An ethical analysis of withdrawal of therapy in patients with implantable cardiac electronic devices: Application of a novel decision algorithm

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Patients with cardiovascular implantable electronic devices (CIEDs), which include pacemakers and implantable cardioverter-defibrillators (ICDs), may request deactivation of their devices as they approach the end of life. The Heart Rhythm Society (2010) has stated that “ethically, and legally, there are no differences between refusing CIED therapy and requesting withdrawal of CIED therapy.” On the basis of the principle that there is no ethical distinction between withholding and withdrawing treatment, this professional organization has suggested that both the antibradycardia and antitachycardia features of these devices may be disabled at the patient’s request. We argue that disabling ICD shocks is analogous to a do-not-resuscitate order and is ethically permissible whereas withdrawing pacing from a pacemaker-dependent patient is an act of intentionally hastening death and not morally licit.

Keywords: Withdrawal of therapy, Pacemakers, ICDs, End of life

Cardiac implantable electronic devices (CIEDs), which include permanent pacemakers and implantable cardioverter-defibrillators (ICDs), are implanted for a spectrum of indications. The extent of cardiovascular disease and the prognosis of these patients is widely variable. CIEDs are implanted with minimally invasive surgical techniques and are easily adjusted noninvasively with a specialized programmer. All CIEDs can deliver *antibradycardia* pacing therapies to treat disorders of the sinus node or atrioventricular conduction system and restore an essentially normal cardiac rhythm with few maintenance requirements. Patients who have little or no intrinsic cardiac rhythm without pacing are classified

as *pacemaker dependent* as they require continuous pacing to prevent severe cardiac symptoms. In addition to these antibradycardia pacing features, ICDs also provide *antitachycardia* therapies to terminate rapid ventricular arrhythmias with either antitachycardia pacing (ATP) or high-energy shocks. Permanent pacing restores an essentially normal cardiac rhythm allowing most patients to lead healthy lives until they die of usually unrelated conditions. At the other end of the spectrum, many persons with ICDs have advanced heart disease that often will progress to become the ultimate cause of their demise.

At various stages of any illness, patients with CIEDs may ask physicians to

deactivate their device so that they will be allowed to die from the natural progression of their disease. In a survey of healthcare providers and CIED allied professionals representing the manufacturers of these devices, 83 percent have personally deactivated a CIED in a terminally ill patient (Mueller et al. 2008). Upon a doctor's order, this task is often carried out by an allied professional employed by the CIED manufacturer whose primary role is to provide technical support for physicians. Knowing that this action could result in the death of a patient, these professionals have reported work-related role conflicts and moral distress when asked to deactivate device therapies (Kramer et al. 2011; Mueller et al. 2011). This has led to ethical concerns surrounding this practice.

Most bioethical decisions center around three principles: autonomy, beneficence, and non-maleficence. When ethical dilemmas occur due to conflicts of these principles, many argue that patient autonomy should generally supersede the other two (Pellegrino 2000; Mueller, Hook, and Hayes 2003; Zellner, Aulisio, and Lewis 2009; Kramer, Ottenberg, and Mueller 2010; Lampert et al. 2010). From this, most physicians accept that patients can refuse to initiate or *withhold* medical treatment that they consider medically futile, burdensome, or simply undesirable. As such, patients with decision-making authority have, if they wish, the right to be left alone by extension, there is also acceptance that patients can ethically stop or *withdraw* a therapy to which they have previously consented (Sulmasy 1998, 2008; Pellegrino 2000; Mueller, Hook, and Hayes 2003; Wilkoff et al. 2008; Zellner, Aulisio, and Lewis 2009; Kramer, Ottenberg, and Mueller 2010; Lampert et al. 2010). Common examples of such withdrawal of consent would be the discontinuance of chemotherapy for a malignancy or dialysis for end stage renal

disease. On the basis of the same autonomous right to *withhold* a therapy, legal precedents in the United States have also supported the right to *withdraw* a previously initiated medical therapy (Lampert et al. 2010). However, it is when withdrawal of these therapies requires some action by the person's physician or caregiver that the provider's duty of non-maleficence may come into conflict with the patient's right of autonomy. This is especially true if the person asked to withdraw a life-sustaining therapy considers this to be an act of killing rather than allowing a patient to die.

