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From Gestational Age–Specific Serum Creatinine Trajectories to an Interactive Clinical Interpretation Tool in Level IV NICU Infants

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Abstract

Objective

To characterize gestational age (GA)-specific serum creatinine (SCr) trajectories among level IV neonatal intensive care unit (NICU) infants and develop an interactive interpretation tool.

Study Design

We analyzed ADVANCE database records linking kidney-specific data with Children's Hospitals Neonatal Consortium clinical data from ten level IV NICUs (2010–2022). Infants with ≥ 1 SCr measurement (DOL 1-365) were included. GA-specific trajectories were generated for DOL 1–28 and week of life 1–16; an interactive tool was developed for clinical use.

Result

Among 34,306 infants contributing 390,612 SCr measurements, SCr trajectories differed by GA. Peak SCr ranged from 0.93 mg/dL (IQR 0.80–1.10) at 22–24 weeks' GA (DOL 4) to 0.76 mg/dL (IQR 0.65–0.90) among term infants (DOL 2), declining to a similar nadir (~ 0.20–0.23 mg/dL) across GA groups.

Conclusion

SCr trajectories vary by GA and postnatal age in this population. These trajectories and the accompanying tool provide context for interpreting SCr values.

Introduction

Serum creatinine (SCr) is the most commonly used biomarker to assess kidney function in infants and is routinely used to identify acute kidney injury (AKI) and guide medication dosing and fluid management. However, interpretation of SCr levels in infants is particularly challenging. At birth, SCr reflects maternal creatinine levels. Neonatal kidney function is initially immature; glomerular filtration rate increases rapidly over the first weeks of life as nephrons mature.[1,2,3] These physiologic factors result in dynamic postnatal changes in SCr concentrations, particularly among preterm infants.[4,5] Additionally, nephrogenesis continues until approximately 34 to 36 weeks' gestation,[6,7] resulting in substantial developmental differences in nephron maturity and renal functional reserve across gestational age (GA) groups. Accordingly, interpretation of neonatal SCr requires consideration of both GA and postnatal age.[8,9]

Despite the importance of SCr in clinical decision-making, available data describing neonatal SCr patterns remain limited. Foundational studies among healthy term[10] and preterm[11] infants have provided

important reference values for these populations; however, prior studies have included small, single-center cohorts or have focused on relatively healthy term infants,[15] often excluding critically ill or medically complex populations,[12],[13],[14] and most report cross-sectional reference values rather than longitudinal trajectories, which may inadequately capture the rapid postnatal changes in SCr that occur across the first weeks of life.[5] In current practice, infants cared for in level IV NICUs frequently have congenital anomalies, genetic abnormalities, or significant medical comorbidities, or require surgical intervention, and SCr patterns in these high-acuity populations may differ from those observed in healthier cohorts.[17] Data describing SCr values in very preterm infants (< 32 weeks' gestation) are particularly limited — a critical gap given the importance of SCr-based clinical decisions in this vulnerable population. Infants in level IV NICUs often have highly complex medical needs and prolonged hospital stays; without gestational age (GA)-specific longitudinal context, clinicians may have difficulty distinguishing expected physiologic changes in SCr from potentially abnormal kidney function — a distinction that is critical for the identification of AKI, medication dosing, and broader clinical decision-making in the NICU. Prior GA-specific, longitudinal descriptions of SCr patterns in extremely preterm and high-risk NICU infants have typically been limited to small cohorts with restricted observation windows. Developing GA-specific longitudinal SCr trends in level IV NICU patients therefore remains an important unmet need.

The objective of this study was to characterize longitudinal SCr trajectories across GA and postnatal age using a large multicenter cohort of infants hospitalized in level IV NICUs. We generated GA-specific trajectories using both daily and weekly postnatal summaries to provide clinically relevant benchmarks for SCr interpretation in high-acuity neonatal populations. These trajectories should not be interpreted as normative values for healthy infants, but rather as trajectories derived from critically ill infants with diverse comorbidities cared for in contemporary level IV NICUs.

To facilitate clinical application, we also developed an interactive tool to support interpretation of individual SCr values relative to these trajectories. Providers can use the tool to compare a patient's SCr value to these GA- and postnatal age-specific trajectories, which may help distinguish expected physiologic patterns from abnormal values.

