Maternal and Neonatal Levels of Care in Illinois

Report for the Illinois Perinatal Advisory Committee October 20, 2016

Prepared By:
Amanda Bennett, PhD
Maternal and Child Health Epidemiologist
Office of Women's Health and Family Services
Illinois Department of Public Health

EXECUTIVE SUMMARY

Regionalized perinatal care helps to ensure that high-risk mothers and infants are delivered in hospitals equipped to care for their complex medical needs. Illinois has had a regionalized perinatal system since the 1970's, with the Illinois Department of Public Health designating hospitals' perinatal level of care under the authority of administrative rules. Within the last several years, the American Academy of Pediatrics (AAP), American College of Obstetrics and Gynecology (ACOG), and the Society for Maternal-Fetal Medicine (SMFM) have issued policy statements and recommendations related to neonatal and maternal levels of care.

In fall 2015, the Illinois Perinatal Advisory Committee (PAC) created a Levels of Care Task Force to look into the issue of the new professional guidelines on maternal and neonatal levels of care, and to make recommendations about whether and how Illinois should incorporate these guidelines into the state perinatal system. This report serves as a data resource to support and inform discussions about the current state of the Illinois perinatal system, the impact of levels of care and various hospital resources on neonatal mortality, and the potential impact of adopting the AAP and/or ACOG/SMFM recommendations.

One of the main sources of data for this report is the Levels of Care Assessment Tool (LOCATe), a hospital survey completed by Illinois perinatal hospitals between September 2015 and June 2016. Illinois achieved a 100% response rate from the 120 perinatal hospitals operating at the time of the survey. The purpose of LOCATe is to be a brief, objective tool for assessing neonatal and maternal levels of care in relation to the newest professional guidelines.

Key Findings Related to Maternal Levels of Care

- Illinois does not currently designate maternal levels of care.
- LOCATe assessed Illinois hospitals as providing the following levels of maternal care: 1 birth center, 22 level I facilities, 72 level II facilities, 19 level III facilities, and 3 level IV facilities.
- Facilities in the non-Chicago perinatal networks in Illinois were more likely to be classified as maternal level I facilities than the hospitals in the Chicago regions.
- Nine out of the ten perinatal networks had at least one hospital that was a maternal level III or IV facility.
- 99% of facilities have a written protocol for obstetric hemorrhage; 65% of facilities have a written protocol for hypertensive emergency, and 80% of facilities have a written protocol for thromboembolism prophylaxis.
- 74% of perinatal hospitals provide critical care services for pregnant women; the percentage of hospitals providing critical care was higher in the Chicago area and for facilities with higher IDPH perinatal designation levels.
- Of hospitals providing critical care to pregnant women, only 20% had all five of the critical care resources recommended by ACOG for the highest maternal level of care.

Key Findings Related to Neonatal Levels of Care

- The largest differences between the current IDPH perinatal system and the 2012 AAP recommendations are:
    - AAP does not include a level II-E facility
    - AAP establishes level IV as the highest level of care

- According to LOCATe, Illinois facilities were classified according to the following AAP neonatal levels of care: 46 level I, 53 level II, 14 level III, and 7 level IV.
    - All 9 of the current IDPH Level I hospitals were classified by LOCATe as neonatal level I
    - 37% of the current IDPH level II hospitals were classified by LOCATe as neonatal level II; the remaining facilities were classified as neonatal level I.
        - For the majority of the facilities that were assessed as level I by LOCATe, no neonatologist on staff was the one missing resource that prevented them being a neonatal level II facility.
    - All of the current IDPH level II-E hospitals were classified by LOCATe as neonatal level II. On average, level II-E facilities had only 1.8 out of the 6 resources required of a neonatal level III facility.
    - For current IDPH level III perinatal hospitals, there was variation in the LOCATe assessment, with 25% assessed as level II, 50% as level III, and 25% as level IV.
- Hospitals outside the Chicago area were more likely to be classified as a neonatal level I than hospitals outside the Chicago area.
- All ten of the state regionalized perinatal networks had at least one hospital that was classified by LOCATe as a neonatal level III or IV facility.
- 94% of Illinois births are to women who live within 50 miles of an IDPH level III perinatal hospital. This remains unchanged even under the LOCATe neonatal levels of care.

Key Findings Related to Neonatal Mortality

General Comparison Across Levels:

- Very low birth weight (VLBW) infants born in level II and II-E facilities had significantly higher mortality rates than those born in level III facilities.
- For both first-day and neonatal mortality, there were no significant differences in the adjusted mortality rates between VLBW infants born in level II and level II-E facilities.

Resource Comparison Within Level Ii & Ii-E Facilities

- For both first-day and neonatal mortality, low birth weight (LBW) infants born in IDPH level II facilities that were classified as level I by the LOCATe algorithm had significantly higher rates of mortality than those born in IDPH level II-E facilities.
- Mortality rates for LBW infants born in IDPH level II facilities classified by LOCATe as level II were not significantly different from those of LBW infants born in IDPH level II-E facilities.
- Mortality rates were marginally higher for LBW infants born in IDPH level II/II-E facilities delivering low volumes of LBW infants.
- Compared to facilities with a neonatologist on staff, LBW infants born in facilities with no neonatologist had 90% and 150% increases in the risk of first-day and neonatal mortality.

RESORUCE COMPARISON WITHIN LEVEL III FACILITIES

- VLBW infants born in IDPH level III facilities classified by LOCATe as level II had significantly increased mortality than the VLBW infants born in LOCATe level IV facilities.
- VLBW infants born in both LOCATe level II and III facilities had significantly increased risk for neonatal mortality compared to VLBW infants born in LOCATe level IV facilities.
- Low volume of VLBW deliveries, and not having a neonatologist, pediatric surgeon, or pediatric anesthesiologist onsite were qualitatively associated with increased risks of first-day and neonatal mortality, though these associations were not statistically significant. These associations should continue to be monitored as more years of mortality data become available.

BACKGROUND

Regionalized perinatal care helps to ensure that high-risk mothers and infants are delivered in hospitals equipped to care for their complex medical needs. Illinois has had a regionalized perinatal system since the 1970's, with the Illinois Department of Public Health designating hospitals' perinatal level of care under the authority of administrative rules. These rules have been updated several times since their creation, with minor amendments most recently adopted in 2011.

Since that time, new recommendations on both neonatal and maternal levels of care have emerged from the American Academy of Pediatrics (AAP), American College of Obstetrics and Gynecology (ACOG), and Society for Maternal-Fetal Medicine (SMFM). These recommendations vary from the IDPH system by: creating separate maternal levels of care and revising the neonatal level of care classifications and requirements.

The maternal levels of care from ACOG/SMFM were published in January 2015 and are the first recommendations for the establishment of maternal levels separate from neonatal levels of care. (ACOG and SMFM, 2015) The definition, key resources, and examples patients for each of the maternal levels of care are briefly summarized in Table 1. While the current Illinois perinatal system includes some aspects of maternal care in the requirements for perinatal designations, Illinois does not currently have a system that designates maternal levels of care.

The AAP neonatal levels of care were published in 2012 (AAP, 2012) and are distinct from the current IDPH perinatal system rules in several ways. First, the AAP recommendations describe different levels from the Illinois perinatal system: 1) the AAP policy creates a Level IV definition, and 2) the AAP policy does not include Level II-E (Special Care nursery). Additionally, some of the resource requirements and patient populations for each level vary between the current Illinois system and the AAP policy recommendations. Table 2 summarizes the AAP policy statement and briefly identifies some of the major differences from the Illinois perinatal system.

In fall 2015, the Illinois Perinatal Advisory Committee (PAC) created a Levels of Care Task Force (LoCTF) to look into the issue of the new professional guidelines on maternal and neonatal levels of care, and to make recommendations to PAC about whether and how Illinois should incorporate these guidelines into the state perinatal system.

REPORT PURPOSE

This report serves as a data resource to support and inform discussions about the current state of the Illinois perinatal system, the impact of levels of care and various hospital resources on neonatal mortality, and the potential impact of adopting the AAP/ACOG/SMFM recommendations for maternal and neonatal levels of care. It is a first step towards evaluating how changes to the Illinois perinatal system could potentially impact hospitals, women, and babies.

However, there are many details about maternal and neonatal levels of care that would require further discussion and decision-making by Illinois. Therefore, this report should not be considered as a blueprint for potential future changes in the Perinatal Administrative Code but rather as data to inform and support Illinois-specific interpretations of the AAP/ACOG/SMFM recommendations.

