Theor Med Bioeth (2009) 30:401–410
DOI 10.1007/s11017-009-9120-6

The self-fulfilling prophecy in intensive care

Dominic Wilkinson

Published online: 27 November 2009

Abstract Predictions of poor prognosis for critically ill patients may become self-fulfilling if life-sustaining treatment or resuscitation is subsequently withheld on the basis of that prediction. This paper outlines the epistemic and normative problems raised by self-fulfilling prophecies (SFPs) in intensive care. Where predictions affect outcome, it can be extremely difficult to ascertain the mortality rate for patients if all treatment were provided. SFPs may lead to an increase in mortality for cohorts of patients predicted to have poor prognosis, they may lead doctors to feel causally responsible for the deaths of their patients, and they may compromise honest communication with patients and families about prognosis. However, I argue that the self-fulfilling prophecy is inevitable when life-sustaining treatment is withheld or withdrawn in the face of uncertainty. SFPs do not necessarily make treatment limitation decisions problematic. To minimize the effects of SFPs, it is essential to carefully collect and appraise evidence about prognosis. Doctors need to be honest with themselves and with patients and their families about uncertainty and the limits of knowledge.

Keywords Prognosis · Futility · Withdrawing treatment · Intensive care · Clinical ethics · Resuscitation orders

Abbreviation
SFP Self-fulfilling Prophecy

D. Wilkinson (✉)
The Ethox Centre, Department of Public Health and Primary Health Care, The University of Oxford, Badenoch Building, Headington OX3 7LF, UK
e-mail: dominic.wilkinson@ethox.ox.ac.uk

D. Wilkinson
Oxford Uehiro Centre for Practical Ethics, The University of Oxford, Oxford, UK

Introduction

> The self-fulfilling prophecy is, in the beginning, a false definition of the situation evoking a new behaviour which makes the original false conception come "true." This specious validity of the self-fulfilling prophecy perpetuates a reign of error. For the prophet will cite the actual course of events as proof that he was right from the very beginning (Robert Merton) [1, p. 477].

The idea of a self-fulfilling prophecy (SFP) was famously introduced by sociologist Robert Merton in the 1950s. Merton was interested in the nature of enquiry in social sciences, and whether it is possible to get at the truth of the matter. Popper, recalling the famous Greek myth, referred to the same idea as "the Oedipus prophecy" [2, p. 139]. A paradigmatic example that Merton cites is that of the fictional Millingville bank. Groundless rumours of an imminent bank collapse lead to a large number of people withdrawing their savings. This in turn leads to the actual collapse of the bank. The SFP raises the question of the overlap between prediction and predestination, echoed in mythology, literature and in science fiction.

In medicine the problem of the self-fulfilling prophecy has been raised in many different contexts. Predictions may affect the mental state and behaviour of patients. For example, giving patients the news that they have a short time to live may cause them to become depressed, to stop taking medicines, and may contribute to their early demise. Awareness of this problem contributes to reluctance among doctors to prognosticate [3]. In intensive care the SFP is particularly apparent in decisions about withdrawal of life-support on the basis of predicted high mortality. The concern is that if life-support is withdrawn from patients who are predicted (if treatment were continued) to have a high risk of dying, this action then leads to a high mortality rate in that group of patients. This may occur whether or not the original prediction was valid. But since it is now true that the majority of patients with this condition die, subsequent similar patients are believed to have a high chance of dying and also have treatment withdrawn. For example, it has been argued that the SFP contributes to mortality rates for extremely premature infants [4], infants with trisomy 13 or 18 [5, 6], as well as for adults with haemorrhagic stroke [7], hypoxic brain injury [8], critical illness [9], and brain death [10].

The issues raised by self-fulfilling prophecies are relevant to all treatment limitation decisions (for example they also apply to do-not-attempt-resuscitation orders and the question of their potential contribution to mortality [11, 12]). In this paper, I focus on the problems caused by self-fulfilling prophecies in relation to treatment withdrawal decisions in intensive care. I will briefly present a definition of self-fulfilling prophecies. I will then outline two types of problem. For populations where a high proportion of deaths follow decisions to limit, withdraw, or withhold life-sustaining treatment, it can be extremely difficult to determine which came first—the high mortality in a particular group, or the prediction of high mortality. This is the epistemic challenge that the SFP creates. But there are also normative questions. Should doctors avoid prognostication if there is a risk of SFPs? Does the SFP lead doctors to act wrongly, or lead to patients being harmed? I will argue that

the SFP is inevitable if withdrawal of treatment occurs in the setting of uncertain prognosis, and that it does not necessarily make treatment withdrawal problematic.

