9 (26.7)	0-100	0-100	.9426 n=104

Table 9. Descriptive Statistics: Baseline QoL Measures for Patients with SVT (cont'd)

Measure	Definition	N	# items	Item #	Mean (SD)	Obs Range	Poss. Range	alpha
Anxiety (ANX3)	amount of time in past month felt very nervous, tense, high strung, restless, or fidgety (+)	106	3	18,38,39	65.6 (22.7)	7-100	0-100	.8422 n=105
Mental Health Index 17-item (MHI17)	general index includes depression, anxiety, positive affect, belonging, behavior/emotional control (+)	106	17	18-20,25,29, 30,32,36,38-42,44,45,47, 48	68.9 (17.0)	34-98	0-100	.9194 n=106
Mental Health Index 5-item (MHLTH5)	amount of time during past month very nervous person, downhearted, down in dumps, happy person, calm & peaceful (+)	106	5	18,19,25, 36,47	67.9 (18.8)	24-96	0-100	.7864 n=104
Behavioral/ Emotional (BEHAV2)	amount of time felt not emotionally stable, or not in firm control of behavior, thoughts, emotions, or feelings (+)	106	2	41,44	67.3 (24.7)	0-100	0-100	.6862 n=106
Positive Affect (POSAFF4)	amount of time felt like a happy person, felt calm & peaceful, cheerful & lighthearted, daily life interesting (+)	106	4	19,29,32, 36	58.7 (19.9)	7-100	0-100	.7937 n=104
Depression (DEPRES8)	amount of time felt in low spirits, downhearted, depressed, moody, down in dumps, nothing to look forward to, not in firm control of behavior, not emotionally stable(+)	106	8	20,25,30, 40-42,44,47	75.0 (18.4)	30-100	0-100	.8883 n=105

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Table 9. Descriptive Statistics: Baseline QoL Measures for Patients with SVT (cont'd)

Measure	Definition	N	# items	Item #	Mean (SD)	Obs Range	Poss. Range	alpha
Depression (DEPRES6)	amount of time felt in low spirits, down in dumps, downhearted, depressed, moody, nothing to look forward to (+)	106	6	20,25,30, 40,42,47	77.6 (19.3)	13-100	0-100	.9093 n=105
Likely Depressive Disorder (DEPRES1)	likely to have major depressive disorder, based on cutpoint* (+)	105	1	25	11%	0-1	0-1	-----
Impact of SVT (w/sex) (IMPACT10)	extent to which SVT limited physical, social, driving, sexual activities (+)	105	10	51a-51j	62.5 (24.9)	0-100	0-100	.8474 n=66
Impact of SVT (w/o sex) (IMPACT9)	extent to which SVT limited physical, social, driving activities(+)	105	9	51a-51i	64.6 (27.7)	0-100	0-100	.9357 n=97
Wkdys missed (WKDAYS)	# of workdays missed due to SVT	85	1	27	2.3 (6.6)	0-30	0-30	-----
Days Cutdown on Activities (CUTDOWN)	# days cutdown on activity due to SVT	93	1	28	8.2 (11.0)	0-30	0-30	-----

* Berwick et al., (1991). Performance of a five-item mental health screening test. Medical Care, 29(2), 169-175.

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Table 9. Descriptive Statistics: Baseline QoL Measures for Patients with SVT (cont'd)

Symptoms:	N	% Yes	% No
Heart flutters	101	75%	25%
Heart skipping	96	71%	29%
Blurred vision	97	21%	79%
Neck pounding	99	39%	61%
Dizziness/lightheadedness	102	66%	34%
Headache	98	51%	49%
Polyuria	97	25%	75%
Sweating	99	46%	55%
Nausea	95	28%	72%
Fatigue/No energy	100	76%	24%
Loss of appetite	97	37%	63%
Trouble sleeping	101	51%	49%
Trouble concentrating	97	52%	49%
Passing out	97	8%	92%
Short of breath	101	60%	40%
Feeling warm/flushed	98	52%	48%
Chest pressure	98	53%	47%
Heart racing	101	78%	22%

Both principal axis and principal components factor analysis with varimax rotation were carried out on the new scale which was developed, called Impact of SVT. Both types of analysis yielded Eigenvalues of 6.14, 1.07, and remaining Eigenvalues of < 1.0. All 10 items loaded partially on two factors, but more strongly on one in the varimax factor rotation. Therefore this was treated as one measure and not two or more.

Because anxiety and depression are noted clinically in some patients with SVT, and little is reported in the literature, additional measures were used to further explore emotional function in this sample. Exploration of new alternative approaches to combining items which were disease specific, yet allowed comparison to other group scores, led the researcher to divide the Depression 8-item scale into two new scales: a Depression 6-item measure and a Behavior/Emotional 2-item scale. As noted in Table 9, these two new measures had alpha coefficients of .9093 and .6862 respectively.

Another measure explored separately in the instrument development study was one item from the Mental Health Index 5-item scale. Extreme responses to this item, "How often have you felt downhearted and blue?" ("all of the time", "most of the time") have been noted by other researchers to be a stronger predictor of major depressive illness than the 5-item scale scores (Berwick, Murphy, Goldman, Ware, Barsky, & Weinstein, 1991).

III. Main Study Results

A. Symptom Frequency and Severity (N=52)

The most frequent symptoms noted by the pre-post sample at baseline, presented in Table 10, are as follows: 69% heart flutters, 65% heart skipping, 80% heart racing, 21% blurred vision, 34% neck pounding, 65% dizziness/lightheadedness, 56% headache, 19% polyuria, 42% diaphoresis, 17% nausea, 71% fatigue, 33% loss of appetite, 42% trouble sleeping, 56% trouble concentrating, 12% syncope, 63% dyspnea, 56% feeling warm/flushed, and 60% chest pressure. Syncopal episodes were always preceded by palpitations, and occasionally some degree of dyspnea and chest discomfort.

Symptom frequency, duration, symptom number, bothersomeness, and total symptom severity score are also presented in Table 10. Episodes of SVT were noted to occur with extreme variation, from one to two times a month (28%) to two to four times a year (26%). Patients also reported episode frequency of two to five times a week (24%). Duration of episodes also exhibited variation, with the most commonly noted durations ranging from longer than one hour (26%) to one to five minutes (24%). The average number of symptoms reported during an SVT episode was 8.4 ($\pm$ 4.1), with an average bothersomeness of 3.1 ($\pm$ .8). Patients reported an average total symptom severity score of 27.3 ($\pm$ 15.8).

B. Symptoms Compared Across Tachycardia Mechanism Groups (N=52)

As indicated in Table 10 are demographics and symptom frequencies for the

Table 10. Patient Characteristics and Symptoms by Tachycardia Mechanism (N=52)

	Total Sample N=52	AVNRT n=30	AVRT/WPW n=16	ATACH n=6	p*
Age	41 ± 17 13-84yrs	44 ± 18 13-84yrs	35 ± 14 14-68yrs	41 ± 15 24-59yrs	NS
Gender Male Female	18 (35%) 34 (65%)	6 (20%) 24 (80%)	9 (56%) 7 (44%)	3 (50%) 3 (50%)	NS
LVEF	65%	65%	65%	65%	NS
Heart flutters	69%	75%	56%	67%	NS
Heart skipping	65%	68%	44%	67%	NS
Heart Racing	80%	75%	75%	67%	NS
Blurred vision	21%	14%	25%	33%	NS
Neck Pounding	34%	25%	31%	50%	NS
Dizziness	65%	64%	69%	50%	NS
Syncope	12%	11%	6%	17%	NS
Dyspnea	63%	54%	63%	67%	NS
Polyuria	19%	14%	31%	17%	NS
Diaphoresis	42%	43%	56%	17%	NS
Nausea	17%	21%	13%	17%	NS
Fatigue	71%	64%	75%	100%	NS
Trouble sleeping	42%	43%	31%	67%	NS
Chest Pressure	60%	54%	69%	67%	NS

AVNRT = atrioventricular nodal reentrant tachycardia; AVRT = atrioventricular reciprocating tachycardia; ATACH = atrial tachycardia; LVEF = left ventricular ejection fraction; % of symptoms are % of patients noting that symptom to be present. *= No significant differences were found between the 3 groups.

Table 10. Characteristics by Tachycardia Mechanism (cont'd)

	Total Sample N=52	AVNRT n=30	AVRT n=16	ATACH n=6	p*
Frequency of Episodes					NS
daily or more often	18%	4%	27%	67%	
2-5 times/week	24%	32%	13%	0	
1 time/week	2%	0	7%	0	
1-2 times/month	28%	32%	20%	17%	
2-4 times/year	26%	25%	33%	17%	
almost never	4%	7%	0	0	
Duration of Episodes					NS
few seconds	12%	11%	13%	17%	
1-5 minutes	24%	19%	27%	33%	
5-15 minutes	14%	11%	20%	0	
20-30 minutes	10%	7%	20%	0	
30-60 minutes	14%	22%	7%	0	
longer than 1 hour	26%	30%	13%	50%	
Number of Symptoms (0-18)	8.4 $\pm$ 4.1	8.3 $\pm$ 4	8.1 $\pm$ 4	9.0 $\pm$ 5.3	NS
Severity of Symptoms (0-5)	3.1 $\pm$ .8	2.9 $\pm$ .7	3.4 $\pm$ .9	3.1 $\pm$ .7	NS
Total Symptom Severity (0-90)	27.3 $\pm$ 15.8	26.1 $\pm$ 15.1	28.8 $\pm$ 16.8	28.8 $\pm$ 19.1	NS

subgroups based on tachycardia mechanism. When the sample was divided into groups based on tachycardia mechanism, there were no significant differences in demographics or symptomatology between the groups. Patients in this study with AVRT tended to be younger and more frequently male than patients in the other two groups, but this was not statistically significant. Patients with atrial tachycardia and AVRT more frequently reported SVT episodes occurring daily or more often, and these patients also reported slightly higher total symptom severity scores.

