Ethical Analysis of Withdrawing Ventricular Assist Device Support

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OBJECTIVE: To describe a series of patients with heart failure supported with a ventricular assist device (VAD) who requested (or whose surrogates requested) withdrawal of VAD support and the legal and ethical aspects pertaining to these requests.

PATIENTS AND METHODS: We retrospectively reviewed the medical records of patients at Mayo Clinic, Rochester, MN, from March 1, 2003, through January 31, 2009, who requested (or whose surrogates requested) withdrawal of VAD support and for whom the requests were fulfilled. We then explored the legal and ethical permissibility of carrying out such requests.

RESULTS: The median age of the 14 patients identified (13 men, 1 woman) was 57 years. Requests were made by 2 patients and 12 surrogates. None of the patients' available advance directives mentioned the VAD. For 11 patients, multidisciplinary care conferences were held before withdrawal of VAD support. Only 1 patient had an ethics consultation. All 14 patients died within 1 day of withdrawal of VAD support.

CONCLUSION: Patients have the right to refuse or request the withdrawal of any unwanted treatment, and we argue that this right extends to VAD support. We also argue that the cause of death in these cases is the underlying heart disease, not assisted suicide or euthanasia. Therefore, patients with heart failure supported with VADs or their surrogates may request withdrawal of this treatment. In our view, carrying out such requests is permissible in accordance with the principles that apply to withdrawing other life-sustaining treatments.

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AD = advance directive; BTT = bridge to (cardiac) transplant; DT = destination therapy; ICD = implantable cardioverter-defibrillator; LVAD = left VAD; VAD = ventricular assist device

Approximately 5 million Americans have heart failure,¹ and of these about 250,000 have end-stage disease with symptoms at rest.² The 1-year mortality rate for patients with severe heart failure exceeds 50%.³ Although heart transplant is an effective treatment for severe heart failure, the demand for donor hearts far exceeds the supply. While waiting for a donor heart, patients can be supported with a left ventricular assist device (LVAD), also known as *bridge to (cardiac) transplant* (BTT). The LVAD is a surgically implanted device that supports circulation by pulling blood from the left ventricle and pumping it into the aorta. The device is connected to an external battery pack and control system by a conduit that passes through the abdominal wall.² Some patients with reversible forms of heart failure are supported with an LVAD until the heart recovers, at which time the device is removed, also known as *bridge to recovery*.

Patients with irreversible and severe heart failure who are not candidates for a heart transplant can be supported with an LVAD for the rest of their lives. This form of LVAD support is known as *destination therapy* (DT). A randomized trial showed that patients with severe heart failure who underwent LVAD/DT implantation survived longer than patients whose conditions were managed medically.³ A recent trial demonstrated significantly greater 2-year survival among patients with severe heart failure treated with continuous-flow LVADs than among patients treated with older pulsatile-flow devices (58% vs 24%).⁴ At Mayo Clinic in Rochester, MN, the 2-year survival rate for patients treated with LVAD/DT is 74%.⁵ These data suggest that ventricular assist device (VAD) technology is improving and that LVAD/DT is a promising long-term treatment for patients with severe heart failure.

Nevertheless, some patients with VADs have complications, such as stroke, infection, and multiorgan failure.^{3,4} These patients (or their surrogates) may conclude that VAD support is more burdensome than beneficial and may request withdrawal of VAD support (ie, that the device be turned off). In the United States, it is ethically and legally permissible for patients to refuse or to request the withdrawal of life-sustaining treatments (eg, mechanical ventilation, hemodialysis, or artificial hydration and nutrition). Likewise, it is ethically and legally permissible for clinicians to comply with these requests. However, the VAD is a new technology, and some clinicians may worry that it is unethical or illegal to withdraw VAD support. In this article, we describe 14 patients at a single institution who requested (or whose surrogates requested) withdrawal of VAD support. We also describe and analyze the ethical concerns raised by these requests.

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PATIENTS AND METHODS

We searched our patient database for the records of patients who underwent VAD implantation at Mayo Clinic in Rochester, MN, from March 1, 2003, through January 31, 2009. During this time, 68 patients underwent VAD implantation; of these, 42 patients (62%) were alive at the time of our study. Of the 26 patients who died, 14 (54%) requested (or their surrogate decision-makers requested) withdrawal of LVAD support. The requests were carried out for all patients. These 14 patients make up the study group. Permission to perform a retrospective review of the patients' medical records was granted by the Mayo Clinic Institutional Review Board in compliance with federal regulations.

