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December 21, 2016

Steven T. James
House Clerk
State House Room 145
Boston, MA 02133

William F. Welch
Senate Clerk
State House Room 335
Boston, MA 02133

Dear Mr. Clerk,

Pursuant to Section 67A and 67C of Chapter 111 of the General Laws, as amended by Chapter 253 of the Acts of 2012, please find enclosed a report from the Department of Public Health entitled *Preterm Hospital Discharge and Quality Improvement.*

Sincerely,

Monica Bharel, MD, MPH
Commissioner
Department of Public Health

Charles D. Baker
Governor

Karyn Polito
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Marylou Sudders
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Preterm Hospital Discharge and Quality Improvement

2016 Annual Report

December 2016

Massachusetts Department of Public Health

Legislative Mandate

The following report is hereby issued pursuant to Subsection (b) of Section 67A of Chapter 111 of the Massachusetts General Laws (M.G.L.) as follows:

> *(b) The department shall submit an annual report to the general court not later than October 1 on the status of premature and high risk infants. The report shall include: (i) a description of the progress in implementing section 67C; (ii) information about the incidence and cause of re-hospitalizations of infants born premature within their first 6 months of life; and (iii) recommendations for improvement of newborn health outcomes and ensuring continued health quality improvement, including recommendations concerning technological needs to improve monitoring of premature infants after discharge from the hospital and transition to a health care provider.*

For reference, M.G.L. c. 111 section 67C reads in relevant part as follows:

> *(b) The department shall, in consultation with the department's multidisciplinary perinatal advisory committee, develop standardized procedures for hospital discharge and follow-up care for premature infants and shall ensure that standardized and coordinated processes are followed as premature infants leave the hospital from a well baby nursery, step down or transitional nursery or neonatal intensive care unit and transition to follow-up care by a health care or homecare provider.*
>
> *(c) The department and its advisory committee shall utilize national evidence-based guidance, including, but not limited to, from the Centers for Medicare and Medicaid Services' Neonatal Outcomes Improvement Project or the Institute for Healthcare Improvement's national initiative for children's healthcare quality to establish hospital discharge follow-up care processes.*
>
> *(d) The department shall utilize existing perinatal databases, such as the pregnancy to early life longitudinal database to develop a statewide report on the causes and incidence of re-hospitalizations of infants that were born premature and who are within their first 6 months of life. The department's perinatal advisory committee shall use such report in developing their standardized procedures.*

Executive Summary

Preterm birth, defined as the birth of an infant before 37 weeks gestation, is the most frequent cause of infant mortality and morbidity and is a leading cause of long-term neurological disabilities in children.[1] In 2005, it is estimated that preterm births cost the U.S. health care system more than $26 billion.[2] Prolonged Neonatal Intensive Care Unit (NICU) stays, rehospitalization, and other post-discharge health care use constitutes a significant portion of preterm infant care costs. According to preliminary birth data for 2015 from the National Vital Statistics Report, 11.29% of the nearly 4 million births in the United States were preterm.[3]

The American Academy of Pediatrics (AAP) reports that "infants born preterm with low birth weight who require neonatal intensive care experience a much higher rate of hospital readmission and death during the first year after birth compared with healthy term infants. Careful preparation for discharge and good follow-up care after discharge may reduce these risks."[4]

This report on Preterm Infant Hospital Discharge and Quality Improvement was developed in response to amendments to M.G.L. c. 111 sections 67A and 67C, as amended by Chapter 253 of the Acts of 2012. The Department of Public Health (the Department) in consultation with the Department's multidisciplinary Perinatal Advisory Committee (PAC), was tasked with responding to these legislative mandates.

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[1] International classification of diseases and related health problems.10th revision.Geneva: World Health Organization; 1992

[2] Centers for Disease Control and Prevention.2014 Preterm Birth.http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/PretermBirth.htm

[3] Brady E. Hamilton, Ph.D., Joyce A. Martin, M.P.H., and Michelle J.K. Osterman, M.H.S., Division of Vital Statistics National Vital Statistics Reports Vol. 65, No. 3, June 2, 2016. Available at : http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_03_tables.pdf

[4] American Academy of Pediatrics, Committee on Fetus and Newborn.Hospital discharge of the high-risk neonate.Pediatrics, 2008.**122**(5):1119-1126.

