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2017 CCS Report Technical Notes

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Introduction

The annual CPQCC-CCS Report serves a dual purpose of fulfilling the CCS requirement to report on all NICU activity of CCS-accredited hospitals, as well as, efficiently utilizing the mortality and morbidity-specific outcomes based on the CPQCC database. Prior to 2006, hospitals were required by CCS to report activity on **all** infants. Through CPQCC membership, some of the data that was previously required of hospitals is now directly abstracted from the CPQCC database, and then combined with data submitted by centers through the annual CCS Supplemental form.

This year's CPQCC-CCS final report format has been revised to facilitate presentation and interpretation. The report contains data from two sources, the CCS supplemental form, and the CPQCC database.

The CCS supplemental form includes the number of live births at the reporting NICU's hospital (or, for satellite NICUs, the number of live births at the hospital location hosting the satellite NICU), NICU

admissions, transport-in and transport-out activity, and mortality information that is based on **all** NICU admissions, provided that the infant was born during 2017 and was less than a year old at the time of admission. This information is used to propagate the **all** Births, NICU Admissions, and NICU Transport statistics for sections A, C, D and E of the CCS report. It is also used to propagate the **all** Admissions Mortality table for section B of the CCS report.

The CCS supplemental form is based on **all** NICU admissions in order to include infants who are not eligible and therefore excluded from the CPQCC database. Infants not eligible for the CPQCC data base include:

1. any infant who is admitted or transported-in to the NICU after Day 28;
2. any infant whose birth weight is less than 401 grams **and** whose gestational age is outside of the 22 weeks 0 days and 31 weeks 6 days (inclusive) range;
3. any infant weighing more than 1,500 grams who does not have evidence of significant illness (severe acuity) such as death, acute transport-in or transport-out, major surgery, prolonged ventilation, hyperbilirubinemia, exchange transfusion, and/or perinatal asphyxia;
4. any infant weighing more than 1,500 grams that is transported for convalescent care.

The CPQCC database is used to generate birth weight specific mortality and morbidity data and is based on a subset of a NICU's admissions. This data is used to generate sections F through L of the CCS Report. To be included in the CPQCC database an infant must be admitted to the NICU prior to 28 days of life. In addition, if the infant is over 1,500 grams there must be evidence of significant illness such as death, acute transport-in or transport-out, major surgery, prolonged ventilation, etc. These restrictions are in order to be able to compare the reporting NICU's outcomes with those reported in similar national databases. Information from the CPQCC database is used to propagate the CPQCC mortality and the CPQCC birth weight specific morbidity sections found in the report.

In summary, the CCS supplemental information is used to provide a synopsis of the overall activity in a NICU based on **all** infants admitted to the NICU within the first year of life. The CPQCC database is used to provide birth weight specific mortality and morbidity information that can be compared across California NICUs based on the subset of 401 to 1,500 grams or 22 to 31 6/7 weeks gestation and > 1,500 gram high acuity infants admitted in the first 28 days of life.

Section A. Hospital Births and NICU Admissions by Birth Weight

All quantities described below are displayed by birth weight group for 2017.

Total Live Births in Your Center

Includes **all** live births of babies born anywhere in your hospital.

Total Admissions to Your NICU

Includes **all** inborn and outborn infants admitted to your NICU. Starting from 2013, the definition of inborn/outborn admission is aligned with the definition that CPQCC uses.

Inborn Admissions to Your NICU

Includes **all** infants who were admitted to your NICU after birth without being previously discharged home or transported out.

Inborn Admission Percentage for Your NICU

Ratio of the total number of inborn admissions and number of live births in your hospital.

Outborn Admissions to Your NICU

Includes 1) transports into your NICU of an inpatient from another facility (inborn or outborn); or 2) admissions to your NICU of any outborn infant regardless of location, e.g., home, another area in your hospital, ER, doctor's office. Note that starting from 2013, outborn admissions are aligned with the definition CPQCC uses. Specifically, multiple re-admissions from hospital locations of the same infant are not counted as separate admissions. The first inborn/outborn admission is counted until an infant goes home. Each time an infant is re-admitted from home, this infant contributes to the outborn admission count.

Acute Outborn Admissions to Your NICU

An Acute Outborn Admission is defined as the admission of an infant with medical problems that require urgent care. If the infant is an acute transport-in, then the care that is medical, diagnostic, or surgical therapy is not provided, or cannot be provided due to temporary staffing / census issues, or insurance restrictions at the referring hospital. Note that starting from 2013, after the first admission after birth, re-admissions to your NICU are only counted if the infant is re-admitted from a non-hospital location.

Non-Acute Outborn Admissions to Your NICU

A Non-Acute Outborn Admission is an admission for growth care, discharge planning care, chronic care, convalescent care, and/or hospice care. If an infant is a non-acute transport-in, then the infant's initial medical, diagnostic, and surgical needs have been met, and the infant's condition has been stabilized. The medical needs of non-acute transports-in may range from extensive and extremely complex care to minimal care for feeding and growth. Note that starting from 2013, after the first admission after birth, re-admissions to your NICU are only counted if the infant is re-admitted from a non-hospital location.

Section A. Co-Located Hospital Births and NICU Admissions by Birth Weight

All quantities described below are displayed by birth weight group for 2017.

Total Live Births at Co-Located Hospital

Includes **all** live births of babies born anywhere in the co-located hospital.

Total Admissions to Your NICU

Includes **all** infants born at the co-located hospital and outborn infants admitted to your NICU.

Admissions to Your NICU of Infants born at Co-Located Hospital

Includes **all** infants who were admitted to your NICU after birth at the co-located hospital without being previously discharged home or transported out.