RESULTS

The clinical features of the 14 patients (13 men, 1 woman) are shown in Table 1. The median (range) age was 57 (41-68) years, and median (range) left ventricular ejection fraction just before VAD implantation was 15% (10%-30%). The indication for VAD support was DT in 7 patients, BTT in 6 patients, and bridge to recovery in 1 patient. Nine patients had pulsatile flow devices, and 5 had continuous flow devices. Eight patients had other implantable cardiac devices (eg, an implantable cardioverter-defibrillator [ICD]). Patients lived with VAD support for a median of 64 days (range, 1-1028 days). Just before death, 11 patients also were receiving mechanical ventilator support, 8 patients were receiving hemodialysis support, and 7 patients were

receiving nutrition support. Most patients had multiorgan failure. All 14 patients died in institutions (12 in hospitals), and all 14 died within 1 day after VAD support was withdrawn.

Only 2 patients had decision-making capacity when their VAD was turned off (Table 2). For the other patients, the decision to withdraw VAD support was made by surrogates. Nine patients had advance directives (ADs) before the hospitalization in which VAD support was withdrawn, but only 7 of these ADs were in the patients' medical records and none of the ADs mentioned the VAD. For 11 patients, multidisciplinary case conferences were held before withdrawal of VAD support to facilitate decision making. Only 1 patient received a formal ethics consultation in response to the request to withdraw VAD support. Ethics consultations have been described in detail previously.⁶

ILLUSTRATIVE CASE REPORTS

The following 7 case histories of patients who were part of the study group illustrate the clinical and psychosocial factors that may have affected decisions to withdraw VAD support. The case numbers correspond to the patient numbers in Tables 1 and 2.

Case 1. In February 2005, a 62-year-old man with severe ischemic cardiomyopathy underwent LVAD/DT implantation. In July 2005, he was found semiconscious at home; on examination after admission to the hospital, he was found to have fungemia and a subarachnoid hemorrhage. On day 2 of hospitalization, he had a cardiac arrest, requiring cardiopulmonary resuscitation and mechanical ventilation. His neurologic function was minimal, and

TABLE 1. Clinical Features of 14 Study Patients^a

Patient No./sex/age (y) at VAD implantation	LVEF (%)	Indication for/type of VAD	Other cardiac devices	Hemodialysis support ^b	Nutrition support ^b	Mechanical ventilation ^b	Cause of death	Time patient lived with VAD (d)
1/M/62	15	DT/PF	No	No	No	Yes	CNS hemorrhage, fungal sepsis	159
2/M/49	25	BTT/PF	No	Yes	No	Yes	MOF	3
3/F/64	15	BTR/PF	No	Yes	FT	Yes	MOF	69
4/M/68	15	DT/PF	ICD, PM	Yes	FT	Yes	Cardiac arrest	118
5/M/60	10	DT/PF	No	Yes	No	No	CHF	16
6/M/54	12	DT/PF	ICD	No	No	No	Cancer	1028
7/M/51	15	BTT/CF	ICD, PM	Yes	FT	Yes	MOF, bowel perforation	59
8/M/48	12	DT/CF	ICD, PM	No	No	Yes	MOF, GI bleeding	874
9/M/64	15	DT/CF	ICD, PM	No	FT	Yes	MOF	167
10/M/41	30	BTT/CF	ICD, PM	Yes	PN	Yes	MOF	58
11/M/47	15	BTT/PF	No	Yes	PN	Yes	MOF	57
12/M/47	10	BTT/PF	No	No	No	Yes	MOF	1
13/M/68	15	DT/PF	ICD, PM	No	No	No	Unknown	168
14/M/62	20	BTT/CF	CRT	Yes	FT	Yes	CNS hemorrhage, fungal sepsis	56

^a BTR = bridge to recovery; BTT = bridge to (cardiac) transplant; CF = continuous flow; CHF = chronic heart failure; CNS = central nervous system; CRT = cardiac resynchronization therapy; DT = destination therapy; F = female; FT = feeding tube; GI = gastrointestinal; ICD = implantable cardioverter-defibrillator; LVEF = left ventricular ejection fraction; M = male; MOF = multiorgan failure; PF = pulsatile flow; PM = pacemaker; PN = parenteral nutrition; VAD = ventricular assist device.

