

**DEVELOPMENT OF AN ADVANCED PRACTICE NURSE-MANAGED
PACEMAKER CLINIC**

by

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Statement By Author

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Introduction

Approximately 162,000 (77,000 in men and 86,000 in women) pacemakers were implanted in the United States during 1999 (American Heart Association, 2002). Because of advancing technology and evolving indications for pacemaker therapy, these numbers are certainly increasing. In October of 2002, the U.S. House of Representatives passed a bill to speed the approval and marketing of a new generation of medical technology including cardiac pacemakers (Pear, 2002). For the patients with a new pacemaker and the other hundreds of thousands of patients who already have a pacemaker, periodic evaluations are crucial to not only assess their pacemaker and cardiac function, but to maintain their quality of life.

The multitude of settings in which Advanced Practice Nurses (APN) are practicing is increasing. However, presently there is a paucity of information describing or supporting the role of the APN related to cardiac pacemaker management. The literature demonstrates the success of the Advanced Practice Nurse (APN) in primary care, acute care, cardiovascular care, and a multitude of other settings. Mundinger et al. (2000) found evidence to strongly support similar patient outcomes comparing nurse practitioners and physicians. Currently, there are many successful clinics led by APNs for conditions such as congestive heart failure (CHF), anticoagulation, and heart transplant recipients (Morse, 2001; Paul, 1997; Porter, 2002). “Advanced practice nurses (APNs) are being recognized increasingly for their role in promoting quality care while containing cost” (Porter, 2002). A pacemaker clinic is another example of a setting in

which an advanced practice nurse could demonstrate a positive effect on patient outcomes and cost containment.

The purpose of this project is to create a framework for the APN-managed pacemaker clinic. This framework, which could be used as a foundation by which an APN can manage a pacemaker clinic, is based on the primary criteria, central competency, and core competencies of advanced nursing practice, as described by Hamric, Spross and Hansen (2000). An APN-managed pacemaker clinic would provide the greatly needed service of pacemaker follow-up, therefore improving patient care related to pacemakers and contribute to patient quality of life and well-being.

Theoretical Framework

This project is based on the integrated approach of Hamric et al. (2000), which conceptualizes advanced nursing practice as follows: “Advanced nursing practice is the application of an expanded range of practical, theoretical, and research-based therapeutics to phenomena experienced by patients within a specialized clinical area of the larger discipline of nursing (Hamric, 1996, p. 47)” (pp. 57). They go on to further define advanced nursing practice with three primary criteria, a central competency, and six core competencies.

Primary Criteria

The three primary criteria or qualifications are explained as necessary elements of advanced nursing practice, but are not sufficient in and of themselves. These primary

criteria are: 1) Graduate education, 2) Certification, and 3) Practice focused on patient/family. For the purposes of this project, Hamric's framework has been modified to include a fourth criterion. The addition to the framework is 4) Expertise in area of specialty.

Central Competency

Next, the central competency of *direct clinical practice* is "central to and informs all of the others" (Hamric et al., 2000, pp. 61). The specific content of the direct clinical competency differs with each specialty but Hamric explains that excellence in this competency is first and foremost to advanced practice nursing. The five characteristics of the direct clinical care provided by APNs are:

- 1) The use of a holistic perspective
- 2) The formation of partnerships with patients
- 3) Expert clinical thinking and skillful performance
- 4) Use of research evidence as a guide to practice
- 5) The use of diverse approaches to health and illness management

Core Competencies

Last are the six core competencies that further define advanced nursing practice regardless of specialty or setting:

- 1) Expert guidance and coaching of patients, families, and other care providers
- 2) Consultation
- 3) Research skills, including utilization, evaluation, and conduct
- 4) Clinical and professional leadership, which includes competence as a change agent
- 5) Collaboration
- 6) Ethical decision-making skills

Each of these six core competencies will be presented in more detail.

Expert Coaching and Guidance

“APN coaching may be defined as a complex, dynamic collaborative, and holistic interpersonal process that is mediated by the APN-patient relationship and the APN’s self-reflective skills” (Hamric et al., 2000, pp. 192). The word “coaching” is used instead of “teaching” to imply the presence of a relationship that is necessary for effective teaching. According to Hamric et al., coaching is a key foci of the APN’s direct care role and not only applies to patients but also to families and other healthcare providers. Hamric stresses the idea that APNs coach through “transitions” which make up the natural course of human lives. The transitions situations that require coaching can be categorized as: 1) Health/ Illness, 2) Developmental, 3) Situational, or 4) Organizational. The APN must know and apply the theoretical and scientific bases for patient teaching

within his/her specialty; however, an expert coach combines education, experience, interpersonal competence, and self-reflection (Hamric et al., 2000).

Consultation

“Consultation is an interaction between two professionals in which the consultant is recognized as having specialized expertise (Caplan, 1970; Caplan & Caplan, 1993)” (Hamric et al., 2000, pp. 220). “Consultation” differs from and should not be used interchangeably with “collaboration”, “co-management”, or “referral”. The goal of consultation is to enhance patient care as well as advance skills and confidence of the consultee. The consultant may or may not see the patient and the consultation is often a one-time event. Hamric et al. (2000) proposes the principles of consultation:

- 1) The consultee usually initiates the consultation.
- 2) The relationship between the consultant and consultee is nonhierarchical and collaborative.
- 3) The consultant always considers contextual factors when responding to the request for consultation.
- 4) The consultant has no direct authority for managing patient care.
- 5) The consultee is free to accept or reject the recommendations of the consultant.
- 6) The consultation should be documented.

The most common consultation situations occur APN to APN and APN to Physician. The call for consultation is frequently related to the consultee's level of diagnostic uncertainty although the consulting APN is likely to already have an idea of how he/she would manage a specific problem. "Consultation offers APNs the opportunity to both share and receive the clinical expertise necessary to meet the increasingly challenging and diverse demands of patient care" (Hamric et al., 2000, pp. 241-242).

Research

APN research competencies consist of using research in practice (research utilization) and basing practice on systematic scientific observation (evidence based medicine). The knowledge and application of research can also boost the credibility of APNs and their interventions (Hamric et al., 2000). "Evidence-based practice refers to the integration of clinical judgment with the most current, relevant, and defensible research evidence to guide healthcare decisions and clinical practice" (DeBourgh, 2001, pp. 492).

Hamric describes three research competencies: 1) interpretation and use of research, 2) evaluation of practice, and 3) participation in collaborative research. All three of these competencies are learned through deliberate education and experiences geared toward research and its applications. "These competencies are essential to APNs as they define, implement, refine, validate and evaluate their practices and as they move

forward to take visible leadership positions in the health care system of the future”
(Hamric et al., 2000, pp, 275).

