

Supplementary Online Content

Rysavy MA, Horbar JD, Bell EF, et al. Assessment of an updated Neonatal Research Network extremely preterm birth outcome model in the Vermont Oxford Network. *JAMA Pediatr*. Published online March 2, 2020. doi:10.1001/jamapediatrics.2019.6294

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eTable 1. Resources Utilized per Surviving Infant by Probability of Survival

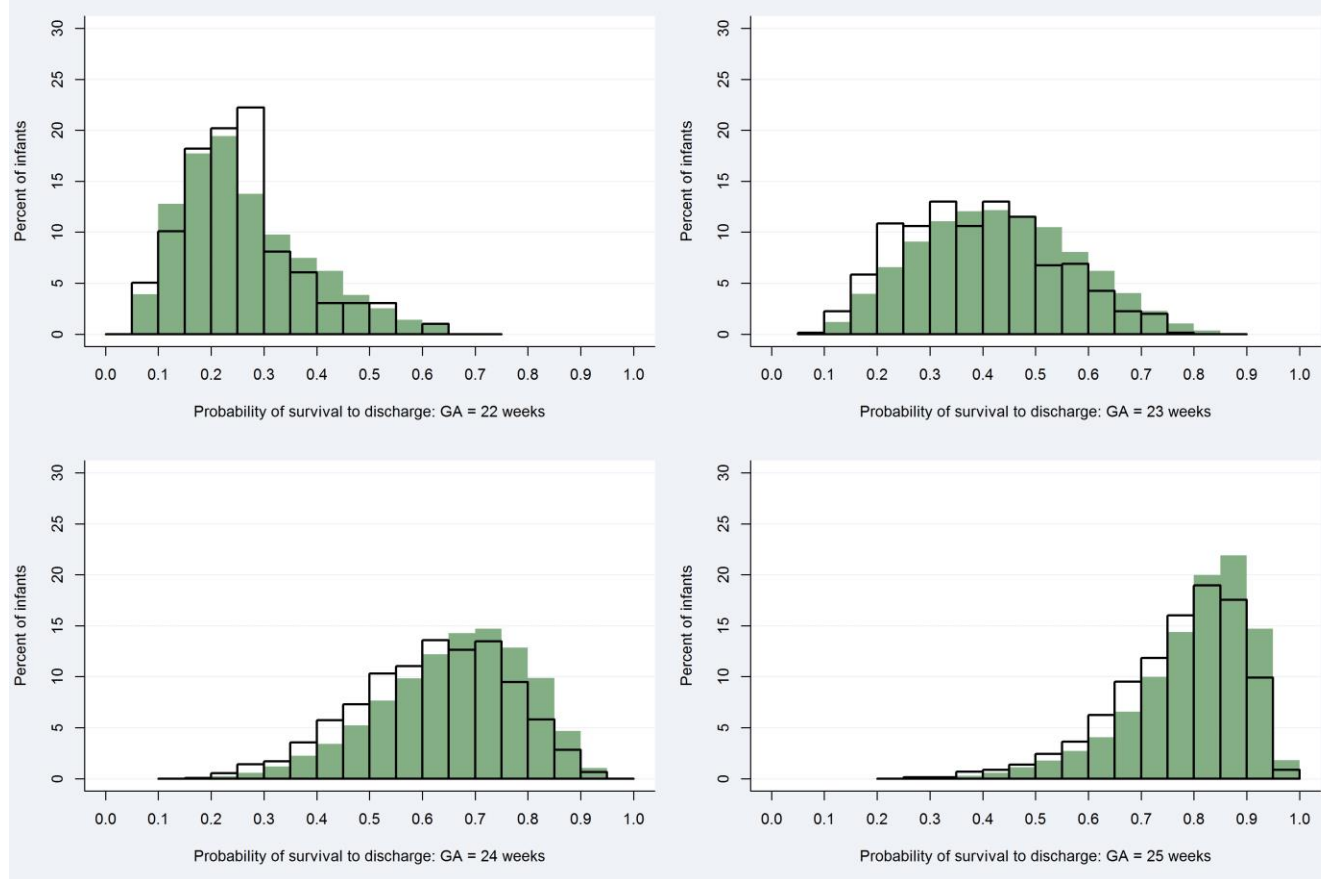
eTable 2. Neurodevelopmental Outcomes Among Infants at Follow-up by Probability of Survival

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eAppendix. List of Participating Hospitals in the Vermont Oxford Network

This supplementary material has been provided by the authors to give readers additional information about their work.

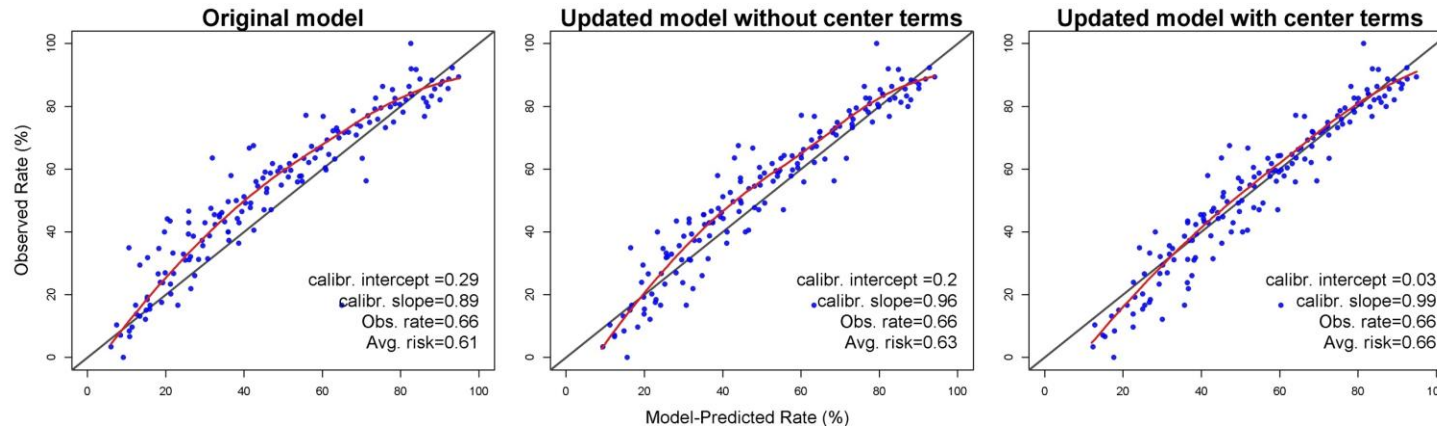
eFigure 1. Estimated survival probabilities in the NRN and VON 2006-2012 cohorts, by gestational age at birth



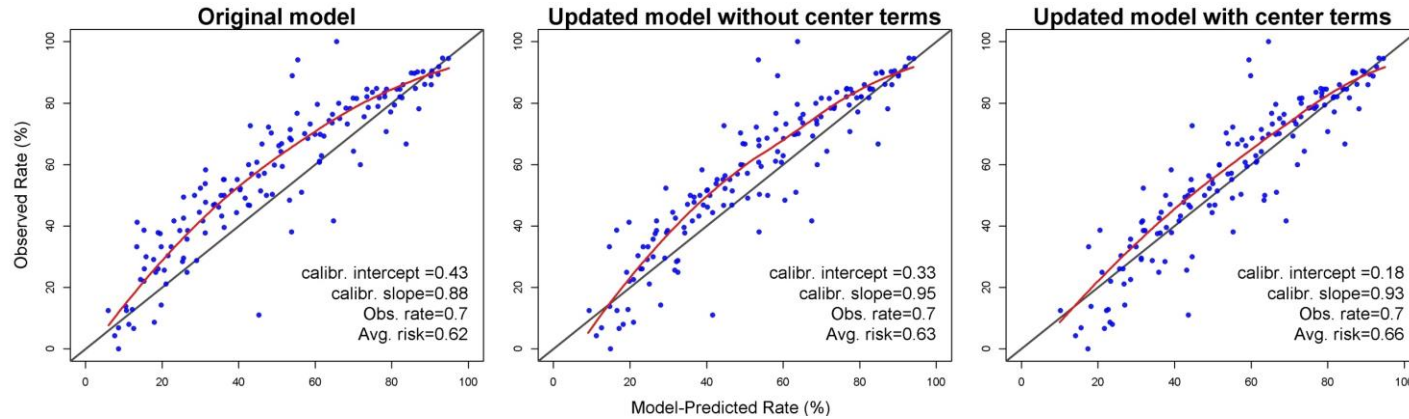
Histograms represent the percentages of infants at each gestational age with a given estimated probability of survival. White bars represent the NRN cohort. Green bars represent the VON cohort. GA=gestational age

eFigure 2. Model calibration plots

VON 2006-2012:



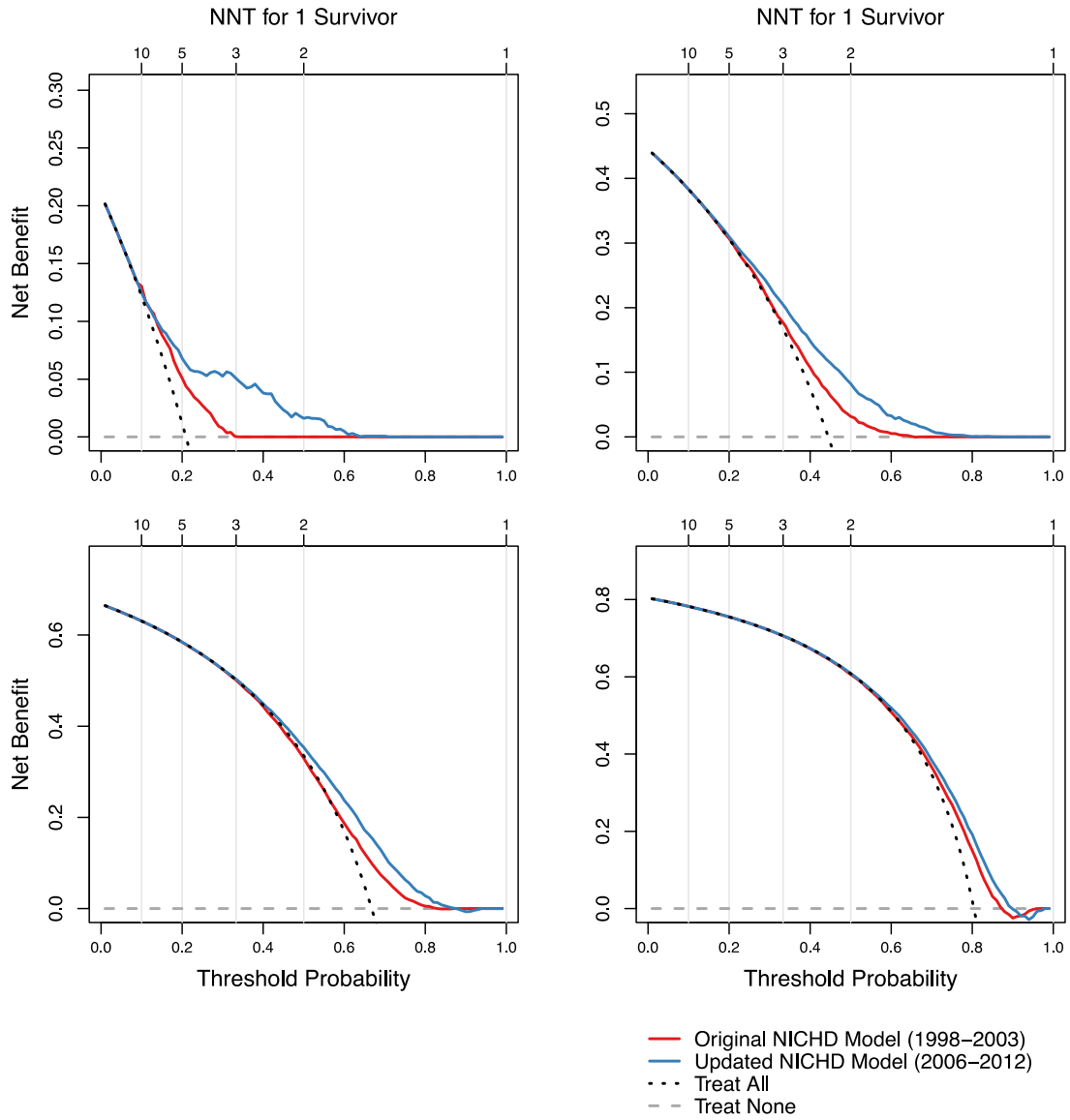
VON 2013-2016:



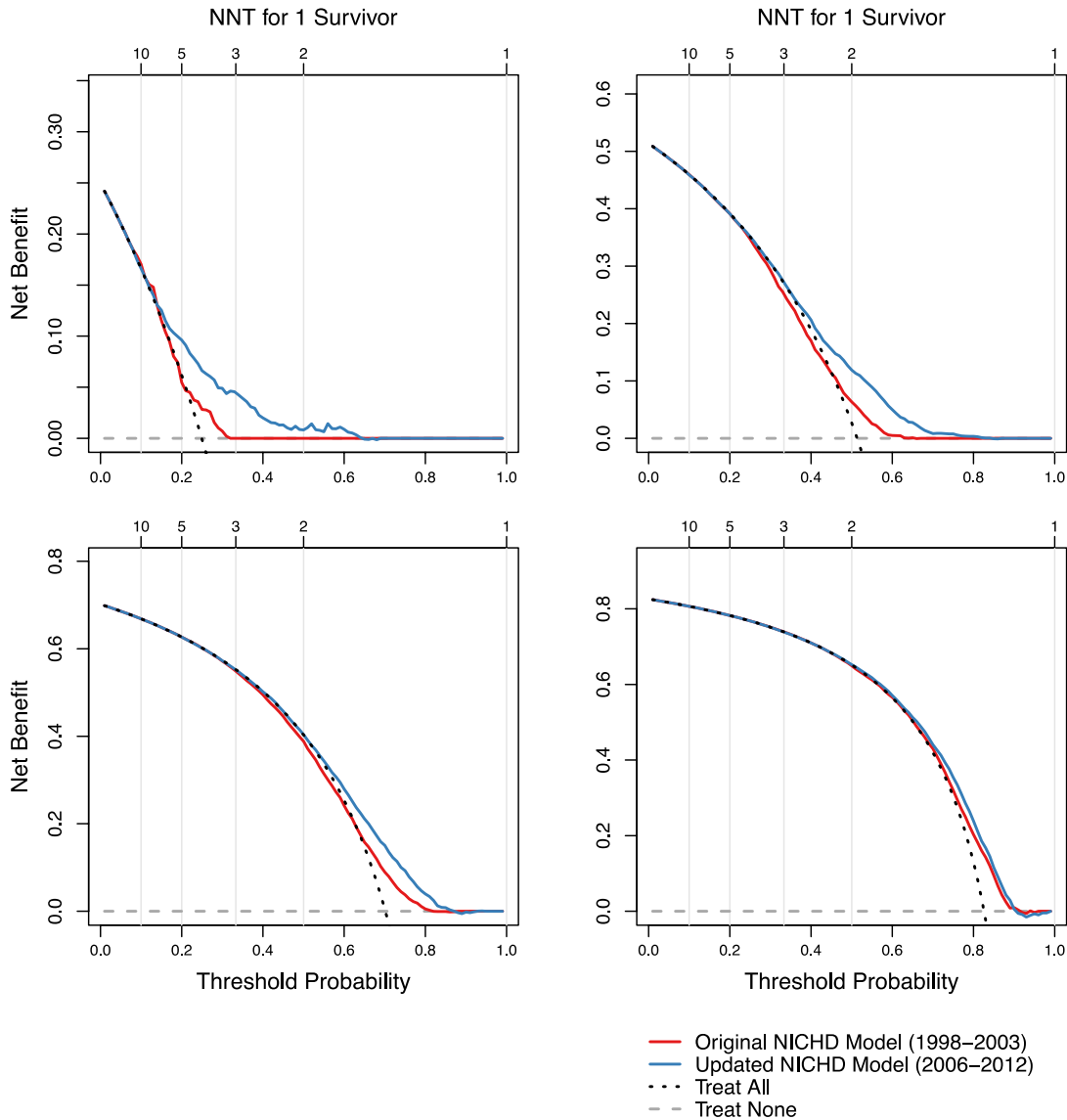
Calibration plots are based on the 160 covariate combinations with at least 5 infants in each. Combinations were based on gestational age week, birthweight (increments of 100 g), infant sex, plurality, and antenatal corticosteroids.