^b At time of death.

TABLE 2. End-of-Life Factors for the 14 Study Patients^a

Patient	Decision-making capacity ^b	AD at time of death	AD completed before or after VAD implant	Surrogate decision-maker(s)	Multidisciplinary care conference	Ethics consultation	Site/year of death
1	No	No	NA	Family	Yes	No	Hospital/2005
2	No	No	NA	Family	Yes	No	Hospital/2005
3	No	Yes	After	Family	Yes	No	Hospital/2005
4	Yes	Yes	Before	NA	Yes	No	Hospital/2005
5	Yes	Yes	After	NA	No	Yes	Hospital/2005
6	No	Yes, but unavailable	NA	Wife	No	No	Hospice/2006
7	No	No	NA	Wife	Yes	No	Hospital/2006
8	No	No	NA	Mother and sister	Yes	No	Hospital/2007
9	No	No	NA	Wife	Yes	No	Hospital/2007
10	No	Yes	Before	Parents	Yes	No	Hospital/2007
11	No	Yes	After	Family	Yes	No	Hospital/2007
12	No	Yes	Before	Family	Yes	No	Hospital/2008
13	No	Yes, but unavailable	NA	Wife	No	No	Hospice/2008
14	No	Yes	Before	Wife	Yes	No	Hospital/2008

^a AD = advance directive; NA = not applicable; VAD = ventricular assist device.

^b At the time of decision to deactivate VAD.

he never regained consciousness. Thereafter, his clinical course deteriorated. Several multidisciplinary conferences were held with the patient's family. Ultimately, after a request from the family to turn off the VAD, the decision was made to withdraw life-prolonging treatments, including VAD support. On day 8 of hospitalization, the VAD was turned off and comfort care measures were implemented. On day 9, the patient was extubated and he subsequently died.

Case 4. In July 2005, a 68-year-old man who had ischemic cardiomyopathy and severe biventricular heart failure underwent mitral valve repair and LVAD/DT placement. His postoperative course was notable for hypotension requiring prolonged inotropic support, kidney failure requiring hemodialysis, and respiratory failure requiring mechanical ventilation. In September 2005, a feeding tube was placed because the VAD was impinging on his duodenum and therefore impairing eating and nutrition. In October 2005, he fell and sustained a left hip fracture. In November 2005, pseudomonal and enterococcal bacteremia developed. Nevertheless, throughout his hospitalization, the patient maintained decision-making capacity. Later that month, the patient expressed an interest in withdrawing life-prolonging treatments and asked "to be allowed to experience a natural death." Several multidisciplinary care conferences were held with the patient and his family, and the decision was made to withdraw all life-prolonging treatments, including VAD support. The patient died shortly after withdrawal of these treatments.

Case 5. In October 2005, a 60-year-old man admitted to the hospital with hyperglycemia and pneumonia was found to have severely decreased left ventricular systolic function. On day 2 of hospitalization, his clinical status rapidly deteriorated. He was intubated and mechanically

ventilated for respiratory failure, received hemodialysis for kidney failure, and underwent right-VAD and LVAD placements. During the next several days, the patient's clinical status improved, and he was extubated. Nevertheless, in November 2005, the patient "...expressed his desire to not be sustained by artificial means." Multiple assessments, including one by a psychiatrist, found that the patient had decision-making capacity. On day 18 of hospitalization, he completed an AD. That same day, the patient, his sister, his physician, and the hospital chaplain met to discuss treatment options. The decision was made to withdraw life-prolonging treatments. An ethics consultation was done and concluded that withdrawal of VAD support was ethically permissible. The VADs were turned off and the patient died shortly thereafter.