% of Live Births at Co-Located Hospital Admitted to Your NICU

Ratio of the total number of infants born at co-located hospital and admitted to your NICU relative to the number of all live births at the co-located hospital.

Outborn Admissions to Your NICU

Includes 1) transports into your NICU of an inpatient from another facility (inborn or outborn); or 2) admissions to your NICU of any outborn infant regardless of location, e.g., home, another area in your hospital, ER, doctor's office. Note that starting from 2013, outborn admissions are aligned with the definition CPQCC uses. Specifically, multiple re-admissions from hospital locations of the same infant are not counted as separate admissions. The first inborn/outborn admission is counted until an infant goes home. Each time an infant is re-admitted from home, this infant contributes to the outborn

admission count.

Acute Outborn Admissions to Your NICU

An Acute Outborn Admission is defined as the admission of an infant with medical problems that require urgent care. If the infant is an acute transport-in, then the care that is medical, diagnostic, or surgical therapy is not provided, or cannot be provided due to temporary staffing / census issues, or insurance restrictions at the referring hospital. Note that starting from 2013, after the first admission after birth, re-admissions to your NICU are only counted if the infant is re-admitted from a non-hospital location.

Non-Acute Outborn Admissions to Your NICU

A Non-Acute Outborn Admission is an admission for growth care, discharge planning care, chronic care, convalescent care, and/or hospice care. If an infant is a non-acute transport-in, then the infant's initial medical, diagnostic, and surgical needs have been met, and the infant's condition has been stabilized. The medical needs of non-acute transports-in may range from extensive and extremely complex care to minimal care for feeding and growth. Note that starting from 2013, after the first admission after birth, re-admissions to your NICU are only counted if the infant is re-admitted from a non-hospital location.

Section B. NICU Deaths by Birth Weight

All quantities described below are displayed by birth weight group for 2017.

In-Hospital Infant Mortality Rate per 1,000 NICU Admissions

Calculated as the ratio of the sum of neonatal (within 28 days of birth counting the day of birth as day 1) and post-neonatal deaths (deaths after age 28 days) to infants while in your NICU or under the care of your NICU staff regardless of the location in your hospital divided by the total number of NICU admissions and multiplied by 1,000.

Total Number of Deaths of Infants Admitted to your NICU

Number of deaths of infants admitted to your NICU or under the care of your NICU staff regardless of the location in your hospital.

Total Number of Deaths Prior to and Including Day 28

Number of deaths of infants admitted to your NICU or under the care of your NICU staff regardless of the location in your hospital that occurred prior to or on the day on which the infant was 28 days counting the day of birth as day 1 (neonatal deaths).

Total Number of Deaths After Day 28

Number of deaths of infants admitted to your NICU or under the care of your NICU staff regardless of the location in your hospital that occurred after the day on which the infant was 28 days (postneonatal deaths).

Delivery Room Deaths

Number of deaths that occurred in your Delivery Room or initial resuscitation area within 12 hours of birth and prior to NICU admission.

Section C. NICU Transports Out by Birth Weight

All quantities described below are displayed by birth weight group for 2017.

Total Number of Infants Transported Out

Number of infants transported out of your NICU to another facility or another unit in your hospital. The total number of infants transported out is the sum of acute and non-acute transports out.

Acute Transports-Out

The number of infants with medical problems that require acute resolution for survival who are transported out in order to obtain medical, diagnostic, or surgical therapy that is not provided, or that cannot be provided due to temporary staffing / census issues, or insurance restrictions at your hospital. A transport is considered acute if the primary reason for the transport was NOT feeding / growing or convalescent reasons. Acute transports occur to get resources that are not available at your hospital. Starting from 2013, if an infant was transported out multiple times without ever going home, this infant is only included once.

Non-Acute Transports Out

The number of infants whose initial medical / surgical needs have been met; whose condition has been stabilized; and who are transported-out in order to obtain growth care, discharge planning care, chronic care, or hospice care. The medical needs of non-acute transports may range from extensive and extremely complex care to minimal care for feeding and growth. Starting from 2013, if an infant was transported out multiple times without ever going home, this infant is only included once.

Section D. Hospital Births and Inborn NICU Admissions by Gestational Age

All quantities described below are displayed by gestational age group for 2017.

Total Live Births in Your Center

Includes **all** live births anywhere in your hospital.

Inborn Admissions to Your NICU

Includes **all** infants who were admitted to your NICU after birth without being previously discharged home or transported out.

Inborn Admission Percentage for Your NICU

Ratio of the total number of inborn admissions and number of live births in your hospital.

Section D. Co-Located Hospital Births and Inborn NICU Admissions by Gestational Age

All quantities described below are displayed by gestational age group for 2017.

Total Live Births at Co-Located Hospital

Includes **all** live births at the co-located hospital born anywhere in the co-located hospital.

Admissions to Your NICU of Infants Born at Co-Located Hospital

Includes **all** infants who were born at the co-located hospital and who were admitted to your NICU after birth without being previously discharged home or transported out.

% of Live Births at Co-Located Hospital Admitted to your NICU

Ratio of the total number of admissions from co-located hospital to your NICU relative to the total number of live births at the co-located hospital.

Section E. Inborn Admission Percentage

The inborn admission percentage is defined as the ratio of total number of infants admitted to your NICU after birth without ever going home and the total number of births in your hospital.

Section E shows 2 charts. The first chart shows **your NICU's** inborn admission percentage relative to the inborn admission percentage of all CPQCC NICUs with live births at the NICU's location. If your NICU is a regional NICU, the second chart shows **your NICU's** inborn admission percentage relative to the inborn admission percentage of all regional CPQCC NICUs with live births at the NICU's location. If your NICU is a Community, Intermediate or non-CCS NICU, the second chart shows **your NICU's** inborn admission percentage relative to the inborn admission percentage of all non-regional CPQCC NICUs with live births at the NICU's location.

