

The Time To Death For Extremely Low Birth Weight Infants In The Neonatal Intensive Care Unit

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Citation

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Abstract

Objectives: To enhance our prenatal consultations and family education regarding survival of extremely low birth weight (ELBW) infants.

Study Design: Retrospective review focusing on the time to death of ELBW infants. Outcome (died, discharged, or in-hospital) in relation to time from birth was graphically plotted and the percent survival to discharge was calculated for given days of life.

Settings: One regional perinatal center

Patients: Infants with birth weight 500-1000 grams over 10 years.

Main outcome measures: Time to death among non-survivors.

Results: In the period 1995-2004, 67% of ELBW infants survived to discharge. Ninety-one percent of the deaths occurred within 60 days. Five percent of the infants who were still in the hospital after 60 days died on a later day.

Conclusions: Two-thirds of the deaths among ELBW infants occurred in the first 2 weeks of life. Studies are needed to evaluate risk factors for late deaths among ELBW infants.

CONFLICT OF INTEREST

None

INTRODUCTION

While there is a continued debate on what is considered the limit of viability, there is strong evidence that the survival of extremely low birth weight (ELBW) infants has significantly improved during the 1990s.^{1,2,3,4,5,6,7} In our neonatal intensive care unit (NICU) we observed the deaths of some ELBW infants after a long hospital stay. The death of a baby in the NICU is a loss for the family and the health care team.⁸ Others have raised the concern that although most NICU non-survivors expire early, they are not dying quite as early as they used to.⁴ We sought to evaluate the length of stay (LOS) [time to death] among non-survivors over a 10 years period in our NICU. We projected that our data will assist in providing the parents with the most up-to-date knowledge on survival probabilities for ELBW infants who have extended

hospital stays.

MATERIAL AND METHODS

All babies of birth weight 500-1000g, born at Cooper University Hospital between January 1, 1995 and December 31, 2004 were identified from a relational database, Neonatal Information System (NIS-Medical Data System, Wayne, PA). The NICU at Cooper University Hospital is a level III regional perinatal center in southern New Jersey providing specialized care to infants; the majority of them are inborn. Occasionally, an infant is transferred to another institution if a specialized care cannot be provided at our hospital or to be close to the parent's residence. Each infant was qualified for this study if; he/she was admitted to the NICU (i.e., survived the delivery room resuscitation) and was not transferred to another institution within 45 days of life. The Institutional Review Board at Cooper University Hospital exempted this retrospective study from review and waived HIPPA regulations since it included pre-existing medical records.

The focus of this study was to evaluate the length of stay (LOS) among survivors [to discharge] and non-survivors [time to death]. Basic clinical data was collected on all ELBW infants. Clinical data for infants who survived to discharge was compared to those for infants who died using 2- tailed t-test. (Software; SPSS for windows Version 13.0, Chicago, IL) The distribution of infants according to outcome (Died/Discharged/In hospital) in relation to time from birth was plotted as a percentage of the whole group of infants. Percent survival to discharge was calculated for day of life 1,7, 14, 21, 28, 60, 90, 150, 180 and 365.

RESULTS

There were 396 infants of birth weight 500-1000 grams born at Cooper Hospital between 1/1/1995 and 12/31/2004. Sixty infants died in the delivery room. Of the 336 infants admitted to the NICU, 14 infants were transferred to another institution prior to completing 45 days in the hospital and 2 were transferred to another institution after 45 days but were known to have eventually died prior to discharge. The remaining 320 infants are included in this report. Of the 320 infants included in this report, 105 expired in the NICU and 215 survived to discharge. Of the 215 infants that survived to discharge, 179 infants were discharged home, 10 infants were discharged to a rehabilitation facility and 26 infants were transferred to another institution for continuation of care. The characteristics of the 320 ELBW infants are shown in Table I. Over the 10-year period, the overall survival rate was 67% (49% in the birth weight subgroup 500-749g compared to 85% in the subgroup 750-1000g). The LOS among non-survivors [time to death] and survivors is shown in Table II broken down to percentage of infants in each group who represent a range of a corresponding length of stay. Forty-nine percent of the infants who died, died within the first week of life and 9% died after two months of life.

Figure 1: Shows the distribution of infants according to outcome (Died/Discharged/In hospital) in relation to time from birth plotted as a percentage of the whole group of 320 infants. Five percent (9/185) of all the infants who were still in the hospital after 60 days eventually died. Figure 2. Shows that survival improved by time but only reached 100% on day of life 180. percent survival on a given day.