Case 6. A 54-year-old man who had chronic obstructive pulmonary disease and severe ischemic cardiomyopathy underwent LVAD/DT placement in March 2003 and then device replacement in March 2004 because of device failure. The replacement procedure was complicated by stroke and resulting right hemiparesis. In July 2005, he was found to have a chest mass, biopsy of which indicated small cell lung cancer, which was treated with chemotherapy. In October 2005, his cancer was found to have progressed and he was admitted to hospice. At that time, the patient (who had decision-making capacity), his wife, and his clinicians made the decision not to replace the VAD if it were to fail. In January 2006, the patient's condition declined markedly, and he lost decision-making capacity. Given this change in the patient's clinical status, his terminal illness, and his previously expressed health care-related values, goals, and preferences, the patient's wife requested withdrawal of VAD support. The hospice asked the patient's cardiologist for "guidance in turning off the pump...so that [the patient's wife] would not

have to take on this responsibility... ." Subsequently, with careful attention to managing symptoms and maintaining comfort, the VAD was turned off and the patient was allowed to die (he died later that day).

Case 8. A 48-year-old man had severe biventricular heart failure for which he underwent LVAD/DT placement in December 2004 and device replacement (due to device failure) in October 2006. In April 2007, he was transferred to our institution from an outside hospital because of hypotension, gastrointestinal tract bleeding, and sepsis. His clinical status rapidly deteriorated; liver failure developed, along with massive ascites, an abdominal compression syndrome due to right heart failure, and loss of decision-making capacity. On day 21 of hospitalization, he had a cardiac arrest and was resuscitated and mechanically ventilated. After this, his blood pressure progressively decreased, he became diffusely cyanotic and mottled, his pupils became fixed and dilated, and severe acidemia developed. A multidisciplinary care conference was held with the patient's mother and sister, and the decision was made to withdraw life-prolonging treatments, including VAD support. Intravenous fluids, mechanical ventilation, and VAD support were withdrawn, and the patient subsequently died.

Case 10. A 41-year-old man received an LVAD as BTT in July 2007 because of worsening heart failure. He had had hypertrophic cardiomyopathy since age 13 years, and heart failure developed initially in 2000. After the VAD implantation procedure, hypoxemia developed, which was subsequently found to be due to an atrial septal defect created from a transcatheter ablation procedure; the defect was later closed with an Amplatzer occluder (AGA Medical Corp, Plymouth, MN). He improved steadily during the following weeks. However, marked hemolysis and multisystem organ failure then developed as a result of VAD malfunction, and he underwent surgery to replace the malfunctioning VAD. Despite this procedure, his condition did not improve and he required extracorporeal membrane oxygenation support. His neurologic condition deteriorated rapidly as a result of bilateral cerebral hemorrhages. The patient's AD specified that clinicians should do "everything possible" if there was "a chance to return to a functional lifestyle" but also stated that, if he was in a vegetative state with no quality of life, he wished "to die with dignity and not go through a drawn-out process of life support." The AD did not mention the VAD. The patient's parents were asked to attend a multidisciplinary care conference, and the decision was made to withdraw all life-prolonging treatments. Extracorporeal membrane oxygenation was stopped and the VAD was turned off, resulting in "no useful cardiac activity." The patient subsequently died.

Case 14. In October 2008, a 62-year-old man with Fabry disease–associated infiltrative cardiomyopathy under-

went LVAD placement as BTT. His postoperative course was notable for encephalopathy, hypotension requiring inotropic support, kidney failure requiring hemodialysis, and respiratory failure requiring mechanical ventilation. He improved and was eventually extubated. However, in December 2008, he abruptly experienced hypotension and respiratory failure requiring reintubation. Despite resuscitative efforts, persistent hypotension, mottled extremities, and acidemia developed. The patient's AD specified a desire for "all life-saving treatments" if he had a reasonable chance of recovery but also a desire to "die in comfort" and for "no tubes." The AD did not mention the VAD. A multidisciplinary care conference was held with the patient's wife, and the decision was made to withdraw all life-sustaining treatments. After withdrawing ventilator and VAD support, the patient died.

DISCUSSION

The LVAD is a promising new technology that provides circulatory support for patients with severe heart failure who are awaiting a heart transplant. It is also used as a long-term treatment for patients who are not candidates for heart transplant. Nevertheless, some patients have complications related to the treatment or their underlying disease and may request withdrawal of VAD support. To our knowledge, we report the largest series of patients who died after VAD support was withdrawn at their own or their surrogates' request.

