ABSTRACT. This clinical report addresses the topic of preexisting do-not-resuscitate (DNR) orders for children undergoing anesthesia and surgery. Pertinent issues addressed include the rights of children, surrogate decision-making, the process of informed consent, and the roles of surgeons and anesthesiologists. The reevaluation process of DNR orders called “required reconsideration” can be incorporated into the process of informed consent for surgery and anesthesia. Care should be taken to distinguish between goal-directed and procedure-directed approaches to DNR orders. By giving parents or other surrogates and clinicians the option of deciding from among full resuscitation, limitations based on procedures, or limitations based on goals, the child’s needs are individualized and better served. *Pediatrics* 2004;114: 1686–1692; anesthesia, pediatric surgery, pediatrics, children, resuscitation, cardiac arrest, respiratory arrest.

ABBREVIATIONS. DNR, do-not-resuscitate, CPR, cardiopulmonary resuscitation, ASA, American Society of Anesthesiologists, ACS, American College of Surgeons.

CONSIDERATIONS FOR CHILDREN WITH DO-NOT-RESUSCITATE ORDERS WHO REQUIRE ANESTHESIA AND SURGERY

In the 1970s, the Critical Care Committee at the Massachusetts General Hospital developed the original do-not-resuscitate (DNR) guidelines in response to nursing requests for clarification of what should be done when cardiopulmonary resuscitation (CPR) was unwanted or believed to be unwarranted by a patient or surrogate.1 DNR orders are clinically and ethically appropriate when the burdens of resuscitation exceed the expected benefit. Currently, all hospitals seeking accreditation from the Joint Commission on Accreditation of Healthcare Organizations are required to have a DNR policy in place.2–6 This policy should define a DNR order and describe the guidelines for its inclusion on a patient’s medical record. A DNR order is a written order by an attending physician and precludes resuscitative efforts being undertaken in the event of cardiopulmonary arrest. DNR orders should not have implications regarding the use of other therapeutic interventions that may be appropriate for the patient, including surgery and anesthesia.7,8

The controversial topic of DNR orders for patients undergoing surgery and anesthesia has received growing attention in the medical literature since the early 1990s. However, the literature does not specifically address the pediatric age group. For children, DNR orders are written when (1) in the judgment of the treating physician, an attempt to resuscitate the child would not benefit the child and (2) the parent or surrogate decision-maker (with the assent of an age-appropriate child) expresses his or her preference that CPR be withheld in the event that the child suffers a cardiopulmonary arrest, as long as this is in accordance with the child’s best interests.7,9 DNR orders are written on the assumption that cardiopulmonary arrest will be a spontaneous event that is the culmination of the dying process of a child who has a terminal illness or a poor quality of life. The dilemma surgeons and anesthesiologists are confronted with regarding children with DNR orders undergoing an operative procedure is twofold: (1) anesthesia promotes some degree of hemodynamic abnormality that may result in cardiopulmonary arrest, and (2) many routine anesthetic manipulations can be classified as resuscitative measures.

A number of hospitals across the nation still do not have a policy that specifically addresses the extent to which DNR orders apply in the operating room.2,5,10,11 or have a policy that mandates suspension of DNR orders.9 According to 1 study, surgical procedures are performed in ~15% of patients with DNR orders.12 The American Academy of Pediatrics and the American Society of Anesthesiologists (ASA) have issued guidelines on forgoing life-sustaining medical treatment, issues of informed consent,13,14 and evaluation and preparation of pediatric patients undergoing anesthesia.15 None of these policies address in detail the approach to be taken when an operative procedure is considered for a child with an existing DNR order. This encounter includes the dilemmas of who should assume responsibility (ie, the primary care physician, the surgeon, or the anesthesiologist) for discussing with the parent or surrogate decision-maker the potential risks of cardiopulmo-
nary arrest during surgery and anesthesia, whether the DNR order should be temporarily suspended during the procedure, and how long a temporary suspension should last if this option is chosen.

SURVEY OF SECTIONS ON SURGERY AND ANESTHESIA

The relevance of this topic was assessed by distributing a survey to the 570 members of the Section on Surgery and 293 members of the Section on Anesthesiology of the American Academy of Pediatrics in 1995. The survey was returned by 242 surgeons (42.5%) and 107 anesthesiologists (36.5%). Demographic data on the respondents are shown in Table 1.

For each group, surgeons and anesthesiologists, finite sample confidence intervals for proportions were computed.16 The finite population correction factor was used for hypotheses testing as needed.16 Statistical software used included SPSS version 10 (SPSS Inc, Chicago, IL [2000]) and StatXact version 4 (Cytel Software Inc, Cambridge, MA [2000]).