Definition

There are a number of ways in which predictions can affect outcome. They may generate an outcome that would not otherwise have occurred. They may increase the chance of an outcome occurring that had some chance of occurring otherwise. Alternatively, in some circumstances they may lead, by virtue of the prediction, to an outcome not taking place [13, p. 136].

Merton had in mind the first of these possibilities. He defined the SFP as a "false prediction," so in his example Millingville bank would not have collapsed without the effect of rumours on consumer confidence [1, p. 476]. Yet the situation in intensive care is more like the second possibility. In almost all situations there is some significant chance of the patient dying even if no attempts at prognosis were made, and treatment were continued. We could think of the SFP in treatment limitation decisions as more of a *self-reinforcing prophecy*. Yet a priori we cannot know whether a prediction is false [14], is possibly true (and magnified by the effect of the prediction) or is actually true. In what follows I use SFP to refer generically to situations where there is the possibility of predictions increasing the chance of an outcome occurring (Box 1).

Box 1: Definition

Self-fulfilling Prophecy: (SFP) A prediction (that a certain outcome is likely or inevitable) that independently increases the probability of the outcome actually occurring.

Epistemic problem of the self-fulfilling prophecy

The first problem related to the SFP is the difficulty that it creates in getting to the facts about prognosis [15]. Indeed, disentangling the prognosis for a group of patients from the effects of predictions can seem as intractable as the ancient conundrum of the chicken and the egg. It would be theoretically possible to know whether a prediction is true (independent of behaviour) if we know what proportion of patients who have a given condition or test result survive when treatment is not withdrawn. Yet it may be extremely difficult to obtain evidence of this nature.

This problem becomes apparent when attempting to compare the usefulness of different tests for predicting outcome for critically ill patients. For example, bilaterally absent somato-sensory evoked potentials are associated with death or severe disability in patients with brain injury [16]. But many deaths follow decisions to withdraw intensive care, and clinicians may be influenced to withdraw treatment by the results of investigations including evoked potentials. This raises the possibility that correlations between particular test results and adverse outcome are amplified by the SFP [17].

One way to minimise the effect of the SFP for new tests that are being studied is to withhold the results of those tests from doctors in order to prevent them influencing decisions. But in practice this is often not done. Clinicians were blinded to test results in 6 out of 17 studies in a systematic review of prognostic tests for adults with anoxic coma [8]. In a review of evoked potentials for prognosis in severe brain injury, only 11 of 25 studies reported blinding [16]. Factors that may explain the lack of blinding in studies include a blurring of the boundaries between research and clinical care, the simultaneous use of tests for several purposes, or ethical qualms about withholding or concealing results from patients and their families. This last is understandable given the emphasis that is placed in medical ethics upon truth telling and the provision of full information to patients. Yet when the prognostic value of a given test result is not known, there are strong reasons not to inform patients/families of those results, since it is unclear how to use that information to benefit the patient. Furthermore, the provision of the information may make it impossible to gather accurate evidence about the test.

But even if test results are withheld from doctors and parents, the problem is not eliminated since treatment withdrawal decisions continue to be made on other grounds. A statistical association between test results and death proves a link between results and treatment withdrawal decisions. It may be, for example, that a certain test pattern is strongly correlated with clinical features that are highly influential in treatment withdrawal decisions. Yet we may have concern about the validity of those clinical features—after all, that is one reason for studying the new prognostic test.

One way to obtain information about the validity of mortality predictions would be to deliberately avoid making any treatment limitation decisions in a cohort of patients, and to study their outcome [7, 18]. If we have literally no evidence about the risk of death in a group of patients, then it would be appropriate to continue life-sustaining treatment in all of them. However, it is far more common that there is already some evidence that a high proportion of such patients die, and hence that withdrawal of treatment may be acceptable. Continuing life-sustaining treatment in order to determine the actual mortality rate risks prolonging the death of a number of patients, causing harm to them and to their family. Disregarding the wishes of patients and families in such a setting would be unethical [7]. Similarly, it would be inappropriate to randomize patients with apparent poor prognosis to continuation or withdrawal of intensive care. These features help explain why self-fulfilling prophecies are so hard to avoid in critically ill patients.

