

Estimating length of stay for very preterm babies

Estimating neonatal length of stay has received limited attention in the past. Anecdotally parents are told that their baby will be discharged home ‘around their due date’ but there is no evidence to suggest this is an accurate estimate. This article provides length of stay estimates by week of gestational age for very preterm babies. Information about likely length of stay, complemented by clinical knowledge and alongside information about the risk of mortality, is important and useful for counselling parents and preparing them for their baby’s discharge.

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Background

Babies born very preterm, before 32 weeks gestational age, who survive the initial period after birth will be admitted to a neonatal unit. Despite all the advances of modern neonatal care, in this group of babies the in-unit mortality can still be high and those who survive to discharge can potentially expect a lengthy period in the neonatal unit.

Little work has been carried out to investigate the length of stay of very preterm babies in neonatal care in the past.¹ Anecdotally, parents are told that their baby will be discharged home ‘around their due date’ or ‘when they are able to keep themselves warm and feed’. However, these statements are not evidence-based and in reality it has been unclear how accurate they are.

What does this project aim to do?

This research project was funded by a National Institute for Health Research (NIHR) Doctoral Research Fellowship (DRF-2013-06-011) with the following aims:

1. To investigate the factors that predict length of stay.
2. To estimate the length of stay for all very preterm babies admitted for neonatal care.
3. To consider the levels of care received by the baby in the estimation of their length of stay. An article related to this appeared in *Infant* previously.⁴

This article focuses on the second aim, where length of stay estimates were calculated to assist clinicians in their conversations with parents.

What data were used?

This research focused on singleton babies born at 24–31 weeks’ gestation and admitted to English neonatal units. Information was obtained from the National Neonatal Research Database (NNRD), which contains details about the care, demographics and patient details of admissions to neonatal care. The analysis was conducted on all babies irrespective of whether they survived to discharge or died while in neonatal care. This enables estimation of length of stay for babies who die in neonatal care and babies who survive to discharge, although the discussion here focuses on babies who survive. Babies were excluded if they were discharged home before 34 weeks’ corrected age as this is the point at which

Keywords

neonatal care; length of stay; mortality; preterm

Key points

Seaton S.E. Estimating length of stay for very preterm infants. *Infant* 2018; 14(5): 180–82.

1. There has been limited research into length of neonatal stay for preterm babies.
2. Information about likely length of stay is known to help parents feel prepared for discharge.
3. This article provides estimates of length of stay that can be used alongside clinical knowledge in the counselling of parents.

Why is it important to predict length of stay?

Predicting length of stay is useful for clinical decision making, the planning of care and the counselling of parents – this work focuses on the latter of these reasons. Parents often report that two of their biggest concerns upon admission to neonatal care are:

- will my baby survive?
- how long will my baby be in neonatal care for?

Other research^{2,3} has highlighted the importance of parents being prepared for the discharge of their baby and this has helped inform conversations clinicians have with parents around length of stay.

most babies learn to suck and feed. Babies were also excluded if they received unusual patterns of care, for example being discharged home having only received intensive care. In total, there were 20,571 babies born from 2011 to 2014 that met these criteria.

Summary information

The 20,571 babies accounted for 1,164,938 days of neonatal care in the study period. The number of babies ranged from 1,085 born at 24 weeks' to 4,984 born at 31 weeks' gestation. A total of 8.6% of babies died during their time in neonatal care.

Statistical analysis

The statistical analysis approach used in the project is known as competing risks. This method allows the measurement of time until an event occurs. Two or more events can be considered at the same time as long as they 'compete' to occur, ie the occurrence of one prevents the other. In this work the events considered are discharge home from neonatal care and death in neonatal care. Once the competing risks model is fitted it is possible to estimate the median length of stay for each event, by each week of gestational age. Further details of the statistical methods and additional results can be found in Seaton et al 2018.⁵

Estimates of length of stay for babies who survive to discharge alongside the 25th and 75th centile can be found in **TABLE 1**. For example, half of babies born at 27 weeks' gestation have been discharged home by the time they are 79 days old.

FIGURE 1 graphically displays the percentages of babies who died or were discharged from neonatal care over time. For example, for babies born at 24 weeks' gestation, after 20 days around 30% had died (black area), none had been discharged (absence of grey area) and the rest remained in the neonatal unit (white).

How can these results be used?

The estimated median lengths of stay by week of gestational age and the percentages of babies who died, were discharged home or remained in the neonatal unit over time can be used to predict length of stay for very preterm babies. For example, for babies born at 24 weeks' gestation, it can be estimated that half of the survivors will be discharged home by the time they are

Gestational age (weeks)	Days to due date	Median length of stay (days) of discharges (25th, 75th centile)	Potential phrases to describe length of stay
24	112	123 (104, 139)	'Four to five months'
25	105	107 (88, 125)	'Around four months'
26	98	92 (74, 109)	'Three to four months'
27	91	79 (63, 96)	'Around three months'
28	84	66 (52, 82)	'Two to three months'
29	77	53 (43, 66)	'One to two months'
30	70	42 (34, 52)	'A little over a month'
31	63	34 (28, 41)	'Around a month'

TABLE 1 Estimated median length of stay by week of gestational age for babies who survive to discharge (adapted from Seaton et al 2018⁵).