The majority of surgeons (88.8%) and anesthesiologists (86%) had been asked to operate on or provide anesthesia to a child with a DNR order in place at the time of surgery, and most indicated that they would not refuse to provide these services. Most surgeons (75.3%) and anesthesiologists (69.2%) would agree to honor a DNR order during a palliative operative procedure, but smaller percentages of surgeons (49.6%) and anesthesiologists (46.7%) were willing to honor a DNR order during an elective operative procedure. More than 95% of surgeons and anesthesiologists discuss resuscitation issues before surgery with parents of children who have standing DNR orders, and a majority of each group felt that there should be a hospital policy for children with DNR orders in the operating room. Only 50.5% of anesthesiologists and 27.5% of surgeons stated that their hospital has such a policy in place.

Surgeons and anesthesiologists then were asked which resuscitation maneuvers should be withheld during intraoperative arrest in a child with a DNR order. Results are summarized in Table 2.

The majority of anesthesiologists (86%) and sur-

TABLE 1. Demographics of Respondents to Survey Regarding DNR Orders

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Pediatric Surgeons</th>
<th>Pediatric Anesthesiologists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age, y</td>
<td>50 (35–81)</td>
<td>44 (32–63)</td>
</tr>
<tr>
<td>Median years in practice, y</td>
<td>18 (3–45)</td>
<td>11 (2–41)</td>
</tr>
<tr>
<td>Practice characteristics,* n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time university</td>
<td>132 (54.8)</td>
<td>55 (51.4)</td>
</tr>
<tr>
<td>University clinical affiliate</td>
<td>57 (23.4)</td>
<td>30 (28.0)</td>
</tr>
<tr>
<td>Private practice</td>
<td>68 (28.2)</td>
<td>26 (24.3)</td>
</tr>
<tr>
<td>Military</td>
<td>3 (1.2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Hospital type,* n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children’s hospital</td>
<td>116 (49.2)</td>
<td>55 (51.4)</td>
</tr>
<tr>
<td>University hospital</td>
<td>95 (40.3)</td>
<td>36 (3.6)</td>
</tr>
<tr>
<td>Community hospital</td>
<td>53 (22.5)</td>
<td>17 (15.9)</td>
</tr>
<tr>
<td>Military hospital</td>
<td>2 (0.8)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

* A small number of surgeons and anesthesiologists reported multiple affiliations.

DISCUSSION

The medical literature contains some ambiguities on the scope of a DNR order and the resuscitative interventions it prevents during surgery and anesthesia. Resuscitative interventions may be broadly defined as any maneuvers and techniques used to prevent or reverse cardiopulmonary arrest.17 However, this definition is inappropriate in an operative setting, because anesthetic agents routinely promote cardiovascular instability.2,5,11,18 Perioperatively, resuscitative measures should only refer to the measures undertaken to restore life once a cardiopulmonary arrest has occurred.8,19 Surveys of physicians and patients with DNR orders confirm that clarification is needed on the interpretation of a DNR order, especially its applicability in the operating room.12,20–22

Physicians caring for children have a duty to respect the wishes of the child and family, to do good (beneficence), and to avoid harm (nonmaleficence), which may lead to conflicting considerations for a child with a DNR order. Some physicians believe that honoring a DNR request harms a child by allowing a potentially reversible death to occur. On the other hand, the child’s welfare is best served by not having a poor quality of life unnecessarily prolonged and not having to endure ineffective therapy.23 Older children and adolescents should be included in the decision-making process (patient assent) when their neurologic status, development, and level of maturity allow. However, legally they require a surrogate decision-maker to act on their behalf (surrogate or parental permission).14 A child’s surrogate, usually a parent, should be the person presumed to be the most appropriate and capable to determine what actions would be in the best interest of the child. Conflicts arise when the parent or other surrogate and/or child and the physician fail to agree on what would be optimal care under a given set of circumstances.

Informed Consent

To respect the child’s and family’s wishes, physicians must obtain informed permission from a parent or surrogate before a child can undergo any medical intervention including surgery and resuscitation. Ordinarily, resuscitation efforts do not require informed consent, because they are deemed emergency interventions and consent is implied. However, terminally ill or severely disabled children and their parents are often confronted with the decision of whether resuscitation should be attempted in the
event the child’s underlying disease results in cardio-pulmonary arrest.