How else can the true validity of predictions be established? It may be possible to look at historical evidence of mortality in the first patients studied with a given illness, since SFP are least likely to have affected the management of such patients. But if treatment has changed since that early experience (as it is likely to have), that evidence will not be relevant.

It might be possible to try to determine statistically the impact of different prognostic factors upon outcome. For example, in one study researchers looked at a number of variables in a multivariate analysis of outcome in adults with intracerebral haemorrhage [7]. Although commonly cited poor prognostic factors (the Glasgow Coma Score and size of haemorrhage) were associated with death, when decisions to

withdraw treatment were added in to the model, no other factors remained statistically significant. The authors of the study claimed that this indicated a bias in decision-making, and that withdrawal of support was the most important determinant of outcome. But it is unsurprising that withdrawal decisions had a strong correlation with death [18], and that this association was stronger than other variables. All of the patients who had life-sustaining treatment withdrawn died. Decisions are likely to have reflected the presence of a combination of prognostic factors, as well as the wishes of patients and family [18]. Variables other than the decision to withdraw are individually unlikely to have as clear an association with death. Therefore it does not seem particularly striking that decisions to withdraw dominated the model in terms of factors that contributed to death. Alternatively, statistical models could use propensity scores to generate a matched cohort study that simulates a randomized trial [19]. This has been used to look at the effect on mortality of decisions to withhold life-sustaining treatment [19, 20]. But such models potentially ignore other prognostic factors that clinicians use in decision-making, especially those that are difficult to quantify. Treatment limitation decisions may be a marker for mortality, rather than a cause of mortality [12]. There may also be other factors than mortality that influence decisions, including the probability of surviving with severe impairment. Such modeling is useful, but it is unlikely to provide a complete answer.

Finally it may be possible to get an idea of the true mortality rate by looking at the outcome in patients predicted to have a poor outcome, but who nevertheless had intensive treatment provided. This might be a hospital or community that has a different philosophy about treatment withdrawal, or may be a group of patients whose family or surrogates refuse to permit treatment to be limited. For example, in a recent large study of outcome for extremely premature infants, researchers were able to distinguish the outcome for those infants who received mechanical ventilation (and hence were actively resuscitated) from those infants who died in the delivery room [21]. If all such patients die (or are severely impaired), we would then have good supporting evidence for the initial prediction. Conversely a higher survival in this cohort may cause us to question the general assumption that prognosis is poor [7]. However, there is a need for caution in interpreting the outcome in the subgroup of patients who received intensive care or had treatment continued. Firstly, they may not be representative of all patients who fit into a group predicted to have poor outcome. They may be younger, or fitter, or from a different demographic or ethnic group. Any of those factors (or others less obvious) may impact both upon the doctors' decision to provide treatment or the family's willingness to withdraw life support, and on their chances of survival. In the study of premature infants, those infants who were ventilated were heavier, less premature, and needed less resuscitation at birth [21]. Secondly, the presence of the poor prognostic factor or previous prediction of extremely poor outcome may influence other management decisions. For example doctors may agree to continue intensive care for a patient with apparently very poor prognosis but negotiate with the family for non-resuscitation in the event of a cardiac arrest. Finally, it may be hard to systematically study this group of patients. Where families have disagreed with doctors about prognosis and continuation of life-sustaining treatment, there may be ongoing anger or distrust of medical staff. They may be reluctant to

participate in research, or they may seek ongoing care elsewhere and be hard to follow-up. Nevertheless, this is an extremely important cohort of patients to study since it may help in prognostication. The rate of favourable outcome in this group may help to estimate the maximum potential benefit of providing treatment [21].

Normative problems of the self-fulfilling prophecy

The SFP may also lead to distinct normative problems in relation to withdrawal of life support in intensive care.

Increase in mortality

One concern about the SFP in relation to treatment decisions in intensive care is that it may lead to the death of patients who would otherwise survive. If predictions of high mortality lead to doctors or families foregoing life-sustaining treatment this may increase the mortality rate for that group of patients. SFPs may then lead to harm.