eFigure 3. Decision curve analyses

VON 2006-2012:



VON 2013-2016:

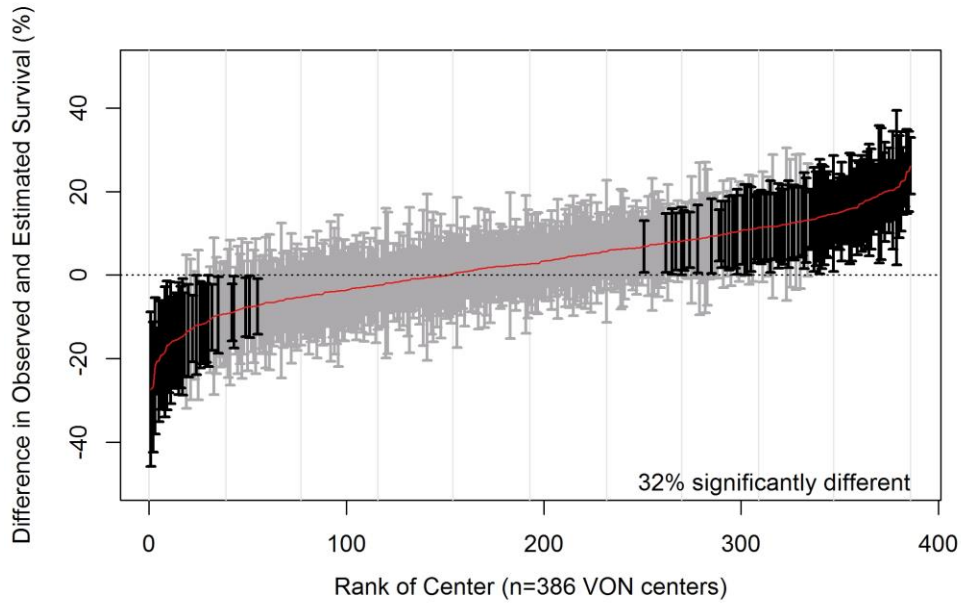


Threshold probability refers to the estimated probability of survival at and above which treatment would be offered. Predictive net benefit refers to the relative gain in the number of survivors compared to the number of treated infants not surviving when infants with an estimated probability of survival at or above the threshold probability are treated. Predictive net benefit was calculated as the difference in the proportion of treated infants who survive (“true positives”) and treated infants who do not survive (“false positives”) weighted by the value placed on the acceptable number of treated infants who survive (in this model, considered a benefit) relative to those treated who do not survive (in this model, considered a harm). Mathematically, this was represented as: $[\text{proportion of treated infants surviving}] - [(\text{proportion of treated infants not surviving}) \times (\text{threshold probability}) / (1 - \text{threshold probability})]$. For example, a threshold probability of 20% (i.e., where infants with predicted probabilities of survival $\geq 20\%$, or 1/5, would be treated), represents that, for treating one infant who survives, it would be acceptable to treat up to 4 infants who do not survive (1 - threshold probability = 80%). Because the acceptable number of treated infants who survive relative to those treated who do not survive varies among individuals, the full range of potential threshold probabilities is presented.

The decision curve analysis provides information on model performance (accounting for “true positives” and “false positives”) at a range of potential threshold probabilities. The highest curve at any threshold probability reflects that the method is the superior decision-making strategy relative to comparators in terms of balancing benefit (treating surviving infants) and harm (treating infants who do not survive) as described by the model.

NNT=number needed to treat

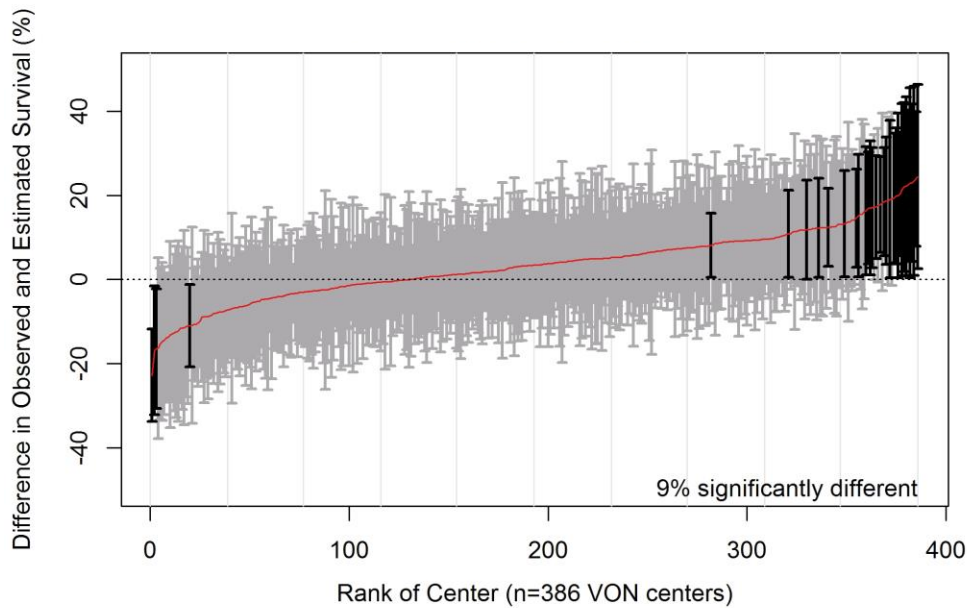
eFigure 4. Differences in observed and expected outcomes in 2006-2012 by hospital, without accounting for hospital differences



A total of 386 VON hospitals (of 637 hospitals contributing data to the study) contributed >20 infants the study period and were included in this analysis. These hospitals represent 88% of infants in the study validation cohort.

Hospitals are shown along the x-axis in rank order from least to greatest observed minus model-estimated (O-E) survival. The red line represents the point estimate of the O-E survival rate for each hospital. Hospitals with 95% confidence intervals shown in grey showed no significant difference in observed and model-estimated outcomes; hospitals with 95% confidence intervals in black do not overlap zero difference.

eFigure 5. Differences in observed and expected outcomes in 2013-2016 by hospital, using hospital-specific intercepts derived 2006-2012



Hospital-specific model intercepts were derived from 2006-2012 data and applied to the 2013-2016 cohort to assess model stability of these hospital-specific terms. The same 386 hospitals are included in both time periods.