Methods

Longitudinal Trajectory Analysis

We used the ADVANCE relational database, which links kidney-specific electronic health record data with detailed NICU clinical data from ten level IV NICUs located in 9 states (AR, DC, NC, OH, WI, TX, IN, GA, MO) from 2010 to 2022.[18] Clinical data were collected across participating sites through the Children's Hospitals Neonatal Database (CHND; Children's Hospitals Neonatal Consortium, Dover, DE; www.thechnc.org) and collated in a standardized format for integration into ADVANCE.[19] Data abstraction procedures within the CHND have been described previously and include prospective, ongoing training in clinical definitions alongside systematic auditing to ensure reliability and validity at

each center. Participating CHNC sites share several common characteristics: greater than 50 NICU beds, more than 400 neonatal admissions annually, a predominantly outborn population (> 70%), and availability of in-house pediatric and surgical subspecialty services.

Infants were eligible if they had at least one SCr measurement obtained between day of life (DOL) 1 and 365 during their NICU hospitalization. Eligibility was intentionally broad — AKI, mortality, prematurity, and congenital anomalies were not exclusionary — to reflect the complex, high-acuity population typically admitted to level IV NICUs. Given the descriptive nature of the study, analysis centered on summary statistics (medians and IQRs) rather than inferential testing.

Because infants frequently undergo multiple laboratory assessments within a single day, an infant-day summary dataset was constructed to avoid within-day pseudoreplication, such that each infant contributed a single value per DOL, defined as the median SCr measured on that day. For weekly analyses, an infant-week dataset was derived independently from the raw SCr data, such that each infant contributed a single value per week of life (WOL), defined as the median of all raw SCr measurements obtained during that week. Median aggregation was selected to reduce the influence of transient outlier measurements and variability related to timing of laboratory acquisition during periods of acute clinical instability.

Although our companion interactive tool, NeoKidneyCurve, provides SCr values for each individual GA week, the cohort was stratified into broader GA categories (22–24, 25–27, 28–30, 31–33, 34–36, and ≥ 37 completed weeks) for graphical presentation (Figs. 1 and 2), to allow comparison of SCr trajectories across the spectrum of prematurity without visual overcrowding. Baseline demographic characteristics were summarized at the infant level. Continuous variables, including birth weight and GA at birth, were summarized using medians and interquartile ranges (IQRs), and categorical variables, including sex, maternal Hispanic ethnicity, and maternal race, were summarized as counts and percentages.

Daily trajectory summaries were generated for DOL 1–28, capturing the neonatal period; weekly summaries were generated for WOL 1–16, reflecting the more stable maturational trajectory observed beyond the first month of life. Within each GA group and postnatal time point, the number of contributing infants, median SCr, and IQR were calculated; cells with fewer than 20 contributing infants were suppressed as unreliable. To quantify uncertainty around median SCr estimates, bias-corrected and accelerated (BCa) bootstrapped 95% confidence intervals[20] were calculated for each median using 1000 replications with the boot[21] package in R (seed = 42); the percentile bootstrap method was used as a fallback where BCa failed to converge. All analyses were performed using R statistical software version 4.3.0 (R Foundation for Statistical Computing, Vienna, Austria) using the packages dplyr, ggplot2, and gtsummary.[22],[23],[24]

Interactive Clinical Tool Development

To facilitate clinical interpretation of SCr values in infants cared for in level IV NICUs, we developed an interactive web-based tool, NeoKidneyCurve, using the Shiny (version 1.7.5) framework in R.[25] Users enter GA at birth and one or more SCr values with the corresponding DOL at which each was obtained. Values entered beyond DOL 28 are automatically converted to the corresponding WOL for plotting. Based on these inputs, SCr values are displayed against GA-specific median trajectories derived from the cohort, with the estimated percentile of each value relative to infants of the same GA and postnatal time point. Multiple values can be entered simultaneously to visualize longitudinal changes within an individual patient.

When no values have been entered, the landing page displays median SCr trajectories for grouped GA categories by DOL (days 1–28) and WOL (weeks 1–16). After a value is entered, the tool displays the individual GA week's daily trajectory for values through DOL 28, and the corresponding weekly trajectory extending through the maximum WOL represented in the underlying data (up to WOL 53, reflecting the cohort's full DOL 1-365 observation window).

Results

Study Population

A total of 34,306 infants from ten level IV NICUs met inclusion criteria and were included in the analysis (Table 1). These infants contributed 390,612 SCr measurements obtained between DOL 1 and 365.