The distribution of the inborn admission percentage across the comparison group is displayed as a horizontal box plot. The box plot displays the lower and upper quartile of the inborn admission percentage for the comparison group as the left and right boundary of the blue box. This means that 25% of comparison group NICUs have an inborn admission percentage that is lower than the lower quartile (left box boundary), and 25% of comparison group NICUs have an inborn admission percentage that is higher than the upper quartile (right box boundary). The median inborn admission percentage across comparison group NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum observed inborn admission percentage across the comparison group that is within the lower and upper inner fence defined as at 1.5 times the Interquartile Range ($IQR=Q3-Q1$), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart. Your NICU's inborn admission percentage is marked by a red star.

If your NICU is not located at a hospital with live births, section E does not apply, and no chart is shown.

Section E. Co-Located Hospital / Inborn Admission Percentage

For satellite NICUs, the Co-Located Hospital / inborn admission percentage is defined as the ratio of the total number of infants born at the co-located hospital and admitted to your NICU after birth without ever going home relative to the total number of births at the co-located hospital. As CPQCC includes a small number of satellite NICUs, the comparison group for this section is expanded to include inborn admissions at all CPQCC NICUs.

Section E shows 2 charts. The first chart shows **your NICU's** co-located hospital admission percentage relative to the co-located hospital / inborn admission percentage of all CPQCC NICUs with live births at the NICU's location. The second chart shows **your NICU's** co-located admission percentage relative to the co-located / inborn admission percentage of all non-regional CPQCC NICUs with live births at the NICU's location.

The distribution of the co-located hospital / inborn admission percentage across the comparison group is displayed as a horizontal box plot. The box plot displays the lower and upper quartile of the co-located hospital / inborn admission percentage across the comparison group as the left and right boundary of the blue box. This means that 25% of comparison group NICUs have a co-located hospital / inborn admission percentage that is lower than the lower quartile (left box boundary), and 25% of comparison group NICUs have a co-located hospital / inborn admission percentage that is higher than the upper quartile (right box boundary). The median percentage across comparison group NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum observed co-located hospital admission percentage across the comparison group that is within the lower and upper inner fence defined as at 1.5 times the Interquartile Range ($IQR=Q3-Q1$), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart. Your NICU's co-located hospital admission percentage is marked by a red star.

Section F. Data Quality Assessment

This section shows some metrics assessing the quality of data submitted by the reporting NICU. All data are shown for inborn infants, outborn infants, and both groups of infants combined.

% Records with Confirmed Unknown Risk Factors including race/ethnicity

The percent of **all** records submitted to CPQCC for which one of the following variables is missing: birth weight, gestational age (weeks and/or days), prenatal care, gender, congenital anomaly, multiple gestation, 5-minute Apgar, maternal age, race, or ethnicity. These risk factors are used in many of the CPQCC risk-adjustment models that allow the generation of risk-adjusted rates. If any of the risk factors needed for appropriate risk adjustment is unknown, the record has to be excluded from the risk-adjustment calculations and might lead to the inability to generate any risk-adjusted rates for the reporting NICU altogether. As race/ethnicity is reported as Confirmed Unknown for a large number of records, CPQCC uses an algorithm that will impute the "average" race for these records.

% Records with Confirmed Unknown Risk Factors excluding race/ethnicity

The percent of **all** records submitted to CPQCC for which one of the following variables is missing: birth weight, gestational age (weeks and/or days), prenatal care, gender, congenital anomaly, multiple gestation, 5-minute Apgar, or maternal age.

% Records with Confirmed Unknown Process/Outcomes Measures

The percent of **all** records submitted to CPQCC for which one of the following variables is missing: initial disposition, any post-transport disposition, enteral feeding at discharge, oxygen at discharge, initial length of stay, total length of stay for transported infants, respiratory support at 36 weeks adjusted gestational age, oxygen at 28 days, nitric oxide, antenatal steroids, documentation of reason for no antenatal steroids when antenatal steroids not given, postnatal steroids, postnatal steroids for chronic lung disease, PVL image, PVL, PDA, NEC, Ibuprofen, Indomethacin, PDA ligation, NEC surgery, ROP eye exam, ROP grade, ROP surgery, Other Surgery, temperature at NICU admission, early bacterial infection, late bacterial infection, cNegStaph infection, fungal infection, cranial image, grade of hemorrhage, pneumothorax, cooling status, cooling method, or HIE.

Mean # of Confirmed Unknown Items in DRD & A/D CPQCC Forms

Shown is the mean number of items that is reported as confirmed unknown on either the Delivery Room Death or Admission/Discharge form.

Mean # of Confirmed Unknown Items in CPeTS Form

Shown is the mean number of items that is reported as confirmed unknown on the CPeTS form. Note that this quantity is not applicable for inborn infants.

Section G. NICU Activity and Outcomes Overview

All high-level summary statistics are displayed for 2017.

Average Daily Census

The occupancy of **all** on-site, licensed NICU beds defined as the total number of patient days in 2017 divided by the number of days in 2017 (365). The average daily census does not include other hospitals or satellite facilities in the same system.

Total Number of Surgeries

The total number of surgeries reported in the CPQCC database that was performed at your facility. Circumcision is not included in the total number of surgeries. ECMO, ECMO cannulation, ECMO decannulation, peritoneal dialysis, placement or removal of peritoneal dialysis catheters, chest tube placement, or central line placement are not considered surgeries and not included in the total number of surgeries. For a complete list of **all** surgeries included, please review the surgeries coded in CPQCC.