Table 1. Maternal Levels of Care: Key Elements of ACOG/SMFM Recommendations

Level of Care	Definition	Examples of Capabilities and Providers	Examples of Patients
Birth Center	Peripartum care of low-risk women with uncomplicated singleton term pregnancies who are expected to have an uncomplicated birth	• Readiness at all times to meet unexpected needs and facilitate transport to acute care setting when necessary • Established agreement with a receiving hospital for timely transport • Every birth attended by at least two professionals • Primary maternal care providers (including certified nurse midwives, etc.)	Term, singleton, vertex presentation
I	BASIC CARE: Care of uncomplicated pregnancies with the ability to detect, stabilize, and initiate management of unanticipated maternal-fetal or neonatal problems until transport	Birth center capabilities, plus: • Ability to begin emergency cesarean delivery • Access to obstetric ultrasound, laboratory testing, and blood bank at all times • Nursing leadership has expertise in perinatal nursing care • Obstetric provider with privileges to perform emergency cesarean available to attend all deliveries • Anesthesia services available for labor and surgery	Any Birth Center patient plus: • Term twin gestation • Trial of labor after cesarean • Uncomplicated cesarean • Preeclampsia without severe features at term
II	SPECIALTY CARE: Level I facility plus care of appropriate high-risk conditions, both directly admitted and transferred from another facility	Level I capabilities, plus: • CT scan and MRI with interpretation available • Ob-gyn available at all times, director of OB services is board-certified Ob-gyn • Maternal-Fetal Medicine (MFM) available for consultation, as needed • Anesthesia services available at all times for labor and surgery • Board-certified anesthesiologist with special training or experience in obstetric anesthesia available for consultation • Medical and surgical consultants available to stabilize obstetric patients	Any Level I patient, plus: • Severe preeclampsia • Placenta previa with no prior uterine surgery
III	SUBSPECIALTY CARE: Level II facility plus care of more complex maternal medical conditions, obstetric complications, and fetal conditions	Level II capabilities, plus: • Advanced imaging available at all times • ICUs accept pregnant women and have critical care providers onsite at all times • Ob-gyn available onsite at all times, director of OB is board-certified Ob-gyn • MFM with inpatient privileges available at all times • Board-certified anesthesiologist with special training or experience in obstetric anesthesia in charge of obstetric anesthesiology services • Full complement of subspecialists available for inpatient consultations	Any Level II patient, plus: • Placenta previa with prior uterine surgery • Suspected placenta percreta • Adult respiratory syndrome • Expectant management of early severe preeclampsia <34 wks gestation
IV	REGIONAL CENTERS: Level III facility plus on-site medical and surgical care of the most complex maternal conditions and critically ill pregnant women and fetuses throughout antepartum, intra-partum, and postpartum care.	Level III capabilities, plus: • Perinatal system leadership • On-site ICU care for obstetric patients • MFM care team led by board-certified MFM with expertise in critical care obstetrics, MFM available at all times for onsite consultation and management. • Director of obstetric service is board-certified MFM or board-certified ob-gyn with expertise in critical care obstetrics • Subspecialty consultation available onsite at all times to collaborate with MFM	Any Level III patient, plus: • Severe maternal cardiac conditions • Severe pulmonary hypertension or liver failure • Pregnant women requiring neurosurgery or cardiac surgery • Preg. women in unstable condition and in need of an organ transplant

Table 2. Neonatal Levels of Care: Key Elements of 2012 AAP Policy and Comparison to IDPH Perinatal System

Level of Care	Definition	Examples of Capabilities	Examples of Providers	Key Differences from IDPH System
I	Well newborn nursery	• Provide neonatal resuscitation at every delivery • Evaluate and provide postnatal care to stable term newborn infants • Stabilize and provide care for infants for 35-37 wk gestation who remain physiologically stable • Stabilize newborn infants who are ill and those born at <35 wk gestation until transfer to higher level of care	Pediatricians, family physicians, nurse practitioners, and other advanced practice registered nurses	• IDPH Level I only allows for care ≥37 weeks; AAP would also allow stable 35-36 week infants to stay in Level I
II	Special care nursery	Level I capabilities, plus: • Provide care for infants born ≥32 wk gestation and weighing ≥1500 g who have physiologic immaturity or who are moderately ill with problems that are expected to resolve rapidly and are not anticipated to need subspecialty services on an urgent basis • Provide care for infants convalescing after intensive care • Provide mechanical ventilation for brief duration (<24 h) or continuous positive airway pressure or both • Stabilize infants born before 32 wk gestation and weighing less than 1500 g until transfer to a neonatal intensive care facility	Level providers, plus: Pediatric hospitalists, neonatologist, and neonatal nurse practitioners	• IDPH Level IIs can ventilate only up to 6 hours; AAP allows up to 24 hours • IDPH has Level II-E, which is not included in AAP
III	Neonatal Intensive Care Unit (NICU)	Level II capabilities, plus: • Provide sustained life support • Provide comprehensive care for infants born <32 wks gestation and weighing <1500 g and infants born at all gestational ages and birth weights with critical illness • Provide prompt and readily available access to a full range of pediatric medical and surgical subspecialists • Provide a full range of respiratory support • Perform advanced imaging, with interpretation on an urgent basis, including computed tomography, MRI, and echocardiography	Level II providers, plus: Pediatric medical sub-specialists*, pediatric anesthesiologists*, pediatric surgeons, pediatric ophthalmologists* *(*may be at the site or at a closely related institution by prearranged consultative agreement)*	• AAP allows telemedicine for provision of some services • AAP gives flexibility in types of surgical coverage
IV	Regional NICU	Level III capabilities, plus: • Located within an institution with the capability to provide surgical repair of complex congenital or acquired conditions • Maintain a full range of pediatric medical subspecialists, pediatric surgical subspecialists, and pediatric anesthesiologists at the site • Facilitate transport and provide outreach education	Level III providers, plus: Pediatric surgical sub-specialists	• No IDPH Level IV: The AAP Level IV distinguishes facilities with extensive surgical capacity and subspecialist availability

DATA SOURCES AND METHODS

Levels of Care Assessment Survey

Beginning in fall 2015, IDPH surveyed hospitals using the Levels of Care Assessment Tool (LOCATe) to learn about the perinatal healthcare system for Illinois' women and babies. LOCATe was developed by the Centers for Disease Control and Prevention as a brief, objective tool for assessing neonatal and maternal levels of care in relation to the newest professional guidelines. The development of LOCATe was grounded in the 2012 AAP Policy Statement on Levels of Neonatal Care, the 2012 AAP/ACOG Publication of Guidelines for Perinatal Care, and the 2015 ACOG/SMFM publication of Maternal Levels of Care, with extensive feedback from the national AAP and ACOG offices in relation to survey development. LOCATe asks hospitals to report on the services they provide, staffing, equipment, and basic maternal and neonatal outcomes.

Online links to the LOCATe survey were distributed to 120 perinatal hospitals in September 2015 via the ten regional administrative perinatal centers, including the four hospitals in St. Louis, MO that are affiliated with the Southern Illinois perinatal network. Within three months, 118 out of 120 hospitals completed LOCATe. The remaining two facilities completed the survey in May and June 2016, bringing the final participation rate to 100%.

For both maternal and neonatal levels of care, the LOCATe responses from a hospital can be combined into algorithms that estimate its AAP and ACOG/SMFM levels of care. The minimum criteria to achieve each maternal and neonatal level of care are respectively shown in Tables 3 and 4. These level assessments are meant to be estimates of the level of care provided by a facility, and they should be interpreted with caution. A site visit would serve as the gold standard for establishing true levels.

Three hospitals were children's hospitals that do not provide obstetric services – these hospitals were only assigned neonatal levels of care (no maternal levels of care). Additionally, in 2016, two new birthing hospitals have opened in Illinois; these hospitals did not participate in the LOCATe survey.

Birth and Death Certificates

The LOCATe responses for each hospital were linked to the birth certificates for Illinois resident births during 2014-2015. This enabled examination of patient volumes and distributions from the 2014-2015 data. The 2014 birth certificates are final and include out-of-state (OOS) occurrences to Illinois residents, while the 2015 birth certificates are provisional and do not include OOS occurrences.

To study neonatal mortality, the final birth certificates from 2014 were linked to death certificates during 2014-2015 to identify babies who died in the first 28 days after birth. First day mortality was defined as an infant death occurring in the first 24 hours of life. Neonatal mortality was defined as an infant death occurring during the first 28 days of life (day 0-27). The death certificate files are final for 2014, but provisional for 2015. OOS death occurrences to Illinois resident infants were only available for 2014 deaths, but because we are only studying mortality in the first 28 days, only infants born in late December had the possibility of a missing OOS death certificate. Multivariable logistic regression was used to study the potential impact of hospitals factors on neonatal mortality, after controlling for relevant confounders, such as case mix.