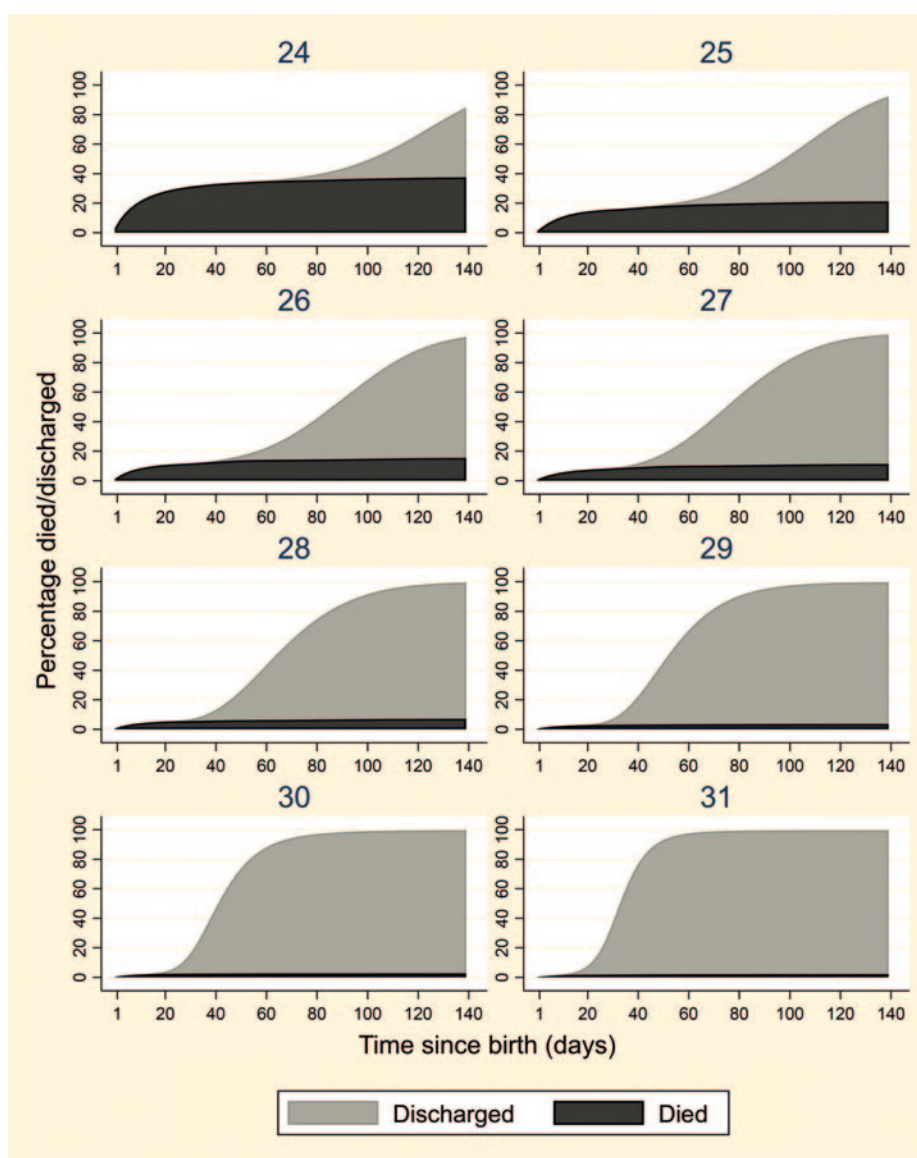


FIGURE 1 The percentage of babies who died, were discharged home or remained in the neonatal unit over time. The black area represents the percentage of babies that died, the grey area is the babies who were discharged and the white area represents those who remained in the neonatal unit (adapted from Seaton et al 2018⁵).

123 days old. On the other hand, for babies born at 31 weeks gestational age, their length of stay will be much shorter with around half of the survivors being discharged home by the time they are

34 days old. Providing precise estimates to parents may be unhelpful as very few babies will exactly match the median length of stay. Therefore, examples of phrases that may

prove useful when counselling parents around length of stay have been provided (TABLE 1). However, all estimates should be complemented with clinical knowledge and clinicians should consider the risk of mortality (seen in FIGURE 1 and presented in more detail in Seaton et al³) and the individual condition of the baby when discussing length of stay.

What these estimates do demonstrate is that using the anecdote of 'home by their due date' for all babies can be misleading. While babies born at 24 and 25 weeks' gestation do have long lengths of stay, sometimes until around their due date, this is not true across all gestational ages. Indeed, babies born at 30 and 31 weeks' are often discharged home a month before this.

Should other factors be considered when estimating length of stay?

At the beginning of this project a systematic review was undertaken¹ to investigate what factors should be considered when estimating length of stay. This identified that gestational age, sex and birth weight are the most important factors, but that this should be balanced against the need for a simple statistical model. In this article, only gestational age was accounted for in the analysis, to reflect the need for simplicity when presenting length of stay results. Preliminary results investigating whether other factors influence length of stay indicate that birth weight impacts on length of stay, with

smaller babies at each gestational week staying longer, but sex had only a minimal effect.

Future work

This study is one of the largest to-date to investigate length of stay in neonatal care. The results have been produced on a national basis, without the bias of local practices within individual hospitals. The results reflect those seen in smaller studies in the past, providing confidence in the results.^{6,7}

While estimates of length of stay are useful for parental counselling, it is unclear what the optimal length of stay is for a baby admitted to neonatal care. There is no evidence to suggest that a shorter length of stay should be aimed for, and indeed this could be harmful. Future work is needed to investigate the number of preterm born babies who are re-admitted to hospital, particularly within a short time, to investigate the benefits and harms of discharge at different time points.

Conclusion

Estimates of length of stay can be used in conversations with parents about the likely length of time their baby may need to spend in the neonatal unit before discharge home. These estimates may help improve parents' readiness for discharge when used alongside clinical knowledge.

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