We found that requests to withdraw VAD support are not uncommon. Of the 68 patients who underwent VAD implantation at our institution from March 1, 2003, through January 31, 2009, 14 (21%) requested (or their surrogates requested) withdrawal of VAD support. After careful consideration, VAD support was withdrawn in all 14 patients, and they all died shortly thereafter. These findings are similar to those of a prior, yet smaller, study.⁷

There is a well-established ethical and legal consensus that patients (or their surrogates) may autonomously request the withdrawal of life-sustaining treatments that are ineffective, or are, in their judgment, more burdensome than beneficial.⁸⁻¹⁰ Under appropriate conditions, it is not uncommon for clinicians to comply with requests to withdraw life-sustaining treatments, such as mechanical ventilation, hemodialysis, artificial hydration and nutrition, and other cardiac device therapies (eg, ICDs and pacemakers).¹¹⁻¹³ The VAD, however, is a new life-sustaining technology, and some of its specific features may lead clinicians to question the ethical and legal permissibility of withdrawing VAD support. These objections, however, do not withstand careful ethical scrutiny. For example, some possible objections to withdrawing VAD support are that

it is a continuous, long-term (especially DT), and constitutive (ie, it takes over an essential function the body can no longer provide for itself) life-sustaining treatment and therefore cannot be withdrawn because death inevitably occurs shortly thereafter. It is widely agreed, however, that carrying out requests to withdraw other continuous, long-term, or constitutive life-sustaining treatments, such as mechanical ventilation, hemodialysis, and artificial hydration and nutrition, is ethically permissible.¹⁴

Some may view a VAD as a replacement treatment—a treatment that literally becomes part of the patient and takes over the function lost by the diseased organ—and, as such, one that cannot be withdrawn. Withdrawal of life-sustaining treatments that are clearly classified as replacement therapies is more likely to be considered assisted suicide or euthanasia. However, a genuine replacement therapy responds to the host's physiologic changes and is independent of external energy sources and the control of an expert.¹⁴ Examples of replacement treatments include the porcine heart valve and organ transplant. Ventricular assist devices, however, lack the characteristics of replacement therapies. Furthermore, although we agree that complying with a request to remove an implanted porcine heart valve or organ would be unethical, withdrawing VAD support does not raise the same concerns. Removing a valve or an organ is invasive and painful and therefore introduces a new pathology (eg, a surgical wound), whereas turning off a VAD is noninvasive and painless and does not introduce a new pathology.

Turning off a VAD, however, may precipitate symptoms of heart failure and, in the case of continuous flow VADs (which do not have valves), symptoms akin to acute aortic insufficiency. However, these potential outcomes are similar to those that may occur after the withdrawal of intra-aortic balloon pump support, inotropic agents, and other device therapies, such as pacemaker support (in a pacemaker-dependent patient) and cardiac resynchronization therapy. Patients and surrogates should be advised of these potential symptoms and appropriate palliative measures implemented to address symptoms (eg, opioids for dyspnea). In our experience, patients whose VADs (including continuous flow VADs) have been turned off and who have received appropriate treatment to palliate symptoms (but not to hasten death) have appeared comfortable at the time of death.

Of note, patients with VADs receive anticoagulation therapy with warfarin. In many patients who request (or whose surrogates request) withdrawal of VAD support, however, anticoagulation either has already been stopped because of VAD-related complications that contraindicate warfarin (eg, intracranial hemorrhage or gastrointestinal bleeding) or is discontinued because it does not help patients achieve their care goals (eg, comfort). Although

thrombotic complications are possible if anticoagulation is discontinued, patients generally do not survive long enough after VAD deactivation for thrombotic complications to occur as a result of waning anticoagulation.

Some may be concerned that withdrawing VAD support is akin to assisted suicide or euthanasia. However, withdrawing VAD support differs from assisted suicide and euthanasia in important ways. In both assisted suicide and euthanasia, the proximate cause of death is a new pathology prescribed or administered by a clinician with the intention of terminating the patient's life. In contrast, when a patient dies after withdrawal of a life-sustaining treatment, the cause of death is dependent on the underlying disease; a new pathology has not been introduced.¹³⁻¹⁷ In typical ethically and legally permissible cases of withdrawing life-sustaining treatments, the intention is to remove a treatment that is perceived by the patient as nonbeneficial or burdensome—ie, the intention is to terminate the treatment, not the patient. A death that follows withdrawal of VAD support is causally dependent on the underlying heart failure, and the act of withdrawing VAD support removes an impediment to that underlying cause. In this context, the act of withdrawing VAD support would be an ethically and legally permissible form of withdrawing a life-sustaining treatment and not akin to assisted suicide or euthanasia.¹⁷