Table 3. Maternal Levels of Care: Minimum Criteria* to Achieve Each Level in Illinois LOCATe

Service	Level IV	Level III	Level II	Level I	Birth Center
OB Unit	X	X	X	X	X
Laboratory onsite	X	X	X	X	
Blood bank onsite	X	X	X	X	
General radiology onsite with interpretation 24/7	X	X	X	X	
Obstetric ultrasound onsite with interpretation 24/7	X	X	X	X	
CT Scan onsite with interpretation 24/7	X	X	X		
MRI onsite with interpretation 24/7	X	X	X		
Interventional ultrasound onsite 24/7	X	X			
Nuclear medicine onsite 24/7	X	X			
Intensive Care Services onsite for obstetric patients	X	X			
Obstetrician on staff	X	X	X		
MFM on staff	X	X			
Anesthesiologist physician for labor and delivery	X	X	X		
Anesthesiologist physician available onsite 24/7	X	X			
Anesthesiologist physician who is obstetric specialist in charge of OB anesthesia	X	X			
Has range of specialists/sub-specialists available to be <u>onsite</u> for inpatient consultations on OB patients: • General Surgeon • Cardiologist • Hematologist • Infection Disease • Nephrologist • Critical Care Specialist • Neurologist • Neonatologist	All 8	All 8			
All sub-specialists (*see above list*) available onsite 24/7	X				

** "Minimum criteria" = a hospital must have **<u>all</u>** of the services marked in a column to qualify as that level of care*

Table 4. Neonatal Levels of Care: Minimum Criteria* to Achieve Each Level in Illinois LOCATe

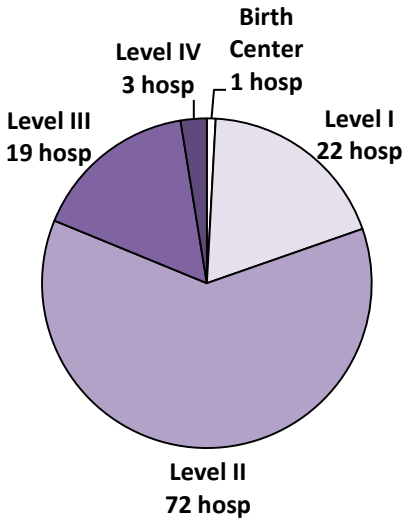
Services	Level IV	Level III	Level II	Level I
Complex ventilation for neonates onsite	X	X	At least one	
Conventional mechanical ventilation or CPAP onsite				
Neonatologist on staff	X	X	X	
Neonatologist *onsite*	X	X		
Advanced/complex imaging for neonates onsite 24/7	X	X		
Pediatric surgeon on staff	onsite	"available"		
Pediatric anesthesiologist on staff	onsite	"available"		
Pediatric ophthalmologist on staff	onsite	"available"		
Congenital cardiac surgery for neonates onsite *<u>OR</u>* Complex pediatric sub-specialty surgery for neonates onsite	X			

** "Minimum criteria" = a hospital must have **<u>all</u>** of the services marked in a column to qualify as that level of care*

MATERNAL LEVELS OF CARE

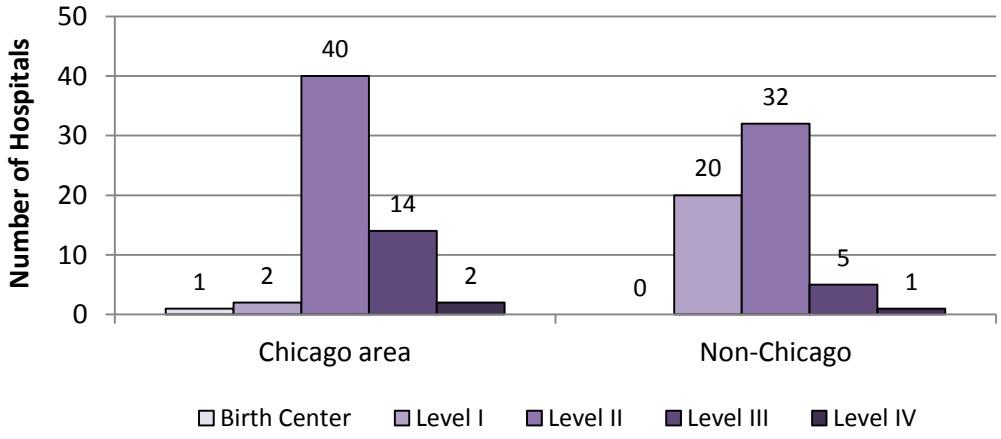
According to LOCATe, 72 of the 117 (62%) perinatal hospitals in Illinois that provide obstetric services are functioning at as a maternal level II hospital (Figure 1). There were additionally one facility that was rated as a birth center (due to a lack of 24/7 obstetric ultrasound services), 22 level I hospitals, 19 level III hospitals, and 3 level IV hospitals.

Figure 1. LOCATe Maternal Levels of Care, Illinois Perinatal Hospitals



There are similar numbers of hospitals in the Chicago area and outside Chicago (59 vs. 58 hospitals, respectively), but the distributions of maternal levels of care in these areas were significantly different (Figure 2). Chicago area perinatal networks had only three hospitals that were classified as a birth center or level I facility compared to twenty hospitals in the non-Chicago networks. The two groups had similar percentages of level II facilities. Chicago area perinatal networks had more hospitals classified as maternal levels III or IV.

Figure 2. Maternal Levels of Care by Perinatal Regional Network, LOCATe 2015



Nine out of the ten Illinois perinatal networks had at least one hospital that was a maternal level III or IV facility. The one network without a maternal level III/IV hospital had one facility that was very close to level III classification; this facility was missing only one service (interventional ultrasound available 24/7) needed to be classified as a maternal level III hospital.

Hospitals were asked to estimate their maternal level of care based on the 2015 ACOG/SMFM guidelines. These "self-assessments" of maternal levels of care were compared to the LOCATe results on maternal levels of care for each facility (see Table 5). Five hospitals responded that they did not know what their maternal level of care would be under ACOG/SMFM guidelines. Nearly 70% of hospitals had matching maternal levels of care between the LOCATe results and the self-assessment. Approximately one-fifth of hospitals self-rated their maternal level of care higher than the LOCATe results; if the LOCATe results are true, these facilities over-rated their level of care by at least one level. Only a small number of hospitals self-rated their maternal level of care lower than the LOCATe results.

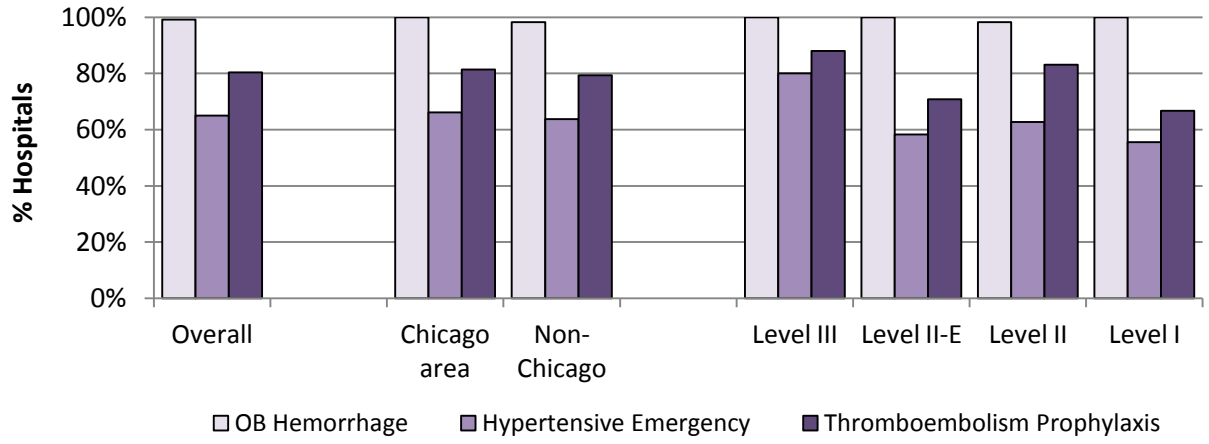
Table 5. Hospital Self-Assessment of Maternal Level of Care Compared to LOCATe Results

	n	%
Did Not Know How to Self-Assess	5	4%
LOCATe Level Higher Than Self-Assessment	6	5%
LOCATe Score Same As Self-Assessment	81	69%
LOCATe Score Lower Than Self-Assessment	25	21%

Written Protocols for Obstetric Events

Hospitals were asked to report whether their facility has written protocols in place for obstetric hemorrhage, hypertensive emergency, and/or thromboembolism prophylaxis. Respectively, 99%, 65%, and 80% of Illinois' delivery hospitals reported having these written protocols (Figure 3). In general, the percentage of hospitals with these written protocols did not substantially vary by geographic area or current IDPH perinatal designation.