Table 1
Characteristics of the Study Population by Gestational Age Group

Characteristic	Overall, N = 34,306[1]	22–24, N = 1,859[1]	25–27, N = 2,960[1]	28–30, N = 2,498[1]	31–33, N = 3,073[1]	34–36, N = 6,346[1]	>=37, N = 17,570[1]
Birth weight, g	2,661 (1,540-3,290)	615 (543–697)	840 (705–970)	1,220 (1,005 – 1,430)	1,770 (1,488-2,070)	2,490 (2,125-2,875)	3,220 (2,845-3,600)
Gestational age at birth, weeks	37.0 (32.1–39.0)	24.0 (23.4–24.4)	26.3 (25.6–27.0)	29.3 (28.6–30.1)	32.4 (31.9–33.3)	35.7 (34.9–36.3)	39.0 (38.0-39.7)
Sex							
Female	14,704 (42.9%)	885 (47.6%)	1,306 (44.1%)	1,070 (42.8%)	1,356 (44.1%)	2,688 (42.4%)	7,399 (42.1%)
Male	19,572 (57.1%)	972 (52.3%)	1,653 (55.8%)	1,426 (57.1%)	1,712 (55.7%)	3,656 (57.6%)	10,153 (57.8%)
Other/ Indeterminate	28 (0.1%)	2 (0.1%)	0 (0.0%)	1 (0.0%)	5 (0.2%)	2 (0.0%)	18 (0.1%)
Unknown/ Missing	2 (0.0%)	0 (0.0%)	1 (0.0%)	1 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Hispanic ethnicity							
No	28,817 (84.0%)	1,611 (86.7%)	2,528 (85.4%)	2,153 (86.2%)	2,658 (86.5%)	5,333 (84.0%)	14,534 (82.7%)
Unknown/ Missing	1,903 (5.5%)	80 (4.3%)	130 (4.4%)	109 (4.4%)	129 (4.2%)	356 (5.6%)	1,099 (6.3%)
Yes	3,586 (10.5%)	168 (9.0%)	302 (10.2%)	236 (9.4%)	286 (9.3%)	657 (10.4%)	1,937 (11.0%)
Maternal race							
American Indian or Alaska Native	105 (0.3%)	1 (0.1%)	6 (0.2%)	14 (0.6%)	17 (0.6%)	30 (0.5%)	37 (0.2%)
Asian	1,112 (3.2%)	61 (3.3%)	76 (2.6%)	55 (2.2%)	81 (2.6%)	175 (2.8%)	664 (3.8%)
Black	8,917 (26.0%)	857 (46.1%)	1,157 (39.1%)	819 (32.8%)	885 (28.8%)	1,345 (21.2%)	3,854 (21.9%)

Characteristic	Overall, N = 34,306[1]	22–24, N = 1,859[1]	25–27, N = 2,960[1]	28–30, N = 2,498[1]	31–33, N = 3,073[1]	34–36, N = 6,346[1]	>=37, N = 17,570[1]
Native Hawaiian or Pacific Islander	50 (0.1%)	5 (0.3%)	3 (0.1%)	0 (0.0%)	7 (0.2%)	10 (0.2%)	25 (0.1%)
Other	2,762 (8.1%)	120 (6.5%)	213 (7.2%)	177 (7.1%)	215 (7.0%)	493 (7.8%)	1,544 (8.8%)
Unknown/ Missing	1,902 (5.5%)	84 (4.5%)	123 (4.2%)	121 (4.8%)	123 (4.0%)	337 (5.3%)	1,114 (6.3%)
White	19,458 (56.7%)	731 (39.3%)	1,382 (46.7%)	1,312 (52.5%)	1,745 (56.8%)	3,956 (62.3%)	10,332 (58.8%)
[1] Median (25%-75%); n (%)							
Values are median (interquartile range) or n (%).							

Baseline characteristics stratified by GA at birth are shown in Table 1. As expected, median birth weight increased with GA. While Non-Hispanic (NH) White and NH Black infants were consistently the largest groups, the percentage of NH White infants increased with GA, while the percentage of NH Black infants declined.

Aggregation to the infant-day level resulted in 329,233 infant-day observations, with one median SCr value per infant per day. Independent aggregation of the raw SCr data to the infant-week level resulted in 140,780 infant-week observations, with one median value per infant per WOL (Supplemental Figure S1).

