

The evolving ethics of infant dialysis

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Received: 22 August 2012 / Revised: 2 October 2012 / Accepted: 3 October 2012 / Published online: 7 November 2012
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Abstract In this paper, we review ethical issues that arise when families and doctors face clinical decisions about renal replacement therapy for an infant with end-stage renal disease (ESRD). Over the last 20 years, many centers have begun to routinely offer renal replacement therapy. However, doctors and nurses both continue to view such therapy as optional, rather than mandatory. We speculate that the burdens of therapy on the family, and the uncertainties about satisfactory outcomes have led to a situation in which renal replacement therapy remains desirable, but non-obligatory. We discuss the reasons why this is likely to remain so, and the ways in which renal replacement therapy for infants with ESRD is similar to, or different from, other clinical situations in pediatrics. Finally, we propose a research agenda to answer questions that are crucial to making good ethical decisions about infant dialysis.

Keywords Dialysis · Infant · Ethics · Life-sustaining treatment

Introduction

The provision of chronic dialysis to infants was pioneered in the 1960s and the first reports of successful transplantation soon followed. In 1978, Hodson and colleagues reported 21 cases in which dialysis was begun in the neonatal period and transplantation occurred at a mean age of 3 years [1]. Four of the children died, 5 lost their initial graft, and the overall patient survival at 4 years of age was 76%. Rizzoni and

colleagues reported similar results [2]. From the outset, some doctors questioned the appropriateness of this aggressive approach to what had been considered a uniformly fatal disease. In 1970, Reinhart wrote, “I seriously question the value of chronic dialysis or renal transplant. In spite of the physician’s desire to heal and parents’ willingness for ‘anything to be done,’ I feel that programs of dialysis and renal transplant for children should be carefully evaluated not in terms of gross survival but in parameters of meaningful growth and development-living. We may find the price the child pays for life too great at present [3].”

These two approaches—one advocating early dialysis and early transplant, one advocating comfort care—would vie with one another over the next decades. For example, in 1987, Polinsky and colleagues published a paper about successful dialysis, but noted, “Developmental delay of varying degrees of severity has been identified in most patients with severe chronic renal failure (CRF) from early infancy [4].” In an accompanying editorial about the ethics of infant dialysis, Cohen, echoing Reinhart’s concerns, noted, “When a treatment does not have a high success rate and will, in addition, cause patients to endure considerable pain and suffering, a strong case can be made against requiring such treatment. Dialysis and transplantation for very young infants with ESRD fall into this category” [5].

In spite of the ethical concerns, more and more centers began to offer dialysis to infants. With clinical experience and careful study, outcomes improved. Lederman and colleagues reviewed their cases of infant dialysis from Great Ormond Street and showed that 16 out of 20 dialyzed infants survived and that most had normal neurodevelopmental outcomes [6]. A review of the North American experience, published in 2007, also showed that outcomes were improving. Infants who received dialysis after 1998 did better than those treated prior to 1998 in terms of patient survival. Infants in the later cohort were more likely to have

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received a transplant within 3 years of initiating dialysis. The authors speculated that the improvement was attributable to “...the advancement of medical and surgical techniques over time, as well as to the accrual of experience by medical centers that provide care for these infants” [7]. By contrast, however, Hijazi and colleagues reported no improvement in survival for infants with ESRD comparing those treated before 1995 with those treated more recently [8].

One might be tempted to see dialysis as following the same trajectory, then, as other innovative therapies in neonatology. Over the years, controversy has surrounded many such therapies, including mechanical ventilation [9], extracorporeal membrane oxygenation (ECMO) [10], high-frequency ventilation [11], and hypothermia [12]. With each of these therapies, early case reports led to questions about the safety and efficacy of treatment. Proponents of the treatments continued to innovate and to learn. Careful study allowed delineation of the indications and contraindications to treatment and the innovative therapy gradually became standard therapy for a more-or-less well-defined population of infants.

However, there are some hints that dialysis is different. Pediatric nephrologists seem to be becoming more cautious than they used to be about recommending dialysis for all infants. This is most striking for the youngest infants, those who develop ESRD in the neonatal period. For example, in 1998, 41% of nephrologists said that they offer dialysis to all neonates with chronic renal failure [13]. In 2011, only 30% said that they did [14]. Many doctors think that parents should have the right to refuse dialysis and to choose palliative care for infants and that number, too, seems to be increasing over time. (Of note, nurses were twice as likely as nephrologists to believe that parents have a right to reject renal replacement therapy (RRT) for infants 1–12 months of age.) Fauriel and colleagues in France, reported that dialysis was eventually withdrawn from 11% of babies who started it [15].

These studies suggest that dialysis continues to occupy a stable moral limbo. It is a treatment with well-understood risks and benefits, well-understood burdens on the family, and well-understood costs. It can clearly save the lives of babies with ESRD. But, in spite of steadily improving outcomes, it is not a therapy that doctors feel to be morally obligatory in most cases. If parents chose palliative care instead of renal replacement therapy for their neonates, most doctors would apparently accede to this parental choice.