Some philosophical and legal commentators do not accept a distinction between *killing* and *allowing to die* and therefore deny the thesis that killing is always wrong, whereas allowing to die may be permissible. They consider that the sole justification for withholding or withdrawing life-sustaining treatment is the withholding or withdrawing of autonomous consent for the treatment. They argue that if death is expected when a clinician withdraws a life-sustaining treatment at the patient's autonomous request, and this act is morally permissible, then the expected death that follows a lethal injection performed at the patient's autonomous request also ought to be morally permissible.¹⁸

We consider, however, that a distinction exists between killing and allowing to die. Logically, then, the moral application of this distinction is that killing patients is always wrong, whereas allowing patients to die by withholding or withdrawing life-sustaining treatments is sometimes morally permissible.¹⁷ The difference between killing and the morally permissible cases of allowing to die depends crucially on a distinction between intending termination of the patient's life and intending termination of a treatment that is inhibiting the natural progression of a lethal pathology. Under certain conditions, such as when the patient judges the burdens of the treatment to outweigh the benefits, this kind of allowing to die is frequently morally appropriate.

Those who acknowledge no distinction between killing and allowing to die not only consider withdrawal of VAD support and withdrawal of ventilator support to be equivalent but also see no difference between withdrawal of VAD support and administration of a lethal injection. Therefore, proponents of euthanasia who do not accept the difference between killing and allowing to die are not likely to be morally opposed to the withdrawal of VAD support.

This article, however, addresses the concerns of clinicians who acknowledge a distinction between killing and allowing to die and are opposed to euthanasia but are worried that the withdrawal of VAD support is morally different from the withdrawal of other life-sustaining treatments (ie, they are unsure whether VAD withdrawal is euthanasia and therefore, in their view, immoral). We have argued that the withdrawal of VAD support is not killing (ie, is not euthanasia), but rather, like the withdrawal of ventilator support, an act of allowing to die that can be morally permissible when the patient consents, the burdens outweigh the benefits, and the intention of the physician is to terminate the treatment, not the patient, even though the death of the patient is foreseeable. Thus, the withdrawal of VAD support should not be opposed by those who acknowledge a difference between killing and allowing to die and are morally opposed to euthanasia but accept that it is sometimes morally permissible to withdraw other life-sustaining treatments.

In fact, the US Supreme Court, in ruling that there is no constitutional right to euthanasia, has accepted a difference between killing and allowing to die.¹⁹ Despite this ruling, however, a person may still believe that killing and allowing to die are the same. Nevertheless, if such a person wanted to prove that VAD withdrawal is legally permissible, he or she would need to argue that withdrawing VAD support is akin to withdrawing other life-prolonging treatments (eg, mechanical ventilation) and therefore legal and not euthanasia.

Indeed, American courts have consistently upheld a patient's right to refuse or to request the withdrawal of any treatment, even if the treatment prolongs the patient's life and not using it results in death. This right extends to patients who lack decision-making capacity and can be exercised through previously expressed explicit statements, formal ADs, and surrogate decision-makers.^{20,21} A patient also has the right to refuse a treatment to which he or she has previously consented.^{8,11,15} If a clinician initiates or continues a treatment that a patient has refused, then legally the clinician is committing battery, regardless of the clinician's intent.¹⁰ Furthermore, there is no legal reason that a treatment must be continued once it has been initiated.^{13,21} Nevertheless, because euthanasia is illegal, consent must be considered a necessary, yet not a sufficient, justification

for carrying out a patient's or surrogate's request to withdraw VAD support. It is also necessary that the intent of the act is to remove a treatment that is perceived by the patient as nonbeneficial or burdensome, not termination of the patient's life.

Pellegrino⁸ described a question-based algorithm for withdrawing life-sustaining treatments that can be applied to the withdrawal of VAD support. The first question is: "Who decides?" Ethically and legally, patients have authority to make decisions, and their decisions have priority over clinicians' opinions. When patients cannot speak for themselves, ADs and surrogate decision-makers may "speak" on their behalf. Only 2 of the 14 patients in our series had decision-making capacity when the decision was made to withdraw VAD support. For the patients who lacked decision-making capacity, the clinicians and surrogates generally had to base their decisions to withdraw VAD support on a broad knowledge of the patients' preferences and goals because, like other specialized treatments, VAD support had not emerged in prior conversations and had not been mentioned explicitly in an AD.