Serum Creatinine Trajectories

SCr trajectories differed substantially by GA at birth across both the neonatal period (DOL 1–28; Fig. 1) and the first 16 weeks of life (Fig. 2). These figures were generated from the same underlying analysis as our companion interactive tool, NeoKidneyCurve, though are presented here as static summary figures rather than direct tool output. Across all GA groups, SCr peaked within the first several days of life then declined, with the timing, peak magnitude, and rate of decline each varying by GA. The most preterm infants (22–24 weeks' GA) had the highest peak SCr (0.93 mg/dL; DOL 4), followed by those born at 25–27 weeks (0.89 mg/dL; DOL 3) and 28–30 weeks (0.85 mg/dL; DOL 3). Among more mature infants, peak SCr was lower: 0.82 mg/dL at DOL 2 for 31–33 weeks, 0.80 mg/dL at DOL 2 for 34–36 weeks, and 0.76 mg/dL at DOL 2 for ≥ 37 weeks. DOL 1 was excluded from peak identification across all GA groups given very limited sample sizes at this time point (see Limitations).

Following the peak, SCr declined progressively across all GA groups, with the rate of decline most pronounced in the first several weeks of life before gradually plateauing. Observed median SCr values

approached a broadly similar nadir of approximately 0.20–0.23 mg/dL across GA groups. The postnatal timing at which this nadir was reached varied across GA but was not consistent across sensitivity analyses excluding a site with limited measurement precision, and did not follow a monotonic pattern across exact GA even in adequately powered strata (Supplemental Table S1); we therefore do not report nadir timing as a precise estimate. The clinical significance of this nadir value, and the mechanisms underlying its timing, warrant further investigation in future studies.

Table 2 summarizes the number of contributing infants, median SCr, and IQR by GA group and DOL (1–28); cells with fewer than 20 contributing infants were suppressed as unreliable rather than reported (see Limitations). Table 3 provides the corresponding summary by GA group and WOL (1–16); all cells in this range were adequately powered (minimum n = 231). Interactive visualization of GA-specific trajectories is available through our companion web-based application, NeoKidneyCurve (https://purl.archive.org/purl/neokidneycurve; Supplemental Figures S2-S4).

Discussion

Principal Findings

In this multicenter cohort of infants hospitalized in ten level IV NICUs located in 9 states (AR, DC, NC, OH, WI, TX, IN, GA, MO) from 2010 to 2022, SCr trajectories varied substantially by both GA and postnatal age: SCr rose or remained elevated during the first days of life before declining and eventually stabilizing, with earlier GA associated with higher peak values and a slower, more prolonged decline. These findings highlight the importance of interpreting neonatal SCr in the context of both GA and postnatal age and provide GA-specific longitudinal benchmarks for SCr interpretation in high-acuity NICU populations.

Physiologic Interpretation of Early Postnatal Creatinine Patterns

The early postnatal patterns observed in this study are consistent with established neonatal kidney physiology. At birth, SCr reflects maternal creatinine levels due to transplacental equilibration, resulting in relatively elevated values during the immediate postnatal period.[8] As neonatal kidney function matures, glomerular filtration rate increases, leading to a gradual decline in SCr over the first weeks of life.[9] Preterm infants have reduced nephron number and maturity, lower kidney perfusion, greater tubular permeability leading to backflow of filtered creatinine, and delayed kidney functional development overall.[9,26] As a result, extremely preterm infants exhibit higher initial SCr values and a more prolonged decline compared with more mature infants. SCr values across all GA groups eventually converged toward a broadly similar nadir (approximately 0.20–0.23 mg/dL); as detailed in the Results, the precise postnatal timing of this convergence varied non-monotonically across GA and was sensitive to site-level measurement precision.

Comparison with Prior Studies

Prior studies describing postnatal SCr patterns, particularly among preterm infants within restricted GA ranges, have more commonly been single-center,[12–14] and many have relied on cross-sectional measurements rather than longitudinal trajectories. Differences in laboratory measurement methods — including the use of modified Jaffe versus enzymatic assays — further complicate direct comparisons across studies, as SCr values are expected to vary by as much as 30% around the mean based on both patient and assay factors.[27] A recent study using advanced modeling techniques characterized SCr and creatinine clearance dynamics in 148 extremely low birth weight infants, providing valuable model-based insight into this population;[28] our study extends this work using an empirical, percentile-based approach across a substantially larger cohort (34,306 infants) spanning the full range of GA from 22 to 42 weeks, rather than a single narrow GA stratum. This approach provides a more comprehensive description of SCr trajectories across the neonatal period for infants admitted to level IV NICUs and additional context for interpreting SCr values in high-acuity populations.

