The Canadian Neonatal Network™

Le Réseau Néonatal Canadien™

Annual Report

Rapport Annual

2006

Acknowledgements

This report is based upon data collected from 24 individual hospitals from across Canada that were members of the Canadian Neonatal Network™ (CNN) during the year 2006. In addition to all investigators and funding agencies, we would like to recognize the invaluable support of the Neonatal Intensive Care Units (NICUs) which contributed to this information, the support of all of the participating hospitals and most importantly, the dedication and hard work of the Site Investigators and CNN Data Abstractors.

Structure of the CNN

The Canadian Neonatal Network™ is a group of Canadian researchers who collaborate on research issues relating to neonatal care. The Network was founded in 1995 by Dr Shoo Lee and included members from 24 hospitals that represented 17 universities across Canada during the year 2006. In the current year (2007) a total of 28 centers are contributing data to CNN. The Network maintains a standardized NICU database and provides a unique opportunity for researchers to participate in collaborative projects on a national and an international scale. Health care professionals, health services researchers and health administrators participate actively in clinical, epidemiologic, outcomes, health services, health policy and informatics research aimed at improving efficacy and efficiency of neonatal care. Research results are published in Network reports and in peer-reviewed journals.

Funding

The CNN infrastructure is funded by the Canadian Institutes of Health Research. Individual participating hospitals provided additional funding via data collection and other related resources.

Coordinating Centre of the CNN

The Integrated Centre for Care Advancement through Research (*i*CARE), University of Alberta, Edmonton, Alberta:

Network Director:	Dr. S. K. Lee, University of Alberta
Steering Committee:	Dr. A. Allen, Dalhousie University
	Dr. K. Aziz, Memorial University of Newfoundland
	Dr. C. Cronin, University of Manitoba
	Dr. P. Shah, University of Toronto
	Dr. A. Synnes. University of British Columbia
	Dr. J. Van Aerde, University of Alberta
Study Coordinator:	Ms. A. Wingert, University of Alberta
Analyst:	Ms. X. Zhang, University of Alberta
Report Review:	Dr. A. Allen, Dalhousie University

Dr. K. Aziz, Memorial University of Newfoundland
Dr. C. Cronin, University of Manitoba
Dr. M. Dunn, University of Toronto
Dr. D. McMillan, Dalhousie University
Ms. J. Narciso, University of Toronto
Dr. A. Ohlsson, University of Toronto
Dr. M. Seshia, University of Manitoba
Dr. P. Shah, University of Toronto
Dr. N. Singhal, University of Calgary
Dr. J. Van Aerde, University of Alberta

Participating CNN Sites for the 2006 Report

Dr. C. Tan-Dy	Victoria General Hospital, Victoria, British Columbia
Dr. A. Synnes	BC Children's Hospital, Vancouver, British Columbia
Dr. T. Sorokan	Royal Columbian Hospital, New Westminster, British Columbia
Dr. N. Singhal	Foothills Medical Centre, Calgary, Alberta
Dr. A. Ninan	Regina General Hospital, Regina, Saskatchewan
Dr. K. Sankaran	Royal University Hospital, Saskatoon, Saskatchewan
Dr. M. Seshia	Winnipeg Health Sciences Centre, Winnipeg, Manitoba
Dr. C. Cronin	St. Boniface General Hospital, Winnipeg, Manitoba
Dr. K. Tan	Hamilton Health Sciences Centre, Hamilton, Ontario
Dr. D. Lee	St. Joseph's Health Centre, London, Ontario
Dr. A. James	Hospital for Sick Children, Toronto, Ontario
Dr. A. Ohlsson	Mount Sinai Hospital, Toronto, Ontario
Dr. M. Dunn	Sunnybrook & Women's College Health Sciences Centre, Toronto, Ontario
Dr. M. Clarke	Kingston General Hospital, Kingston, Ontario
Dr. L. Kovacs	Jewish General Hospital, Montréal, Québec
Dr. B. Piedboeuf	Centre Hospitalier Universitaire de Québec, Sainte Foy, Québec
Dr. P. Riley	Montréal Children's Hospital, Montréal, Québec
Dr. S. Nadeau	Royal Victoria Hospital, Montréal, Québec
Dr. D. McMillan	IWK Health Centre, Halifax, Nova Scotia
Dr. R. Canning	Moncton Hospital, Moncton, New Brunswick
Dr. B. Bulleid	Dr. Everett Chalmers Hospital, Fredericton, New Brunswick
Dr. C. Ojah	St. John Regional Hospital, Saint John, New Brunswick
Dr. K. Aziz	Janeway Children's Health and Rehabilitation Centre, St. John's, Newfoundland

Written & Prepared By:

X. Zhang, Dr. S.K. Lee, A. Wingert, Dr P. S. Shah, and Members of the Report Review Committee

Cover page by Haley Shandro

Table of Contents

E. Site Comparisons: *Mortality*

F. Site Comparisons: *Morbidity Outcomes*

G. Site Comparisons: *Risks Adjusted Analysis*

H. Trends: 2003-2006

A. Executive Summary

The Canadian Neonatal Network™ is currently comprised of 28 tertiary neonatal intensive care units (NICUs) across Canada. This report is based on data from 24 of these tertiary NICUs which contributed data in the year 2006. The CNN is funded through the Canadian Institutes of Health Research (CIHR) and additional institutional resources (see Acknowledgements). The purposes of the Network are to:

- Maintain a national network of multidisciplinary national researchers interested in neonatal-perinatal research.
- Maintain a national neonatal-perinatal database and provide the infrastructure to facilitate collaborative research.
- Study longitudinal outcomes and variations in medical care including cost-effectiveness.
- Examine the impact of resource utilization and practice patterns on patient outcomes and costs of care, and provide benchmarking information for Canadian NICUs.
- Develop innovative research methods that lead to better outcomes.

Summary of Results/Methodology

Canadian Neonatal Network™ Database: Between January 1st, 2006 and December 31st, 2006, 10,789 infants (11,427 admissions including transfers between NICUs and re-admissions) received care from the 24 NICUs included in this report. Infants who were transferred to a "normal newborn care area" (level I nursery) or discharged home within 24 hours of their admission to the NICU were excluded. Data on patient demographics (no patient identifiers are transferred), components of care and outcome until discharge from the hospital were entered into a computer and transferred electronically to the Coordinating Centre, Integrated Centre for Care Advancement through Research (*i*CARE) where the data were verified and analyzed.

Results presented in this report are comprised of the following categories: (1) population demographics, (2) population incidence of common neonatal complications, (3) descriptive and risk-adjusted analyses of survival and outcomes by site and (4) trends of common neonatal outcomes over the last 4 years.

Some sites are limited in funding and therefore are only able to contribute data from a subset of the eligible infants admitted to the hospital. This may be evident in the presentations to follow. Moreover, the 'missing' data on outcome variables vary for each presentation and caution should be used in interpreting the data.

B. Background and Objectives

NICUs utilize the combined abilities of health care team members in expanding knowledge and advancing the technology to provide effectively the care of newborn infants. To support continuous improvement in outcomes of Canadian NICUs, the Canadian Neonatal Network™ Database provides ordinal and categorical data to identify variations in mortality, morbidity and resource utilization. The first CNN report saw the validation of a newborn severity score [Score for Acute Neonatal Physiology (SNAPII)[1]], a severity of illness scale [Neonatal Therapeutic Intervention Scoring System (NTISS)[2]], and an instrument for assessing infant transport outcomes [Transport Risk Index of Physiologic Stability (TRIPS)[3]]. The use of these three scores permitted benchmarking of risk-adjusted variations in mortality and morbidity among Canadian NICUs. This demonstrated variations in outcomes and practices among Canadian NICUs, and indicated that different hospitals had different strengths and areas in need for improvement. The results also suggested that practice and outcome variations are associated, and led to the inception of an additional research project investigating the target of specific practices for change to improve outcomes at NICUs across Canada.

The Evidence-based Practice Identification and Change (EPIC) project explores new methodologies for identifying care practices associated with good or poor outcomes, and provides an evidence-based approach to improving quality of care. Building upon traditional Continuous Quality Improvement (CQI) techniques, EPIC uses multidisciplinary teams at CNN sites, who work collaboratively to implement best practice changes and monitor outcomes

Research using the data was overseen by a Steering Committee, which was elected by members of the Canadian Neonatal Network™. Separate ethics approvals were obtained from the participating institutions for specific projects. Studies conducted by Canadian Neonatal Network™ researchers are supported by the Neonatal-perinatal Interdisciplinary Capacity Enhancement (NICE) Team, comprising leading researchers from across Canada.

We aimed to establish trends in several common neonatal outcomes over the last 4 years for the centres which have participated in the CNN database. This will enable us to understand changes in the process of care, outcomes and resource utilization among centres in Canada.

C. Information Systems

Patients included in the report are those who were admitted to a CNN participating site between January 1st, 2006 and December 31st, 2006, and were discharged by March 31st, 2007. The patients must have had a length of stay in the tertiary NICU of one of the CNN participating sites for greater than or equal to 24 hours, or died or were transferred to another level 2 or 3 facility within 24 hours. A total of 10,789 patients accounted for 11,427 admissions as some infants were admitted on more than one occasion.

Patient information was retrospectively abstracted from patient charts by trained personnel using standard definitions and protocols contained in a standard manual of operations. Data were usually entered into a laptop computer using a customized data entry program with built-in error checking and subsequently sent electronically to the Canadian Neonatal Network™ Coordinating Centre, located at the Integrated Centre for Care Advancement through Research (*i*CARE) in Edmonton, Alberta. Patient data at each participating NICU are available to the respective site investigator only. Patient identifiers were stripped prior to data transfer to the Coordinating Centre. Patient confidentiality was strictly observed. Individual-level data are used for analysis, but only aggregate data are reported. The results presented in this report will not identify participating NICUs by name; each site is anonymous using a randomly assigned number. Wherever a small cell size (≤5) was observed in the data output, the data were often grouped to maintain anonymity. This was not always possible due to small number of data among all centres for select outcomes.

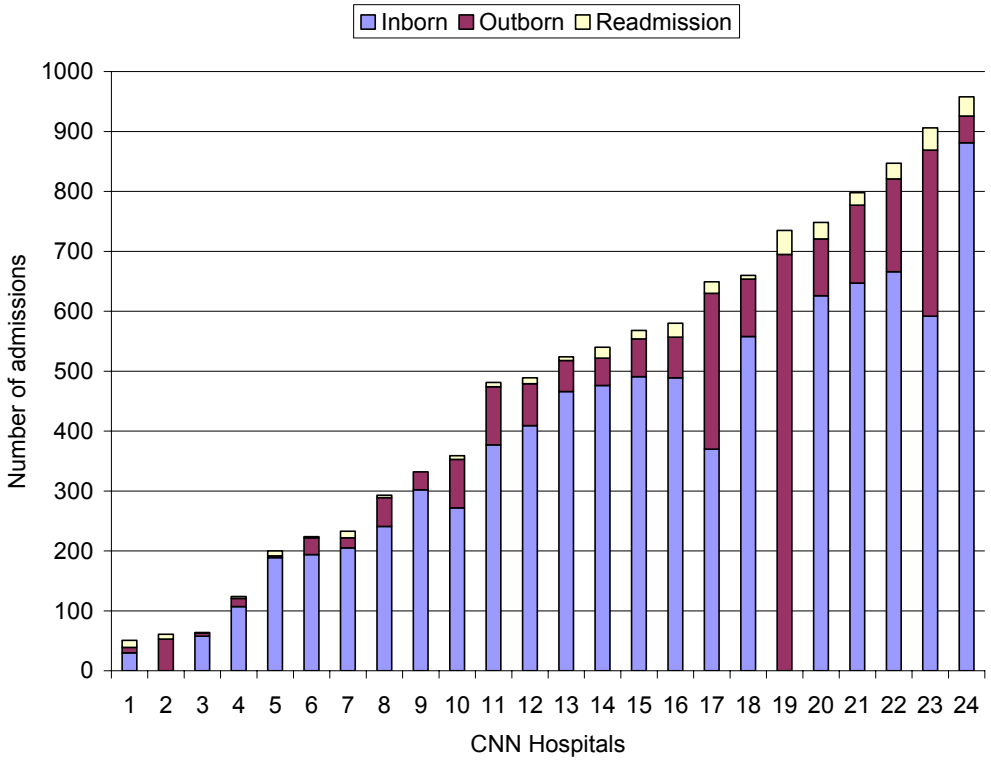
At each participating NICU, data are stored in a secured database in the NICU or in an alternate secured site used by the NICU to store patient information (e.g. health records department, computer services department). At the Coordinating Centre, the central database is stored in a secured computer database located on a server and off site back-up that is maintained and secured by the Capital Health Information Systems Department. At the Coordinating Centre, information was verified for completeness and was reviewed for accuracy by looking for "unusual" and missing values on individual data items and by comparison with other information which might be related (e.g. gestational age and birthweight). However, the principal accuracy rests upon the diligence and capabilities of the individual sites. Each site had one (or occasionally two) dedicated person(s) responsible for data acquisition and transmittance.

In the Coordinating Centre, analyses were conducted using univariate, bivariate, and multivariate analyses for the total cohort, and for individual sites. Multivariate regression analysis was used to identify risk factors associated with mortality and major morbidities. Grouped data enabled development of outcome curves by gestational age and birthweight for mortality and selected major morbidities. Similar systems have been used to guide stratification in randomization trials, assist in quality assurance and predict resource utilization.

D. Descriptive Analysis – Canadian Population

Presentation A

Admissions to Canadian NICU Network participating units

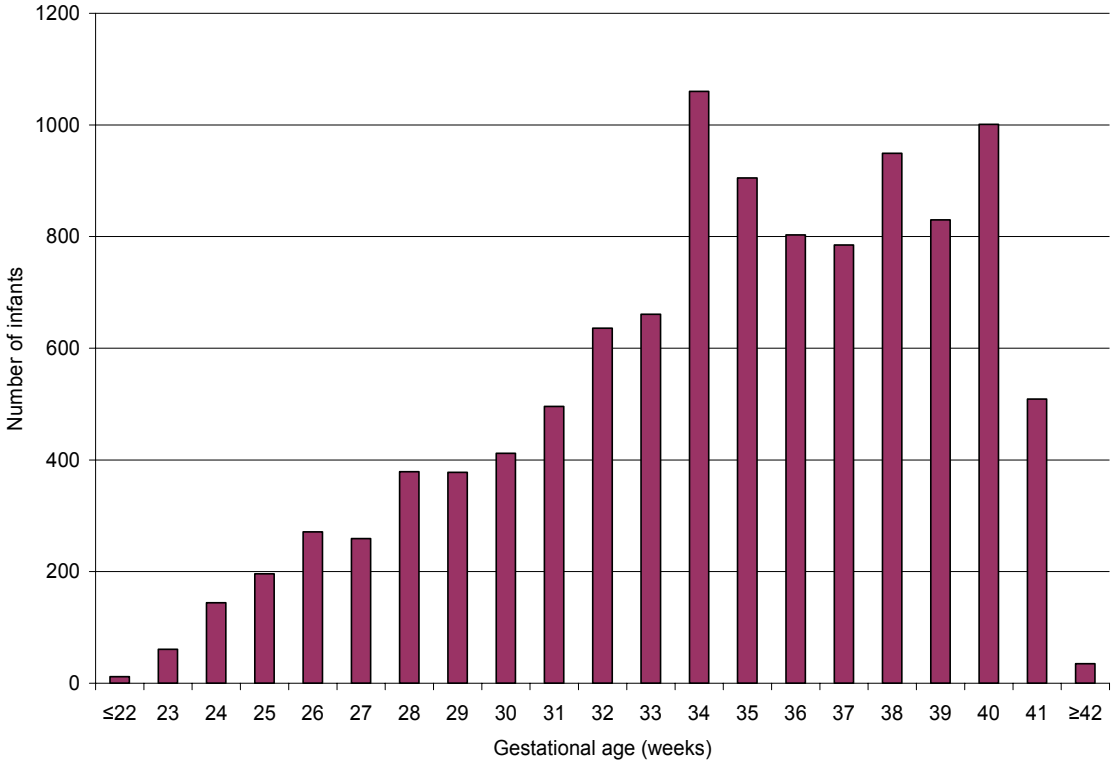


Presentation A (*continued*)
Admissions to Canadian NICU Network participating units

Hospitals		Admission Status			Total	Hospitals	Admission status			Total
		Inborn	Outborn	Readmission			Inborn	Outborn	Readmissions	
1	Count	30	9	12	51	13	466	52	6	524
	%	58.8	17.6	23.5	100.0		88.9	9.9	1.1	100.0
2	Count	0	53	8	61	14	476	46	18	540
	%	0.0	86.9	13.1	100.0		88.1	8.5	3.3	100.0
3	Count	58	5	1	64	15	491	63	14	568
	%	90.6	7.8	1.6	100.0		86.4	11.1	2.5	100.0
4	Count	107	14	3	124	16	489	68	23	580
	%	86.3	11.3	2.4	100.0		84.3	11.7	4.0	100.0
5	Count	189	3	8	200	17	370	260	19	649
	%	94.5	1.5	4.0	100.0		57.0	40.1	2.9	100.0
6	Count	194	28	2	224	18	558	96	6	660
	%	86.6	12.5	0.9	100.0		84.5	14.5	0.9	100.0
7	Count	205	17	11	233	19	0	695	40	735
	%	88.0	7.3	4.7	100.0		0.0	94.6	5.4	100.0
8	Count	241	48	4	293	20	626	95	27	748
	%	82.3	16.4	1.4	100.0		83.7	12.7	3.6	100.0
9	Count	302	30	0	332	21	647	130	21	798
	%	91.0	9.0	0.0	100.0		81.1	16.3	2.6	100.0
10	Count	272	81	6	359	22	666	155	26	847
	%	75.8	22.6	1.7	100.0		78.6	18.3	3.1	100.0
11	Count	377	97	7	481	23	592	277	37	906
	%	78.4	20.2	1.5	100.0		65.3	30.6	4.1	100.0
12	Count	409	70	10	489	24	881	45	32	958
	%	83.6	14.3	2.0	100.0		92.0	4.7	3.3	100.0
Missing										3
Total number of patients										11427

COMMENTS: During the period of January 1, 2006 to December 31, 2006 data from 24 participating Canadian NICUs were collected. Analysis of available data produced 11,427 admissions. Adjusting for readmission and transfers, this represents 10,789 infants.

Presentation B
Gestational age at birth

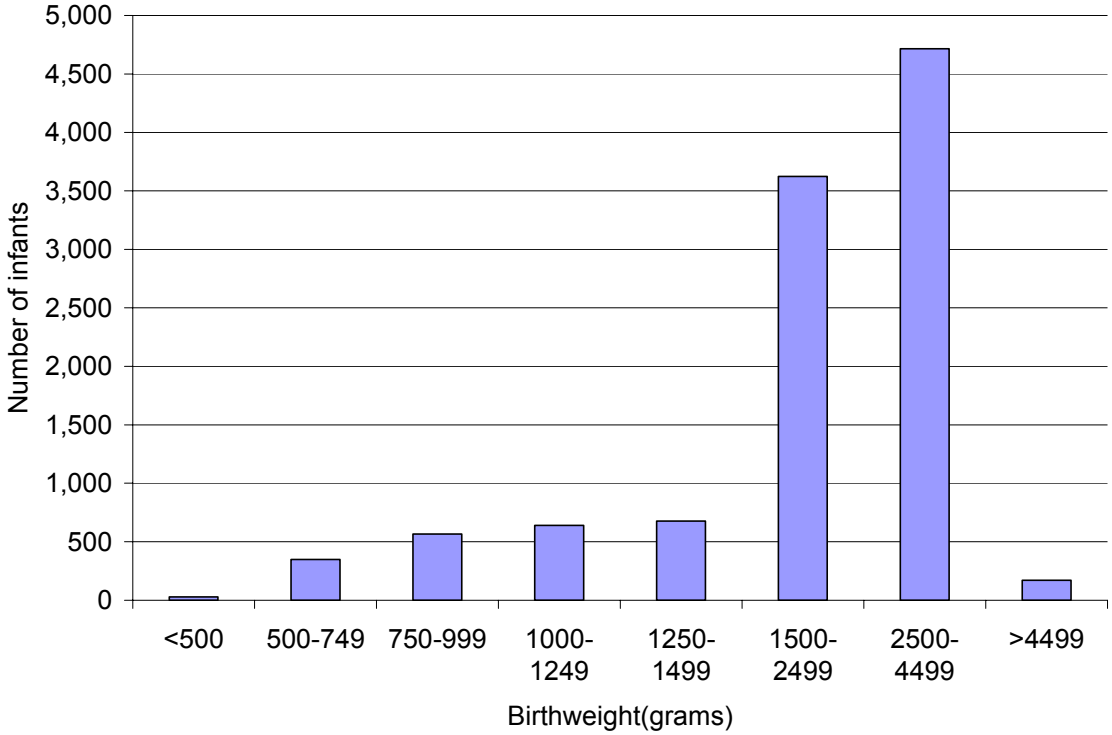


Presentation B (*continued*)
Gestational age at birth

Gestational age at birth	Frequency	Percent	Cumulative Percent
≤22	12	0.1	0.1
23	61	0.6	.7
24	144	1.3	2.0
25	196	1.8	3.8
26	271	2.5	6.3
27	259	2.4	8.7
28	379	3.5	12.3
29	378	3.5	15.8
30	412	3.8	19.6
31	496	4.6	24.2
32	636	5.9	30.1
33	661	6.1	36.2
34	1060	9.8	46.0
35	905	8.4	54.4
36	803	7.4	61.9
37	785	7.3	69.2
38	949	8.8	78.0
39	830	7.7	85.7
40	1001	9.3	95.0
41	509	4.7	99.7
≥42	35	0.3	100.0
Total included	**10782**	100.0	
Missing	**7**		
Total # of infants	**10789**		

COMMENTS: The gestational age distribution of infants is shown here. Term babies (≥37 weeks) represent about 38% of the total.

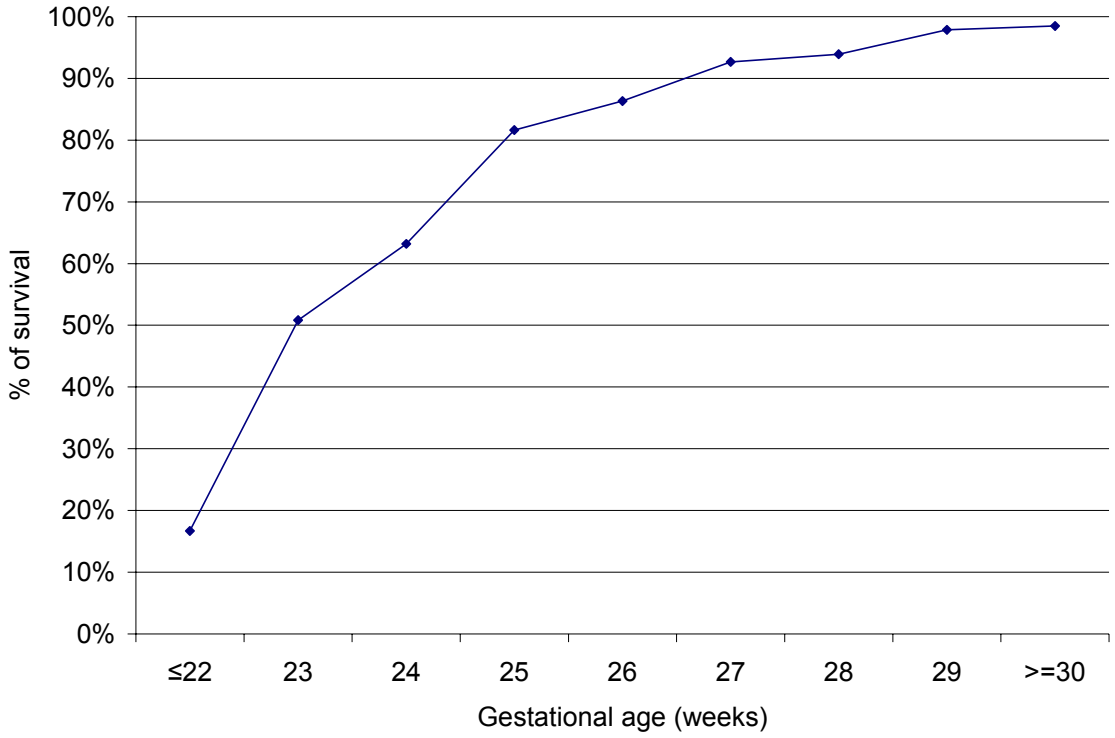
Presentation C
Birthweight



Birthweight	Frequency	Percent	Cumulative Percent
<500	27	0.3	0.3
500-749	348	3.2	3.5
750-999	566	5.3	8.7
1000-1249	640	5.9	14.7
1250-1499	676	6.3	21.0
1500-2499	3623	33.6	54.6
2500-4499	4716	43.8	98.4
>4499	171	1.6	100.0
Total included	**10767**	100.0	
Missing	**22**		
Total # of infants	**10789**		

COMMENTS: The birthweight distribution of infants admitted to NICUs. Seventy-nine percent weighed over 1500g at birth and 45.4% weighed over 2500g.

Presentation # 1
Gestational age at birth and survival to NICU discharge

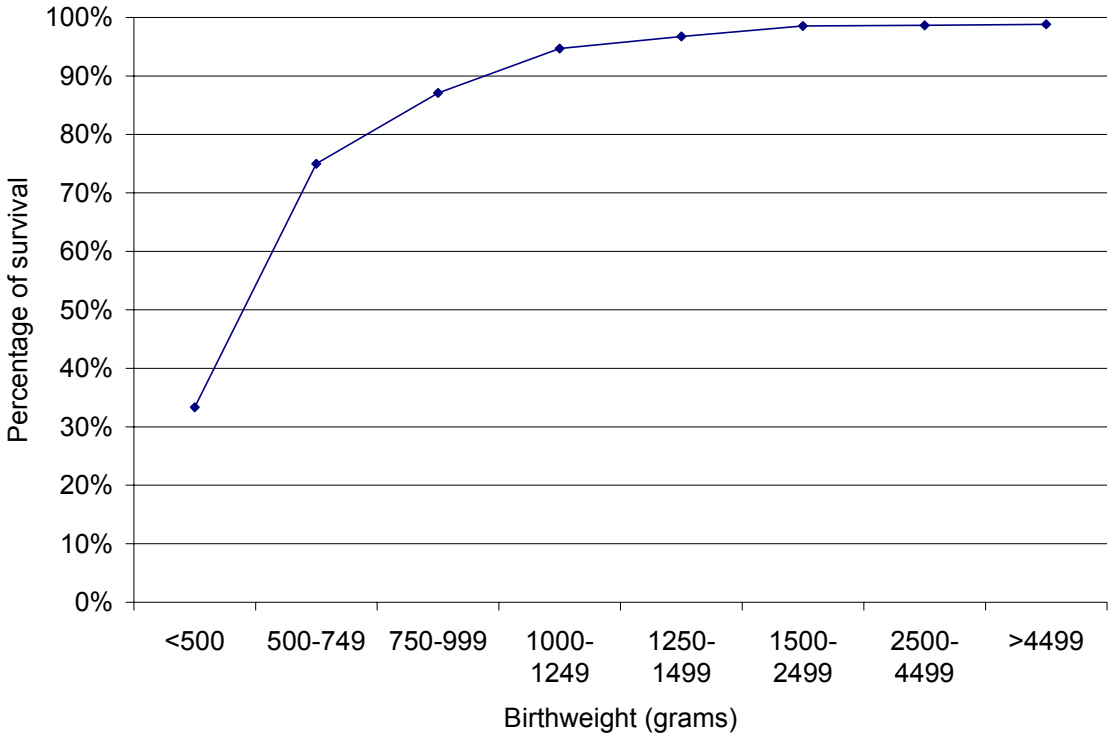


Gestational age (weeks)	Number of infants	Number of survivors	% of survivors
≤22	12	2	16.7
23	61	29	47.5
24	144	88	61.1
25	196	159	81.1
26	271	232	85.6
27	259	237	91.5
28	379	352	92.9
29	378	368	97.4
≥30	9082	8937	98.4
Total included	**10782**	10404	96.5
Missing	7		
Total # of infants	**10789**		

Caveat: The survival rates only refer to infants admitted to the NICU and should be used cautiously for antenatal counseling.

COMMENTS: The survival rate is based upon the final discharge from the participating neonatal site. Note that this only includes infants admitted to the NICU and thus, is not reflective of the Canadian population. Figures do not represent infants (especially those at very low gestational ages) who died prior to admission to the NICU.

Presentation #2
Birth weight and survival to NICU discharge



Birthweight(g)	Number of infants	Number of survivors	% of survivors
<500	27	9	33.3
500-749	348	254	73.0
750-999	566	488	86.2
1000-1249	640	602	94.1
1250-1499	676	652	96.4
1500-2499	3623	3566	98.4
2500-4499	4716	4652	98.6
>4499	171	169	98.8
Total included	**10767**	10392	96.5
Missing	**22**		
Total # of infants	**10789**		

Caveat: The survival rates refer only to infants admitted to the NICU, and should be used cautiously for antenatal counseling.

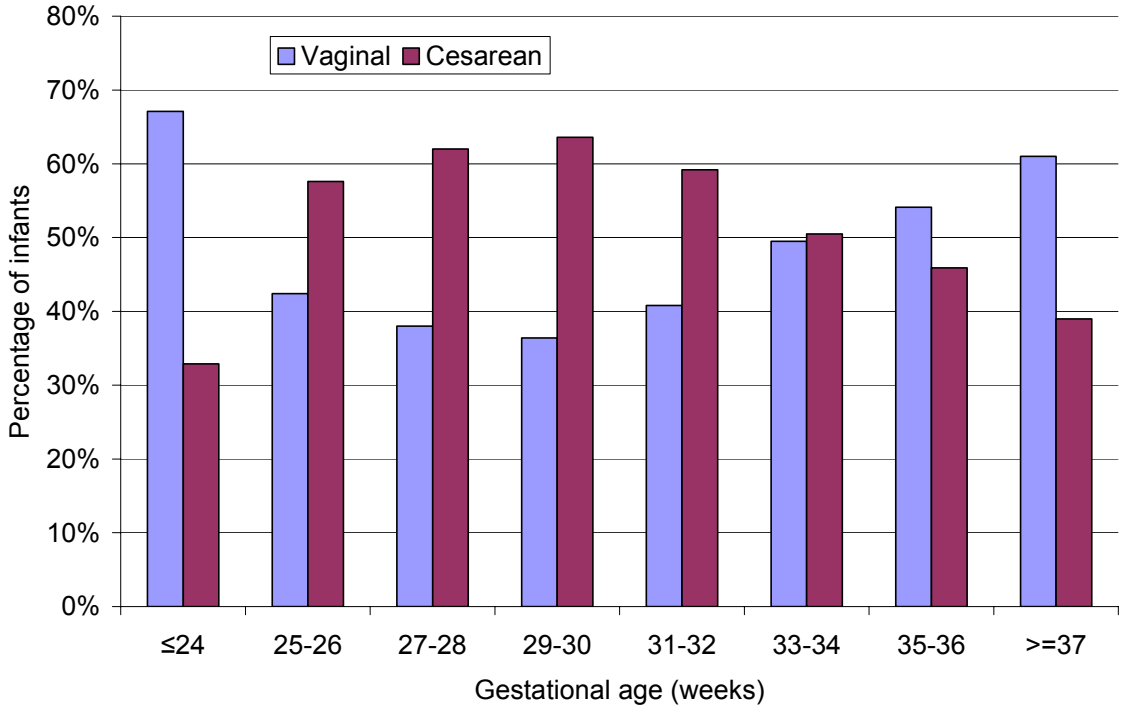
COMMENTS: The survival rate is based upon the final discharge from the participating neonatal site. Note that this only includes infants admitted to the NICU and thus, is not reflective of the Canadian population. Figures do not represent infants (especially those at very low gestational ages) who died prior to admission to the NICU.