C. Quality of Life of Patients with SVT Compared to Others (N=107)

As a part of instrument development, baseline QoL scores were generated for the measurement sample (N=107). Baseline scores for this sample in comparison to other groups are presented in Table 11. Indicated in this table are the measurement scales analyzed and their corresponding definitions, Cronbach alpha coefficients for each scale, the mean scores and standard deviations for the SVT sample, as well as previously established scores for the general population, and patients suffering from congestive heart failure, a recent myocardial infarction, and chronic disease.

Patients with SVT reported lower than expected baseline QoL scores. When compared to other groups, the SVT sample appears to have similar health distress, fatigue, health perceptions, mental health, and limits in physical, emotional, and social functioning as patients with congestive heart failure or a recent myocardial infarction. The SVT sample reported substantially lower scores than the general population on subscales of physical functioning, current health, vitality, and mental

Table 11. Baseline Quality of Life Measures: SVT Subscale Scores are Compared to Other Patient Groups (N=107)

Measure	Definition	alpha	SVT Mean (SD)	Comparison Groups						
				Gen'l Population		MI		CHF		Chron Dis[c]
				SF20[a]	SF36[b]	SF20[a]	SF36[b]	SF20[a]	SF36[b]	
Self-rated Health (SRHLTH1)	overall rating of general health (+)	-----	63.2 (27.2)							60.7 (25.3)
Physical function (PHYS10)	extent to which health limits moderate or vigorous physical activities (+)	.93	69.5 (28.9)		84.15 (23.3)		69.68 (26.1)		47.54 (31)	73.2 (26.4)
Current Hlth (CURHTH5)	overall ratings of current health (+)	.83	56.2 (25.7)	74.6		62.7 (2.2)		59.2 (1.7)		
Energy/ Fatigue (ENFT5)	amount of time in past month felt full of pep, energetic, worn out, tired (+)	.89	45.3 (24.4)							55.4 (22.0)
Vitality (VITAL4)	amount of time felt full of pep, tired, energetic, worn out (+)	.87	43.5 (24.3)		60.86 (21.0)		57.68 (19.0)		44.29 (24.4)	
Health Distress (HTLHDS6)	amount of time in past month felt discouraged, distressed, or worried about health (+)	.94	61.9 (26.7)							80.0 (22.6)
Anxiety (ANX3)	amount of time in past month felt very nervous, tense, high strung, restless, or fidgety (+)	.84	65.6 (22.7)							74.2 (21.3)

Table 11. Baseline Quality of Life Measures: SVT Subscale Scores in Comparison to Other Patient Groups (cont'd)

Measure	Definition	alpha	SVT Mean (SD)	Comparison Groups						
				Gen'l Population		MI[b]		CHF[b]		Chron Dis[c]
				SF 20[a]	SF 36[b]	SF 20	SF 36	SF 20	SF 36	
Mental Health Index (17 item) (MHI17)	general index includes depression, anxiety, positive affect, belonging, behavior / emotional control (+)	.92	68.9 (17.0)							72.8 (19.5)
Mental Health Index (5 item) (MHLTH5)	amount of time during past month very nervous, down in dumps, calm & peaceful, downhearted, happy person (+)	.79	67.9 (18.8)	78.0	74.74 (18.1)	74.8 (1.7)	75.78 (15.7)	73.3 (1.3)	74.68 (21.3)	72.0 (20.8)
Positive Affect (POSAFF4)	amount of time felt like daily life interesting, a happy person, calm & peaceful, cheerful & lighthearted (+)	.79	58.7 (19.9)							60.7 (23.3)
Depression (DEPRES8)	amount of time felt in low spirits, downhearted, depressed, moody, down in dumps, nothing to look forward to, not in firm control of behavior, not emotionally stable(+)	.89	75.0 (18.4)							78.9 (19.6)

References:

[a] = Stewart et al.,(1989).Functional status and well-being of patients with chronic conditions: Results from the Medical Outcome Study. Journal of the American Medical Association, 262(7), 907-913.

[b] = Ware, Snow, Kosinski, & Gandek, (1993).SF-36 Health Survey: Manual & Interpretation Guide. The Health Institute.

[c] = Stewart & Ware, (1992).Measuring Functioning and Well-Being: The Medical Outcomes Study Approach. Durham: Duke University Press.

health. When compared to other normative samples and patients with chronic diseases, the subjects with SVT scored substantially lower in areas of physical functioning, energy/fatigue, health distress, anxiety, and mental health. Patients with SVT scored approximately the same as those patients with chronic diseases in areas of depression and positive affect.

When compared to patients suffering a recent myocardial infarction, the subjects in this study scored about the same in physical functioning and current health, yet lower in vitality and mental health. Patients with chronic congestive heart failure scored better than this sample in areas of mental health, but about the same to slightly worse in physical functioning, current health, and vitality. At baseline, these subjects had QoL scores at least equal to, and in some cases worse than, patient groups with congestive heart failure and/or recent myocardial infarctions.

D. Changes Following Radiofrequency Ablation (N=52)

Comparison of pre- and post-RF ablation scores are presented in Table 12. Indicated in this table are the measurement scales analyzed and their corresponding definitions, the mean scores and standard deviations for both pre- and post-RF ablation samples, as well as 95% confidence intervals and *p* values. Patients with SVT reported lower than expected baseline QoL scores. Overall, the post ablation QoL scores are significantly improved ($p < 0.05$) from baseline measurements.

Patients' self rated health, positive affect, and workdays missed did not significantly change following ablation ($p > 0.151$). However, the measures of life

Table 12. Quality of Life Scores for Pre-Ablation vs. Post-Ablation Questionnaires (N=52)

Measure	Definition	Pre-Score n=52	Post Score n=52	Change Score	95% CI	p
Self-rated Health (SRHLTH1)	overall rating of general health (+)	71.1 (19.6)	71.2 (21.1)	0.1	(-8.3, 5.1)	.627
Life Satisfaction (LIFESAT1)	overall satisfaction w/personal life (+)	57.7 (24.0)	73.8 (22.3)	16.1	(-22.9, -8.9)	<.001
Physical function (PHYS10)	extent to which health limits physical activities such as self-care, walking, climbing stairs, bending lifting, & moderate and vigorous activities (+)	74.7 (25.3)	87.9 (21.5)	13.2	(-22.1, -6.4)	.001
Current Health (CURHLTH5)	overall ratings of current health (+)	59.8 (23.6)	74.9 (23.0)	15.1	(-23.7, -8.4)	<.001
Energy/ Fatigue (ENFT5)	amount of time in past month felt full of pep, energetic, worn out, tired, had enough energy to do things wanted to do (+)	46.2 (24.0)	60.7 (23.0)	14.5	(-23.9, -7.6)	<.001
Vitality (VITAL4)	amount of time felt full of pep, energetic, tired, worn out (+)	42.9 (24.7)	59.2 (23.3)	16.3	(-25.8, -9.2)	<.001
Health Distress (HLTHDS6)	amount of time in past month felt worried, distressed, or discouraged about health (+)	63.1 (24.9)	82.0 (21.8)	18.9	(-26.6, -10.3)	<.001
Anxiety (ANX3)	amount of time in past month felt very nervous, tense, high strung, fidgety, restless (+)	65.2 (23.9)	79.2 (17.7)	14.0	(-18.8, -7.3)	<.001

Table 12. QoL Scores for Pre-Ablation vs. Post-Ablation Questionnaires (cont'd)

Measure	Definition	Pre-Score n=52	Post Score n=52	Change Score	95% CI	p
Mental Health Index (MHI17)	general index includes depression, anxiety, positive affect, belonging, behavior/emotional (+)	69.8 (16.2)	78.5 (14.5)	8.7	(-12.6, -4.6)	<.001
Mental Health 5-item (MHLTH5)	amount of time during past month very nervous person, downhearted, down in dumps, happy person, calm & peaceful (+)	69.0 (17.8)	76.2 (15.4)	7.2	(-12.4, -2.3)	.004
Positive Affect (POSAFF4)	amount of time felt like a happy person, felt calm & peaceful, cheerful, lighthearted, daily life interesting (+)	61.9 (15.7)	65.4 (19.1)	3.5	(-9.5, 1.5)	.151
Depression (DEPRES8)	amount of time felt in low spirits, depressed, moody, down in dumps, nothing to look forward to, not in firm control of behavior, not emotionally stable (+)	74.5 (18.4)	83.6 (15.9)	9.1	(-13.5, -4.9)	<.001
Likely Depressive Disorder (DEPRES1)	likely to have major depressive disorder, based on cutpoint [% of patients marking 'all of the time' or 'most of the time'] (+)	13.7%	2.0%	11.7%	(-1.6, -.35)	<.001
Impact of SVT (w/sex) (IMPACT10)	extent to which SVT limited physical, social, driving, & sexual activities (+)	68.8 (19.9)	83.3 (17.4)	14.5	(-20.7, -9.8)	<.001