Implementation of Section 67C

The Department convened the Perinatal Advisory Committee (PAC) in January, March, and September of 2015. One of the key items discussed at these meetings was the requirement in M.G.L. c. 111 section 67C for the Department, in consultation with the PAC, to develop standardized procedures for hospital discharge and follow-up care for premature infants. The goal of developing such procedures is to ensure that standardized and coordinated processes are followed as premature infants leave the hospital from a well newborn nursery, step down, transitional nursery, or NICU and transition to follow-up care by a health care or homecare provider.

To meet this statutory mandate, the Department issued a Memorandum (Memorandum 15-7-08[5]) on July 14, 2015, to provide recommendations for enhancements to existing hospital discharge and follow-up care of preterm infants born at less than 37 weeks gestation, and high risk infants, defined as small for gestational age (SGA[5]). To develop the memorandum, the Department consulted with the PAC and incorporated its feedback into the final document.

This memorandum is intended to serve as an adjunct to existing hospital regulations and hospital policies. The memorandum includes several sample discharge planning worksheets described in the *Journal of Perinatology* article, "Neonatal Intensive Care Unit Discharge Preparation, Family Readiness and Infant Outcomes: Connecting the Dots."[6] The examples were provided as reference only, and the documents were meant to provide each hospital with guidance on enhancing its discharge policies. Per existing regulation, applicable discharge policies should be available for review, if requested by the Department.

The Department's memorandum encouraged hospitals to review the guidance and reference information and to incorporate recommendations into existing policies and procedures, such as:

- A structured discharge teaching plan that can be customized for the needs of the individual family, while ensuring that all basic information is taught, including technical baby care skills, home environment preparation, car seat/bed use, preterm infant behavior (normal and abnormal), and anticipatory guidance. The teaching should be documented.
- Support for oral teaching with written materials, instructions, and checklists where appropriate.
- A structured discharge summary.

[5] http://www.mass.gov/eohhs/docs/dph/quality/hcq-circular-letters/2015/bhscq-150708.pdf

[6] VC Smith, SS Hwang, D Dukhovny, S Young and DM Pursley. "Neonatal Intensive Care Unit Discharge Preparation, Family Readiness and Infant Outcomes: Connecting the Dots". Journal of Perinatology. (2013), 1–7. Online Publication.

- Adherence to the American Academy of Pediatrics (AAP) guidelines for high risk discharge[7].
- Adherence to the AAP guidelines for late preterm infant discharge[8].
- Coordination of the transition of care to a medical home and/or primary care provider (PCP), including documentation of the transition. Due to the complexity of follow-up after hospital discharge, it is recommended that the following action steps are in place:
    - pre-discharge planning;
    - assistance to families in identifying a PCP; and
    - communication and coordination with the PCP to ensure providers in the community are prepared to support the infant post-discharge. It is strongly recommended that the hospital team and the primary care provider have ongoing communication to ensure optimal continuity of care. The PCP should be made aware before patient discharge and preferably be included in the discharge planning.
- Identification of community resources. A number of community services are available in Massachusetts through the Department and other state partners and can be incorporated into discharge plans for families. An attachment titled, "Massachusetts Community Resources" was distributed with the memorandum.

The memorandum was distributed to all Acute Care Hospitals and Birthing Centers and is available online at: http://www.mass.gov/eohhs/docs/dph/quality/hcq-circular-letters/2015/bhscq-150708.pdf.

Another key discussion item for the PAC meetings was Executive Order No. 562, which requires all state agencies to do a comprehensive review of all of state regulations under their jurisdiction to ensure that:

1. there is a clearly identified need for each regulation;
2. the cost of each regulation does not exceed the benefit;
3. each regulation does not exceed federal requirements or duplicate local requirements; and
4. less restrictive and intrusive alternatives have been considered and found less desirable than each regulation based on a sound evaluation.