This will not always be the case. If the prognosis is accurate and treatment is withdrawn, the mechanism of death will change, but not the outcome. Treatments are withheld rather than given, but patients succumb either way. But where death despite treatment is not certain, treatment withdrawal decisions will necessarily increase mortality. Consider the following hypothetical example. A patient has severe multi-organ failure and a 1% chance of survival if intensive care is continued. However, survival is likely to require a prolonged period of invasive and potentially unpleasant treatment and hospitalisation. Some patients and families would choose to continue treatment in this setting, but many would not. Perhaps 10% of families would request continued treatment. One point worth noting is that it is inevitable that the mortality for this group of patients will increase. The chance of survival will fall to 0.1%.[1] But intuitively it seems that a SFP in this setting is not inherently problematic. It is a necessary consequence of decision-making in the face of uncertainty.

Responsibility

On the other hand, whether or not a SFP actually changes the outcome for patients, doctors who act on the basis of a SFP may feel responsible for the death of the patient. Nicholas Christakis, in his work looking at the attitudes of doctors towards prognostication, notes that doctors' fear of causing or hastening death leads them to attribute great significance to the possibility of self-fulfilling prophecies [13, p. 158]. Christakis was talking about prognostication in general, but this might be even more important for prognostication that affects withdrawal of life-sustaining treatment.

[1] Assuming that all patients who have treatment withdrawn die, but only 1% of patients who have treatment continued survive.

On the other hand, it is widely accepted that it is permissible for doctors to withdraw treatment even if that will lead to the death of a patient. So it is not necessarily a problem for doctors to be causally implicated in death. And although doctors may be responsible for the deaths of patients who would not otherwise have died, they may nevertheless have acted in the most appropriate way. It may be useful here to distinguish between what you ought to try to do given what you know, and what you ought to do if you had perfect knowledge of all of the facts [22]. The former is sometimes referred to as the *evidence relative* sense of 'ought', and the latter as the *fact-relative* sense [23, Chap. 6, pp. 120–135].

When we make decisions, we rarely if ever have access to all of the relevant facts. We cannot know for sure which action we ought to take in the fact-relative sense. But we still need to act. Doctors must make decisions (in collaboration with their patients) on the basis of the available evidence. So when a decision is made to withdraw life-support on the basis of evidence of an extremely high chance of dying, that can be the right thing to have done in the evidence relative sense even if in actual fact that particular patient would have survived. A SFP does not then lead doctors to do the wrong thing if they withdraw life-support on the basis of evidence of high mortality. They may be doing what they have most reason to do.

Deception

It is possible that the SFP may lead physicians to breach another duty—that of dealing honestly with patients and their families. SFPs may compromise honest communication with families by causing doctors to mislead families about the patient's chance of survival [4].

For example, parents anticipating the delivery of an extremely premature infant (say at 22 or 23 weeks gestation) may be told that all previous patients cared for at this gestation have died, or that the chance of survival in a published cohort of patients was very low or zero [24]. However, the risk of death in both of these cited instances was likely influenced by treatment-limitation decisions, and doctors may be wittingly or unwittingly deceiving families [4]. Of course, it may be relevant to families to know that treatment is usually withdrawn in cases like this. But since the question is whether or not to continue life-support, the thing that families need to know is what the chance of survival for the patient is *if all supportive measures are provided*. Doctors may not be able to provide this probability because of the problems outlined in section B. Yet, sometimes at least, patients are misled into thinking that the answer they have been given is of this sort, when in fact it is the chance of survival when treatment is limited.

The effect of the SFP on uncertainty

One reason for objecting to the SFP may be because of its effect on uncertainty and the threshold for treatment limitation. Some doctors and families are unwilling to allow a patient to die when there remains even a small chance of recovery. And because of the epistemic problems outlined above, the presence of a potential SFP

may create sufficient uncertainty about outcome that it is felt to be impermissible to withdraw treatment.

But there are a number of reasons why it may be permissible to withdraw treatments despite uncertainty. Withdrawal can be justified by the wishes (previously expressed or implied) of the patient for limits to life-prolonging interventions. So, many accept that it would be permissible to allow a patient to die even in the face of a 100% chance of recovery if that were consistent with the clearly expressed desires of a competent or previously competent patient. Withdrawal could also be justified on the basis of the burden of treatments in proportion to the benefits, or on the basis of distributive justice.

When it comes to withdrawing life-sustaining treatments in intensive care, the other reason that uncertainty may be acceptable is because some outcomes may be judged (from the perspective of the patient) to be worse than death. The possible outcomes for a critically ill patient include death within a short time frame, a prolonged hospital and intensive care stay followed by death, survival to hospital discharge with severe impairment, or survival to hospital discharge without severe impairment. If the second or third of those possibilities are viewed very negatively by the patient (or would have been), it may be rational to withdraw life support even where there is some distinct chance of a good outcome.