Leadership

Unexpected and constant change is a reality in the health care environment and how that change is managed is crucial. Change requires effective leadership and APNs play an important role as leaders in the process of change. According to Hamric et al. (2000) there are four different types of leadership. *Clinical leadership* is displayed via role models and mentors who empower patients and colleagues. “They serve as change agents who implement change strategies that improve patient care and enhance APN practice enactment” (pp. 283). *Interdisciplinary leadership* requires the skills necessary to interact with issues in another profession and therefore occurs at a very high level. *Entrepreneurial leadership* refers to those who go outside the traditional APN positions and create new opportunities to exercise their unique abilities. Strong entrepreneurial skills are strongly suggested to succeed in the marketplace today. Last, *organizational leadership* refers to positions of power within organizations that the ANP is appointed or elected. These positions are important to the growth and strength of the APN personally as well as professionally.

Collaboration

Collaboration is a dynamic, interpersonal process in which two or more individuals make a commitment to each other to interact authentically and

constructively to solve problems and to learn from each other in order to accomplish identified goals, purposes, or outcomes. The individuals recognize and articulate the shared values that make this commitment possible (Hamric et al., 2000, pp. 318).

Research demonstrates that collaboration works and the presence or absence of collaboration affects patient care. It has even been shown to decrease cost of care. In order for collaboration to be successful the APN must possess or acquire the skills and behaviors necessary. Hamric et al. (2000) explains, “Collaboration depends on clinical and interpersonal expertise and an understanding of factors that can promote or impede efforts to establish collegial relationships” (pp. 316).

There are several characteristics of effective collaboration including; common purpose, clinical competence, interpersonal competence, trust, valuing and respecting of diverse, complementary knowledge and humor. Of all those listed, clinical competence is possibly the most significant because without it, the trust and desire needed to work together are not possible (Hamric et al., 2000).

Ethical Decision –Making Skills

There are many factors in the health care system that have increased the number and complexity of ethical issues. According to Hamric et al. (2000), APNs are increasingly being called on to be actively involved with the patient, family, and health care team in comprehending and seeking ethical resolutions to multifaceted problems.

There are three phases of ethical decision-making and each phase relies on fully grasping phase at the previous level.

Phase I is knowledge development in both ethical theories and principles and the ethical issues common to specific patient populations. One key aspect is developing the ability to differentiate a true ethical dilemma from a clinically problematic situation. Phase II is applying the knowledge gained in Phase I. The APN must be actively involved in identifying and resolving the ethical dilemmas. Phase III is creating an ethical environment and it is expected that the APN becomes the teacher and mentor regarding ethical decision-making (Hamric et al., 2000).

As demonstrated in Figure 1, this framework is illustrated by three concentric circles. The innermost circle represents the primary criteria, the middle circle contains the central criteria and the largest, outermost circle is representative of the six core competencies. All of the circles are formed with dashed lines to illustrate how they are interdependent and how each informs the others. Together, these three circles represent a structure for the APN to use for practice and can specifically be applied to an APN-managed pacemaker clinic.

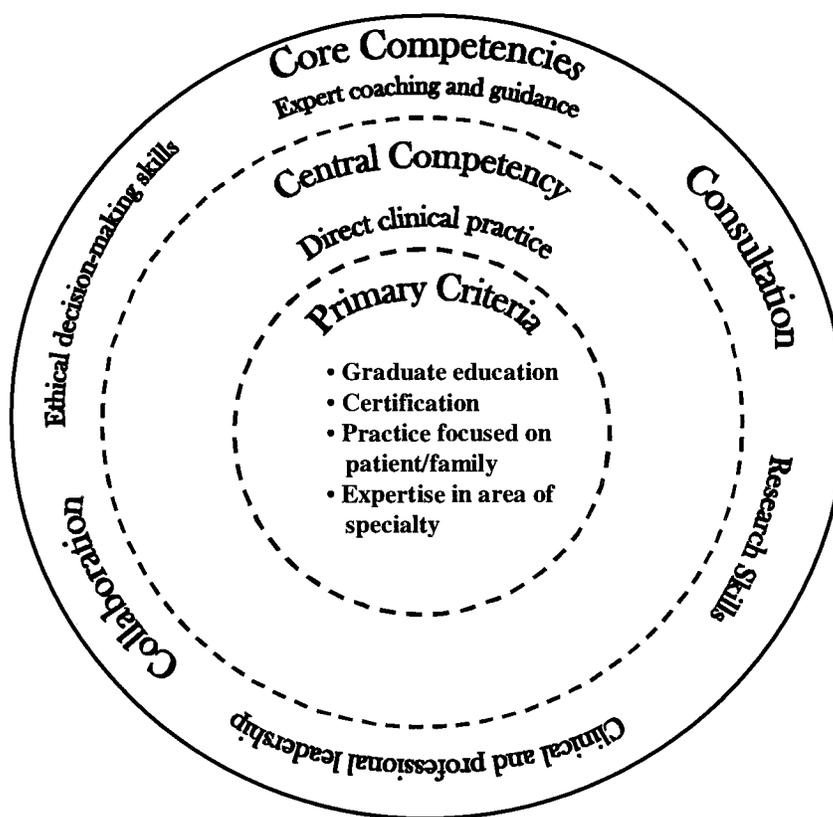


Figure 1. Primary criteria, central competency, and core competencies of advanced nursing practice. Modified from Hamric et al., (2000), pp. 63.

Background

Introduction

This background will briefly cover the development and advancement of pacemaker therapies. More extensive information regarding the indications for pacemaker therapy as well as pacemaker functions and other health-related considerations will then be provided. Last, there will be a discussion about the professionals who provide pacemaker care.

Development and Advancement of Pacemaker Therapies

The cardiac pacemaker was developed as a device to primarily manage symptomatic bradyarrhythmias. Through scientific research and rapidly innovative technology, the indications for the insertion of a permanent cardiac pacemaker have evolved beyond conduction system disorders (Obias-Manno, 2001). “Even the simplest modern pulse generator is considerably more complex than the most elaborate pacemaker of the 1980’s” (Bernstein et al., 1994, pp. 1724). To add to the complexity, the capabilities of the pacemaker are numerous and vary with each model and company. Most pacemakers can be programmed in literally millions of possible combinations.

Pacemakers today not only treat bradyarrhythmias, but also attempt to prevent and treat tachyarrhythmias. In addition to pacemakers, the implantable cardioverter-defibrillator (ICD) is particularly worthy of mention. Information regarding the ICD is invariably included in current pacemaker literature and research. Although this paper

concentrates on cardiac pacemakers, there will also be references to the ICD, as many patients will have a device with capabilities of both pacing and defibrillation. The earlier single-chamber ICDs feature ventricular demand pacing for bradycardia and the more recent dual-chamber ICDs have all the capabilities of dual-chamber pacemakers, including adaptive-rate pacing and automatic mode-switching (Atlee & Bernstein, 2001).

Indications for Pacemaker Therapy

In September of 2002, the American College of Cardiology (ACC), the American Heart Association (AHA) and the North American Society for Pacing and Electrophysiology (NASPE) issued new practice guidelines for use of pacemakers. The complete guidelines are available in the October 16th 2002 issue of The Journal of the American College of Cardiology or online at www.acc.org, www.americanheart.org and www.naspe.org. These guidelines further expand the indications for pacemaker and ICD use (Faxon, 2002) and will serve as a learning and reference tool for the pacemaker clinic APN.