Clinical Implications and Role of the Interactive Tool

Interpretation of SCr in infants is complex, as values vary substantially by both GA and postnatal age. A single SCr threshold may therefore be misleading; values that are expected for an extremely preterm infant in early postnatal life may be atypical in a more mature infant.[9,27] The GA-specific longitudinal trajectories described in this study provide a framework for interpreting SCr values and may assist clinicians in distinguishing expected physiologic patterns from values that fall outside this expected range.

Trajectory-based interpretation may support earlier recognition of impaired kidney function, which is critical given that neonatal AKI is common in the NICU and associated with increased morbidity and mortality.[30] Infants with SCr values persistently exceeding higher percentile thresholds (e.g., > 75th percentile) may warrant closer clinical evaluation. Chen et al. demonstrated that infants with SCr above the 95th percentile for postnatal age had mortality rates comparable to those meeting neonatal KDIGO AKI criteria, underscoring the clinical relevance of percentile-based interpretation.[31] Such context may be particularly relevant during high-risk clinical states — including sepsis, patent ductus arteriosus treatment, necrotizing enterocolitis, extracorporeal membrane oxygenation support, nephrotoxic medication exposure, and postoperative care — during which kidney function often changes rapidly.

Previous studies have demonstrated that postnatal creatinine trajectories may provide clinically relevant information beyond isolated creatinine values.[32–36] In preterm neonates specifically, a delayed rate of SCr decline has been associated with longer length of stay, prolonged ventilation, and greater need for vasoactive medications and diuretics.[36] Our findings extend this concept by providing GA-specific longitudinal trajectories across a large multicenter cohort of high-acuity NICU infants.

Recognition of atypical SCr trajectories may help alert clinicians to potential kidney injury or impaired function, potentially prompting renoprotective strategies such as optimization of kidney perfusion through maintenance of adequate blood pressure, careful fluid management, avoidance of or reductions in nephrotoxic medications, and closer monitoring of kidney function.[37,38,39] In this context, trajectory-

based interpretation may prompt consideration of clinically actionable steps, including more frequent SCr monitoring, tighter fluid balance, medication review, and early nephrology consultation.

Rather than functioning solely as a static laboratory measurement, neonatal SCr may serve as a dynamic developmental biomarker reflecting the interaction between renal maturation, nephron developmental stage, systemic illness severity, and evolving hemodynamic adaptation. To facilitate clinical application of these findings, we developed an interactive web-based tool, NeoKidneyCurve, that allows users to visualize individual SCr values relative to GA-specific trajectories and view the corresponding percentile for an infant's GA and postnatal age. The trajectories presented in this study provide GA- and postnatal age-specific context for interpreting SCr values in infants admitted to level IV NICUs. Future studies are needed to determine whether incorporation of these trajectories into clinical workflows improves recognition of kidney dysfunction, clinical decision-making, or patient outcomes. Separately, structured nephrotoxin-monitoring and fluid-stewardship bundles have demonstrated improvements in kidney-related outcomes in NICU populations;[40] whether trajectory-based context of the kind presented here can support similar structured approaches is an important question for future work.

To our knowledge, NeoKidneyCurve represents one of the largest publicly available, multicenter resources for GA-specific SCr interpretation in critically ill neonates, built from 34,306 infants across ten level IV NICUs. The tool is freely accessible online, requires no software installation, and allows clinicians to enter a patient's GA and one or more SCr values to instantly visualize that patient's trajectory against the full cohort, at either daily or weekly resolution depending on postnatal age. For each value entered, the tool reports the corresponding percentile for that infant's exact GA and postnatal day or week, allowing clinicians to directly contextualize an individual SCr value relative to a large cohort of other critically ill NICU infants of the same maturity and postnatal age, rather than relying on a single fixed threshold. By translating a large, complex multicenter dataset into an interactive, bedside-accessible format, this work aims to make GA- and postnatal age-specific context readily available at the point of care, rather than requiring clinicians to consult static tables or published literature.