Hospitals are shown along the x-axis in rank order from least to greatest observed minus model-estimated (O-E) survival. The red line represents the point estimate of the O-E survival rate for each hospital. Hospitals with 95% confidence intervals shown in grey showed no significant difference in observed and model-estimated outcomes; hospitals with 95% confidence intervals in black do not overlap zero difference.

eTable 1. Resources utilized per surviving infant by probability of survival

Probability of survival	Actively treated infants (n)	Died on day of birth (n, %)	Age at death (d)—median, 25th-75 th percentile	Survived (n, %)	Infant-days of mechanical ventilation per surviving infant (d)	Infant-days of hospitalization per surviving infant (d)
≤5%	0	N/A	N/A	0	N/A	N/A
6-10%	6	3 (50%)	6 (3-18)	0 (0%)	N/A	N/A
11-20%	90	39 (43%)	10 (3-24)	9 (10%)	153	280
21-40%	523	122 (23%)	11 (4-23)	155 (30%)	90	191
41-60%	976	122 (13%)	11 (4-24)	478 (49%)	62	160
61-80%	1599	72 (5%)	17 (6-44)	1173 (73%)	44	137
>80%	979	28 (3%)	18 (9-36)	826 (84%)	28	115

Data derived from the NICHD Neonatal Research Network 2006-2012. Age at death (in days) derived for infants who did not die on the day of birth. Infant-days of mechanical ventilation per surviving infant were calculated as the total number of ventilator days for all actively treated infants with a given range of survival probabilities divided by the number of surviving infants. Infant-days of hospitalization per surviving infant were calculated analogously.

eTable 2. Neurodevelopmental outcomes among infants at follow-up by probability of survival

Probability of survival	Profound neurodevelopmental impairment	Moderate-severe neurodevelopmental impairment ^a	Blindness	Deafness	Moderate-severe cerebral palsy	BSID-III cognitive score >1 SD below mean
<10%	—	—	—	—	—	—
11-20%	11%	78%	0	11%	22%	67%
21-40%	6%	52%	<1%	5%	15%	46%
41-60%	5%	37%	<1%	2%	9%	35%
61-80%	3%	32%	<1%	1%	6%	31%
>80%	1%	21%	<1%	1%	4%	19%

Neurodevelopmental assessment at 18-22 (for infants born April 2006 – June 2012) and 22-26 (from July 2012 – December 2012) months' corrected age was performed by standardized, annually certified examiners. Profound neurodevelopmental impairment (NDI) was defined as cognitive score on the Bayley Scales of Infant and Toddler Development, third edition, (BSID-III) that was untestable or a Gross Motor Function Classification System (GMFCS) level of 5 (on a scale of 0 [normal] to 5 [most impaired]). A level of 0 represents no noted deficits whereas a level of 5 represents limited muscle function including an inability to lift the head against gravity. Moderate-severe NDI was defined as a BSID-III cognitive score of less than 85 (i.e., >1 standard deviation [SD] below the scale mean; mean [\pm SD] of 100 \pm 15), moderate or severe cerebral palsy, a Gross Motor Function Classification System (GMFCS) level of 2-5, bilateral blindness, or severe hearing impairment that could not be corrected with bilateral amplification. The composite outcomes deviate from those used by the original five-factor model due to the change in instrument from the second to the third edition of the Bayley Scales of Infant and Toddler Development, which occurred for births in the NICHD Neonatal Research Network cohort after January 1, 2006. Therefore, outcomes cannot be directly compared to those used in the original five-factor model. There were 6 infants with estimated survival <10% who were actively treated; of these, none survived to follow-up.

^a Includes profound neurodevelopmental impairment

eTable 3. Observed and predicted rates of survival for actively treated and all infants

	Gestational Age	Total infants	Actively treated infants (%)	Observed survival rate among treated (%)	Predicted survival rate among treated (%)	Observed survival rate among all infants (%)	Maximum potential survival rate among all infants (%)
<i>VON cohort 2006-2012</i>							
	22	5156	1432 (28%)	21%	26%	6%	22%
	23	11009	9026 (82%)	45%	43%	37%	41%
	24	16712	16383 (98%)	67%	66%	66%	66%
	25	18428	18338 (99%)	80%	80%	80%	80%
	All	51305	45179 (88%)	66%	66%	58%	61%
<i>VON cohort 2013-2016</i>							
	22	2611	850 (33%)	25%	29%	8%	23%
	23	6285	5521 (88%)	51%	45%	45%	44%
	24	9355	9233 (99%)	70%	67%	69%	67%
	25	10388	10365 (100%)	83%	81%	82%	81%
	All	28639	25969 (91%)	70%	67%	63%	63%

Rates for all infants include for infants both actively treated and not actively treated. All infants who did not receive active treatment died. The maximum potential survival rate among all infants represents the predicted survival rate if all infants were treated. It assumes that infants not receiving potentially lifesaving interventions had the same potential for survival as infants actively treated after birth and so provides an extreme optimistic estimate of potential outcomes.

eAppendix. List of Participating Hospitals in the Vermont Oxford Network

Hospital	City	State
Brookwood Medical Center	Birmingham	AL
Huntsville Hospital	Huntsville	AL
USA Children's and Women's Hospital	Mobile	AL
Baptist Medical Center East	Montgomery	AL
Baptist Medical Center South	Montgomery	AL
Children's Hospital at Providence	Anchorage	AK
Abrazo Arrowhead Campus	Glendale	AZ
Banner Thunderbird Medical Center	Glendale	AZ
Cardon Children's Medical Center	Mesa	AZ
Arizona Children's Center Maricopa Integrated Health	Phoenix	AZ
Banner Estrella Medical Center	Phoenix	AZ
Phoenix Children's Hospital	Phoenix	AZ
St. Joseph's Hospital and Medical Center	Phoenix	AZ
HonorHealth Scottsdale Shea Medical Center	Scottsdale	AZ
Banner University Medical Center	Tucson	AZ
Mercy Hospital Fort Smith	Fort Smith	AR
Willow Creek Women's Hospital	Johnson	AR
Arkansas Children's Hospital	Little Rock	AR
University of Arkansas for Medical Sciences	Little Rock	AR
Anaheim Regional Medical Center	Anaheim	CA
Kaiser Permanente Orange County/Anaheim	Anaheim	CA
St. Mary Medical Center	Apple Valley	CA
Methodist Hospital of Southern California	Arcadia	CA
Bakersfield Memorial Hospital	Bakersfield	CA
Kern Medical Center	Bakersfield	CA
Mercy Southwest Hospital	Bakersfield	CA
Kaiser Permanente Baldwin Park	Baldwin Park	CA
Kaiser Permanente Bellflower	Bellflower	CA
Alta Bates Summit Medical Center	Berkeley	CA
Providence St. Joseph Medical Center	Burbank	CA
Mercy San Juan Medical Center	Carmichael	CA
Scripps Mercy Hospital Chula Vista	Chula Vista	CA
Sharp Chula Vista Medical Center	Chula Vista	CA
Arrowhead Regional Medical Center	Colton	CA
Downey Regional Medical Center	Downey	CA
Kaiser Permanente Downey	Downey	CA
El Centro Regional Medical Center	El Centro	CA
Rady Children's at Scripps Encinitas Memorial Hospital	Encinitas	CA

Hospital	City	State
Rady Children's at Palomar Health Downtown Campus	Escondido	CA
Northbay Medical Center	Fairfield	CA
Kaiser Permanente Fontana	Fontana	CA
Fountain Valley Regional Hospital and Medical Center	Fountain Valley	CA
San Joaquin General Hospital	French Camp	CA
Community Regional Medical Center	Fresno	CA
St. Jude Medical Center	Fullerton	CA
Adventist Health	Glendale	CA
Glendale Memorial Hospital and Health Center	Glendale	CA
Kaiser Permanente South Bay	Harbor City	CA
Centinela Hospital Medical Center	Inglewood	CA
Kaiser Permanente Irvine	Irvine	CA
Rady Children's at Scripps La Jolla	La Jolla	CA
Grossmont Hospital Women's Health Center	La Mesa	CA
Saddleback Memorial Medical Center	Laguna Hills	CA
Antelope Valley Hospital	Lancaster	CA
Loma Linda University Children's Hospital	Loma Linda	CA
Miller Children's and Women's Hospital at Long Beach	Long Beach	CA
St. Mary Medical Center	Long Beach	CA
Adventist Health	Los Angeles	CA
California Hospital Medical Center	Los Angeles	CA
Cedars-Sinai Medical Center	Los Angeles	CA
Good Samaritan Hospital	Los Angeles	CA
Hollywood Presbyterian Medical Center	Los Angeles	CA
Kaiser Permanente Sunset/Los Angeles	Los Angeles	CA
Kaiser Permanente West Los Angeles	Los Angeles	CA
King Drew Medical Center	Los Angeles	CA
Los Angeles County, University Southern California	Los Angeles	CA
UCLA Mattel Children's Hospital at Ronald Reagan	Los Angeles	CA
St. Francis Medical Center	Lynwood	CA
Providence Holy Cross Medical Center	Mission Hills	CA
Doctors Medical Center of Modesto	Modesto	CA
Memorial Medical Center	Modesto	CA
Garfield Medical Center	Monterey Park	CA
Riverside University Health System Medical Center	Moreno Valley	CA
Paradise Valley Hospital	National City	CA
Hoag Memorial Presbyterian Hospital	Newport Beach	CA
Northridge Hospital Medical Center	Northridge	CA
Kaiser Permanente Oakland	Oakland	CA
Tri-City Health Care District	Oceanside	CA