Presentation #3
Cesarean or vaginal birth according to fetal presentation (by gestational age)

Delivery mode	Gestational age (birth)		Presentation				
			Vertex	Breech	Other*	Unknown**	Total
Vaginal	≤24	N	95	33	5	12	145
		%	65.5%	22.8%	3.4%	8.3%	100.0%
	25-26	N	154	28	0	10	192
		%	80.2%	14.6%	.0%	5.2%	100.0%
	27-28	N	208	18	4	11	241
		%	86.3%	7.5%	1.7%	4.6%	100.0%
	29-30	N	249	20	6	10	285
		%	87.4%	7.0%	2.1%	3.5%	100.0%
	31-32	N	416	26	7	12	461
		%	90.2%	5.6%	1.5%	2.6%	100.0%
	33-34	N	781	35	12	20	848
		%	92.1%	4.1%	1.4%	2.4%	100.0%
	35-36	N	846	28	18	29	921
		%	91.9%	3.0%	2.0%	3.1%	100.0%
	>=37	N	2339	18	62	71	2490
		%	93.9%	.7%	2.5%	2.9%	100.0%
	Total included	**N**	5088	206	114	175	5583
		%	91.1%	3.7%	2.0%	3.1%	100.0%
	Missing (GA)	**N**					**3**
Cesarean	≤24	N	10	43	12	6	71
		%	14.1%	60.6%	16.9%	8.5%	100.0%
	25-26	N	89	117	19	36	261
		%	34.1%	44.8%	7.3%	13.8%	100.0%
	27-28	N	158	162	22	51	393
		%	40.2%	41.2%	5.6%	13.0%	100.0%
	29-30	N	220	175	18	85	498
		%	44.2%	35.1%	3.6%	17.1%	100.0%
	31-32	N	324	221	25	97	667
		%	48.6%	33.1%	3.7%	14.5%	100.0%
	33-34	N	436	273	41	116	866
		%	50.3%	31.5%	4.7%	13.4%	100.0%
	35-36	N	469	185	21	107	782
		%	60.0%	23.7%	2.7%	13.7%	100.0%
	>=37	N	1129	215	27	223	1594
		%	70.8%	13.5%	1.7%	14.0%	100.0%
	Total included	**N**	2835	1391	185	721	5132
		%	55.2%	27.1%	3.6%	14.0%	100.0%
	Missing (GA)	**N**					**4**
Total							**10715**
Missing(Pres/GA)							**7**
Missing(mode)							**67**
Total # of infants							**10789**

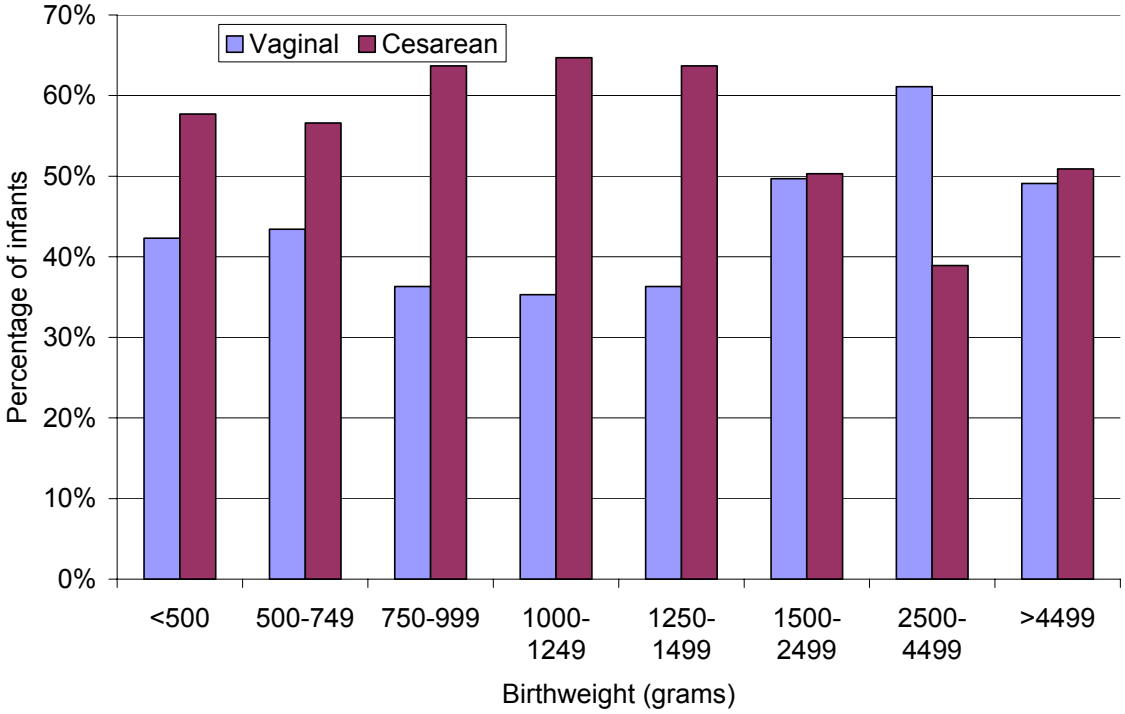
*Other includes: shoulder, transverse, brow, face, oblique vertex, compound presentation
**Unknown: no mention of presentation, may include multiple pregnancies

Presentation #4
Vaginal or cesarean birth in relation to gestational age



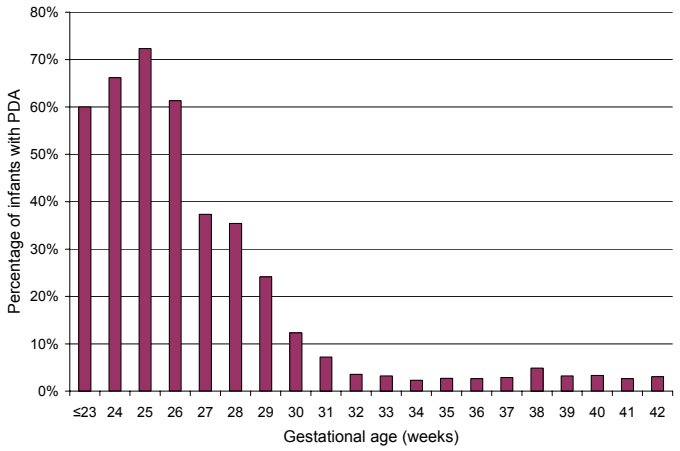
Birth gestational age (weeks)	Delivery type				Total
	Vaginal		Cesarean		
	Number	%	Number	%	
≤24	145	67.1%	71	32.9%	216
25-26	192	42.4%	261	57.6%	453
27-28	241	38.0%	393	62.0%	634
29-30	285	36.4%	498	63.6%	783
31-32	461	40.8%	668	59.2%	1129
33-34	848	49.5%	866	50.5%	1714
35-36	922	54.1%	783	45.9%	1705
≥37	2490	61.0%	1595	39.0%	4085
Total included	5584	52.1%	5135	47.9%	10719
Missing					**70**
Total # of infants					**10789**

Presentation #5
Vaginal or cesarean birth in relation to birthweight



Birthweight (g)	Delivery type				Total
	Vaginal		Cesarean		
	Number	%	Number	%	
<500	11	42.3%	15	57.7%	26
500-749	148	43.4%	193	56.6%	341
750-999	202	36.3%	354	63.7%	556
1000-1249	224	35.3%	411	64.7%	635
1250-1499	243	36.3%	427	63.7%	670
1500-2499	1795	49.7%	1817	50.3%	3612
2500-4499	2867	61.1%	1824	38.9%	4691
>4499	84	49.1%	87	50.9%	171
Total included	5574	52.1%	5128	47.9%	10702
Missing					**87**
Total # of infants					**10789**

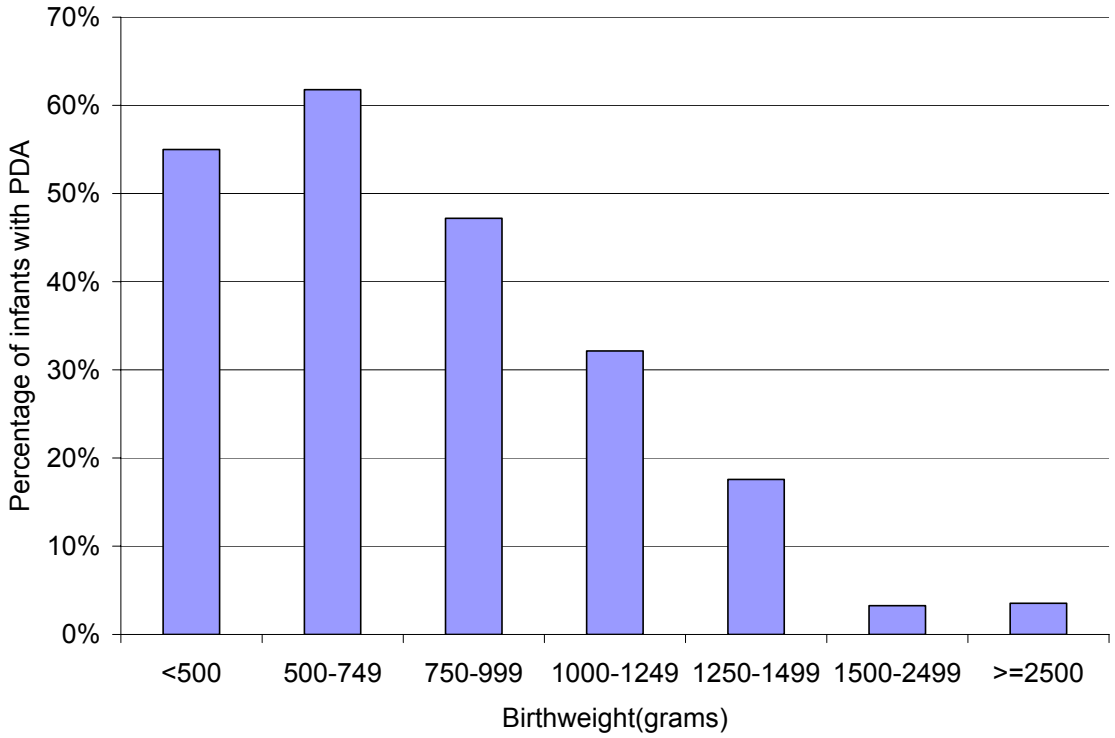
Presentation #6
Incidence of patent ductus arteriosus (by gestational age)



Gestational age(birth)	Number of infants	with PDA	%
≤23	60	36	60.0%
24	139	92	66.2%
25	188	136	72.3%
26	261	160	61.3%
27	257	96	37.4%
28	367	130	35.4%
29	369	89	24.1%
30	406	50	12.3%
31	486	35	7.2%
32	620	22	3.5%
33	652	21	3.2%
34	1031	24	2.3%
35	885	24	2.7%
36	790	21	2.7%
37	761	22	2.9%
38	926	45	4.9%
39	806	26	3.2%
40	964	32	3.3%
41	492	13	2.6%
42	33	1	3.0%
Total included	**10493**	**1075**	10.2%
Missing	**296**		
Total # of infants	**10789**		

COMMENTS: Diagnosis of PDA was clinical and did not require cardiac ultrasound confirmation.

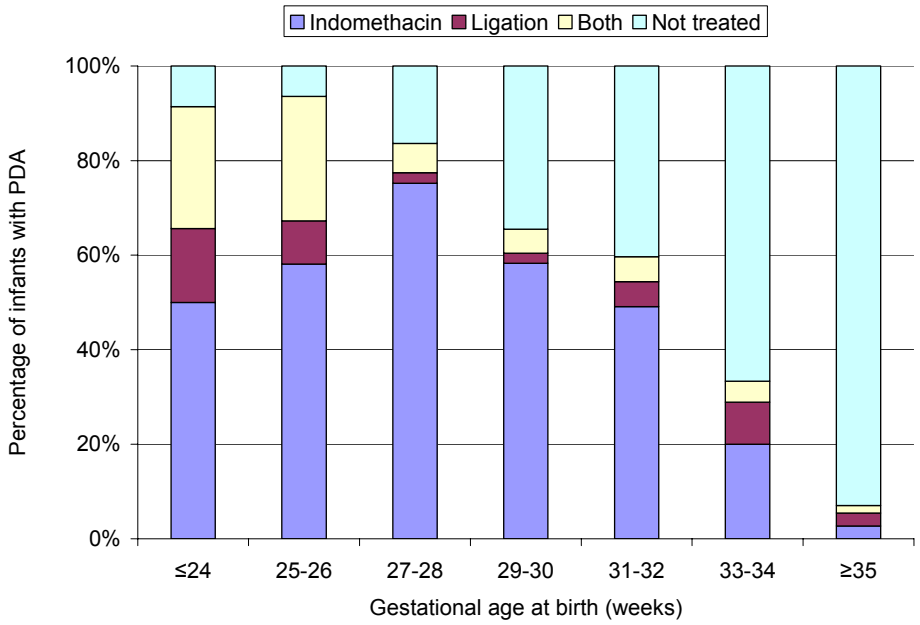
Presentation #7
Incidence of patent ductus arteriosus (by birthweight)



Birthweight(g)	Number of infants	with PDA	%
<500	20	11	55.0%
500-749	335	207	61.8%
750-999	549	259	47.2%
1000-1249	622	200	32.2%
1250-1499	660	116	17.6%
1500-2499	3549	115	3.2%
≥2500	4743	167	3.5%
Total included	**10478**	**1075**	**10.3%**
Missing	**291**		
Total	**10789**		

COMMENTS: Incidence of clinically diagnosed patent ductus arteriosus (PDA) in relation to gestational age and birthweight is shown in Presentation #7 and #8. Diagnosis was made by a physician and did not require cardiac ultrasound confirmation.

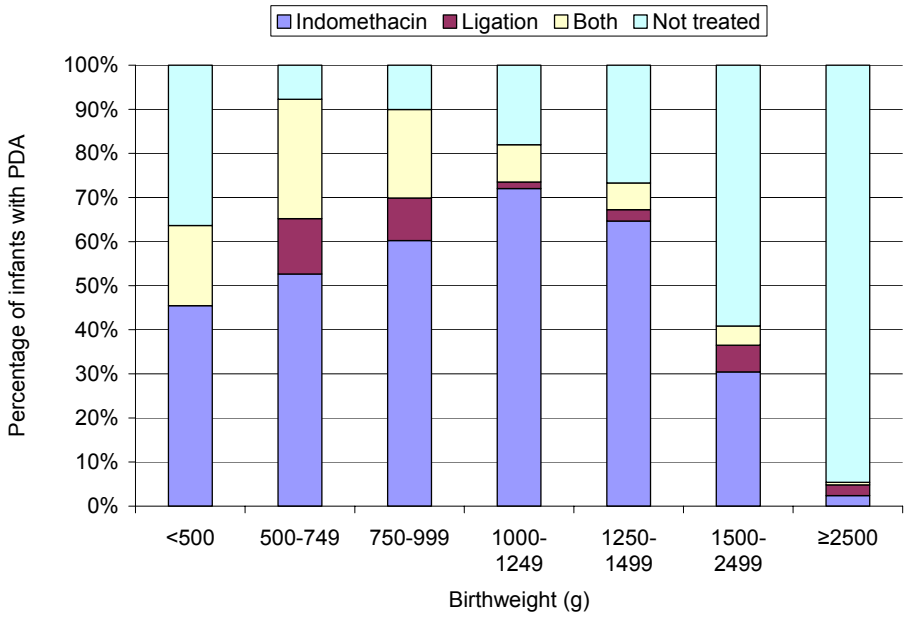
Presentation #8
Treatment of patent ductus arteriosus (by gestational age)



Birth gestational age (weeks)		Infants with PDA	Treatment			Not treated
			Indomethacin	Ligation	Both	
≤24	**N**	128	64	20	33	11
	%	100.0%	50.0%	15.6%	25.8%	8.6%
25-26	**N**	296	172	27	78	19
	%	100.0%	58.1%	9.1%	26.4%	6.4%
27-28	**N**	226	170	5	14	37
	%	100.0%	75.2%	2.2%	6.2%	16.4%
29-30	**N**	139	81	3	7	48
	%	100%	58.3%	2.2%	5.0%	34.5%
31-32	**N**	57	28	3	3	23
	%	100%	49.1%	5.3%	5.3%	40.4%
33-34	**N**	45	9	4	2	30
	%	100%	20.0%	8.9%	4.4%	66.7%
≥35	**N**	184	5	5	3	171
	%	100.0%	2.7%	2.7%	1.6%	92.9%
Total included	**N**	1075	529	67	140	339
	%	100.0%	49.2%	6.2%	13.0%	31.5%
Missing data		**292**				
Total # of infants without PDA		**9422**				

COMMENTS: Specific reasons for treatment of indomethacin and frequency of repeat course of indomethacin were not recorded. Excludes indomethacin prophylaxis started on the first day of birth. Only one hospital used ibuprofen for PDA and data on ibuprofen administration are not included.

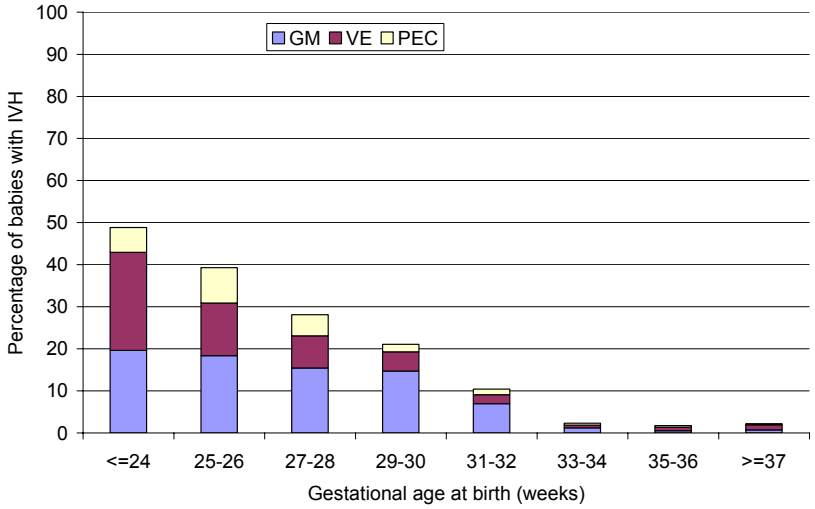
Presentation #9
Treatment of patent ductus arteriosus (by birthweight)



Birthweight (g)		Infants with PDA	Treatment			Not treated
			Indomethacin	Ligation	Both	
<500	N	11	5	0	2	4
	%	100.0%	45.5%	.0%	18.2%	36.4%
500-749	N	207	109	26	56	16
	%	100.0%	52.7%	12.6%	27.1%	7.7%
750-999	N	259	156	25	52	26
	%	100.0%	60.2%	9.7%	20.1%	10.0%
1000-1249	N	200	144	3	17	36
	%	100.0%	72.0%	1.5%	8.5%	18.0%
1250-1499	N	116	75	3	7	31
	%	100.0%	64.7%	2.6%	6.0%	26.7%
1500-2499	N	115	35	7	5	68
	%	100.0%	30.4%	6.1%	4.3%	59.1%
≥2500	N	167	4	4	1	158
	%	100.0%	2.4%	2.4%	.6%	94.6%
Total included	N	1075	528	68	140	339
	%	100.0%	49.1%	6.3%	13.0%	31.5%
Missing data		292				
Total # of infants without PDA		9422				

COMMENTS: Specific reasons for treatment of indomethacin and frequency of repeat course of indomethacin were not recorded. Excludes indomethacin prophylaxis started on the first day of birth. Only one hospital used ibuprofen for PDA and data on ibuprofen administration are not included.

Presentation #10
Incidence of intraventricular hemorrhage (by gestational age)

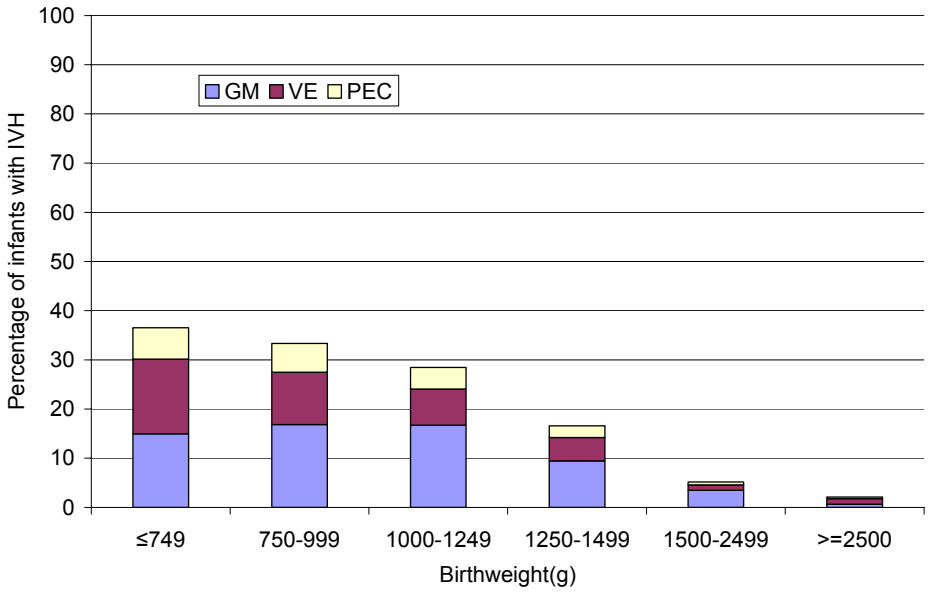


Birth gestational age (weeks)		IVH					Number of infants
		None	GM	VE	PEC	Not screened	
≤24	N	58	43	51	13	54	219
	%	26.5	19.6	23.3	5.9	24.7	100
25-26	N	222	85	58	39	59	463
	%	47.9	18.4	12.5	8.4	12.7	100
27-28	N	388	99	49	32	73	641
	%	60.5	15.4	7.6	5.0	11.4	100
29-30	N	472	116	36	14	150	788
	%	59.9	14.7	4.6	1.8	19.0	100
31-32	N	487	79	24	15	527	1132
	%	43.0	7.0	2.1	1.3	46.6	100
33-34	N	274	21	11	8	1407	1721
	%	15.9	1.2	0.6	0.5	81.8	100
35-36	N	229	9	14	7	1446	1705
	%	13.4	0.5	0.8	0.4	84.8	100
≥37	N	774	30	49	11	3241	4105
	%	18.9	0.7	1.2	0.3	79.0	100
Total included	N	2904	482	292	139	6957	10774
	%	27.0	4.5	2.7	1.3	64.6	100
Missing (GA/ IVH)							**15**
Total # of infants							**10789**

Footnote: not all infants at these gestational groups were screened.

COMMENTS: These analyses are based on those examined (detection rate). The incidence of intraventricular hemorrhage (IVH) in relation to gestational age and birthweight is shown in Presentation #11 and #12, respectively. GM and VE diagnoses are based on cranial ultrasound examination, CT Scans or MRIs in the first two weeks of life. PEC diagnoses are based on cranial ultrasound examination, CT Scans or MRIs after 21 days of life.

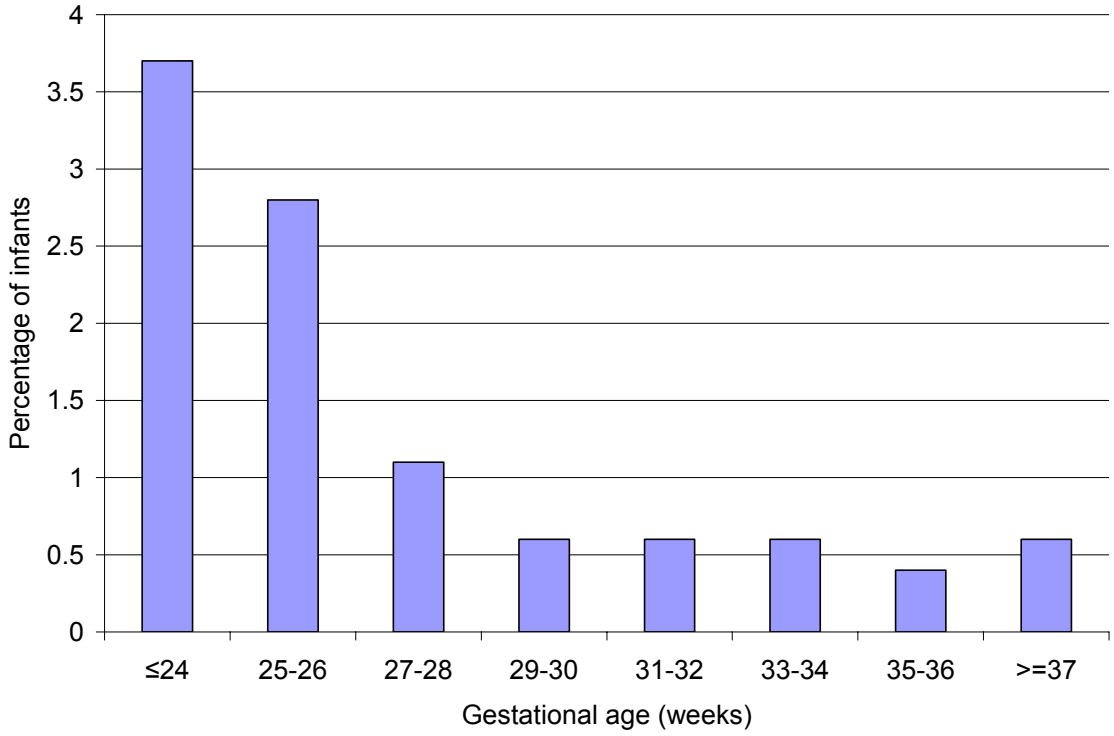
Presentation #11
Incidence of intraventricular hemorrhage (by birthweight)



Birthweight (g)		IVH					Number of infants
		None	GM	VE	PEC	Not screened	
≤749	N	165	56	57	24	73	375
	%	44	14.9	15.2	6.4	19.5	100
750-999	N	301	95	60	33	75	564
	%	53.4	16.8	10.6	5.9	13.3	100
1000-1249	N	371	107	47	28	87	640
	%	58.0	16.7	7.3	4.4	13.6	100
1250-1499	N	416	64	32	16	148	676
	%	61.5	9.5	4.7	2.4	21.9	100
1500-2499	N	821	126	39	22	2613	3621
	%	22.7	3.5	1.1	0.6	72.2	100
≥2500	N	823	32	55	16	3956	4882
	%	16.9	0.7	1.1	0.3	81.0	100
Total included	N	2897	480	290	139	6952	10758
	%	26.9	4.5	2.7	1.3	64.6	100
Missing (birthweight or IVH)							**31**
Total # of infants							**10789**

COMMENTS: These analyses are based on those examined (detection rate). The incidence of intraventricular hemorrhage (IVH) in relation to gestational age and birthweight is shown in Presentation #11 and #12, respectively. GM and VE diagnoses are based upon cranial ultrasound examination, CT Scans or MRIs in the first two weeks of life. PEC diagnoses are based on cranial ultrasound examination, CT Scans or MRIs after 21 days of life.

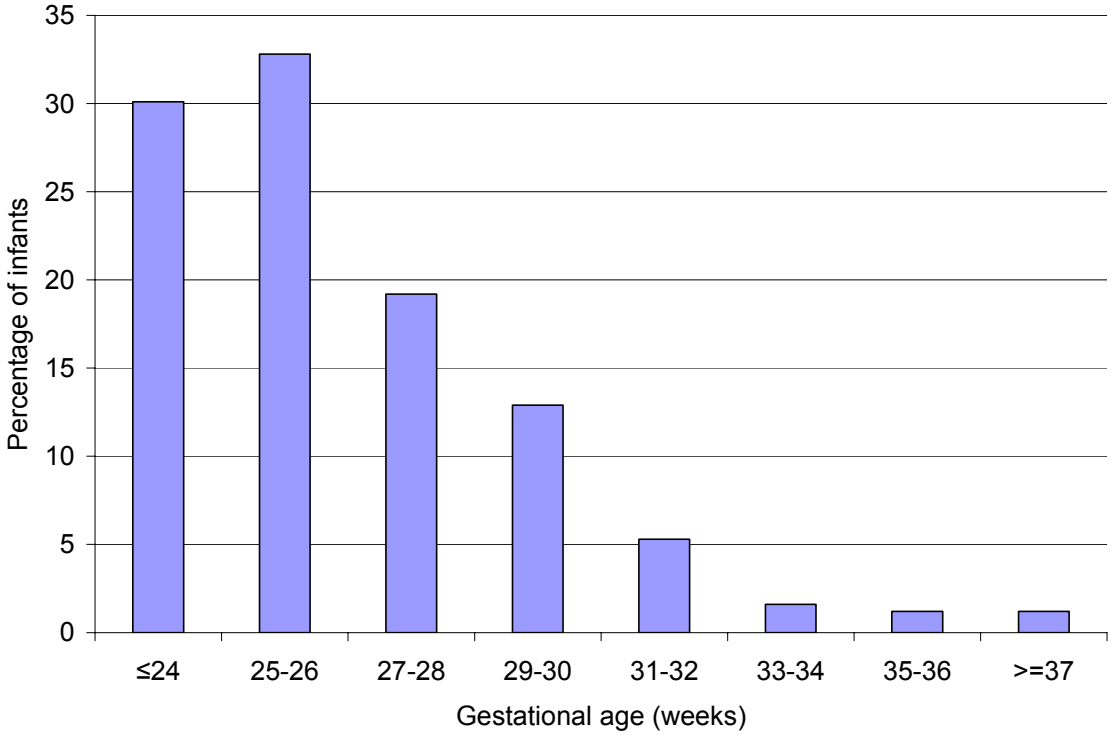
Presentation #12
Primary infection (by gestational age)



Gestational age at birth	Infants	No. of infants with infection	%
≤24	219	8	3.7
25-26	464	13	2.8
27-28	641	7	1.1
29-30	789	5	0.6
31-32	1132	7	0.6
33-34	1722	10	0.6
35-36	1707	6	0.4
≥37	4108	26	0.6
Total included	10782	82	0.8
Missing (GA)	**7**		
Total # of infants	**10789**		

COMMENTS: Primary infection is indicated by positive blood and/or cerebrospinal fluid, bacterial or candida culture in the first two days after birth (adjusted for readmission and transfers).

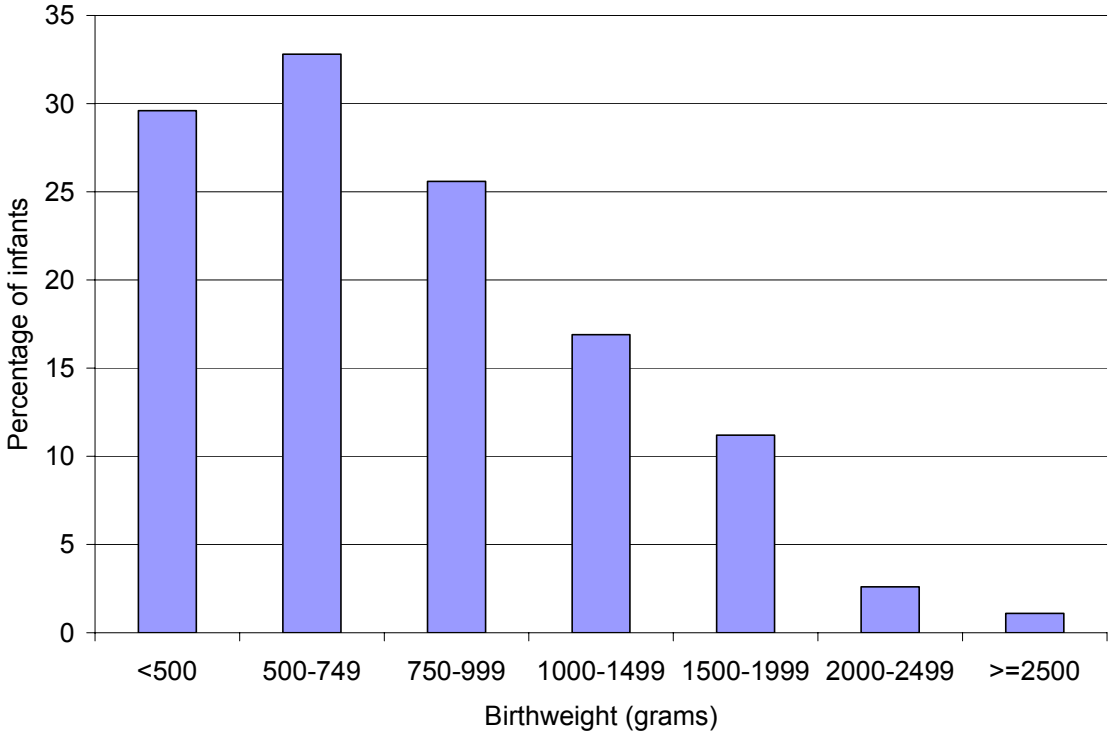
Presentation #13
Nosocomial infection (by gestational age)



Gestational age at birth	Infants	# with at least one infection	%
≤24	219	66	30.1
25-26	464	152	32.8
27-28	641	123	19.2
29-30	789	102	12.9
31-32	1132	60	5.3
33-34	1722	27	1.6
35-36	1707	21	1.2
≥37	4108	51	1.2
Total included	**10782**	**602**	**5.6**
Missing	**7**		
Total # of infants	**10789**		

COMMENTS: Nosocomial infection (likely hospital acquired after two days of age) at varying gestational ages and birthweights is shown in Presentation #13 and #14, respectively. The number is adjusted for readmission and transfer. These analyses include only positive blood and/or cerebrospinal fluid, bacterial or candidal cultures, and do not include pneumonia, urinary tract infections, or skin infections.

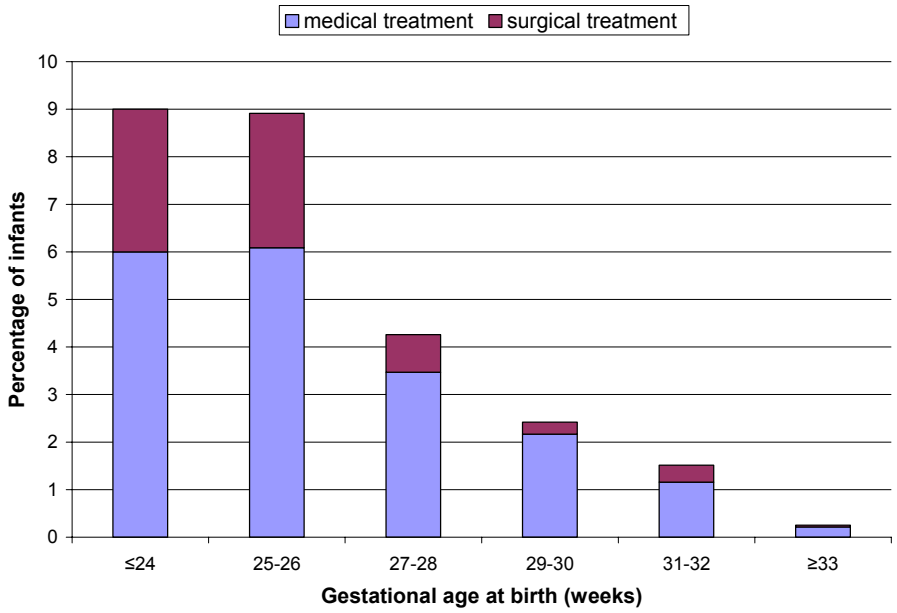
Presentation #14
Nosocomial infection (by birthweight)



Birthweight(g)	Infants	# with at least one infection	%
<500	27	8	29.6
500-749	348	114	32.8
750-999	566	145	25.6
1000-1499	640	108	16.9
1500-1999	676	76	11.2
2000-2499	3623	96	2.6
≥2500	4887	54	1.1
Total included	**10767**	**601**	**5.6**
Missing (birthweight)	**22**		
Total # of infants	**10789**		

COMMENTS: Nosocomial infection (likely hospital acquired after two days of age) at varying gestational ages and birthweights is shown in Presentation #13 and #14, respectively. The number is adjusted for readmission and transfer. These analyses include only positive blood and/or cerebrospinal fluid, bacterial or candidal cultures, and do not include pneumonia, urinary tract infections, or skin infections.

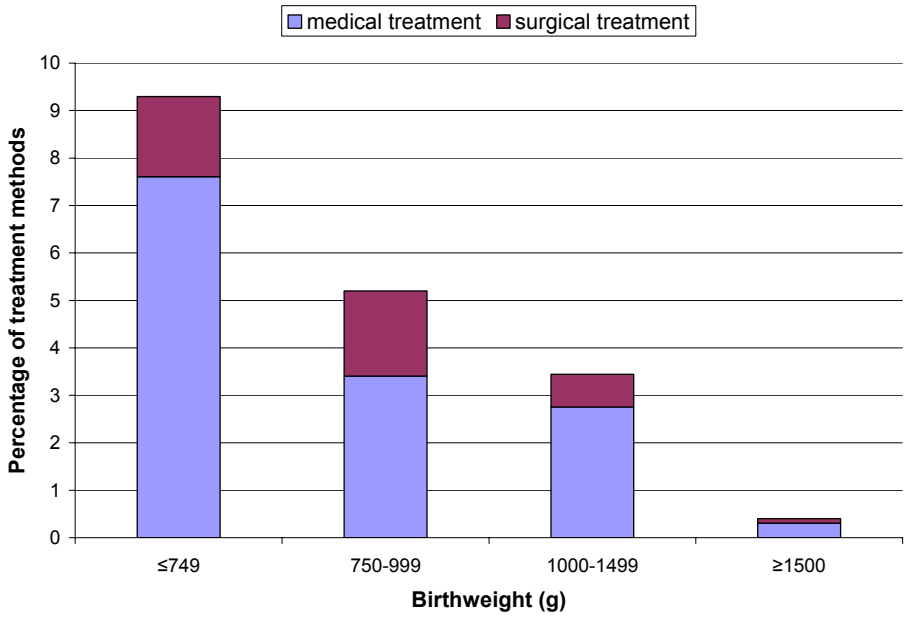
Presentation #15
Incidence of necrotizing enterocolitis (by gestational age)



Birth gestational age (weeks)		Number of infants	Necrotizing Enterocolitis		
			none	medical treatment	surgical treatment
≤24	N	200	182	12	6
	%	100.0%	91.0%	6.0%	3.0%
25-26	N	460	419	28	13
	%	100.0%	91.1%	6.1%	2.8%
27-28	N	634	607	22	5
	%	100.0%	95.7%	3.5%	0.8%
29-30	N	785	766	17	2
	%	100.0%	97.6%	2.2%	0.3%
31-32	N	1123	1106	13	
	%	100.0%	98.5%	1.2%	0.4%
≥33	N	7480	7461	16	3
	%	100.0%	99.7%	0.2%	0.0%
Total included	N	10682	10541	108	33
	%	100.0%	98.7%	1.0%	0.3%
Missing		**107**			
Total # of infants		**10789**			

COMMENTS: Necrotizing enterocolitis is scored according to the following criteria: a) definite pneumatosis (air in the bowel wall) or portal/hepatic air as diagnosed by x-ray, or b) if there is a surgical or autopsy diagnosis of NEC. Diagnoses of 'suspected NEC' or x-rays showing free air without pneumatosis are not classified as NEC.

