Relationship Between Site of Training and Residents’ Attitudes About Neonatal Resuscitation

Annie Janvier, MD; Keith Barrington, MB, ChB; Marianne Deschênes, MD; Elise Couture, MD; Sophie Nadeau, MD; John Lantos, MD

Objective: To determine whether the attitudes of pediatric and obstetric residents concerning the resuscitation of extremely preterm infants, and their knowledge of outcomes, varies according to their center of training and its resuscitation practices.

Design: Anonymous questionnaire.

Setting: Four province of Quebec, Canada, university centers.

Participants: A total of 165 pediatric and obstetric residents.

Interventions: Survey of attitudes about resuscitation of neonates born between 23 and 27 weeks of gestation, and knowledge of the prevalence of cerebral palsy in survivors.

Main Outcome Measures: Proportion of residents who would resuscitate a depressed, very preterm infant, and the proportion who overestimated the prevalence of cerebral palsy.

Results: The percentage of residents who would resuscitate a depressed infant born at 24 weeks varied from 11% to 39% between centers, at 25 weeks between 26% and 69%, and at 26 weeks between 51% and 86%. At the center most likely to intervene for very immature infants, the greatest proportion of residents favored resuscitation at each gestational age. At the least interventionist center, the smallest proportion would resuscitate. The center of training was the only factor related to willingness to resuscitate at 24, 25, 26, and 27 weeks of gestation; not age, years of training, religion, sex, or parental status (whether the person surveyed has children). A total of 53% of residents thought the prevalence of cerebral palsy was 25% or 40% in this population. Residents with a more accurate knowledge of outcome were more likely to want to resuscitate very immature infants.

Conclusion: Different treatment centers may develop their own ethos regarding resuscitation, which then shapes both the way the residents understand epidemiological data and how they make decisions.

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Significant practice variation exists between neonatal centers in their resuscitation practices. For example, Vohr et al1 reported that among the leading neonatal centers in the United States, the rate of active delivery room resuscitation for newborns weighing 401 g to 1000 g ranges from 5% to 28%. Lee et al2 evaluated the differences in 12 Canadian centers and found that for infants born between 22 and 25 weeks of gestation, delivery room deaths (a condition for non-resuscitation) ranged from 8.5% to 57.4%. Such differences are neither illegal nor contrary to the guidelines of professional organizations. The American Academy of Pediatrics guidelines’ statement that resuscitation is futile prior to 22 weeks of gestational age and is generally obligatory at 25 weeks of gestational age or above, with 22 to 25 weeks as an acknowledged “gray zone.” The Canadian Pediatric Society considers resuscitation optional before 25 weeks.4 Other professional guidelines consider resuscitation optional between 22 and 25 weeks, and recommend a process of shared decision making between physicians and parents for these difficult cases.3

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A process of shared decision making requires physicians to counsel parents about the risks, benefits, and likely outcomes of treatment. Often, parents ask physicians for their opinions about what ought to be done — or even ask the physicians what they would do if faced with the decision...
for their own infant. Little is known, however, about the process by which physicians form their own opinions and attitudes about newborn resuscitation.

We wondered whether the practice variations between centers would be related to differences in knowledge and/or the attitudes of the trainees at those centers. We therefore studied pediatric and obstetric residents at 4 university-based residency programs in Canada (province of Quebec). Each program is affiliated with a level III neonatal center. We wished to describe the different approaches to resuscitation at the borderline of viability in these 4 university-based centers. We hypothesized that residents’ knowledge and attitudes about resuscitation and prognosis would be related to the center in which they trained. We also wished to describe the effects of other factors that may be related to attitudes regarding resuscitation, such as religious beliefs, knowledge of outcomes, year of training, and whether the residents we surveyed had children themselves.

METHODS

Between July and October 2002, we collected data from directors of neonatal centers and from the residents who train in these residency programs. We interviewed the directors of neonatology at all 4 university centers in Quebec about the prevailing resuscitation practices at their center. We then administered an anonymous questionnaire to all residents at the 4 university centers regarding their attitudes about resuscitation. Individuals gave their consent to be included. We asked residents about their resuscitation preferences in 3 ways. First, we asked them to state whether they would want their own infant resuscitated at 5 different gestational ages, from 23 to 27 completed weeks of gestation. Second, we asked whether they would recommend resuscitation for a sister’s or a good friend’s infant at those same gestational ages. For each of these questions, residents could respond on a Likert scale, with options for their likelihood of resuscitating being “always,” “generally,” “exceptionally,” or “never.” We scored these answers for some of the nonparametric analyses by grading the responses and giving 4 points for “always” down to 1 for “never.”