Hospital	City	State
University of California Irvine Medical Center	Orange	CA
St. John's Regional Medical Center	Oxnard	CA
Desert Regional Medical Center	Palm Springs	CA
Kaiser Permanente Panorama City	Panorama City	CA
Huntington Memorial Hospital	Pasadena	CA
Pomona Valley Hospital Medical Center	Pomona	CA
Mercy Medical Center	Redding	CA
Redlands Community Hospital	Redlands	CA
Kaiser Permanente Riverside	Riverside	CA
Parkview Community Hospital	Riverside	CA
Riverside Community Hospital	Riverside	CA
Kaiser Permanente Sacramento/Roseville	Roseville	CA
Sutter Roseville Medical Center	Roseville	CA
Anderson Lucchetti Women's and Children's Center	Sacramento	CA
Kaiser Permanente Sacramento	Sacramento	CA
Methodist Hospital of Sacramento	Sacramento	CA
UC Davis Medical Center	Sacramento	CA
Natividad Medical Center	Salinas	CA
Salinas Valley Memorial Healthcare System	Salinas	CA
Community Hospital of San Bernardino	San Bernardino	CA
St. Bernadine Medical Center	San Bernardino	CA
Kaiser Permanente San Diego	San Diego	CA
Naval Medical Center San Diego	San Diego	CA
Scripps Mercy Hospital San Diego	San Diego	CA
Sharp Mary Birch Hospital for Women	San Diego	CA
UCSD Medical Center - Hillcrest	San Diego	CA
California Pacific Medical Center - West	San Francisco	CA
Kaiser Permanente San Francisco	San Francisco	CA
UCSF Benioff Children's Hospital	San Francisco	CA
Zuckerberg San Francisco General Hospital and Trauma Center	San Francisco	CA
San Gabriel Valley Medical Center	San Gabriel	CA
Good Samaritan Hospital	San Jose	CA
O'Connor Hospital	San Jose	CA
Regional Medical Center of San Jose	San Jose	CA
Santa Clara Valley Medical Center	San Jose	CA
Kaiser Permanente San Leandro	San Leandro	CA
Sierra Vista Regional Medical Center	San Luis Obispo	CA
Orange County Global Medical Center	Santa Ana	CA
Santa Barbara Cottage Hospital	Santa Barbara	CA

Hospital	City	State
Kaiser Permanente Santa Clara	Santa Clara	CA
Marian Regional Medical Center	Santa Maria	CA
UCLA Medical Center & Orthopaedic Hospital	Santa Monica	CA
Santa Rosa Memorial Hospital	Santa Rosa	CA
Sutter Santa Rosa Regional Hospital	Santa Rosa	CA
Dameron Hospital Association	Stockton	CA
St. Joseph's Medical Center	Stockton	CA
Olive View - UCLA Medical Center	Sylmar	CA
Providence Tarzana Medical Center	Tarzana	CA
Los Robles Regional Hospital and Medical Center	Thousand Oaks	CA
Harbor - UCLA Medical Center	Torrance	CA
Providence Little Company of Mary Medical Center	Torrance	CA
Torrance Memorial Medical Center	Torrance	CA
San Antonio Regional Hospital	Upland	CA
Henry Mayo Newhall Memorial Hospital	Valencia	CA
Valley Presbyterian Hospital	Van Nuys	CA
Community Memorial Hospital of Ventura	Ventura	CA
Ventura County Medical Center	Ventura	CA
Kaweah Delta Healthcare District	Visalia	CA
John Muir Medical Center	Walnut Creek	CA
Kaiser Permanente Walnut Creek	Walnut Creek	CA
Watsonville Community Hospital	Watsonville	CA
Citrus Valley Medical Center	West Covina	CA
Presbyterian Intercommunity Hospital	Whittier	CA
Kaiser Permanente Woodland Hills	Woodland Hills	CA
University of Colorado Health Sciences Center	Aurora	CO
Denver Health Medical Center	Denver	CO
Rocky Mountain Hospital for Children	Denver	CO
Rose Medical Center	Denver	CO
Saint Joseph Hospital	Denver	CO
Swedish Medical Center	Englewood	CO
Poudre Valley Hospital	Fort Collins	CO
St. Mary's Hospital and Medical Center	Grand Junction	CO
Good Samaritan Medical Center	Lafayette	CO
Danbury Hospital	Danbury	CT
University of Connecticut Health Center	Farmington	CT
Greenwich Hospital	Greenwich	CT
Connecticut Children's Medical Center	Hartford	CT
St. Francis Hospital	Hartford	CT
Hospital of Central Connecticut	New Britain	CT

Hospital	City	State
Norwalk Hospital	Norwalk	CT
Stamford Hospital	Stamford	CT
Christiana Care Health Services	Newark	DE
Washington Hospital Center	Washington	DC
West Boca Medical Center	Boca Raton	FL
Brandon Regional Hospital	Brandon	FL
Broward Health Salah Foundation Children's Hospital	Fort Lauderdale	FL
Golisano Children's Hospital of Southwest Florida	Fort Myers	FL
UF Health Shands Hospital	Gainesville	FL
Joe DiMaggio Children's Hospital	Hollywood	FL
UF Health Jacksonville	Jacksonville	FL
Northwest Medical Center	Margate	FL
Baptist Children's Hospital	Miami	FL
Jackson Memorial Hospital	Miami	FL
Florida Hospital for Children	Orlando	FL
Winnie Palmer Hospital for Women and Babies	Orlando	FL
Sacred Heart Health System	Pensacola	FL
Sheridan Children's Plantation Hospital	Plantation	FL
Morton Plant Mease	Safety Harbor	FL
All Children's at Sarasota Memorial	Sarasota	FL
Tallahassee Memorial Hospital	Tallahassee	FL
St. Joseph's Children's Hospital	Tampa	FL
Tampa General Hospital	Tampa	FL
Women's Center at Florida Hospital	Tampa	FL
St. Mary's Hospital	West Palm Beach	FL
Piedmont Athens Regional	Athens	GA
Emory University Hospital, Midtown	Atlanta	GA
Northside Hospital	Atlanta	GA
Piedmont Hospital	Atlanta	GA
Augusta University Health System	Augusta	GA
Wellstar Cobb Hospital	Austell	GA
Medical Center at Columbus Regional	Columbus	GA
Piedmont Rockdale Hospital	Conyers	GA
Hamilton Medical Center	Dalton	GA
WellStar Atlanta Medical Center South	East Point	GA
Northeast Georgia Medical Center	Gainesville	GA
Gwinnett Hospital System	Lawrenceville	GA
Coliseum Medical Center	Macon	GA
Wellstar Kennestone Hospital	Marietta	GA
Southern Regional Medical Center	Riverdale	GA