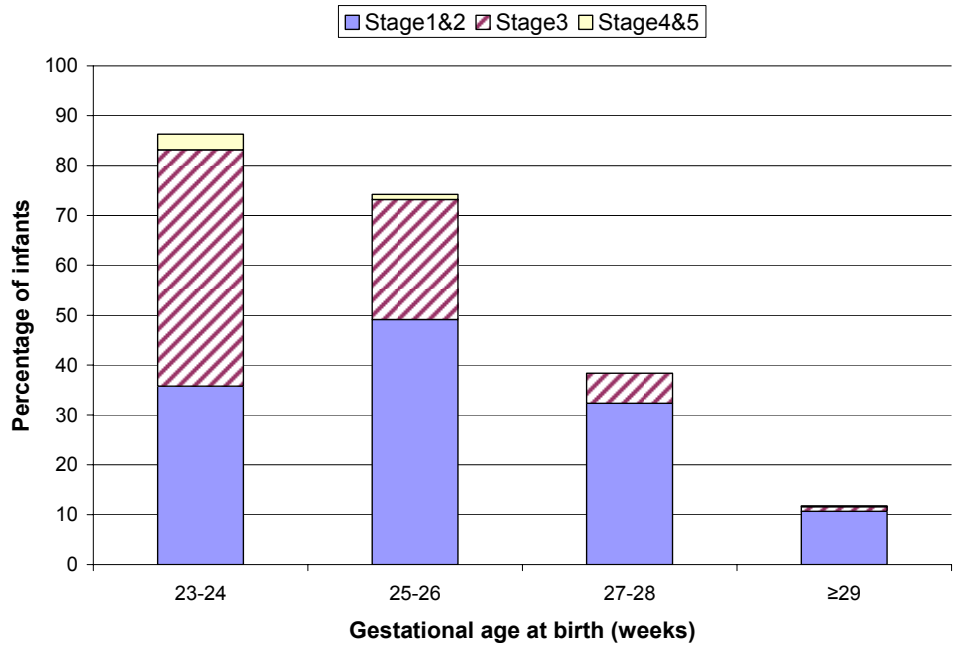
Presentation #16
Incidence of necrotizing enterocolitis (by birthweight)



Birthweight (g)		Number of infants	Necrotizing Enterocolitis		
			none	medical treatment	surgical treatment
≤749	N	355	322	27	6
	%	100.0%	90.7%	7.6%	1.7%
750-999	N	558	529	19	10
	%	100.0%	94.8%	3.4%	1.8%
1000-1249	N	637	610	21	6
	%	100.0%	95.8%	3.3%	0.9%
1250-1499	N	670	652	15	3
	%	100.0%	97.3%	2.2%	0.4%
≥1500	N	8446	8412	26	8
	%	100.0%	99.6%	0.3%	0.1%
Total included	N	10666	10525	108	33
	%	100.0%	98.7%	1.0%	0.3%
Missing		**123**			
Total # of infants		**10789**			

COMMENTS: Necrotizing enterocolitis is scored according to the following criteria: a) definite pneumatosis (air in the bowel wall) or portal/hepatic air as diagnosed by x-ray, or b) if there is a surgical or autopsy diagnosis of NEC. Diagnoses of 'suspected NEC' or x-rays showing free air without pneumatosis are not classified as NEC.

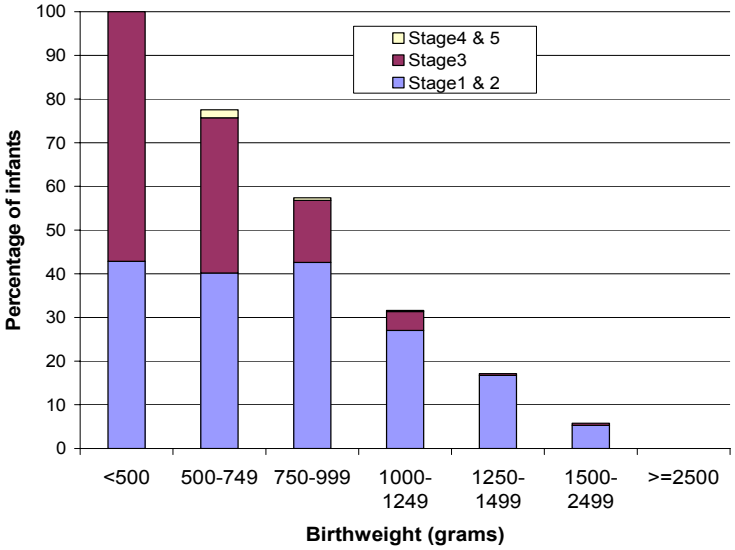
Presentation #17
Incidence of retinopathy of prematurity (by gestational age)



Birth gestational age (weeks)		Retinopathy of prematurity				Number of infants received eye examination	Therapy
		none	Stages 1 & 2	Stage 3	Stage 4 & 5		
≤24	N	13	34	45	3	95	31
	%	13.7%	35.8%	47.4%	3.2%	100.0%	14.2%
25-26	N	76	145	71	3	295	62
	%	25.8%	49.2%	24.1%	1.0%	100.0%	13.4%
27-28	N	244	128	24	0	396	12
	%	61.6%	32.3%	6.1%	.0%	100.0%	1.9%
≥29	N	578	70	6	1	655	4
	%	88.2%	10.7%	.9%	.2%	100.0%	0.0%
Total included	**N**	911	377	146	7	1441	109
	%	63.2%	26.2%	10.1%	.5%	100.0%	1.0%
Missing(GA or ROP)						**2**	
Total # of infants						**1443**	

COMMENTS: Retinopathy of prematurity is defined according to the International Classification of Retinopathy of Prematurity (ICROP). Information is based on infants who received eye examinations. More advanced stages may have been detected in infants transferred from network NICUs to level II hospitals or units. Caution should be used in interpreting these data.

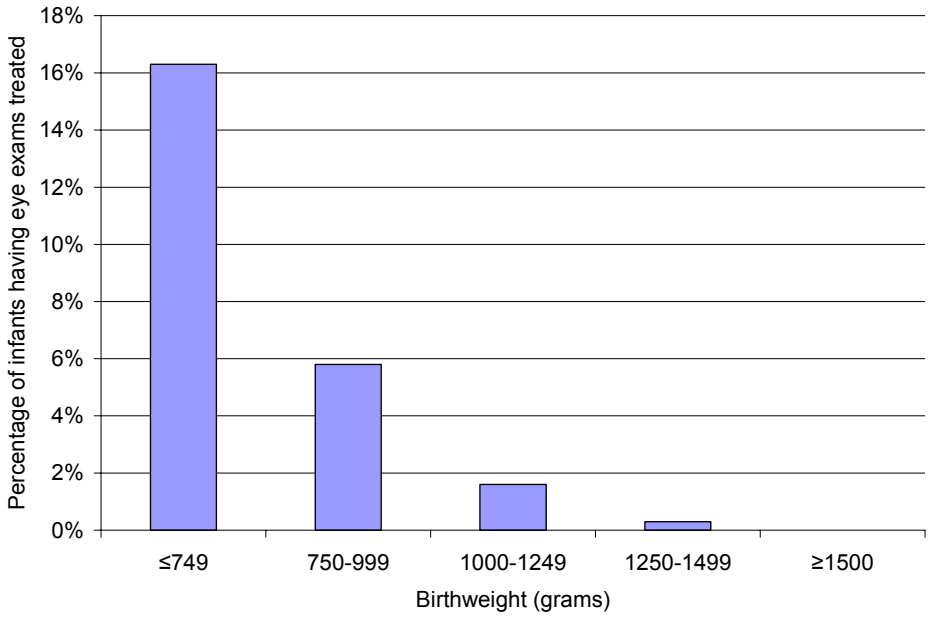
Presentation #18
Incidence of retinopathy of prematurity (by birthweight)



Birthweight (grams)		Retinopathy of prematurity				Number of infants received eye examination
		none	Stages 1 & 2	Stage 3	Stage 4 & 5	
<500	N	0	3	4	0	7
	%	.0%	42.9%	57.1%	.0%	100.0%
500-749	N	48	86	76	4	214
	%	22.4%	40.2%	35.5%	1.9%	100.0%
750-999	N	141	141	47	2	331
	%	42.6%	42.6%	14.2%	.6%	100.0%
1000-1249	N	238	94	15	1	348
	%	68.4%	27.0%	4.3%	.3%	100.0%
1250-1499	N	208	42	1	0	251
	%	82.9%	16.7%	.4%	.0%	100.0%
1500-2499	N	195	11	1	0	207
	%	94.2%	5.3%	.5%	.0%	100.0%
≥2500	N	79	0	0	0	79
	%	100.0%	.0%	.0%	.0%	100.0%
Total included	N	909	377	144	7	1437
	%	63.3%	26.2%	10.0%	.5%	100.0%
Missing (birthweight)						**6**
Total # of infants						**1443**

COMMENTS: Retinopathy of prematurity is defined according to the International Classification of Retinopathy of Prematurity (ICROP). Information is based on infants who received eye examinations. More advanced stages may have been detected in infants transferred from network NICUs to level II hospitals or units. Caution should be used in interpreting these data.

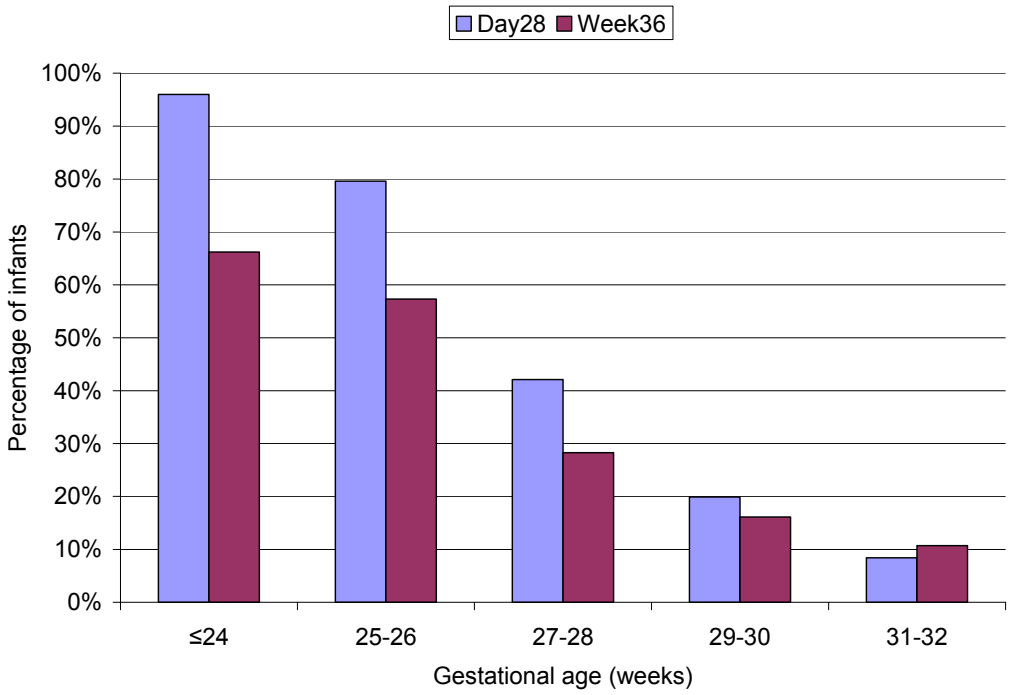
Presentation #18a
Incidence of cryo/laser therapy for infants with retinopathy of prematurity



Birthweight (grams)		Number of infants received eye examination	Therapy
≤749	N	221	61
	%		16.3%
750-999	N	331	33
	%		5.8%
1000-1249	N	348	10
	%		1.6%
1250-1499	N	251	2
	%		0.3%
≥1500	N	286	1
	%		0.0%
Total included	N	**1437**	107
	%		1.0%
Missing		**6**	
Total # of infants		**1443**	

COMMENTS: Retinopathy of prematurity is defined according to the International Classification of Retinopathy of Prematurity (ICROP). Information is based on infants who received eye examinations. More advanced stages may have been detected in infants transferred from network NICUs to level II hospitals or units. Caution should be used in interpreting these data.

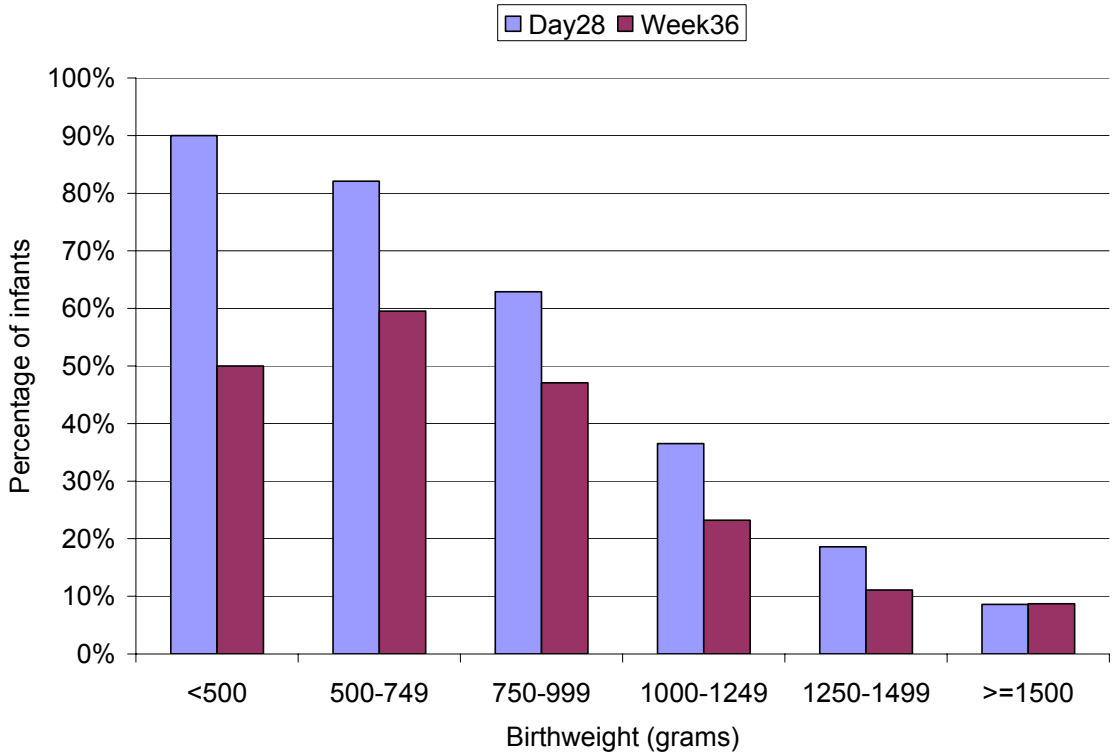
Presentation #19
Incidence of bronchopulmonary dysplasia (by gestational age) among infants with GA <32 weeks



Birth gestational age (weeks)	Day 28					Week 36				
	Infants	with BPD	% with BPD	Number of infants without BPD	% Survival without BPD	Infants	with BPD	% with BPD	Number of infants without BPD	% Survival without BPD
≤24	101	97	96.0	4	100.0	68	45	66.2%	23	100.0
25-26	333	265	79.6	68	95.6	206	118	57.3%	88	100.0
27-28	447	188	42.1	259	98.8	276	78	28.3%	198	100.0
29-30	402	80	19.9	322	100.0	249	40	16.1%	209	100.0
31-32	395	33	8.4	362	99.4	159	17	10.7%	142	98.6
Total included	1678	663	39.5	1015	99.2	958	298	31.1%	660	99.7
Missing	0	0				0	0			
Total # of infants	**1678**	**663**				**958**	**298**			

COMMENTS: Bronchopulmonary dysplasia is defined as: a) having received assisted ventilation at any time in the NICU prior to day 28 or week 36, and b) receiving supplemental oxygen on day 28 or week 36. The information is for infants with gestational age ≤32 weeks at birth. There were no requirements for chest radiographs at the time of diagnosis.

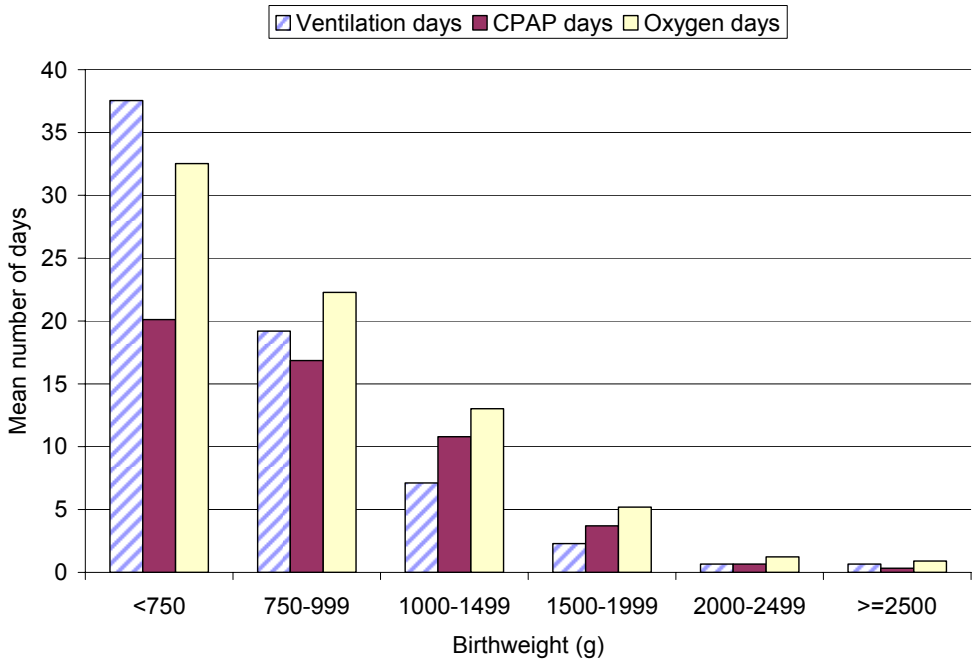
Presentation #20
Incidence of bronchopulmonary dysplasia (by birthweight) among infants with GA <32 weeks



Birthweight (g)	Day 28			Week 36		
	Infants	with BPD	%	Infants	with BPD	%
<500	10	9	90.0	8	4	50.0
500-749	224	184	82.1	158	94	59.5
750-999	380	239	62.9	242	114	47.1
1000-1249	394	144	36.5	233	54	23.2
1250-1499	295	55	18.6	153	17	11.1
>=1500	373	32	8.6	161	14	8.7
Total	1676	663	39.6	955	297	31.1
Missing	**2**	**0**		**3**	**1**	
Total # of infants	**1678**			**958**	**298**	

COMMENTS: Bronchopulmonary dysplasia is defined as: a) having received assisted ventilation at any time in the NICU prior to day 28 or week 36, and b) receiving supplemental oxygen on day 28 or week 36. The information is for infants with gestational age ≤32 weeks at birth. There were no requirements for chest radiographs at the time of diagnosis.

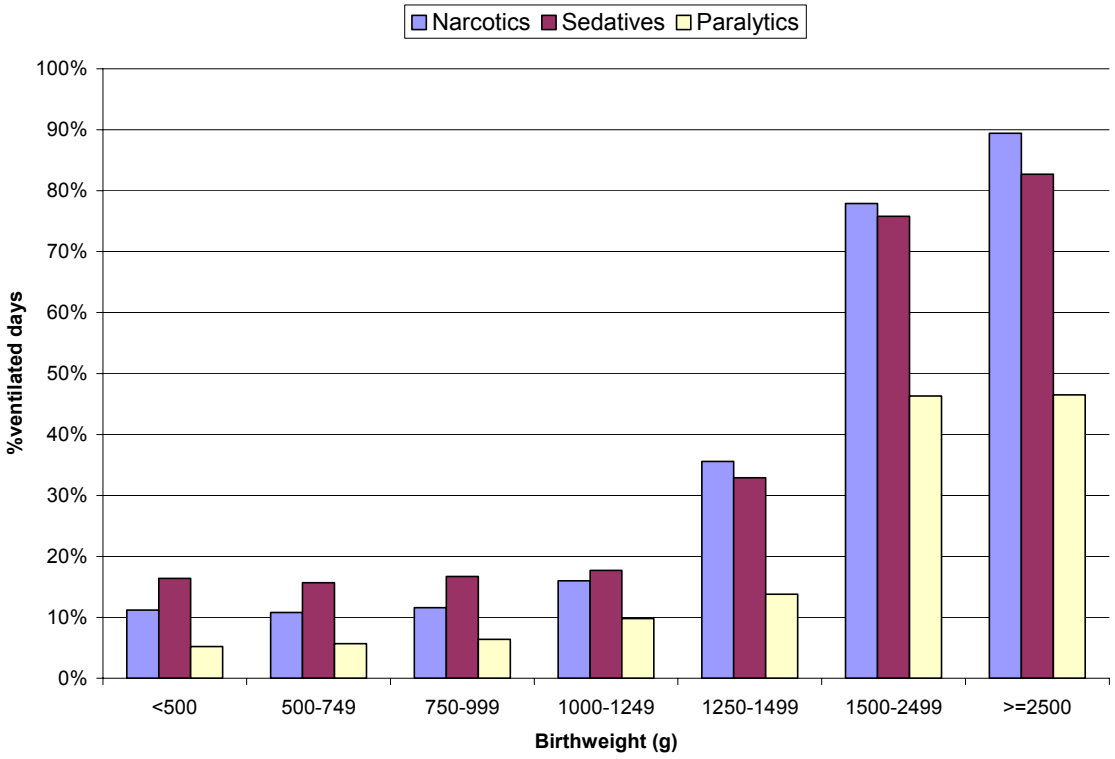
Presentation #21
Days on assisted ventilation and oxygen (by birthweight)



		Birthweight (g)						
		<750	750-999	1000-1249	1250-1499	1500-2499	≥2500	Total # of infants
Ventilation days*	N	103	160	214	236	1782	2418	4913
	Mean	37.5	19.2	7.1	2.3	0.7	0.7	2.4
	SEM	2.3	1.5	0.8	0.3	0.1	0.0	0.1
	Median	41	14	2	0	0	0	0
CPAP days*	N	103	160	214	236	1782	2418	4913
	Mean	20.1	16.9	10.8	3.7	0.7	0.3	2.0
	SEM	1.6	1.3	0.9	0.5	0.1	0.0	0.1
	Median	17	14	5	1	0	0	0
Oxygen days*	N	103	160	214	236	1782	2418	4913
	Mean	32.5	22.3	13.0	5.2	1.2	0.9	3.1
	SEM	2.3	1.6	1.2	0.6	0.1	0.1	0.1
	Median	30	16.5	7	0	0	0	0

COMMENTS: This presentation represents respiratory support information collected at time of discharge where only the highest form of support is recorded for each day (please see Appendix A on CD for specific criteria). Oxygen days indicate days where the infant is only on oxygen for the day(s), with no assisted ventilation. The information is for all infants discharged home directly from network hospitals.

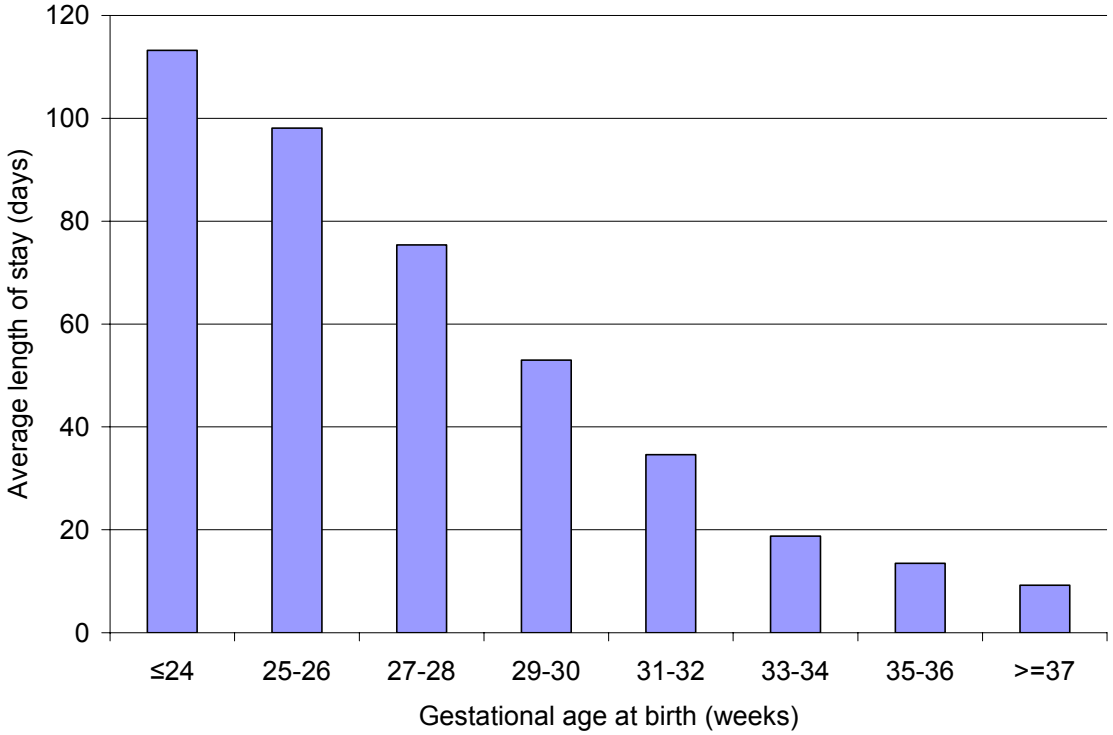
Presentation #22
Medication days and assisted ventilation



Birthweight (g)	Narcotics			Sedatives			Paralytics			Days on ventilation		
	N	mean %	median %	N	mean %	median %	N	mean %	median %	N	mean	median
<500	15	11.2%	5.9%	5	16.4%	11.8%	8	5.2%	5.9%	19	37.1	17
500-749	255	10.8%	2.4%	84	15.7%	4.8%	72	5.7%	2.4%	328	42.7	42
750-999	357	11.6%	3.8%	82	16.7%	7.7%	70	6.4%	3.8%	550	31.0	26
1000-1249	256	16.0%	8.3%	47	17.7%	8.3%	33	9.8%	8.3%	561	18.6	12
1250-1499	171	35.6%	25.0%	25	32.9%	25.0%	23	13.8%	25.0%	517	8.9	4
1500-2499	452	77.9%	50.0%	88	75.8%	50.0%	64	46.3%	50.0%	1481	4.8	2
≥2500	754	89.4%	100.0%	209	82.7%	50.0%	203	46.5%	50.0%	1490	4.5	2
Total	2260	31.1%	25.0%	540	36.0%	25.0%	473	17.1%	25.0%	4946	12.3	4

COMMENTS:
Mean % = [(mean number of days on medication) ÷ (mean number of days on assisted ventilation)]*100.
Median % = [(median (number of days on medication) ÷ (median number of days on assisted ventilation)]*100.
Of those infants who were ventilated and received any narcotic(s), sedative(s), or paralytic(s), approximately 12% died. These results include patients who died.

Presentation #23
Length of stay prior to discharge home from the Network hospital in relation to gestational age at birth*

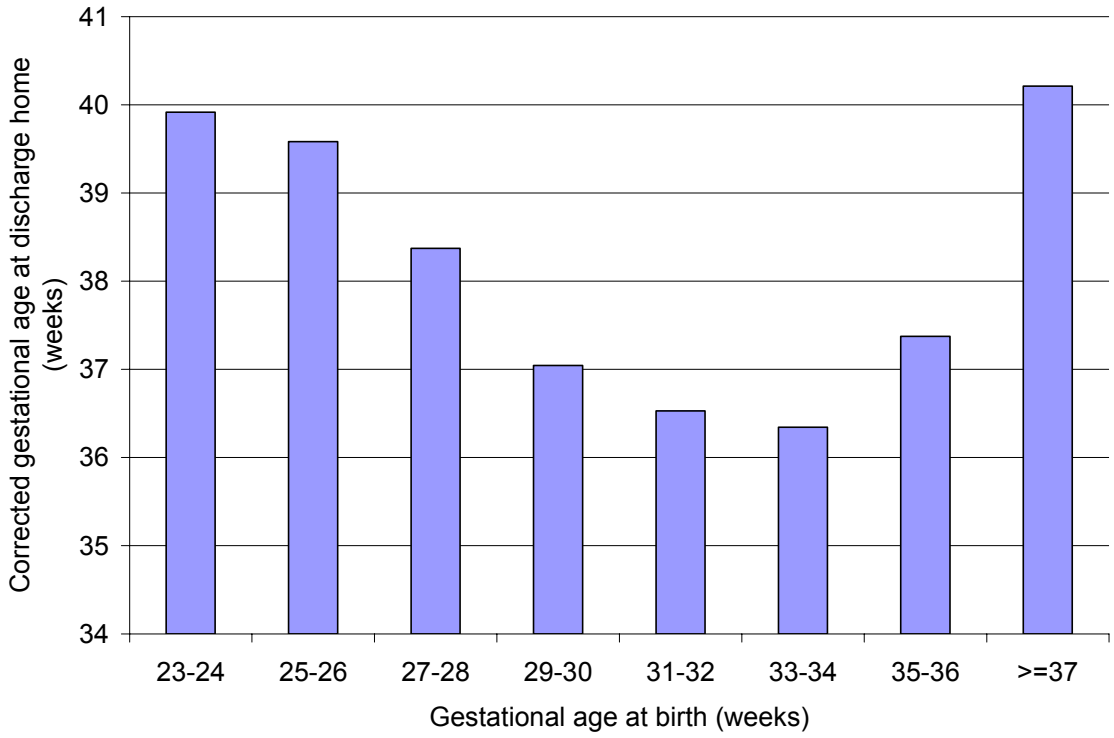


Gestational age at birth	# of infants	Mean	SEM	Median
≤24	47	113.2	4.7	122
25-26	130	98.1	2. 7	99
27-28	217	75.4	1.7	72
29-30	251	53.0	1.2	51
31-32	454	34.6	0.7	31
33-34	934	18.8	0.4	16
35-36	929	13.5	4.4	11
≥37	1956	9.2	0.2	7
Total included	4918	22.7	0.4	13
Missing	**2**			
Total # of infants	**4920**			

*Data shown apply to infants discharged home from network hospitals (data for infants transferred to other units are presently unavailable)

COMMENTS: For infants discharged home from a network hospital, the length of stay in hospital from the day of admission to the day when the patient went home from the hospital, in relation to gestational age at birth, is illustrated. It is unknown whether those transferred to another hospital have different lengths of stay.

Presentation #24
Post-menstrual age at discharge home*



Gestational age at birth	Post-menstrual age (weeks) at discharge home			
	# of infants	Mean	SEM	Median
≤24	47	39.9	0.7	41.1
25-26	130	39.6	0.4	39.9
27-28	217	38.4	0.2	38.1
29-30	251	37.0	0.2	36.9
31-32	454	36.5	0.1	36.1
33-34	934	36.3	0.1	36.0
35-36	929	37.4	0.1	37.1
≥37	1956	40.2	0.0	40.1
Total included	4918	38.3	0.0	38.0
Missing	**2**			
Total # of infants	**4918**			

*Data shown apply to infants discharged home from network NICUs (data for infants transferred to other units are presently unavailable)

COMMENTS: For infants discharged home from a network hospital, the length of stay in hospital from the day of admission to the day when the patient went home from the hospital, in relation to gestational age at birth, is illustrated. It is unknown whether those transferred to another hospital have different lengths of stay.

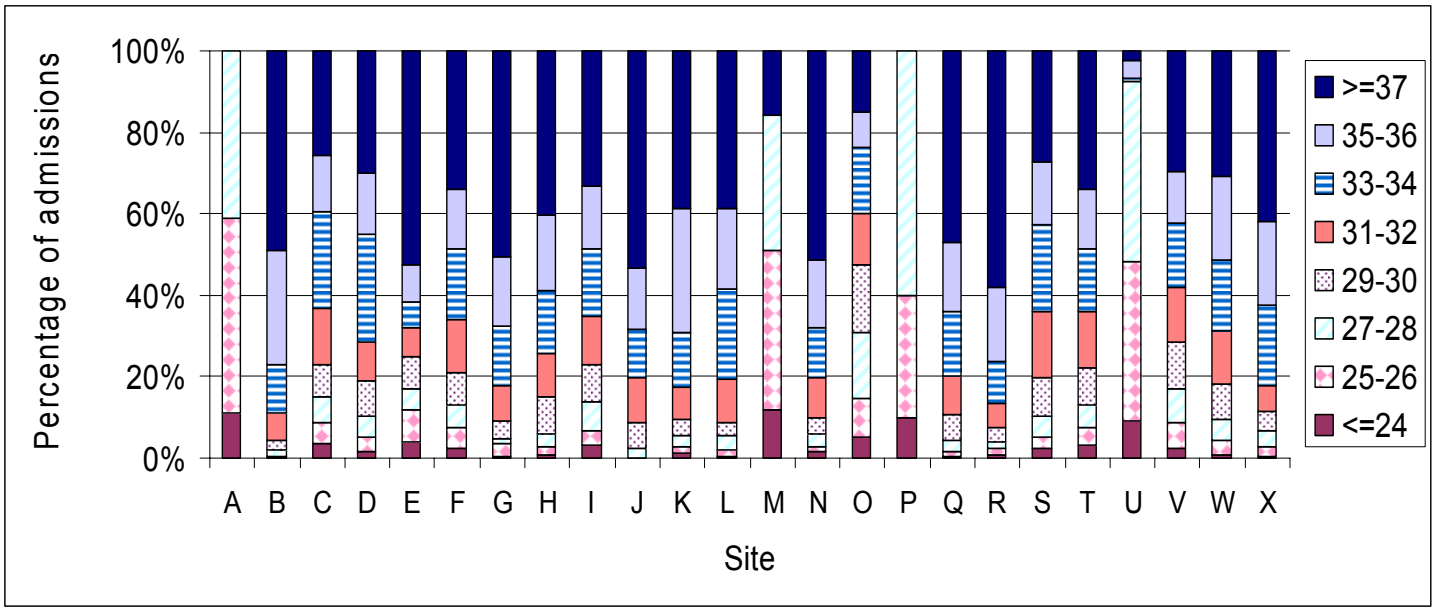
Presentation #25
Use of oxygen at discharge home

Gestational age (weeks)	Admissions	Oxygen	
		N	%
≤24	47	20	24.7%
25-26	130	38	46.9%
27-28	217	12	14.8%
29-30	251	1	1.2%
31-32	454	0	0%
33-34	934	1	1.2%
35-36	929	1	1.2%
≥37	1956	8	9.9%
Total included	4918	81	100.0%
Missing	**2**		
Total # of infants	**4920**		

COMMENTS: There were no infants discharged home on CPAP or IMV.