Table 12. QoL Scores for Pre-Ablation vs. Post-Ablation Questionnaires (cont'd)

Measure	Definition	Pre-Score n=52	Post Score n=52	Change Score	95% CI	p
Impact of SVT (w/o sex) (IMPACT9)	extent to which SVT limited physical, social, or driving activities(+)	71.5 (22.8)	90.2 (20.8)	18.7	(-25.8,-13.2)	<.001
Workdays missed (WKDAYS)	# of workdays missed due to SVT	.68 (1.9)	2.3 (6.2)	1.6	(-2.8, .67)	.220
Days Cutdown on Activities (CUTDOWN)	# days cutdown on activity due to SVT	6.7 (10.0)	2.9 (7.3)	3.8	(1.0, 6.5)	.008
Number of Symptoms (NUMSYM)	number of symptoms (0-18)	8.4 (4.1)	4.5 (4.4)	3.9	(2.3, 5.3)	<.001
Mean Severity of Symptoms (BOTHER)	mean bother of endorsed symptoms (1-5)	3.1 (.80)	2.4 (.76)	.69	(.31, .92)	<.001
Total Symptom Score (BOTHRSYM)	number of symptoms times the mean severity (0-60)	27.34 (15.8)	12.3 (15.2)	15.0	(8.6, 19.8)	<.001

Table 12. QoL Scores for Pre-Ablation vs. Post-Ablation Questionnaires (cont'd)

Measure	Definition	Pre-Score n=52	Post Score n=52	Change Score	95% CI	p
Frequency of SVT (FREQ)	average # of times SVT episodes occurred in last month				(-2.3, -.53)	.002
	daily or more often	18%	18%	0%		
	2-5 times/week	24%	4%	20%		
	1 time/week	2%	0	2%		
	1-2 times/month	28%	8%	20%		
	2-4 times/year	26%	70%	44%		
	almost never	4%	0	4%		
Duration of SVT (DURATION)	average length of SVT episodes in last month				(2.8, 4.7)	.001
	no episodes	0	67%	67%		
	few seconds	12%	16%	4%		
	1-5 minutes	24%	4%	20%		
	5-15 minutes	14%	8%	6%		
	20-30 minutes	10%	0	10%		
	30-60 minutes	14%	0	14%		
	longer than 1 hour	26%	4%	22%		

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Table 12. QoL Scores for Pre-Ablation vs Post-Ablation (cont'd)

Symptoms:	% Yes Pre-Ablation	%Yes Post-Ablation
Heart flutters	75%	47%
Heart skipping	71%	48%
Blurred vision	21%	15%
Neck pounding	39%	19%
Dizziness/lightheadedness	66%	29%
Headache	51%	40%
Polyuria	25%	9%
Sweating	46%	27%
Nausea	28%	20%
Fatigue/No energy	76%	42%
Loss of appetite	37%	17%
Trouble sleeping	51%	30%
Trouble concentrating	52%	27%
Passing out	8%	2%
Short of breath	60%	23%
Feeling warm/flushed	52%	25%
Chest pressure	53%	21%
Heart racing	78%	21%

satisfaction, physical function, current health, energy/fatigue, vitality, health distress, anxiety, mental health, and depression did significantly improve following ablation therapy ($p<0.008$). Patients also reported significant decreases in number and bothersomeness of symptoms, and total symptom severity during the one month after RF ablation ($p< 0.001$).

The Impact of SVT scores demonstrated that episodes of SVT greatly limited patient activities pre-ablation. Pre-ablation measures indicated that patients had to miss work an average of .68 days and cut down on activities for an average of 6.7 days per month due to the SVT. Surprisingly, restricted activity days actually increased following ablation to 2.3 days per month. In each of these other measures, the post ablation scores are significantly improved ($p < 0.05$) from baseline measurements.

IV. Summary of Results

The results have demonstrated that patients with SVT have very impaired QoL pre-RF ablation with a high proportion reporting a variety of symptoms as noted in Table 9. The most frequent symptoms in patients with SVT appear to be: fatigue (71%), heart palpitations (70%), dizziness (65%), dyspnea (63%), chest pressure (60%), diaphoresis (42%), and trouble sleeping (42%). The mean total symptom severity score was 27.3 ± 15.8 (range of 0=no symptoms/low severity to 90=all symptoms/high severity). When symptoms across the three tachycardia mechanism groups were compared, the differences in type, number, or severity of symptoms

within these groups were not found to be statistically significant. The QoL subscale scores for this sample were much lower in some areas than previously reported scores from patients with a recent myocardial infarction or chronic congestive heart failure. There was a dramatic improvement in virtually all generic and disease specific QoL outcomes at one month after RF ablation.

CHAPTER FIVE: DISCUSSION

I. Summary of Study Findings

Measurement Development

The generic plus disease specific measures used in this study demonstrated good reliability and validity for this population. The generic measures enabled comparison of the sample to other well and chronically ill patient groups. The disease specific measures enabled assessment of changes in the conditions and QoL of patients with SVT which other more generic measures may have missed altogether.

Symptom Frequency and Severity

The results presented in Table 11 indicate that the typical SVT patient is severely symptomatic (mean of 8 moderately bothersome symptoms out of 18) before RF ablation. The commonly reported symptoms of palpitations ("heart flutters", "heart skipping", "heart racing"), dizziness or lightheadedness, dyspnea ("shortness of breath") were expected to be seen in a majority of patients with SVT. The chest pressure which was reported by 60% of the sample was higher than expected. Clinically however, some women with SVT note an atypical type of chest pain during episodes of SVT. Since only 2% of the sample had cardiac disease, it is unlikely that the chest pressure reported is ischemic in origin.

It becomes evident when discussing the symptom data that episodes of SVT appear to be quite incapacitating. The symptom of fatigue, which clinically is rarely noted, was reported by a much higher proportion of patients than expected. Patients

discussed having to "go to bed" for up to two days after an especially long episode of SVT. Patients mentioned that coping with the fatigue often interfered with personal plans, employment, family and social activities. The symptom of general fatigue was mentioned as something patients dealt with on an ongoing basis, and the etiology of this type of fatigue could be multifactorial. However, a more specific physically exhausting fatigue was also noted following tachycardia episodes. The physiological etiology of this type of fatigue seems quite clearly due to the increased metabolic demands during the SVT, but this has not been adequately examined.

Symptoms Compared Across Tachycardia Mechanism Groups

The differences between groups of patients with different tachycardias were not statistically significant. Patients in the AVRT group, who tend to have faster heart rates during SVT, did report a slightly higher frequency of symptoms usually associated with decreased cardiac output than the other two groups. These symptoms of blurred vision, dizziness, diaphoresis, and polyuria were more commonly noted by patients with AVRT, but these differences were not statistically significant. These results could very well be related to a lack of power due to the small number of subjects in the AVRT and atrial tachycardia groups. Another explanation could be that although the mechanism of the SVT differs between groups, the symptomatology is very similar.

Quality of Life of Patients with SVT Compared to Others

The comparison between patients with SVT and other general and ill patient

populations gave the QoL scores in this study context and meaning. When compared to other samples of well and chronically ill adults, the patient with SVT appears to have similar health distress, fatigue, health perceptions, mental health, and limitations in physical, emotional, and social functioning as patients with congestive heart failure or a recent myocardial infarction.

As reported in Table 9 this sample reported substantially lower scores than the general population on subscales of physical functioning, current health, vitality, and mental health. When compared to patients with various chronic diseases, the subjects with SVT scored substantially lower in areas of physical functioning, energy/fatigue, health distress, anxiety, and mental health. Patients with SVT scored approximately the same as those patients with chronic diseases in areas of depression and positive affect.

Patients with SVT scored about the same as patients suffering a recent myocardial infarction in physical functioning and current health, yet lower in vitality and mental health. Patients with chronic congestive heart failure scored better than this sample in areas of mental health, but about the same to slightly worse in physical functioning, current health, and vitality.

These findings demonstrate an incredible amount of health dysfunction for patients previously thought of as being very healthy and just having a benign, occasional fast heart rate. The subjects in this study reported significant impairment in many areas of their life and a poor QoL before RF ablation. These patients have

a low degree of physical function and little energy. This is substantiated with the high number of patients (77%) reporting fatigue in the sample. These patients also reported a high degree of worry and distress about their health. The symptomatic episodes required the patient to change jobs and driving habits and/or stop leisure activities, often affecting personal relationships and self-esteem. They perceived a significant negative impact of their condition on the quality of their lives.