Number of Inborn Infants > 1,500 grams admitted to NICU

Displays the total number of infants weighing more than 1,500 grams that were born at your facility and then admitted to your NICU without a prior discharge.

Number of Severe Acuity (CPQCC) Inborn Infants > 1,500 grams Admitted to NICU

The number of infants weighing more than 1,500 grams that were born at your facility and were admitted to your NICU and for whom a CPQCC record was submitted. A CPQCC record is submitted for **all** infants > 1,500 grams who are admitted to your NICU within 28 days of birth and who experienced one of the following events: infant death, surgery, ventilation > 4 hours, acute transport-in, acute transport-out, early bacterial sepsis, or re-admission for hyperbilirubinemia.

Average LOS for Infants 401 to 1,500 grams or 22 to 29 Weeks Gestation Admitted on or before DOL 28 and Discharged Home

The average length of stay (in days) for inborn or outborn infants 401 to 1,500 grams or 22 to 29 completed weeks of gestation at birth who were admitted to your NICU on or before DOL 28 days and discharged home from your NICU.

Observed to Expected Ratio with 95% Confidence Limits

The ratio of your average LOS described above to a statistically expected LOS based on the entire population of CPQCC infants and upon risk factors in your patients. A ratio lower than 1 means that your infants were discharged home sooner than predicted by the statistical model. A ratio higher than 1 means that your infants were discharged home later than predicted by the statistical model. The two numbers shown in parentheses are the 95% confidence limits for the O/E ratio. A lower confidence limit exceeding 1 indicates that the length of stay in your center was statistically significantly longer than expected; an upper confidence limit less than 1 indicates that the length of stay in your center was statistically significantly shorter than expected. The statistical model uses multivariable logistic regression and takes into account your facility's mix of infant race, sex, gestational age, severity of congenital malformation, birth weight, 5-minute Apgar score, location of birth (inborn/outborn), multiple gestation, and whether or not the mother received prenatal care.

In-Hospital Mortality per 100 Infants 401 to 1,500 grams or 22 to 29 weeks Gestation Admitted on or before DOL 28

The in-hospital death percentage for inborn or outborn infants 401 to 1,500 grams or 22 to 29 completed weeks of gestation at birth who were admitted to your NICU on or prior to DOL 28 days and expired in your NICU.

Observed to expected ratio with 95% confidence limits

The ratio of your in-hospital mortality percentage described above to a statistically expected rate based on the entire population of CPQCC infants and upon risk factors in your patients. A ratio lower than 1 means that mortality at your NICU was lower than predicted by the statistical model. A ratio higher than 1 means that mortality at your NICU was higher than predicted by the statistical model. The two numbers shown in parentheses are the 95% confidence limits for the O/E ratio. A lower confidence limit exceeding 1 indicates that the mortality in your center was statistically significantly

higher than expected; an upper confidence limit less than 1 indicates that the mortality in your center was statistically significantly lower than expected. The statistical model uses multivariable logistic regression and takes into account your facility's mix of infant race, sex, gestational age, severity of congenital malformation, birth weight, 5-minute Apgar score, location of birth (inborn/outborn), multiple gestation, and whether or not the mother received prenatal care.

Section H. CPQCC-CCS Linked HRIF Referral Summary for Infants Discharged Home

The California Children's Services (CCS) High Risk Infant Follow-Up (HRIF) program was established to follow infants considered at increased risk for neurodevelopmental-related CCS-eligible conditions after discharge from a CCS-approved NICU. CCS Program standards require that each CCS-approved NICU ensure the follow-up of such discharged high risk infants and that each NICU shall either have an organized program or a written agreement for provision of these services by another CCS-approved NICU.

Section H summarizes for several infant subgroups the number and percentage of CPQCC infants who were registered with HRIF. HRIF uses a web-based reporting system to allow CCS NICUs to enroll infants in the HRIF program. The HRIF reporting program operates independently of CPQCC. Therefore, in order to generate the data for section H, it was necessary to link the independent HRIF and CPQCC databases.

At the time of registration, besides other variables, the HRIF program collects data on birth date, gestational age in days, maternal date of birth, infant sex, birth order, number of multiples, birth location, registering NICU and CPQCC infant ID at the registering NICU. Reporting on these variables is not complete for all infants. Therefore, we devised a 2-step process that matches an HRIF infant with its CPQCC record:

1. In the first step, the CPQCC ID number and registering NICU's OSHPD ID number is used to find an HRIF infant in the CPQCC database. Based on the other data in the infant's HRIF and CPQCC record, an agreement statistic is calculated that reflects how well the information submitted to HRIF and to CPQCC agrees. Only if the information submitted shows a satisfactory level of agreement, the HRIF and CPQCC records are considered a match.
2. In the second step, the birth dates submitted to HRIF and CPQCC are used to generate a possible set of CPQCC matches for each HRIF infant. For each possible record pair, an agreement statistic is calculated that reflects how well the information submitted to HRIF and to CPQCC agrees. The matched record pair with the highest agreement statistic is retained, and only if the agreement statistic for this matched record pair exceeds a minimum threshold, the match is retained.

This description implies that if an infant's CPQCC ID number and birth date are both mis-coded in either data source, infants cannot be matched. In our tests, we found that this 2-step process worked very well in identifying matches even in the presence of coding errors.

The table displayed in Section H shows the total number of CPQCC infants and the number and percent of CPQCC infants referred to HRIF for 5 HRIF eligibility criteria:

- Very Low Birth Weight (\leq 1,500 grams birth weight);
- Extremely Low Birth Weight ($<$ 1,000 grams birth weight);
- Gestational Age $<$ 28 weeks;
- Gestational Age 28 to 31 weeks;
- Infants with Moderate/Severe HIE or Cooling;
- Infants with ECMO.