This principle, that there is no ethical distinction between withholding and withdrawing medical treatment, has been applied to the moral conflicts of disabling CIED therapies (Lampert et al. 2010). In 2010, the Heart Rhythm Society (HRS) Consensus Statement of the Management of Cardiovascular Implantable Electronic Devices has stated that

ethically, and legally, there are no differences between refusing CIED therapy and requesting withdrawal of CIED therapy (Lampert et al. 2010).

In addition, the HRS Consensus Statement makes no distinction between withdrawal of a CIED's antitachycardia or antibradycardia therapies, even if the patient is pacemaker dependent. According to the document, healthcare providers who refuse to disable a CIED for religious or ethical reasons are obligated to find a colleague who will.

Despite this professional statement, of which one of us (GNK) is a co-author, many healthcare providers have not accepted the notion that deactivation of a CIED's antibradycardia therapies is morally acceptable. In Mueller et al.'s (2008) study, 56 percent of providers report that they are comfortable with turning off the shocking therapies of an ICD, but only 34 percent are comfortable with turning off a

pacemaker. In this report, we will submit that deactivation of an ICD's antitachycardia therapies is ethically permissible while deactivation of antibradycardia pacing in pacemaker-dependent patients is ethically equivalent to euthanasia or physician-assisted suicide. This review aims to address the ethical issues involved in CIED deactivation from a Catholic perspective and offers a framework to consider the ethics of withdrawing a therapy.

To begin, we will use the definitions of the Congregation for the Doctrine of the Faith as set forth in the Declaration on Euthanasia (Congregation for the Doctrine of the Faith 1980). This document defines euthanasia as

an action or an omission which of itself or by intention causes death, in order that all suffering may in this way be eliminated (Congregation for the Doctrine of the Faith 1980).

As this Declaration emphasizes, a medical act that hastens death must be considered both in relation to the intention of the will of the person(s) performing the act and in the methods used. In keeping with the consistent teaching of the Church,

nothing and no one can in any way permit the killing of an innocent human being, whether a fetus... or one suffering from an incurable disease, or a person who is dying.

In terms of physician-assisted suicide, the Church teaches that

no one is permitted to ask for this act of killing, either for himself or herself or for another person entrusted to his or her care, nor can he or she consent to it, either explicitly or implicitly. Nor can any authority legitimately recommend or permit such an action (Congregation for the Doctrine of the Faith 1980).

In contrast to physician-assisted killing, the *Catechism of the Catholic Church* recognizes that

discontinuing medical procedures that are burdensome, dangerous, extraordinary, or disproportionate to the expected outcome can be legitimate; it is the refusal of "over-zealous" treatment. Here one does not will to cause death; one's inability to impede it is merely accepted. The decisions should be made by the patient if he is competent and able or, if not, by those legally entitled to act for the patient, whose reasonable will and legitimate interests must always be respected (*Catechism of the Catholic Church* 1997).

WITHDRAWAL OF ANTITACHYCARDIA THERAPIES OF AN ICD

A high-energy ICD shock for ventricular arrhythmias is often quite painful and may induce considerable anxiety for both the patient and their family. For most patients, infrequent shocks, though uncomfortable, are generally accepted as the price of preventing sudden cardiac death. In contrast, frequent shocks are often deeply distressing and may produce a severe form of post-traumatic stress, anxiety, and depression. Patients in the terminal stages of an illness, such as congestive heart failure, can have clusters of painful ICD shocks that fail to restore normal rhythm with little effect on their ultimate outcome. In this situation, patients may request that ICD shocks be deactivated so that they will be spared these unpleasant discharges and be allowed to die of the natural progression of their disease. Thus, following deactivation, the ICD will not intervene should ventricular tachycardia or ventricular fibrillation occur. In this way, deactivation of the ICD is analogous to a "Do Not Resuscitate" order. Thus, deactivation of the ICD induces no symptoms other than relief of anxiety. There is a

general acceptance among physicians and other providers that the deactivation of these antitachycardia features of an ICD is both ethical and humane. In this situation, the patient's expression of autonomy is well aligned with the caregiver's principle of non-maleficence.