E. Site Comparisons – Mortality

Presentation #26
Site specific gestational age categories of infants

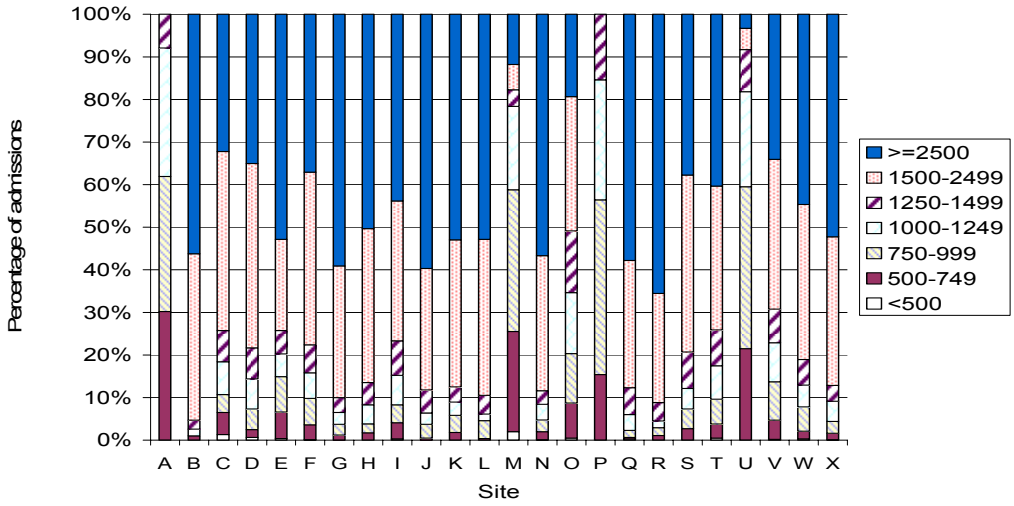


Presentation #26 (*continued*)
Site specific gestational age categories of infants

		Gestational age (weeks)								
		≤24	25-26	27-28	29-30	31-32	33-34	35-36	≥37	Total %
Admissions per site (%)	A	11.1%	47.6%	41.3%	N/A	N/A	N/A	N/A	N/A	100.0%
	B	.5%	N/A	1.6%	2.1%	6.8%	12.0%	28.1%	49.0%	100.0%
	C	3.7%	5.0%	6.2%	8.1%	13.9%	23.6%	13.7%	25.9%	100.0%
	D	1.5%	3.6%	5.3%	8.6%	9.5%	26.3%	15.1%	30.0%	100.0%
	E	4.1%	7.7%	5.0%	8.2%	7.0%	6.5%	8.9%	52.6%	100.0%
	F	2.3%	5.1%	5.8%	7.6%	13.4%	17.3%	14.5%	34.1%	100.0%
	G	.3%	3.2%	1.1%	4.6%	8.6%	14.6%	17.2%	50.4%	100.0%
	H	.7%	2.1%	3.1%	9.0%	10.7%	15.6%	18.3%	40.5%	100.0%
	I	3.1%	3.7%	7.1%	9.0%	12.0%	16.5%	15.4%	33.3%	100.0%
	J	N/A	N/A	2.3%	6.3%	11.3%	11.7%	14.9%	53.6%	100.0%
	K	1.3%	1.3%	3.1%	3.6%	8.1%	13.5%	30.5%	38.6%	100.0%
	L	.4%	1.7%	3.3%	3.3%	10.8%	22.1%	19.6%	38.8%	100.0%
	M	11.8%	39.2%	33.3%	N/A	N/A	N/A	N/A	15.7%	100.0%
	N	1.4%	1.4%	3.1%	4.0%	10.0%	12.3%	16.6%	51.2%	100.0%
	O	5.2%	9.5%	16.1%	16.6%	12.7%	16.3%	8.4%	15.2%	100.0%
	P	10.0%	30.0%	60.0%	N/A	N/A	N/A	N/A	N/A	100.0%
	Q	.3%	1.1%	3.1%	6.2%	9.6%	15.5%	17.2%	46.9%	100.0%
	R	.9%	1.4%	1.8%	3.2%	6.3%	10.1%	18.2%	57.9%	100.0%
	S	2.3%	2.7%	5.3%	9.5%	16.2%	21.3%	15.6%	27.2%	100.0%
	T	3.0%	4.4%	5.7%	9.0%	14.1%	15.2%	14.7%	34.0%	100.0%
	U	9.0%	39.3%	44.3%	N/A	N/A	.8%	4.1%	2.5%	100.0%
	V	2.2%	6.4%	8.2%	11.8%	13.2%	15.8%	12.9%	29.5%	100.0%
	W	.9%	3.3%	5.4%	8.7%	13.0%	17.5%	20.5%	30.7%	100.0%
	X	.4%	2.4%	4.0%	4.8%	6.1%	19.8%	20.8%	41.7%	100.0%
Total		2.2%	4.7%	6.2%	7.4%	10.6%	15.8%	15.6%	37.5%	100.0%

COMMENTS: Proportion of the gestational age categories of infants varied considerably among sites. Note some centres are only submitting a subset of the eligible population.

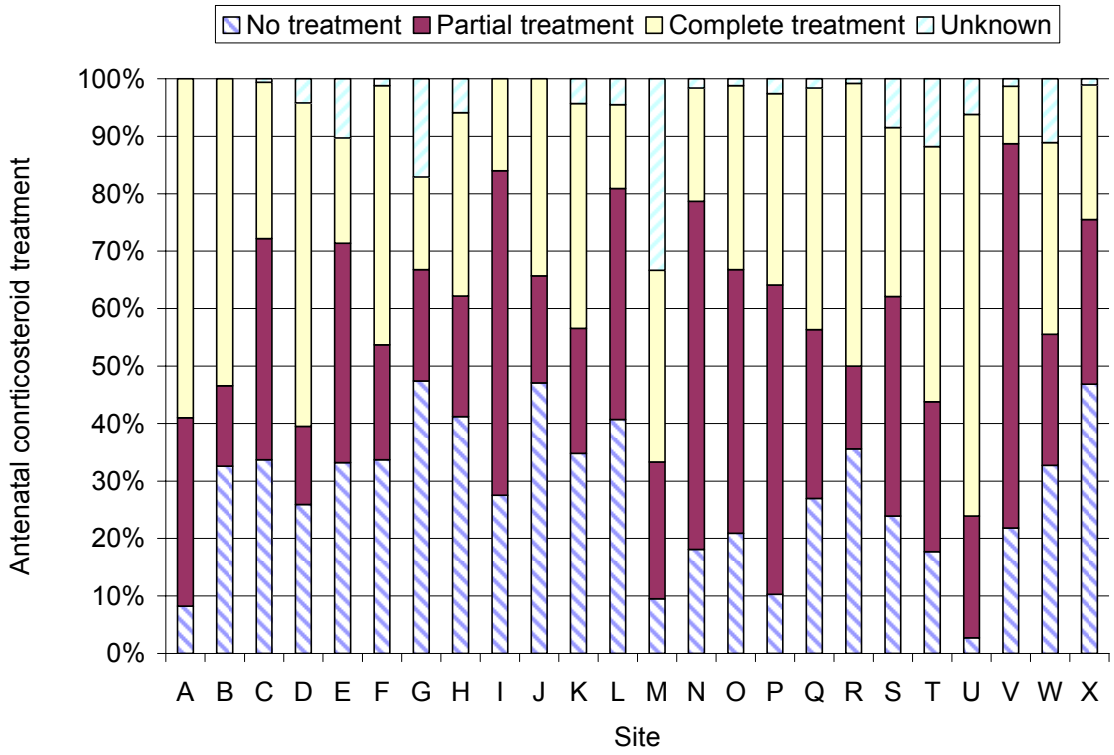
Presentation #27
Site specific birthweight categories of infants



Birthweight (g)		<500	500-749	750-999	1000-1249	1250-1499	1500-2499	≥2500	Total
Admissions per site (%)	A		30.2%	31.7%	30.2%	7.9%			100.0%
	B		1.0%		1.6%	2.1%	39.1%	56.3%	100.0%
	C	1.3%	5.2%	4.2%	7.7%	7.3%	42.0%	32.2%	100.0%
	D	.6%	1.9%	4.8%	7.1%	7.3%	43.3%	35.1%	100.0%
	E	.4%	6.2%	8.3%	5.3%	5.5%	21.4%	52.8%	100.0%
	F	.1%	3.5%	6.2%	6.0%	6.6%	40.5%	37.1%	100.0%
	G		1.2%	2.5%	2.8%	3.5%	30.9%	59.1%	100.0%
	H		1.7%	2.1%	4.5%	5.2%	36.1%	50.3%	100.0%
	I	.3%	3.8%	4.2%	6.9%	8.1%	32.8%	43.8%	100.0%
	J		.5%	3.2%	2.7%	5.4%	28.5%	59.7%	100.0%
	K		1.8%	4.0%	3.1%	3.6%	34.5%	52.9%	100.0%
	L		.4%	4.2%	1.5%	4.4%	36.7%	52.9%	100.0%
	M	2.0%	23.5%	33.3%	19.6%	3.9%	5.9%	11.8%	100.0%
	N	.1%	1.9%	2.7%	3.7%	3.2%	31.7%	56.6%	100.0%
	O	.5%	8.2%	11.6%	14.3%	14.5%	31.5%	19.3%	100.0%
	P		15.4%	41.0%	28.2%	15.4%			100.0%
	Q	.3%	.3%	1.7%	3.7%	6.3%	29.9%	57.8%	100.0%
	R		1.1%	1.8%	1.6%	4.3%	25.6%	65.5%	100.0%
	S		2.7%	4.6%	4.8%	8.6%	41.5%	37.7%	100.0%
	T	.5%	3.3%	5.8%	7.9%	8.4%	33.8%	40.4%	100.0%
	U		21.5%	38.0%	22.3%	9.9%	5.0%	3.3%	100.0%
	V	.2%	4.5%	9.0%	9.2%	7.9%	35.2%	34.1%	100.0%
	W	.3%	1.8%	5.7%	5.1%	6.0%	36.4%	44.6%	100.0%
	X	.1%	1.5%	2.8%	4.7%	3.7%	34.9%	52.2%	100.0%
Total		.3%	3.5%	5.7%	6.2%	6.4%	33.3%	44.6%	100.0%

COMMENTS: Some centres are only submitting a subset of the eligible population.

Presentation #28
Antenatal corticosteroid treatment of infants ≤ 34 weeks gestational age

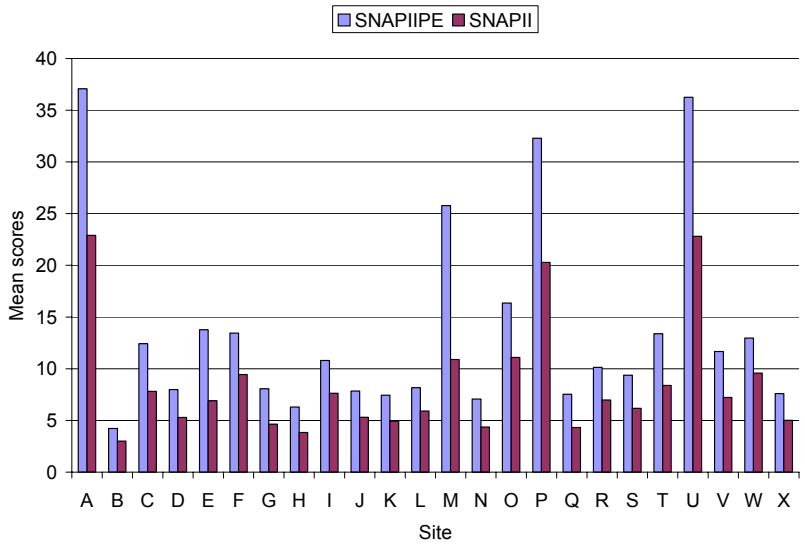


COMMENTS: Doses of antenatal corticosteroid are scored according to the following criteria: a) complete = at least 1 dose of corticosteroids (including bethmethasone, beta celestone, dexamethasone, cortisone, or dihydrosone but NOT prednisone) 24 hours or greater before delivery AND a second dose at 7 days or less prior to delivery; a complete course is therefore comprised of 2 doses, and b) partial = at least 1 dose <24 hours or more than 7 days prior to delivery.

Presentation #28 (*continued*)
Antenatal corticosteroid treatment of infants ≤ 34 weeks gestational age

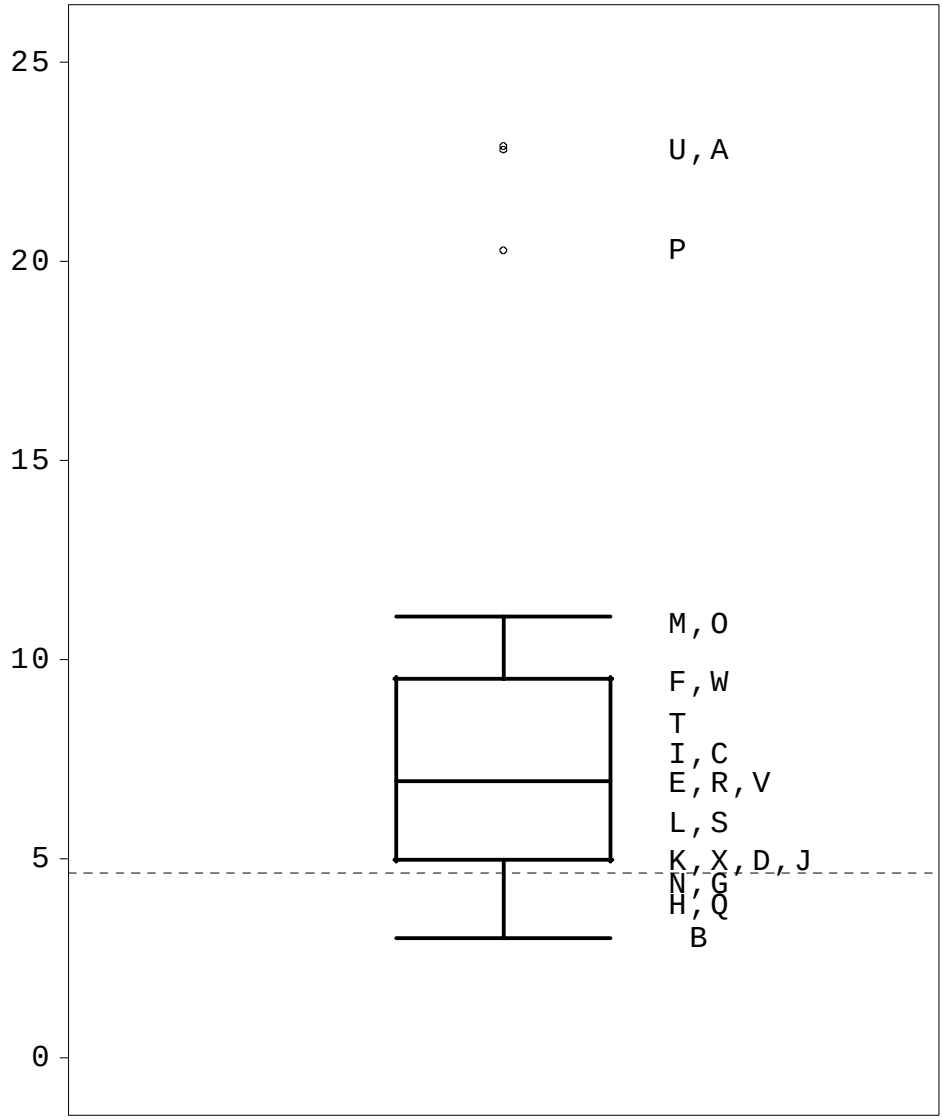
Site	Antenatal corticosteroid				Total
	No treatment	Partial treatment	Complete treatment	Unknown	
A	8.2%	32.8%	59.0%	0%	100.0%
B	32.6%	14.0%	53.5%	0%	100.0%
C	33.7%	38.5%	27.2%	.6%	100.0%
D	25.9%	13.6%	56.3%	4.2%	100.0%
E	33.2%	38.2%	18.3%	10.3%	100.0%
F	33.7%	20.0%	45.1%	1.2%	100.0%
G	47.4%	19.4%	16.1%	17.1%	100.0%
H	41.2%	21.0%	31.9%	5.9%	100.0%
I	27.5%	56.4%	16.0%	0%	100.0%
J	47.1%	18.6%	34.3%	0%	100.0%
K	34.8%	21.7%	39.1%	4.3%	100.0%
L	40.7%	40.2%	14.6%	4.5%	100.0%
M	9.5%	23.8%	33.3%	33.3%	100.0%
N	18.1%	60.6%	19.7%	1.6%	100.0%
O	20.9%	45.9%	32.0%	1.2%	100.0%
P	10.3%	53.8%	33.3%	2.6%	100.0%
Q	27.0%	29.4%	42.1%	1.6%	100.0%
R	35.6%	14.4%	49.2%	.8%	100.0%
S	23.9%	38.2%	29.4%	8.5%	100.0%
T	17.7%	26.1%	44.4%	11.8%	100.0%
U	2.7%	21.2%	69.9%	6.2%	100.0%
V	21.8%	66.9%	10.0%	1.3%	100.0%
W	32.7%	22.8%	33.3%	11.1%	100.0%
X	46.8%	28.6%	23.4%	1.1%	100.0%
Mean	28.5%	36.9%	30.3%	4.3%	100.0%

Presentation #29
Mean illness severity on admission by hospital



Site		SNAPIIPE	SNAPII	Site		SNAPIIPE	SNAPII
A	Mean	37.1	22.9	M	Mean	25.8	10.9
	SEM	2.7	1.8		SEM	2.6	2.5
B	Mean	4.2	3.0	N	Mean	7.1	4.4
	SEM	0.6	0.4		SEM	0.5	0.3
C	Mean	12.4	7.8	O	Mean	16.4	11.1
	SEM	0.7	0.5		SEM	0.8	0.5
D	Mean	8.0	5.3	P	Mean	32.3	20.3
	SEM	0.7	0.5		SEM	3.5	3.0
E	Mean	13.8	6.9	Q	Mean	7.5	4.3
	SEM	0.6	0.4		SEM	0.7	0.5
F	Mean	13.4	9.4	R	Mean	10.1	7.0
	SEM	0.6	0.4		SEM	0.6	0.5
G	Mean	8.1	4.6	S	Mean	9.4	6.2
	SEM	0.6	0.4		SEM	0.7	0.5
H	Mean	6.3	3.8	T	Mean	13.4	8.4
	SEM	0.7	0.4		SEM	0.7	0.5
I	Mean	10.8	7.6	U	Mean	36.2	22.8
	SEM	0.5	0.4		SEM	2.0	1.3
J	Mean	7.9	5.3	V	Mean	11.7	7.2
	SEM	0.8	0.5		SEM	0.5	0.3
K	Mean	7.4	4.9	W	Mean	13.0	9.6
	SEM	0.8	0.5		SEM	0.9	0.6
L	Mean	8.2	5.9	X	Mean	7.6	5.0
	SEM	0.7	0.5			0.6	0.4
Total	Mean	11.0	7.0				
	SEM	0.2	0.1				

Presentation #29a
Mean illness severity on admission among sites



R – 75th percentile
H – 25th percentile
U – median

……- a line indicating the 5 sites with the lowest rate

Presentation #30
Survival rate by gestational age in each site

Site	Percentage survival for each gestational age (weeks)							
	≤26	27-28	29-30	31-32	33-34	35-36	≥37	Mean*
A	67.6	73.1	N/A	N/A	N/A	N/A	N/A	69.8
B	100.0	100.0	75.0	100.0	100.0	100.0	100.0	99.5
C	60.0	96.9	97.6	100.0	99.2	95.8	94.8	94.0
D	77.8	92.9	100.0	98.0	99.3	98.7	98.1	97.3
E	79.5	85.7	91.4	93.9	93.5	85.7	94.1	90.9
F	95.1	97.9	98.4	99.1	97.2	99.2	99.3	98.4
G	82.6	85.7	93.3	98.2	97.9	97.3	99.7	97.8
H	100.0	100.0	100.0	100.0	100.0	100.0	99.1	99.7
I	71.2	95.2	100.0	99.0	97.9	100.0	97.6	96.5
J	N/A	80.0	85.7	100.0	100.0	100.0	99.2	98.2
K	50.0	85.7	100.0	100.0	100.0	100.0	98.8	97.8
L	70.0	87.5	100.0	100.0	98.1	100.0	98.9	98.1
M	88.5	82.4	N/A	N/A	N/A	N/A	75.0	84.3
N	63.6	100.0	100.0	100.0	97.9	96.9	99.2	97.8
O	85.4	97.8	96.8	100.0	100.0	100.0	98.8	96.8
P	75.0	100.0	N/A	N/A	N/A	N/A	N/A	90.0
Q	60.0	90.9	100.0	97.1	98.2	100.0	98.8	98.0
R	53.8	90.0	100.0	100.0	100.0	100.0	99.1	98.2
S	83.3	100.0	100.0	98.7	100.0	100.0	100.0	98.9
T	87.2	86.1	100.0	97.8	95.8	95.7	97.2	95.7
U	81.4	96.3	N/A	N/A	100.0	100.0	100.0	89.3
V	78.5	92.1	99.1	97.6	98.6	99.2	98.9	96.4
W	64.3	94.4	100.0	100.0	100.0	100.0	100.0	98.2
X	55.0	93.1	97.1	100.0	100.0	99.3	99.7	98.1
Mean**	77.8	93.2	97.9	98.8	98.6	98.4	98.4	96.7

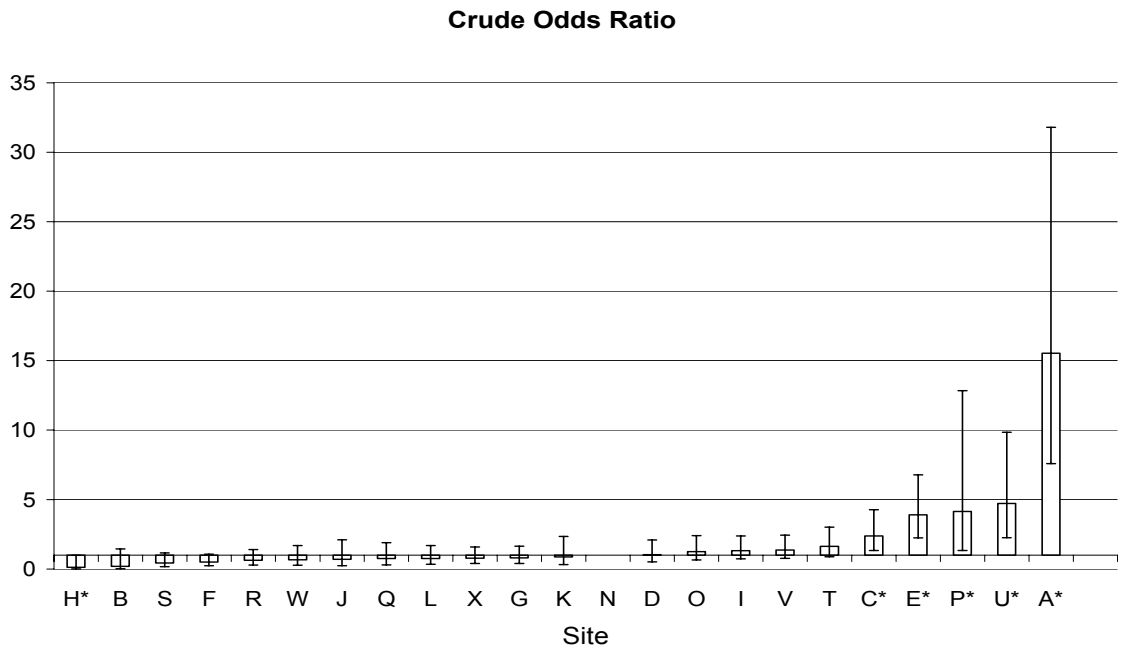
Mean* = (number of infants survived for site χ / total number of infants for site χ)*100.
Mean** = (number of infants for gestational age category χ / total number of infants in gestational age category χ)*100.
NA = non-applicable

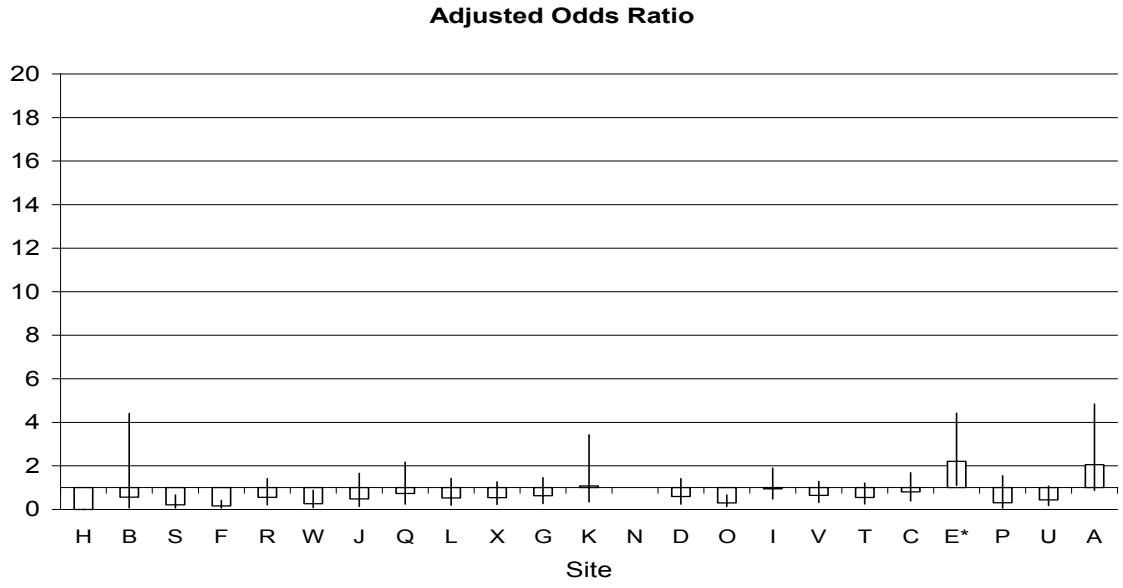
Presentation #31
Survival rate by birthweight in each site

Site	Percentage survival for each birthweight (g) category								
	<500	500-749	750-999	1000-1249	1250-1499	1500-2499	2500-4499	>4499	Mean*
A	68.4	75.0	68.4	60.0	N/A	N/A	N/A	N/A	69.8
B	100	N/A	100.0	75.0	100.0	100.0	100.0	N/A	99.5
C	14.3	66.7	86.4	97.5	97.4	96.8	97.5	100.0	94.0
D	33.3	80.0	88.0	94.6	100.0	99.1	98.3	100.0	97.3
E	66.7	76.7	81.0	91.9	94.7	88.6	94.6	92.9	90.8
F	100.0	96.6	96.1	95.9	94.4	99.7	98.7	100.0	98.4
G	N/A	75.0	87.5	88.9	87.0	99.0	99.2	100.0	97.8
H	N/A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
I	33.3	72.7	83.8	96.7	100.0	98.6	97.8	100.0	96.5
J	N/A	100.0	71.4	83.3	100.0	100.0	99.2	100.0	98.2
K	N/A	25.0	88.9	100.0	100.0	100.0	99.1	100.0	97.8
L	N/A	50.0	90.0	85.7	95.2	98.9	99.2	100.0	98.1
M	100.0	100.0	88.2	60.0	100.0	100.0	66.7	N/A	84.3
N	0.0	66.7	95.2	96.6	96.0	98.4	99.1	100.0	97.8
O	66.7	84.8	90.8	98.8	97.5	99.4	100.0	100.0	96.8
P	N/A	83.3	93.8	90.9	100.0	N/A	N/A	N/A	92.3
Q	0.0	100.0	83.3	92.3	95.5	99.0	99.0	100.0	98.0
R	N/A	33.3	70.0	100.0	100.0	99.3	99.4	100.0	98.2
S	N/A	69.2	100.0	100.0	100.0	99.5	100.0	100.0	98.9
T	100.0	85.7	86.5	96.0	96.2	96.7	97.2	88.9	95.7
U	N/A	73.1	91.3	92.6	100.0	100.0	100.0	N/A	89.3
V	0.0	71.4	90.4	95.3	98.6	98.8	99.7	100.0	96.5
W	0.0	83.3	89.5	94.1	95.0	100.0	100.0	100.0	98.2
X	0.0	63.6	70.0	100.0	96.3	99.6	99.7	100.0	98.1
Mean**	40.0	76.5	88.0	94.6	96.9	98.5	98.7	98.8	96.7

Mean* = (number of infants survived for site χ / total number of infants for site χ)*100.
Mean** = (number of infants survived for gestational category χ / total number of infants in gestational category χ)*100.
NA = non-applicable

Presentation #31 *(continued)*
Site comparison of mortality (not adjusted for congenital anomalies)





Reference site: N (Site M excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

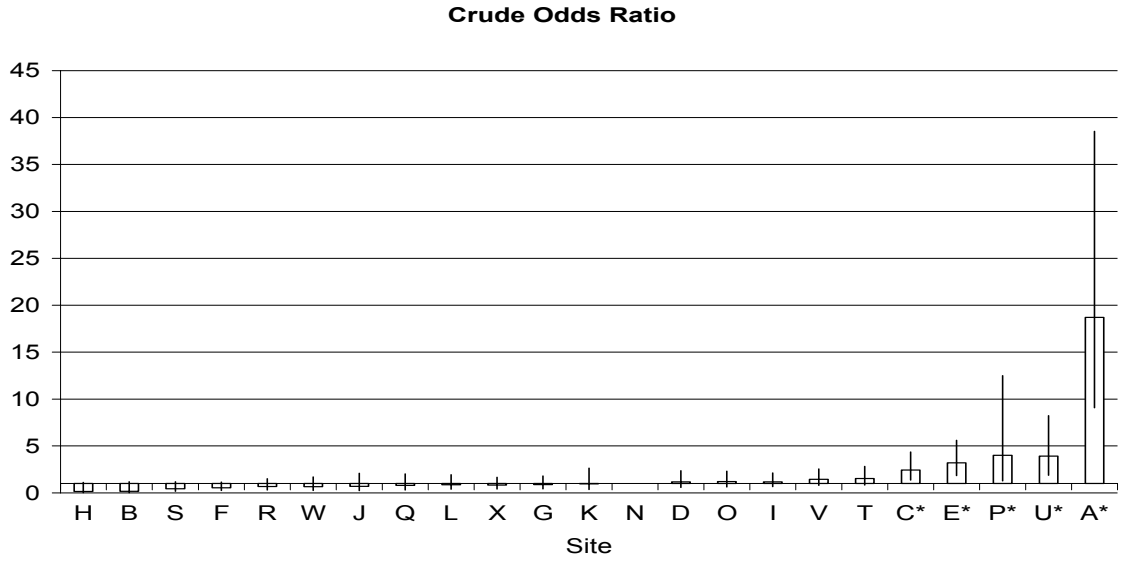
Inclusion criteria:
Age at admission less than 4 days
Not moribund on admission

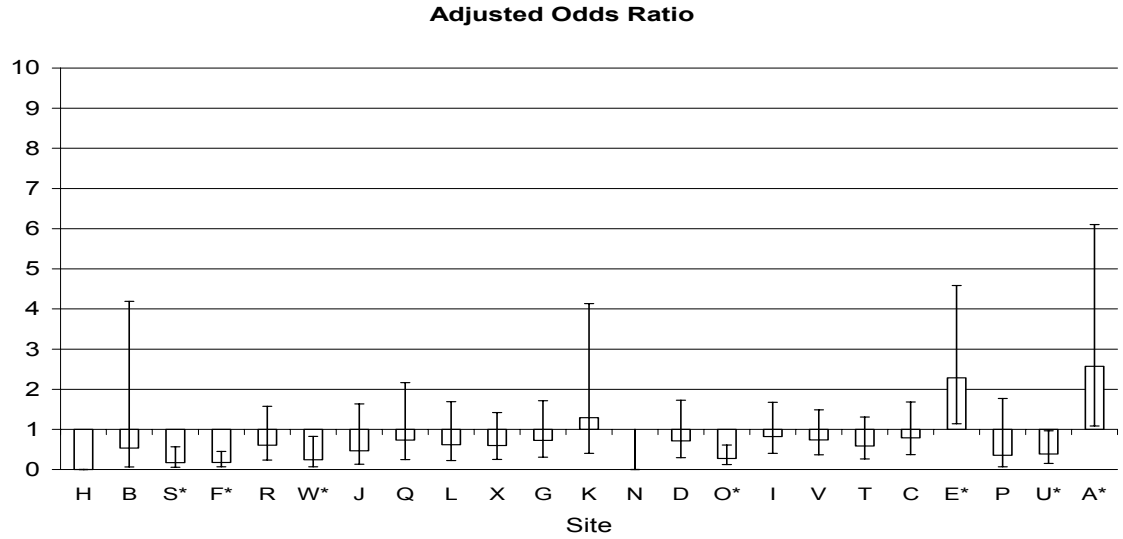
Mortality is attributed to the Network hospital of first admission.

Significant predictors identified by multivariate analysis and adjusted for:

SNAP-II
Apgar at 5 min
Gestational age
Birthweight
Antenatal steroids

Presentation#31 *(continued)*
Site comparison of mortality (adjusted for congenital anomalies)





Reference site: N (site M excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

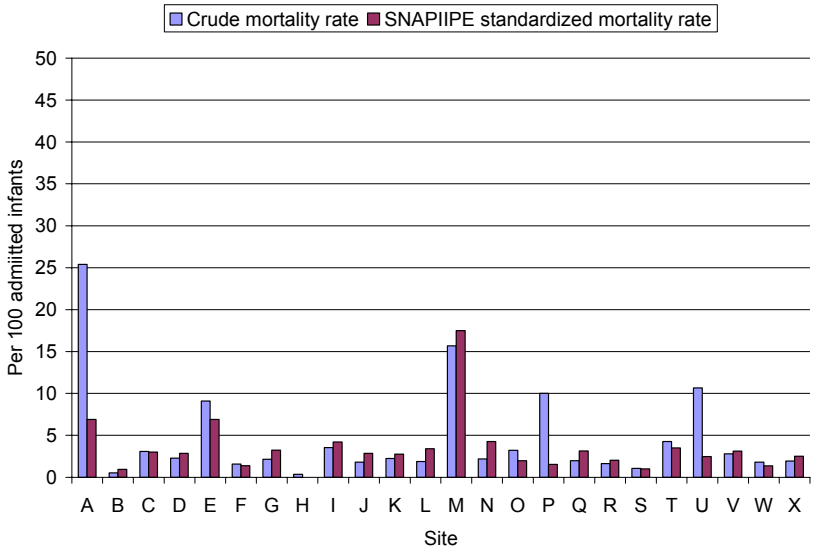
Inclusion criteria:
Age at admission less than 4 days
Not moribund on admission

Mortality is attributed to the Network hospital of first admission.