Changes Following Radiofrequency Ablation

The majority of QoL measures improved at one month after ablation. Patients reported being significantly more satisfied with their life, current state of health, improved physical function, more energy, vitality, and mental health. Subjects noted less fatigue, anxiety, distress over their health, interruption of their life and activities due to SVT, and less amount of time that they were depressed or in low spirits. Fewer symptoms were also reported at a lesser amount of bothersomeness as prior to ablation. In clinical practice, SVT patients frequently appear anxious from the uncertainty regarding the paroxysmal episodes of SVT. Anxiety scale scores in this study demonstrated that this is true for patients with SVT before ablation, and the anxiousness significantly decreased following the procedure. Measures which did not significantly change included patients' overall rating of their general health, and days from work missed due to the SVT. Reasons why these scales did not significantly change could be multifactorial. However, patients who felt unhappy prior to ablation treatment, probably felt the same way following the procedure.

Ablation therapy would not be expected to change these aspects of one's personality or outlook towards life. Perhaps the one month follow up period was too soon for patients to note a change in an overall rating of their health. Many patients reported in the post-ablation questionnaire that they had taken time off from work to "recover" from ablation, "take it easy for awhile", or visit physician offices for follow up checks. Thus, the days marked for workdays missed due to SVT might have not actually been due to symptoms or episodes of tachycardia, but to recuperating from the ablation procedure.

Symptom scores also demonstrated an overall improvement after ablation. The number of symptoms and the total symptom severity scores were reduced by 50%. The remaining symptoms were reported to be significantly less bothersome.

Some patients may have falsely elevated reports of SVT frequency and duration after RF ablation. Several patients spoke of no episodes of SVT following ablation, yet marked a specific frequency and duration of a sustained tachycardia on the post-ablation questionnaires. Later in the study when patients were called to ask about their answers, they reported having only random "heart flutters". The explanation for the continued symptoms of palpitations reported by 21%-48% of the sample following ablation is puzzling. Patients commonly describe isolated feelings of "heart flutters" or "heart skips" for many weeks following ablation, which eventually disappear in the majority of patients. Perhaps this is what these patients were feeling and reported. It is unclear whether this was actually an episode of SVT

or isolated palpitations. The reports of no episodes in 67% of the sample after RF ablation seem to suggest that the symptoms of "heart flutters", "heart skipping", and "heart racing" were isolated palpitations. It remains to be explored in future studies how long these palpitations actually last in patients following this procedure, and if some of these palpitations indicate in which patients this procedure was not completely successful.

The actual incidence of symptoms and QoL scores could be much worse than that reported in this study. It could be hypothesized that patients with episodic tachycardias might be symptom free and report good health during periods between SVT events, thus the scores reported by these patients could be falsely elevated (better QoL), if any patients had not experienced a recent episode. However, the scores reported on the impact of SVT measure would also be expected to have been high (better QoL), given this hypothesis. This was not the case, in fact the impact of SVT scores demonstrated that patients' lives were severely affected by living with SVT.

Ablation appears to have a dramatic effect on improving QoL and decreasing symptom scores for this sample. The decrease in both frequency and severity of symptoms following RF ablation was strongly associated with improved QoL scores.

II. Strengths and Limitations

Strengths

Although researchers have recently begun to investigate QoL in patients with

SVT, most have defined (and therefore) measured QoL inadequately. The concept of QoL has been defined as merely mortality, morbidity, or physical functioning. Questionnaires have typically been investigator designed and not standardized, with no reporting of psychometric properties of the tool. This has been one of the first studies to examine QoL in patients with SVT with a generic and disease specific approach. Development of this questionnaire was thoughtfully and thoroughly carried out by incorporating clinical experience, literature review, and both health care and patient expertise.

As previously discussed, measuring the symptom experience and symptom outcomes for SVT patients is in the early stages and has been carried out in an inconsistent, fragmented fashion. This study was important in advancing the science of understanding the symptom experience of patients with SVT. The symptom management model described by Larson and colleagues (1994), provided a strong conceptual framework to this study. Utilizing the symptom management model assisted the researcher in building a theoretical framework for exploring symptom management in SVT patients. Quality of life was conceptualized in this study as a multidimensional and complex construct, incorporating both generic and disease specific measures, such as the impact of SVT and symptom checklist measures. The sample was not limited to only patients with atrial fibrillation, as the literature mainly discusses, but included patients with a variety of types of SVT.

Limitations

Because most of these patients came from a tertiary referral center, it could be construed that they represented all patients with SVT, when in actuality, they may be only the most symptomatic. The patients recruited for this study were willing to risk undergoing a very invasive procedure for definitive treatment of the SVT. This highly motivated, and highly symptomatic group of patients may be very different from other groups of patients with SVT. Perhaps it was the fact that the majority of these patients were treated at a busy referral center used to dealing with arrhythmia patients. Therefore the improvement after RF ablation could be attributed to patient confidence and a sense of security instilled by the expert physicians and nurses at this center, rather than from the ablation procedure.

In the present study, patients with SVT showed a dramatic improvement in all areas following the RF ablation procedure. Since only patients undergoing successful ablation were included in this sample, serious selection bias is likely and would allow these findings to be relevant to patient populations with similar successful ablation procedures. The one month follow up demonstrates improved QoL scores, and results could indicate a euphoria from knowing that the SVT was cured and the situation resolved. Perhaps at later follow up points these initial results would plateau or decrease to some new baseline as time went on. It would be important to pursue longer follow up in future studies of QoL with dysrhythmia patients to determine if these encouraging findings persist.

A randomized clinical trial would give more conclusive, definitive answers to these questions. There was no control group in this study. It is hard to imagine that this type of study would be possible however, because of the ethical issues involved in withholding such a highly effective, low morbidity procedure from patients. Finding a group of patients who are managed medically, rather than with ablation, would also involve comparisons of different types of medical centers and settings which would include additional confounding effects.

Other limitations to this study are those inherent to all survey research. These are factors such as under reporting of undesirable characteristics, and over reporting of desirable behaviors. Other QoL researchers have reported that co-existing conditions may account for up to 13 point differences in QoL scores (Stewart et al., 1989). However, there was such a low incidence of comorbid conditions in this sample that this was probably not a factor in the present study. Other questions arising in survey research is whether the subjects who chose not to respond were the patients who had worse outcomes. Attempts were made to confront this issue by comparing the patients who returned the baseline questionnaire to the patients who returned both. These groups were not significantly different. It is unclear however, whether the most ill patients were the ones who did not return any of the questionnaires.

III. Findings in Relationship to the Literature

These findings support prior work on the range of symptoms in patients with

SVT (Bhandari and associates, 1992; Wood et al., 1994; Wood, Drew & Scheinman, in press). More recently the work done by Bubien and colleagues on QoL and symptom frequency/severity in patients with a variety of dysrhythmias also supports this study's findings that patients with SVT are severely symptomatic prior to RF ablation. The findings from the present study also support prior work noting the improvement in QoL of patients following RF ablation (Brignole and colleagues, 1994; Bubien and associates, in press; Fitzpatrick et al., 1996; Jenkins and colleagues, 1995; Jensen and colleagues, 1995; Knotts and colleagues, 1994; Lesh, Tracy, Cooperman, & Langberg, 1994; Olgin and Scheinman, 1993). However these findings are in contrast to those of Hamer and associates (1994) which suggest that patients with SVT are basically well-adjusted with only moderately disruptive symptoms.

Dysrhythmia occurrence follows an acute, episodic pattern. Findings from this study confirmed previous work that the paroxysmal and unpredictable nature of SVT occurrence, the frequency, severity, and duration of symptoms, as well as any emergency department visits and hospitalizations had detrimental effects on the patient's QoL (Bubien and associates, in press; Ganz & Friedman, 1995; Wood et al., in press). In addition to the actual disability caused by the episodic symptoms themselves, QoL was further impaired by limits on physical, emotional, social, and sexual activities, as well as medication side effects.

Palpitations, previously noted by others to be the classic clinical feature of all

the tachycardias, were also reported by over 71% of this sample (Brugada et. al, 1993; Luria, 1971). Morady and associates (1985) also noted symptoms of palpitations (57%), chest pain (27%), dyspnea (25%), weakness (6%), nausea (3%), diaphoresis (3%), and flushing (2%) in their sample of patients with ventricular arrhythmias. In contrast to patients with ventricular arrhythmias, patients in this study had a much higher incidence of palpitations, chest pressure, dyspnea, fatigue, nausea, and feelings of warmth/flushing. In contrast to findings by Gursoy et al. (1992), those from the present study indicated that the symptom of pounding in the neck was seen not only in patients with AVNRT, but more frequently in patients with AVRT and atrial tachycardia. Future research is necessary to determine if this difference is due to a lack of power in the AVRT and atrial tachycardia groups, or the that neck pounding may be a non-specific symptom in SVT.

Anecdotal patient comments from the present study would support conclusions drawn by Lau and associates (1995). Patients with SVT have many concerns about strenuous activities, long distance travel, psychological burdens, dietary restrictions, and potential adverse effects on their job due to the SVT. Future qualitative research is needed to explore these concerns thoroughly.