WITHDRAWAL OF ANTIBRADYCARDIA PACING THERAPY OF A PACEMAKER OR ICD

The decision to turn off antibradycardia pacing has often been seen as more problematic for many physicians, especially those opposed to physician-assisted suicide. Unlike ICD shocks, pacing stimuli are imperceptible to the patient. Pacing stimuli are low-voltage, short-duration electrical pulses that initiate a self-regenerating wavefront of activation in the myocardium. Like artificial heart valves, pacemakers are well integrated into both the patient's cardiovascular anatomy and physiology. These devices are automatically self-regulating and require minimal maintenance with an easily replaceable battery with 7–12 years longevity. For some patients, especially those with an adequate underlying cardiac rhythm, withdrawal of pacing support may produce minimal or no symptoms. However, for pacemaker-dependent patients, withdrawal of pacing may result in rapid death, syncope, or a more prolonged episode of weakness, lightheadedness, and discomfort if the underlying cardiac rhythm is inadequate to provide blood flow to the peripheral tissues.

IS THERE REALLY NO ETHICAL DISTINCTION BETWEEN WITHHOLDING A THERAPY AND WITHDRAWING A THERAPY?

Many clinicians accept with absolute validity that there is no ethical distinction between withholding and withdrawing a therapy (Pellegrino 2000; Mueller, Hook, and Hayes 2003; Zellner, Aulisio, and Lewis 2009; Kramer, Ottenberg, and Mueller 2010; Lampert et al. 2010). This is based on the primacy of patient autonomy in making end-of-life medical decisions. And yet, common sense argues that this may not always be true. Most would agree that it would be unethical to honor a patient's request to die by removing a well-functioning renal allograft or heart valve. Sulmasy (2008) has proposed that the features of a therapy may distinguish those treatments that may be withdrawn from those that may not. Therapies such as organ transplants that restore normal physiology by *replacing* a pathologic process, are more ethically difficult to withdraw than those therapies that are *substituting* for a diseased organ, such as hemodialysis. Sulmasy's criteria for identifying a replacement therapy are the following: (1) its responsiveness to changes in the organism or its environment; (2) properties such as growth and self-repair; (3) independence from external energy sources or supplies; (4) independence from external control by an expert; (5) immunologic compatibility; and (6) physical integration into the patient's body. Despite its attractiveness, only a few treatments would satisfy all six of these criteria, such as an autologous bone marrow transplant or an allograft from an identical twin donor. Sulmasy also remarks that some replacement therapies may not fit into all of these criteria.

One can think of several scenarios where Sulmasy's framework might be

problematic. A prosthetic mitral valve, for example, does not meet all of these criteria, but most clinicians would not honor a patient's request to surgically remove it so that they would be allowed to die of acute cardiac failure. Or, what physician would agree to remove a successfully functioning coronary artery stent at the request of a dying patient? In these hypothetical circumstances the principle of non-maleficence would seem to overrule the patient's autonomy. In both of these examples, physicians typically weigh the negligible burden of a normally functioning heart valve or a coronary stent against the additional burden of removing the medical device, most concluding that, rather than allowing a patient to die, such withdrawal would be an act of euthanasia.

So, are there other ways to distinguish when it would be ethical to withhold a treatment but not to withdraw it? Huddle and Bailey (2012) have suggested another way to consider requests for withdrawal of medical therapies. This approach does not rely on the

degree of organic integration, the role of the treatment in the patient's physiology, the internal or external location, or the degree of independence that they allow the patient to assume.

Rather, they propose that it is the role of ongoing physician agency that distinguishes those therapies that may be withdrawn (such as ventilators) from those that should not be withdrawn (organ transplants, heart valves, or coronary bypass grafts). Thus,

if a tissue or device is playing a critical role in maintaining the physiologic equilibrium (and, hence, his/her life), the removal of said tissue or device may be doing (killing) or an allowing-to-die in so far as the physician is not or is actively

involved in the tissue/device's presence and activity (Huddle and Bailey 2012).

Additionally, they point out that the distinction is dependent on the intentions of the person performing the treatment withdrawal. For example, a homicidal physician may kill a patient who is expected to recover from an illness by turning off a ventilator (or a pacemaker) (Huddle and Bailey 2012). However, therapies that are in place and do not require physician agency would seem to be those in which removal would be equivalent to active euthanasia.