Significant predictors identified by multivariate analysis and adjusted for:

Congenital anomalies
SNAP-II
Apgar at 5 min
Birthweight
Antenatal steroids
Gestational age

Presentation #32
SNAP-II PE adjusted site mortality rates



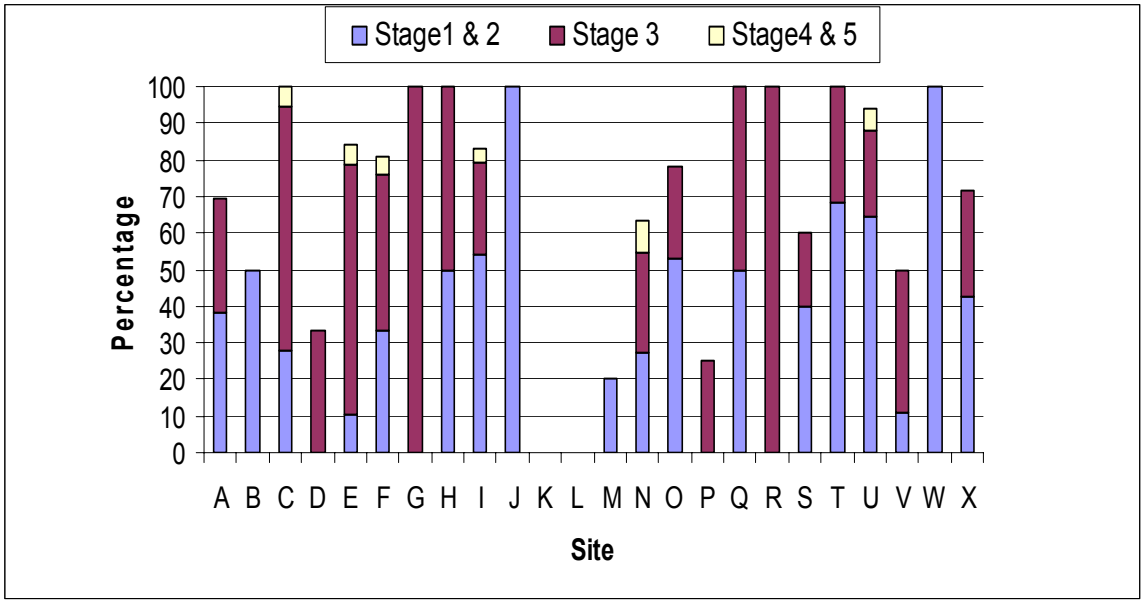
Site	Mortality rate (%)	SNAP-II PE Standardized rate (%)
A	25.4	6.9
B	0.5	0.9
C	3.1	3.0
D	2.3	2.8
E	9.1	6.9
F	1.6	1.4
G	2.2	3.2
H	0.3	0.0
I	3.5	4.2
J	1.8	2.9
K	2.2	2.8
L	1.9	3.4
M	15.7	17.5
N	2.2	4.3
O	3.2	2.0
P	10.0	1.5
Q	2.0	3.1
R	1.6	2.0
S	1.1	1.0
T	4.3	3.5
U	10.7	2.5
V	2.8	3.1
W	1.8	1.4
X	1.9	2.5
Mean	**4.6**	**3.5**

COMMENTS: SNAP-II PE standardized mortality rates were calculated by adjusting mortality for illness severity. Mortality is attributed to the hospital of first admission.

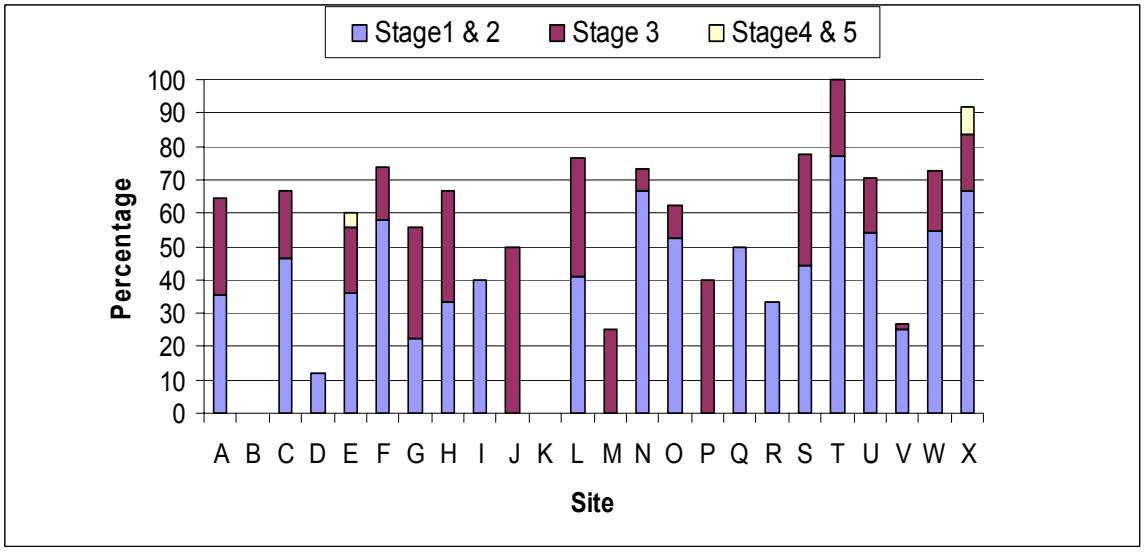
F. Site Comparisons – Morbidity Outcomes

Presentation #33
Incidence of retinopathy of prematurity among infants with eye exams with birthweight <1500g

A. <750g

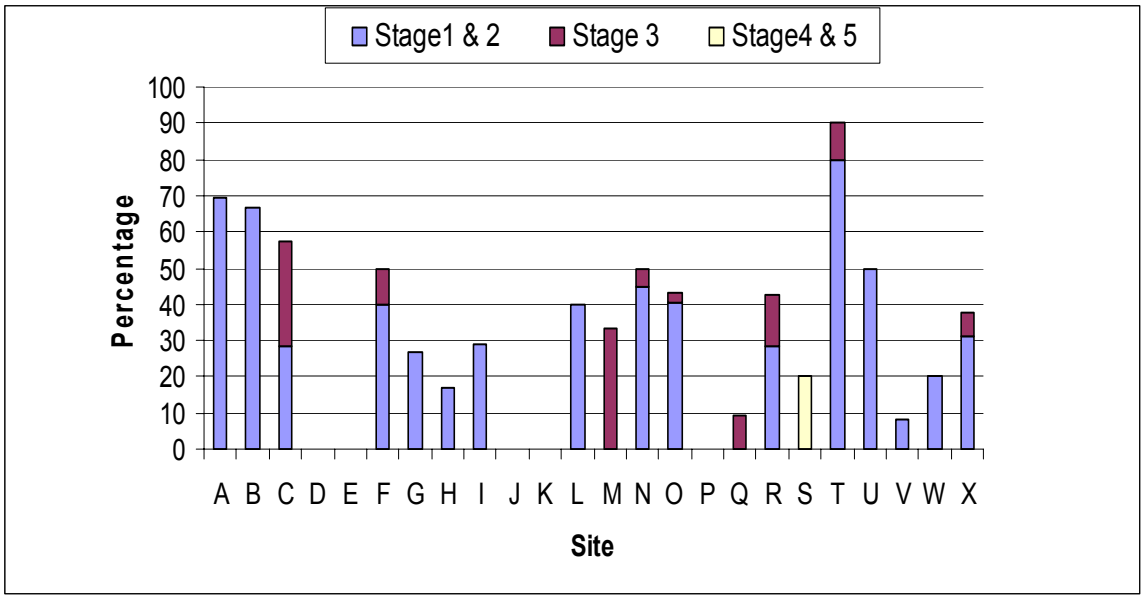


B. 750-999g

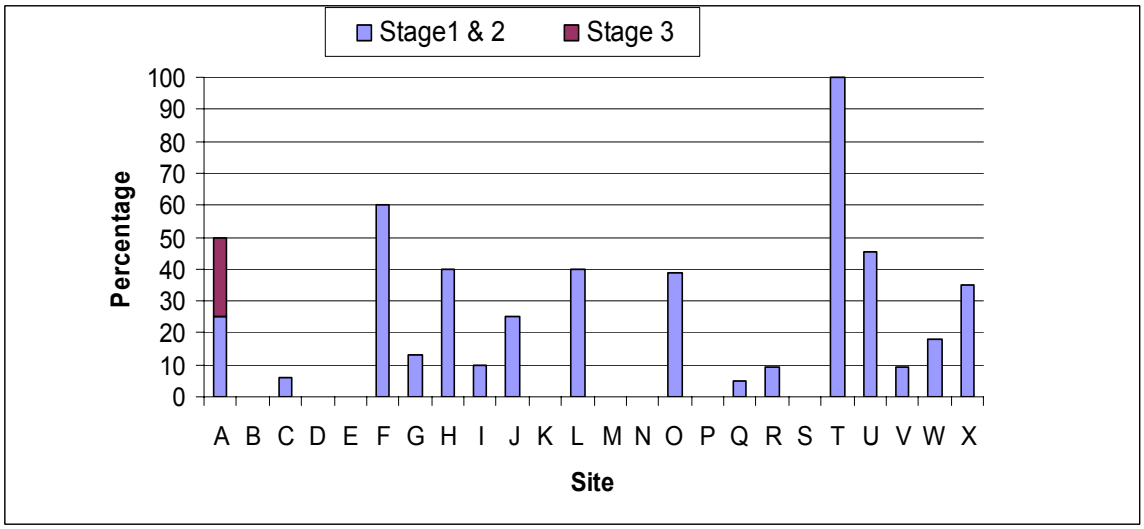


Presentation #33 (*continued*)
Incidence of retinopathy of prematurity among infants with eye exams with birthweight <1500g

C. 1000-1249g



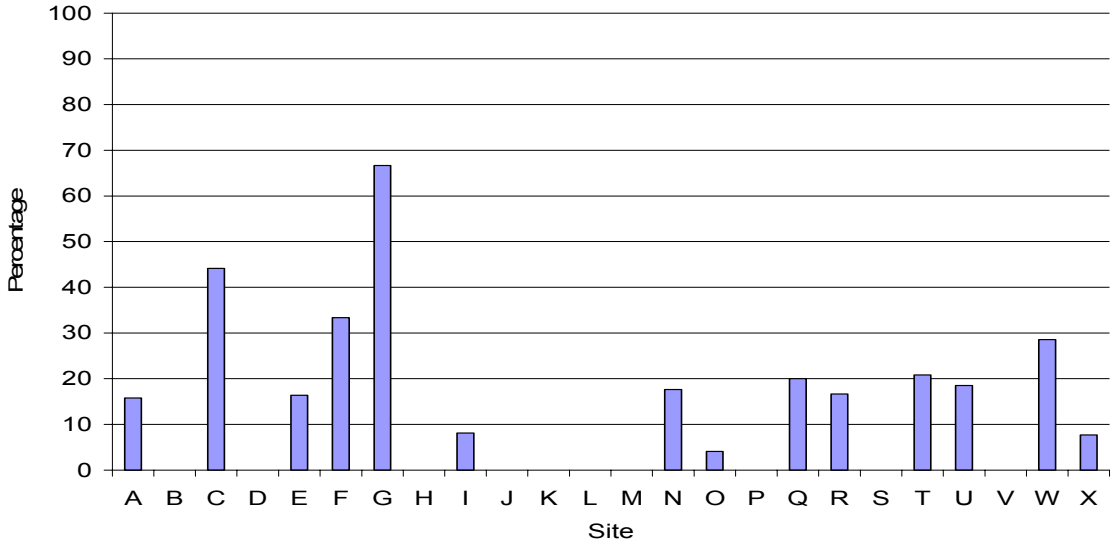
D. 1250-1499g (note: no sites in this BW category with infants diagnosed with Stage 4/5 ROP)



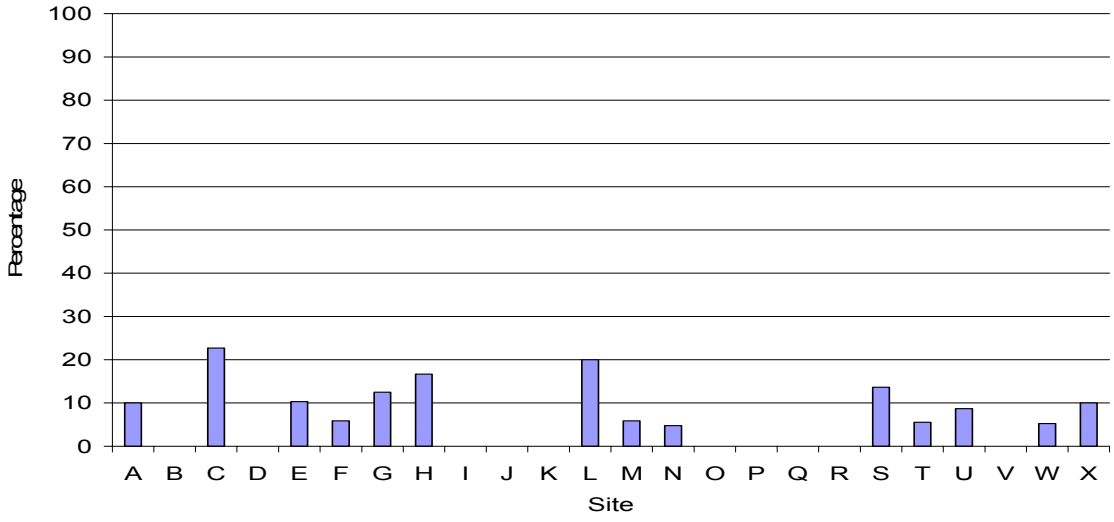
COMMENTS: Not all centres have infants in each birthweight category. Infants who are transferred to non-participating CNN centres are not captured here.

Presentation #34
Treatment for retinopathy of prematurity among infants with eye exams with birthweight <1500g

A. <750g

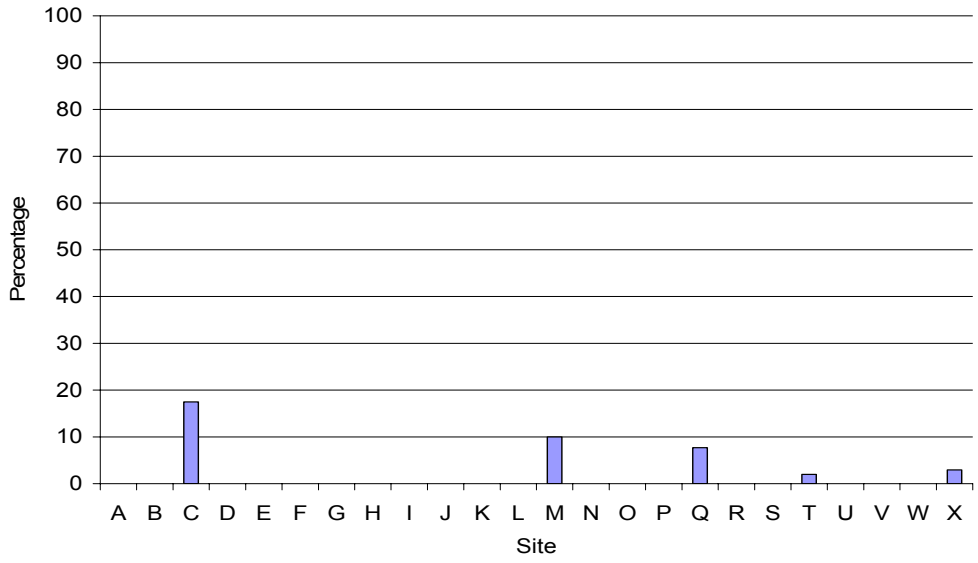


B. 750-999g

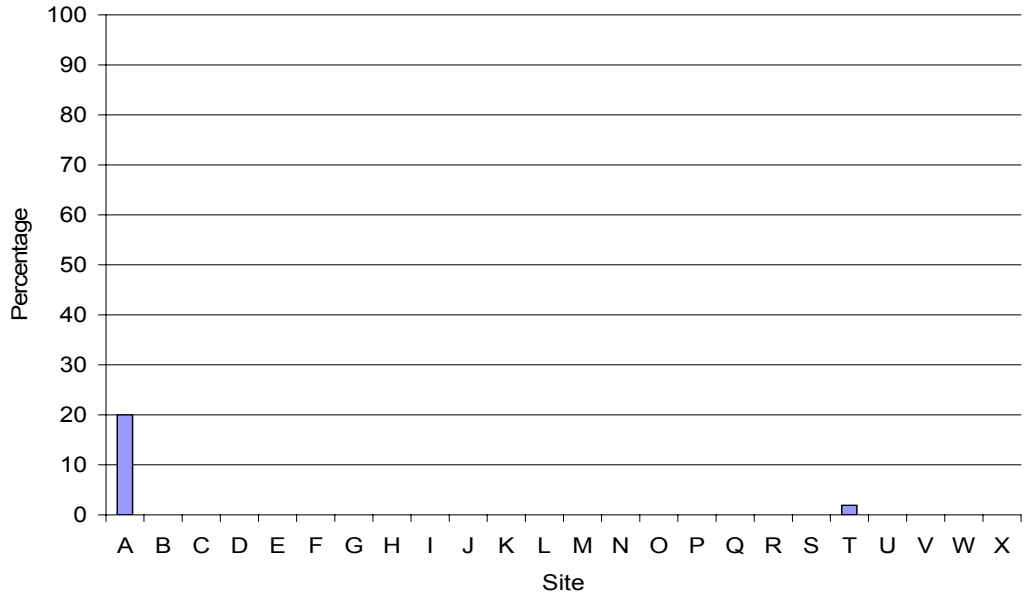


Presentation #34 (*continued*)
Treatment for retinopathy of prematurity among infants with eye exams with birthweight <1500g

C. 1000-1249g

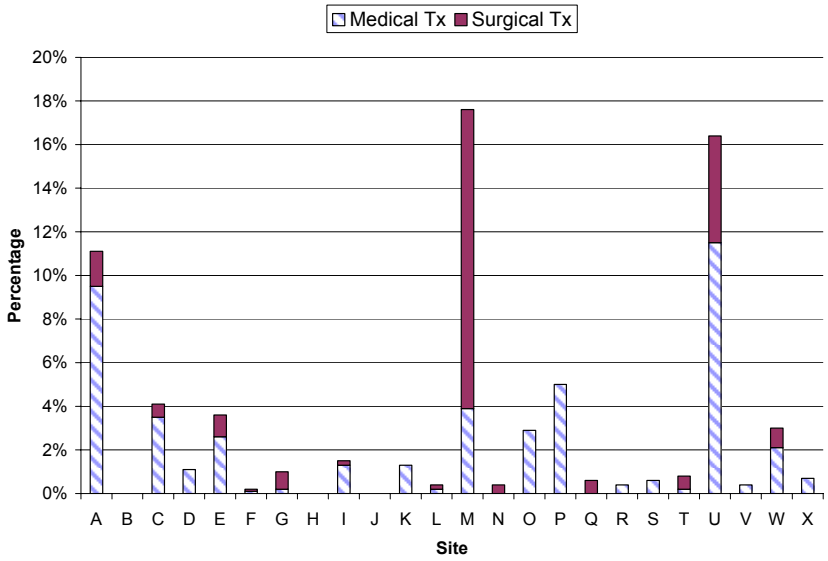


D. 1250-1499g



COMMENTS: Not all centres have infants in each birthweight category. Infants who are transferred to non-participating CNN centres are not captured here.

Presentation #35
Incidence of necrotizing enterocolitis



Site	Treatment		
	Medical Tx	Surgical Tx	Any
A	9.5%	1.6%	11.1%
B	0	0	0.0%
C	3.5%	.6%	4.0%
D	1.1%	0	1.1%
E	2.6%	1.0%	3.6%
F	.1%	.1%	0.2%
G	.2%	.8%	0.9%
H	0	0	0.0%
I	1.3%	.2%	1.5%
J	0	0	0.0%
K	1.3%	0	1.3%
L	.2%	.2%	0.4%
M	3.9%	13.7%	17.6%
N	0	.4%	0.4%
O	2.9%	0	2.9%
P	5.0%	0	5.0%
Q	0	.6%	0.6%
R	.4%	0	0.4%
S	.6%	0	0.6%
T	.2%	.6%	0.8%
U	11.5%	4.9%	16.4%
V	.4%	0	0.4%
W	2.1%	.9%	3.0%
X	.7%	0	0.7%
Total	1.1%	.4%	1.5%

Presentation #36
Use of antibiotics on Day 1 and primary infection rates

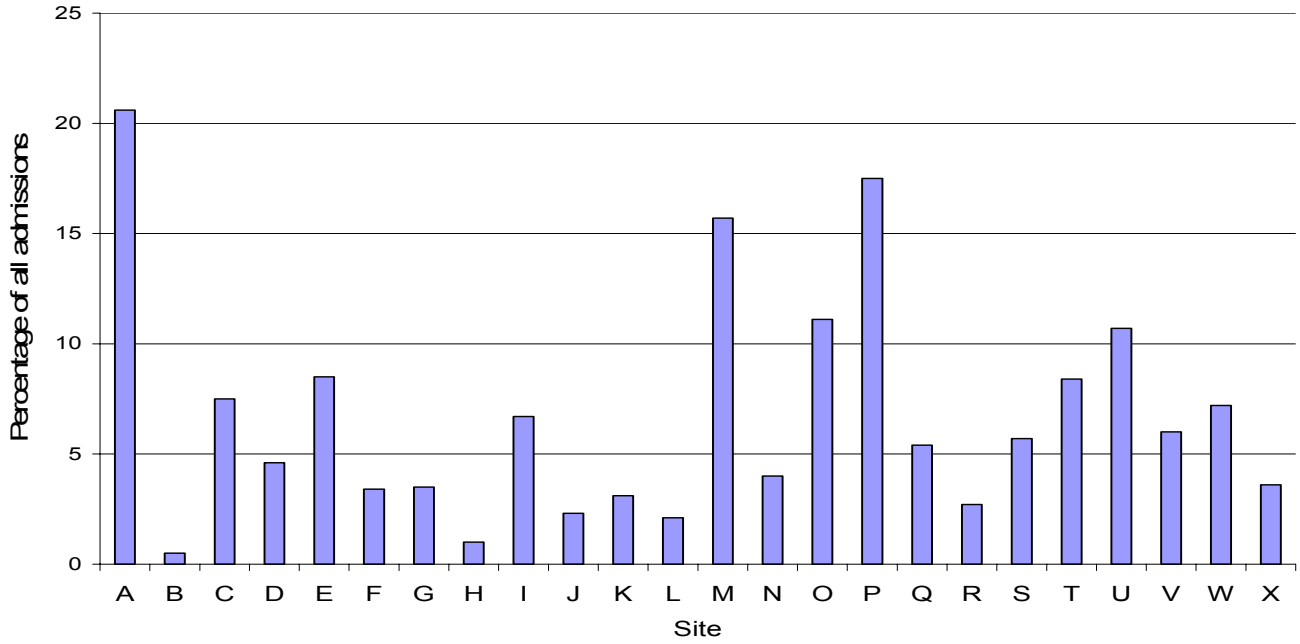
Site	Mean number of days in NICU	Antibiotic use on day 1	Primary infection	
		% of infants	infants	%
A	71.08	90.5%	1	1.6%
B	18.32	18.2%	3	1.6%
C	24.35	64.0%	1	.2%
D	18.90	42.2%	7	1.3%
E	15.12	86.6%	1	.1%
F	12.72	56.7%	4	.5%
G	15.37	65.7%	3	.5%
H	18.80	43.6%	1	.3%
I	15.80	71.0%	4	.5%
J	16.70	51.8%	4	1.8%
K	18.17	28.3%	0	
L	18.10	61.5%	4	.8%
M	23.80	56.9%	0	
N	16.68	46.7%	6	.8%
O	21.95	84.8%	14	2.5%
P	49.58	90.0%	2	5.0%
Q	21.50	66.9%	3	.8%
R	12.24	66.1%	3	.5%
S	16.64	59.8%	3	.6%
T	20.25	76.0%	6	.9%
U	64.59	90.2%	2	1.6%
V	17.76	80.4%	0	
W	20.10	39.5%	3	.9%
X	18.06	62.0%	7	1.0%
ALL	18.45	63.7%	82	.7%

Presentation #36 (*continued*)
Positive blood and CSF cultures by admission

Site	Blood culture			CSF culture		
	cultures per admission	positive per admission	% positive	cultures per admission	positive per admission	% positive
A	2.3	0.2	9.6%	0.2	0	0.0%
B	0.3	0.0	8.2%	0.1	0	0.0%
C	1.1	0.1	6.7%	0.2	0	0.0%
D	0.7	0.1	8.3%	0.0	0	0.0%
E	1.0	0.1	10.1%	0.3	0.001	0.4%
F	0.9	0.0	4.1%	0.2	0.001	0.5%
G	1.0	0.0	4.0%	0.1	0	0.0%
H	0.5	0.0	2.6%	0.0	0	0.0%
I	0.9	0.1	8.6%	0.2	0.001	0.7%
J	1.2	0.0	3.3%	0.1	0	0.0%
K	0.5	0.0	6.3%	0.0	0.004	16.7%
L	0.9	0.0	3.5%	0.1	0	0.0%
M	3.2	0.2	4.8%	0.4	0.02	5.6%
N	0.9	0.0	5.4%	0.1	0.004	3.0%
O	1.3	0.1	10.0%	0.3	0.007	2.5%
P	2.5	0.2	9.2%	0.3	0	0.0%
Q	1.0	0.1	6.1%	0.1	0.003	3.1%
R	1.0	0.0	3.2%	0.0	0	0.0%
S	0.9	0.1	6.2%	0.1	0.004	5.4%
T	1.1	0.1	8.8%	0.1	0	1.8%
U	2.8	0.1	4.4%	0.3	0	0.0%
V	1.2	0.1	5.2%	0.2	0.001	0.4%
W	0.7	0.1	12.2%	0.0	0	0.0%
X	1.0	0.0	4.2%	0.1	0.001	1.8%

COMMENTS: Percentage of positive cultures of blood or cerebrospinal fluid at any time during hospital stay varied among sites. This does not include cultures that may have been taken in hospitals of birth prior to transfer.

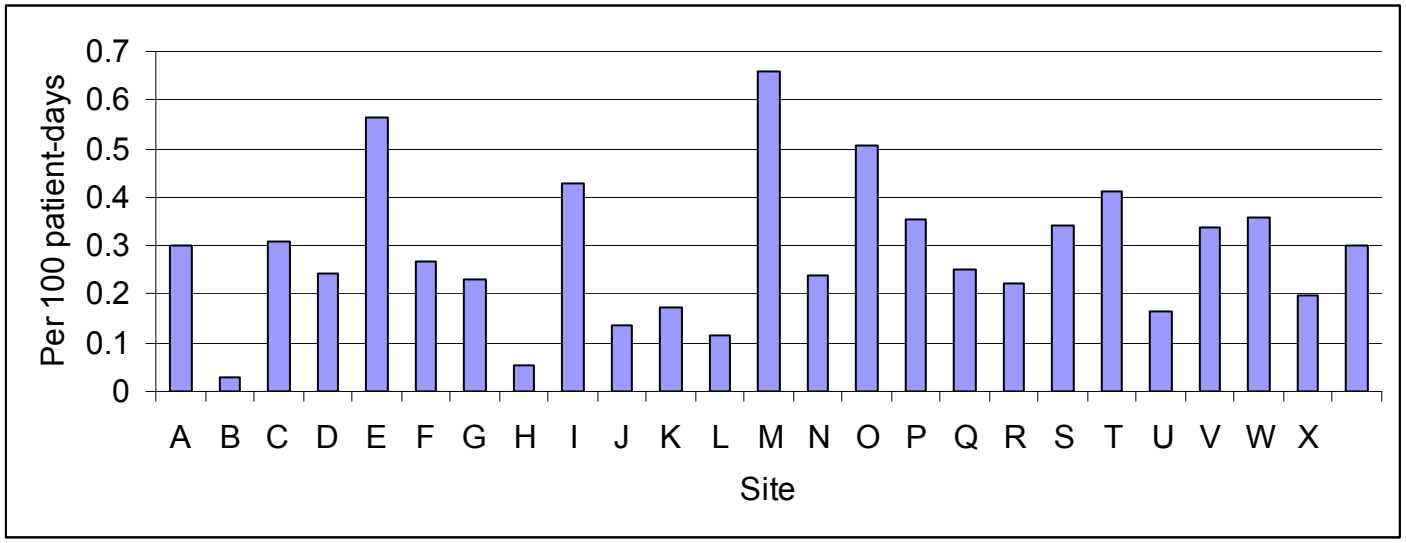
Presentation #37
Incidence of nosocomial infection*



Site	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Mean
%	20.6	0.5	7.5	4.6	8.5	3.4	3.5	1.0	6.7	2.3	3.1	2.1	15.7	4.0	11.1	17.5	5.4	2.7	5.7	8.4	10.7	6.0	7.2	3.6	5.5

*Nosocomial infection indicates any positive blood and/or cerebrospinal fluid culture 2 days following admission (includes all admissions).

Presentation #38
Nosocomial infection per 100 patient days*

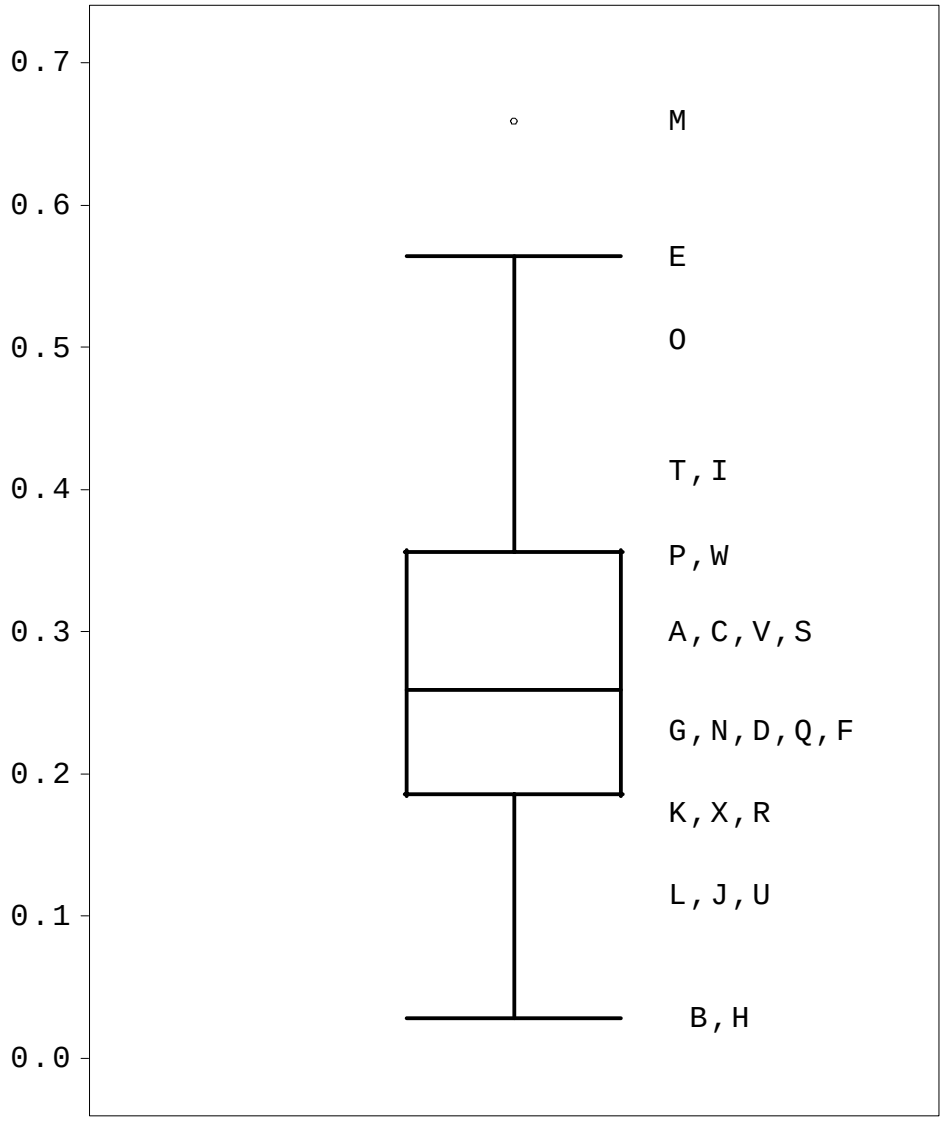


Site	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Average Rate
Infections per 100 patient days	0.3	0.0	0.3	0.2	0.6	0.3	0.2	0.1	0.4	0.1	0.2	0.1	0.7	0.2	0.5	0.3	0.2	0.2	0.3	0.4	0.2	0.3	0.4	0.2	0.3

*Nosocomial infection indicates positive blood and/or cerebrospinal fluid culture 2 days following admission (includes all admissions)

COMMENTS: Considerable variation still persists when nosocomial infections are analyzed as infections per 100 patient days. Percentiles are shown in Presentation #43.