Customarily, physicians will approach the parent or surrogate about instituting a DNR order when it is felt that resuscitation of the child would not be beneficial and would only prolong the time to death. When a parent or surrogate consents to a DNR order, it is under the assumption that cardiopulmonary arrest will be a direct consequence of the child’s underlying disease. Surgery and anesthesia constitute a change in the child’s medical status, because they introduce additional risks to the patient. Because surgeons and anesthesiologists are rarely involved in the original DNR decision, they cannot be certain that the implications of the DNR status in the perioperative setting were discussed with the patient’s parent (or other surrogate). Therefore, the parent or surrogate, the surgeon, and the anesthesiologist should reevaluate the DNR order for a child who requires an operative procedure. This reevaluation process has been called “required reconsideration” and should be incorporated into the process of informed consent for surgery and anesthesia. Discussions regarding consent under these circumstances should be initiated by attending staff, particularly in hospitals with residency teaching programs in which residents may be routinely involved in the consent process.

The surgeon and anesthesiologist must approach the parents and child with compassion. There is often no previous relationship established between the patient, parents, and surgical team, precluding a brief preoperative assessment. “Active listening” is essential. The parent or surrogate should be asked about specific interventions and their understanding of the relative merits of each of these interventions during resuscitation (Table 3). Airway management should be determined by what is mandated by the child’s condition and the surgical procedure. Specific prohibition of tracheal intubation is problematic, and beliefs and concerns must be carefully elicited and discussed. Exceptions to the injunctions against intervention should be specifically noted in the patient’s medical record. The parent may agree to a temporary suspension of the DNR order during the perioperative period. If so, the temporal end point to the DNR suspension needs to be recorded as well. If an agreement cannot be obtained after thorough discussion, the wishes of the informed parent or surrogate must prevail. In some cases, the parents may feel that the burden of a therapy is not worth the potential benefits and decline the procedure. When an individual physician feels that the parent’s wishes are inconsistent with his or her medical, ethical, or moral views, the physician should withdraw from the case after ensuring continuity of care and could consider consulting the institutional ethics committee.

### Role of the Surgeon

The following are operative interventions that might be considered for a pediatric patient with a DNR order:

1. Provision of a support device that will enable the child to be discharged from the hospital (e.g., gastrostomy tube or tracheostomy).
2. Urgent surgery for a condition unrelated to the underlying chronic problem (e.g., acute appendicitis in a terminal cancer patient).
3. Urgent surgery for a condition related to the underlying chronic problem but not believed to be a terminal event (e.g., a pathologic fracture or bowel obstruction).
4. A procedure to decrease pain.
5. A procedure to provide vascular access.

### Tables

**Table 2.** Responses When Asked Whether Resuscitation Maneuvers Should Be Withheld During Intraoperative Arrest in a Child With a DNR Order

<table>
<thead>
<tr>
<th>Maneuver</th>
<th>Pediatric Surgeons*</th>
<th>Pediatric Anesthesiologists</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive-pressure ventilation</td>
<td>Yes, %</td>
<td>No</td>
<td>Yes, %</td>
</tr>
<tr>
<td>Vasoactive drugs</td>
<td>60 (26.7)</td>
<td>165</td>
<td>23 (21.5)</td>
</tr>
<tr>
<td>Endotracheal intubation</td>
<td>93 (41.5)</td>
<td>131</td>
<td>34 (31.8)</td>
</tr>
<tr>
<td>Defibrillation</td>
<td>63 (28.1)</td>
<td>161</td>
<td>22 (20.6)</td>
</tr>
<tr>
<td>Closed cardiac massage</td>
<td>166 (73.8)</td>
<td>56</td>
<td>65 (60.7)</td>
</tr>
<tr>
<td></td>
<td>175 (77.4)</td>
<td>51</td>
<td>36 (33.6)</td>
</tr>
</tbody>
</table>

NS indicates not significant.

* Some respondents did not answer every question

**Table 3.** Potential Interventions During Resuscitation

- Airway management
- Supplemental oxygen
- Oral airway
- Bag and mask ventilation
- Intubation
- Arterial puncture
- Needle thoracentesis
- Chest tube insertion
- Blood product transfusion
- Invasive monitoring
- Chest compressions
- Defibrillation
- Cardiac pacing
- Arrest medications (epinephrine, atropine, sodium bicarbonate, calcium, other vasoactive drugs)
- Postoperative ventilatory support
surrogates, although it is implied. It is expected that the surgeon will advise parents or other surrogates and the child (if developmentally appropriate) regarding operative risks and benefits and advocate a policy of required reconsideration of previous DNR orders. The results of all discussions should be documented in the patient’s medical record. The surgeon should also ultimately convey the patient’s wishes to the members of the entire operating room team, help operating team members understand the patient’s or surrogate’s wishes, and find alternate team members to replace individuals who disagree with the patient’s or surrogate’s wishes. With children, the difficulty arises when there is no one who is willing to honor a family’s wish to continue the DNR status during the anesthesia and surgery. Stalemates such as this should be referred to the ethics committee of the institution.