It is beyond the scope of this paper to examine every detailed indication for pacemaker therapy. However, the most common, traditional indications for permanent pacemaker therapy in the adult population will be briefly overviewed. Then, in order to illustrate the significance and complexity of the modern pacemaker patient, the nontraditional applications will be discussed in more detail.

According to the ACC/AHA, classifications I, II, and III are used to summarize indications for a pacing or ICD device as follows:

Class I: Conditions for which there is evidence and/or a general agreement that a device may be useful and effective.

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a device

Ia: Weight of evidence/opinion is in favor of usefulness/efficacy

Ib: Usefulness/efficacy is less well established by evidence/opinion

Class III: Conditions for which there is general agreement/evidence that a device is unnecessary and possibly even harmful (i.e., not indicated)

(Gregoratos et al., 2002).

Traditional Indications for Pacemaker Therapy

The first four sections of the 2002 ACC/AHA/NASPE Practice Guidelines outline the more common indications for pacemaker insertion. These sections contain the recommendations for permanent pacing in the following areas: 1) Acquired Atrioventricular Block (AVHB) in Adults, 2) Chronic Bifascicular and Trifascicular Block, 3) Atrioventricular Block Associated with Acute Myocardial Infarction (AMI) and 4) Sinus Node Dysfunction.

Acquired Atrioventricular Block (AVHB) in Adults.

Patients with AV conduction abnormalities may be asymptomatic or have symptoms related to bradycardia, ventricular dysrhythmias, or both. The presence or absence of symptoms directly attributable to bradycardia has an important influence on the decision to implant a permanent pacemaker. In addition, many

indications for pacing with AVHB have evolved over 30 years on the basis of experience rather than prospective randomized trials, in part because there is no good alternative treatment (Atlee & Bernstein, 2001, pp.1266).

AV block is classified as first-, second-, advanced second- or third-degree block. The Class I and Class II indications are numerous and detailed and can be found in Section I-A of the ACC/AHA/NASPE Practice Guidelines.

Chronic Bifascicular and Trifascicular Block.

Section I-B of the 2002 ACC/AHA/NASPE Practice Guidelines outlines the recommendations for permanent pacing in Chronic Bifascicular and Trifascicular Block. Class I recommendations are for intermittent third-degree AV block, type II second-degree AV block, and alternating bundle-branch block (Gregoratos et al., 2002). Often the pacemaker is considered a prophylactic treatment if there has been syncope of an unknown cause and the patient has a bifascicular or trifascicular heart block.

Atrioventricular Block Associated with Acute Myocardial Infarction (AMI).

Converse to AVHB, pacing indications after acute myocardial infarction (AMI) are most often not related to symptoms but rather to the presence of intraventricular conduction defects. The recommendations generally follow the ACC/AHA Guidelines for the Management of Patients with Acute Myocardial Infarction. Also, related to patients with a prior AMI, there are new indications for ICD therapy. Patients with left ventricular ejection fraction of less than or equal to 30%, at least one month post MI and

three months post coronary artery revascularization surgery is considered a Class IIa recommendation for an ICD (Gregoratos et al., 2002, pp. 8).

Sinus Node Dysfunction.

Sinus node dysfunction may present itself as sinus bradycardia, sinus pause or arrest, or sinoatrial block, with or without escape rhythms. It may also manifest as chronotropic incompetence, when a patient cannot increase his/her heart rate to exercise or stress. Patients with sinus node dysfunction may have symptoms due to bradycardia, tachycardia, or both and correlation of symptoms with dysrhythmias is imperative. (Atlee & Bernstein, 2001). “Although sinus node dysfunction is frequently the primary indication for implantation of permanent pacemakers, permanent pacing in patients with sinus node dysfunction may not necessarily result in improved survival time, although symptoms related to bradycardia may be relieved” (Gregoratos et al., 2002, pp. 9).

Class I indications for pacing in sinus node dysfunction include bradycardia as a consequence of essential long-term drug therapy of a type and dose for which there are no acceptable alternatives (Gregoratos et al., 2002).

Nontraditional Applications in Pacemaker Therapy

Hypertrophic Obstructive Cardiomyopathy.

In hypertrophic obstructive cardiomyopathy (HOCM), there is asymmetric hypertrophic involvement of the septum, which leads to obstruction of mainly left ventricular outflow but occasionally also involves the right ventricle. When severe,

HOCM is frequently responsible for progressive symptoms of heart failure, angina and syncope (Lakkis, 2000). Dual-chamber pacing for HOCM has been proposed as an additional treatment for symptomatic patients refractory to drug therapy. There is no data to support that pacing alters the course of the disease or improves survival or quality of life. However, numerous isolated anecdotal observations as well as observational studies give credence to dual-chamber pacing for improvement of functional class and exercise duration in HOCM with associated reduction in outflow gradient (Obias-Manno, 2001). HOCM with sinus node dysfunction or AV block is a Class I indication and medically refractory, symptomatic HOCM with significant resting or provoked LV outflow obstruction is a Class IIb indication (Gregoratos et al., 2002, pp. 14).

Idiopathic Dilated Cardiomyopathy.

“Thirty to fifty percent of patients with congestive heart failure have intraventricular conduction defects which can lead to suboptimal contraction of a ventricle that is already hemodynamically compromised (Gregoratos et al., 2002). It has been shown that standard right ventricular apical pacing causes mechanical asynchrony of the right and left ventricles, leading to reduction in ejection fraction. A newer method of pacing, which involves three leads is biventricular (combined right and left ventricular) pacing or Cardiac Resynchronization Therapy, CRT. CRT can provide a more coordinated pattern of ventricular contraction and potentially reduces both QRS duration and ventricular asynchrony. The beneficial hemodynamic effects and increased quality of life as a result of CRT have been demonstrated in several studies and controlled trials. The biventricular pacing system also incorporates ICD capabilities

(Naccarelli, 2002). The current Class IIa recommendation is as follows: Biventricular pacing in medically refractory, symptomatic New York Heart Association (NYHA) class III or IV patients with idiopathic dilated or ischemic cardiomyopathy, prolonged QRS interval, LV end-diastolic diameter greater than or equal to 55 mm and ejection fraction less than or equal to 35% (Gregoratos et al., 2002, pp. 16).

Prevention and Termination of Tachyarrhythmias by Pacing.

When an arrhythmia such as symptomatic recurrent SVT is reproducibly terminated by pacing, it is a Class IIa recommendation for a permanent pacemaker. However, treatment with drugs and/or ablation therapy must first be attempted to control the SVT. Because it is highly unlikely that the previously mentioned treatments would fail, this recommendation was recently downgraded from a Class I to the current Class IIa. The sole Class I indication for pacing recommendations to prevent tachycardia is: sustained pause-dependent VT, with or without prolonged QT, in which the efficacy of pacing is thoroughly documented (Gregoratos et al., 2002, pp. 10).

Atrial Fibrillation.