The second question in Pellegrino's algorithm is: "By what criteria?" To properly answer this question, a treatment's effectiveness, benefits, and burdens must be assessed. Although VADs are effective in prolonging life by maintaining circulation in the setting of fatal heart failure,^{3,4} they do not cure the underlying heart disease or other pathologies (eg, stroke or sepsis). Whereas the clinician determines the effectiveness of a treatment (eg, on the basis of clinical trials), the patient generally determines the benefits and the burdens of a life-sustaining treatment. What is perceived as beneficial and nonburdensome by one patient may not be by another. Benefit might include improved quality of life. Burden might include psychosocial and spiritual burdens or prolonging a life of suffering without hope of relief.⁸ In our series, the 2 patients with decision-making capacity requested that their VADs be turned off because the devices were perceived to be nonbeneficial and burdensome despite their effectiveness in maintaining circulation. For the 12 remaining profoundly ill patients, surrogates determined that VAD support was nonbeneficial and burdensome. This scenario, in which the VAD merely maintains a moribund state or permanent unconsciousness, has been dubbed *destination nowhere* by Bramstedt.²² The absence of benefit coupled with substantial burdens justifies withdrawal of VAD support in these patients.

The third question is: "How are conflicts among decision-makers resolved and prevented?"⁸ Multidisciplinary care conferences, ethics consultation, and palliative care consultation can be helpful in resolving these conflicts. Our experience has prompted a change in our approach to patients who are being considered for or who have VADs. Since January

2009, all patients being considered for LVAD/DT placement also receive consultation with a palliative medicine specialist, who engages the patient in the process of advance care planning, including completion of a detailed AD referred to as a *preparedness plan*. The permissibility of withdrawing VAD support is discussed, as is planning regarding wishes in the event of device failure, catastrophic complication, development of a secondary comorbid condition, or ongoing poor quality of life. The initial results of this effort will be reported elsewhere, but it generally has been well received by patients, their loved ones, and the health care team. This process has been modeled after similar ones that have been successfully used elsewhere.^{7,23}

In general, clinicians at our institution were not reluctant to carry out requests to withdraw VAD support, as evidenced by the fact that an ethics consultation was requested for only 1 patient in our series. Several factors may account for this observation. First, we think that discussions, debate, ethics consultations, and scholarship (eg, lectures and publications^{6,13}) generated by requests to withdraw other life-sustaining treatments at our institution (eg, pacemaker and ICD support) informed our clinicians regarding the permissibility of meeting these requests. Nevertheless, in ambiguous situations, clinicians should consider ethics consultation. Second, decisions to withdraw VAD support typically were made by achieving agreement during multidisciplinary care conferences with the patients and/or their loved ones present. However, if acceding to a persistent request to turn off a VAD violates a clinician's conscience and if no agreement can be reached via the aforementioned mechanisms, the clinician should transfer the patient's care to another physician.¹⁰⁻¹³ Finally, clinicians in charge of the care of these patients should not compel others (eg, nurses) who conscientiously object to withdrawing VAD support to carry out requests to turn off VADs.

CONCLUSION

Ethical and legal precedents affirm that patients have the right to refuse or request the withdrawal of unwanted life-prolonging treatments, such as mechanical ventilation, hemodialysis, and artificial hydration and nutrition. On the basis of our experience with 14 patients who requested (or whose surrogates requested) withdrawal of VAD support, it is our opinion that this right extends to withdrawal of VAD support as well. Carrying out such requests is not akin to assisted suicide or euthanasia; the cause of death is the patient's underlying disease. Assuming the patient (or surrogate) is informed regarding alternatives to and consequences of withdrawing VAD support, clinicians should honor such requests or transfer the patient's care to another physician. Plans for palliative care should be made for pa-

tients who undergo withdrawal of VAD support. Conflicts related to care management in patients with VADs may be prevented by engaging patients in advance care planning (preferably before the device is implanted) and proactive palliative medicine consultation. Ethics consultation can be helpful in resolving dilemmas that arise while caring for these patients.