One approach to this type of decision is to use decision theory [25, 26]. If, for example, there is a 10% chance of severe impairment (given a relative value of -0.5), and a 10% chance of death after prolonged hospitalisation (given a relative value of -0.3), it would be preferable to withdraw intensive care (leading to inevitable death, value 0), if the chance of survival without impairment (value 1) is less than 8%.

What we ought to do in this case or in other situations of uncertainty depends upon the value that is placed upon different outcomes [13, p. 146], including how bad it is to prolong treatment that ultimately leads to a bad outcome compared to how bad it is to withdraw treatment from a patient who would have survived without impairment. This may yield a judgement that treatment should continue. Yet it also seems clear that it may not be a problem to withdraw life-support from a patient in the setting of uncertainty. The epistemic problems of the SFP may make it difficult to make rational decisions, they may increase uncertainty about outcome but the SFP itself does not necessarily make withdrawal problematic.

Conclusions

In this paper I have outlined the problem of self-fulfilling prophecies in treatment limitation decisions. SFP might in theory arise in any treatment decision. But they are a particular problem for decisions about life-sustaining treatment because the outcome is closely related to decisions made on the basis of predictions, randomized controlled trials are usually inappropriate, and because the potential outcomes involved (death, life, severe impairment) are enormously important to patients. I have described how self-fulfilling prophecies affect decisions about withdrawal of life-sustaining treatment in intensive care. The problems described in this paper are

also relevant to decisions about resuscitation and treatment beyond the walls of the intensive care unit.

SFPs may lead to an increase in the mortality for cohorts of patients predicted to have poor prognosis, they may lead doctors to feel causally responsible for the deaths of their patients, and they may compromise honest communication with patients and families about prognosis. But the SFP is a necessary consequence of decision-making in the face of uncertainty. It is widely accepted that it is ethically permissible to limit or withdraw treatment in the face of uncertainty if that is consistent with the wishes of the patient or with their best interests (where there wishes are unknown). Withdrawal of treatment on the basis of poor prognosis, whether or not predictions may be self-fulfilling, can be justified by expected value, or an evidential sense of what ought to be done.

However, the SFP does present a serious epistemic problem for assessing the genuine prognosis of patients who may or may not have treatment withdrawn. Where the evidence of poor prognosis has been influenced by a SFP it can be extremely difficult to determine what the prognosis would be if all treatment were provided. Nevertheless, attempting to do so is one important way for doctors to justify their prognostications, and their decisions to allow patients to die. I have outlined several ways to do this (Box 2).

Box 2. Recommendations for reducing the normative and epistemic problems associated with SFP

1. Research into new prognostic tests should ensure where possible that test results are not used to influence treatment limitation decisions.
2. Other prognostic factors should also be studied to determine the independent value of new tests for prognostication.
3. Patients whose treatment is continued despite a poor prognosis should be followed-up, and reported separately.
4. When talking to patients and families about prognosis, doctors should distinguish between survival rates if treatment is continued, and survival rates in populations where treatment is limited.

If we are to avoid Merton's "reign of error" from self-fulfilling prophecies, it is essential to carefully collect and appraise evidence about prognosis. The other imperative is that doctors are honest with themselves and with patients and their families about uncertainty and the limits of knowledge. In many cases it is simply not possible to know how likely it is that a patient would survive if all supportive treatment were provided. It might be difficult for families to accept, but it may still be the best course of action to withdraw treatment and allow that patient to die.

Acknowledgements I am grateful to Tony Hope, Julian Savulescu, Tom Douglas and two anonymous reviewers for very helpful comments on earlier drafts of this paper. Dominic Wilkinson is supported by an Oxford Nuffield Medical Fellowship, Eric Burnard Fellowship, and Royal Australasian College of Physicians Astra-Zeneca Medical Fellowship. The funders had no involvement in this work.

References

1. Merton, Robert King. 1968. *Social theory and social structure*. New York: Free Press.
2. Popper, Karl R. 2002. *Unended quest: An intellectual autobiography*. London: Routledge.