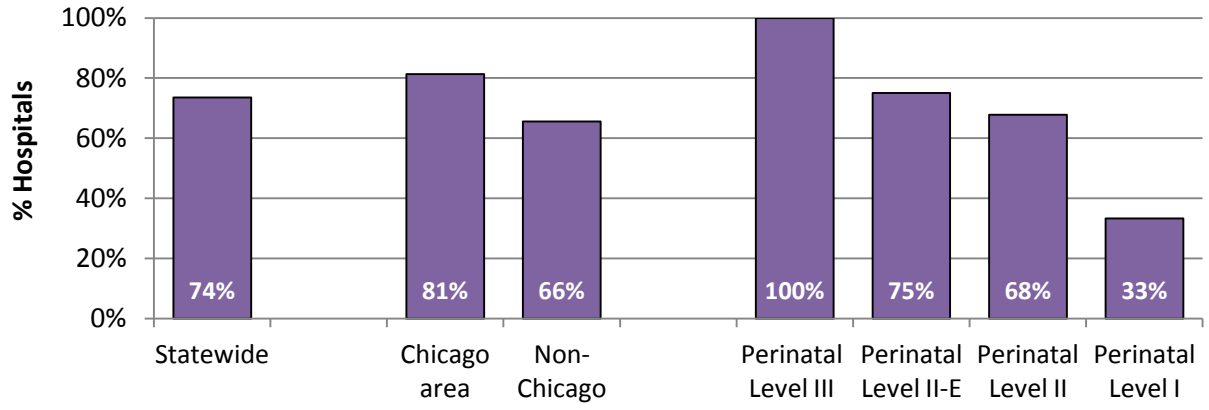
Figure 3. Percentage of Illinois Hospitals with Written Protocols for Obstetric Events



Critical Care for Obstetric Patients

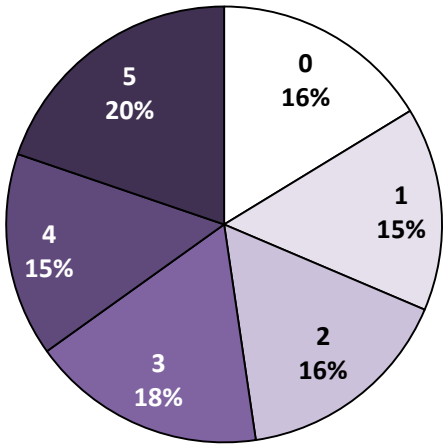
Figure 4 shows the percent of perinatal hospitals that provide critical care services for obstetric patients. Statewide, 74% of perinatal hospitals reported providing critical care services for obstetric patients. Chicago area (network # 1-6) facilities were more likely to provide critical care services than facilities outside the Chicago area (networks #7-10). All hospitals currently designated as level III perinatal facilities provided critical care services for OB patients, and the percent providing critical care services decreased as the IDPH perinatal designation decreased.

Figure 4. Percentage of Illinois Perinatal Hospitals Providing Critical Care Services to Pregnant Women



The resources available for obstetric critical care were further assessed to identify the extent to which hospitals are equipped to handle high-risk women requiring complex and intensive services. Based on the ACOG/SMFM guidelines for critical care in maternal level III and IV facilities, five critical care resources were defined: 1) Critical care specialist onsite 24/7, 2) Obstetric anesthesiology specialist available onsite 24/7, 3) Maternal-fetal medicine specialist on staff, 4) Neonatologist on staff, and 5) six specific specialists/sub-specialists available to be onsite for inpatient consultations (general surgeon, cardiologist, hematologist, nephrologist, infectious disease specialist, and neurologist).

Figure 5. Among Hospitals Providing Obstetric Critical Care Services, How Many of the Recommended Critical Care Resources Were Available?



Out of the 86 hospitals reporting provision of critical care services for obstetric patients, there was wide variation in the number of critical-care-related resources available (Figure 5). It was roughly evenly distributed across the spectrum of 0-5 resources: with 15-20% of hospitals in each category. Only 20% of hospitals providing critical care services for obstetric patients had all five of the resources needed to support critical care services at higher maternal levels of care. Additionally, 16% of hospitals providing obstetric critical care had zero of the five critical care resources.

Availability of each of the five critical care recommendations are further described in the text below, and in Figures 6 and 7.

Figure 6. Among Hospitals Providing Obstetric Critical Care (OB-CC), Percent with Recommended High-Risk Critical Care Resources

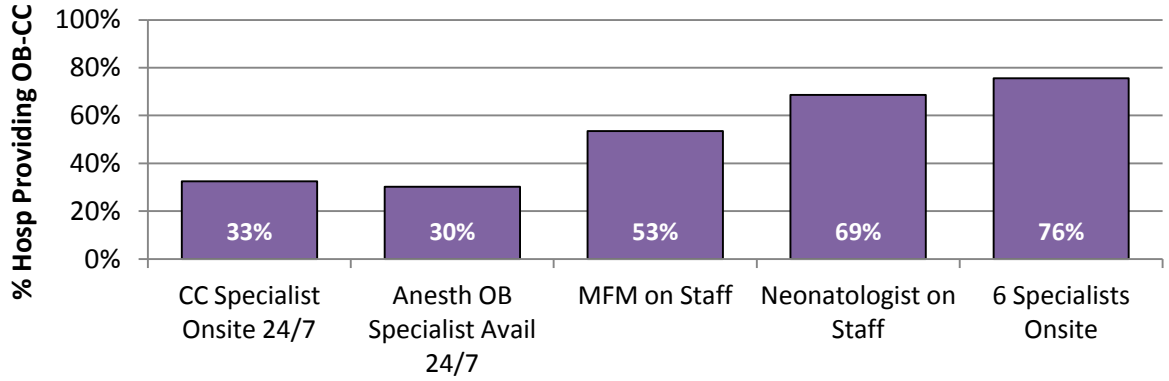
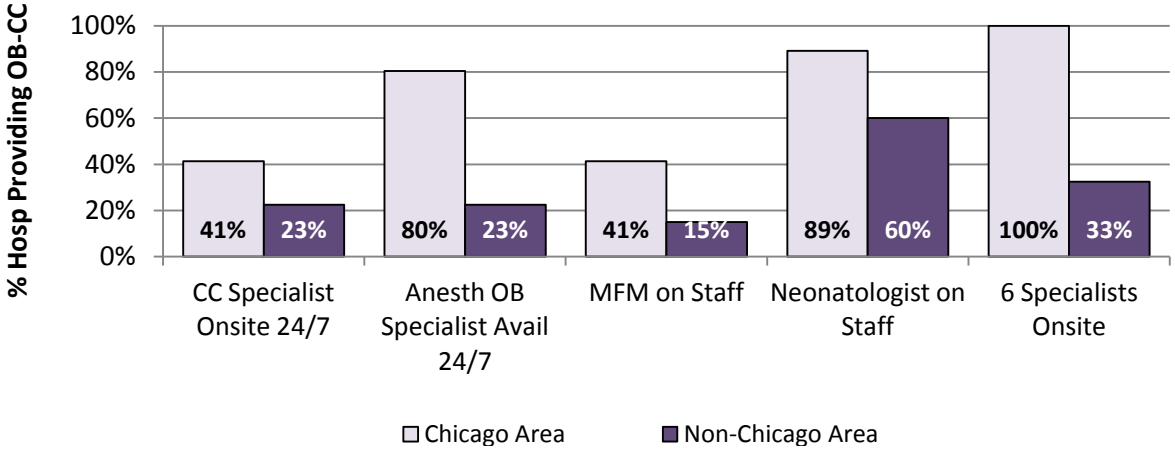


Figure 7. Among Hospitals Providing Obstetric Critical Care (OB-CC), Percent with Recommended High-Risk Critical Care Resources, By Geographic Region



Critical Care Specialist. In general, all hospitals reporting that they provide critical care services had a critical care specialist on staff, but the availability of these specialists varied across facilities. Only one-third of facilities providing critical care services for OB patients had a critical care specialist onsite 24/7 (a level IV requirement). An additional 38% of facilities had a critical care specialist available to be onsite 24/7, as needed. Of hospitals providing obstetric critical care services, Chicago area hospitals were more likely than hospitals outside the Chicago area to have a critical care specialist onsite 24/7.

Obstetric Anesthesiology. A requirement of all level III and IV facilities under the ACOG/SMFM guidelines is that anesthesia services are available at all times and that a board-certified anesthesiologist with special training/experience in obstetrics is in charge of obstetric anesthesia services. Only 29% of facilities providing critical care services met these criteria for OB

anesthesiology. Of hospitals providing obstetric critical care services, Chicago area hospitals were more likely than hospitals outside the Chicago area to have an anesthesiologist with obstetric training available 24/7.

Maternal-Fetal Medicine (MFM). The ACOG/SMFM guidelines specify that level III and IV facilities should have an MFM available at all times. About half of facilities providing critical care services reported that they had an MFM on staff. LOCATe did not ask about the onsite availability of these providers, so we could not explore the specific availability of MFM providers. Of hospitals providing obstetric critical care services, Chicago area hospitals were more likely to have an MFM on staff than the hospitals outside the Chicago area.