Each resident was asked if they thought it was reasonable to resuscitate a depressed infant in the delivery room at 22, 23, 24, 25, 26, 27, and 28 completed weeks of gestation. For this question, the 22 and 28 weeks of gestation options were added, as these were felt likely to elicit answers close to 0% and 100%, respectively, as a further test of the validity of the questionnaire.

To assess the residents’ knowledge of 1 aspect of the outcomes for infants at these gestational ages, we asked them to estimate the prevalence of cerebral palsy (CP) in 5-year-old to 8-year-old survivors among infants born weighing less than 1000 g. The possible responses were 10%, 15%, 25%, and 40%. In this birth weight range, actual rates of cerebral palsy range from 8% to 11%; we classified 10% or 15% as correct answers.

In center A, when infants were born at 23 and 24 weeks of gestation, parents and physicians engaged in a process of shared decision making. Infants were resuscitated if parents requested this. In 2002, 60% and 73% of infants were resuscitated in the delivery room at 23 and 24 weeks of gestation, respectively (data collected routinely by unit).

In center B, infants born at 23 weeks were not offered resuscitation. Infants born at 24 weeks were resuscitated if parents requested this. No infants born at 23

<table>
<thead>
<tr>
<th>Category</th>
<th>Center A</th>
<th>Center B</th>
<th>Center C</th>
<th>Center D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size, No.</td>
<td>43</td>
<td>36</td>
<td>27</td>
<td>59</td>
<td>165</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30, y</td>
<td>67</td>
<td>77</td>
<td>70</td>
<td>59</td>
<td>65</td>
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<td>Age</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>30-34, y</td>
<td>18</td>
<td>12</td>
<td>11</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Infant outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
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<td>3</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
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<td>18</td>
<td>14</td>
<td>8</td>
<td>27</td>
<td>18</td>
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<tr>
<td>Parents</td>
<td>18</td>
<td>14</td>
<td>8</td>
<td>27</td>
<td>18</td>
</tr>
</tbody>
</table>

RESULTS

There were 173 residents training in pediatrics and obstetrics at the 4 centers in 2002. Of these, 165 were reached (95%) and 100% of those who received the questionnaire completed the survey. There were no significant differences in sex, age, or percentage of junior and senior residents between the centers (Table 1). Residents in the 4 centers were of similar ages (Table 1). A total of 18% of the residents had children. Center D was more culturally diverse; more than 5 religious groups, and atheists, were represented, none representing greater than 40% of the respondents. Residents in center D were more likely to have children (27% compared with 8%-18% in other groups) (Table 1) (odds of having children, 3.49; 95% confidence interval [CI], 1.57-7.74).

CENTER RESUSCITATION PRACTICES

The directors at each center described their resuscitation policies in 2002 as follows:

In center A, when infants were born at 23 and 24 weeks of gestation, parents and physicians engaged in a process of shared decision making. Infants were resuscitated if parents requested this. In 2002, 60% and 73% of infants were resuscitated in the delivery room at 23 and 24 weeks of gestation, respectively (data collected routinely by unit).

In center B, infants born at 23 weeks were not offered resuscitation. Infants born at 24 weeks were resuscitated if parents requested this. No infants born at 23

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greater proportion of residents favored resuscitation at
weeks and the majority of infants born at 24 weeks, were
resuscitated in 2002, according to the unit director.
In center C, infants born at 23 and 24 weeks of ges-
tation were not offered resuscitation.
In center D, when infants were born at 23 and 24 weeks of
gestation, parents and physicians engaged in a pro-
cess of shared decision making. Infants were resusci-
tated if parents requested this. In 2002, 75% of infants
born at 23 and 100% of infants born at 24 weeks
were resuscitated (data collected by unit).