Presentation #39
Nosocomial infection per 100 patient days among sites



P, W—75th percentile

K, X, R – 25th percentile

Presentation #40
Incidence of bronchopulmonary dysplasia (28 days)* in infants with gestational age ≤32 weeks at birth

	Gestational age at birth						
Site	**≤22**	**23-24**	**25-26**	**27-28**	**29-30**	**31-32**	**Mean***
A	N/A	100.0	72.0	14.3	NA	NA	**46.8**
B	N/A	0	NA	33.3	0	20.0	**18.8**
C	N/A	100.0	100.0	73.3	29.4	2.1	**42.8**
D	N/A	100.0	90.0	28.0	5.1	0	**20.6**
E	N/A	100.0	100.0	57.1	37.5	66.7	**70.3**
F	N/A	93.8	88.6	72.2	53.8	11.8	**68.7**
G	N/A	100.0	75.0	83.3	25.9	16.1	**37.0**
H	N/A	100.0	66.7	71.4	13.0	0	**23.4**
I	N/A	90.9	61.9	35.5	5.9	23.1	**40.9**
J	N/A	NA	NA	33.3	20.0	0	**10.3**
K	N/A	NA	100.0	57.1	12.5	0	**25.8**
L	N/A	100.0	100.0	53.8	6.7	12.0	**30.0**
M	N/A	NA	100.0	71.4	NA	NA	**83.3**
N	N/A	100.0	77.8	52.6	16.0	4.9	**28.3**
O	N/A	100.0	57.9	14.6	21.1	0	**40.8**
P	N/A	100.0	80.0	58.8	NA	NA	**66.7**
Q	N/A	100.0	100.0	44.4	18.2	8.7	**25.4**
R	N/A	NA	100.0	88.9	28.6	10.5	**36.4**
S	N/A	100.0	90.0	33.3	14.8	3.8	**29.1**
T	N/A	87.5	81.8	34.8	15.8	9.1	**48.4**
U	N/A	100.0	91.4	48.0	NA	NA	**67.4**
V	N/A	100.0	66.7	44.6	37.8	20.0	**48.8**
W	N/A	100.0	14.3	0	0	0	**3.5**
X	N/A	100.0	83.3	37.0	19.4	13.0	**31.9**
Mean**	**N/A**	**96.3**	**79.0**	**43.3**	**20.1**	**8.9**	**40.1**

NA = non-applicable Note: Outcome is attributed to the hospital of first admission

Presentation #41
Incidence of bronchopulmonary dysplasia (36 weeks)* in infants with gestational age ≤32 weeks at birth

	Gestational age at birth						
Site	**≤22**	**23-24**	**25-26**	**27-28**	**29-30**	**31-32**	**Mean***
A	N/A	100.0	41.7	22.2	NA	NA	34.9
B	N/A	100.0	NA	0	0	25.0	20.0
C	N/A	100.0	85.7	54.2	22.2	5.6	44.7
D	100.0	0	28.6	13.3	7.7	0	11.1
E	N/A	66.7	87.5	40.0	50.0	60.0	63.0
F	N/A	100.0	63.6	71.4	33.3	18.2	56.3
G	N/A	0	58.3	0	28.6	16.7	31.7
H	N/A	100.0	100.0	42.9	6.7	0	20.7
I	N/A	70.0	31.3	12.5	0	40.0	34.9
J	N/A	NA	NA	25.0	12.5	0	14.3
K	N/A	0	0	20.0	20.0	0	12.5
L	N/A	100.0	60.0	27.3	12.5	11.1	26.5
M	N/A	100.0	100.0	80.0	NA	NA	75.0
N	N/A	75.0	60.0	52.9	11.1	8.3	32.1
O	N/A	12.5	0	7.1	0	0	4.4
P	N/A	100.0	0	14.3	NA	NA	15.8
Q	N/A	0	66.7	12.5	10.0	0	13.2
R	N/A	0	100.0	11.1	18.2	0	21.9
S	N/A	0	75.0	11.1	15.4	16.7	20.0
T	N/A	41.7	53.3	25.0	0	0	32.7
U	N/A	100.0	86.7	29.0	NA	NA	60.0
V	N/A	83.3	57.1	46.4	35.0	23.1	45.5
W	N/A	100.0	33.3	0	0	0	4.3
X	N/A	0	33.3	19.0	25.0	33.3	25.0
Mean**	100.0	66.7	55.9	28.9	16.9	11.3	31.6

NA = non-applicable

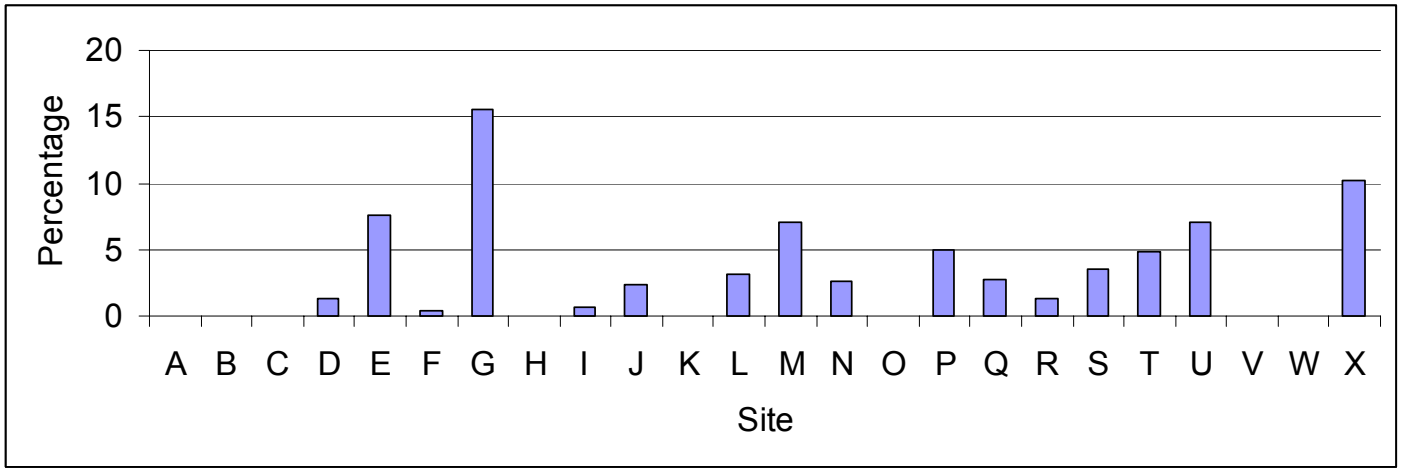
Note: Outcome is attributed to the hospital of first admission

Presentation #42
Days on assisted ventilation and oxygen

Site	Ventilation days				CPAP days				Oxygen days			
	N	Mean	SEM	Median	N	Mean	SEM	Median	N	Mean	SEM	Median
A	21	26.3	4.3	23	23	22.3	2.6	21	23	23.5	4.2	18
B	6	4.0	1.8	3	8	2.5	0.6	3	49	4.0	1.2	2
C	65	15.6	2.3	6	76	8.5	1.1	3	86	17.7	2.2	5
D	63	6.8	0.8	4	79	5.3	0.7	3	87	7.6	1.1	3
E	23	7.0	2.0	3	6	11.8	6.0	5	11	8.3	3.9	2
F	42	14.1	3.2	3	35	6.5	1.3	3	100	8.5	1.3	2
G	116	8.4	1.7	2	57	4.6	0.9	3	159	9.8	1.1	3
H	26	7.8	2.7	2	35	6.1	1.4	3	58	13.4	3.5	2
I	89	8.0	1.4	3	73	7.3	1.7	2	46	6.6	1.8	2
J	26	5.3	1.5	4	28	3.1	0.7	2	22	4.7	1.2	3
K	5	7.0	3.6	2	9	2.4	0.4	2	39	7.7	2.1	3
L	84	8.0	1.4	3	113	5.7	0.8	2	96	7.5	1.0	3
M	8	17.9	6.8	12	3	2.7	0.3	3	9	30.6	10.1	26
N	88	8.0	1.5	2	69	6.9	1.1	2	86	7.8	1.3	2
O	42	17.8	2.7	12	48	8.9	1.3	5	42	12.8	2.1	6
P	15	11.6	2.9	5	15	12.8	2.7	8	13	21.7	5.5	11
Q	48	4.9	1.5	2	75	7.5	1.5	2	32	10.9	2.9	4
R	88	5.3	0.8	3	77	2.4	0.3	2	150	5.1	0.7	2
S	31	4.3	1.1	2	31	4.0	0.8	2	40	3.4	0.6	2
T	69	10.7	1.8	4	32	13.1	3.0	4	56	10.4	2.1	3
U	55	22.9	3.0	13	54	22.4	2.1	20	49	29.0	2.2	30
V	53	11.3	1.9	4	95	13.8	1.8	4	95	8.7	1.0	5
W	33	12.4	3.4	3	67	7.3	1.4	2	95	6.5	1.1	2
X	104	7.3	1.1	2	104	9.1	1.2	3	123	8.4	0.9	4
Total	**1200**	**9.9**	**0.4**	**3**	**1212**	**8.3**	**0.3**	**3**	**1566**	**9.7**	**0.4**	**3**

COMMENTS: The information is for all infants sent home from network hospitals (for whom complete information is available). This includes some infants who received supplemental oxygen only.

Presentation #43
Percentage of admissions with gestational age ≤32 weeks at birth with postnatal use of steroids for any indication*



Postnatal Steroid Use	Site																								
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Total
%	0	0	0	1.3	7.6	0.4	15.5	0	0.7	2.3	0	3.2	7.0	2.6	0	5.0	2.8	1.3	3.5	4.8	7.1	0	0	10.2	2.7

*Percentage of all admissions to each network NICU

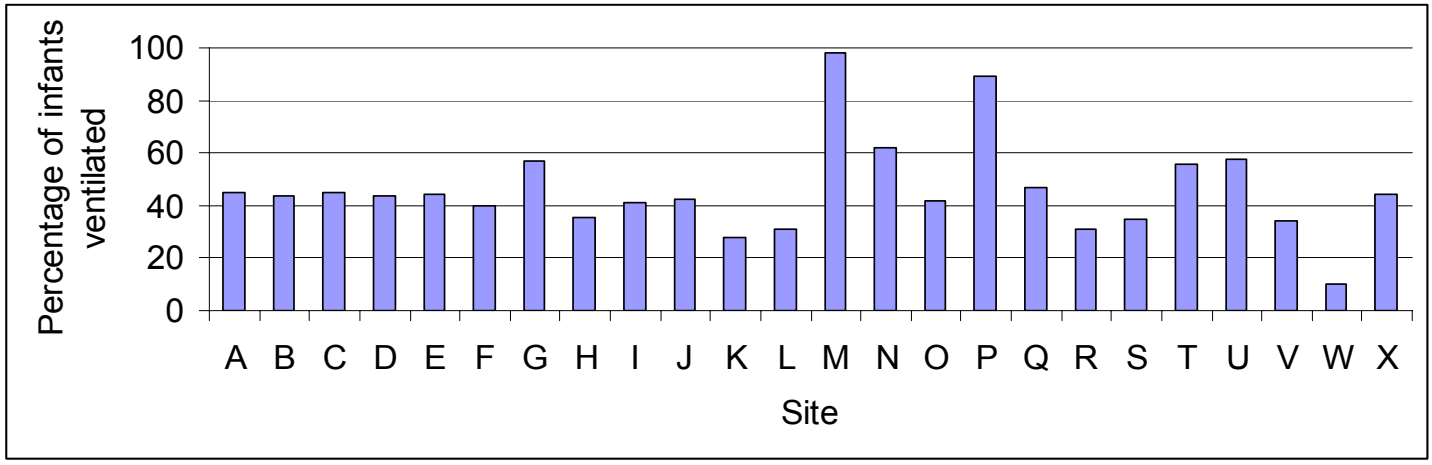
COMMENTS: Specific criteria for these treatments in each hospital are not documented here.

Presentation #44
Use of narcotics on Day 1 (by birthweight)*

Site	<1000		1000-1499		1500-1999		2000-2499		≥2500		Total	
	bolus	infusion	bolus	infusion	bolus	infusion	bolus	infusion	bolus	infusion	bolus	infusion
A	0	0	4.2	0	0	0	0	0	0	0	1.6	0
B	0	0	14.3	0	5.6	0	0	0	0.9	0	1.6	0
C	16.1	7.1	3.8	5.1	8.8	3.5	4.8	5.7	6.0	12.6	7.1	7.5
D	15.8	7.9	22.7	0	4.3	0	5.2	0.7	4.9	3.8	8.2	2.1
E	38.5	48.1	26.7	28.0	25.4	46.3	36.6	50.0	25.3	49.3	28.7	46.6
F	8.6	11.1	5.8	3.9	5.8	3.2	5.1	1.7	6.3	7.9	6.1	5.5
G	25.0	33.3	12.2	14.6	4.8	8.3	4.3	6.0	6.0	7.3	6.6	8.6
H	0	0	14.3	3.6	0	0	0	1.7	2.8	3.4	2.8	2.4
I	23.3	9.6	13.0	4.6	10.9	1.5	12.0	6.0	13.3	11.2	13.5	7.7
J	25.0	0	11.1	0	8.0	0	10.5	0	6.8	0	8.6	0
K	0	0	0	0	0	0	0	0	0.8	0	0.4	0
L	18.2	9.1	17.9	10.7	1.3	5.1	1.0	0	6.3	7.9	5.6	6.0
M	30.0	36.7	16.7	33.3	100	100	50.0	100.0	33.3	33.3	29.4	39.2
N	13.5	10.8	11.1	5.6	8.3	5.2	4.6	3.3	6.8	5.9	7.2	5.5
O	4.4	10.5	2.5	5.0	2.9	3.8	0	2.8	1.9	6.5	2.5	5.9
P	36.4	4.5	70.6	0	0	0	0	0	0	0	52.5	2.5
Q	37.5	25.0	25.7	5.7	15.9	6.8	9.8	4.9	8.4	6.9	11.9	6.8
R	37.5	6.3	9.1	0	3.8	0	5.6	0	9.6	2.2	9.2	1.6
S	14.3	25.7	7.8	3.1	4.0	0	2.0	3.1	2.2	8.4	4.2	6.1
T	9.8	24.6	12.6	11.7	10.7	9.1	16.1	18.3	17.6	26.2	14.5	19.2
U	11.1	4.2	10.3	10.3	0	50.0	75.0	75.0	100.0	50.0	15.6	10.7
V	2.4	3.1	3.8	0.6	4.1	0.5	9.8	4.5	7.6	6.0	5.8	3.3
W	0	15.4	0	2.7	0	0	0	2.8	0.7	1.4	0.3	2.7
X	31.3	25.0	16.4	8.2	8.2	7.1	5.4	4.8	7.7	7.7	9.1	7.7
Total	**15.1**	**14.9**	**11.1**	**6.2**	**6.9**	**5.1**	**6.9**	**5.9**	**8.7**	**10.5**	**9.0**	**8.7**

*percentage of admissions in each birthweight category of each site receiving treatment
Note: This table indicates use of narcotics on Day 1 for any indication.

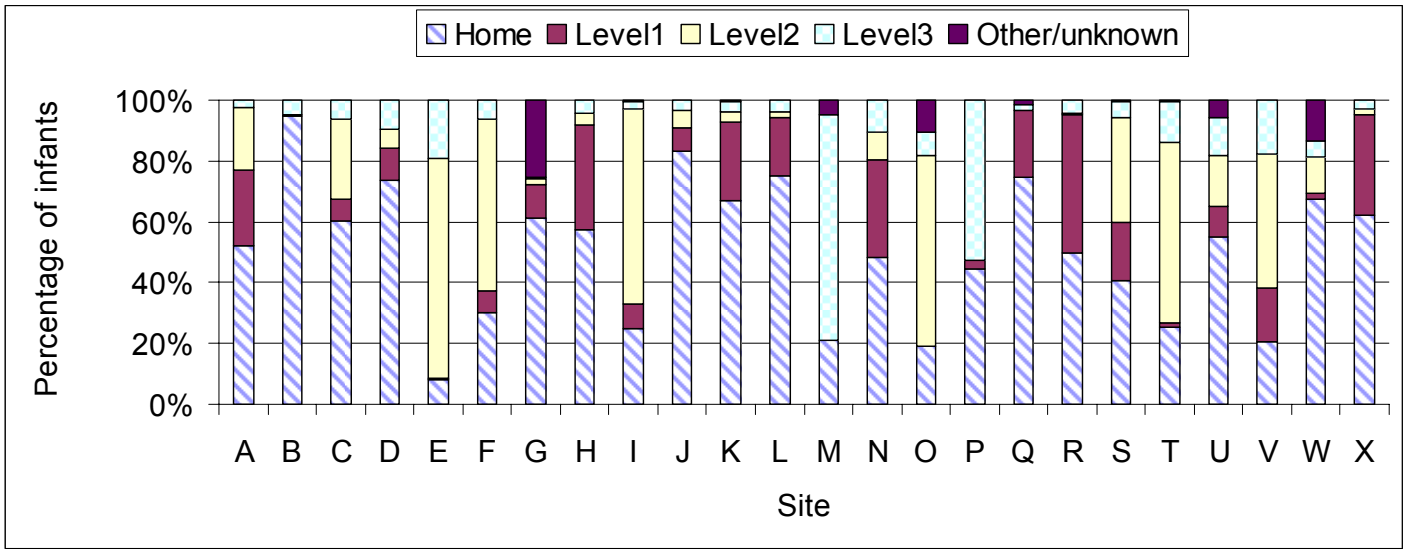
Presentation #45
Use of narcotics in ventilated infants*



Site	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Mean
%	45.0	43.8	45.0	43.8	44.0	40.1	56.9	35.6	41.0	42.1	27.6	31.2	98.0	61.8	41.6	89.2	46.7	31.0	34.9	55.4	57.6	34.0	10.4	44.6	47.2

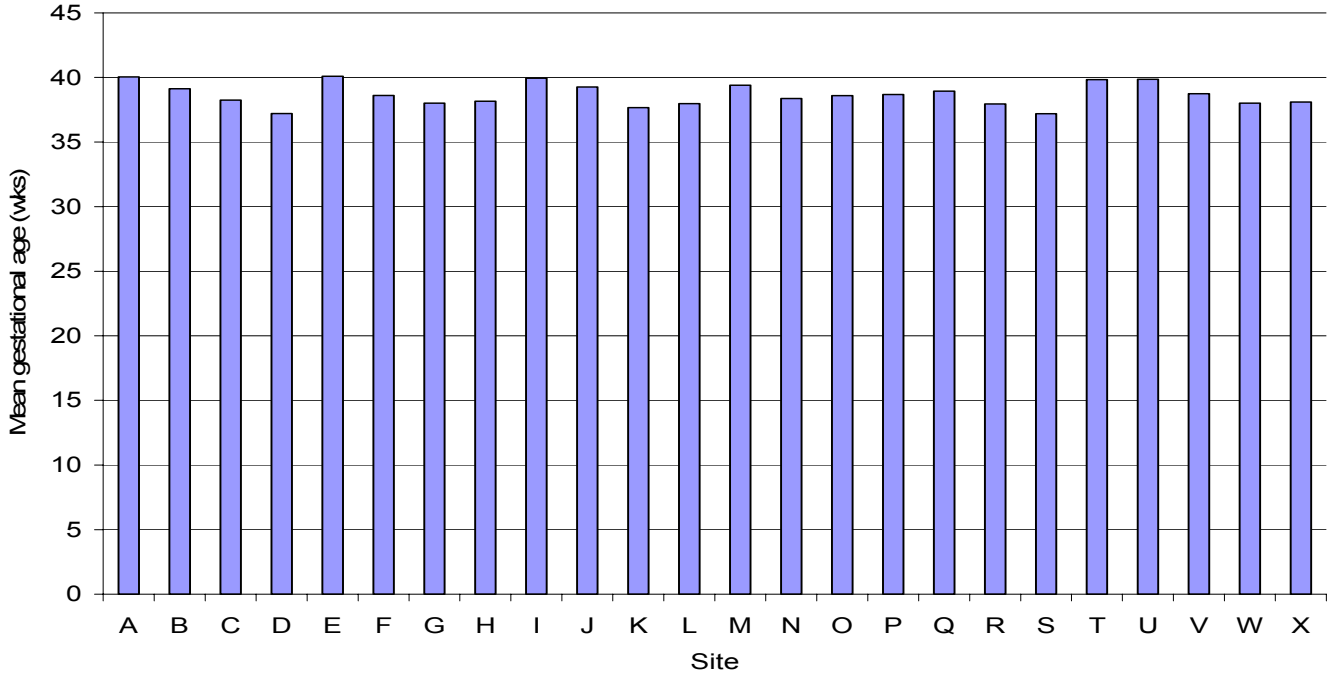
*Percentage of ventilated infants receiving narcotics (morphine, fentanyl and codeine) for any indication.

Presentation #46
Discharge destination of infants



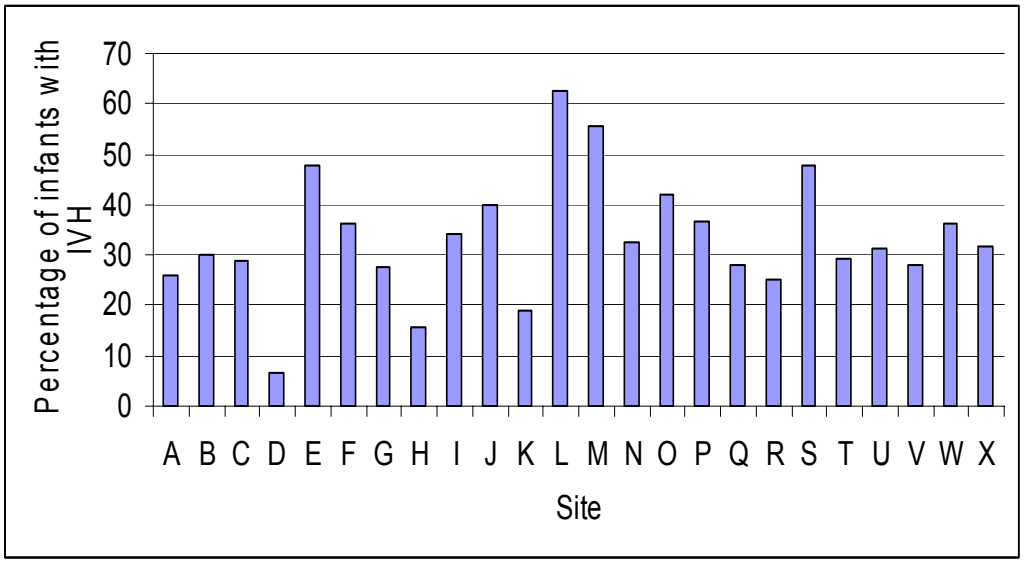
COMMENTS: Discharge destinations varied considerably, possibly affected by the availability of the health care resources, geography and practice variations at different hospitals. Destinations to Level 1 and 2 nurseries may include nursery within own hospital. "Other/unknown" is the pediatric ward(s).

Presentation #47
Post-menstrual age at discharge home directly from NICU



Site	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Mean
Mean	40	39	38	37	40	39	38	38	40	39	38	38	39	38	39	39	39	38	37	40	40	39	38	38	38
Std. Error of Mean	0.8	0.2	0.1	0.1	0.5	0.1	0.1	0.2	0.2	0.2	0.1	0.1	1.2	0.1	0.3	0.8	0.2	0.1	0.2	0.3	0.5	0.2	0.2	0.1	0.0
Median	39	39	38	37	40	39	38	38	40	39	37	37	40	38	39	38	39	37	37	40	40	39	37	38	38

Presentation #48
Incidence of IVH among infants <32 weeks of gestational age



Site	≤22	23-24	25-26	27-28	29-30	31	Mean*
A	N/A	75.0	24.1	20.0	N/A	N/A	**25.9**
B	N/A	N/A	0	33.3	50.0	0.0	**30.0**
C	N/A	66.7	54.2	37.9	11.1	8.7	**28.8**
D	50.0	0	5.9	3.7	9.1	3.8	**6.6**
E	100.0	75.0	59.3	45.8	37.7	43.5	**47.9**
F	N/A	44.4	44.1	21.7	29.4	40.0	**36.1**
G	N/A	100.0	57.9	14.3	13.0	15.8	**27.5**
H	N/A	0	66.7	0	16.7	0.0	**15.8**
I	N/A	78.3	48.4	29.1	24.6	17.6	**34.0**
J	N/A	N/A	0	75.0	38.5	0.0	**40.0**
K	100.0	0	33.3	14.3	16.7	0.0	**19.0**
L	N/A	100.0	62.5	66.7	81.3	42.1	**62.7**
M	N/A	100.0	33.3	71.4	N/A	N/A	**55.6**
N	N/A	45.5	50.0	26.1	36.7	19.0	**32.6**
O	N/A	66.7	45.1	46.5	32.1	28.6	**42.2**
P	N/A	100.0	41.7	22.7	N/A	N/A	**36.8**
Q	N/A	100.0	25.0	11.1	36.4	14.3	**27.9**
R	N/A	75.0	14.3	11.1	40.0	0.0	**25.0**
S	100.0	83.3	100.0	30.8	42.1	50.0	**47.6**
T	N/A	58.8	26.1	29.4	24.5	20.0	**29.4**
U	N/A	87.5	35.6	18.9	N/A	N/A	**31.1**
V	N/A	38.5	48.1	32.4	13.5	22.7	**27.9**
W	N/A	100.0	77.8	46.2	28.6	11.8	**36.1**
X	N/A	66.7	80.0	35.7	9.1	20.0	**31.9**
Mean**	**80.0**	**63.3**	**44.1**	**31.3**	**25.6**	**20.1**	**33.0**

Mean* = (number of infants with IVH for site x / total number of infants for site x)*100
Mean** = (number of infants with IVH for gestational age category x / total number of infants in gestational category x)*100
NA = non-applicable

G. Site Comparisons – Risks Adjusted Analysis

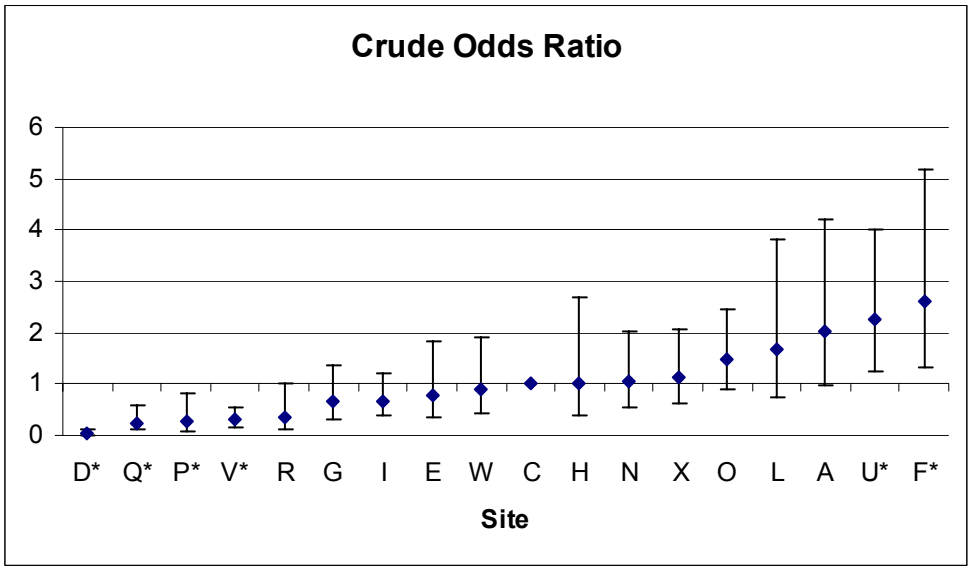
Comments: Logistic regression is used for this section-- Risk Adjusted Analysis. This technique is used to analyze interactions in which there are one or more independent variables that determine an outcome. The outcome is measured using a dichotomous variable.

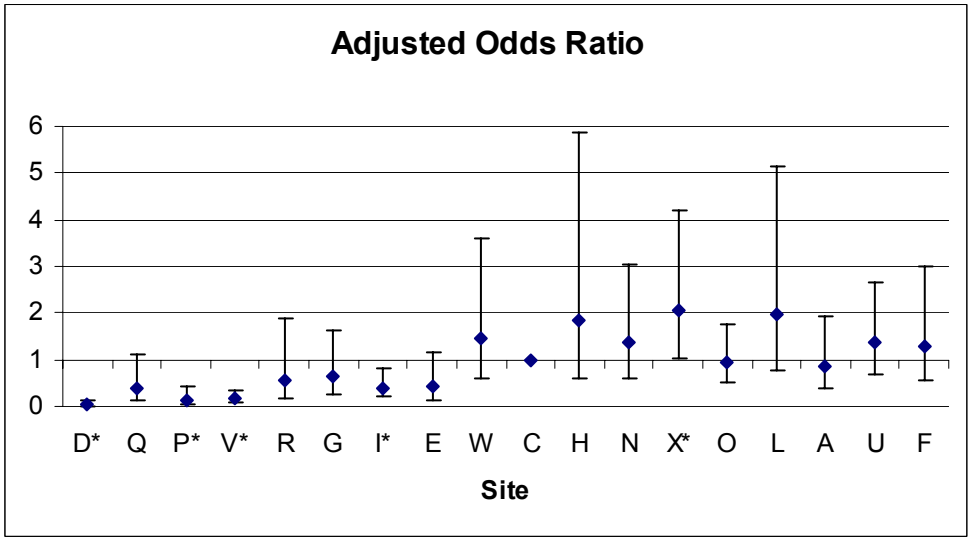
The goal of logistic regression is to find the best fitting (yet biologically reasonable) model to describe the relationship between the dichotomous characteristic of interest (dependent variable = response or outcome variable) and a set of independent (predictor or explanatory) variables. Logistic regression generates the coefficients (and its standard errors and significance levels) of a formula to predict a *logit transformation* of the probability of presence of the characteristic of interest:

$$\text{logit}(p) = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \ldots + b_k X_k$$

where p is the probability of presence of the characteristic of interest

Presentation #49
Site comparison of retinopathy of prematurity





Reference site: C (B, J, K, M and S excluded due to small sample size)
Site T excluded due to outlier data.

***Sites significantly different from reference site (P<0.05)**

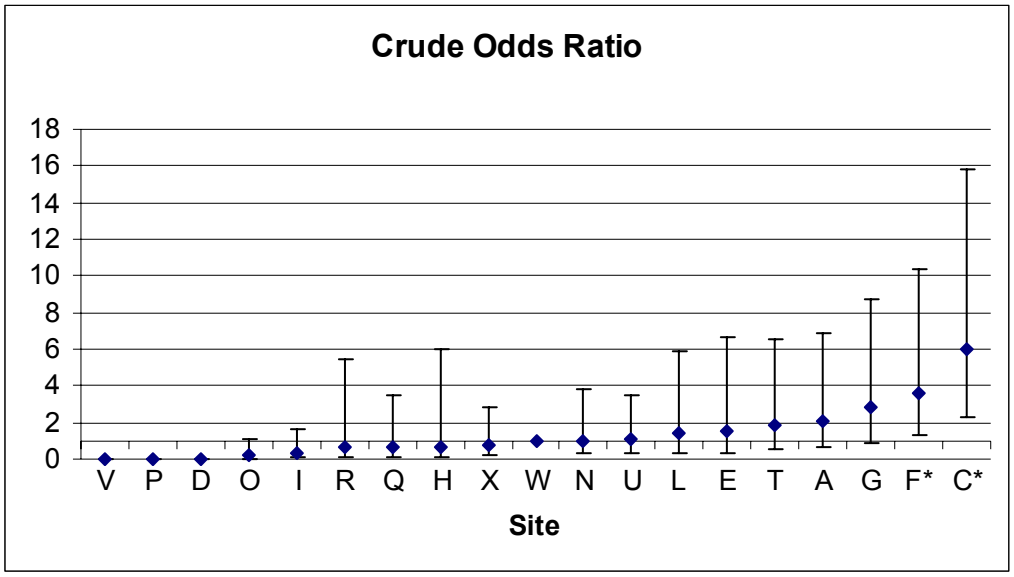
Inclusion criteria:
Birthweight <1500g
Screened for ROP
Age at admission less than 4 days

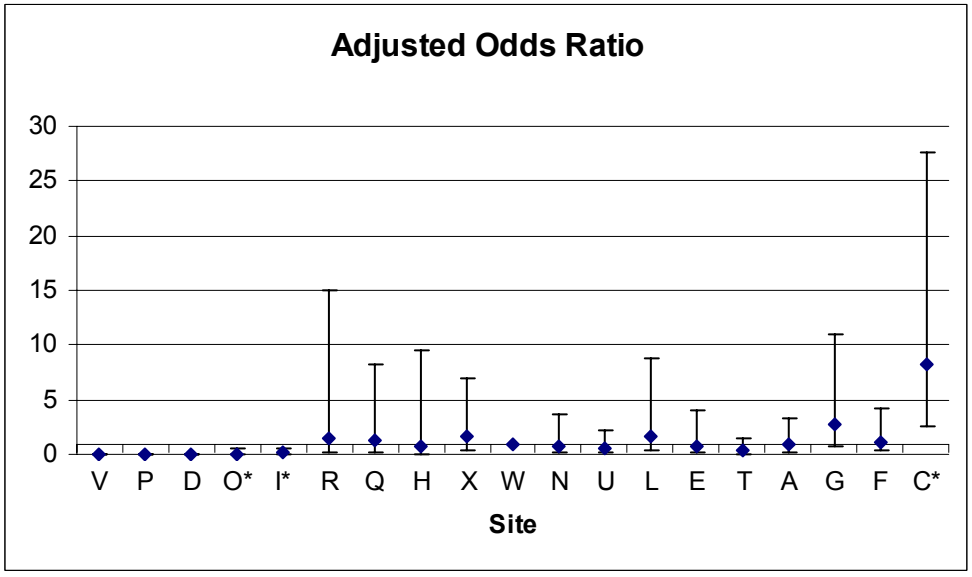
Outcome is attributed to the network hospital of first admission.

Significant predictors identified by multivariate analysis and adjusted for:

Birthweight
Gestational age
Gender

Presentation #50
Site comparison of cryo/laser therapy for retinopathy of prematurity





Reference site: W (B, J, K, M and S excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

Inclusion criteria:
Birthweight <1500g
Screened for ROP
Age at admission less than 4 days

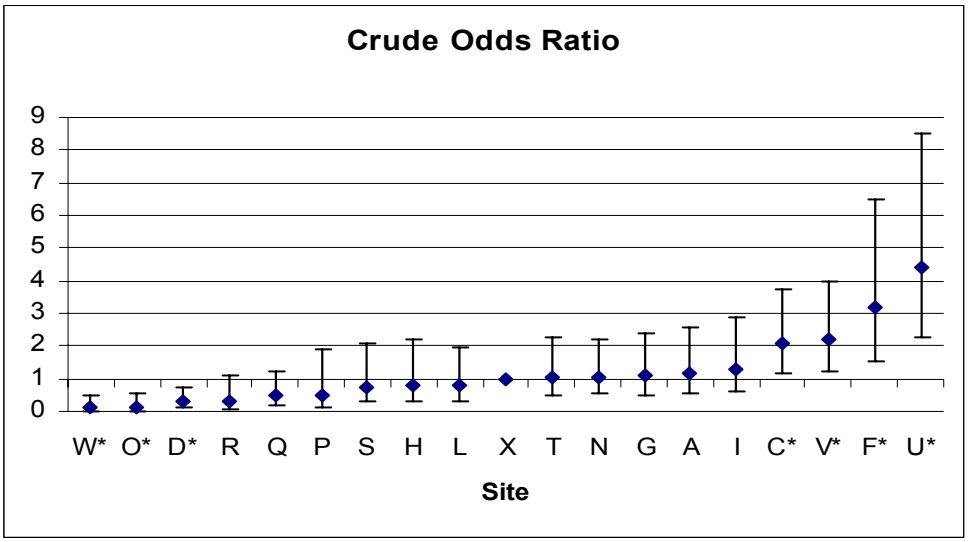
Outcome is attributed to the network hospital of first admission.