Limitations

Several limitations should be considered. This study was conducted in level IV NICUs among infants with complex medical conditions, including congenital anomalies, surgical conditions, and critical illness. AKI and critical illness were intentionally not exclusionary, as our objective was to characterize a real-world level IV NICU population rather than to construct a healthy-infant reference standard. Accordingly, these trajectories should be interpreted as patterns observed in a high-acuity NICU population rather than as normative values for healthy infants, and may not generalize to lower-acuity settings. Because SCr measurements were obtained through routine clinical care rather than a standardized protocol, infants with greater illness severity likely contributed disproportionately more observations, introducing potential surveillance bias, and measurement frequency and timing varied across patients and centers.

DOL 1 was excluded from peak SCr identification across all GA groups due to very limited sample sizes at this time point; similarly, DOL 1 was the only time point suppressed in Table 2 due to fewer than 20

contributing infants, with all other cells across days 2 through 28 adequately powered. SCr assay methodology was not captured uniformly across ADVANCE sites and may have varied within sites over the study period, introducing inter- and intra-center variability in absolute SCr values. Consistent with this, one site reported SCr values exclusively to one decimal place, and another site's data contained no values below 0.2 mg/dL, suggesting that the observed convergence in SCr values across GA groups may partly reflect measurement or reporting resolution rather than a purely physiologic steady state. Finally, SCr is an imperfect biomarker of kidney function, influenced by factors including muscle mass, fluid status, and maternal creatinine levels.[9] The trajectories and interactive tool were developed using a single multicenter database and have not yet undergone external validation in independent neonatal populations.

Conclusions

In this large multicenter cohort of infants hospitalized in level IV NICUs, SCr trajectories varied substantially by GA and postnatal age. GA-specific longitudinal trajectories provide clinically useful context for interpreting SCr values in high-acuity neonatal populations. The accompanying interactive tool offers a practical approach for applying these data at the bedside. Future studies are needed to evaluate the applicability of these trajectories in broader neonatal populations and to assess their role in improving clinical decision-making and outcomes. Future work should focus on integration into electronic health record–based clinical decision support systems and incorporation of complementary kidney metrics, including urine output, fluid balance, and nephrotoxic medication exposure burden.

Abbreviations

AKI
Acute Kidney Injury
DOL
Day of Life
WOL
Week of Life
NICU
Neonatal Intensive Care Unit

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board at the University of Arkansas for Medical Sciences (UAMS; IRB# 274162), with a waiver of informed consent given the retrospective nature of the data. The study was performed in accordance with the Declaration of Helsinki.

Consent for Publication

Not applicable.

Availability of Data and Materials

Data may not be shared due to institutional and data use agreements.

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Author Contributions

JAR conceptualized the study, contributed to data curation, performed the formal analysis, and drafted the manuscript. SIP contributed to conceptualization, data curation, and critically revised the manuscript. JB contributed to data curation, methodology, and formal analysis. AMS contributed to data curation, conceptualization, and critically revised the manuscript. EMB contributed to data curation, data interpretation, and critically revised the manuscript. MK contributed to data curation, data interpretation, and critically revised the manuscript. MCG contributed to data curation, data interpretation, and critically revised the manuscript. JA contributed to data curation, methodology, and formal analysis. SG contributed to data curation, data interpretation, and critically revised the manuscript. DL contributed to data curation and critically revised the manuscript. MST contributed to data curation and critically revised the manuscript. TN contributed to data curation and critically revised the manuscript. CS contributed to data curation and critically revised the manuscript. CCB contributed to methodology and critically revised the manuscript. MWH contributed to data curation, data interpretation, and critically revised the manuscript. TAN contributed to data curation, data interpretation, and critically revised the manuscript. RH contributed to data curation and critically revised the manuscript. PER supervised the work and critically revised the manuscript. CN supervised the study, contributed to conceptualization, data curation, and critically revised the manuscript. MSCH supervised the study, contributed to conceptualization, and critically revised the manuscript.