OTHER FACTORS ASSOCIATED WITH THE COLLABORATION BETWEEN PARENTS AND PHYSICIANS
A greater number of residents also believed resuscita-
tion to be appropriate at 24 weeks’ gestation in center
D (OR for center D compared with the remaining cen-
ters, 3.40; 95% CI, 1.6-7.2). Fewer pediatric residents in
center C believed it appropriate to resuscitate a de-
pressed premature infant born between 25 and 27 weeks’
gestation (OR at 25 weeks, 0.33; 95% CI, 0.13-0.83; OR at
26 weeks, 0.45; 95% CI, 0.19-0.98). Even at 27 weeks’
gestation, fewer residents in residency program C would
resuscitate (OR, 0.27; 95% CI, 0.10-0.74). At 28 weeks’
gestation, there was no difference between the centers,
as more than 93% of residents would resuscitate in ev-
ery center (Table 3).

We entered all the variables into a multiple regres-
sion analysis to see whether the centers remain statisti-
cally significant after correcting for the other variables.
The residents’ threshold for resuscitation of a depressed
infant was not related to age of respondents, years of train-
ing, religion, sex, or whether they had children. The cen-
ter of training was the only factor related to willingness
to resuscitate at 24, 25, 26, and 27 weeks. For example,
the adjusted OR for wishing to resuscitate at 25 weeks’
gestation in center D was 4.6 (95% CI, 2.3-9.3), and at
24 weeks it was 3.4 (95% CI, 1.6-7.2).

THE THRESHOLD OF RESUSCITATION
FOR A DEPRESSED PRETERM INFANT
A total of 75% and 44% of residents did not consider re-
suscitation reasonable for a depressed infant born at 24
and 25 weeks’ gestation, respectively. Residents consid-
ering whether resuscitation was appropriate for a de-
pressed infant at 24 weeks’ gestation varied between 11% and
39% between centers, at 25 weeks between 26% and
69%, at 26 weeks between 31% and 86%, and at 27 weeks
between 70% and 94% (Table 3); the threshold for re-
uscitation differed markedly from center to center.

CP PREVALENCE IN EXTREMELY
LOW-BIRTH-WEIGHT INFANTS
A total of 53% of residents thought the prevalence of
CP was 25% or 40% in this population. Knowledge of
CP prevalence did not increase substantially with year of
training. Of first year residents, 49% estimated the
prevalence correctly, compared with 55% of residents in
years 4 and 5. Estimates of the prevalence of CP
were not related to age, sex, religious beliefs, or paren-
tal status. They were only significantly related to the
center. A higher percentage of residents who trained at
centers B and C overestimated the prevalence of CP
than at centers A and D (Table 3). For example, 63%

Table 3. Percentage of Respondents Who Think It
Is Reasonable to Resuscitate (in the Delivery Room)
a Depressed Premature Infant by Week of Gestation

<table>
<thead>
<tr>
<th>Week of Gestation</th>
<th>Center A</th>
<th>Center B</th>
<th>Center C</th>
<th>Center D</th>
</tr>
</thead>
<tbody>
<tr>
<td>23b</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>24c</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>25c</td>
<td>2.2</td>
<td>2.4</td>
<td>2.1</td>
<td>3.0</td>
</tr>
<tr>
<td>26b</td>
<td>2.7</td>
<td>2.8</td>
<td>2.6</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.
a For 24 weeks of gestation, OR (95% CI) for center D responses was
3.40 (1.60-7.21).
b For 25 weeks of gestation, OR (95% CI) for center D responses was
4.63 (2.30-9.26).
c For 27 weeks of gestation, OR (95% CI) for center C responses was
0.27 (0.10-0.74).
of residents had a correct answer in center D compared with 28% and 33% in centers B and C, respectively (Table 4).

Residents who answered that the prevalence of CP was 10% were much more likely to want their own infant resuscitated at 24 and 25 weeks' gestation, and to want to resuscitate a depressed infant born at 24 or 25 weeks, compared with residents who answered that CP prevalence was 40% (Figure). A priori we had decided to divide the answers into 2 groups: 10% or 15%, and 25% or 40%. The OR for wanting to resuscitate their own infant born at 24 weeks was 0.37 (95% CI, 0.18-0.78) among those who incorrectly placed the percentage too high, compared with the others; at 25 weeks the OR was 0.57 (95% CI, 0.30-0.97).