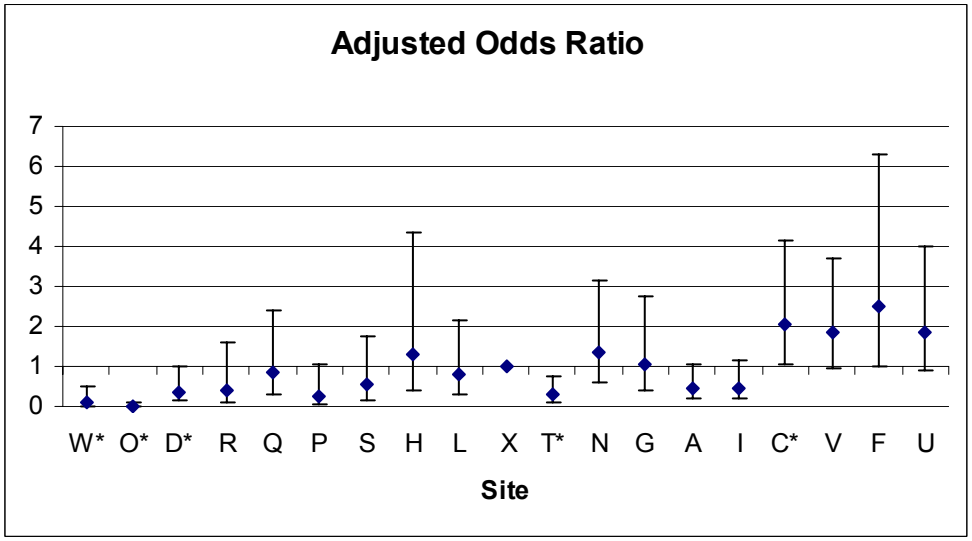
Significant predictors identified by multivariate analysis and adjusted for:

Gestational age

Note: retinopathy of prematurity refers to stage 3 and above

Presentation #51
Site comparison of oxygen dependency at 36 weeks post-menstrual age





Reference site: X (B, E, J, K and M excluded due to small sample size)

***Sites significantly different from reference site (P<0.05)**

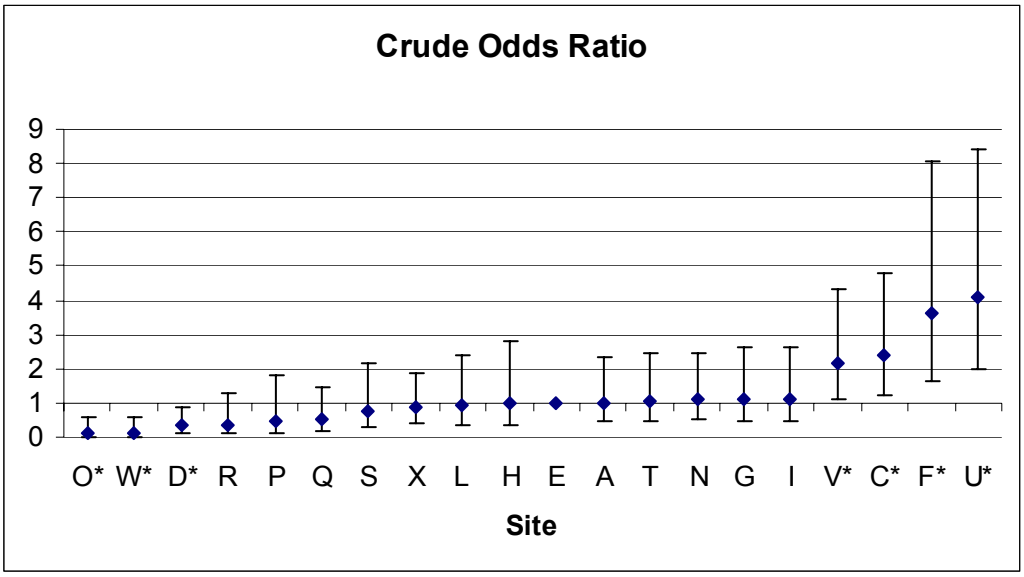
Inclusion criteria:
Gestational age <33 weeks
Age at admission less than 4 days
Survival to and remaining hospitalized at 36 weeks post-menstrual age

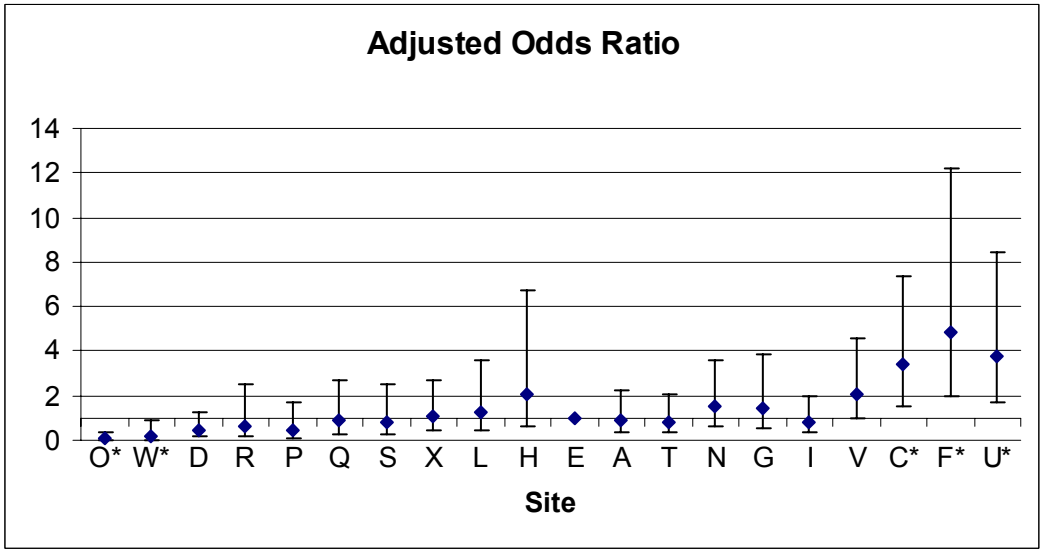
Outcome is attributed to the network hospital of first admission.

Significant predictors identified by multivariate analysis and adjusted for:

SNAP-II score
Gestational age
Gender
Birthweight
Outborn

Presentation #52
Site comparison of oxygen dependency at 36 weeks post-menstrual age or death





Reference site: E (B, J, K and M excluded due to small sample size)

***Sites significantly different from reference site (P<0.05)**

Inclusion criteria:
Gestational age <33 weeks
Age at admission less than 4 days
Survival to and remaining hospitalized at 36 weeks post-menstrual age or death before 36 weeks post-menstrual age and beyond 3 days of life

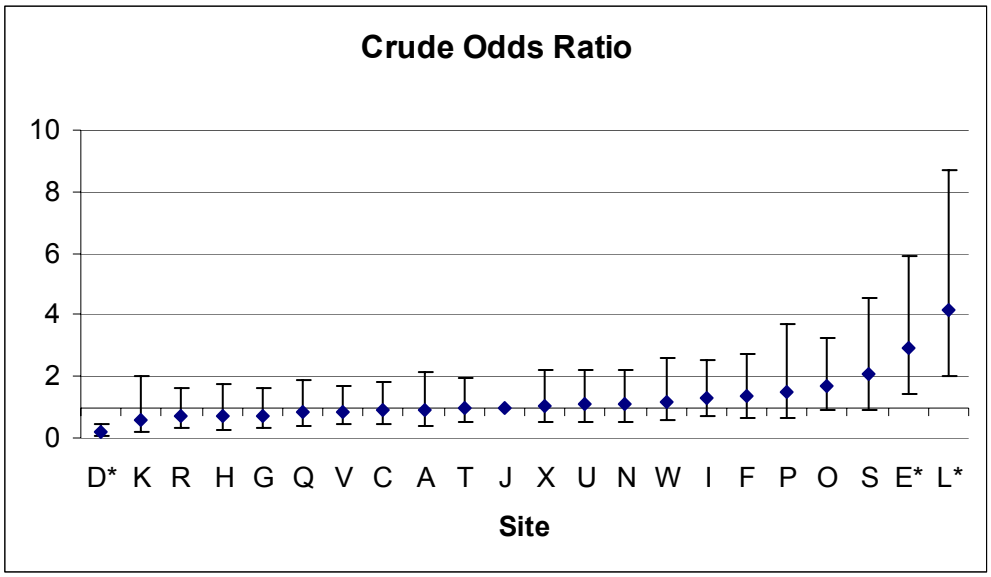
Outcome is attributed to the network hospital of first admission.

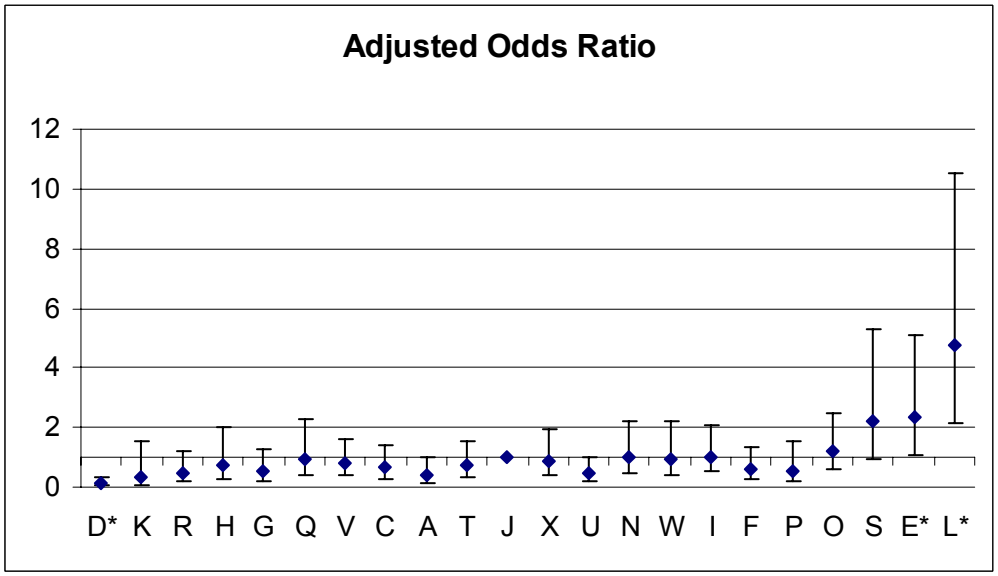
Significant predictors identified by multivariate analysis and adjusted for:

Birthweight
Gender
Outborn

Note: this reflects the differences in odds ratio of

Presentation #53
Site comparison of intraventricular hemorrhage among infants <33 weeks gestational age





Reference site: J (site B and M excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

Inclusion criteria:
Gestational age <33 weeks
Age at admission less than 4 days
Ultrasound reports in the first two weeks of life

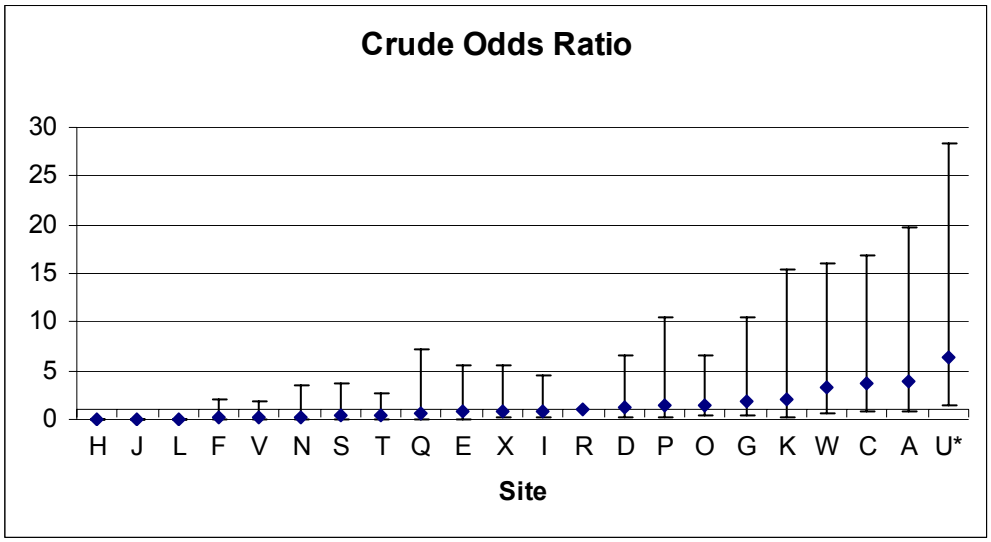
Outcome is attributed to the network hospital of first admission.

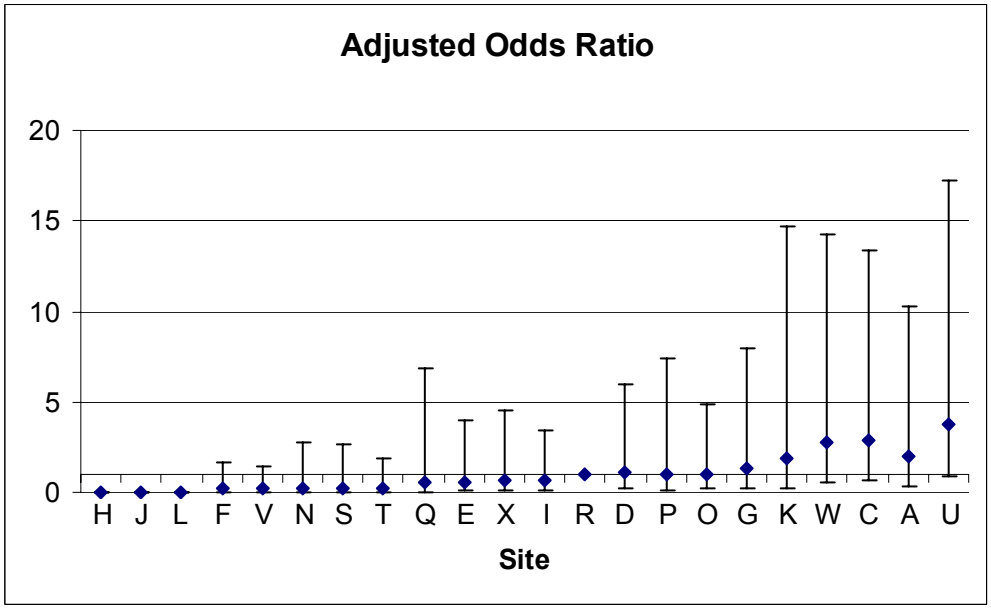
Significant predictors identified by multivariate analysis and adjusted for:

Admission SNAP-II score
Gestational age
Apgar at 5 mins
Cesarean section
Antenatal Corticosteroid use

Note: IVH refers to probable or definite IVH.

Presentation #54
Site comparison of necrotizing enterocolitis among infants <1500g at birth





Reference site: R (site B and M execulded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

Inclusion criteria:
Birthweight <1500g
Age at admission less than 4 days

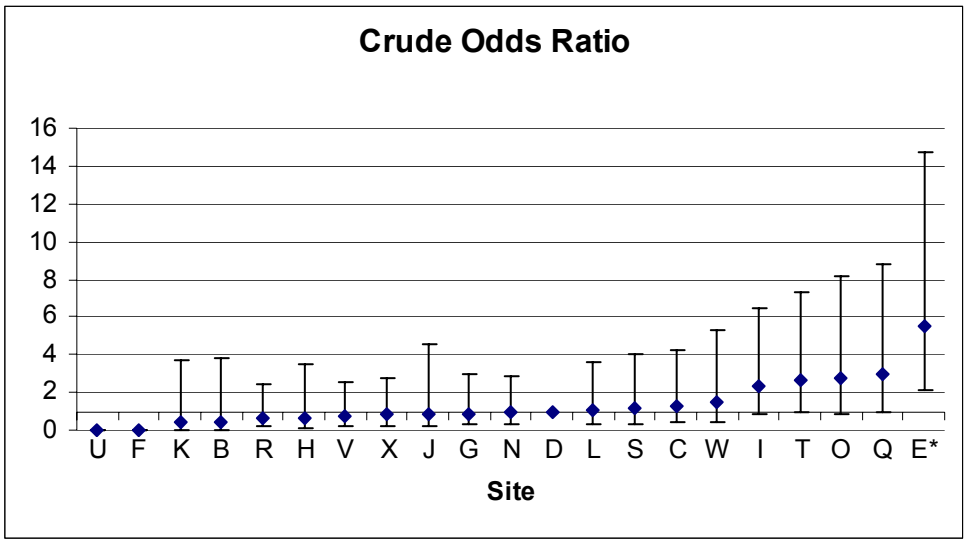
Outcome is attributed to the network hospital of first admission.

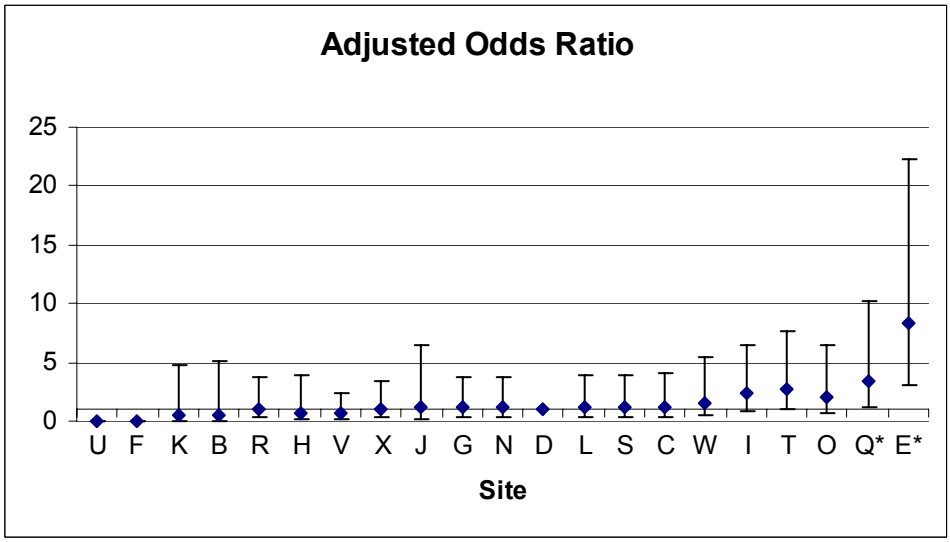
Significant predictors identified by multivariate analysis and adjusted for:

Gestational age
Cesarean section

Note: Necrotizing enterocolitis is based on clinical diagnosis (using Bell's criteria, stage 2 or higher) and the presence of pneumatosis on abdominal radiographs and/or compatible surgical/pathological findings.

Presentation #55
Site comparison of nosocomial infection among infants ≥1500g at birth





Reference site: D (A, M and P excluded due to no birthweights ≥1500g; K excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

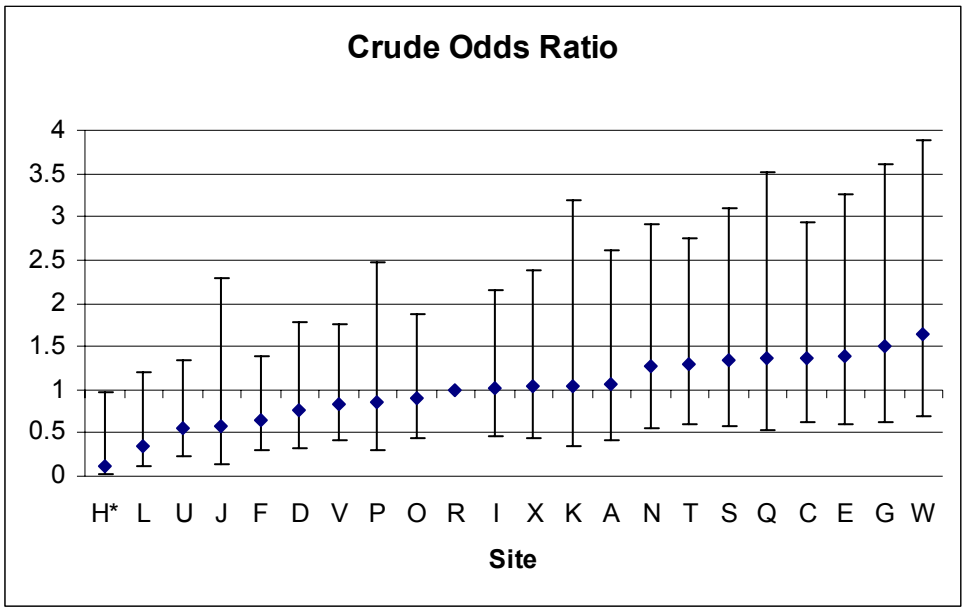
Inclusion criteria:
Birthweight ≥1500g
Age at admission less than 4 days
Remained hospitalized beyond 2 days after birth

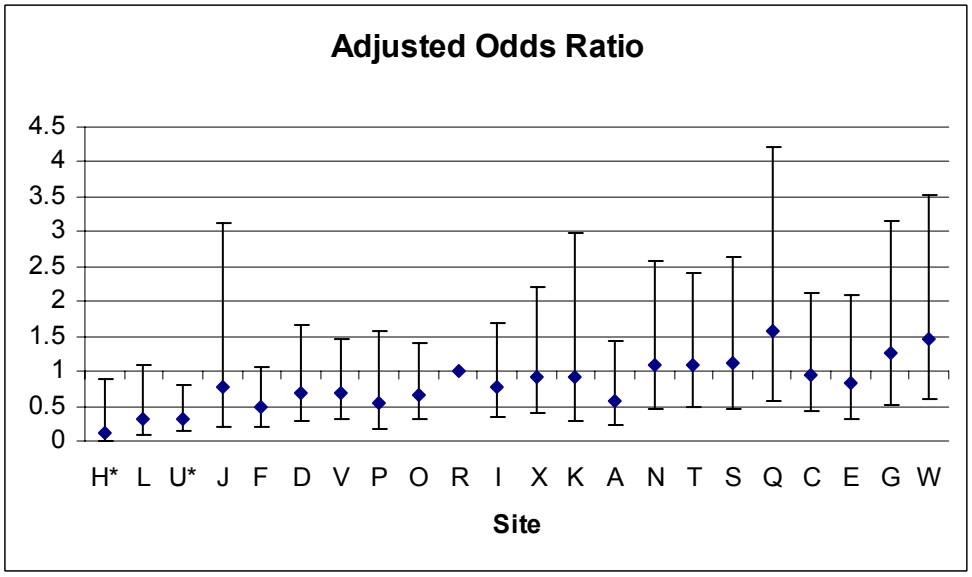
Outcome is attributed to the hospital in which the infection occurred (adjusted for transfer).

Significant predictors identified by multivariate analysis and adjusted for:

Gestational age
Multiple birth
SNAP_II score

Presentation #56
Site comparison of nosocomial infection among infants <1500g at birth





Reference site: R (B and M excluded due to small sample size)
***Sites significantly different from reference site (P<0.05)**

Inclusion criteria:
Birthweight <1500g
Age at admission less than 4 days
Remained hospitalized beyond 2 days after birth

Outcome is attributed to the hospital in which the infection occurred (adjusted for transfer).

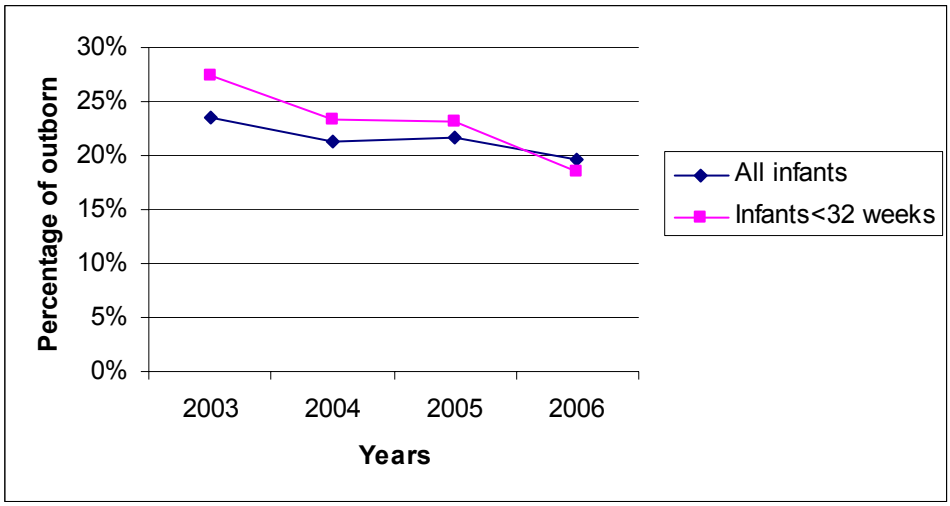
Significant predictors identified by multivariate analysis and adjusted for:

Gestational age
Birthweight
Outborn

H. Trends – 2003-2006

Presentation #57
Infants in the participating hospitals: admission status

Year	Number of Hospitals	Total Number of Infants	Inborn	% (row)	Outborn	% (row)	Readmissions	% (row)
2003	**13**	5867	4432	75.5%	1380	23.5%	55	0.9%
2004	**16**	6996	5475	78.3%	1492	21.3%	29	0.4%
2005	**24**	11000	8578	78.0%	2376	21.6%	46	0.4%
2006	**24**	10786	8629	80.0%	2124	19.7%	33	0.3%
Total		34649	27114	78.3%	7372	21.3%	163	0.5%
Missing		11						
Total # of infants		34660						

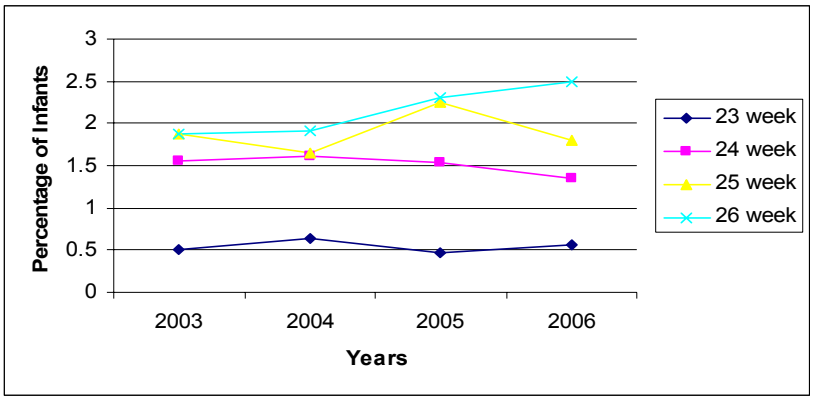


COMMENT: There was a steady decline in the number of outborn infants admitted to network centers among all infants and infants < 32 weeks gestational age at the time of admission. Note different number of hospitals that participated in data collections over the 4 years and that may have influenced results.

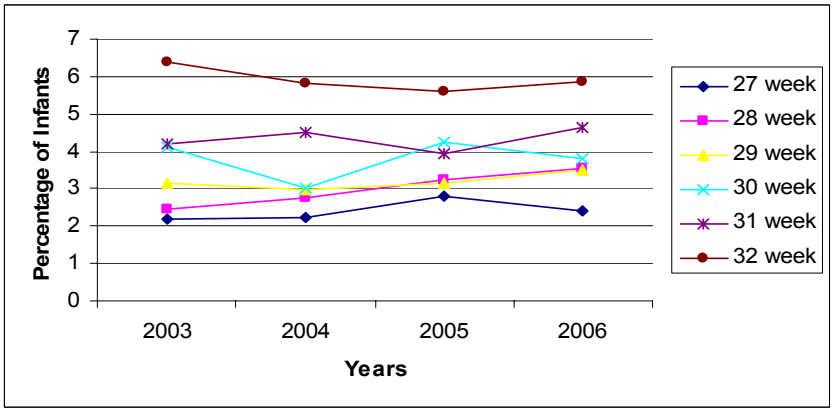
Presentation #58
Percentage of infants at various gestational age and birth weight groups

a. Gestational age

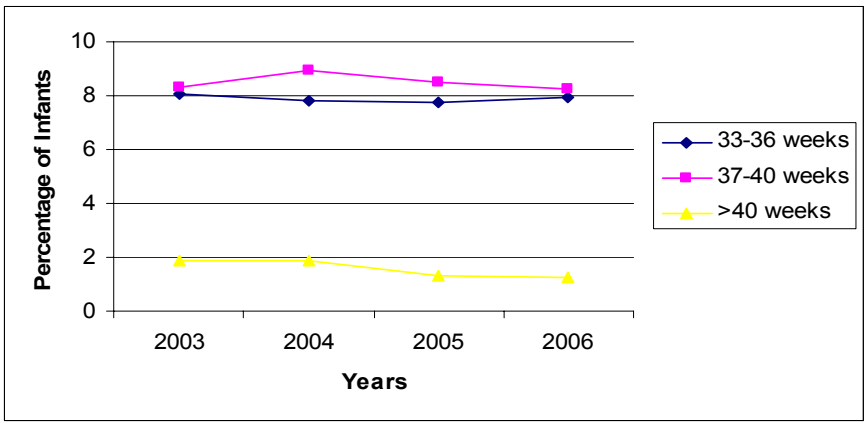
a1. 23-26 weeks:



a2. 27-32 weeks:



a3. >32 weeks:

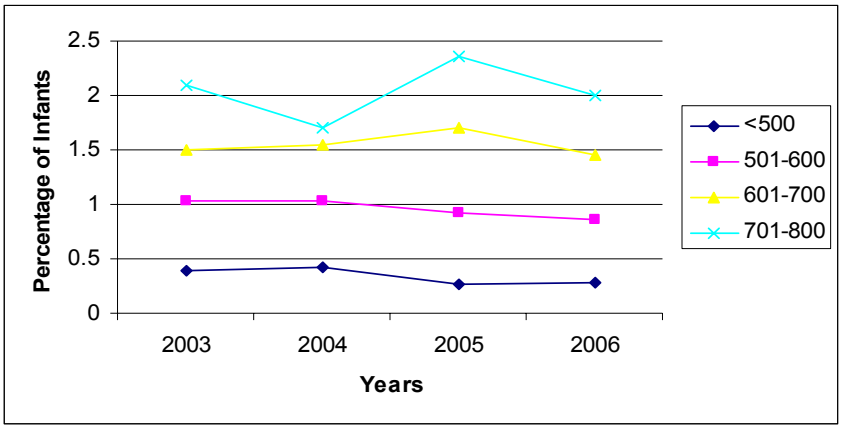


COMMENT: Except for mild variations there were no obvious changes in the incidences of admissions at various gestational ages.

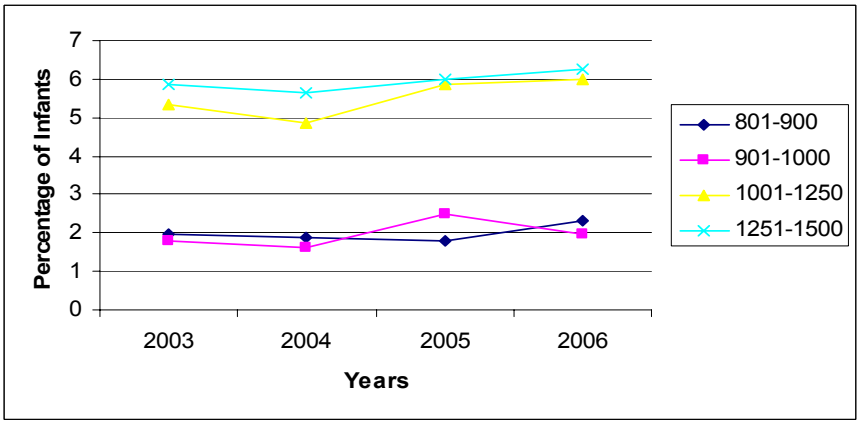
Presentation #58 *(continued)*
Percentage of infants at various gestational age and birth weight groups

b. Birth weight

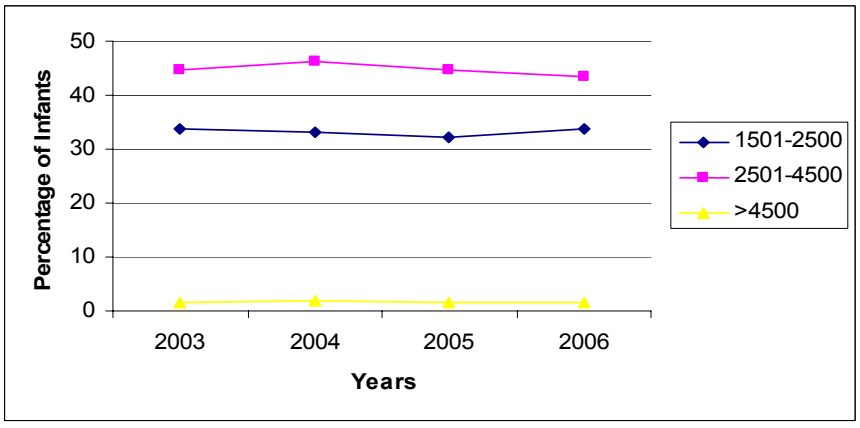
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



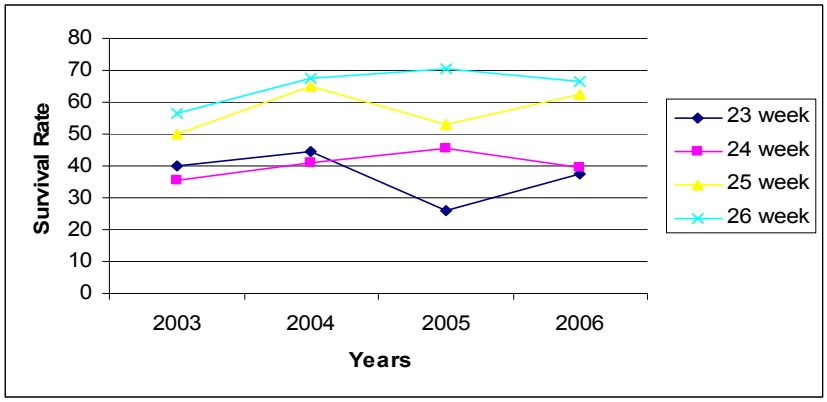
b3. Birth weight >1500g:



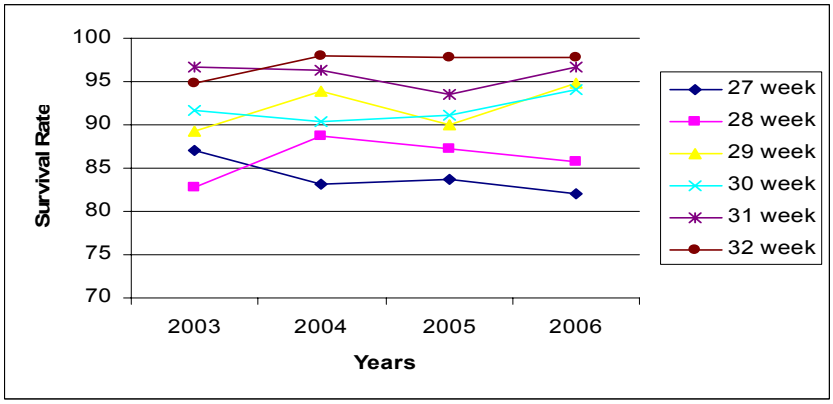
COMMENT: Except for mild variations there were no obvious changes in the incidences of admissions at various gestational ages.

Presentation #59
Survival Rate

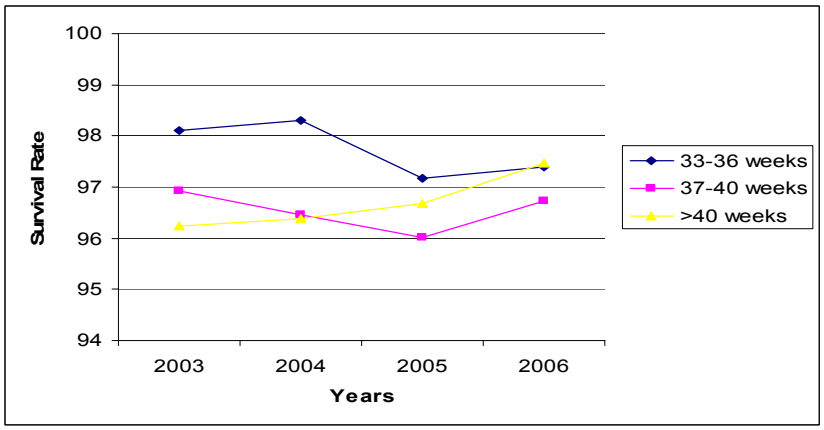
a1. 23-26 weeks:



a2. 27-32 weeks:



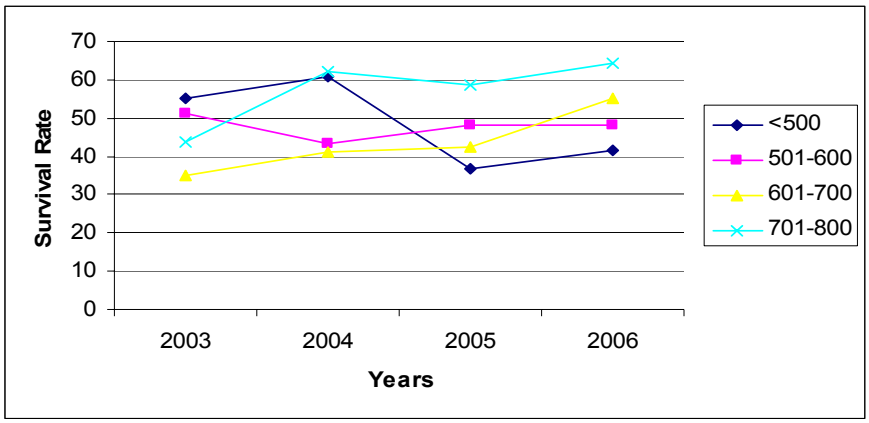
a3. >32 weeks:



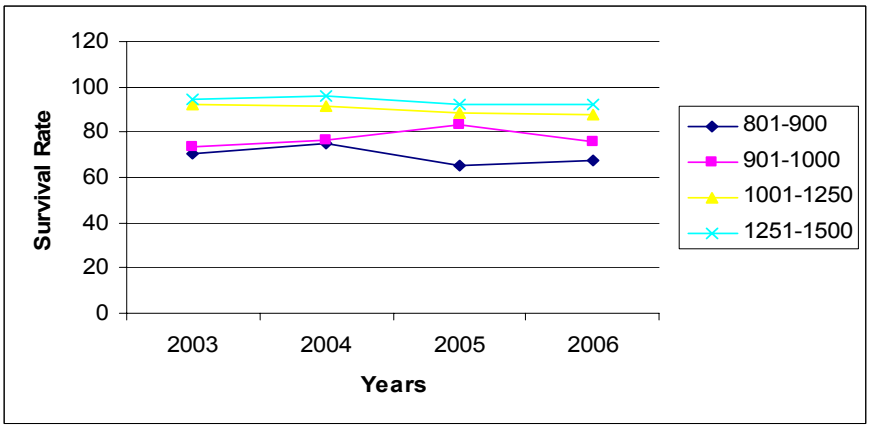
COMMENT: Survival among infants of 23, 24 and 31 weeks GA did not change over the last 4 years; however, a steady improvement was noticed among 25, 26, 28, 29, 30 and 32 weeks GA over the last 4 years.