IV. Implications for Clinical Practice

As has been discussed in the previous paper, RF ablation is the current treatment of choice for curing most of the SVTs commonly seen. Yet many patients are managed on a variety of drugs before RF ablation is recommended. This has

historically been the case because these patients can be managed long term by primary care practitioners before referral to a cardiologist or electrophysiologist occurs. It would seem from these results, that gatekeepers, such as internal medicine or family practice physicians, and nurse practitioners, need to refer patients sooner for this procedure. Perhaps RF ablation should be recommended for even mildly symptomatic patients based on these findings.

Nurses have been forced to extrapolate from the literature written about ventricular dysrhythmia subjects information regarding the symptomatology and QoL of SVT patients. This study provides important information that patients feel better and have an improved QoL following this procedure. This information allows nurses to educate patients and better assist them in decision making about treatment of SVT and post-procedure expectations.

The incidence of tachycardia polyuria, previously noted as occurring in 5%-19.2% of patients with regular, paroxysmal tachycardia, was noted in 25% of the sample in the present study (Brugada, Gursoy, Brugada, & Andries, 1993; Luria, 1971). Medical and nursing students have been taught in the past that the symptom of tachycardia polyuria is a classic symptom of tachycardias, but these results prove this to be not completely true. Educational materials should be updated to mention tachycardia polyuria as a possible symptom for patients with SVT, but certainly not a classic one.

V. Recommendations for Future Research

Future qualitative studies should be carried out to further examine what living with SVT is like and how life changes following RF ablation. This study provides data to suggest typical symptoms, but information on precipitating factors, and the meaning of the symptoms has not been obtained. Little information on patient management strategies is available (ie. lying down, standing on head, squatting, or carotid sinus massage), and should be addressed in further research. Patients are often told little about managing their symptoms at home, and it would be helpful to define what strategies patients find most useful. Psychological and behavioral responses to episodes of SVT, as well as following ablation, also remain to be defined.

Future research should more closely examine the symptom of fatigue in patients with SVT. Clinically, this author has noted several SVT patients complain of a post-ictal type of state after some SVT episodes. The symptoms and sensations of the post-episode period have not been explored. It stands to reason that the faster the heart rate during episodes of SVT, the more symptomatic patients would be. However, this was not always the case in this study. Additionally, studies should further explore the physiologic basis for the atypical type of chest pressure which patients reported in this study.

Organizing the findings of previous research within the symptom management model elucidated the large gaps in our current knowledge about SVT patients.

Seventy-five percent of the sample in this study were Caucasian, however SVT may occur in any ethnic group. More culturally diverse samples should be included in future SVT research, to examine how, or if, the symptom experience differs across ethnicities.

VI. Conclusion

The instrument designed for this study demonstrated good validity, reliability, and variability for measuring generic and disease specific aspects of QoL in an SVT population. Patients with SVT who participated in this study reported a significant impairment in many areas of their life and a poor QoL before RF ablation. At one month following the ablation procedure, these subjects reported significant reductions in number and severity of symptoms. These improvements in symptoms appear to be associated with improvement in physical, emotional, and social aspects of QoL.

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APPENDICES

Appendix A

Committee on Human Research Approvals

COMMITTEE ON HUMAN RESEARCH
OFFICE OF RESEARCH AFFAIRS, Box 0962
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

CHR APPROVAL LETTER

TO: Barbara J. Drew, Ph.D.
Box 0610

Kathryn Wood, R.N., M.S.N.
Box 0610

RE: Symptoms in Patients with Supraventricular Tachycardia: Impact on Quality of Life

The Committee on Human Research, the UCSF Institutional Review Board holding Department of Health and Human Services Multiple Assurance #M-1169, has reviewed and approved this application to involve humans as research subjects, with the following

COMMENT: For the next submission of the consent form, the members suggested that text beginning with the sentence "Your child's participation. . . ." in the Risks and Discomforts section be made into a separate paragraph labeled "Consent."

APPROVAL NUMBER: H6052-11480-01. This number is a UCSF CHR number and should be used on all consent forms, correspondence and patient charts.

APPROVAL DATE: March 30, 1995. **Expedited Review**

EXPIRATION DATE: April 1, 1996. If the project is to continue, it must be renewed *by the expiration date*. See reverse side for details.

ADVERSE REACTIONS/COMPLICATIONS: All problems having to do with subject safety must be reported to the CHR within ten working days.

MODIFICATIONS: All protocol changes involving subjects must have prior CHR approval.

QUESTIONS: Please contact the office of the Committee on Human Research at (415) 476-1814 or campus mail stop, Box 0962.

Sincerely,

Reese T. Jones, M.D.
Chairman
Committee on Human Research

cc:

Project # 95011480

Alta Bates

MEDICAL CENTER

September 22, 1995

MEMORANDUM TO: Susan Eisenberg, M.D., Kathy Wood, R.N., MSN
1545 Eddy St., Apt. 425, San Francisco, CA 94115

FROM: Committee for the Protection of Human Subjects

SUBJECT: LETTER OF APPROVAL OF PROTOCOL and CONSENT FORM - NEW
Protocol #636
Title: Symptoms in Supraventricular Tachycardia
Expiration Date: September, 1996

At its meeting on September 21, 1995, the Committee for the Protection of Human Subjects discussed and **approved the above listed protocol.**

A reminder will be sent to you before the protocol's expiration date. In order for the protocol to be considered for renewal, the renewal form and any required documentation must be completed and submitted before that month's agenda cutoff.

Any of the following changes must receive Committee approval: protocol modification(s) affecting subjects; consent form modification(s); protocol/procedure deletion(s), including reclassification of any of the procedures to standard therapy.

All complications must be reported immediately to the Committee. Unanticipated risks or new information that may affect the risk/benefit ratio must be promptly reported to, and reviewed by, the Committee to ensure adequate protection of the welfare of human subjects.

Please direct renewal forms and questions about agenda due dates to the Medical Staff Services Office, 204-1414. If you have any other questions, please contact either of the CoChairperson(s), Doctors Carol Brosgart or Susan Jacobson.

CB:SJ:lj

approve.new

Alta Bates Medical Center
2450 Ashby Avenue, Berkeley, CA 94705
Tel 510.204.4444

Appendix B

Data Collection Instruments

Quality of Life Questionnaire

1. In general, would you say your health is:

☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

2. How happy, satisfied, or pleased have you been with your personal life during the past month? (Circle one number)

Extremely happy, could not have been more satisfied and pleased	1
Very happy most of the time	2
Generally satisfied, pleased	3
Sometimes fairly satisfied, sometimes fairly unhappy	4
Generally dissatisfied, unhappy	5
Very dissatisfied, unhappy most of the time	6

Does your health limit you in the following activities? (Circle one number on each line)

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. Vigorous activities such as lifting heavy objects, running or participating in strenuous sports.	1	2	3
4. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	1	2	3
5. Lifting or carrying groceries	1	2	3
6. Climbing several flights of stairs.	1	2	3
7. Climbing one flight of stairs.	1	2	3
8. Bending, kneeling, or stooping.	1	2	3
9. Walking more than a mile.	1	2	3
10. Walking several blocks.	1	2	3
11. Walking one block.	1	2	3
12. Eating, dressing, bathing, or using the toilet.	1	2	3

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Please circle one number in each line that best describes whether each of the following statements is true or false for you.

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
13. I am somewhat ill.	1	2	3	4	5
14. I am as healthy as anybody I know.	1	2	3	4	5
15. My health is excellent.	1	2	3	4	5
16. I have been feeling bad lately.	1	2	3	4	5

For each of the following questions, please circle the number for the one answer that comes closest to the way you have been feeling during the past 4 weeks. Circle one number on each line.

How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
17. Did you feel tired?	1	2	3	4	5	6
18. Have you been a very nervous person?	1	2	3	4	5	6
19. Have you felt calm and peaceful?	1	2	3	4	5	6
20. Did you feel depressed?	1	2	3	4	5	6
21. Did you feel worn out?	1	2	3	4	5	6
22. Were you afraid because of your health?	1	2	3	4	5	6
23. Did you feel full of pep?	1	2	3	4	5	6
24. Were you discouraged by your health problem?	1	2	3	4	5	6
25. Have you felt downhearted and blue?	1	2	3	4	5	6
26. Did you have a lot of energy?	1	2	3	4	5	6

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27. During the past 4 weeks, how many days did you miss work or school due to your fast heart rhythm? (Write in the number of days)

☐☐ days

28. How many days during the past 4 weeks did you cut down on the things you usually do because of your fast heart rhythm? (Write in the number of days)

☐☐ days

For each of the following questions, please circle the number for the one answer that comes closest to the way you have been feeling during the past 4 weeks. Circle one number on each line.