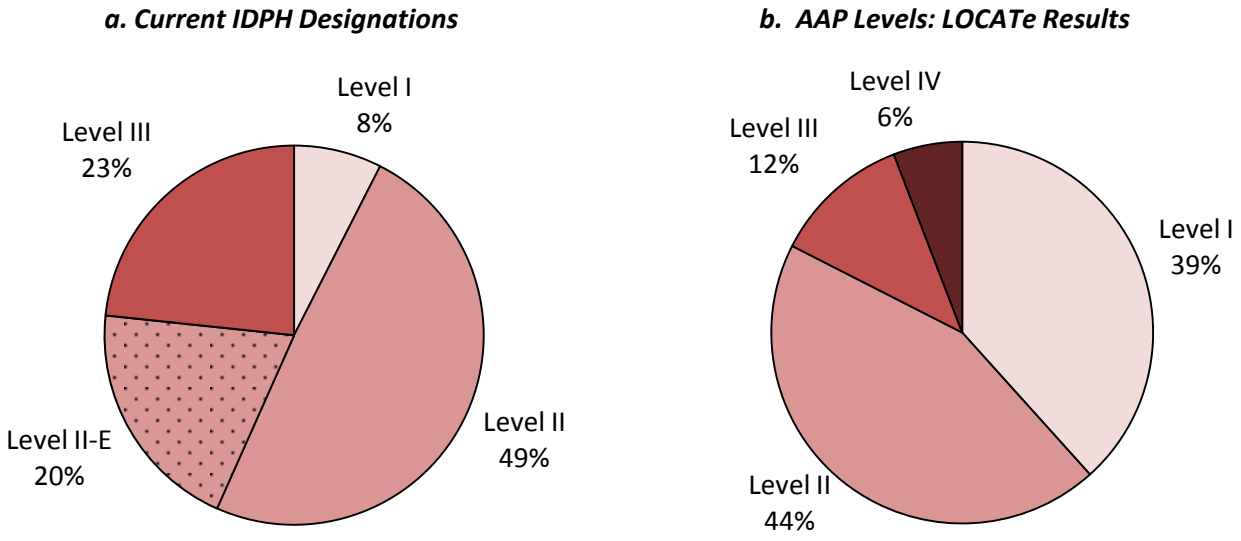
Neonatology. A neonatologist is one of the specialists specifically listed as necessary for maternal level III and IV facilities in the ACOG/SMFM guidelines. In Illinois, all hospitals have access to neonatology consults through the administrative perinatal centers, but not all facilities have their own staff neonatologist available for inpatient consultations. Of the facilities providing critical care services, 69% had a neonatologist on staff. Chicago area hospitals were more likely to have a neonatologist on staff than hospitals outside the Chicago area.

Specialist & Sub-Specialist Availability. According to the ACOG/SMFM guidelines, six other sub-specialists must be available for inpatient consultations in maternal level III and IV facilities. About three-quarters of facilities providing critical care services for obstetric patients reported that they had all six of these specialists available to be onsite. Of hospitals providing obstetric critical care services, Chicago area hospitals were more likely to have all six specialists available onsite than hospitals outside the Chicago area.

NEONATAL LEVELS OF CARE

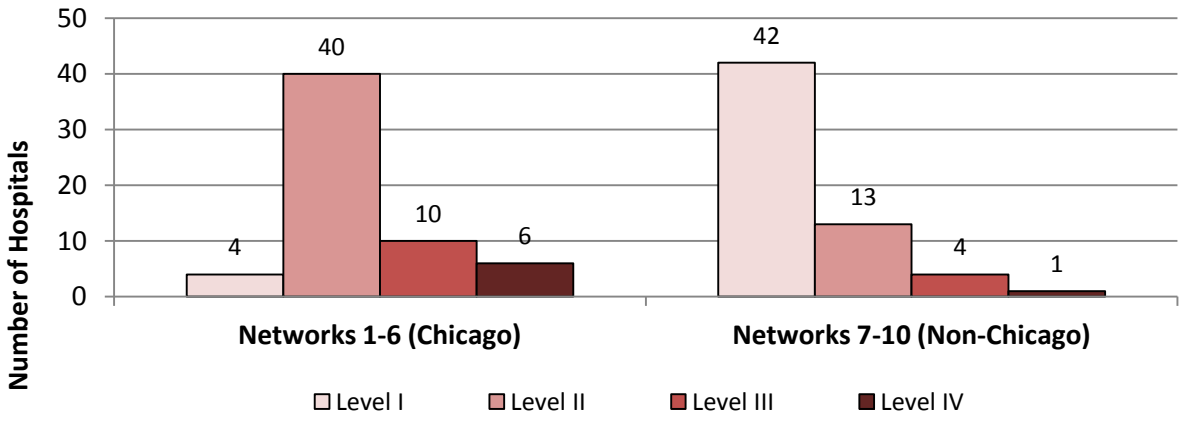
In the current Illinois system of 120 hospitals, 9 are level I, 59 are level II, 24 are level II-Extended (II-E), and 28 are level III. When the AAP levels of care were assessed by LOCATe, this translated into 46 level I facilities, 53 level II facilities, 14 level III facilities, and 7 level IV facilities (Figure 8).

Figure 8. Neonatal Levels of Care for Illinois Perinatal Hospitals



The distribution of neonatal levels of care varied by geographic area (Figure 9). In the Chicago area, there were four level I facilities, with about two-thirds of hospitals classified as level II. In contrast, outside the Chicago area, more than two-thirds of facilities were level I. Additionally, 75% of all the facilities assessed as AAP levels III and IV were located in the Chicago area. However, all ten of the state regionalized perinatal networks had at least one hospital that was classified as a neonatal level III or IV facility.

Figure 9. AAP Neoanatal Levels of Care by Perinatal Regional Network, LOCATe 2015



Hospitals were asked to estimate their neonatal level of care based on the 2012 AAP policy statement. These "self-assessments" of neonatal levels of care were compared to the LOCATe results on neonatal levels of care for each facility (Table 6). Five hospitals responded that they did not know what their maternal level of care would be under ACOG/SMFM guidelines. Sixty percent of hospitals had matching neonatal levels of care between the LOCATe results and the self-assessment. For those hospitals where the self-assessment differed from the LOCATe score, nearly all had self-rated their neonatal level of care higher than the LOCATe results. If the LOCATe results are true, these facilities over-rated their level of care by at least one level.

Table 6. Hospital Self-Assessment of Maternal Level of Care Compared to LOCATe Results

	n	%
Did Not Know How to Self-Assess	4	3%
LOCATe Level Higher Than Self-Assessment	1	1%
LOCATe Score Same As Self-Assessment	72	60%
LOCATe Score Lower Than Self-Assessment	43	36%

Table 7 describes the pattern between current IDPH designation and the neonatal level derived from LOCATe. For 58% of perinatal hospitals (69 facilities), the current perinatal designation and the LOCATe neonatal level of care were similar. Based on facilities' current IDPH designations, key findings include:

- **Level I:** all 9 hospitals were classified by LOCATe as AAP level I
- **Level II:** 22 of 59 (37%) facilities were classified as an AAP level II, all others (63%) were classified as an AAP level I.
- **Level II-E:** There is no direct match with the AAP levels, so level II was considered to be the closest match for these facilities. All level II-E facilities were assessed as an AAP level II.
- **Level III:** There was considerable variability in the level III facilities, with 7 (25%) assessed as AAP level II, 14 (50%) assessed as AAP level III, and 7 (25%) assessed as AAP level IV.

Table 7. Neonatal Level of Care for Illinois Hospitals: Comparing Current IDPH Designation and AAP

	LOCATe Maternal Level of Care				% Hosp with Matching IDPH Designation & AAP Neonatal LoC*
Current IDPH Designation	**Level I**	**Level II**	**Level III**	**Level IV**	
Level I	9	0	0	0	100 %
Level II	37	22	0	0	37 %
Level II-E	0	24	0	0	100 %
Level III	0	7	14	7	74 %

** "Matching" cells are highlighted*

The specific patterns of services and providers that influenced these patterns are further described on pages 15-16.

Resources and Staffing that Influenced LOCATe Results for Neonatal Level of Care

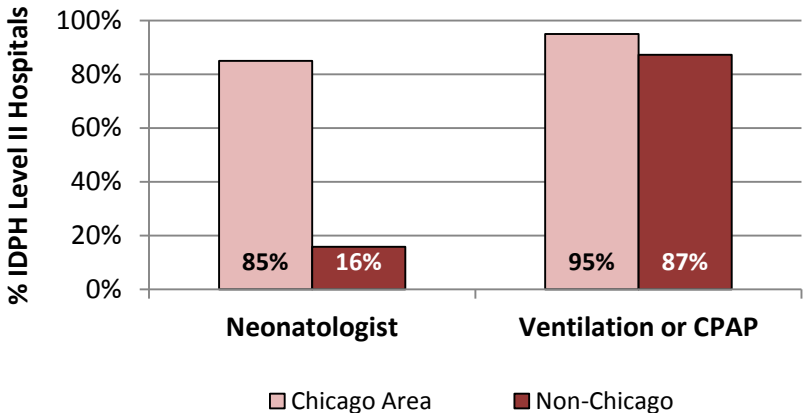
CURRENT IDPH LEVEL II FACILITIES

The two minimum criteria for a hospital to be classified by LOCATe as a level II were:

- have a neonatologist on staff AND
- have complex ventilation, conventional mechanical ventilation, and/or continuous positive airway pressure (CPAP) onsite for neonates.