Note that only infants who were discharged home from your NICU are included in the HRIF referral report.

The matching of HRIF and CPQCC data is performed once daily.

Section I. Growth Trajectories for Infants 22 to 29 Weeks Admitted to NICU

Section I was added to the CCS report for the first time in 2012.

Section I overlays the weight growth trajectories, that are observed for your NICU's infants born at 22 to 29 weeks gestation, on the 10th, 50th (median) and 90th percentile of the Fenton Weight Growth Curve (Fenton TR. A new growth chart for preterm babies: Babson and Benda's chart updated with recent data and a new format. *BMC Pediatrics* 2003, 3:13).

The 10th and 90th percentile of the Fenton growth chart is shown as a blue band. The median is shown as a black solid line.

The top chart is based on all infants who were initially discharged home from your NICU. If no infants were initially discharged home from your NICU, no chart is produced. The bottom chart is based on all infants who were initially transported out of your NICU. If no infants were initially transported out of your NICU, no chart is produced.

Each chart shows gestational age (GA) in completed weeks / post-menstrual age (PMA) in completed weeks on the horizontal axis. Post-menstrual age is calculated as:

$$\text{(Weeks Gestation in Days + (Age in Days at Admission - 1) + (Initial Length of Stay - 1)) / 7}$$
which is rounded down to completed weeks.

Two lines are shown. The blue line shows for each completed week gestation the median birth weight observed for your NICU. The blue number near the horizontal axis shows the number of infants born at that GA. The green line shows for each post-menstrual age week the median discharge weight observed for your NICU. The green number near the horizontal axis shows the number of infants initially discharged at that PMA.

For the top chart usually the blue and green line do not overlap. If they do, please check your CPQCC data. For the bottom chart, it is possible for the blue and green line to overlap. In this case the number of infants at each GA / PMA is separated by a black vertical slash (/).

Section J. Percent of Eligible Infants Receiving Interventions Associated with Improved (ANS, Cranial Imaging, ROP Exam, Breast Milk) or with Compromised (Postnatal Steroids) Outcomes

This graph shows the percentage of your facility's infants who received the listed interventions / experienced the listed outcome.

The distribution of the percentage across the CPQCC network is displayed as a horizontal box plot for each outcome. The box plot displays the lower and upper quartile of the percentage across the CPQCC network as the left and right boundary of the blue box. This means that 25% of CPQCC NICUs have a percentage that is lower than the lower quartile (left box boundary), and 25% of CPQCC NICUs have a percentage that is higher than the upper quartile (right box boundary). The median percentage across CPQCC NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum outcome percentage across the comparison group that is within the lower and upper inner fence defined as at 1.5 times the Interquartile Range (IQR=Q3-Q1), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart.

The red star represents the percentage of infants receiving the listed intervention / experienced the listed outcome at your center.

The calculation of each measure is based on the appropriate subset of eligible infants as explained below:

Antenatal Steroids

The antenatal steroid process measure has been revised in 2013 to largely follow The Joint Commission (TJC) recommendation. Only those infants are included who were born at your center and who were 24 to 31 completed weeks of gestation at birth. Infants with unknown antenatal steroid usage are assumed to not have received antenatal steroids. Per JCAHO recommendation, infants who were born to a mother who did not receive antenatal steroids due to a documented reason are not included in the calculations.

Cranial Imaging Prior to Day 28

The process measure cranial imaging prior to day 28 is based on infants 401 to 1,500 grams or 22 to 29 weeks of gestation. Infants for whom cranial imaging prior to day 28 is reported as unknown are assumed to not have had cranial imaging.

ROP Eye Exam Prior Discharge

The process measure ROP eye exam prior discharge is based on infants who received an eye exam at the appropriate post-menstrual age as determined by gestational age at birth, age in days at admission to, length of stay at, and discharge status from your facility. For infants with unknown eye exam status, it is assumed that the infant did not receive an eye exam.

Home Discharge on at least Some Breast Milk

The process measure home discharge on at least some breast milk is based on infants 401 to 1,500 grams or 22 to 29 weeks of gestation who were discharged home from your center. For infants with unknown breast milk use, it is assumed that the infant did not receive breast milk.

Postnatal Steroids for CLD

The postnatal steroids for CLD measure is based on a) infants with evidence of CLD; and b) infants who received postnatal steroids for CLD at your center. For the purpose of this report, an infant is considered as having CLD if i) the infant is hospitalized and on oxygen at 36 weeks adjusted gestational age; ii) the infant is discharged home on oxygen at 34 or 35 weeks adjusted gestational age; iii) the infant is transported out on oxygen at 34 or 35 weeks adjusted gestational age and not transported back to your center. Infants who were discharged prior to 34 weeks adjusted gestational age are included in the denominator if they were not discharged on oxygen; however infants who were discharged prior to 34 weeks adjusted gestational age and on oxygen at the time of discharge are not included in any calculations since their CLD status is unknown. **All** other infants who were not hospitalized at 36 weeks adjusted gestational age are not included in the CLD percentage.

Section K. Percent of Infants 401 to 1,500 grams or 22 to 29 Weeks Gestation with Selected Morbidities

Section H shows the observed percentage of your facility's infants who were 401 to 1,500 grams or 22 to 29 weeks gestation at birth with selected morbidities. Note that the numbers shown in Section H are not adjusted for your center's case mix. Section I displays risk-adjusted numbers.