Hospital	City	State
Memorial Health Savannah	Savannah	GA
Piedmont Henry Hospital	Stockbridge	GA
Kaiser Permanente Moanalua Medical Center	Honolulu	HI
Kapiolani Medical Center for Women & Children	Honolulu	HI
St. Luke's Regional Medical Center	Boise	ID
Portneuf Medical Center	Pocatello	ID
St. Luke's Magic Valley	Twin Falls	ID
Northwest Community Hospital	Arlington Heights	IL
Rush Copley Medical Center	Aurora	IL
Advocate Illinois Masonic Medical Center	Chicago	IL
John H. Stroger, Jr. Hospital of Cook County	Chicago	IL
Mercy Hospital and Medical Center	Chicago	IL
Mt. Sinai Hospital Medical Center	Chicago	IL
Northwestern Memorial	Chicago	IL
Rush University Medical Center	Chicago	IL
St. Joseph Hospital	Chicago	IL
University of Chicago	Chicago	IL
University of Illinois at Chicago	Chicago	IL
Advocate Good Samaritan Hospital	Downers Grove	IL
Evanston Hospital	Evanston	IL
Adventist Hinsdale Hospital	Hinsdale	IL
St. Alexius Medical Center	Hoffman Estates	IL
Provena Saint Joseph Medical Center	Joliet	IL
Ronald McDonald Children's Hospital at Loyola University Medical Center	Maywood	IL
Edward Hospital and Health Services	Naperville	IL
Advocate Children's Hospital	Oak Lawn	IL
Advocate Children's Hospital	Park Ridge	IL
OSF Children's Hospital of Illinois	Peoria	IL
Rockford Memorial Hospital	Rockford	IL
St. John's Hospital	Springfield	IL
Carle Foundation Hospital	Urbana	IL
Central DuPage Hospital	Winfield	IL
Indiana University Health North Hospital	Carmel	IN
St. Vincent Evansville	Evansville	IN
Dupont Hospital	Fort Wayne	IN
Lutheran Hospital of Indiana	Fort Wayne	IN
Parkview Women's and Children's Hospital	Fort Wayne	IN
St. Joseph Hospital	Fort Wayne	IN
Methodist Hospitals Northlake Campus	Gary	IN

Hospital	City	State
Community Hospital North Indianapolis	Indianapolis	IN
St. Vincent Women's Hospital	Indianapolis	IN
Franciscan Health Lafayette	Lafayette	IN
Ball Memorial Hospital	Muncie	IN
Women's Hospital	Newburgh	IN
Memorial Hospital	South Bend	IN
Mercy Medical Center	Cedar Rapids	IA
St. Luke's Hospital Cedar Rapids	Cedar Rapids	IA
Genesis Medical Center	Davenport	IA
Blank Children's Hospital	Des Moines	IA
St. Luke's Regional Medical Center	Sioux City	IA
Covenant Medical Center	Waterloo	IA
University of Kansas Hospital Authority	Kansas City	KS
Overland Park Regional Medical Center	Overland Park	KS
Shawnee Mission Medical Center	Shawnee Mission	KS
Via Christi Hospitals	Wichita	KS
Wesley Medical Center	Wichita	KS
King's Daughters Medical Center	Ashland	KY
The Medical Center	Bowling Green	KY
Methodist Hospital	Henderson	KY
Jennie Stuart Medical Center	Hopkinsville	KY
Baptist Health Lexington	Lexington	KY
Kentucky Children's Hospital	Lexington	KY
Norton Children's Hospital	Louisville	KY
Norton Women's and Children's Hospital	Louisville	KY
University of Louisville Hospital	Louisville	KY
Baptist Health Madisonville	Madisonville	KY
Owensboro Health Regional Hospital	Owensboro	KY
Baptist Health Paducah	Paducah	KY
Christus St. Frances Cabrini Hospital	Alexandria	LA
Rapides Women's and Children's Hospital	Alexandria	LA
Earl K. Long Medical Center	Baton Rouge	LA
Ochsner Medical Center Baton Rouge	Baton Rouge	LA
Woman's Hospital	Baton Rouge	LA
Ochsner Medical Center West Bank	Gretna	LA
North Oaks Medical Center	Hammond	LA
Terrebonne General Medical Center	Houma	LA
Lafayette General Medical Center	Lafayette	LA
Women's and Children's Hospital	Lafayette	LA
Christus Lake Area Hospital	Lake Charles	LA

Hospital	City	State
West Jefferson Medical Center	Marrero	LA
East Jefferson General Hospital	Metairie	LA
Tulane Lakeside Hospital for Women and Children	Metairie	LA
Medical Center of Louisiana at New Orleans	New Orleans	LA
Ochsner Medical Center	New Orleans	LA
Touro Infirmary	New Orleans	LA
CHRISTUS Highland Medical Center	Shreveport	LA
LSU Health Sciences Center	Shreveport	LA
Willis Knighton South	Shreveport	LA
Eastern Maine Medical Center	Bangor	ME
Barbara Bush Children's at Maine Medical	Portland	ME
Anne Arundel Medical Center	Annapolis	MD
Franklin Square Hospital Center	Baltimore	MD
Greater Baltimore Medical Center	Baltimore	MD
Johns Hopkins Bayview Medical Center	Baltimore	MD
Johns Hopkins Hospital	Baltimore	MD
Mercy Medical Center	Baltimore	MD
Sinai Hospital of Baltimore	Baltimore	MD
St. Agnes Hospital	Baltimore	MD
University of Maryland Medical Center	Baltimore	MD
Walter Reed National Military Medical Center	Bethesda	MD
Prince George's Hospital Center	Cheverly	MD
Howard County General Hospital	Columbia	MD
Frederick Memorial Hospital	Frederick	MD
Shady Grove Adventist Hospital	Rockville	MD
Peninsula Regional Medical Center	Salisbury	MD
Holy Cross Hospital	Silver Spring	MD
University of Maryland St. Joseph Medical Center	Towson	MD
Beth Israel Deaconess Medical Center	Boston	MA
Boston Medical Center	Boston	MA
Brigham and Women's Hospital	Boston	MA
Massachusetts General Hospital for Children	Boston	MA
Steward St. Elizabeth's Medical Center	Brighton	MA
South Shore Hospital	South Weymouth	MA
Baystate Medical Center	Springfield	MA
UMass Memorial Healthcare	Worcester	MA
St. Joseph Mercy Hospital	Ann Arbor	MI
Beaumont Hospital	Dearborn	MI
Henry Ford Hospital	Detroit	MI
St. John Detroit Riverview Hospital	Detroit	MI

Hospital	City	State
St. John Hospital and Medical Center	Detroit	MI
Hurley Medical Center	Flint	MI
DeVos Children's, Spectrum Health	Grand Rapids	MI
Mercy Health Saint Mary's	Grand Rapids	MI
Children's Hospital at Bronson	Kalamazoo	MI
Sparrow Hospital	Lansing	MI
UP Health System Marquette	Marquette	MI
St. Joseph Mercy Oakland	Pontiac	MI
William Beaumont Hospital	Royal Oak	MI
Covenant Healthcare	Saginaw	MI
Providence Hospital and Medical Center	Southfield	MI
Munson Medical Center	Traverse City	MI
Essentia Health St. Mary's Children's Hospital	Duluth	MN
Children's Minnesota Minneapolis Hospital	Minneapolis	MN
Hennepin County Medical Center	Minneapolis	MN
University of Minnesota Masonic Children's Hospital	Minneapolis	MN
North Memorial Medical Center	Robbinsdale	MN
Mayo Foundation	Rochester	MN
St. Cloud Hospital	Saint Cloud	MN
Children's Minnesota Saint Paul Hospital	Saint Paul	MN
Merit Health River Oaks	Flowood	MS
Merit Health Woman's Hospital	Flowood	MS
Memorial Hospital at Gulfport	Gulfport	MS
Forrest General Hospital	Hattiesburg	MS
Merit Health Wesley	Hattiesburg	MS
Batson Children's Hospital at University Mississippi Medical Center	Jackson	MS
Merit Health Central	Jackson	MS
Mississippi Baptist Health Systems	Jackson	MS
St. Dominic-Jackson Memorial Hospital	Jackson	MS
Anderson Regional Medical Center	Meridian	MS
Rush Foundation Hospital	Meridian	MS
North Mississippi Medical Center	Tupelo	MS
SoutheastHEALTH	Cape Girardeau	MO
St. Francis Medical Center	Cape Girardeau	MO
Women's & Children's Hospital, University of Missouri	Columbia	MO
Centerpoint Medical Center	Independence	MO
Freeman Hospital and Health System	Joplin	MO
Research Medical Center	Kansas City	MO
St. Luke's Hospital	Kansas City	MO