COMMENTS

This report puts to a glance the pattern of LOS [time to death] in non-survivors of ELBW infants. It has been well established in the literature that the probability of survival of an individual ELBW infant improves by time while the

infant is in the NICU.^{4,9,10} Furthermore, multi-center and single-center reports documented improvement in survival of ELBW infants in the 1990s and attributed this to major advances in management that included prenatal steroids and exogenous surfactant.^{1,2,3,4,5,6,7,11} We report our outcome data from 1995-2004 on infants with birth weight 500-1000 g. The overall survival rate for the 10 years was 67% compared to survival ranges from 57% to 71% in the most recent outcome reports.^{1,2,4,7,12,13,14} Some recent reports compared the time to early death between the 1980s and early 1990s to the late 1990s and showed a significant decrease in early deaths in the late 1990s.^{1,4,7,15} Predictors of early death are discussed in the literature.^{14,17,18,19,20} Previously published and utilized mortality risk prediction models are helpful tools in clinical trials differentiating treatment effects and possibly comparing outcomes across neonatal intensive care units.^{14,17,18,19,20,21} They are, however, used early on in the clinical course and are not intended to limit the care of an individual infant since they are not sufficiently accurate to identify those patients who cannot be saved.^{17,18,20}

In this report, we had less deaths by DOL 4 (36% of all deaths) compared to others who reported ~ 80%.^{2,4,10} Forty-nine percent of the deaths occurred by one week in our cohort compared to 63% reported by Gould et al.¹⁵ Eighty percent of the deaths in our report occurred by DOL 30 which is comparable to 83% and 84% reported by others.^{7,15} It is known that early survival rates can be affected by the aggressiveness of delivery room resuscitation and initial management for which differences are reported between centers and even within the same center.^{13,14,22,23} Our low rate of early death may reflect that we excluded all infants that died in the delivery room (60/396) in addition to that our report goes into the 2000s for which reports are not yet as abundant as the reports from 1980s and 1990s.

Our observation of some late deaths in the NICU prompted the question that was already raised by others concerning a possible effect of the advances in the management on time to death in ELBW infants.^{4,15,24} Data on late neonatal death is, however, not usually the focus of outcome reports. In this cohort 4% of the deaths occurred after DOL 90 compared to 5.7% of deaths after DOL 84 reported by Cooper et al in 1998.⁹ Although inconsistent in the literature, we had significantly more survivors than non-survivors delivered by cesarean section.^{2,16,25}

The emotional impact of death in the NICU does not only affect the infant's family but it also affects the whole health

care team.^{8,26,27} Late death carries even a stronger impact since a long relationship has already developed between the health care team and the family in addition to the family's higher expectation for survival compared to earlier on in the hospitalization period.

Walsh et al reported that infants with prolonged mechanical ventilation 60 days had 'less' chance of survival and 'less' chance of survival free of neurodevelopmental impairment.¹²

Our data along with the data reported by Walsh et al, suggest the possibility of developing mortality prediction models based on the clinical condition at a later time in the NICU course.¹² Until this is reached, clinicians should find our data useful in overall evaluating the risk of not surviving till discharge based only on the length of stay but not tailored to the individual patient's condition.

We report that 95% (176/185) of the infants who were still in the hospital after DOL 60 survived till discharge. We suggest that; First, an agreement is needed among outcome reports on a time to death to be considered 'late death'; Second, a larger cohort will be needed to evaluate the replication of our mortality rate after a specified LOS in the NICU and then look closer at this population for other possible predictors of late mortality.