REFERENCES

1. American Heart Association (AHA). 2000 Heart and Stroke Statistical Update. Dallas, TX: Association Heart Association; 2000.
2. Ferris H, Hunt S. Destination ventricular assist devices for heart failure #205. *J Palliat Med*. 2009;12(10):956-957.
3. Rose EA, Gelijns AC, Moskowitz AJ, et al; Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure (REMATCH) Study Group. Long-term mechanical left ventricular assistance for end-stage heart failure. *N Engl J Med*. 2001;345(20):1435-1443.
4. Slaughter MS, Rogers JG, Milano CA, et al; HeartMate II Investigators. Advanced heart failure treated with continuous-flow left ventricular assist device. *N Engl J Med*. 2009;361(23):2241-2251.
5. Boilson BA, Schirger JA, Durham LA III, et al. Transformation of LVAD destination therapy, "good to great": ever increasing survival benefit [abstract 3662]. *Circulation*. 2009;120:S844.
6. Swetz KM, Crowley ME, Hook CC, Mueller PS. Report of 255 clinical ethics consultations and review of the literature. *Mayo Clin Proc*. 2007;82(6):686-691.
7. MacIver J, Ross HJ. Withdrawal of ventricular assist device support. *J Palliat Care*. 2005;21(3):151-156.
8. Pellegrino ED. Decisions to withdraw life-sustaining treatment: a moral algorithm. *JAMA*. 2000;283(8):1065-1067.
9. Pellegrino ED, Sulmasy DP. Ethical issues in palliative care. In: Chochinov HM, Breitbart W, eds. *Handbook of Psychiatry in Palliative Medicine*. 2nd ed. Oxford, England: Oxford University Press; 2009:267-280.
10. Snyder L, Leffler C; Ethics and Human Rights Committee, American College of Physicians. Ethics manual: fifth edition. *Ann Intern Med*. 2005;142(7):560-582.
11. Quill TE, Barold SS, Sussman BL. Discontinuing an implantable cardioverter defibrillator as a life-sustaining treatment. *Am J Cardiol*. 1994;74(2):205-207.
12. Mueller PS, Jenkins SM, Bramstedt KA, Hayes DL. Deactivating implanted cardiac devices in terminally ill patients: practices and attitudes. *Pacing Clin Electrophysiol*. 2008;31(5):560-568.
13. Mueller PS, Hook CC, Hayes DL. Ethical analysis of withdrawal of pacemaker or implantable cardioverter-defibrillator support at the end of life. *Mayo Clin Proc*. 2003;78(8):959-963.
14. Sulmasy DP. Within you/without you: biotechnology, ontology, and ethics. *J Gen Intern Med*. 2008;23(suppl 1):69-72.
15. Rhymes JA, McCullough LB, Luchi RJ, Teasdale TA, Wilson N. Withdrawing very low-burden interventions in chronically ill patients. *JAMA*. 2000;283(8):1061-1063.
16. Meisel A, Snyder L, Quill T; American College of Physicians—American Society of Internal Medicine End-of-Life Care Consensus Panel. Seven legal barriers to end-of-life care: myths, realities, and grains of truth. *JAMA*. 2000;284(19):2495-2501.
17. Sulmasy DP. Killing and allowing to die: another look. *J Law Med Ethics*. 1998;26(1):55-64, 4.
18. Dworkin R, Nagel T, Nozick R, Rawls J, Scanlon T, Thomson JJ. Assisted suicide: the philosophers' brief. *New York Rev Books*. 1997 Mar 27:41-47.
19. *Vacco v. Quill*, 521 U.S. 793 (1997).
20. Francis LP. Legal rights to health care at the end of life. *JAMA*. 1999;282(21):2079.
21. Emanuel EJ. Securing patients' right to refuse medical care: in praise of the Cruzan decision. *Am J Med*. 1992;92(3):307-312.
22. Bramstedt KA. Destination nowhere: a potential dilemma with ventricular assist devices. *ASAIO J*. 2008;54(1):1-2.
23. Rizzieri AG, Verheijde JL, Rady MY, McGregor JL. Ethical challenges with the left ventricular assist device as a destination therapy. *Philos Ethics Humanit Med*. 2008;3:20.