Hospital	City	State
Truman Medical Center	Kansas City	MO
Mercy Children's Hospital St. Louis	Saint Louis	MO
SSM Health Cardinal Glennon Children's Hospital	Saint Louis	MO
St. Louis Children's Hospital	Saint Louis	MO
Cox Health Neonatology	Springfield	MO
Mercy Children's Hospital Springfield	Springfield	MO
St. Vincent Hospital & Health Center	Billings	MT
Benefis Healthcare	Great Falls	MT
Community Medical Center	Missoula	MT
Good Samaritan Hospital Kearney	Kearney	NE
Bryan Medical Center	Lincoln	NE
CHI Health St. Elizabeth	Lincoln	NE
CHI Health Bergan Mercy Medical Center	Omaha	NE
Children's Hospital and Medical Center	Omaha	NE
Creighton University Medical Center	Omaha	NE
Methodist Women's Hospital	Omaha	NE
Nebraska Medical Center	Omaha	NE
St. Rose Dominican Hospital - Siena Campus	Henderson	NV
Children's Hospital of Nevada at UMC	Las Vegas	NV
Sunrise Hospital and Medical Center	Las Vegas	NV
Dartmouth Hitchcock Medical Center	Lebanon	NH
Elliot Hospital	Manchester	NH
Children's Regional Hospital at Cooper	Camden	NJ
Our Lady of Lourdes Medical Center	Camden	NJ
CentraState Medical Center	Freehold	NJ
Hackensack University Medical Center	Hackensack	NJ
Robert Wood Johnson University Hospital Hamilton	Hamilton	NJ
Jersey City Medical Center	Jersey City	NJ
Monmouth Medical Center Southern Campus	Lakewood	NJ
Saint Barnabas Medical Center	Livingston	NJ
Monmouth Medical Center	Long Branch	NJ
Mountainside Hospital	Montclair	NJ
Goryeb Children's Hospital	Morristown	NJ
Jersey Shore University Medical Center	Neptune	NJ
Robert Wood Johnson University Hospital	New Brunswick	NJ
St. Peter's Medical Center	New Brunswick	NJ
Children's Hospital of New Jersey at Newark Beth Israel Medical Center	Newark	NJ
University Hospital	Newark	NJ
St. Joseph Hospital and Medical Center	Paterson	NJ

Hospital	City	State
Capital Health Medical Center - Hopewell	Pennington	NJ
Atlanticare Regional Medical Center	Pomona	NJ
Community Medical Center	Toms River	NJ
Virtua Hospital Systems	Voorhees	NJ
Children's Medical Center at Presbyterian Hospital	Albuquerque	NM
Lovelace Women's Hospital	Albuquerque	NM
Albany Medical Center	Albany	NY
St. Peter's Hospital	Albany	NY
Montefiore Medical Center - Wakefield Campus	Bronx	NY
Weiler Hospital Montefiore	Bronx	NY
Brookdale Hospital Medical Center	Brooklyn	NY
Brooklyn Hospital Center	Brooklyn	NY
Kings County Hospital Center	Brooklyn	NY
Maimonides Medical Center	Brooklyn	NY
University Hospital of Brooklyn	Brooklyn	NY
Woodhull Medical Center	Brooklyn	NY
Arnot Ogden Medical Center	Elmira	NY
North Shore University Hospital	Manhasset	NY
NYU Winthrop	Mineola	NY
Cohen Children's Medical Center of New York	New Hyde Park	NY
Bellevue Hospital	New York	NY
Columbia University Medical Center	New York	NY
Lenox Hill Hospital	New York	NY
Mt. Sinai Kravis Children's Hospital	New York	NY
St. Vincent Hospital and Medical Center	New York	NY
Tisch Hospital, NYU Medical Center	New York	NY
Weill Cornell Medical Center	New York	NY
Vassar Brothers Hospital	Poughkeepsie	NY
Golisano Children's Hospital at Strong	Rochester	NY
Richmond University Medical Center	Staten Island	NY
Staten Island University Hospital	Staten Island	NY
Stony Brook University Medical Center	Stony Brook	NY
St. Joseph's Health Center	Syracuse	NY
Good Samaritan Hospital Medical Center	West Islip	NY
Mission Children's Hospital	Asheville	NC
Carolinas Medical Center	Charlotte	NC
Novant Health Presbyterian Medical Center	Charlotte	NC
Jeff Gordon Children's Hospital	Concord	NC
Cape Fear Valley Medical Center	Fayetteville	NC
CaroMont Regional Medical Center	Gastonia	NC

Hospital	City	State
Cone Health Women's Hospital	Greensboro	NC
Vidant Medical Center	Greenville	NC
Catawba Valley Medical Center	Hickory	NC
Frye Regional Medical Center	Hickory	NC
Onslow Memorial Hospital	Jacksonville	NC
FirstHealth Moore Regional Hospital	Pinehurst	NC
Rex Hospital	Raleigh	NC
WakeMed Health	Raleigh	NC
Betty H. Cameron Women's & Children's Hospital	Wilmington	NC
Brenner Children's Hospital	Winston-Salem	NC
Forsyth Memorial Hospital	Winston-Salem	NC
Sanford Medical Center Bismarck	Bismarck	ND
Essentia Health	Fargo	ND
Sanford Medical Center Fargo	Fargo	ND
Altru Health System	Grand Forks	ND
Trinity Hospital	Minot	ND
Summa Akron City Hospital	Akron	OH
St. Elizabeth Boardman Hospital	Boardman	OH
Aultman Hospital	Canton	OH
Mercy Medical Center	Canton	OH
Children's Hospital Medical Center	Cincinnati	OH
Fairview Hospital	Cleveland	OH
MetroHealth Medical Center	Cleveland	OH
Mt. Carmel Health Systems	Columbus	OH
Nationwide Children's Hospital	Columbus	OH
Doctor's Hospital West	Columbus	OH
Grant Medical Center	Columbus	OH
Riverside Methodist Hospital	Columbus	OH
Ohio State Medical Center	Columbus	OH
Miami Valley Hospital	Dayton	OH
Southview Medical Center	Dayton	OH
Dublin Methodist Hospital	Dublin	OH
Kettering Medical Center	Kettering	OH
St. Rita's Medical Center	Lima	OH
Hillcrest Hospital	Mayfield Heights	OH
Mercy Children's Hospital	Toledo	OH
Toledo Children's Hospital	Toledo	OH
Mount Carmel St. Ann's Hospital	Westerville	OH
Northside Regional Medical Center	Youngstown	OH
Mercy Health Center	Oklahoma City	OK