Figure 1

Table 1: Characteristics of 320 ELBW infants

	B wt 500-749 gms (n=156)		P	B wt 750-1000gms (n=166)		P	B wt 500-1000gms (n=320)		P
	Survived to Discharge (n=76)	Died (n=80)		Survived to Discharge (n=139)	Died (n=25)		Survived to Discharge (n=215)	Died (n=105)	
GIA weeks	25.4 ±3.8	24.81 ±3	<0.001	26.8 ±1.7	26.81 ±5	0.027	26.3 ±1.8	24.5 ±1.6	<0.001
Birth Weight (gms)	632 ±68	621 ±69	0.007	878 ±73	844 ±65	0.033	798 ±129	674 ±117	<0.001
Sex (no)	38 (50%)	41 (51%)	0.877	85 (61%)	16 (64%)	0.789	123 (57%)	57 (54%)	0.222
Race									
Black	45 (59%)	39 (49%)	0.255	69 (50%)	8 (32%)	0.087	114 (53%)	47 (45%)	0.166
White	16 (21%)	21 (26%)	0.575	55 (40%)	9 (36%)	0.789	73 (33%)	30 (29%)	0.423
Hispanic	13 (17%)	16 (20%)	0.645	15 (10%)	8 (32%)	0.041	28 (13%)	24 (23%)	0.039
Other	2 (3%)	4 (5%)	0.445	0	0		2 (1%)	4 (4%)	0.150
Multiple Gestation	11 (14.5%)	23 (29%)	0.030	29 (21%)	1 (4%)	0.002	40 (19%)	24 (23%)	0.373
C-section	41 (54%)	16 (20%)	<0.001	74 (53.2%)	9 (36%)	0.089	115 (53.4%)	25 (24%)	<0.001
Breast	25 (33%)	27 (34%)	0.913	35 (25%)	4 (16%)	0.279	60 (28%)	31 (29%)	0.764
Perinatal Steroids	57 (75%)	50 (63%)	0.176	90 (70.5%)	20 (80%)	0.301	135 (72%)	72 (68.5%)	0.516

Figure 2

Table 2: Length of stay of 320 ELBW infants

LOS(Days)	Non-Survivors			Survivors to Discharge		
	500-749g (n=80)	750-1000g (n=25)	All (n=105)	500-749g (n=76)	750-1000g (n=139)	All (n=215)
1-7 days	42(53%)	9(36%)	51(49%)	0	0	0
8-14 days	13(16%)	5(20%)	18(17%)	0	0	0
15-30 days	13(16%)	5(20%)	18(17%)	0	0	0
31-60 days	7(9%)	2(8%)	9(9%)	4 (5%)	34(24%)	38(17.5)
61-90 days	3(4%)	2(8%)	5(5%)	33(43%)	72(52%)	105(49%)
91-120 days	1(1%)	0	1(1%)	30(40%)	22(16%)	52(24%)
121-240 days	1(1%)	2(8%)	3(3%)	8(11%)	11(8%)	19(9%)
241-356 days	0	0	0	1(1%)	0	1(0.5%)

Figure 1: Outcome (died, discharged or in-hospital) from birth to 12 month of 320 extremely low birth weight infants.

Figure 3

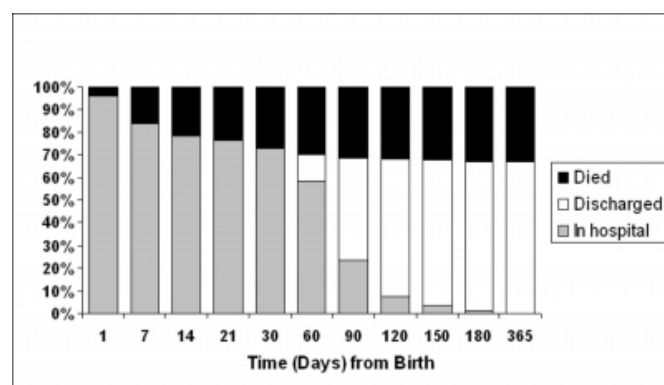
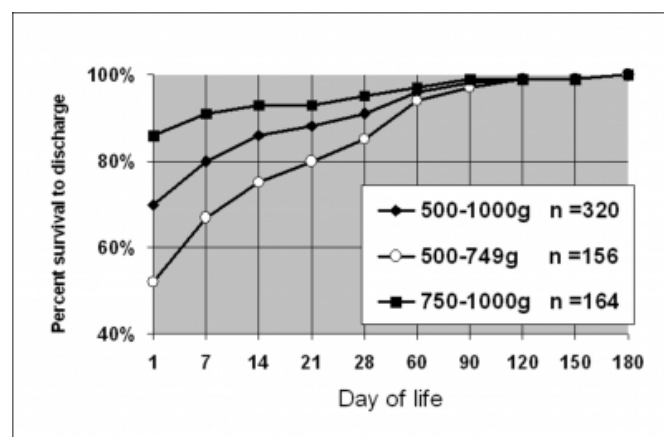


Figure 4

Figure 2: Percent survival to discharge on a given day of life in 320 extremely low birth weight infants.



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