How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
29. Have you felt cheerful or lighthearted?	1	2	3	4	5	6
30. Did you feel that you had nothing to look forward to?	1	2	3	4	5	6
31. Was your health a worry in your life?	1	2	3	4	5	6
32. Has your life been full of things that were interesting to you?	1	2	3	4	5	6
33. Did you feel despair over your health problems?	1	2	3	4	5	6
34. Did you have enough energy to do the things you wanted to do?	1	2	3	4	5	6
35. Did you feel weighed down by your health problems?	1	2	3	4	5	6
36. Have you been a happy person?	1	2	3	4	5	6
37. How often has feeling depressed interfered with what you wanted to do?	1	2	3	4	5	6
38. How much of the time have you felt tense or "high-strung"?	1	2	3	4	5	6

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How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
39. Have you felt fidgety, restless, or impatient?	1	2	3	4	5	6
40. Have you been moody or brooded about things?	1	2	3	4	5	6
41. Have you been in firm control of your behavior, thoughts, emotions, and feelings?	1	2	3	4	5	6
42. Have you been in low or very low spirits?	1	2	3	4	5	6
43. Have you been bothered by nervousness, or your "nerves"?	1	2	3	4	5	6
44. Have you felt emotionally stable?	1	2	3	4	5	6
45. Have you been anxious or worried?	1	2	3	4	5	6
46. Were you frustrated about your health?	1	2	3	4	5	6
47. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
48. Have you felt loved and wanted?	1	2	3	4	5	6

49. How often on average, does your fast heart rhythm occur? (Circle one number)

Three or more times daily	1
Twice daily	2
Daily or almost daily	3
4-5 times a week	4
2-3 times a week	5
About 1 time a week	6
About 2 times a month	7
About 1 time a month	8
About 2-4 times a year	9
Almost never or never	10

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50. How long <u>on the average</u> do the fast heart rhythm episodes last? (Circle one number)

A few seconds	1
About 1-5 minutes	2
About 5-10 minutes	3
About 10-15 minutes	4
About 20-30 minutes	5
About 30-40 minutes	6
About 45 minutes to one hour	7
Longer than one hour	8

The following questions ask specifically about how your fast heart rhythm has affected your activities. Some people with several medical problems have difficulty determining what it is that limits them, but please go over the activities listed below and indicate how much limitation you have had due to **your fast heart rhythm** <u>over the past 4 weeks</u>.

51. <u>During the past 4 weeks</u>, how much did your fast heart rhythm interfere with the following things?

(Circle one number on each line)	Not at all	A little bit	Moderately	Quite a bit	Extremely
a. Your mood	1	2	3	4	5
b. Your ability to walk or move about	1	2	3	4	5
c. Your sleep	1	2	3	4	5
d. Your normal work (including both work outside of the home and housework)	1	2	3	4	5
e. Your recreational activities	1	2	3	4	5
f. Your enjoyment of life	1	2	3	4	5
g. Your social activities (like visiting friends or close relatives, or going out for dinner, or the movies)	1	2	3	4	5
h. Your ability to drive a car	1	2	3	4	5
i. Your relationship with spouse/partner or boyfriend/girlfriend	1	2	3	4	5
j. Your sexual relationship with spouse/partner or boyfriend/girlfriend	1	2	3	4	5

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Symptom Questionnaire

(a) **Have you had any of these symptoms in the last 4 weeks?** (Circle one number on each line)	NO	YES	(b) **If present, how much did it bother you?** (Circle one number on each line)				
			Not at all	A little bit	Moderately	Quite a bit	Extremely
Heart flutters	0	1	1	2	3	4	5
Heart skipping	0	1	1	2	3	4	5
Blurred vision	0	1	1	2	3	4	5
Neck pounding	0	1	1	2	3	4	5
Dizziness/lightheadedness	0	1	1	2	3	4	5
Headache	0	1	1	2	3	4	5
Passing a lot of urine	0	1	1	2	3	4	5
Sweating	0	1	1	2	3	4	5
Nausea	0	1	1	2	3	4	5
Fatigue/ no energy	0	1	1	2	3	4	5
Loss of appetite	0	1	1	2	3	4	5
Trouble sleeping	0	1	1	2	3	4	5
Trouble concentrating	0	1	1	2	3	4	5
Passing out	0	1	1	2	3	4	5
Hard to catch breath	0	1	1	2	3	4	5
Feeling warm/flushed	0	1	1	2	3	4	5
Chest pressure	0	1	1	2	3	4	5
Heart racing	0	1	1	2	3	4	5
Other:	0	1	1	2	3	4	5

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Quality of Life Questionnaire

1. In general, would you say your health is:

☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

2. How happy, satisfied, or pleased have you been with your personal life during the past month since your ablation? (Circle one number)

Extremely happy, could not have been more satisfied and pleased	1
Very happy most of the time	2
Generally satisfied, pleased	3
Sometimes fairly satisfied, sometimes fairly unhappy	4
Generally dissatisfied, unhappy	5
Very dissatisfied, unhappy most of the time	6

Has your health limited you in the following activities since your ablation? (Circle one number on each line)

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. Vigorous activities such as lifting heavy objects, running or participating in strenuous sports.	1	2	3
4. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	1	2	3
5. Lifting or carrying groceries	1	2	3
6. Climbing several flights of stairs.	1	2	3
7. Climbing one flight of stairs.	1	2	3
8. Bending, kneeling, or stooping.	1	2	3
9. Walking more than a mile.	1	2	3
10. Walking several blocks.	1	2	3
11. Walking one block.	1	2	3
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Please circle one number in each line that best describes whether each of the following statements is true or false for you since your ablation.

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
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15. My health is excellent.	1	2	3	4	5
16. I have been feeling bad lately.	1	2	3	4	5

For each of the following questions, please circle the number for the one answer that comes closest to the way you have been feeling during the past 4 weeks since your ablation. Circle one number on each line.

How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
17. Did you feel tired?	1	2	3	4	5	6
18. Have you been a very nervous person?	1	2	3	4	5	6
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23. Did you feel full of pep?	1	2	3	4	5	6
24. Were you discouraged by your health problem?	1	2	3	4	5	6
25. Have you felt downhearted and blue?	1	2	3	4	5	6
26. Did you have a lot of energy?	1	2	3	4	5	6

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27. During the past 4 weeks since your ablation, how many days did you miss work or school due to your fast heart rhythm? (Write in the number of days)

☐☐ days

28. How many days during the past 4 weeks since your ablation did you cut down on the things you usually do because of your fast heart rhythm? (Write in the number of days)

☐☐ days

For each of the following questions, please circle the number for the one answer that comes closest to the way you have been feeling during the past 4 weeks since your ablation. Circle one number on each line.

How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
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31. Was your health a worry in your life?	1	2	3	4	5	6
32. Has your life been full of things that were interesting to you?	1	2	3	4	5	6
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37. How often has feeling depressed interfered with what you wanted to do?	1	2	3	4	5	6
38. How much of the time have you felt tense or "high-strung"?	1	2	3	4	5	6

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How often during the past 4 weeks. . . .	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
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41. Have you been in firm control of your behavior, thoughts, emotions, and feelings?	1	2	3	4	5	6
42. Have you been in low or very low spirits?	1	2	3	4	5	6
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46. Were you frustrated about your health?	1	2	3	4	5	6
47. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
48. Have you felt loved and wanted?	1	2	3	4	5	6

49. How often on average over the past month since your ablation, did your fast heart rhythm occur? (Circle one number)

Three or more times daily	1
Twice daily	2
Daily or almost daily	3
4-5 times a week	4
2-3 times a week	5
About 1 time a week	6
About 2 times in the month	7
About 1 time in the month	8
Not at all	9

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50. Since your ablation how long did any episodes of the fast heart rhythm last? (Circle one number)

Not applicable	0
A few seconds	1
About 1-5 minutes	2
About 5-10 minutes	3
About 10-15 minutes	4
About 20-30 minutes	5
About 30-40 minutes	6
About 45 minutes to one hour	7
Longer than one hour	8

The following questions ask specifically about how your fast heart rhythm has affected your activities. Some people with several medical problems have difficulty determining what it is that limits them, but please go over the activities listed below and indicate how much limitation you have had due to **your fast heart rhythm** over the past 4 weeks since your ablation.

51. During the past 4 weeks since your ablation, how much did your fast heart rhythm interfere with the following things?

(Circle one number on each line)	Not at all	A little bit	Moderately	Quite a bit	Extremely
a. Your mood	1	2	3	4	5
b. Your ability to walk or move about	1	2	3	4	5
c. Your sleep	1	2	3	4	5
d. Your normal work (including both work outside of the home and housework)	1	2	3	4	5
e. Your recreational activities	1	2	3	4	5
f. Your enjoyment of life	1	2	3	4	5
g. Your social activities (like visiting friends or close relatives, or going out for dinner, or the movies)	1	2	3	4	5
h. Your ability to drive a car	1	2	3	4	5
i. Your relationship with spouse/partner or boyfriend/girlfriend	1	2	3	4	5
j. Your sexual relationship with spouse/partner or boyfriend/girlfriend	1	2	3	4	5

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Symptom Questionnaire

(a) **Have you had any of these symptoms in the last 4 weeks since your ablation?** (Circle one number on each line)	NO	YES	(b) **If present, how much did it bother you?** (Circle one number on each line)				
			Not at all	A little bit	Moderately bothersome	Quite a bit	Extremely bothersome
Heart flutters	0	1	1	2	3	4	5
Heart skipping	0	1	1	2	3	4	5
Blurred vision	0	1	1	2	3	4	5
Neck pounding	0	1	1	2	3	4	5
Dizziness/lightheadedness	0	1	1	2	3	4	5
Headache	0	1	1	2	3	4	5
Passing a lot of urine	0	1	1	2	3	4	5
Sweating	0	1	1	2	3	4	5
Nausea	0	1	1	2	3	4	5
Fatigue/ no energy	0	1	1	2	3	4	5
Loss of appetite	0	1	1	2	3	4	5
Trouble sleeping	0	1	1	2	3	4	5
Trouble concentrating	0	1	1	2	3	4	5
Passing out	0	1	1	2	3	4	5
Hard to catch breath	0	1	1	2	3	4	5
Feeling warm/flushed	0	1	1	2	3	4	5
Chest pressure	0	1	1	2	3	4	5
Heart racing	0	1	1	2	3	4	5
Other:	0	1	1	2	3	4	5

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Appendix C

University of California, San Francisco Consent Forms

University of California, San Francisco
Information Sheet about being a Research Subject

Purpose & Background: Barbara Drew, RN, PhD, Assistant Professor in the Department of Physiological Nursing and Kathryn Wood, RN, MSN, a doctoral student in the Department of Physiological Nursing, are conducting a research study to describe typical symptoms in patients with an irregular heartbeat. Because you have had an irregular heartbeat and perhaps have experienced some of these symptoms, you are being asked to participate in this study.