We entered all the variables into a multiple regression analysis to see whether the center remains statistically significant after correcting for the other variables. The residents' estimation of CP rates in extremely low birth weight infants was not related to age of respondents, years of training, religion, sex, or whether they had children. The center of training was the only factor related to inaccurate estimation of CP, with centers A and D having a greater number of correct answers, and being less likely to estimate CP as 40% (OR for an answer of 40% at centers A and D compared with B and C, 0.11; 95% CI, 0.03-0.71).

The purpose of this study was to analyze the relationship between prevailing resuscitation practices at different centers and the knowledge and attitudes of the residents who were being trained. Our first significant finding was that, between the 4 centers we studied, there were differences in prevailing resuscitation practices. In 2002, in 2 out of 4 university centers, resuscitation was routinely offered at 23 and 24 weeks' gestation. In the other 2 centers, resuscitation was either never offered or discouraged at 23 and 24 weeks' gestation.

Our second finding is that residents' attitudes at the different centers were related to the prevailing practices at those centers. Where resuscitation of infants born at 23 and 24 weeks was routine, residents were more likely to favor resuscitation; conversely, where resuscitation was not offered, residents were far less likely to favor resuscitation. Because this was a cross-sectional survey, we could not say whether the attitudes of residents shifted over time, so we do not know whether residents selected programs whose practices were most consistent with their own values, or whether those values were shaped by the practices they observed.

Although we only studied residents in the province of Quebec, this restriction in the geographic extent of the study was felt to reduce some of the other variations between centers that might be present if a larger number of universities had been included. Three of the 4 universities have residents that are primarily French-speaking and mostly originally from Quebec: the other is mainly English-speaking, with a larger proportion of residents who are from outside of Quebec. The French-speaking universities had very similar respondent demographics, but had different approaches to the resuscitation of extremely preterm infants, and significantly different responses to our questions. Thus, even within a geographically restricted area, major differences between training centers exist. Furthermore, our methodology having a response rate of nearly 100% allows for the elimination of response bias, which is always a major limitation of postal surveys.

A third interesting finding is that there were also differences in the residents' knowledge of prognosis for extremely premature infants. Clearly, CP is not the only long-term disability among formerly preterm infants.

### Table 4. Residents' Knowledge of Cerebral Palsy Rates Among Preterm Neonates by Center

<table>
<thead>
<tr>
<th>Estimate of Cerebral Palsy Prevalence</th>
<th>Center A</th>
<th>Center B</th>
<th>Center C</th>
<th>Center D</th>
<th>OR of Lowest Center vs Remainder (95% CI)</th>
<th>OR of Highest Center vs Remainder (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>5</td>
<td>25</td>
<td>22</td>
<td>8</td>
<td>0.25 (0.06-1.1)</td>
<td>2.79 (1.09-7.2)</td>
</tr>
<tr>
<td>25%</td>
<td>44</td>
<td>47</td>
<td>44</td>
<td>29</td>
<td>0.51 (0.26-1.0)</td>
<td>1.4 (0.7-2.9)</td>
</tr>
<tr>
<td>15%</td>
<td>21</td>
<td>8</td>
<td>26</td>
<td>37</td>
<td>0.73 (0.33-1.6)</td>
<td>1.4 (0.7-2.8)</td>
</tr>
<tr>
<td>10%</td>
<td>9</td>
<td>0</td>
<td>11</td>
<td>20</td>
<td>0.74 (0.68-0.82)</td>
<td>3.8 (1.4-10.2)</td>
</tr>
<tr>
<td>Incorrect estimate</td>
<td>49</td>
<td>72</td>
<td>67</td>
<td>37</td>
<td>0.39 (0.20-0.77)</td>
<td>2.5 (1.2-5.5)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.

a Percentages of respondents according to center of training with responses to the question: “What is the prevalence of cerebral palsy in infants born weighing less than 1000 g when examined at 5 to 8 years of age?”
Developmental delay, learning disabilities, hearing loss, etc, occur with an elevated frequency among these children. The question focused on CP because it is consistently and clearly reported and is relatively stable between studies.②④ Residents in the 4 training centers were not well informed about this outcome, although those in centers where resuscitation was more prevalent at 23 and 24 weeks’ gestation were better informed. Furthermore, these differences in knowledge were related to differences in resuscitation practices, with center D having the most correct answers, centers B and C the least, and center A having an intermediate number. Knowledge of outcomes and center of training were more influential than age, sex, or religious beliefs.