The distribution of the outcome percentage across the CPQCC network is displayed as a horizontal box plot for each outcome. The box plot displays the lower and upper quartile of the outcome percentage across the CPQCC network as the left and right boundary of the blue box. This means that 25% of CPQCC NICUs have an outcome percentage that is lower than the lower quartile (left box boundary), and 25% of CPQCC NICUs have an outcome percentage that is higher than the upper quartile (right box boundary). The median percentage across CPQCC NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum observed percentage across the comparison group that is within the lower and upper inner fence

defined as at 1.5 times the Interquartile Range (IQR=Q3-Q1), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart.

The red star represents the outcome percentage for the reporting center.

For **all** morbidities shown in Section H, only observations with non-missing observations for the listed outcome are included. For instance, if it is not known whether or not an infant has NEC, this infant is not included in the percentage calculations for NEC.

Pneumothorax @

The percent of infants with pneumothorax only includes those infants with evidence of pneumothorax at your facility.

Chronic Lung Disease (CLD)

For the purpose of this report, an infant is considered as having CLD if i) the infant is hospitalized and on oxygen at 36 weeks adjusted gestational age; ii) the infant is discharged home on oxygen at 34 or 35 weeks adjusted gestational age; iii) the infant is transported out on oxygen at 34 or 35 weeks adjusted gestational age and not transported back to your center. Infants who were discharged prior to 34 weeks of adjusted gestational age and not on oxygen at discharge are included in the denominator as they are assumed to not have had CLD; however infants who were discharged prior to 34 weeks adjusted gestational age and on oxygen at the time of discharge are not included in any calculations since their CLD status is unknown. **All** other infants who were not hospitalized at 36 weeks adjusted gestational age are not included in the CLD percentage.

Discharged Home on Oxygen

The percent of infants who are discharged home on oxygen only includes infants with known oxygen at discharge status who went home from your center (possibly after being transported out from and transported back to your center).

Nosocomial Infection @

The percent of infants with a nosocomial infection is based on infants with a late bacterial, CNegStaph, or fungal infection that was first diagnosed at your facility. This measure includes infants who were in your hospital on or after day 3 of birth; infants who were never in your center on or after day 3 are excluded.

CNegStaph Infection @

The percent of infants with a cNegStaph infection is based on infants who were first diagnosed with CNegStaph at your center. Only infants who were hospitalized in your facility on or after day 3 are included.

Fungal Infection @

The percent of infants with a fungal infection is based on infants who were first diagnosed with a fungal infection at your center. Only infants who were hospitalized in your facility on or after day 3 are included.

Any Peri-Intraventricular Hemorrhage (Peri-IVH)

The any peri-IVH morbidity outcome is the percentage of infants with any grade of peri-intraventricular hemorrhage relative to all infants with a cranial exam within 28 days of birth.

Severe Peri-IVH

The severe peri-IVH morbidity outcome is the percentage of infants with grades 3 and 4 of peri-intraventricular hemorrhage relative to all infants with a cranial exam within 28 days of birth.

Shunt Placed for Bleed

The percent of infants which had a shunt placed to address peri-IVH is the number of infants who had a shunt placed for bleeding relative to all infants with a cranial image within 28 days of birth.

Periventricular Leukomalacia (PVL)

The PVL morbidity outcome is based on infants diagnosed with PVL relative to all infants who ever had a cranial image done.

Any Retinopathy of Prematurity (ROP)

The any ROP morbidity outcome is the percentage of infants with evidence of retinopathy of prematurity stages 1 through 5 relative to all infants who had an eye exam.

Severe ROP or ROP Surgery

The Severe ROP morbidity outcome is the percentage of infants with evidence of stage 3 through 5 ROP or who experienced ROP surgery relative to all infants with an eye exam.

Necrotizing Enterocolitis (NEC) @

The NEC morbidity outcome is the ratio of infants diagnosed with NEC at your facility relative to all infants admitted to your NICU.

NEC surgery @

The percent of infants with NEC surgery is calculated as the number of infants with NEC surgery at your facility relative to all infants with evidence of NEC.

Cold-Stressed

An infant is considered cold-stressed if its first temperature within 1 hour of NICU admission ranges from 36 to 36.4°C. The cold-stressed percentage is obtained as the ratio of cold-stressed infants relative to all infants admitted to your NICU with a known first temperature at NICU admission who were not cooled. Note that infants undergoing hypothermic therapy at the reporting NICU and acutely transported in infants who were cooled at referral, at initial evaluation or NICU admission are excluded from the numerator and denominator of the coldstressed percentage.

Hypothermic

An infant is considered hypothermic if its first temperature within 1 hour of NICU admission is under 36°C. The hypothermic percentage is obtained as the ratio of hypothermic infants relative to all infants admitted to your NICU with a known first temperature at NICU admission who were not cooled. Note that infants undergoing hypothermic therapy at the reporting NICU and acutely transported in infants who were cooled at referral, at initial evaluation or NICU admission are excluded from the numerator and denominator of the hypothermic percentage.

Section L. Observed to Expected Ratios for Major Morbidities of Infants 401 to 1,500 Grams or 22 to 29 Weeks Gestation

For Section I the measures shown in Section H are risk-adjusted using multivariable logistic regression. Risk-adjustment models were developed for each outcome shown in this section based on 2017 data for **all** CPQCC centers. The red star shows your facility's observed to expected ratio for each morbidity measure. The observed to expected ratio compares the observed number of events to those expected based on the entire population of CPQCC infants and upon the specific risk factors in your patients. A ratio lower than 1

means fewer of your infants had the condition than predicted by the statistical model. A ratio higher than 1 means more of your infants had the condition than predicted by the statistical model.

The blue line shows the 95% confidence limits of the O/E ratio: A lower confidence limit exceeding 1 indicates that the morbidity experience in your center was statistically significantly higher than expected; an upper confidence limit less than 1 indicates that the morbidity experience in your center was statistically significantly lower than expected.