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45. St Paul, Children’s Minnesota (Ann Downey)
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47. Toronto, The Hospital for Sick Children (Kyong-Soon Lee)
48. Washington, Children's National Hospital (Billie Lou Short)
49. Wilmington, Nemours/Alfred I. duPont Hospital for Children (Kevin Sullivan)
50. Winston-Salem, Brenner Children's Hospital (Cherrie Welch)

Conflict of Interest

The authors have no financial relationships relevant to this article to disclose. AMS had prior advisory board relationships with Idorsia Pharmaceuticals US, Inc.; Travere Therapeutics, Inc.; and Kyowa Kirin Co., Ltd.; and a prior consultant relationship with Conjupro Biotherapeutics, Inc.

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Tables 2 and 3

Tables 2 and3 are available in the Supplementary Files section.

Figures

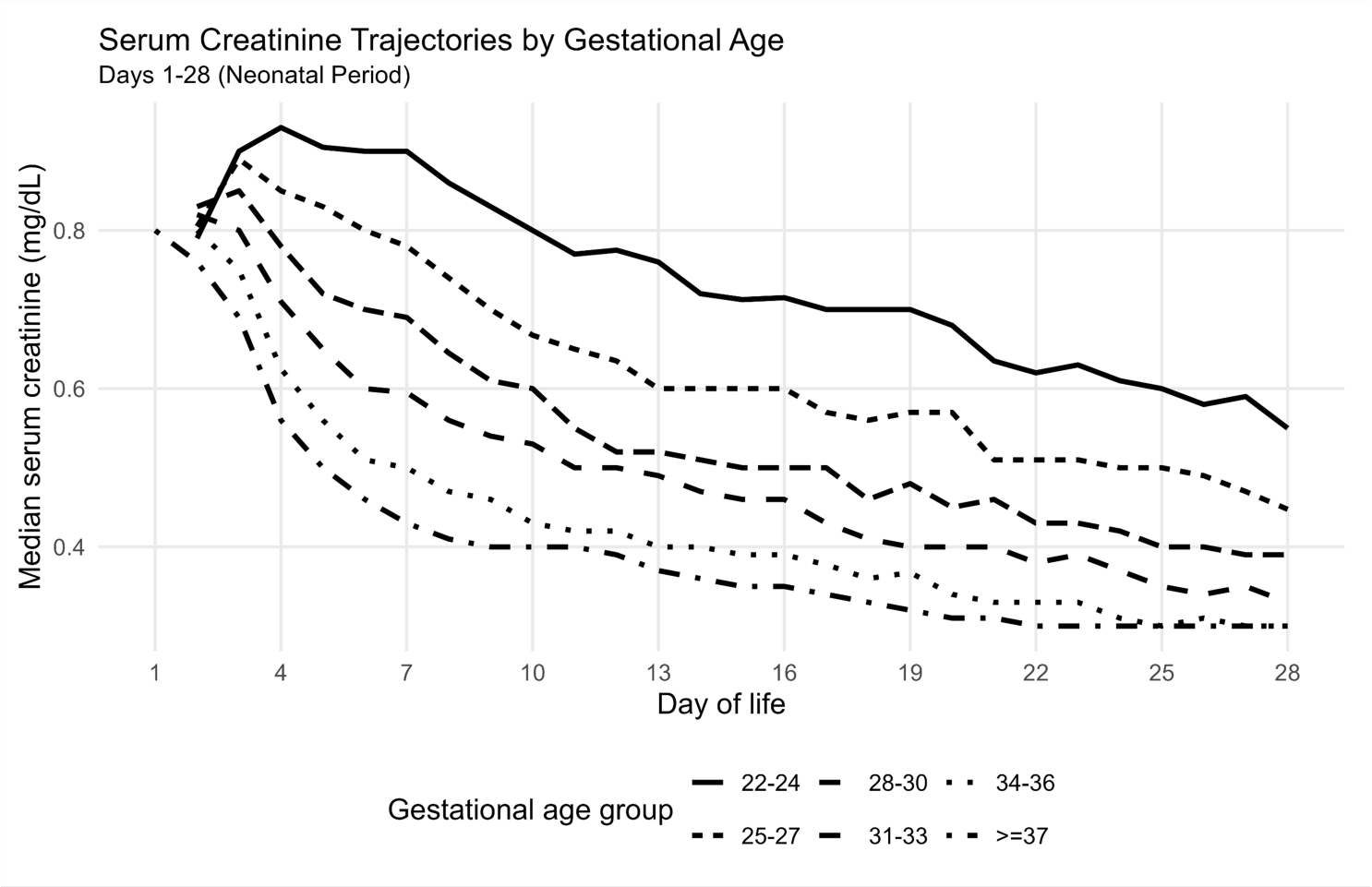


Figure 1

Serum creatinine trajectories by gestational age and day of life (DOL 1–28). Lines represent median serum creatinine values for each gestational age group.