How do we apply these concepts to our understanding of which therapies might ethically be withdrawn? Sulmasy's distinction between replacement and substitutive therapies, while valid, may be too restrictive to serve all clinical scenarios. On the other hand, the proposal by Huddle and Bailey may not be restrictive enough. Permanent pacemakers and ICDs are well (but not perfectly) integrated into the body, are responsive to changes in the organism, are immunologically inert, are independent of external energy supplies, and can go years without any external expert control. However, they clearly have no capacity for growth or self-repair, and the internalized power source, though lasting years before requiring battery replacement, will eventually become depleted. Though they are very much *like* replacement therapies (Goldstein et al. 2008), CIEDs do not fit precisely into Sulmasy's definition. Using the criterion of Huddle and Bailey, both ICDs and pacemakers are completed therapies that do not require active physician agency for their function. Thus, deactivating a pacemaker in a pacemaker-dependent patient would be ethically problematic. Whether the criterion of on-going physician agency would exclude deactivation of the antitachycardia therapies of an ICD is not quite as clear.

We propose that the following criteria be satisfied in order to allow an act of therapy withdrawal to be an act of allowing-to-die rather than killing in a person who is near the end of their life:

- (1) The patient or their decision-making surrogate requests withdrawal of the therapy and understand the consequences of the decision
- (2) The therapy itself is a direct and significant burden to the patient
- (3) The act of withdrawal does not directly introduce an increased burden to the patient
- (4) The act of withdrawal is not intended to directly cause the patient's death.

These criteria modify the concepts of both Sulmasy and Huddle and Bailly to incorporate the considered treatment's effects on the patient. If each of these criteria were met, we believe that it would be ethical to withdraw a treatment. For example, a provider could ethically withdraw mechanical ventilator therapy at the request of a patient with emphysema if it was felt to be burdensome, with an indirect effect of allowing the patient to succumb to their underlying lung disease. In applying these criteria, further courses of chemotherapy for a malignancy could be discontinued to relieve the patient of its burdens. For a patient with complications such as an intractable infection or hemolysis from a left ventricular assist device (LVAD), it would be ethical to withdraw the LVAD at their request as the treatment has become intolerably burdensome. Though perhaps the clearest application of this criterion would be withdrawal of a therapy intended to treat the illness from which a patient is dying, forbidding withdrawal of other directly burdensome therapies unrelated to the primary illness would likely be too restrictive. For example, it might be ethical to honor the request of a patient to

discontinue chronic hemodialysis who is in the terminal phases of cancer.

APPLYING THE PROPOSED CRITERIA TO WITHDRAWAL OF CIED ANTITACHYCARDIA AND THE ANTIBRADYCARDIA THERAPIES

For practicing clinicians, distinguishing those therapies that may be ethically withdrawn from those that may not really depends on whether the intent of the therapy withdrawal is killing or allowing-to-die. Killing is an act that creates a new pathophysiologic state with the intention of causing the patient's death. Allowing-to-die is the removal of a life-sustaining treatment that ameliorates or forestalls a preexisting fatal condition "that is causing the patient's death" (Sulmasy 1998). The intuitive reluctance of clinicians to withdraw pacing from a pacemaker-dependent patient comes from the fact that withdrawal introduces a new, directly burdensome, pathophysiology to someone with an otherwise stable cardiac physiologic equilibrium (Kay and Bittner 2009). Consider a patient with complete atrioventricular block who has lived a normal life with a permanent pacemaker for many years but then develops metastatic gastric carcinoma. As the cancer progresses the patient or her decision-making surrogate might be tempted to ask her cardiologist to deactivate her pacemaker so that she would be relieved of her suffering. However, the only way that deactivating the pacemaker would relieve the pain of metastatic cancer is by intentionally ending her life. Her underlying complete heart block is not the cause of her impending death; it is her uncontrolled malignancy. In contrast to withdrawing pacing, withdrawal of continued chemotherapy for her cancer would allow her fatal condition (cancer) to

progress naturally while relieving her of the side effects of this treatment. In this example, there is nothing medically futile or burdensome about cardiac pacing whereas chemotherapy may have been both ineffective and burdensome. Thus, for this patient, the act of withdrawing pacing represents deliberate killing whereas withdrawing chemotherapy is an allowing-to-die. In this case, we can best serve this person, by reassuring them that we will be there to control their pain and reassure their concerns that the pacemaker will not impede them from passing when their time comes.