Atrial fibrillation is the most common clinical arrhythmia and antiarrhythmic drug treatment is only about fifty percent effective (Bubien & Sanchez, 2001). Atrial fibrillation, unless it causes a symptomatic bradycardia, is not an indication for pacemaker therapy. However, the newer ACC/AHA/NASPE (2002) guidelines, specifically Section I-E: Prevention and Termination of Tachyarrhythmias by Pacing explains, "In some patients with bradycardia-dependent atrial fibrillation, atrial pacing

may be effective in reducing the frequency of recurrences” (pp. 10). Currently under investigation are several other pacing techniques focused at preventing atrial fibrillation such as dual-site (high right atrium and coronary sinus os) and biatrial (high right atrium and distal coronary sinus) pacing. There are also several new programmable features of pacemakers by which paroxysmal atrial fibrillation may be effectively prevented. Some involve chronic pacing of the atrium higher than the base sinus rate and others involve shortening the AV delay to avoid short-long cycles (Obias-Manno, 2001). The pacemaker also provides memory and diagnostic capabilities so efficacy of interventions can be determined (Mitchell, 2002). Also worthy of note is the clinical trial, The Dual Site Atrial Pacing for Prevention of Atrial Fibrillation, which explores the notion that patients may better tolerate antidysrhythmics because pacing minimizes the known bradycardic effects of antidysrhythmic agents (Bubien and Sanchez, 2001).

Hypersensitive Carotid Sinus and Neurocardiogenic Syncope.

A hyperactive carotid sinus response is defined as asystole lasting greater than 3 seconds due to sinus arrest or atrioventricular heartblock (AVHB), a sudden reduction in blood pressure, or both. Because this response can be a result of both cardioinhibitory (bradycardia, asystole, and AVHB) and vasodepressor (vasodilation with hypotension) components, the etiology must be determined prior to the prescription of pacemaker therapy (Atlee & Bernstein, 2001). The Class I indication for a pacemaker is recurrent syncope caused by carotid sinus stimulation; minimal carotid sinus pressure induces ventricular asystole of more than 3-second duration in the absence of any medication that depresses the sinus node or AV conduction (Gregoratos, et al., 2002, pp. 11).

Neurally mediated syncope or vasovagal syncope is a dysfunction of the autonomic nervous system, which results in hypotension, bradycardia and resultant loss of consciousness. The causes are primarily idiopathic but can be secondary to systemic disorders or medications. Using certain standard programming features on pacemakers may lead to amelioration or prevention of the syncope. Minimally, those patients would be adequately warned and take the necessary precautions to prevent falling (Obias-Manno, 2001). “Significantly symptomatic and recurrent neurocardiogenic syncope associated with bradycardia documented spontaneously or at the time of tilt-table testing” is a Class IIa indication for pacemaker therapy (Gregoratos et al., 2002, pp. 11).

Long-QT Syndrome.

Current research is being gathered on patients with long-QT syndrome and how to screen and identify these persons. There is also more of an awareness of which drugs can induce this syndrome. Persons with long-QT syndrome commonly develop a ventricular tachyarrhythmia (i.e., Torsade de Pointes) in relation to adrenergic stimulation or from a certain number of medications. Patients with pacemakers for long-QT should have relatively fast base rates to shorten the QT interval (Viskin, 2000). The newer generation dual-chamber pacemaker/defibrillator is the better option for these patients (Obias-Manno, 2001). High-risk patients with congenital long-QT syndrome is a Class IIa indication, however Torsade do Pointes VT due to reversible causes is a Class III (Gregoratos, et al., 2002, pp.10).

Pacemaker Functions

With the aforementioned pacemaker/ICD advancements and ever changing indications comes increased complexity with both the pacing system and overall care of the patient. Obias-Manno, 2001, expresses concern regarding the intricacy of basic pacemaker functions, “With the advent of sophisticated programming, pacemaker evaluation requires more than the usual understanding of basic functions. At times what appears to be malfunction may be appropriate therapy. The emergence of newer applications can further confuse the clinician's recognition of the desired goal of therapy” (pp. 136).

Numerous publications note the importance of optimally programming the pacemaker to increase battery life as well as enhance cardiac function. “Optimal programming of output voltages, pulse widths, and AV delays can markedly decrease battery drain; a study showed that expert programming of pacemaker generators can have a major impact on longevity, prolonging it by an average of 4.2 years compared with nominal settings ” (Gregoratos et al., 2002, pp. 23).

There are also safety issues to consider when programming a parameter such as the maximal pacing rate. A maximal pacing rate that is programmed too low can impair exercise capacity. “However, an individualized approach to determine the optimum heart rate limit is mandatory and specifically recommended in young and active patients with severe heart disease to avoid excess heart rates which might be harmful” (Reuters Health, 2002).

According to a local pacemaker educator, pacemaker functions are not being optimized on a consistent basis (David Bishop, personal communication, July 18, 2002). The reasons for this are numerous; the complexity of the newer pacemakers, the physician's time constraints, the availability of the device company representative and the fact that many persons performing the pacemaker evaluations are not adequately trained. A similar point is made in the literature.

Belott (1999) discusses the possible hemodynamic benefits of dual-chamber pacing in patients with dilated cardiomyopathy. "Despite the benefit of optimization of atrioventricular delay, dual-chamber pacemakers often are left at the default value...it is the consensus of independent researchers that optimization of AV interval is not routinely performed" (pp. 414).

It is also worthy of note that there are many conditions in the external environment that may interfere with pacemaker function. There are also various medications as well as metabolic conditions within the body that can influence pacemaker function and thresholds. There must be a thorough understanding of these conditions and medications to ensure safe patient care.

Health-Related Considerations

As mentioned above, there are many aspects of care to consider in the pacemaker patient other than the pacemaker itself. When a patient comes into a clinic for a pacemaker evaluation, there is often much more to the visit than pacemaker interrogation.

Hee et al. (1999) claims, “in our tertiary medical center’s pacemaker clinic we frequently encounter medical problems not directly related to the pacemaker” (pp. 327S). In a poster presentation, Hee et al. (1999) quantitated those problems and the necessary interventions. The reported patient complaints (No. = 181) were: dyspnea (26%), fatigue (20%), dizziness (37%), palpitations (12%), chest pain (10%), pacemaker pocket (5%) and others (13%). The problems (No. = 181) were related to: pacemaker (37%), hypertension (35%), arrhythmia (24%) and others (4%). There were 579 interventions performed by: a nurse (45%), pacer MD (40%), and follow-up MD (15%). The conclusion of Hee et al. (1999) is as follows:

- 1) Patients frequently have complaints of cardiac symptoms and/or problems detected during routine pacemaker clinic visits; 2) non-pacemaker problems outnumber those directly related to the pacemaker; and 3) same day physician involvement was required to handle a significant portion of these (pp. 328S).

The issue of non-pacemaker clinical problems is further illustrated in Bernstein et al.’s (1994) Recommendations for Direct Evaluation.

In a recent study of 250 consecutive direct pacemaker patient evaluations, about 80% of the problems detected were unrelated to pacing. Of those, almost half were classified as urgent (unstable angina, severe hypertension, and syncope). Moreover, patients may assume that their regular pacemaker monitoring provides adequate screening for incidental problems. Despite the low priority assigned to

such issues by the survey respondents, it is recommended that clinical problems unrelated to pacing be given close attention during direct evaluation (pp.1719).