Of current IDPH level II hospitals, only 37% met both criteria and were classified by LOCATe as a neonatal level II. The main service gap preventing hospitals from meeting the level II standard was not having a neonatologist on staff. Of current IDPH level II facilities, less than 40% have a neonatologist on staff, but 90% had ventilation or CPAP available onsite for neonates. Chicago area and non-Chicago network hospitals had similar availability of ventilation or CPAP, but non-Chicago area facilities were far less likely to have a neonatologist on staff (Figure 10).

Figure 10. Availability of AAP Level II Resources in Illinois Facilities Currently Designated as Level II



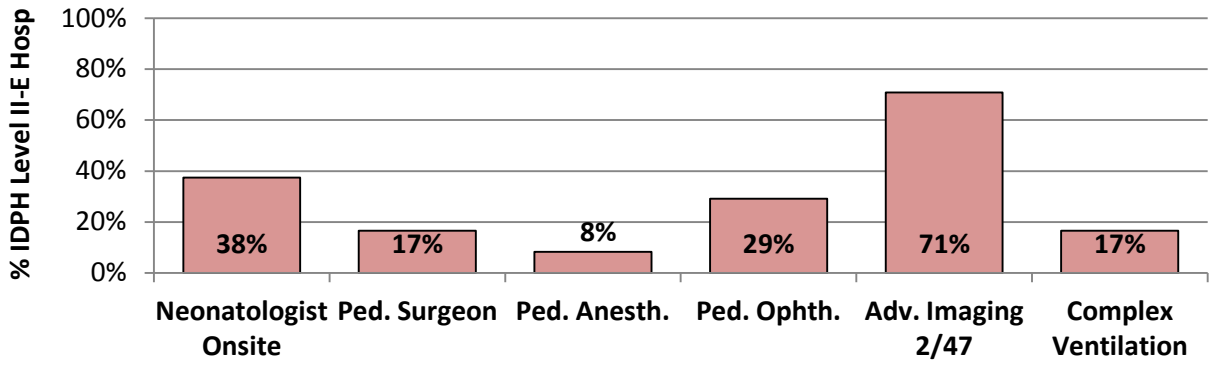
CURRENT IDPH LEVEL II-E FACILITIES

There were six minimum criteria for a hospital to be classified by LOCATe as a neonatal level III facility:

- neonatologist onsite
- pediatric surgeon on staff
- pediatric anesthesiologist on staff
- pediatric ophthalmologist on staff
- advanced imaging available 24/7
- complex ventilation available for neonates

None of the Illinois hospitals currently designated as level II-E had all six components available, so zero of these facilities were classified as neonatal level III by LOCATe. The highest number of components present in a level II-E facility was four, with an average of 1.8, out of six. The availability of these resources within current level II-E facilities is summarized in Figure 11.

Figure 11. Availability of AAP-Level III Resources in Illinois Facilities Currently Designated as Level II-E



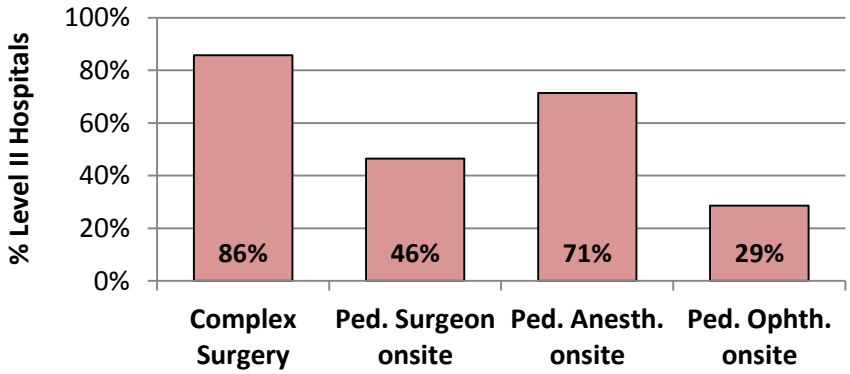
Of current IDPH level II-E facilities, the most common AAP level III resource that was available was advanced imaging 24/7 (71% of level II-E facilities). Each of the other five LOCATe criteria for level III were available in less than 40% of level II-E facilities, with pediatric surgeons, pediatric anesthesiologists, and complex ventilation being the least commonly available resources (<20% of level II-E facilities). Because nearly all level II-E facilities are located in the Chicago area, geographic variability could not be assessed.

IDPH LEVEL III FACILITIES

In addition to the level III resource requirements, there were four additional minimum criteria for a hospital to be classified by LOCATe as a level IV facility: 1) complex subspecialty **or** congenital cardiac surgery available for neonates, 2) pediatric surgeon located onsite, 3) pediatric anesthesiologist located onsite, and 4) pediatric ophthalmologist located onsite.

Figure 12 summarizes the availability of the level IV resources in current IDPH level III facilities. Of all IDPH level III facilities, 25% had all the resources to be a level IV in the LOCATe assessment. Most current level III's provide complex surgery for neonates (86%), while onsite pediatric surgeons, anesthesiologists, and ophthalmologists were less common (46%, 71%, and 29%, respectively). Four additional facilities would have been classified by LOCATe as neonatal level IV if they had had an onsite pediatric ophthalmologist.

Figure 12. Availability of AAP-Level IV Resources in Illinois Facilities Currently Designated as Level III



NEONATAL SURGICAL CAPACITY AND VOLUME

Complex Surgeries for Neonates

Twenty-four facilities reported they provide complex subspecialty surgery for neonates onsite. All of these facilities are currently designated by IDPH as level III facilities and are located throughout the state. Of these facilities, all but one (96%) reported doing at least ten complex neonatal surgeries per year.

Congenital Cardiac Surgeries

Eleven facilities reported providing congenital heart surgeries for neonates onsite. All of these facilities are currently designated by IDPH as level III facilities. All but one of the eleven facilities were located in the Chicago area or the St. Louis area. Eight of the eleven facilities (72%) reported doing at least 10 congenital cardiac surgeries on neonates per year.

Surgical Resources

Of the twenty-four facilities offering complex subspecialty surgery for neonates, 100% reported having a pediatric surgeon on staff, a pediatric anesthesiologist on staff, and advanced imaging available 24/7. All but one of the twenty-four facilities (96%) reported having a pediatric radiologist on staff. The specific timing of availability for the specialist providers is shown below in Table 8.

Table 8. Availability of Pediatric Specialist Providers in Illinois Facilities Reporting Providing Complex Surgery Services for Neonates

Specialist Availability	Pediatric Surgeon	Pediatric Anesthesiologist	Pediatric Radiologist
Onsite	12	18	13
Within 30 Minutes	7	4	6
30-60 Minutes	4	2	2
>60 Minutes	1	0	0
Telemedicine only	0	0	2

Geographic Access to Level III Neonatal Facilities

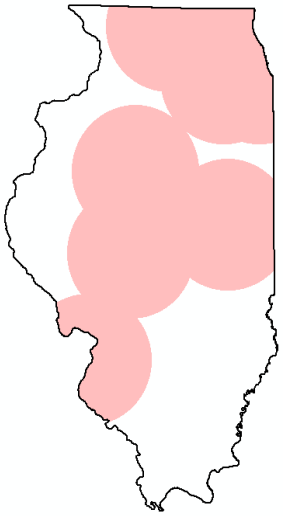
Geographically, access to facilities is very similar under the current perinatal system and the potential AAP neonatal levels of care (Table 9). When a 50-mile radius is used from the residential zip code of deliveries, the percentage of births occurring to residents in the highest level facility service areas would not change under the AAP levels of care (Figure 13). Ninety-four percent of all births in Illinois are to women who reside in zip codes within 50 miles of a Level III facility (whether determined by the IDPH designation or LOCATe neonatal levels).

In the regions outside the Level III 50 mile radii (white spaces on the map), if AAP neonatal levels were adopted in Illinois, the highest level of access would likely shift from mostly level II-E to mostly level II. However, even with the possibility of many facilities shifting to neonatal Level I, only 1% of births were to residents of zip codes where a Level I facility was the only level of care within 50 miles.

Table 9. Percent of Births, By Distance from Residential Zip Code to Highest Neonatal Level of Care Available in Geographic Area, 2014-2015

% births within 50 miles	*IDPH Designation*	*AAP Neonatal Levels of Care*
Level III or IV	94%	94%
Level II-E	4%	*n/a*
Level II	2%	5%
Level I	0%	1%

Figure 13. 50-Mile Radii from Neonatal Level III/IV Facilities



Distance to a level III facility is particularly pertinent for determining whether very low birth weight infants are delivered in a risk-appropriate facility. According to AAP, all infants <1500 grams should be delivered in a level III facility. As shown in Table 10, the farther a woman lived from an IDPH level III facility, the less likely her very low birth weight infant would be delivered in a level III facility.