Procedures: If you agree to participate in this study, the following will occur:
(1) You will be asked to complete a six (6) page paper and pencil questionnaire. These questions will ask you information about how this irregular heartbeat has affected your life, which symptoms you have experienced, and how bothersome you find the symptoms are. The entire questionnaire booklet will be mailed to you to be filled out at home and mailed back to the researchers in a postage paid envelope. The questionnaire should take you approximately 15 minutes to complete. You will be asked to fill out this questionnaire before and again at about one month after your procedure to treat your heart rhythm.
(2) You will be asked to participate in a short 15 minute interview, which will be voice recorded, only if you give your permission. During this interview you will be asked to describe a typical episode of your fast heart rhythm, how long the episodes last, how frequently they occur, and how the episodes make you feel. These interviews will take place in a private room while you are waiting in the doctor's office at UCSF.

Risks & Benefits: The risks to you are minimal. In case any of the questions on the questionnaire or in the interview make you uncomfortable, you are free to decline to answer any questions or stop the interview at any time. All information from this study will be handled confidentially. Participation in research may involve a loss of privacy. However, your records will be kept as confidential as is possible under the law. A copy of the questionnaire will be kept in your physician's office. Only Kathryn Wood and Dr. Drew will have access to any voice recorded tapes. After the interview has been transcribed from the tapes, the tapes will be destroyed. No individual identities will be used in any reports or publications resulting from this study. There are no direct benefits to you for being in this study, however the findings of this study may provide information that will help other patients like yourself with irregular heartbeats.

You will not receive any reimbursement for participation in this study. **Your participation in this study is voluntary. You have the right to decline to participate and to withdraw at any time during the study without any jeopardy to your treatment and care.** If you choose to participate in this study, your completion and return of the questionnaire will demonstrate your consent. If you choose NOT to participate in this study, your medical care will not be affected by this choice. If you have any comments or concerns about participating in this study, you should first contact the investigators at the numbers below. If for some reason you do not wish to do this, you may contact the Committee on Human Research, which is concerned with the protection of volunteers in research projects. You may reach the committee office between 8:00 and 5:00, Monday through Friday, by calling (415) 476-1814. If you have any questions or concerns about participation in this study, you may call Kathryn Wood at (415) 476-9406, or Dr. Barbara Drew at (415) 476-4302.

University of California, San Francisco
Consent to Participate in Research

Purpose & Background: Barbara Drew, RN, PhD, Assistant Professor in the Department of Physiological Nursing and Kathryn Wood, RN, MSN, a doctoral student in the Department of Physiological Nursing, are conducting a research study to describe typical symptoms in teenage patients with an irregular heartbeat. Because your child has had an irregular heartbeat and perhaps has experienced some of these symptoms, you are being asked to give your permission for your child to participate in this study.

Procedures: If you agree for your child to participate in this study, the following will occur:
(1) He/she will be asked to complete a six (6) page questionnaire. These questions will ask him/her information about how this irregular heartbeat has affected his/her life, which symptoms he/she has experienced, and how bothersome he/she finds the symptoms to be. The entire questionnaire booklet will be mailed to you for your child to fill out at home and mail back to the researchers in a postage paid envelope. The questionnaire should take approximately 15 minutes to complete. Your child will be asked to fill out this questionnaire before and again at about one month after his/her procedure to treat the fast heart rhythm.
(2) He/she will be asked to participate in a short 15 minute telephone interview, only if you and your child give your permission. During this interview he/she will be asked to describe a typical episode of the fast heart rhythm, how long the episodes last, how frequently they occur, and how the episodes make him/her feel.

Risks & Benefits: The risks to your child are minimal. In case any of the questions on the questionnaire or in the interview make your child uncomfortable, he/she is free to decline to answer any questions or stop the interview at any time. All information from this study will be handled confidentially. Participation in research may involve a loss of privacy. However, your child's records will be kept as confidential as is possible under the law. A copy of the questionnaire will be kept in your physician's office. No individual identities will be used in any reports or publications resulting from this study. There are no direct benefits to your child for being in this study, however the findings of this study may provide information that will help other teenage patients like your child with irregular heartbeats. Your child will not receive any reimbursement for participation in this study. **Your child's participation in this study is voluntary. He/she has the right to decline to participate and to withdraw at any time during the study without any jeopardy to his/her treatment and care.** If you choose to allow your child to participate in this study, you and your child will need to sign and date one copy of this consent form. You can return a signed copy of the consent form with your child's completed questionnaire in the postage paid return envelope. If you choose NOT to allow your child to participate in this study, his/her medical care will not be affected by this choice. If you or your child have any comments or concerns about participating in this study, you may call Kathryn Wood at (415) 476-9406 or Dr. Barbara Drew at (415) 476-4302.

_____ _____

Research Subject Signature Date

_____ _____

Parental Signature Date

Appendix D

Alta Bates Consent Form

Alta Bates Medical Center
Consent Form to Participate in Research

Research Study Title: Symptoms in Supraventricular Tachycardia: Impact on Quality of Life

IRB Protocol #:

Introduction: Before volunteering to participate in this research study, I agree to carefully read this Informed Consent document. It describes the purpose, procedures, and precautions of the study and the possible benefits, risks, and discomforts of study therapy. It also explains the alternative treatments available to me and my right to withdraw from the study at any time. My refusal to participate in this study will not influence my present or future medical care in any way.

Description of Research: This study is being conducted by Kathryn Wood, RN, MSN, a doctoral student at the University of California, San Francisco, and Drs. Randy Lieberman and Dr. Susan Eisenberg from Alta Bates Medical Center

A. Purpose & Background: This study will describe typical symptoms in patients with an irregular heartbeat. Because you have had an irregular heartbeat and perhaps have experienced some of these symptoms, you are being asked to participate in this study.

B. Procedures: If you agree to participate in this study, the following will occur:
(1) You will be asked to complete a six (6) page paper and pencil questionnaire. These questions will ask you information about how this irregular heartbeat has affected your life, which symptoms you have experienced, and how bothersome you find the symptoms are. The entire questionnaire booklet will be mailed to you to be filled out at home and mailed back to the researchers in a postage paid envelope. The questionnaire should take you approximately 15 minutes to complete. You will be asked to fill out this questionnaire before and again at about one month after your procedure to treat your heart rhythm.
(2) You will be asked to participate in a short 10 minute interview. During this interview you will be asked to describe a typical episode of your fast heart rhythm, how long the episodes last, how frequently they occur, and how the episodes make you feel. These interviews will take place in a private room while you are waiting in your doctor's office or over the phone, whichever is more convenient for you.

C. Risks & Precautions: The risks to you are minimal. In case any of the questions on the questionnaire or in the interview make you uncomfortable, you are free to decline to answer any questions or stop the interview at any time.

D. Potential Benefits: There are no direct benefits to you for being in this study, however the findings of this study may provide information that will help other patients like yourself with irregular heartbeats.

E. Compensation: You will not receive any reimbursement for participation in this study.

F. The Right to Withdraw: Your participation in this study is voluntary. You have the right to decline to participate and to withdraw at any time during the study without any jeopardy to your treatment and care. If you choose to participate in this study, your completion

and return of the questionnaire will demonstrate your consent. If you choose NOT to participate in this study, your medical care will not be affected by this choice.

G. Questions: If you have any comments or concerns about participating in this study, you should first contact Kathryn Wood at (415) 476-9406. If for some reason you do not wish to do this, you may contact the Committee for the Protection of Human Subjects at Alta Bates Medical Center, which is concerned with the protection of volunteers in research projects. You may reach the committee office between 8:00 and 5:00, Monday through Friday, by calling (510) 204-1414. If you have any questions or concerns about participation in this study, you may call Kathryn Wood at (415) 476-9406 or your physician at (510) 204-1478.

H. Confidentiality: All information from this study will be handled confidentially. Participation in research may involve a loss of privacy. However, your records will be kept as confidential as is possible under the law. Only Kathryn Wood and your doctor will have access to any of this information. No individual identities will be used in any reports or publications resulting from this study.