In addition to the aforementioned clinical problems, the typical pacemaker patient will likely have cardiac related medical issues that coexist with the necessity of a pacemaker. The vast majority of pacemaker patients are elderly and cardiovascular disease is the most frequent single cause of death in persons over 65 years of age (Lye & Donnelan, 2000). In order to illustrate some of the cardiovascular related conditions in a typical pacemaker patient, a brief overview of Lye & Donnelan's (2000) Heart Disease in the Elderly will be discussed.

“Cardiovascular pathologies such as hypertension and cerebrovascular disease, and heart diseases such as coronary artery disease, arrhythmias, and heart failure, increase in incidence with increasing age” (Lye & Donnelan, 2000, pp. 560). Along with these pathologies, there are age related structural and functional changes that also affect the cardiovascular system. Some of these changes include: increased left ventricular wall thickness, increased fibrosis and calcification of the valves, loss of sinoatrial node cells, loss of arterial elasticity, a decline in exercise performance, and decreased rate and volume of diastolic filling. As a result of aging changes and disease process, heart failure, coronary artery disease, and hypertension are common morbidities in the elderly.

“Only 17% of people with heart failure are less than 65 years of age” (Lye & Donnelan, 2000, pp. 561). It is important to realize that “diastolic” heart failure is more prevalent in the elderly population because it is treated differently than “systolic” heart

failure. Clinically, it may be difficult to distinguish between systolic and diastolic heart failure but often systolic failure has a gradual worsening of symptoms where as diastolic dysfunction may present with a more sudden onset of symptoms. Either way, a 2D echocardiogram is helpful to assess hemodynamic function as well as a possible cause such as a valvular lesion.

The elderly have a high incidence of coronary artery disease (CAD) as age itself is an independent risk factor. Two common results of CAD are myocardial infarction (MI) and/or angina. The MI in the elderly may not present classically. Instead of acute chest pain, the elderly are likely to present with dyspnea, confusion, syncope, vertigo or epigastric pain. Also, the elderly may not display typical ST elevation or Q waves on presentation and they are more likely to delay treatment when compared to younger patients. Elderly patients are less likely to be treated with a thrombolytic because they are more likely to experience adverse effects such as a hemorrhagic stroke. When comparing MI outcomes in the elderly with younger patients, Lye & Donnelan (2000) state, "Poor prognosis in this age group is multifactorial. Numerous studies have shown that the therapeutic approach in older patients is unjustifiably less aggressive than in younger patients and potentially beneficial drugs are underused" (pp. 564).

Angina can be difficult to diagnose and manage in the older patient. It may be over diagnosed because the clinician fails to obtain an adequate history and this is a "self-diagnosis". Or it may be under diagnosed because the elderly patient may take on a sedentary lifestyle so as not to provoke symptoms. Typical drugs used to treat angina

may not be well tolerated by the older patient due to postural hypotension, edema or decreased cardiac output. Many elderly are not referred for intervention even though this may provide symptom relief.

Blood pressure increases with age and while hypertension is common in the elderly, it is not a benign condition and there are many benefits to treating it. Hypertension predisposes the elderly to strokes, heart failure, coronary heart disease and peripheral vascular disease. Isolated systolic hypertension is predominant in the elderly and is for the most part related to strokes, however, if the hypertension is controlled, strokes are more preventable than heart disease.

Pacemaker Care Providers

Clearly, the typical pacemaker patient and the typical pacemaker visit can be complex and challenging. There can be numerous patient concerns and many coexisting medical issues. The clinician performing the pacemaker assessment must have expert knowledge of the pacemaker and the electrical system of the heart as well as cardiovascular disease and its management.

It is important for the pacemaker clinician to understand the pathophysiology for which the pacemaker is indicated and be able to assess the patient appropriately. There is also a need to fully understand the medications many pacemaker patients will be taking. “Most of the newer clinical applications are used as adjunct to pharmacologic therapy. An understanding of this will also help the clinician to recognize synergistic effects of combined therapy” (Obias-Manno, 2001, pp. 136)

Currently, the person who often performs pacemaker maintenance is the device company representative of the pacemaker. Although the device company representatives have vast knowledge of the pacemaker itself, most often their educational background is one in business rather than medicine. This common practice of having a device company representative or even a medical assistant (MA) perform the pacemaker evaluation would not be optimal for the patient or the practice as it results in fragmentation of care. Regarding any questions, complaints or coexisting medical problems, the patient would either have to re-schedule an appointment, or the current visit time would be increased by the necessity of calling in the physician or ANP to address the problems/complaints. This increased time can sometimes mean a wait of several hours to several weeks for patients (Mary Kaye Pierce, personal communication, March 17, 2003).

Arguably, an Advanced Practice Nurse (APN), more specifically a Nurse Practitioner (NP), would be an ideal professional to not only perform pacemaker evaluations, but to run a pacemaker clinic. "The role of advanced practice nursing is evolving and changing to meet patients' needs in an increasingly complex health care environment. The advanced practice nurse is uniquely qualified to meet those needs in a variety of roles and settings" (DeBourgh, 2001, pp. 494).

The Nurse Practitioner can provide services and manage care for the patient involving the pacemaker and both medical and pharmaceutical needs. This would result in improved continuity of care as well as decrease the duplicity of care when multiple clinicians are involved. Mary Kaye Pierce, a Nurse Practitioner who led a device clinic at the Veterans Hospital, stated,

I have found that my device clinic patients are extremely grateful for the 'one stop shopping' approach I can give in clinic. I can perform an assessment, a thorough evaluation of the device, trouble shooting if necessary, reprogramming, medication changes, education and referrals if needed. Not only is this efficient use of time, but it provides 'customer satisfaction' for the patient which is an important part of healthcare (personal communication, March 17, 2003).

Nurse Practitioners are recognized for their delivery of holistic care, which is paramount with pacemaker patients. Obias-Manno, 2001, states ...in spite of advances in technology, the clinician should never lose sight of the importance of the patient as a whole, rather than the function of the device...it is better to understand the patients' condition and the goal of therapy, than to try to make the therapy "fit" the patient (pp. 136).

Additionally, research supports the effectiveness of Nurse Practitioner's abilities to manage healthcare of the elderly. "Because advanced practice nurses have the skills to meet the physical, psychosocial, spiritual, and environmental healthcare needs of older adults, they fill a vital role in geriatric healthcare" (Siccardi, 2001). This is significant as "more that 85% of pacemaker recipients are at least 64 years old. Elderly pacemaker patients are the rule, not the exception" (Gregoratos et al., 2002, pp. 22).

This arena of pacemaker evaluation is an area in which an APN can play a vital role. One resource mentioned in the ACC/AHA/NASPE 2002 Guidelines is Bernstein et al. (1994), which discusses pacemaker follow-up at length. It describes the advantages

and disadvantages of direct evaluation (“hands-on” examination) as well as transtelephonic monitoring (TTM). Direct evaluation is “indispensable to clinically effective follow-up” and judged by patients as most useful (pp. 16-17). According to this article, in cardiac pacing, an associated professional (AP) is a “nonphysician characterized in terms of what he or she does with respect to pacemaker implantation and follow-up, rather than according to his or her educational background, which may vary widely from one individual to another” (pp. 1724). Qualified APs have been from the military, respiratory therapists, pulmonary technicians, registered nurses and physician’s assistants (PA). A properly trained APN could also be included in this list of qualified AP’s.