Table 10. Percent of Very Low Birth Weight (VLBW) Births (500-1499g) Delivered in a Level III Facility, By Distance from Residential Zip Code to Nearest Level III Facility, 2014-2015

Residential Zip code Distance to Level III	# VLBW Births	# VLBW in IDPH Level III	% VLBW in IDPH Level III
<10 miles	2782	2356	84.7%
10-24 miles	592	421	71.1%
25-49 miles	368	253	68.8%
≥50 miles	192	90	46.9%

Potential Impact on Facility Delivery Volume

Table 11 summarizes the number of facilities impacted, the changes in patient population, and the resulting theoretical change in patient volume experienced by various facilities if the AAP guidelines were adopted. These values are **estimates** based on the patient population that delivered in Illinois facilities during 2014 and 2015, assuming that all women would choose to deliver in the hospital closest to their home if it were a risk-appropriate facility for their infant's gestational age. These numbers likely represent the most liberal estimate of how facility volumes would change.

Table 11. Potential Impact of AAP Neonatal Levels of Care on Facility Delivery Volume

IDPH Designation	AAP-Neonatal Level	# Facilities Impacted	Change in Patients Under AAP Guidelines	% Change in Total Facility Delivery Volume	Avg Annual # Infants Per Facility	Approx Annual # Infants Impacted Statewide
Level I	Level I	9	Can care for infants 35-36 weeks gestation	+ 8.9 %	+ 17	150
Level II	Level I	37	Cannot care for infants 32-34 weeks gestation	- 1.2 %	- 8	295
Level II-E	Level II	24	Cannot care for infants <30-31 weeks gestation	- 0.3 %	- 5	120
Level III	Level II	7	Cannot care for infants <32 weeks gestation	- 1.7 %	- 50	350

All nine of the current IDPH level I facilities were also classified as AAP level I facilities by LOCATe. The AAP guidelines allow Level I's to care for healthy infants with a gestational age of at least 35 weeks, which is currently outside their scope of the care. If women who lived closest to these facilities delivered their 35-36 week infants at these level I facilities, the annual delivery volume would increase by an average of 8.9% (17 patients annually) per facility.

Thirty-seven of Illinois' fifty-nine (63%) current level II facilities were classified as a level I under the AAP neonatal levels of care guidelines. If this shift in level occurred, these facilities would need to transport deliveries at 32-34 weeks gestation to higher level facilities. On average, this would result in a delivery volume decrease of 1.2% (8 patients annually) per impacted facility.

All of Illinois' current level II-E facilities were classified by LOCATe as AAP level II. Under the AAP guidelines, these facilities would be able to care for infants at least 32 weeks gestation, and would therefore need to transport deliveries 30-31 weeks gestation to higher level facilities. On average, this would result in a delivery volume decrease of 0.3% (5 patients annually) per facility.

Seven of Illinois' current level III facilities were assessed as AAP level II. This would reduce the range of gestations that could be delivered in these facilities, eliminating their ability to care for infants <32 weeks gestation. On average, this would result in a delivery volume loss of 1.7% (50 patients annually) for these seven impacted IDPH level II facilities.

CONCORDANCE OF MATERNAL AND NEONATAL LEVELS OF CARE

The ACOG/SMFM consensus statement creates maternal levels of care that are independent of neonatal levels of care. Therefore, it would not be expected that the maternal and neonatal levels would align, as some facilities may have more resources and expertise in caring for either high-risk women or babies.

Despite this, it is of interest to know about the level of concordance or discordance of maternal and neonatal levels of care. This information would be helpful for ensuring that transport policies are designed to account for the medical needs of both the woman and her infant. Both maternal and neonatal risk levels would need to be assessed to inform transport to an appropriate facility.

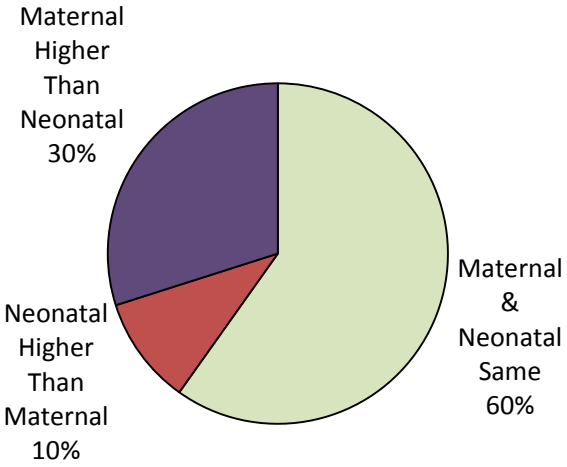
Table 12 and Figure 14 show the matching between the maternal and neonatal levels of care assessed by LOCATe (for the 117 hospitals providing obstetric care). According to LOCATe, 70 hospitals (60%) had the same maternal and neonatal levels of care, 12 hospitals (10%) had a higher level of neonatal care than maternal care, and 35 hospitals (30%) had a higher level of maternal care than neonatal care.

Table 12. Illinois Perinatal Hospitals by LOCATe Maternal and Neonatal Levels of Care

		Neonatal Level			
		I	II	III	IV
Maternal Level	BC	0	1	0	0
	I	19	3	0	0
	II	27	41	3	1
	III	0	6	9	4
	IV	0	1	1	1

Shaded cells are facilities with same levels of maternal and neonatal care.
Cells above the shaded line represent facilities where the neonatal level was higher than the maternal level.
Cells below the shaded line represent facilities where the maternal level was higher than the neonatal level.

Figure 14. Illinois Perinatal Hospitals by LOCATe Maternal and Neonatal Levels of Care



IMPACT OF HOSPITAL RESOURCES ON NEONATAL MORTALITY

Overall Level of Care

The scientific literature has well established the impact of perinatal regionalization on infant mortality, especially among very low birth weight (VLBW) and very preterm (VPT) infants. A meta-analysis from 2010 showed that VLBW and VPT infants who are born in Level III facilities have reduced infant mortality than those infants born outside Level III facilities (Lasswell, Barfield, Rochat, & Blackmon, 2010).

Table 13 shows how neonatal mortality for VLBW infants varies according to the current IDPH designations. After controlling for birth weight and the presence of any congenital anomalies, VLBW infants born in level II and II-E facilities had significantly higher mortality rates than those born in level III facilities. The first-day and neonatal mortality rates for VLBW infants born in level II facilities were respectively 350% and 300% higher than those for VLBW infants born in level III facilities. For VLBW infants born in level II-E facilities, the first-day mortality rate was 320% higher, and the neonatal mortality rate was 155% higher, than the rates for VLBW born in level III facilities.

For both first-day and neonatal mortality, there were no significant differences in the adjusted mortality rates between VLBW infants born in level II and level II-E facilities.

Hospital Variation within IDPH Level II/II-E Facilities

Table 14 explores variations in hospital characteristics and resources within current IDPH level II and II-E facilities, and the impact of these factors on first-day and neonatal mortality among low birth weight infants. The odds ratios in this table adjust for factors indicating the severity of an infant's medical needs, i.e., birth weight and the presence of any congenital anomalies.

For both first-day and neonatal mortality, current IDPH level II facilities classified as neonatal level I by LOCATe had significantly higher mortality rates for LBW infants than level II-E facilities. The first-day and neonatal mortality rates for LBW infants born in IDPH level II facilities that were classified by LOCATe as neonatal level II were not significantly different from those of LBW infants born in IDPH level II-E facilities.

Within level II and II-E facilities, the first-day and neonatal mortality rates were not significantly different by volume of LBW infants delivered. However, the first-day and neonatal mortality rates among LBW infants born in low LBW volume hospitals appears to be qualitatively higher than the rates in hospitals with higher LBW volumes. This suggests a possible association, though further analysis will be needed when more years of data can be combined to improve statistical power.

Table 14 also demonstrates the importance of a neonatologist for reducing mortality among LBW infants born in level II and II-E facilities. Compared to facilities that had a neonatologist on staff, the infants born in facilities with no neonatologist on staff had 90% increased risk of first-day mortality and 150% increased risk of neonatal mortality.