We had a priori decided to pool the results of the CP knowledge question into 2 groups. Examining the data after collection showed that there was little difference in the resuscitation threshold between those who estimated CP prevalence as 15% and those who estimated it at 25%, the main differences being at estimates of 10% and 40% (Figure). However, changing the data analysis plan after viewing the results was not felt to be appropriate. We have also performed numerous comparisons, which increases the risk of a type I error, and warrants caution in interpretation. However, the results were consistent with our hypotheses, and always in the same direction, which increases our confidence in their reliability.

The resuscitation decision that residents would recommend to a family or close friend were almost identical to the decisions made when they thought about a patient or about their own infant. This may be in part because of an attempt to “not do to others what you would not want done to yourself,” or because close family and friends often share the same values.

These data suggest that each center develops its own ethos regarding resuscitation. That ethos then shapes the way the physicians understand epidemiological data, the way that they would make decisions for themselves or their family, and the recommendations that they would make for patients. This consistency between personal decisions and recommendations to parents could be considered compassionate and empathetic, but is not necessarily value-neutral.

One question raised by this study, and other studies of practice variation in neonatal resuscitation, is whether such variation is somehow more tolerable with regard to extremely premature infants than it might be for other children with life-threatening disease. We suspect that there is less practice variation, for example, in the institution of treatment of children with cancer or severe trauma. If that is the case, it would suggest that decisions about premature infants reflect more complex motivations than solely an assessment of the child’s best interests.⑪

This is a questionnaire study that has multiple limitations. We do not know if opinions would translate into actions if the resident were in the specific situation. Answering a questionnaire is clearly very different than having to make a decision for a living infant, but there was no other way to know caregivers’ opinions without placing them in the actual situation. This study was done in a single Canadian province and although we explain our reasoning for doing this above, the results might not reflect the attitudes of other groups of residents.

Previous investigators have shown that misapprehension by both obstetricians and pediatricians regarding outcomes of extremely preterm infants affects their willingness to actively treat mothers and their infants.⑫⑬ Haywood et al⑭ have shown that pediatricians who are the most pessimistic about the outcomes of extremely preterm infants are the least likely to say they would actively resuscitate. This underestimation of a good outcome appears to lead to variations in patterns of real-world practice and of outcomes.⑮ None of the previous studies have questioned residents; one might have hoped that residents would be better informed and more consistent in their attitudes, but this was clearly not the case.

This study does not explain why residents have these attitudes to intervention for extremely preterm infants. We did not ask them specifically, but perhaps they are following the lead of official statements⑮⑯⑰ that usually claim that low survival rates and a high frequency of disability are justifications for having a limit to intervention, although we have questioned this reasoning.⑱ Further research is needed to continue exploring these avenues. Our research confirms that our experiences and the environment in which we work form our opinions, values, and possibly our ethical framework. It is important to acknowledge the complexity of caring for infants in high-risk situations, to regularly question our values, to be critical of our rules of conduct, and to work with the uncertainty of ethical issues instead of blindly accepting policies. Only in doing so can we show residents to do likewise.

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Correspondence: Keith J. Barrington, MB, ChB, Royal Victoria Hospital, 687 Pine Ave W, Montreal, Quebec, H3A 1A1, Canada (keith.barrington@mcgill.ca).

Author Contributions: Study concept and design: Janvier, Barrington. Acquisition of data: Janvier, Barrington, Deschénes, Couture, Nadeau. Analysis and interpretation of data: Janvier, Barrington, Lantos. Drafting of the manuscript: Janvier. Critical revision of the manuscript for important intellectual content: Janvier, Barrington, Deschénes, Couture, Nadeau, Lantos. Statistical analysis: Barrington. Administrative, technical, and material support: Janvier, Nadeau, Lantos. Study supervision: Janvier, Barrington, Lantos.

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REFERENCES

Specialization in the nineteenth century was at first vehemently opposed by many in the profession who felt that it would be detrimental to the patient. Examples from the past of itinerant charlatans who specialized in pulling teeth, cutting for the stone, or treating only one kind of illness (for instance, venereal disease) caused ethical practitioners, and many lay people also, to regard with suspicion any physician who established himself to treat one group of diseases or one organ system. . . . Nevertheless, as the pressures of scientific, social, and economic factors became irresistible, specialization became an accepted fact.