Significance

Due to the expanding indications, pacemakers and ICDs are medical devices that are becoming increasingly common. As previously described, there is a significant need for improved care of the pacemaker patient. A properly trained APN can successfully fill this gap resulting in cost containment, improved patient and family satisfaction, and superior, safer patient care. Using a slightly modified version of Hamric et al.’s primary criteria, central competency and six core competencies for the APN, a framework will be presented for an APN-managed pacemaker clinic. In addition to a detailed discussion, each of the sections described will be included in abbreviated form in Appendix A.

Framework for an Advanced Practice Nurse-Managed Pacemaker Clinic

Primary Criteria

This section will explain how the pacemaker focused ANP can meet the primary criteria as well as set goals for the pacemaker clinic. These primary criteria are necessary core elements of advanced nursing practice and must be met prior to managing a pacemaker clinic.

Hamric et al. (2000) describes three primary criteria of *graduate education, certification and practice focused on patient/family*. As previously mentioned, the fourth criterion of *expertise in area of specialty* has been added. With respect to the first criterion, the pacemaker clinic APN should be a graduate (masters or doctoral) from an accredited nurse practitioner program. Graduate education provides the APN with advanced nursing theory, physiology, assessment and management skills. It also opens the door for many advanced practice opportunities such as practice within a specialty area or research. Second, the APN should be nationally certified either through the American Academy of Nurse Practitioners (AANP) or the American Nurse Credentialing Center (ANCC). Obtaining national certification is optimal, as this validates the APN has knowledge consistent with a national standard. The national trend is moving towards national certification as a requirement for nurse practitioners, not merely a recommendation. National certification is also necessary if the ANP wishes to bill directly for his/her services. Overall, graduate education and national certification boosts the integrity and credibility of the APN.

The third criterion listed is practice focused on patient/family. Throughout graduate education, holistic care of the patient/family is stressed and the ANP is expected to practice in a holistic manner. Also, with respect to the third criterion, the goals of this APN-managed pacemaker clinic should be established that reflect a practice focused on patient /family. Therefore, for the purposes of this project, the APN-managed pacemaker clinic is conceptualized to be a full service or “holistic” clinic. Using Sutton’s (1996) report of a British Pacing and Electrophysiology Group (BPEG) policy conference on pacemaker follow up as a reference, the goals of the APN-managed pacemaker clinic are as follows:

1. To optimize the pacemaker system to meet the patient’s needs together with safe maximization of generator life.
2. To identify abnormalities in the pacemaker system and complications of the treatment to permit prompt treatment.
3. To predict end-of-life of the pulse generator to permit elective (non-emergent) change of the pulse generator.
4. To provide holistic care to the patient, recognizing the pacemaker as only one aspect of the patient’s healthcare and utilizing other therapies.
5. To provide patient and family support and education in a way that suits the individual patient.

6. To accumulate a database that offers information on the present and past pacing systems for each patient and general data on the pacemaker itself (including generator and leads) from a wide a field as possible.
7. To provide education and training opportunities for medical staff.
8. To provide a clinical cardiology follow-up service when appropriate. In some cases this is provided by a separate clinic or another medical facility.
9. To provide direct involvement in clinical research as well as provide patients with the option of clinical research study participation.

Regarding the fourth criterion of expertise in area of specialty, it is necessary to receive further education and training in a specialty area such as cardiac pacemakers. Although cardiac knowledge and training can be obtained during formal education and clinical time, there needs to be additional, very specific preparation to become an expert in an area of such specialization. Before the APN can perform direct clinical practice with pacemaker patients, there must be adequate education and training. There are currently no steadfast qualifications required to work in or run a pacemaker clinic. Pacemakers are frequently interrogated and adjusted by MDs, device company representatives, RNs, MAs or Techs. As previously mentioned, the non-physicians are referred to as associated professionals (APs). The NASPE Council of Associated Professionals (CAP) has developed educational guidelines for APs involved in pacing

and electrophysiology. The guidelines are divided into three categories: (1) Core Curriculum which defines a base of knowledge common to both areas of pacing and electrophysiology; (2) Pacemaker Electrophysiology Curriculum which defines knowledge specific to Associated Professionals who practice only pacing; and (3) Electrophysiology Curriculum which defines knowledge specific to APs who practice electrophysiology. These categories are not applicable to every AP, but rather are presented as guidelines for training and education. "It is expected that familiarity with the Core Curriculum will provide a common base of knowledge essential to everyone in the field and will thus enhance patient care" (Faust et al., 1990, pp. 1448). The specific suggested core curriculum can be found at

www.naspe.org/naspe_action/position_statements/view/?id=8596.

A local pacemaker expert, who is a Nurse Practitioner, indicated that pacemaker education for health care providers is frequently obtained through the device companies and via self-study. It is the opinion of this pacemaker expert that it takes a minimum of six months of working with pacemaker patients to become competent and comfortable with interrogation and trouble shooting (Mary Kaye Pierce, personal communication, December, 2002). At least two device companies offer weeklong courses annually or biannually and all of the pacemaker companies offer seminars and study materials.

Once educated and trained, there is the option for physicians and APs of taking the examination of the North American Society of Pacing and Electrophysiology (NASPEXAM). There is a separate exam for physicians and non-physicians. This exam

is rigorous. However, if successfully passed, it is an excellent demonstration of competence in this specialty.

Central Competency

As described earlier, Hamric et al.'s (2000) central competency of the APN is direct clinical practice. This section briefly describes how the pacemaker clinic provides a venue for the APN to carry out direct clinical practice.

The role of the APN in the cardiac pacemaker clinic would include direct clinical practice, as the APN will be the direct provider of care to the patient. On a daily basis, the APN would be responsible to identify, diagnose and treat patients with a pacemaker and/or ICD regarding pacemaker and other cardiac needs.

All five of the characteristics of direct clinical care as described by Hamric et al. (2000) will be addressed relative to an APN-managed pacemaker clinic. The APN should provide holistic care and form partnerships with their patients and families. Pacemaker and cardiac care in general require expert clinical thinking and skillful performance while using research as a practice guide. Last, the APN should use diverse approaches to health and illness management with the pacemaker patient.

Core Competencies

Expert Guidance and Coaching

There are many ways in which an APN can demonstrate this core competency. Interventions used by the APN should be holistic and require technical and interpersonal experience (Hamric et al., 2000). This section discusses various areas of education that should be offered to patients, families, and other healthcare providers.