I. PARTICIPATION IN RESEARCH IS VOLUNTARY. I have the right to decline to participate or to withdraw at any point in the study without jeopardy to my medical care. If I wish to participate, I should sign below. With full knowledge of the above information, I consent to participate in this research study.

_____ _____

Patient's Signature Date

_____

Printed Name

_____ _____

Signature of Person Obtaining Consent Date

_____

Printed Name

Alta Bates Medical Center
Consent Form to Participate in Research

Research Study Title: Symptoms in Supraventricular Tachycardia: Impact on Quality of Life

IRB Protocol #:

Introduction: Before volunteering to participate in this research study, I agree to carefully read this Informed Consent document. It describes the purpose, procedures, and precautions of the study and the possible benefits, risks, and discomforts of study therapy. It also explains the alternative treatments available to me and my right to withdraw from the study at any time. My refusal to participate in this study will not influence my present or future medical care in any way.

Description of Research: This study is being conducted by Kathryn Wood, RN, MSN, a doctoral student at the University of California, San Francisco, and Drs. Randy Lieberman and Dr. Susan Eisenberg from Alta Bates Medical Center.

A. Purpose & Background: This study will describe typical symptoms in teenage patients with an irregular heartbeat. Because your teenage child has had an irregular heartbeat and perhaps has experienced some of these symptoms, you and your child are being asked to give permission for your child to participate in this study.

B. Procedures: If you agree for your child to participate in this study, the following will occur: **(1)** He/she will be asked to complete a six (6) page paper and pencil questionnaire. These questions will ask him/her information about how this irregular heartbeat has affected his/her life, which symptoms he/she has experienced, and how bothersome he/she finds the symptoms to be. The entire questionnaire booklet will be mailed to your child to fill out at home and mail back to the researchers in a postage paid envelope. The questionnaire should take approximately 15 minutes to complete. Your child will be asked to fill out this questionnaire before the procedure and again at about one month after his/her procedure to treat the fast heart rhythm. **(2)** He/she will be asked to participate in a short 10 minute interview. During this interview he/she will be asked to describe a typical episode of the fast heart rhythm, how long the episodes last, how frequently they occur, and how the episodes make him/her feel. These interviews will take place in a private room in the same area where you will be waiting while you are at your doctor's office or over the phone, whichever is more convenient for you.

C. Risks & Precautions: The risks to your child are minimal. In case any of the questions on the questionnaire or in the interview make your child uncomfortable, he/she is free to decline to answer any questions or stop the interview at any time.

D. Potential Benefits: There are no direct benefits to your child for being in this study, however the findings of this study may provide information that will help other patients with irregular heartbeats.

E. Compensation: You or your child will not receive any reimbursement for participation in this study.

F. The Right to Withdraw: Your child's participation in this study is voluntary. He/she

has the right to decline to participate and to withdraw at any time during the study without any jeopardy to your treatment and care. If you choose to allow your child to participate in this study, you will be asked to sign the consent form and return one (1) copy with the completed questionnaire. If you or your child choose NOT to participate in this study, your child's medical care will not be affected by this choice.

G. Questions: If you or your child has any comments or concerns about participating in this study, you should first contact Kathryn Wood at (415) 476-9406. If for some reason you do not wish to do this, you may contact the Committee for the Protection of Human Subjects at Alta Bates Medical Center, which is concerned with the protection of volunteers in research projects. You may reach the committee office between 8:00 and 5:00, Monday through Friday, by calling (510) 204-1414. If you have any questions or concerns about participation in this study, you may call Kathryn Wood at (415) 476-9406 or your physician at (510) 204-1478.

H. Confidentiality: All information from this study will be handled confidentially. Participation in research may involve a loss of privacy. However, your child's records will be kept as confidential as is possible under the law. Only Kathryn Wood and your doctor will have access to any of this information. No individual identities will be used in any reports or publications resulting from this study.

I. PARTICIPATION IN RESEARCH IS VOLUNTARY. You and your child have the right to decline to participate or to withdraw at any point in the study without jeopardy to your child's medical care. If you wish to allow your child to participate, you both should sign below. With full knowledge of the above information, you and your child are consenting to participate in this research study.

_____ _____

Patient's Signature Date

_____

Printed Name

_____ _____

Parent/Guardian's Signature Date

_____

Printed Name

_____ _____

Signature of Person Obtaining Consent Date

_____

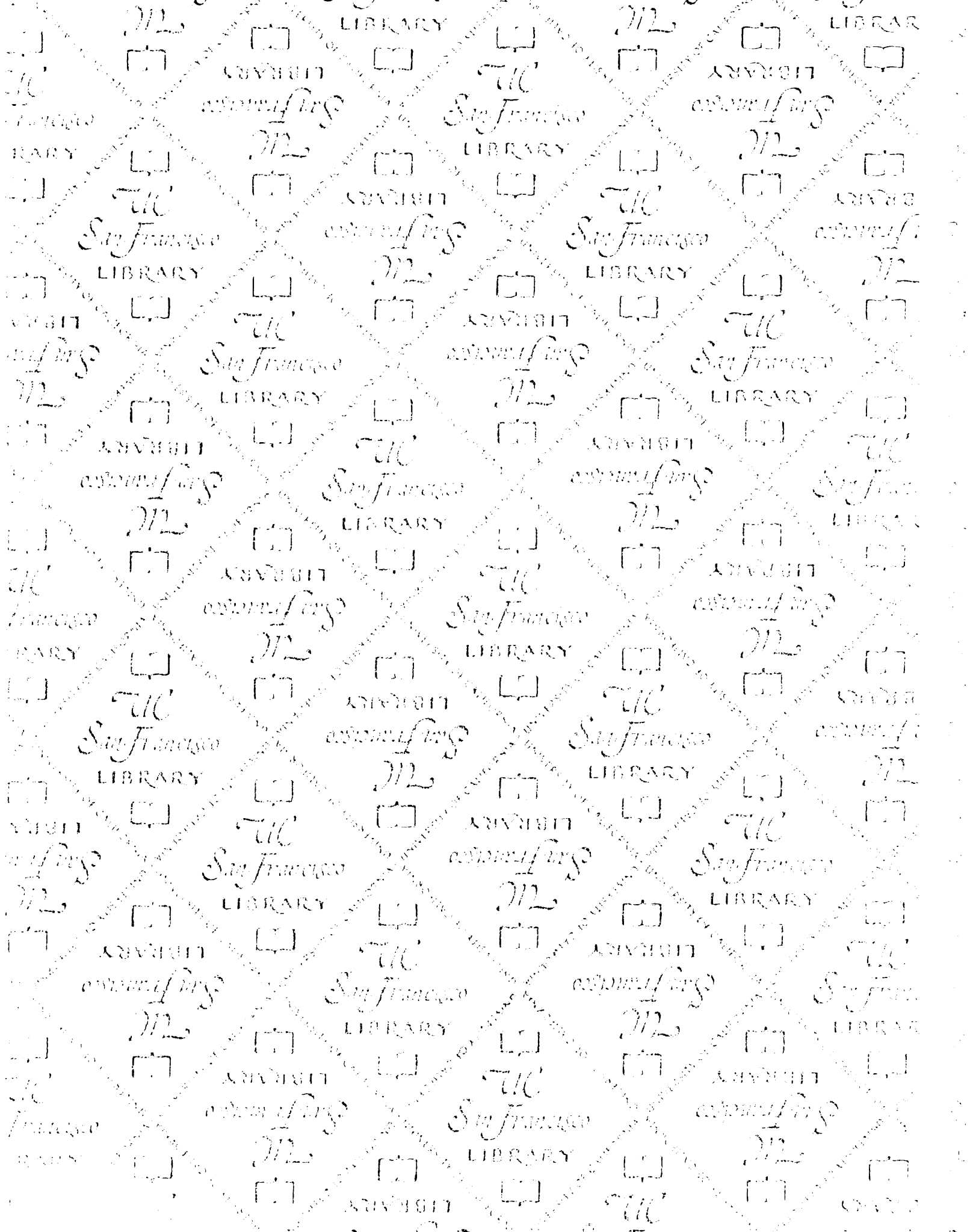
Printed Name

The only QoL studies done in an SVT population have utilized mainly atrial fibrillation patients with decreased cardiac function. This is different from the typical SVT patient. Of the QoL measures commonly used in cardiac populations, none is appropriate for SVT subjects. The MOS SF-36 is appealing due to its ease of administration, generic comparisons to other patient groups, and good psychometric properties. Even this instrument however, must be adapted with disease specific measures for use in a SVT population.

Utilizing the symptom management model discussed earlier in this paper would assist researchers in building a conceptual framework of symptom management in SVT patients. The information obtained would give nurses much to offer these SVT patients and their families in the future. Drawing from the small number of papers discussed relating to SVT patients, results suggest that SVT patients' symptoms may be more interruptive and disabling than previously thought and deserve further investigation.

VIII. Research Questions

The following questions were addressed in this study: (1) What is the frequency and severity of physical and emotional symptoms experienced by patients who have SVT? (2) Do these symptoms differ among the three groups (based on the underlying mechanisms) of patients with SVT? (3) What are the average QoL scores of SVT patients and how do these scores compare to other groups of general and patient populations? (4) Do symptoms and other aspects of QoL change after RF ablation treatment?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