By removing the burden of painful shocks, deactivation of the antitachycardia therapies of an ICD would not introduce a new pathophysiology but would allow the patient to die of ventricular tachycardia or fibrillation (should it occur) and not be euthanasia. We believe that deactivation of the antitachycardia features of an ICD at the request of a patient is analogous to a "Do-Not-Resuscitate" order that prevents acute interventions during cardiac arrest. There has been widespread consensus among cardiologists, cardiac electrophysiologists, nurses, and device industry representatives favoring this practice (Pellegri 2000; Mueller, Hook, and Hayes 2003; Goldstein et al. 2008; Zellner, Aulisio, and Lewis 2009; Kapa et al. 2010; Kramer, Ottenberg, and Mueller 2010; Lampert et al. 2010; Mueller 2010).

In contrast, withdrawal of CIED pacing support, which is not directly burdensome, from a pacemaker-dependent patient suffering from congestive heart failure or cancer would be euthanasia. In this case, unlike the patient's other treatments for their underlying disease which may be medically futile, there is nothing futile about the pacing therapy's ability to maintain a functional cardiac rhythm. Therefore, since pacing stimuli are undetectable by the patient and present no burden, then if the

goal of deactivating the pacing function of a CIED is to relieve suffering, it can only do so by directly hastening the patient's death. In fact withdrawal of pacing in a pacemaker-dependent patient is the very definition of euthanasia—

an action or an omission which of itself or by intention causes death, in order that all suffering may in this way be eliminated (Congregation for the Doctrine of the Faith 1980).

It is a common misperception that pacing therapy will keep someone alive who is otherwise dying of an overwhelming illness. This is simply not the case. Pacing therapy depends on the cardiac tissue's conduction properties to conduct its localized impulses throughout the heart. As a patient's body is failing, the resulting acidosis and electrolyte changes impede global activation of electrical impulses and thus cardiac contraction. This results in pulseless electrical activity and ultimately cardiac asystole due to the failure of the heart's conduction system.

From this, we respectfully disagree with certain aspects of our HRS's consensus statement. We feel that the statement places an imprudent primacy on a patient's autonomy over the providers' thoughtful consideration of the beneficence and non-maleficence of withdrawal. This primacy may prevent caregivers from adequately addressing the true reasons for the patient's request and offering treatments that could better directly address their needs. We also disagree that caregivers with ethical objections are obligated to find caregivers who are willing to execute a request that they find immoral. We feel that the physician should assist in finding others who can care for a patient, leaving the final decision between the patient, their families, and the new caregiver.

CONCLUSION

Illness and death are the ultimate violations of a person's autonomy. It is the final revelation that we are not in control. Faced with this, patients often cling to aspects of this process that they believe can be controlled. Patients may make these decisions out of fear or despair for the days that lie ahead. We too often forget to ask patients about their concerns and goals as they approach the end of their lives. Providers are also caregivers, so we are tasked with not only treating their physical needs, but also caring for their emotional and spiritual needs.

Advocates for physician-assisted suicide say that its opponents are preventing patients to "die with dignity" while prolonging suffering. However, a person's dignity is not diminished by suffering. Our faith tells us that from conception to natural death, human dignity is intrinsic. It cannot be measured or subjected to the judgments of others based on physical or mental capabilities. It is sophistry to propose that individuals who devote their lives to healing are not concerned about minimizing suffering. For physicians and other caregivers, our calling, our mandate, and our privilege are to escort and aid our patients' journey through this important, but uniformly inevitable, transition of life's journey.