Of utmost importance is patient and family education. There is a vast amount of written materials and Internet information available for the patient and practitioner; however, it needs to be effectively utilized. Using education offered through The Red Oak Cardiovascular Center as a reference at [www.redoak.com/our_services/pacemaker arrythmia services/#pacemaker](http://www.redoak.com/our_services/pacemaker_arrhythmia_services/#pacemaker), information and education both verbally and in writing should be offered to the patient and family in the following areas:

First, it is important for the patient to understand basic information about the heart and how it normally conducts electricity. Next, the patient needs to understand the permanent pacemaker/ICD and how it works with the heart. Having this foundation will help the patient to better understand his/her own condition for which the pacemaker/ICD is indicated. Whatever the diagnosis, i.e. sinus node dysfunction, HOCM, atrial fibrillation or VT, the patient and family must understand this dysfunction and how the pacemaker/ICD assists the heart.

In an elective pacemaker insertion, the patient may be seen in the clinic prior to implantation. If this occurs, education prior to insertion is optimal. The patient should receive education about the procedure of implantation including sedation, where the incision will be and where the generator and leads sit in the body. Then, post-op teaching and what to expect after insertion should be discussed. This includes information on site care and activity restrictions. The patient must also be aware of signs and symptoms of pacemaker malfunction or cardiac symptoms in general for which to contact their healthcare provider.

Next, the patient and family should learn about environment and home guidelines and what equipment does or does not affect the pacemaker. There are many potentials for interaction between pacemakers/ICDs and the medical and nonmedical environment and the patient must be aware of these. He/she should also be given information about their pacemaker/ICD I.D. card and its significance.

The patient should be enrolled in the pacemaker clinic and be given a visit schedule. This schedule will vary from patient to patient. He/she should also be provided with means to obtain information about their pacemaker/ICD including pharmaceutical contacts, phone numbers, websites, etc.

As the pacemaker clinic grows in number, a support group for pacemaker/ICD patients and families should be offered. This is especially important as implantation of a device may result in a change of body image, create problems in psychosocial adaptation and quality of life, and contribute to the development of affective disorders. Too often

clinicians are focused on the technical aspect of the device and are unaware of the psychosocial impact of pacemakers or ICDs (Duru et al., 2001). The offered support groups can address all of these important aspects of quality patient care.

The APN with expertise in pacemakers should also be a resource for other practitioners as well as nurses who may work in the hospital setting. It is the experience of the author that pacemaker knowledge is limited for most RNs, even those who work in a cardiac setting. Often a call is made to the MD or the pacemaker representative for normal pacemaker function that appears abnormal to the untrained RN or monitor tech. The unique programs and functions in newer pacemakers further cloud this issue. The APN can provide in-services along with written materials for continuing education for these healthcare providers.

Consultation

The APN must be aware of the different types of consultation, when and with whom to consult. This section briefly explains some of the most likely consulting situations for the pacemaker ANP.

The most common consultations will most likely be *client-centered* with the cardiologist with whom the APN has a collaborative relationship or *consultee-centered* with the device company representative. When the APN needs assistance to develop an effective plan of care for a patient who may have a complex problem, it is likely that the

MD or another APN will likely fill the role of consultant. The primary goal in this type of consultation is helping the patient (Hamric et al., 2000).

In a *consultee-centered* case consultation, the emphasis is focused directly on the consultee's problem in handling the situation. The goal is to assist the APN to acquire the skill, confidence, or objectivity needed to address the problem effectively (Hamric et al., 2000). The device company representative is the expert on the device itself, and the APN will depend on that knowledge when troubleshooting a difficult pacemaker problem.

Another form of consultation is *program-centered administrative* which focuses on the planning and administration of clinical services (Hamric et al., 2000). Prior to starting a pacemaker clinic, the APN must rely on persons with expertise in the areas of billing and insurance. In order to optimize patient care as well as finances, the APN must be knowledgeable about the allowed frequency of visits and intricacies of billing and coding.

Research Skills

Research skills are of utmost importance for the APN. Research drives an evidence-based practice, which is paramount for optimal patient care. In this section, various ways the APN can be involved in research are discussed. This includes the development or following of practice protocols, participation in clinical research trials, and using research as an evaluating tool.

One important utilization of research is the creation and/or use of practice protocols. In many states, the APN is dependent on practice protocols that provide an organized method for analyzing and managing a disease or major symptom (Paul, 1999). Arizona is not a state that requires practice protocols, however, they would be useful tools for the APN.

Protocols differ from guidelines or standards of practice. Standards of practice portray the minimal acceptable practice and are often broad in scope. Guidelines are general and often the specifics of how to perform the tasks to achieve the goals are left up to the healthcare provider (Paul, 1999). Pacemaker interrogation and adjustment are sophisticated skills and well-defined protocols would help guide the APN. "Protocols are often more task or procedure specific and are usually designed for a distinct patient population. Protocols force clinicians to examine their practice styles and defend them with evidence" (Paul, 1999, pp. 345).

The ACC/AHA/NASPE 2002 Guidelines mention that careful follow-up and continuity of care are required after implantation of a pacemaker. The Practice Guidelines considered publishing recommendations for follow-up but opted to defer, because other statements and guidelines have been published. "The frequency and method of follow-up is dictated by multiple factors, including other cardiovascular or medical problems managed by the physician involved, the age of the pacemaker, and geographic accessibility of the patient to medical care" (Gregoratos et al., 2002, pp. 23). Using guidelines from Bernstein et al. (1994) and information from a local cardiologist,

Mark Goldberg, MD (personal communication, January, 2003), protocols for the following will need to be obtained or developed for the pacemaker clinic:

A first clinic visit for the patient with a freshly implanted pacemaker/ICD should be scheduled within two weeks after pacemaker implantation. It is assumed that the patient was seen by the MD or an APN prior to discharge from the hospital. Next, there is the *routine clinic visit* for the pacemaker/ICD patient. The timing of this visit will vary depending on the device, date of insertion, battery life, insurance coverage and level of patient risk. There also should be a protocol for a specific *visit to determine optimum pacemaker settings*. Sometimes this can be done at a routine visit, however some patients will require more time for measures such as a treadmill test or doppler echocardiography to determine optimum maximal pacing rates.

Next, there is the *troubleshooting pacemaker/ICD visit*. This visit should occur when the patient has a complaint that may be related to his/her pacemaker/ICD. This visit type will also be essential after a medication change or a change in health that may affect the threshold levels of the pacemaker. Also, this visit will be necessary to evaluate the patient and device after receiving a shock from the ICD.

To ensure safety and reliability, there should be a protocol for the *recommended and optional equipment* required for the pacemaker clinic and this protocol should include standards for quality assurance. An actual list of this equipment, as recommended by Bernstein et al. (1994), has been provided in Appendix A. The need for

additional protocols will be discovered and will be developed as the clinic becomes established, grows and as devices change.

Clinical Research is vital in the rapidly changing technological world of devices such as pacemakers and ICDs. The research is continuous in an attempt to discover new indications for pacemaker implantation and create new functions for the pacemaker unit. The APN can and should be directly involved in this process. According to Hamric et al. (2000), participating in collaborative nursing and interdisciplinary research is a more realistic competency. One way the APN can do this is by serving as a sub-investigator of a clinical trial. The Food and Drug Administration (FDA) mandates that an MD be the Primary Investigator, however a nurse practitioner can function as the co-investigator and participate in many aspects of the trial. This also gives the pacemaker patients and prospective patients an opportunity to be involved in clinical research.