The risk-adjustment is based on multivariable logistic regression taking into account your facility's case mix of infant race, sex, gestational age, severity of congenital malformation, birth weight, 5-minute Apgar score, location of birth (inborn/outborn), multiple gestation, and whether or not the mother received any prenatal care.

For the specific definition of each measure displayed in Section I please consult the narrative for Section H.

Only if more than 2 expected events occur in the reporting NICU, O/E ratios are provided. Otherwise the chart displays **Cannot be produced.**

Section M. Central Line Associated Blood Stream Infections (CLABSI) and CLABSI Best Practices

Starting 2013, the CCS report includes this section on central line days (CL days) and central line associated infections along with line placement and maintenance practices that were in place at your NICU.

This section follows the CDC/NHSN definition of central line-associated bloodstream infection (CLABSI) as already used by all California hospitals.

CLABSI Rate by Birth Weight

This section shows for the reporting NICU the number of CLABSI, the number of CL days and the implied CLABSI rate as the number of CLABSI per 1000 CL days per year stratified by birth weight. The number of CL days is based on the number of days that patients in each birth weight category had any central line(s) (umbilical catheter and/or 1 or more non-umbilical) in place.

Comparison of CLABSI Rate by Birth Weight

For each birth weight group, the chart shows a box plot reporting CLABSI rates at the reporting NICU in the context of rates observed across the CPQCC network (top panel) and across a comparison group of centers of the same CCS level. The box plot displays the lower and upper quartile of the CLABSI rate across the reference group as the left and right boundary of the blue box. This means that 25% of CPQCC NICUs have a CLABSI rate that is lower than the lower quartile (left box boundary), and 25% of CPQCC NICUs have a CLABSI rate that is higher than the upper quartile (right box boundary). The median across CPQCC NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum CLABSI rates across the comparison group that is within the lower and upper inner fence defined as at 1.5 times the Interquartile Range ($IQR=Q3-Q1$), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart. The red star represents the CLABSI incidence at the reporting NICU.

Note: This section was revised on 05/30/2014 to include a table and a chart. Due to the rare incidence of CLABSIs, the chart does not always show a "box." As the box is defined by the lower and upper quartile of the CLABSI rate across the comparison group, if the lower and upper quartiles are both zero, the box cannot be seen. The table shows for the same comparison groups as the chart, the group's CLABSI rate and the median, lower quartile, upper quartile and upper decile as observed across the comparison group.

Antibiotic Usage

This section uses a box plot to report antibiotic usage at the reporting NICU in the context of the range of a) antibiotic use within the CPQCC network and b) antibiotic use at a subset of CPQCC centers based on CCS level. Antibiotic use is reported as the ratio of total number of days infants were exposed to at least 1 antibiotic (antibacterial or antifungal agents administered IV or IM) to the total number of patient days in the reporting NICU. The box plot displays the lower and upper quartile of the antibiotic use across the reference range as the left and right boundary of the blue box. This means that 25% of the comparison group's NICUs have a value that is lower than the lower quartile (left box boundary), and 25% of the comparison group's NICUs have a value that is higher than the upper quartile (right box boundary). The median antibiotic use value across the reference range of NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum antibiotic use across the comparison group that is within the lower and upper inner fence defined as 1.5 times the Interquartile Range ($IQR=Q3-Q1$), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart. The reporting NICU's antibiotic use is shown as a red star.

Note that - as a balancing measure - data forwarded to CCS includes the incidence per 1,000 live births of early bacterial sepsis by pathogen.

Newborn Antibiotic Exposure Percent

This section reports on newborn antibiotic exposure as the percent of all newborn antibiotic exposures at the NICU hospital (or co-located hospital for satellite NICUs) among all live births inborn newborns. For the purpose of this percentage, delivery room deaths (DRDs) are not included in the denominator. A newborn is considered to have experienced an antibiotic exposure if he/she received one or more doses of an antibacterial or antifungal agent administered intravenously or intramuscularly in any location in the hospital (or co-located hospital for satellite NICUs) or your NICU during the inpatient stay associated with maternal delivery. Thus, each newborn will be counted as either a "0" - if there were no such medication exposures, or a "1" - if there were any such medication exposures (number of doses/number of days does not matter). As for antibiotic use, a boxplot is used to show the NICU percent in the context of the range of a) newborn antibiotic exposure within the CPQCC network and b) newborn antibiotic exposure at a subset of CPQCC centers based on CCS level. The box plot displays the lower and upper quartile of the newborn antibiotic exposure percent across the reference range as the left and right boundary of the blue box. This means that 25% of the comparison group's NICUs have a value that is lower than the lower quartile (left box boundary), and 25% of the comparison group's NICUs have a value that is higher than the upper quartile (right box boundary). The median antibiotic use value across the reference range of NICUs is displayed as a vertical bar. The box plot also shows the minimum and maximum antibiotic use across the comparison group that is within the lower and upper inner fence defined as 1.5 times the Interquartile Range ($IQR=Q3-Q1$), i.e., the minimum value at or above $Q1 - 1.5 * IQR$ and the maximum value at or below $Q3 + 1.5 * IQR$. Note that the inner fence is not displayed in the chart. The reporting NICU's newborn antibiotic exposure percent is shown as a red star.

Note that - as a balancing measure - data forwarded to CCS includes the incidence per 1,000 live births of early bacterial sepsis by pathogen.

Section N. Inventory of Active Perinatal Quality Improvement Projects

This section summarizes quality improvement projects actively pursued in your center in 2017. It was designed to fulfill several purposes:

1. To support the California Children's Services' goal to monitor quality improvement efforts for **all** CCS-approved units.
2. To fulfill the American Board of Pediatrics' requirement for Quality Improvement Competency

Validation for Sub-specialty Recertification for neonatologists.