A conceptual framework for decisions about life-sustaining treatment in infants

In 1983, the President’s Commission for the Study of Ethical Problems in Medicine issued a report entitled, “Deciding to Forego Life-Sustaining Treatment [16].” In the

chapter on decisions for seriously ill newborns, they articulated a conceptual framework for making such decisions by which the doctor would first categorize treatment as falling into one of three categories:

1. Clearly beneficial
2. Clearly futile
3. Outcomes ambiguous or uncertain

When treatment is clearly beneficial, they argued, treatment should be provided even if the parents do not consent. When treatment is clearly futile, they suggested that it should not be provided even if parents wanted it, but acknowledged that this was often a difficult situation. In “ambiguous or uncertain” situations, they argued, the parents should be the final determiners of the course of action. Bunchman endorsed a similar framework for decisions about dialysis in infants [17].

The Commission did not give strict criteria for making the distinction between the categories, instead suggesting only that “any set of standards, when honestly applied, leaves some difficult or uncertain cases.” Those cases, the Commissioners wrote, “require prudent and discerning judgment.”

This conceptual framework, while still somewhat vague, remains useful. Clinical ethical decisions about life-sustaining treatment for infants begin with a determination of whether treatment is clearly beneficial, clearly futile, or somewhere in between. To set the futility threshold, doctors ask whether the overall outcomes for a baby with a particular condition who is given a particular treatment are likely to be so dismal that treatment should not be provided even if the parents want it. A “softer” futility threshold would be one in which it is not offered but would be provided if the parents demand it. Examples of such treatments would be intubation and mechanical ventilation for a child with anencephaly or ECMO for a child with trisomy 18. In both these examples, many doctors would argue that the treatment is futile and should not be provided, though some would provide the treatment [18].

The other threshold is the one at which a treatment becomes morally obligatory based upon a judgment that it is clearly in the best interest of the patient. A treatment that falls above this threshold is one for which doctors consider parental refusal to be a form of medical neglect. If parents cannot be convinced to give permission for such treatment, doctors generally seek court orders for protective custody of the child and mandated treatment. Examples of this would be a blood transfusion for a Jehovah’s witness child, or neonatal intensive care for an otherwise healthy baby born at 27 weeks’ gestation.

In between these two thresholds, where the outcomes of treatment are ambiguous or uncertain, most bioethicists recommend a process of shared decision-making between

doctors and parents that aims to come up with the best decision for the individual child and family under the particular circumstances of the case [19]. The ethical question, today, regarding chronic dialysis for infants is whether it falls into the “clearly beneficial” category or whether it is a situation in which outcomes should still be considered “ambiguous or uncertain.”

A number of factors make decisions about infant dialysis complex. One is that renal failure in the first months of life is not a single disease. It can be an isolated problem or it can also be associated with a variety of other anomalies or comorbid conditions. The severity of the accompanying conditions can change the likelihood that the patient will survive or that survival will be accompanied by significant impairments. At least 30% of infants with ESRD have associated co-morbidities [20, 21].

A second factor that makes dialysis decisions complicated is that dialysis is, in most cases, an outpatient therapy. The parents must be active, committed and sophisticated participants in the care plan. In this, it is quite different from neonatal intensive care or surgery in the newborn period: treatments that are provided in hospital and that are generally time-limited. Of course, some children who have surgery or neonatal intensive care survive with complex health problems that require home treatment. But dialysis is, from the start, typically a home-based therapy.

Finally, renal failure, like many neonatal problems, can often be anticipated based upon prenatal diagnosis. A prenatal discovery of renal abnormalities allows parents time to think about possible responses. Some choose to terminate pregnancy whereas others may decide to forego dialysis and opt for palliative care. The possibility of prenatal diagnosis and termination of pregnancy complicates any data on the natural history of these conditions, since it is hard to know how the decisions to terminate pregnancy after a prenatal diagnosis of renal dysplasia alter the patient populations seen after birth.

At the same time, prenatal diagnosis also allows better planning for treatment in the immediate perinatal period. Babies can be delivered in a tertiary care center where ECMO and dialysis are readily available. With this sort of anticipatory management, some centers are reporting frequent success in the treatment of such babies [22].

Why isn't dialysis of infants morally obligatory?

One can imagine a number of different justifications for a decision not to offer dialysis or to accept parental refusal of dialysis for an infant compared with an older child.

First, it may be that, over the years, with more experience, we've learned that the medical outcomes for infants are worse than the outcomes for older children. This does not seem to be

the case. In the NAPRTCS database, 5-year survival rates for neonates and for older children who initiated dialysis during infancy were both about 60%. As expected, neonates waited a little longer to get a transplant than did older children.

Second, it may be that the burdens on the family are perceived as higher when the patient is an infant. There are no empirical studies that show this to be the case [23]. Home peritoneal dialysis—the treatment of choice for children—is a challenge for the family of a child at any age, but it is widely recognized to be a greater challenge when the patient is an infant [24].