REFERENCES

- Catechism of the Catholic Church*. 1997. United States Catholic Conference, Libreria Editrice Vaticana, paragraph 2278.
- Congregation for the Doctrine of the Faith. Declaration on Euthanasia, June 1980.
- Goldstein, N.E., D. Mehta, E. Teitelbaum, E.H. Bradley, and R.S. Morrison. 2008. "It's like crossing a bridge" complexities preventing physicians from discussing deactivation of implantable defibrillators at the end of life. *Journal of General Internal Medicine* 23(Suppl. 1):2–6.
- Huddle, T., and F.A. Bailey. 2012. Pacemaker deactivation: Withdrawal of support or active ending of life? *Theor Med Bioeth* 33: 421–33.
- Kapa, S., P.S. Mueller, D.L. Hayes, and S.J. Asirvatham. 2010. Perspectives on withdrawing pacemaker and implantable cardioverter-defibrillator therapies at end of life: Results of a survey of medical and legal professionals and patients. *Mayo Clinic Proceedings* 85:981–90.
- Kay, G.N., and G.T. Bittner. 2009. Should implantable cardioverter-defibrillators and permanent pacemakers in patients with terminal illness be deactivated? Deactivating implantable cardioverter-defibrillators and permanent pacemakers in patients with terminal illness. An ethical distinction. *Circulation: Arrhythmia and Electrophysiology* 2:336–9.
- Kramer, D.B., A.L. Ottenberg, and P. S. Mueller. 2010. Management of cardiac electrical implantable devices in patients nearing the end of life or requesting withdrawal of therapy. *Polskie Archiwum Medycyny Wewnętrznej* 120:497–501.
- Kramer, D.B., A.L. Ottenberg, S. Gerhardson, L.A. Mueller, S.R. Kaufman, B.A. Koenig, and P.S. Mueller. 2011. "Just because we can doesn't mean we should": Views of nurses on deactivation of pacemakers and implantable cardioverter-defibrillators. *Journal of Interventional Cardiac Electrophysiology* 32: 243–52.
- Lampert, R., D.L. Hayes, G.J. Annas, M. A. Farley, N.E. Goldstein, R.M. Hamilton, G.N. Kay, D.B. Kramer, P.S. Mueller, L. Padeletti, L. Pozuelo, M.H. Schoenfeld, P.E. Vardas, D.L. Wiegand, and R. Zellner. 2010. HRS expert consensus statement on the management of cardiovascular implantable electronic devices (CIEDs) in patients nearing end of life or requesting withdrawal of therapy. *Heart Rhythm* 7:1008–26.
- Mueller, P.S. 2010. Clinicians' views regarding deactivation of cardiovascular implantable electronic devices in seriously ill patients. *Heart Rhythm* 7:1543–4.
- Mueller, P.S., A.L. Ottenberg, D.L. Hayes, and B.A. Koenig. 2011. "I felt like the angel of death": Role conflicts and moral

- distress among allied professionals employed by the US cardiovascular implantable electronic device industry. *Journal of Interventional Cardiac Electrophysiology* 32:253–61.
- Mueller, P.S., C.C. Hook, and D.L. Hayes. 2003. Ethical analysis of withdrawal of pacemaker or implantable cardioverter-defibrillator support at the end of life. *Mayo Clinic Proceedings* 79:959–63.
- Mueller, P.S., S.M. Jenkins, K.A. Bramstedt, and D.L. Hayes. 2008. Deactivating implanted cardiac devices in terminally ill patients: Practices and attitudes. *Pacing Clinical Electrophysiology* 31:560–8.
- Pellegrino, E.D. 2000. Decisions to withdraw life-sustaining medical treatment: A moral algorithm. *JAMA* 283:1065–7.
- Sulmasy, D.P. 1998. Killing and allowing to die: Another look. *Journal of Law, Medicine & Ethics* 26:55–64.
- Sulmasy, D.P. 2008. Within you/without you: Biotechnology, ontology, and ethics. *Journal of General Internal Medicine* 23 (Suppl 1):69–72.
- Wilkoff, B.L., A. Auricchio, J. Brugada, M. Cowie, K.A. Ellenbogen, A.M. Gillis, D.L. Hayes, J.G. Howlett, J. Kautzner, C.J. Love, J.M. Morgan, S.G. Priori, D.W. Reynolds, M.H. Schoenfeld, and P.E. Vardas. 2008. HRS/EHRA expert consensus on the monitoring of cardiovascular implantable electronic devices (CIEDs): Description of techniques, indications, personnel, frequency, and ethical considerations. *Heart Rhythm* 5:907–25.
- Zellner, R.A., M.P. Aulisio, and W.R. Lewis. 2009. Should implantable cardioverter-defibrillators and permanent pacemakers in patients with terminal illness be deactivated? Deactivating permanent pacemaker in patients with terminal illness. Patient autonomy is paramount. *Circ Arrhythm Electrophysiol* 2:340–4.

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