Table 13. Impact of Current IDPH Designation on First-Day and Total Neonatal Mortality among Very Low Birth Weight Infants (500-1499g), 2014 Births

		FIRST DAY MORTALILTY					NEONATAL MORTALILTY				
IDPH Perinatal Designation	**# VLBW Births**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**
Level II	172	26	151.2	4.47	(2.57 - 7.76)	**<0.001**	42	244.2	3.99	(2.52 - 6.31)	**<0.001**
Level II-E	190	23	121.1	4.20	(2.37 - 7.44)	**<0.001**	31	163.2	2.55	(1.57 - 4.15)	**<0.001**
Level III	1,626	69	42.4	ref	-	**-**	143	88.0	ref	-	**-**
** adjusted for infant medical need severity (birth weight and congenital anomalies)*											

Table 14. Impact of IDPH Level II and II-E Hospital Resources on First-Day and Neonatal Mortality among Low Birth Weight Infants (500-2499g), 2014 Births

		FIRST DAY MORTALILTY					NEONATAL MORTALILTY				
Hospital Characteristic or Staffing Resource	**# LBW Births**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**
Current II, LOCATe Level I	1221	22	18.0	2.10	(1.07 – 4.12)	**0.031**	36	29.5	2.84	(1.58 – 5.12)	**0.001**
Current II, LOCATe Level II	1277	13	10.2	0.89	(0.41 – 1.95)	0.761	22	17.2	1.19	(0.61 – 2.32)	0.611
Current II-E, LOCATe Level II	2225	26	11.7	ref	-	-	37	16.6	ref	-	-
<3 LBW babies per month	717	14	19.5	1.73	(0.71 – 4.23)	0.227	20	27.9	1.95	(0.88 – 4.32)	0.101
3-9 LBW babies per month	3137	34	10.8	0.91	(0.44 – 1.92)	0.811	57	18.2	1.23	(0.65 – 2.36)	0.526
10+ LBW babies per month	869	13	15.0	ref	-	-	18	20.7	ref	-	-
No Neonatologist on staff	1159	41	11.5	1.90	(1.00 – 3.61)	**0.049**	34	29.3	2.53	(1.46 – 4.37)	**0.001**
Neonatologist on staff	3564	20	17.3	ref	-	-	61	17.1	ref	-	-
** adjusted for infant medical need severity (birth weight and congenital anomalies)*											

Hospital Variation within IDPH Level III Facilities

Table 15 explores variations in hospital characteristics and resources within current IDPH level III facilities, and the impact of these factors on first-day and neonatal mortality among low birth weight infants. The odds ratios in this table adjust for factors indicating the severity of an infant's medical needs, i.e., birth weight and the presence of any congenital anomalies.

Current level III facilities were assessed by the LOCATe survey to be neonatal level II, III, or IV facilities. For first day mortality, the VLBW infants born in facilities that were classified by LOCATe as level II had significantly increased mortality than the VLBW infants born in LOCATe level IV facilities. There were no significant differences in the first-day mortality for VLBW infants born in LOCATe level III and IV facilities. However, infants born in both LOCATe level II and III facilities had significantly increased risk for neonatal mortality compared to VLBW infants born in LOCATe level IV facilities.

Low volume of VLBW deliveries, not having a neonatologist onsite at all times, and not having a pediatric surgeon available onsite at all times were not significantly associated with first-day or neonatal mortality rates for VLBW infants born in level III facilities. Not having a pediatric anesthesiologist available onsite at all times was significantly associated with increased first-day mortality for VLBW infants, but not for neonatal mortality. However, for all of these hospital characteristics, the patterns in mortality consistently pointed towards higher mortality rates for VLBW born in in lower volume facilities, and in facilities with lower staffing resources. For nearly all of these relationships, the association neared statistical significance (p values in the range of 0.06 to 0.15), but further analysis with larger sample size is needed to increased statistical power and provide stronger evidence for this association. The fact that the associations were consistent and neared significance, despite small sample sizes with only one year of mortality data, suggests that these relationships are worth further study and consideration.

Table 15. Impact of IDPH Level III Hospital Resources on First-Day and Total Neonatal Mortality among Very Low Birth Weight Infants (500-1499g), 2014 Births

		FIRST DAY MORTALILTY					NEONATAL MORTALILTY				
Hospital Characteristic or Staffing Resource	**# VLBW Births**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**	**# Deaths**	**Deaths per 1000 Births**	**OR***	**95% CI**	**p value**
LOCATe Level II	378	20	52.9	2.09	(1.01 – 4.35)	**0.049**	35	92.6	1.76	(1.03 – 3.02)	**0.040**
LOCATe Level III	771	31	40.2	1.39	(0.71 – 2.70)	0.334	74	96.0	1.82	(1.14 – 2.90)	**0.012**
LOCATe Level IV	477	18	37.7	ref	-	-	34	71.3	ref		-
<5 VLBW babies / month	342	18	52.6	1.45	(0.77 – 2.74)	0.246	38	111.1	1.52	(0.98 – 2.36)	0.064
5+ VLBW babies / month	1284	51	39.7	ref	-	-	105	81.8	ref	-	-
No Neonatologist onsite	175	11	62.9	1.73	(0.83 – 3.62)	0.143	22	125.7	1.61	(0.94 – 2.75)	0.081
Neonatologist onsite	1451	58	40.0	ref	-	-	121	83.4	ref	-	-
No Ped. Surgeon Onsite	677	33	48.7	1.53	(0.89 – 2.61)	0.123	66	97.5	1.38	(0.95 – 2.01)	0.095
Pediatric Surgeon Onsite	949	36	37.9	ref	-	-	77	81.1	ref	-	-
No Ped. Anesthesiologist Onsite	429	22	51.3	1.82	(1.01 – 3.25)	**0.045**	40	93.2	1.40	(0.92 – 2.14)	0.118
Pediatric Anesthesiologist Onsite	1197	47	39.3	ref	-	-	103	86.0	ref	-	-

** adjusted for infant medical need severity (birth weight and congenital anomalies)*

POTENTIAL APPLICATIONS

This report is a first step towards evaluating how changes to the Illinois perinatal system could potentially impact hospitals, women, and babies. However, there are many details about maternal and neonatal levels of care that would require further discussion and decision-making by Illinois.

First, there are elements of the AAP/ACOG/SMFM policy statements that are flexible or not precisely defined. The interpretation taken by the LOCATe survey may not be the only interpretation of these policy statements. For instance, one area of flexibility is the interpretation of the AAP policy statement related to level II neonatal providers, which AAP lists as "pediatric hospitalists, neonatologists, and neonatal nurse practitioners." The Illinois version of LOCATe only asked about the presence of neonatologists (not pediatric hospitalists or nurse practitioners), therefore assessing hospitals only according to one of the potential resource requirements for level II. This may be an area of flexibility that could be utilized to support neonates in rural parts of the state. In addition, the ability of LOCATe to distinguish level III from level IV (for both maternal and neonatal care) may be limited because the survey included only a basic assessment of sub-specialist availability and surgical capacity. For many issues in the policy statements, Illinois would need to decide how to handle the resource requirements that are left open-ended, vague, or flexible.

Secondly, the assessments of maternal and neonatal levels of care in this report should be taken as approximations, not rigid, absolute findings. LOCATe is not a comprehensive assessment of every element of the ACOG/SMFM and AAP policy statements, but was instead intended to capture some of the major components influencing level determination. Additionally, as with all surveys, the findings may be subject to reporting errors based on who at the facility completed LOCATe. If Illinois were to proceed with changing the state perinatal system, more detailed assessment of hospitals policies, staffing, and resources would be needed to establish a facility's true level of care. Site visits, like the process currently established for facility designation and re-designation, would serve as the gold standard for assessing and determining a facility's level of care.

Furthermore, even if the LOCATe assessments are "correct", the findings represent only a snapshot in time. IDPH will provide hospitals with feedback on their LOCATe results to allow for internal discussions about resources and how to meet the criteria for the desired level of maternal or neonatal care. For instance, a hospital that scored as a LOCATe neonatal level II only because they were missing an onsite neonatologist may choose to alter a contract to ensure onsite coverage 24/7 and therefore be eligible for level III status.

Finally, the levels of care discussion should not be focused solely on individual facilities. There are also other infrastructure improvements related to Illinois' perinatal regionalization that could be made to positively impact women, babies, and families. For example, ensuring appropriate transport and back-transport is an essential component of improving the perinatal system. There are also efforts underway at IDPH to assess risk-appropriate care for very preterm infants and to identify the barriers to ensuring that babies are delivered in the appropriate level facility. There may be opportunities for intervention at the patient, provider, facility, and system levels to improve the system of transports prior to delivery. Additionally, back-transport of infants from level III to lower level hospitals closer to the infant's home remains a challenge in Illinois. Enabling a robust system of back-transport would benefit level III facilities by freeing up NICU beds for very sick infants, benefit lower level facilities by enabling them to provide care (and receive reimbursement) for stable infants, benefit families by enabling them to return to their community, and benefit payers by allowing infants to be cared for in lower reimbursement hospitals.

References

AAP (2012). Levels of Neonatal Care. *Pediatrics , 130* (3), 587-597.

ACOG and SMFM (2015). Levels of Maternal Care. *Obstetric Care Consensus , 2*.

Lasswell, S., Barfield, W., Rochat, R., & Blackmon, L. (2010). Perinatal regionalization for very low birth weight and very preterm infants: a meta-analysis. *JAMA , 304* (9), 992-1000.