3. Christakis, N.A. 2001. Prognostication and bioethics. *Daedalus* 128: 197–214.
4. Mercurio, M.R. 2005. Physicians' refusal to resuscitate at borderline gestational age. *Journal of Perinatology* 25: 685–689.
5. Embleton, N.D., J.P. Wyllie, M.J. Wright, J. Burn, and S. Hunter. 1996. Natural history of trisomy 18. *Archives of Disease in Childhood. Fetal and Neonatal Edition* 75: F38–F41.
6. Mcgraw, M.P., and J. Perlman. 2008. Attitudes of neonatologists toward delivery room management of confirmed trisomy 18: Potential factors influencing a changing dynamic. *Pediatrics* 121: 1106–1110.
7. Becker, K.J., A.B. Baxter, W.A. Cohen, H.M. Bybee, D.L. Tirschwell, D.W. Newell, et al. 2001. Withdrawal of support in intracerebral hemorrhage may lead to self-fulfilling prophecies. *Neurology* 56: 766–772.
8. Zandbergen, E.G., R.J. De Haan, C.P. Stoutenbeek, J.H. Koelman, and A. Hijdra. 1998. Systematic review of early prediction of poor outcome in anoxic ischaemic coma. *Lancet* 352: 1808–1812.
9. Cook, D., G. Rocker, J. Marshall, P. Sjokvist, P. Dodek, L. Griffith, et al. 2003. Withdrawal of mechanical ventilation in anticipation of death in the intensive care unit. *The New England Journal of Medicine* 349: 1123–1132.
10. Truog, R., and W. Robinson. 2003. Role of brain death and the dead-donor rule in the ethics of organ transplantation. *Critical Care Medicine* 31: 2391–2396.
11. Hemphill, J.C. III 2007. Do-not-resuscitate orders, unintended consequences, and the ripple effect. *Critical Care* 11: 121.
12. Sulmasy, D.P. 1999. Do patients die because they have DNR orders, or do they have DNR orders because they are going to die? *Medical Care* 37: 719–721.
13. Christakis, Nicholas A. 1999. *Death foretold: Prophecy and prognosis in medical care*. Chicago: University of Chicago Press.
14. Miller, Cecil. 1961. The self-fulfilling prophecy: A reappraisal. *Ethics* 72: 46–51.
15. Bernat, J.L. 2009. Ethical issues in the treatment of severe brain injury: The impact of new technologies. *Annals of the New York Academy of Sciences* 1157: 117–130.
16. Carter, B.G., and W. Butt. 2005. Are somatosensory evoked potentials the best predictor of outcome after severe brain injury? A systematic review. *Intensive Care Medicine* 31: 765–775.
17. Sleigh, J.W., J.H. Havill, R. Frith, D. Kersel, N. Marsh, and D. Ulyatt. 1999. Somatosensory evoked potentials in severe traumatic brain injury: A blinded study. *Journal of Neurosurgery* 91: 577–580.
18. Rabinstein, A.A., and M.N. Diringer. 2007. Withholding care in intracerebral hemorrhage: Realistic compassion or self-fulfilling prophecy? *Neurology* 68: 1647–1648.
19. Chen, Y.Y., A.F. Connors Jr., and A. Garland. 2008. Effect of decisions to withhold life support on prolonged survival. *Chest* 133: 1312–1318.
20. Shepardson, L.B., S.J. Youngner, T. Speroff, and G.E. Rosenthal. 1999. Increased risk of death in patients with do-not-resuscitate orders. *Medical Care* 37: 727–737.
21. Tyson, J.E., N.A. Parikh, J. Langer, C. Green, and R.D. Higgins. 2008. Intensive care for extreme prematurity—moving beyond gestational age. *The New England Journal of Medicine* 358: 1672–1681.
22. Persson, I. 2008. A consequentialist distinction between what we ought to do and ought to try. *Utilitas* 20: 348–355.
23. Parfit, D. 2008. *On what matters* (unpublished manuscript) http://users.ox.ac.uk/~ball2568/parfit/bibliography.htm. Accessed 28 July 2009.
24. Costeloe, K., E. Hennessy, A.T. Gibson, N. Marlow, and A.R. Wilkinson. 2000. The EPICure study: Outcomes to discharge from hospital for infants born at the threshold of viability. *Pediatrics* 106: 659–671.
25. Savulescu, J. 1994. Treatment limitation decisions under uncertainty: The value of subsequent euthanasia. *Bioethics* 8: 49–73.
26. Wilkinson, D. 2009. The window of opportunity: Decision theory and the timing of prognostic tests for newborn infants. *Bioethics* 23: 503–514.