Hospital	City	State
University of Oklahoma Health Sciences Center	Oklahoma City	OK
The Children's Hospital at Saint Francis	Tulsa	OK
Oklahoma State University Medical Center	Tulsa	OK
Peggy V. Helmerich Women's Center	Tulsa	OK
St. John Medical Center	Tulsa	OK
St. Charles Health Care	Bend	OR
Rogue Regional Medical Center	Medford	OR
Oregon Health and Science University	Portland	OR
Providence St. Vincent Medical Center	Portland	OR
Randall Children's Hospital at Legacy Emanuel	Portland	OR
Salem Hospital	Salem	OR
Sacred Heart Medical Center	Springfield	OR
Abington Memorial Hospital	Abington	PA
Lehigh Valley Health Network	Allentown	PA
St. Luke's Allentown Campus	Allentown	PA
St. Luke's University Hospital	Bethlehem	PA
Bryn Mawr Hospital	Bryn Mawr	PA
Geisinger Medical Center	Danville	PA
Doylestown Hospital	Doylestown	PA
Penn Highlands DuBois	DuBois	PA
Ephrata Community Hospital	Ephrata	PA
Hamot Medical Center	Erie	PA
St. Vincent Health Center	Erie	PA
Penn State Children's Hospital	Hershey	PA
Conemaugh Memorial Medical Center	Johnstown	PA
Lancaster General Health - Women & Babies Hospital	Lancaster	PA
St. Mary Medical Center	Langhorne	PA
Holy Redeemer Hospital and Medical Center	Meadowbrook	PA
Riddle Hospital	Media	PA
Einstein Medical Center	Philadelphia	PA
Hahnemann University Hospital	Philadelphia	PA
Hospital of the University of Pennsylvania	Philadelphia	PA
Pennsylvania Hospital	Philadelphia	PA
Temple University Hospital	Philadelphia	PA
Thomas Jefferson University Hospital	Philadelphia	PA
Allegheny General Hospital	Pittsburgh	PA
Magee-Womens Hospital of UPMC	Pittsburgh	PA
Western Pennsylvania Hospital	Pittsburgh	PA
Reading Hospital - Tower Health	Reading	PA
Moses Taylor Hospital	Scranton	PA

Hospital	City	State
Crozer Chester Medical Center	Upland	PA
Chester County Hospital	West Chester	PA
Lankenau Medical Center	Wynnewood	PA
WellSpan York Hospital	York	PA
Medical University of South Carolina	Charleston	SC
Trident Medical Center	Charleston	SC
Palmetto Health Baptist	Columbia	SC
Palmetto Health Richland	Columbia	SC
McLeod Regional Medical Center	Florence	SC
Children's Hospital of Greenville	Greenville	SC
Spartanburg Regional Healthcare System	Spartanburg	SC
Summerville Medical Center	Summerville	SC
Rapid City Regional Hospital	Rapid City	SD
Avera McKennan Hospital	Sioux Falls	SD
Sanford Health	Sioux Falls	SD
Children's Hospital at Erlanger	Chattanooga	TN
Parkridge East Hospital	Chattanooga	TN
Maury Regional Medical Center	Columbia	TN
Jackson Madison County General Hospital	Jackson	TN
Niswonger Children's Hospital	Johnson City	TN
Wellmont Holston Valley Medical Center	Kingsport	TN
St. Mary's Hospital	Knoxville	TN
University of Tennessee Medical Center	Knoxville	TN
Baptist Memorial Hospital for Women	Memphis	TN
Regional One Health	Memphis	TN
St. Francis Hospital Memphis	Memphis	TN
Children's Hospital at TriStar Centennial	Nashville	TN
Monroe Carell Jr. Children's Hospital Vanderbilt	Nashville	TN
Baptist St. Anthony's Health System	Amarillo	TX
Texas Tech University Health Science Center	Amarillo	TX
Medical Center of Arlington	Arlington	TX
Texas Health Arlington Memorial Hospital	Arlington	TX
North Austin Medical Center	Austin	TX
St. David's Medical Center	Austin	TX
Valley Regional Medical Center	Brownsville	TX
Christus Spohn Hospital Corpus Christi South	Corpus Christi	TX
Corpus Christi Medical Center	Corpus Christi	TX
Baylor Healthcare System	Dallas	TX
Medical City Dallas	Dallas	TX
Methodist Dallas Medical Center	Dallas	TX

Hospital	City	State
Presbyterian Hospital of Dallas	Dallas	TX
Women's Hospital At Renaissance	Edinburg	TX
Las Palmas Medical Center	El Paso	TX
University Medical Center of El Paso	El Paso	TX
Baylor All Saints Medical Center	Fort Worth	TX
Cook Children's Medical Center	Fort Worth	TX
Harris Methodist Fort Worth Hospital	Fort Worth	TX
John Peter Smith Hospital	Fort Worth	TX
University of Texas Medical Branch	Galveston	TX
Ben Taub General Hospital	Houston	TX
Memorial Hermann Memorial City Medical Center	Houston	TX
Memorial Hermann Southeast	Houston	TX
Methodist Willowbrook Hospital	Houston	TX
Texas Children's Hospital, Baylor College of Medicine	Houston	TX
Woman's Hospital of Texas	Houston	TX
Kingwood Medical Center	Kingwood	TX
Medical City Lewisville	Lewisville	TX
Christus Good Shepherd Medical Center	Longview	TX
Covenant Women and Children's Hospital	Lubbock	TX
Medical Center Hospital	Odessa	TX
Medical City Plano	Plano	TX
Texas Health Presbyterian Hospital Plano	Plano	TX
Children's Hospital of San Antonio	San Antonio	TX
Methodist Children's Hospital	San Antonio	TX
Metropolitan Methodist Hospital	San Antonio	TX
North Central Baptist Hospital	San Antonio	TX
St. Luke's Baptist Hospital	San Antonio	TX
University Hospital San Antonio	San Antonio	TX
McLane Children's Hospital	Temple	TX
Memorial Hermann The Woodlands	The Woodlands	TX
St. Luke's The Woodlands Hospital	The Woodlands	TX
Christus Trinity Mother Frances Health System	Tyler	TX
Clear Lake Regional Medical Center	Webster	TX
Intermountain Medical Center	Murray	UT
McKay Dee Hospital Center	Ogden	UT
Utah Valley Regional Medical Center	Provo	UT
Dixie Regional Medical Center	Saint George	UT
University of Vermont Children's Hospital	Burlington	VT
University of Virginia	Charlottesville	VA
Inova Fair Oaks Hospital	Fairfax	VA

Hospital	City	State
Inova Children's Hospital	Falls Church	VA
Mary Washington Hospital	Fredericksburg	VA
Centra Virginia Baptist Hospital	Lynchburg	VA
Children's Hospital of the King's Daughters	Norfolk	VA
Naval Medical Center	Portsmouth	VA
Bon Secours St. Mary's Hospital	Richmond	VA
Children's Hospital of Richmond at VCU	Richmond	VA
CJW Medical Center - Chippenham Campus	Richmond	VA
Henrico Doctors' Hospital	Richmond	VA
Johnston-Willis Hospital	Richmond	VA
Carilion Clinic Children's Hospital	Roanoke	VA
Winchester Medical Center	Winchester	VA
Overlake Hospital Medical Center	Bellevue	WA
Providence Regional Medical Center Everett	Everett	WA
Evergreen Health	Kirkland	WA
UW Medicine Valley Medical Center	Renton	WA
Kadlec Regional Medical Center	Richland	WA
Swedish Medical Center	Seattle	WA
University of Washington Medical Center	Seattle	WA
Deaconess Hospital	Spokane	WA
Providence Sacred Heart Medical Center & Children's Hospital	Spokane	WA
Legacy Salmon Creek Hospital	Vancouver	WA
PeaceHealth Southwest Medical Center	Vancouver	WA
Yakima Valley Memorial Hospital	Yakima	WA
Charleston Area Medical Center	Charleston	WV
Cabell Huntington Hospital	Huntington	WV
West Virginia University School of Medicine	Morgantown	WV
St. Elizabeth Hospital	Appleton	WI
Aurora Baycare Medical Center	Green Bay	WI
St. Vincent Hospital	Green Bay	WI
Gundersen Lutheran Medical Center	La Crosse	WI
Meriter Hospital	Madison	WI
SSM Health St. Mary's Hospital Medical Center	Madison	WI
St. Joseph Hospital / Marshfield Clinic	Marshfield	WI
Ascension St. Joseph's Hospital	Milwaukee	WI
Aurora Sinai Medical Center	Milwaukee	WI
Children's Hospital of Wisconsin	Milwaukee	WI
Columbia St. Mary's Hospital	Milwaukee	WI
Children's Hospital of Wisconsin, Fox Valley	Neenah	WI

Hospital	City	State
Ascension All Saints Hospital	Racine	WI
Waukesha Memorial Hospital	Waukesha	WI
Aspirus Wausau Hospital	Wausau	WI
Aurora Women's Pavilion	West Allis	WI