Role of the Anesthesiologist

In 1994 and 1999, the ASA released recommendations on caring for surgical patients with active DNR orders. These guidelines explicitly reject the practice of automatically rescinding the DNR order before procedures involving the use of anesthesia, because this practice “may not sufficiently address a patient’s rights to self-determination in a responsible and ethical manner.” The purpose of required reconsideration of DNR orders is to determine what is best for the patient under the circumstances, not to convince the patient and family to have the DNR order suspended. The guidelines proposed by the ASA clearly recommend that all physicians involved in the case (primary physician, surgeon, and anesthesiologist) discuss together with the patient (or other surrogate) the appropriateness of maintaining the DNR order during the operation. The 1999 guidelines distinguish between goal-directed and procedure-directed DNR orders. Model procedure-specific DNR documentation forms are published and may be modified for individual hospital use.

A goal-directed approach focuses on the patient’s goals, values, and preferences rather than on individual procedures. The primary goal is to do everything to prevent the need for resuscitation, but if it occurs, this approach recognizes that patients are often less concerned with technical details of the resuscitation than with more subjective and personal issues regarding quality of life before and after resuscitation. This model promulgates an approach that honors the family’s treatment goals while reflecting the reality and unique aspects of the perioperative environment. However, some anesthesiologists are uncomfortable with the indeterminate nature of a goal-directed DNR order and have ethical or legal concerns about having such crucial decisions rest solely on their best judgment at the time of arrest.

Goal-directed DNR orders may be less feasible if the anesthesiologist and surgeon caring for the child have not established a relationship with the family before surgery. A procedure-directed approach may be more appropriate in these circumstances, which involves careful consideration of a series of specific interventions that are likely to be used (Table 3). Each must be placed in the context of the child’s usual quality of life and likelihood of the ability of the procedure to produce the desired effect, given his or her unique physiology. This approach has limited flexibility when an unexpected situation occurs.

Perioperative suspension of the DNR order is considered by some anesthesiologists to be the ideal compromise, because it enables the physician to act without restraint while providing the patient with a realistic chance of achieving the operative goals. Anesthetic agents and techniques may promote some degree of hemodynamic and respiratory abnormality, especially in patients with a deteriorated health condition. The deliberate depression of vital functions by the anesthetic may require resuscitative measures to stabilize the patient. Consequently, controversy about the use of these interventions arises when the patient has a written DNR order. Many of the routine anesthetic interventions performed as part of operative maintenance are considered resuscitative measures under different circumstances. These interventions include the use of paralytic agents, vasoactive drugs, blood products, and positive-pressure ventilation. This overlap in terminology promotes confusion and inconsistencies among physicians on the interpretation of a patient’s DNR order and what it implies in an operative setting. Keffer and Keffer proposed that resuscitation in the operating room be defined as “those measures undertaken to reestablish cardiac rhythm once a cardiac arrest has occurred.” This definition establishes a simple end point beyond which a patient’s wish not to be resuscitated would come into play.

The anesthesiologists’ concern for patient comfort during the procedure may support perioperative suspension of DNR orders. An active DNR order restricts the physicians’ ability to treat any complications of their own procedure during anesthesia. Faced with this dilemma, anesthesiologists are forced to decrease the risk of cardiopulmonary arrest by increasing hemodynamic stability through the use of less anesthetic. For the patient, this may potentially result in more discomfort and suffering.

One reason to distinguish DNR in the operating room from DNR in other settings is the difference in the success rate of CPR administered for a spontaneous cardiopulmonary arrest versus one that results from anesthesia. Anesthetic-related arrests are believed to be more easily reversible because of the immediate ability to respond and the controlled nature of the event. One study of surgical patients suggested that when a cardiac arrest was ascribed to anesthesia, 92% of the patients were resuscitated successfully. However, it is difficult to determine how these statistics apply to terminally ill patients with a DNR designation, because the survey was very broad and inclusive. A more relevant survey was conducted on 4301 seriously ill adult patients, and a few underwent an operative
procedure and had previously written DNR orders in their medical records. Only 3 of the 57 patients with DNR orders (5%) experienced an intraoperative cardiopulmonary arrest, but all died within 5 days of operation.29

Traditionally, CPR has been considered a success if the patient survives the initial resuscitation effort. For patients with DNR orders, the success of CPR may be better gauged on the length of patient survival and expected quality of life after resuscitation. Using this definition, CPR may be inappropriate to recover or deteriorates, withdrawal of ventilatory support should be considered. Generally speaking, the suspension of DNR orders should continue until the postanesthetic visit, until the patient has been weaned from mechanical ventilation, or until the primary physician involved in the patient’s care and the family agree to reinstate the DNR order.