[7]Engle WA, Tomashek KM, Wallman C; Committee on Fetus and Newborn, American Academy of Pediatrics. "Late- preterm" infants: a population at risk. Pediatrics. 2007;**120**(6):1390–1401

[8]Late Preterm Infants: Near Term But Still in a Critical Developmental Time Period. A.Kugelman , A., Colin, A Pediatrics 2013; Vol. 132 No. 4 October 1, 2013 pp. 741 -751; DOI: 10.1542/peds.2013-1131

http://pediatrics.aappublications.org/content/132/4/741.full.html

As part of this process, the Department sought feedback from the PAC on the maternal and newborn services sections of the hospital licensure regulation (105 CMR 130). The Department has proposed updates to the maternal and newborn services sections of the regulation, including the reorganization and consolidation of duplicative sections. The proposed amendments remove overly prescriptive language that could limit a hospital's ability to develop new and innovative approaches to patient care based upon current standards of practice.

Pursuant to this Executive Order, the Department also proposed rescission of the Birth Center regulation (105 CMR 142) and incorporation of its provisions into hospital (105 CMR 130) and clinic regulations (105 CMR 140). The proposed regulations and additional information can be found at: http://www.mass.gov/eohhs/gov/laws-regs/dph/proposed-regulations/

Re-hospitalizations of infants born premature within their first 6 months of life

Incidence and causes of rehospitalization among premature infants born in Massachusetts in calendar year 2012

This section addresses the status of preterm and high risk infants. The results shown are based on data analyses from the Pregnancy to Early Life Longitudinal (PELL) Data System. PELL is a unique, longitudinal, population-based reproductive health data system that enables Massachusetts to monitor the health and well-being of mothers and infants over time and to assess the effectiveness of state maternal and child health programs and policies. The core PELL dataset comprises Massachusetts birth certificates and fetal deaths records from 1998-2013, linked to the corresponding hospital discharge records of birth for the mother and infant. This core dataset is further linked longitudinally to non-birth related health services utilization data, using hospital discharge records, observational stays and emergency department visits for the mother and the child.

In order to address hospital discharges and quality improvement for preterm and high-risk infants, the Department has analyzed core PELL data linked longitudinally with non-birth hospital discharges for all infants born in 2012. While data from the core PELL linkage for births through 2013 are available, the corresponding longitudinal linkages to hospital non-birth discharge records for 2013 are not yet complete. Therefore, the 2012 birth cohort is the most recent cohort for which non-birth rehospitalization data are available through PELL. As more recent birth cohorts are linked longitudinally with their corresponding non-birth hospital discharges, this report will be updated.

Methodology

The Department analyzed the frequency and causes of rehospitalizations among infants during the first six months of life using PELL data for the 2012 birth cohort. All analyses were restricted to live-born infants born in Massachusetts hospitals to Massachusetts resident mothers. Rehospitalization was defined as readmission to the same or a different hospital within the first six months (less than 180 days) of life after the infant was discharged home. Infants readmitted on the same day they were discharged were regarded as transfers; transfers were not counted as rehospitalizations.

Preterm infants were defined as infants born at less than 37 weeks gestation. For the purpose of this analysis, high-risk infants were defined as full-term (equal or greater than 37 weeks) but small for gestational age (SGA) in accordance with M.G.L. c. 111 section 67A (a), which reads, “Within 10 days after the birth of any infant weighing 2500 grams or less or any infant with a high risk problem as defined by the department.” The SGA classification of birth weight percentiles by gestational age is a more accurate

definition of high-risk among infants compared to the fixed birth weight of 2500 grams, which does not account for gestational age. In this analysis, normal birth weight and SGA categories were calculated using the 10th percentile.

Causes of rehospitalizations were based on the primary diagnosis recorded in each non-birth hospital discharge record using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes.

Based on the annual report requirements as outlined in statute, the Department examined the incidence and causes of rehospitalization for the following three categories among infants born in 2012:

(1) Full-term infants (equal or greater than 37 weeks) with normal birth weight based on their gestational age;

(2) Preterm infants (less than 37 weeks) regardless of their birth weight; and

(3) High-risk infants defined as full-term but SGA.

Results

In 2012, 71,643 live infants were born to Massachusetts resident mothers. These data do not include infants with unknown gestational age and/or birth weight (n=134). The 71,643 births were analyzed according to the three categories defined above: full-term with normal birth weight represented 80.3% (n= 57,513); preterm infants represented 10.1% (n= 7,229); and full term high-risk infants represented 9.6% (n= 6,901) (Table 1).

