

# Investigation of Normative Physiologic Vital Signs in Neonates: A Retrospective Chart Review



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## INTRODUCTION

- Current guidelines for a normal mean arterial pressure in extremely low birth weight neonates indicate that it should be approximately equivalent to the gestational age in weeks.
- The gestational age rule of thumb is predominately based on observational studies of premature neonates during the first 24 to 72 hours of life.
- Recent studies, including meta-analysis of anti-hypotensive treatment in neonates and observational studies of physiologic vital signs in neonates, have reaffirmed this trend in the first several days of life.
- Available data regarding the normative physiologic vital signs of neonates after the first several days of life is still limited.

## AIMS

- Determine if the gestational age rule of thumb for a normal mean arterial pressure in neonates is accurate beyond the first several days of life.
- Determine if a neonate's gestational age at birth has a significant impact on normative physiologic vital signs at a given corrected gestational age.
- Identify normative physiologic vital signs other than mean arterial pressure amongst premature neonates beyond the first several days of life.
- Identify physiologic vital sign thresholds that trigger interventional care at DHMC in premature neonates and compare those thresholds to current guidelines.

## DATA FROM THE LITERATURE

### A 24 Weeks Gestational Age

Figure removed from archived version due to copyright restrictions. Figure displayed trends with 95% confidence intervals of systolic, mean and diastolic blood pressures during the first 72 hours of life in premature neonates born at 24 weeks gestational age. At 0 and 72 hours, respective blood pressures (mmHg) were shown as follows: systolic, 32 and 54; mean, 22 and 36; diastolic, 18 and 26.

### B 25 Weeks Gestational Age

Figure removed from archived version due to copyright restrictions. Figure displayed trends with 95% confidence intervals of systolic, mean and diastolic blood pressures during the first 72 hours of life in premature neonates born at 25 weeks gestational age. At 0 and 72 hours, respective blood pressures (mmHg) were shown as follows: systolic, 31 and 56; mean, 23 and 35; diastolic, 20 and 25.

*Fig 1* Systolic blood pressure (red), mean blood pressure (grey), and diastolic blood pressure (green) during the first 72 hours of life in premature neonates born at (A) 24-, (B) 25-, (C) 26-, and (D) 27-weeks gestational age. The 95% confidence intervals are also shown. Adapted from Elsayed Y, Ahmed F. Blood pressure normative values in preterm infants during postnatal transition. *Pediatr Res.* 2024;95(3):698-704. doi:10.1038/s41390-023-02788-8

### Lowest Mean Arterial Blood Pressure by Day of Life

Figure removed from archived version due to copyright restrictions. Figure displayed 10<sup>th</sup>, 50<sup>th</sup>, and 90<sup>th</sup> percentile lowest daily mean blood pressure (mmHg) over the first 14 days of life amongst neonates stratified by weeks gestational age. At 0 and 14 days, respective 50<sup>th</sup> percentile measurements were shown as follows: 24 weeks, 25 and 34, 25 weeks, 26 and 36; 26 weeks, 27 and 39; 27 weeks, 29 and 42.

### C 26 Weeks Gestational Age

Figure removed from archived version due to copyright restrictions. Figure displayed trends with 95% confidence intervals of systolic, mean and diastolic blood pressures during the first 72 hours of life in premature neonates born at 26 weeks gestational age. At 0 and 72 hours, respective blood pressures (mmHg) were shown as follows: systolic, 33 and 57; mean, 24 and 36; diastolic, 21 and 26.

### D 27 Weeks Gestational Age

Figure removed from archived version due to copyright restrictions. Figure displayed trends with 95% confidence intervals of systolic, mean and diastolic blood pressures during the first 72 hours of life in premature neonates born at 27 weeks gestational age. At 0 and 72 hours, respective blood pressures (mmHg) were shown as follows: systolic, 34 and 58; mean, 26 and 37; diastolic, 22 and 28.

*Fig 2* Median lowest mean arterial blood pressure (solid lines) observed over the first 14 days of life amongst neonates born at 24-, 25-, 26-, and 27-weeks gestational age with no anti-hypotensive treatment. The 10<sup>th</sup> and 90<sup>th</sup> percentile mean arterial pressures are also shown (dotted lines). Adapted from Peeples ES, Comstock BA, Heagerty PJ, et al. Blood pressure values and hypotension management in extremely preterm infants: a multi-center study. *J Perinatol.* 2022;42(9):1169-1175. doi:10.1038/s41372-022-01425-2

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## METHODS

- Vital signs recorded for patients in the DHMC NICU between 2018 and 2025 will be collected through a retrospective chart review.
- Patients will be divided into cohorts based on gestational age at birth. Any cohort with less than 10 patients will be omitted.
- Average mean arterial pressure, heart rate, and respiratory rate will be calculated for each day during a patient's stay in the NICU. These averages will be aggregated within cohorts to report average vital sign recordings on each day of life.
- One-way analysis of variance tests will be used to compare daily average vital signs across cohorts for any given corrected gestational age.
- Mean arterial pressures that trigger medical intervention will be noted and then compared to the gestational age rule of thumb for normal mean arterial pressures.

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