The surgeon and anesthesiologist should feel comfortable, and should be allowed, to reinstate a DNR order intraoperatively through consultation with the family under certain conditions. For example, if cardiac arrest occurs during surgery and it is apparent that the arrest is the result of an irreversible underlying disease or complication and that CPR would only allow continued deterioration, the DNR order should be reinstated. If resuscitation measures are withheld and intraoperative arrest occurs, such a death should be classified as “expected” for quality-assurance purposes rather than “unexpected.” Expected deaths do not require mandatory quality-assurance review.18,31

IMPLEMENTING “REQUIRED RECONSIDERATION”

Hospitals are encouraged to develop and maintain written policies permitting the forgoing of life-sustaining treatment of patients, including children, in appropriate circumstances.13 Once a DNR order is in place according to accepted standards, it is important that it be reviewed before surgery to determine applicability in the operating room and the postoperative recovery period. Hospitals wishing to develop a “required reconsideration” policy (Table 4) may want to address the following elements:

- Include in the discussion with a child’s parent or other surrogate information about the likelihood of requiring resuscitative measures, a description of these measures and their reversibility, the chance of success, and possible outcomes with and without resuscitation. Establish an agreement about what, if any, resuscitative measures will be instituted during the procedure.
- Make the decision to uphold or suspend a DNR order on the basis of the planned procedure, the anticipated benefit for the child, and the likelihood of patient compromise as a result of the procedure.
- Document the salient features of the physician-family discussion in the medical record.
- Communicate plans to honor an intraoperative DNR order among relevant staff.
- Require any physician or other health care professional who is unwilling to honor a family’s refusal

### If DNR Orders Are Suspended: Qualification of Perioperative Interval

If the family or medical personnel involved in a child’s care choose to suspend DNR orders during anesthesia and surgery, it is necessary to define the duration of suspension.30 The physiologic effects of anesthesia and surgery rarely terminate at the end of the procedure, but the duration thereafter depends on the anesthetic technique used and the type of surgical procedure performed. The acute effects of most anesthetic medications generally resolve within several hours or 1 day after surgery, and most anesthesiologists visit the patient the day after a surgical procedure and document recovery status in the patient record. Recovery of respiratory function after surgery depends on preoperative pulmonary function, chronicity of illness, and length of the procedure. Some patients will experience cardiopulmonary arrest during or immediately after surgery, which may be the result of an acute and reversible complication. It is appropriate to use mechanical ventilation after surgery as long as the patient continues to show significant and sustained improvement in pulmonary function. Once the patient ceases to recover or deteriorates, withdrawal of ventilatory support should be considered. Generally speaking, the suspension of DNR orders should continue until the postanesthetic visit, until the patient has been weaned from mechanical ventilation, or until the primary physician involved in the patient’s care and the family agree to reinstate the DNR order.

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### TABLE 4. Required Reconsideration Options for Pediatric Patients With DNR Orders Who Require Anesthesia and Surgery

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full resuscitation</td>
<td>Perioperative suspension of DNR orders with qualification of perioperative interval</td>
</tr>
<tr>
<td>Goal-directed approach</td>
<td>Focuses on patient goals, values, and preferences</td>
</tr>
<tr>
<td>Most subjective approach</td>
<td>Implies personal relationship between physician and patient/family with understanding of quality-of-life concerns</td>
</tr>
<tr>
<td>Procedure-directed approach</td>
<td>Specific interventions (see Table 3) placed in context of child’s quality of life are each reviewed prior to procedure</td>
</tr>
</tbody>
</table>
of resuscitation to withdraw from the case and allow others to assume care. The withdrawing physician or health care professional should make a conscientious effort to identify another physician who is willing to honor the DNR request.13

• Recognize that a patient’s or surrogate’s decision to refuse intraoperative resuscitation can be compatible with the provision of therapeutic measures to treat conditions other than arrest. This decision does not necessarily imply limits on other forms of care such as intensive care.

• If the family chooses to rescind the DNR order in the operating room and arrest occurs with resuscitation, but the patient’s process of dying has only been prolonged, make a provision to discuss withdrawal of life support after a determined amount of time.3,5,19

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