Of the 71,643 reported live births, 3,645 infants (5.1%) were rehospitalized at least once within the first six months of life. Rehospitalization varied by identified categories: 8.3% of preterm infants and 6.1% of high risk infants were rehospitalized while 4.6% of full-term normal birth weight infants required hospitalization (Table 2).

The causes of rehospitalization, as defined by the primary ICD-9-CM diagnosis in the non-birth hospital discharge records, were analyzed by occurrence instead of by infant; for example, if an infant was rehospitalized twice within six months of life, both causes of rehospitalization were counted in this analysis. As a result, the total numbers of rehospitalizations for preterm and high risk infants exceed the numbers of infants who were rehospitalized in these categories. The top three causes of rehospitalization (n=733 occurrences) among preterm infants were: (1) Certain Conditions Originating in the Perinatal Period (27.4%); (2) Diseases of the Respiratory System (26.6%); and (3) Congenital Anomalies (9.1%) (Table 3-1).

Similarly, the most frequently reported primary ICD-9-CM diagnosis codes resulting in rehospitalization of high risk infants (n = 512 occurrences) were (1) Diseases of the

Respiratory System (25.2%); (2) Certain Conditions Originating in the Perinatal Period (24.8%); and (3) Congenital Anomalies (10.9%) (Table 3-2).

Detailed information about the causes of rehospitalization for preterm and high-risk infants within their first six months of life is presented in Tables 3-1 and 3-2.

Conclusion

In comparing 2011 data to 2012 data, preterm live births to Massachusetts resident mothers increased from 8.4% to 10.1%. Similarly, the percentage of high risk infants (full-term but SGA) increased from 9.3% to 9.6%. The proportion of infants who were hospitalized within the first six months of life was 5.1% compared to 6.1% in 2011. Overall causes for rehospitalization within the first six months of life were varied but remained consistent from 2011 to 2012 with a decrease in the number of rehospitalizations, mainly due to acute respiratory infections from 32.6% in 2011 to 27.2% in 2012.

Recommendations

The Department continues to work with health care providers and members of the PAC to identify evidence-based recommendations that will result in improvement of newborn health outcomes and ensure continued quality improvement. To ensure that standardized and coordinated processes are followed as preterm infants leave the hospital and transition to follow-up care by a health care or homecare provider, DPH health care facility surveyors monitor facility compliance with regulatory requirements through onsite surveys at hospitals, off-site communications, and complaint investigations, as necessary. Additionally, the Department and the PAC will continue to ensure guidelines and recommendations are appropriate for preterm infants during hospital discharge and follow-up care.

Conclusion

Massachusetts continues to work on reducing preterm birth rates in the state. The Department collaborates with the Massachusetts Perinatal Quality Collaborative (MPQC) and the March of Dimes to guide perinatal quality improvement efforts across hospitals. One of the MPQC projects involves tracking recent trends in elective (non-medically indicated) deliveries prior to 39 weeks of gestation and birth outcomes across the state and understanding the impact of preterm deliveries on birth outcomes.

In addition, the Department, through the Healthcare Associated Infections (HAI) program within in the Bureau of Health Care Safety and Quality, continues to assist the Neonatal Quality Improvement Collaborative (NeoQIC) of Massachusetts with data collection. NeoQIC is a voluntary organization, open to all hospitals in Massachusetts with Level III NICUs, that supports quality improvement in the health care of newborns through the open sharing of information and practices.

The Department has also been a leader in the Collaborative Improvement and Innovation Network (CoIIN) to Reduce Infant Mortality, which is funded by the Health Resources and Service Administration (HRSA). The CoIIN is a multiyear national movement engaging federal, state and local leaders, public and private agencies, professionals and communities to employ quality improvement, innovation and collaborative learning to reduce infant mortality and improve birth outcomes.

In 2014, the CoIIN expanded to all 50 states and refocused on national versus regional collaboration. Three strategic areas of focus selected by the Department-led Massachusetts CoIIN team are Social Determinants of Health, Prevention of Preterm and Early Term Births, and promotion of safe sleep practices. The CoIIN teams are working to incorporate evidence-based policies and programs and place-based strategies to improve social determinants of health and equity in birth outcomes.