3. To provide CPQCC Members a convenient summary of neonatal improvement activities that would be useful to submit to the Joint Commission and other similar organizations.

For each project, its title, specific aim, target population, project leader, project leader contact information, description, start date, and project Institute for Health Improvement (IHI) Level are shown. The IHI level assessment may be based on preliminary CPQCC data available in December of the report year with final updates if indicated when CPQCC database for the report year closes.

Section O. NICU Comment

This section can be used by NICUs to share any information regarding their NICU that is relevant for the CCS report.

Section P. NICU Attestation and Confirmation Status

Section P displays information on the current confirmation status of your center's CCS report. Note that the CCS report can only be confirmed from June 2, 2018 at midnight until June 7, 2018 at 11:59 PM. To qualify for the Early Bird Recognition Award confirm the Final CCS Report by June 3, 2018 at 11:59 PM.

Appendix: List of 2017 Surgeries Included in Section G, Total Number of Surgeries

Head and Neck

- ROP Surgery
- Tracheostomy
- Cricoid split
- Ophthalmologic surgery OTHER than laser or cryosurgery for ROP
- Cleft lip or palate repair
- Branchial cleft sinus excision
- Thyroglossal duct excision
- Palliative or definitive repair of choanal atresia
- Mandibular (jaw) distraction
- Craniotomy
- Other head and neck surgery requiring general or spinal Anesthesia

Thorax

- Tracheal Resection
- Aortopexy
- Tracheoesophageal atresia and/or fistula repair
- Thoracoscopy (with or without pleuridesis/pleurectomy)
- Thoracotomy (with or without pleural or lung biopsy)
- Pneumonectomy, lobectomy, or partial lobectomy
- Resection of pulmonary sequestration (intrathoracic or extrathoracic)
- Resection of mediastinal mass

Resection of chest wall
Bronchoscopy (with or without biopsy)
Esophagoscopy (with or without biopsy)
Surgery for congenital cystic adenomatoid malformation of the lung
Lung transplant
Sternal Closure
Other thoracic surgery requiring general or spinal anesthesia

Abdomen and Gastro-Intestinal

Rectal biopsy with or without anoscopy
Laparoscopy (diagnostic, with/without biopsy)
Laparotomy (diagnostic or exploratory, with/without biopsy)
Fundoplication
Pyloromyotomy
Pyloroplasty
Jejunostomy, ileostomy, colostomy for intestinal diversion (with/without bowel resection)
Small bowel resection
Large bowel resection
Duodenal atresia/stenosis/web repair
Jejunal, ileal, or colonic atresia repair (or repair of multiple intestinal atresias)
Excision of Meckel's diverticulum
Drainage of intra-abdominal abscess (not as primary treatment for NEC, see code S333)
Surgery for meconium ileus
Excision of omphalomesenteric duct or duct remnant

Gastroschisis repair (primary or staged)
Omphalocele repair (primary or staged)
Lysis of adhesions without other procedure
Repair of imperforate anus (with or without vaginal, urethral, or vesicle fistula)
Pull through for Hirschsprung's disease (any technique)
Pancreatectomy (partial, near total or total)
Partial/complete splenectomy or splenorrhaphy
Resection of retroperitoneal tumor
Resection of sacrococcygeal tumor
Repair of diaphragmatic hernia
Plication of the diaphragm
Gastrostomy/jejunostomy tube
Upper endoscopy (stomach or duodenum, with or without biopsy)

Colonoscopy, sigmoidoscopy

Takedown of ostomy and/or reanastomosis of bowel (small or large)

Ladd's or other procedure for correction of malrotation

Appendectomy

Primary peritoneal drainage for NEC, suspected NEC, or intestinal perforation

Anoplasty

Kasai procedure

Liver biopsy done during laparotomy or laparoscopy (including wedge or needle techniques)

Umbilical Hernia Repair

Other abdominal surgery requiring general or spinal anesthesia

Genitourinary

Cystoscopy (diagnostic, with or without biopsy)

Adrenalectomy

Nephrectomy

Nephrostomy

Urteterostomy

Resection of urachal cyst

Cystostomy

Closure of bladder exstrophy

Resection of posterior urethral valves

Inguinal hernia repair

Orchidopexy

Orchiectomy

Drainage or removal of ovarian cyst

Oophorectomy (partial or complete)

Pyeloplasty

Renal transplant

Other genitourinary surgery requiring general or spinal anesthesia

Open Heart or Vascular Procedures

PDA Ligation

PDA Closure by Catheterization

Vascular Ring division

Repair of coarctation of the aorta

Repair of major vascular injury

Repair or palliation of congenital heart disease

Heart transplant

Implanted Pacemaker (permanent - do not code temporary pacemakers)

Other open heart or vascular surgery requiring general or spinal anesthesia

Diagnostic or interventional cardiac catheterization

Diagnostic cardiac catheterization

Interventional catheterization with balloon septostomy

Interventional catheterization with aortic valvuloplasty

Interventional catheterization with pulmonary valvuloplasty

Other interventional catheterization requiring general or spinal anesthesia

Skin and Soft Tissue

Skin or soft tissue surgery requiring general or spinal anesthesia

Musculoskeletal System

Other musculoskeletal surgery requiring general or spinal anesthesia

Central Nervous System

Ventriculoperitoneal or other ventricular shunt

External ventricular drain

Ventricular drain with reservoir placement or removal

Meningocele or myelomeningocele repair

Encephalocele repair

Other central nervous system surgery requiring general or spinal anaesthesia

Fetal Surgery

Separation of conjoined twins

Fetal surgery

Close Window