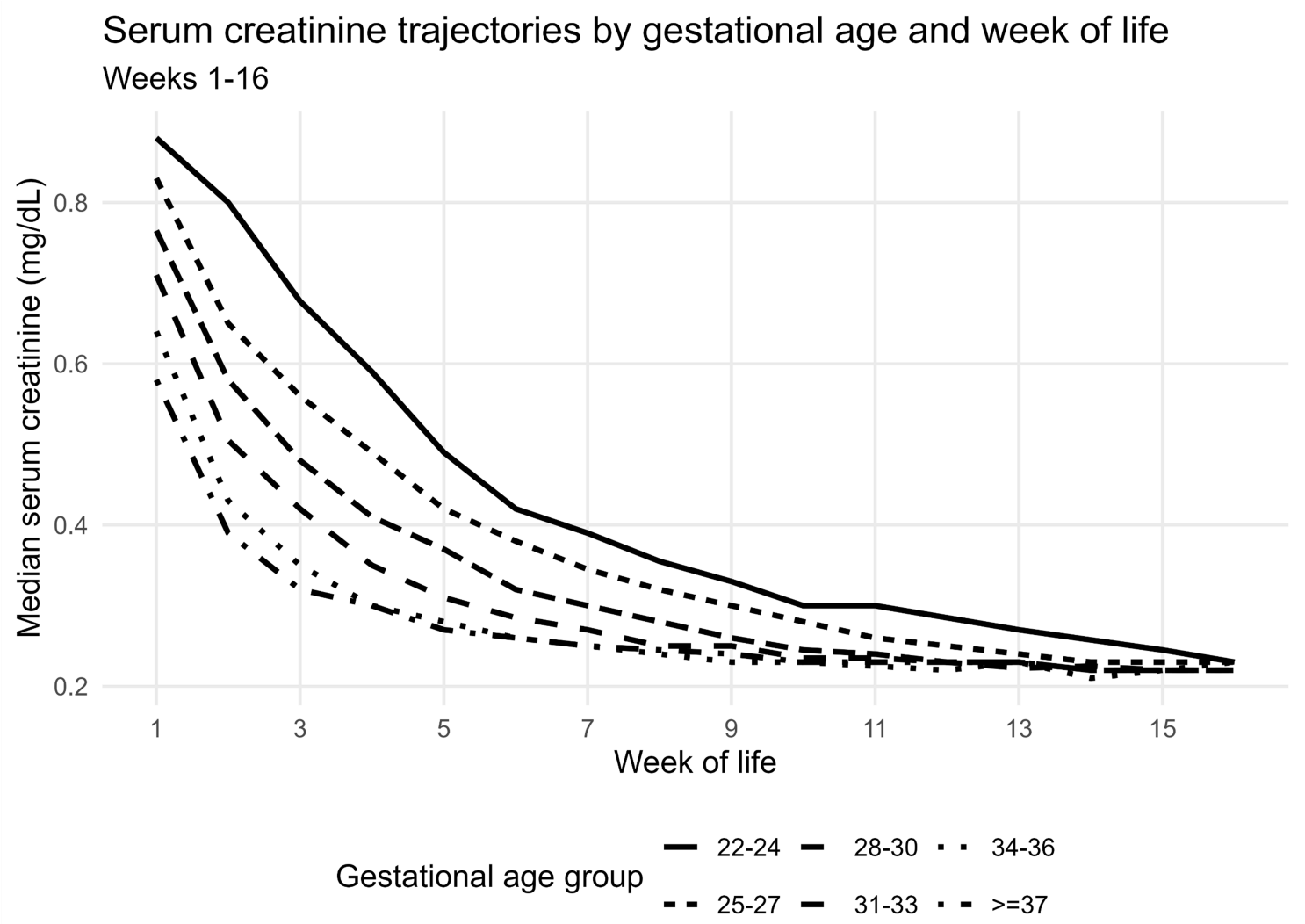


Figure 2

Serum creatinine trajectories by gestational age and week of life (WOL 1–16). Lines represent median serum creatinine values for each gestational age group.

Supplementary Files

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- Table2DOLSCr.rtf
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