Addendum

Table 1. Number and Percentage of Massachusetts (1) Term, Normal Weight, (2) Preterm and (3) High Risk (Term SGA) Live Births 2012

	Number	Percentage
Term, Normal Weight	57,513	80.3%
Preterm	7,229	10.1%
High Risk (Term, SGA)	6,901	9.6%
Total	71,643*	100%

*Total does not include 134 reported births where gestational age and/or birth weight are unknown.

Table 2. Number and Percentage of Massachusetts (1) Term, Normal Weight, (2) Preterm and (3) High Risk (Term SGA) Live Births Rehospitalized Within the First Six Months of Life

	Total	Rehospitalization	
		Number	Percentage
Term, Normal Weight	57,513	2,623	4.6%
Preterm	7,229	598	8.3%
High Risk (Term, SGA)	6,901	424	6.1%
Total	71,643*	3,645	5.1%

*Total does not include 134 reported births where gestational age and/or birth weight are unknown.

Table 3-1. Causes of Rehospitalization Within First Six Months of Life: Preterm Infants, Born in 2012

Causes		Number	Percentage
Diseases of the respiratory system (ICD-9-CM Codes 460-519) (N=195, 26.6%)	Acute respiratory infections	150	20.5%
	Pneumonia and influenza	24	3.3%
	Other diseases of respiratory system	13	1.8%
	Chronic obstructive pulmonary disease and allied conditions	3	0.4%
	Pneumoconioses and other lung diseases due to external agents	3	0.4%
	Other diseases of the upper respiratory tract	2	0.3%
Certain conditions originating in the perinatal period (ICD-9-CM Codes 760-779) (N=201, 27.4%)	Other perinatal jaundice	66	9.0%
	Disorders relating to short gestation and low birthweight	43	5.9%
	Other respiratory conditions of fetus and newborn	21	2.9%
	Other and ill-defined conditions originating in the perinatal period	33	4.5%
	Infections specific to the perinatal period	13	1.8%
	Conditions involving the integument and temperature regulation of fetus and newborn	12	1.6%
	Perinatal disorders of digestive system	2	0.3%
	Respiratory distress syndrome	2	0.3%
	Hemolytic disease of fetus or newborn, due to isoimmunization	3	0.4%
	Hematological disorders of newborn	1	0.1%
	Fetal and neonatal hemorrhage	0	0.0%
	Slow fetal growth and fetal malnutrition	0	0.0%
	Endocrine and metabolic disturbances specific to the fetus and newborn	4	0.5%
	Birth trauma	1	0.1%
Congenital Anomalies (ICD-9 CM Codes**740-759)**		67	9.1%
Other Causes		270	36.8%
Total		733	100.0%

Table 3-2. Causes of Rehospitalization Within First Six Months of Life: High Risk Infants (Full-term, SGA), born in 2012

Causes		N	%
Diseases of the respiratory system (ICD-9-CM Codes 460-519) (N=129, 25.2%)	Acute respiratory infections (460-466)	98	19.1%
	Pneumonia and influenza (480-488)	14	2.7%
	Other diseases of respiratory system (510-519)	14	2.7%
	Chronic obstructive pulmonary disease and allied conditions (490-496)	1	0.2%
	OTHER DISEASES OF THE UPPER RESPIRATORY TRACT (470-478)	2	0.4%
Certain conditions originating in the perinatal period (ICD-9-CM Codes 760-779) (N=127, 24.8%)	Other perinatal jaundice	35	6.8%
	Other and ill-defined conditions originating in the perinatal period	32	6.3%
	Conditions involving the integument and temperature regulation of fetus and newborn	13	2.5%
	Infections specific to the perinatal period	17	3.3%
	Other respiratory conditions of fetus and newborn	10	2.0%
	Disorders relating to short gestation and low birthweight	7	1.4%
	Perinatal disorders of digestive system	2	0.4%
	Respiratory distress syndrome	2	0.4%
	Endocrine and metabolic disturbances specific to the fetus and newborn	6	1.2%
	Intrauterine hypoxia and birth asphyxia	1	0.2%
	Hemolytic disease of fetus or newborn, due to immunization	2	0.4%
Congenital Anomalies (740-759)		56	10.9%
Other Causes		200	39.1%
Total		512	100.0%