Another way for the APN to stay current with research is to receive and interpret peer reviewed journals. The three pacemaker related journals available either by subscription or on-line are: *Pacing and Clinical Electrophysiology (PACE)*, *Indian Pacing and Electrophysiology Journal*, and *Europace*. There are several ways these journals could be utilized by the APN: subscribe to the aforementioned or other cardiovascular relevant journals; attend monthly journal club meetings with other health care members using these journals as a source; and use the published research to re-analyze his/her practice.

Last, the APN must use research to evaluate the effectiveness of the pacemaker clinic. Research questions asked are relevant to the interests and needs of not only the APN, but others as well. For example, patient satisfaction and quality of life could be assessed via simple annual questionnaires, and billing for pacemaker services could be tracked to evaluate the economic advantages/disadvantages of the clinic.

Clinical and Professional Leadership

This section describes how the APN implementing the pacemaker clinic displays the four different types of leadership: clinical leadership, interdisciplinary leadership, entrepreneurial leadership and organizational leadership.

Clinical leadership should be obtained as the ANP becomes an expert in the cardiac arena of pacemakers and be a resource and mentor for patients and colleagues. Interdisciplinary leadership could be illustrated via frequent interactions with cardiologists, nurses and pharmaceutical personnel. This NP managed pacemaker clinic is not the traditional role of the APN, thus demonstrating entrepreneurial leadership. Lastly, organizational leadership could be obtained by joining local and national APN groups or societies. There is also a prestigious group, the North American Society of Pacing and Electrophysiology (NASPE), for which the APN can eventually apply for membership. NASPE is a professional group representing the specialties of cardiac pacing and electrophysiology. This organization plays an important role in education and they also serve as a liaison between government regulatory agencies and members of the

profession (About NASPE, 2003, p1). Being a member of this elite society demonstrates the strength and credibility of the APN.

Collaboration

The pacemaker APN could have collaborative relationships with many different professionals. This section discusses some of those relationships between the APN and MDs, device company representatives or other pacemaker centers/care providers.

The Rules of the State Board of Nursing issued by The Arizona State Board of Nursing (2002) mandates that a nurse practitioner maintain a collaborative relationship with a physician. Although the physician need not directly supervise, he/she must be available on an as-needed basis (pp. 4). The pacemaker clinic would most likely be located in an existing cardiology practice and there will often be an MD on site. The APN will maintain this collaborative relationship with the in-office cardiologist as well as other physicians. By collaborating with the aforementioned, there would be shared responsibility and sharing of expertise, which will in turn benefit patient care.

Although the relationship between the APN and the device company representative is typically on a consulting basis, consultation can promote a collaborative environment. When the APN is faced with a complex patient or a new pacemaker is introduced, the relationship would become more collaborative to ensure quality patient care.

There should also be a collaborative relationship between pacemaker centers and/or other providers. Many patients commute during different seasons and the APN must be able to obtain and provide up-to-date information on the patient and the pacemaker system. This also brings up the issue of record keeping. The APN must work collaboratively with other staff to maintain meticulous, legally sufficient medical records. Sutton, BPEG Council, (1996) stresses, "Accurate record keeping is of the utmost importance. An implant report, discharge summary, previous follow up notes, medical letters, and the pacemaker's program should be available to the clinic" (pp. 459).

Ethical Decision-Making Skills

This section discusses a few of the ethical situations the APN may face. This includes issues surrounding collaboration, the elderly, end of life, quality of life and other ethical questions raised with pacemakers.

Hamric et al., (2000) states, "Compassionate, ethical patient care that provides a healing environment requires collaborative working relationships between physicians and nurses (Aroskar, 1998; Larson, 1999; see Chapter 12)" (pp. 323). This suggests that a failure to collaborate is an ethical issue; therefore, the APN/MD relationship is a step towards ethical decision-making.

Because the majority of pacemaker patients are elderly, there should be an opportunity for the APN to be involved in ethical issues such as end-of-life and quality of

life issues. It is expected that the APN be involved in the identification as well as the resolution of these dilemmas.

Last, there are numerous ethical issues under current investigation such as the actual necessity of pacemaker or a new generator (Kowey, 2002). Questions can and have been raised such as: Is the generator sometimes programmed so that a new one will be needed sooner? Do the incentives provided by device company representatives influence which brand of pacemaker is selected? Is it unethical to not optimize a patient's pacemaker settings? The APN must be prepared to develop ethical decision-making skills and deal with these situations.

Summary

During the past several years, the actual and potential indications for pacemaker and ICD implantation have expanded considerably. This has resulted in an increased rate of implantation and a subsequent need for pacemaker follow-up care. Pacemaker evaluation is essential to detect pacemaker malfunction as well as optimize function for improved patient quality of life.

Pacemaker care is often performed by professionals that are experts in pacemakers/ICDs and business but not thoroughly trained health care providers. This can lead to care that lacks in sophistication, continuity, and is neither time nor cost effective. An APN that has been adequately trained can provide the services and care necessary to the pacemaker population.

Following Hamric et al.'s (2000) definition of advanced nursing practice, a framework for which an APN can manage a pacemaker clinic has been developed. Using this framework, the distinctive skills of the APN as a practitioner, educator, consultant, collaborator, researcher and change agent ensure optimal outcomes for pacemaker patients and their families.

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Appendix A

Abbreviated Framework for APN-managed Pacemaker Clinic

Primary Criteria

Graduate Education

- Master's or Doctorate of Nursing

Certification

- National Certification

Practice focused on patient/family

- Outline holistic goals for clinic

Expertise in area of specialty

- Pacemaker education/training

Central Competency

Direct clinical practice

- Provide direct care/service to pacemaker patients

Core Competencies

Expert Guidance and Coaching

- Patient and Family Education
 - Understanding the heart
 - Understand indication for pacemaker/ICD
 - Understand the pacemaker/ICD
 - Pre-op teaching
 - Post-op teaching
 - Environmental guidelines
 - Pacemaker/ICD clinic schedule
 - Provide means for additional information
 - Support group
- Education for healthcare providers

Consultation

- Client-centered with physician
- Consultee-centered with device company representative
- Program-centered administrative
 - Billing/Insurance/Coding

Research Skills

- Practice Protocols
 - First clinic visit
 - Routine clinic visit
 - Optimizing device visit
 - Troubleshooting visit
 - Recommended* and optional equipment
 - Pacemaker programmer with magnet* (one for every common model)
 - 12-lead ECG machine*
 - Crash cart*
 - Pulse generator for external overdrive
 - Exercise test facilities
 - Facilities for ambulatory ECG recording
 - Event recorders
 - Access to doppler echocardiography
 - Computerized database management
- Involvement in clinical research
- Journals
- Evaluate effectiveness of clinic

Clinical and Professional Leadership

- Resource/Mentor
- Frequent interdisciplinary interaction
- Join local/national groups or societies

Collaboration

- Physician/APN
- Device company representative
- Other pacemaker/medical centers

Ethical Decision-Making Skills

- Collaborate
- Awareness of end of life and QOL issues
- Pacemaker programming

Miscellaneous

- Record keeping