Cost could be a factor. Dialysis is clearly expensive, and the cost of caring for a neonate or young infant with ESRD is more expensive than for adults. According to Medicare figures, the average annual cost of treatment for ESRD in 2009 was about \$70,000 (Kidney Disease Statistics for the United States. <http://kidney.niddk.nih.gov/kudiseases/pubs/kustats/>, accessed Oct 29, 2012). This is much lower than the cost of dialysis for a child, as reported by a Swiss study in which “the annual median costs of conservative treatment, peritoneal dialysis, the year of transplantation, and follow-up after transplantation amounted to 30,000, 93,000, 130,000, and 28,000 Swiss francs, respectively” [25]. Converting 1990 Swiss francs to 2012 US dollars, this would yield an annual cost of about \$200,000 for home dialysis, \$300,000 for the total cost of all care during the year of a kidney transplant, and about \$75,000/year for follow-up. However, babies are rarely denied treatment of any sort, including dialysis, neonatal intensive care or organ transplantation, on the basis of cost.

Another piece may simply be that ESRD is rare in newborns and that very few centers have extensive experience with the dialysis of neonates. This may lead to a feeling that the treatment is always a bit experimental, a bit extraordinary, and not something that would ever be forced upon an unwilling family.

Finally, it may be that we simply treat babies differently than we treat older children. Janvier and colleagues have done a series of elegant studies showing that, given a choice, doctors prefer to treat older children rather than newborns, especially premature newborns [26]. This may lead both parents and doctors to view the withholding of dialysis from a neonate differently than they might view the same decision for an older child.

Directions for future research

Our analysis suggests that one of the key factors in the moral analysis of infant dialysis is the burden that this therapy places on the family. To the extent that this is true, two urgent considerations follow. First, how high must the burden of dialysis, or any therapy, be in order for that burden to outweigh the life-saving benefits of the therapy. Put another

way, this consideration seems to be a violation of the principle that ethical decisions for children should be based only on considerations of the best interests of the child. Consideration of family burden suggests that there are some things that we do not have the moral right to expect of families. If infant dialysis is emblematic of situations in which a balance between the interests of the infant and the burdens on the family must be struck, then it raises questions about just how high that burden must be in order to justify a decision to let a baby die.

The second urgent consideration raised by attention to burdens on families is related to informed consent. How, exactly, do clinicians explain the burdens that are associated with dialysis when they are seeking the family's informed consent to such treatment? What sort of education do clinicians receive in order to help them understand that burden, understand the systems that are in place to help relieve that burden? Is there any standardized approach to communication and counseling? An analogy can be drawn to antenatal counseling for women who are about to deliver an extremely premature baby. In that situation, the adequacy of counseling is considered to be so important that the American Academy of Pediatrics has developed guidelines for what should or should not be discussed [27]. Such guidelines have been critiqued and different approaches have been proposed [28]. The process of proposals, critiques, and counterproposals allows discussion of best practices and allows critical scrutiny that will likely lead to improvements in the scrutinized practices. Counseling regarding infant dialysis, and research on the efficacy of such counseling, would likely improve practice and lead to more informed and more standardized decisions.

Another direction for future research should be with regard to the effect of cost on decisions. There are no good studies on the cost of infant dialysis to the family, either in situations in which they have private insurance, public insurance, or no insurance. Furthermore, even when the medical costs are covered by health insurance, infant dialysis will inevitably generate other costs to the family. One spouse may need to quit working in order to stay home and care for the infant. Intercurrent illnesses may lead to lost days at work. Studies of these costs and of the role that they play in parents' evaluation of the burdens of dialysis would help to inform the decisions that such parents face.

Finally, we suggest that future outcome studies distinguish, as much as possible, the cases of isolated or "uncomplicated" renal failure in infants from those cases with associated co-morbidities. The prognosis in isolated renal failure seems to be much better than that in complicated renal failure. To the extent that survival, cost, the burdens of therapy, and the long-term psychosocial outcomes are better in isolated renal failure, it should be treated as a separate disease. The ethics of treatment refusal turn on the facts

about long-term outcomes. Precision about those facts is an ethical imperative.

Conclusion

Neonatal dialysis seems to have followed a different trajectory than many neonatal therapies. Instead of moving inexorably from the realm of innovative therapy to become viewed as clearly beneficial, dialysis remains a treatment for which outcomes are thought of as ambiguous or uncertain. While many doctors *recommend* dialysis for most infants with ESRD, most *are willing* to provide only palliative care if that is what the parents want.

However, neonatal dialysis might not be unusual. Instead, it may be one of a number of therapies that continue to be viewed as falling near the upper threshold defined by the President's Commission in 1983. That is, the outcomes are seen as ambiguous enough or uncertain enough that we routinely recommend the treatment, but continue to defer to parents and to allow them to choose palliative care. Other therapies that might fall into this category include surgery for hypoplastic left heart syndrome [29], liver transplantation for biliary atresia [30], or treatment for babies born at 24 weeks' gestation [31]. In each of these clinical situations, the outcomes for the infants are seen as good enough for the treatment to be strongly recommended and even considered the standard of care. However, the burdens of therapy are high enough, and the chances of a bad outcome high enough, that the treatments continue to be viewed as legally and ethically optional. In our view, it is generally appropriate to categorize these therapies in this way, recognizing, as the President's Commission did 30 years ago, that reaching the right decision in any particular case requires prudent and discerning judgment.

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