Presentation #59 *(continued)*
Survival Rate

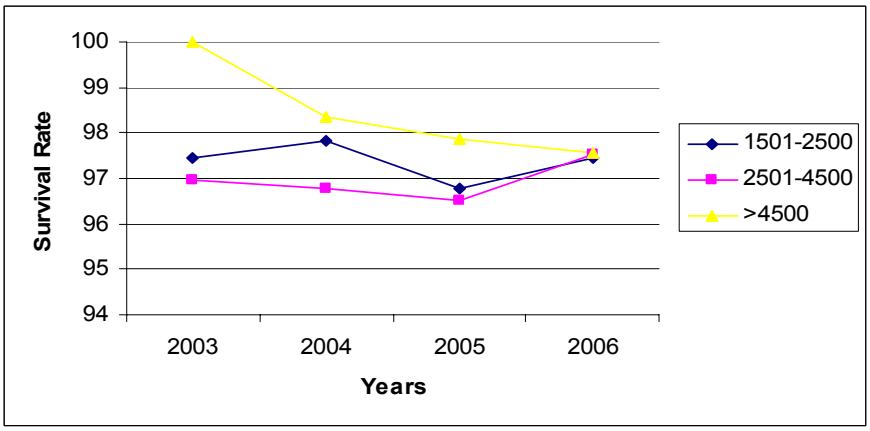
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:

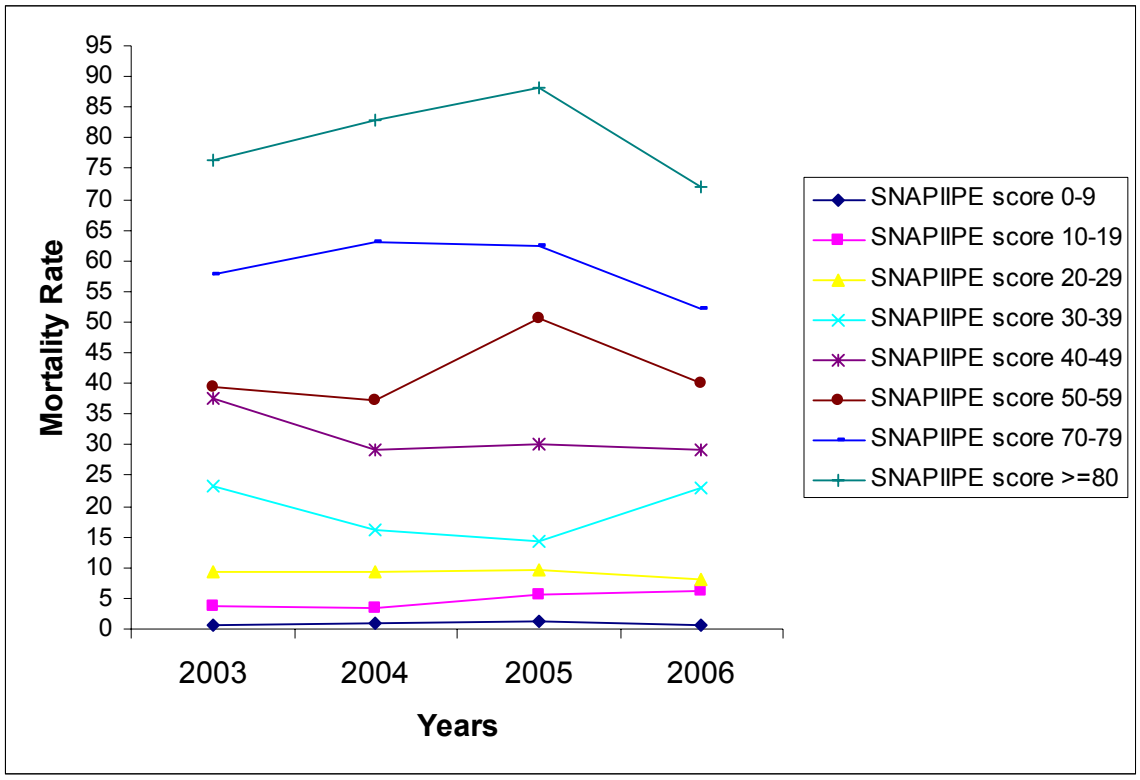


b3. Birth weight >1500g:



COMMENT: There was improved survival among infants with BW of 601-800g over the last 4 years.

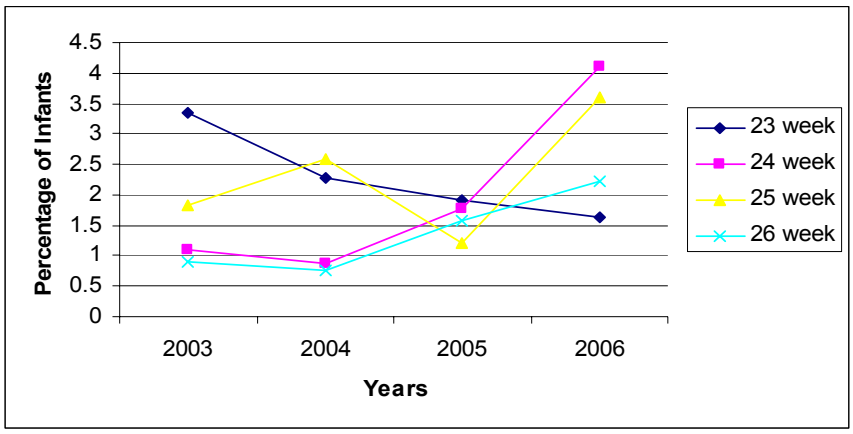
Presentation #60
SNAP-II PE score related to mortality



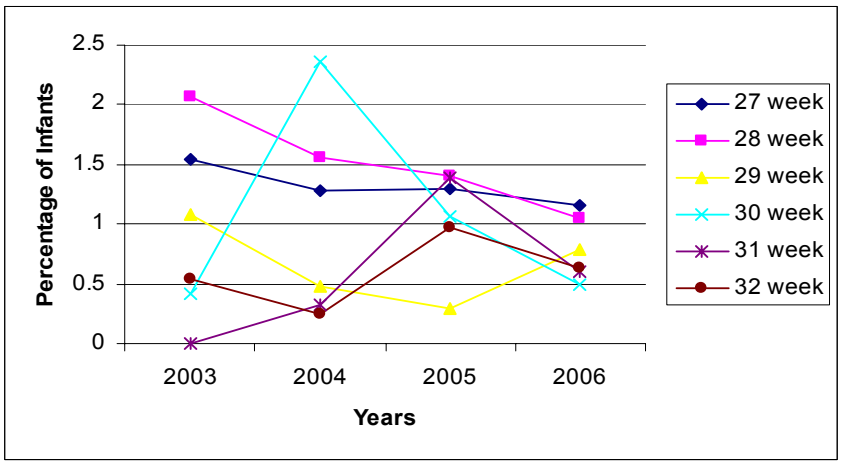
COMMENT: There was consistent performance of SNAP-II PE scores in predicting mortality over the last 4 years.

Presentation #61
Primary infection

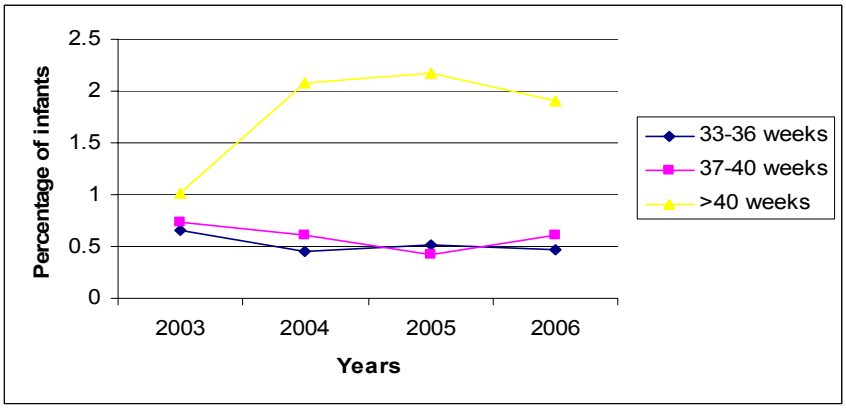
a1. 23-26 weeks:



a2. 27-32 weeks:



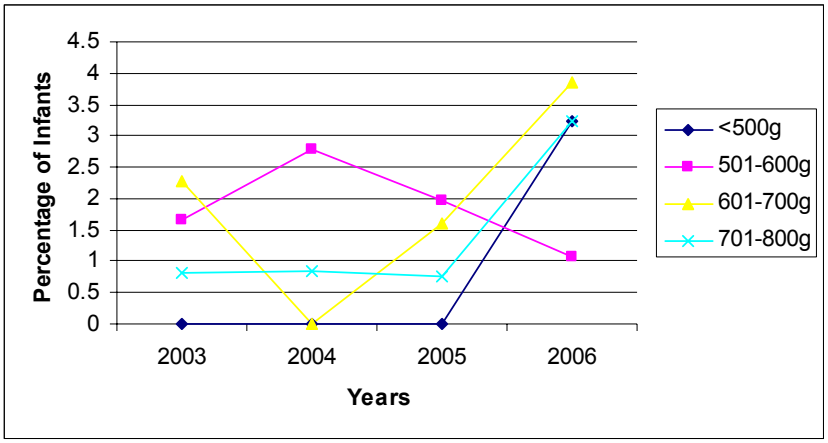
a3. >32 weeks:



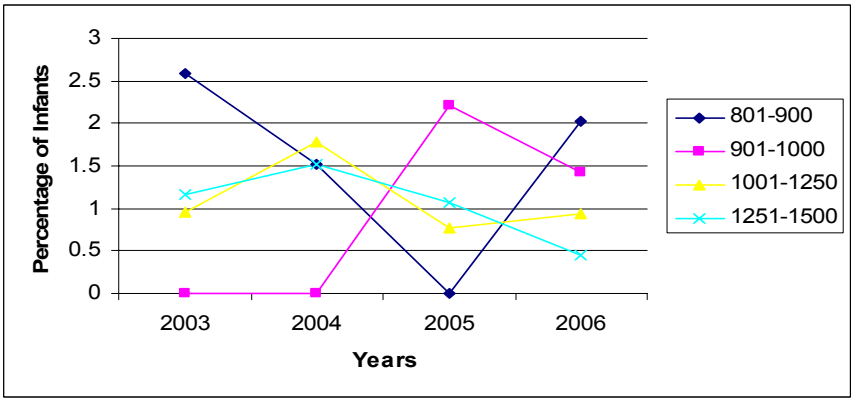
COMMENT: There was an increase in primary infections among 24-26 and 31 weeks GA but a decrease in primary infection among 27-29 weeks GA over last 4 years.

Presentation #61 *(continued)*
Primary infection

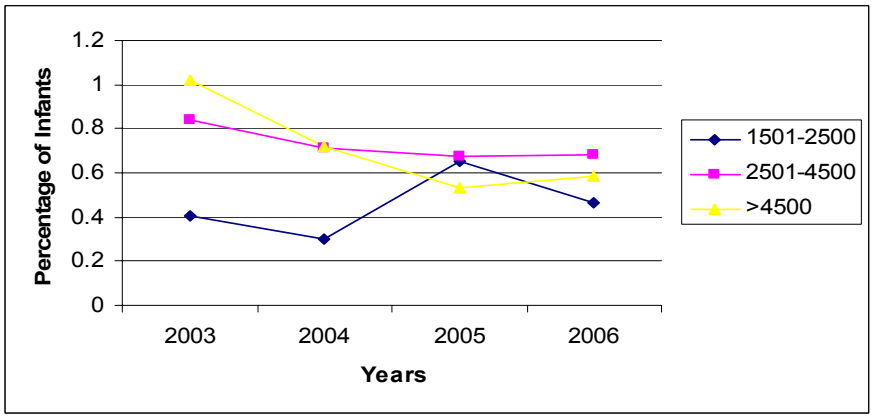
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



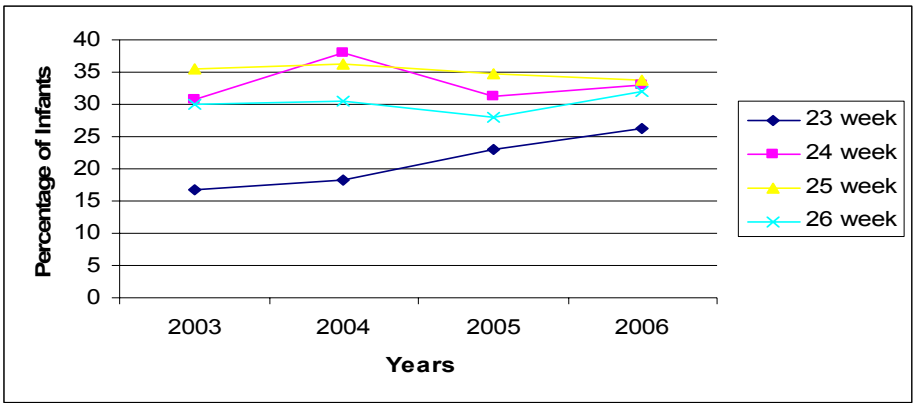
b3. Birth weight >1500g:



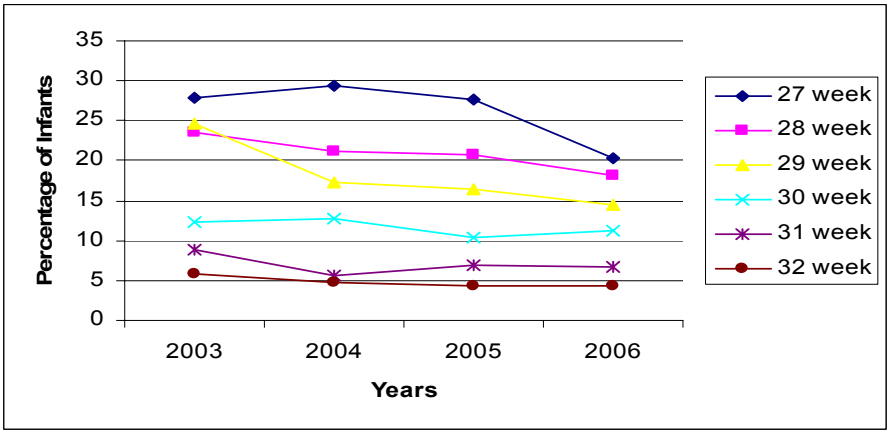
COMMENT: There was considerable variability in the incidence of primary infection among infants <1500g BW. There was a steady decline in the primary infection in infants >2500g BW over the last 4 years.

Presentation #62
Nosocomial infections

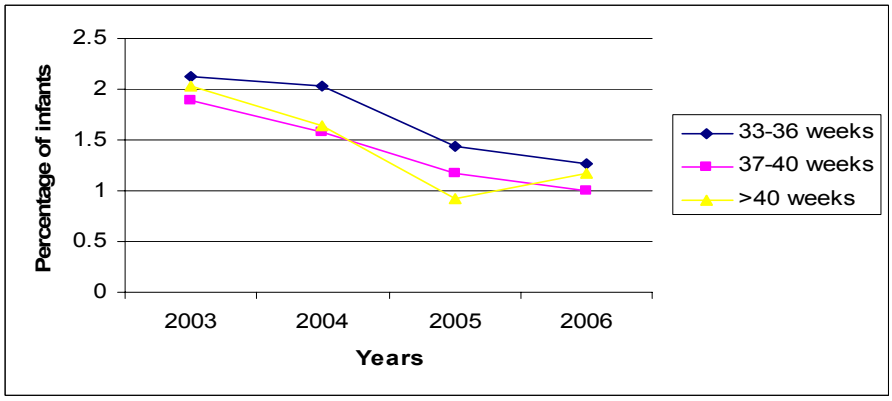
a1. 23-26 weeks:



a2. 27-32 weeks:



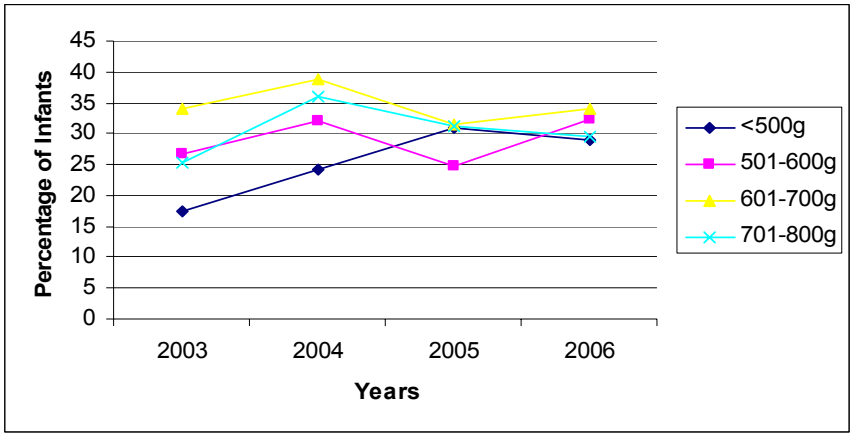
a3. >32 weeks:



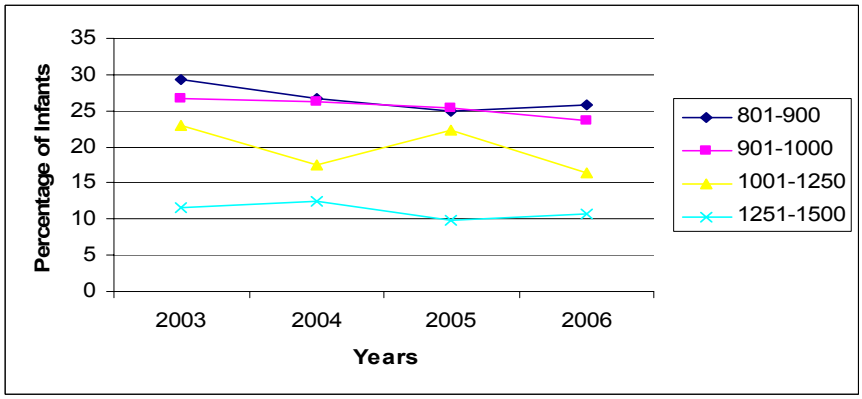
COMMENT: There was an increase in the incidence of nosocomial infection among 23 weeks GA (which may be due to improved survival). There was no change in the incidence of nosocomial infection among 24-26 and 30-32 weeks GA. There was a steady decline in the nosocomial infections rate among infants born >27 weeks GA.

Presentation #62 (*continued*)
Nosocomial infections

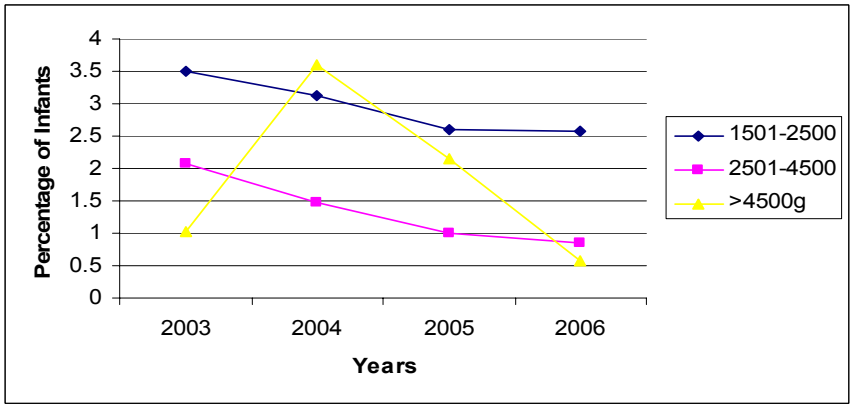
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



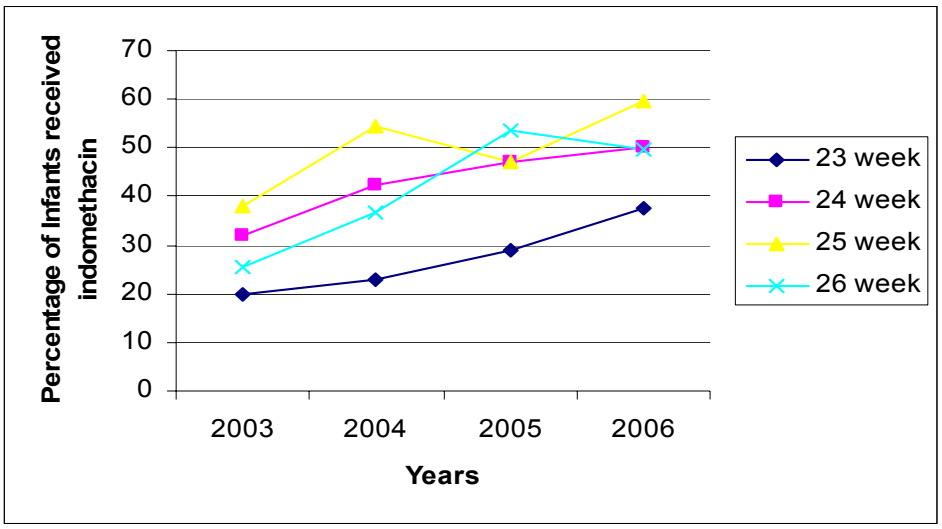
b3. Birth weight >1500g:



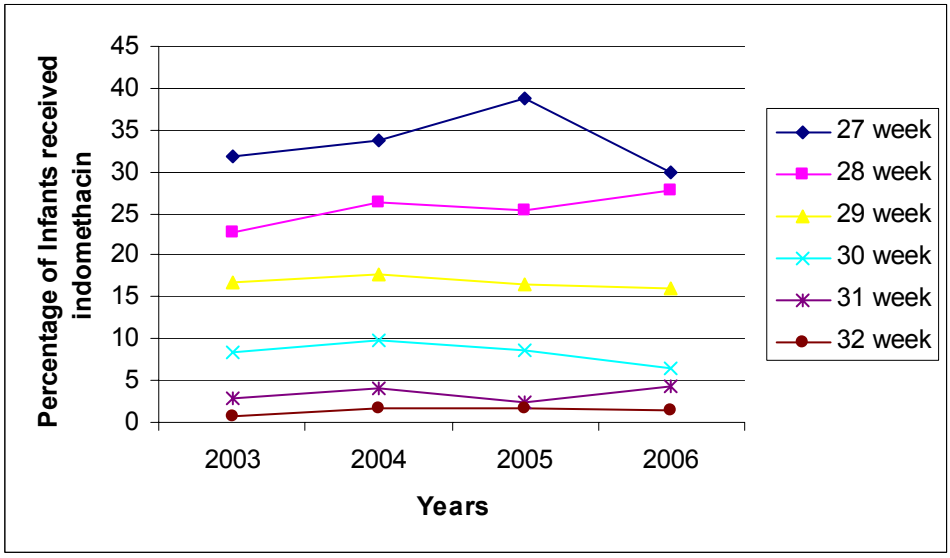
COMMENT: There was an increase in the incidence of nosocomial infections among infants <800g BW (except 601-700g BW group); however, there was a steady decline in the incidence of nosocomial infections among infants >801g BW over the last 4 years (except 1251 to 1500g BW group).

Presentation #63
Indomethacin treatment for PDA

a1. 23-26 weeks:



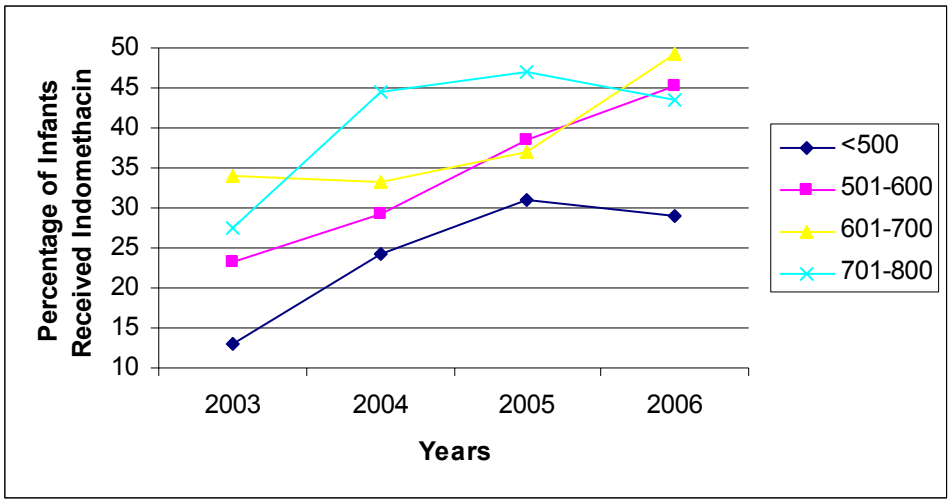
a2. 27-32 weeks:



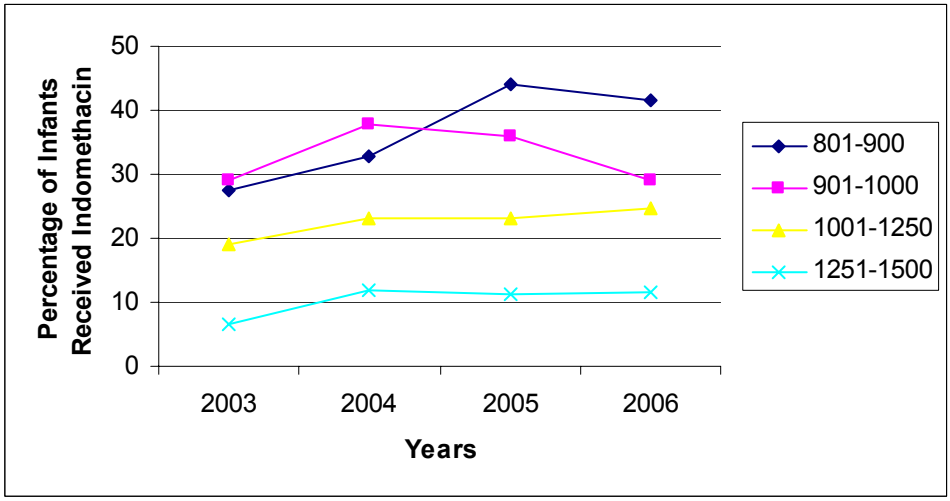
COMMENT: There was a steady increase in the percentage of infants who received indomethacin among infants < 26 weeks GA; however, there was minimal variability in the percentage of infants who received indomethacin among infants > 27 weeks GA.

Presentation #63 *(continued)*
Indomethacin treatment for PDA

b1. Birth weight less than 800g:



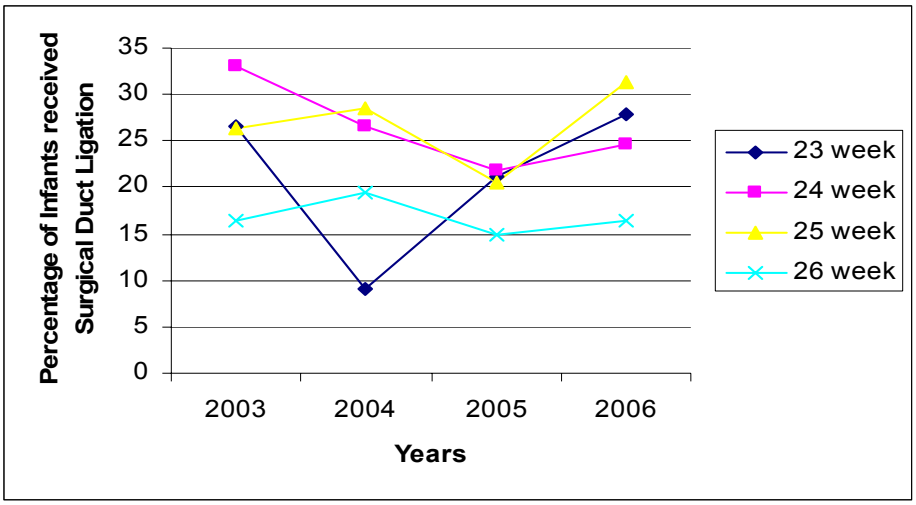
b2. Birth weight 801g-1500g:



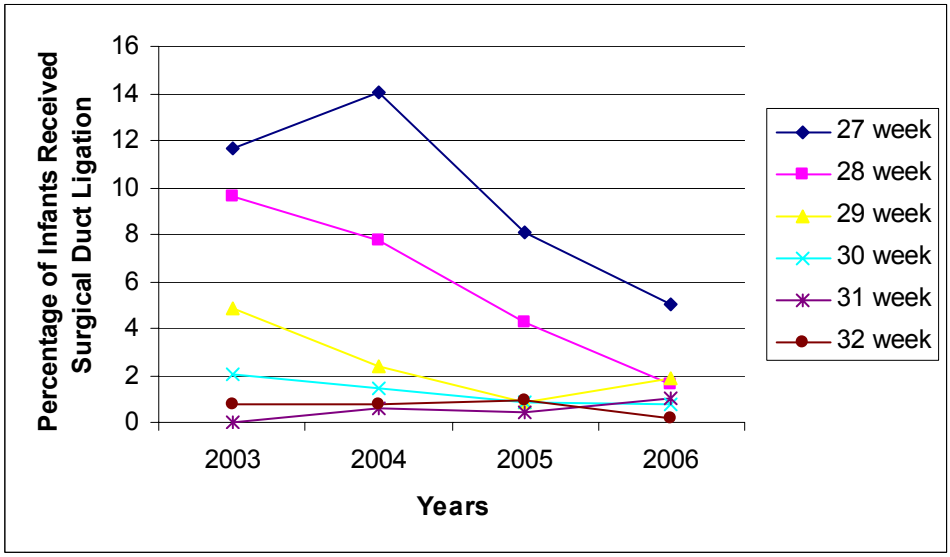
COMMENT: There was a steady increase in the percentage of infants who received indomethacin among infants with BW < 900g and minimal variability among infants with BW 901-1500g.

Presentation #64
Surgical duct ligation for PDA

a1. 23-26 weeks:



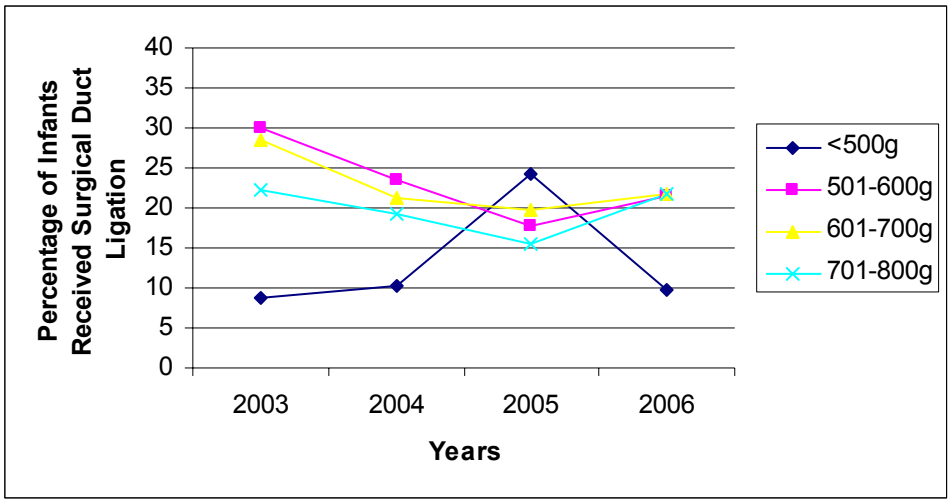
a2. 27-32 weeks:



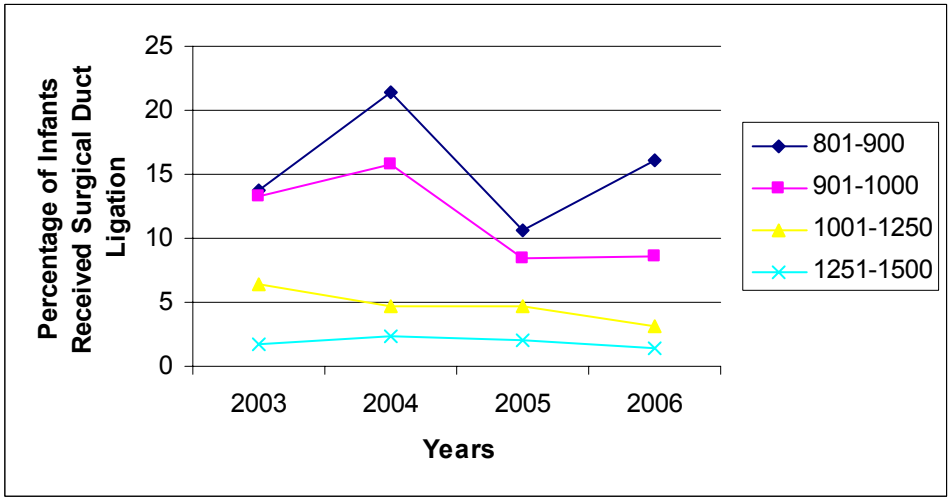
COMMENT: There was variability in the percentage of infants who had surgical ligation for PDA among infants <26 weeks GA; however, a steady decline among infants between 27-30 weeks GA over the last 4 years.

Presentation #64 *(continued)*
Surgical duct ligation for PDA

b1. Birth weight less than 800g:



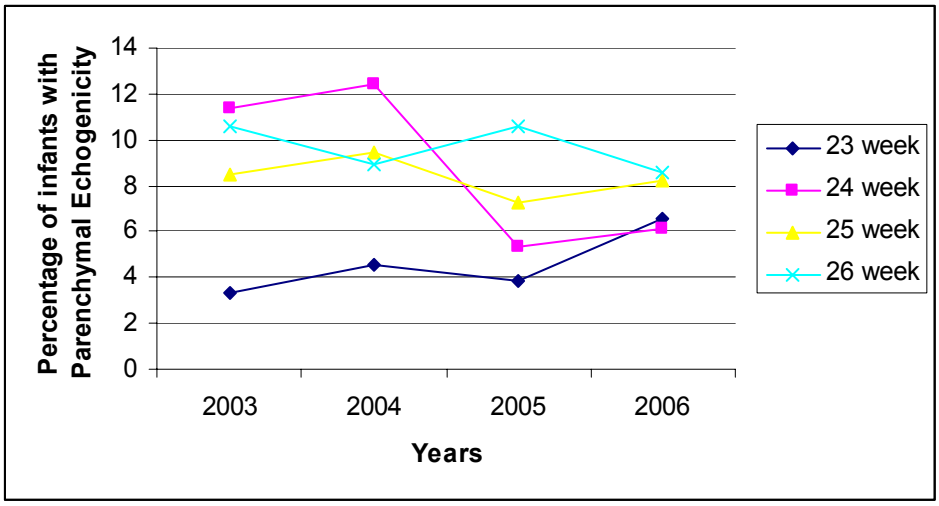
b2. Birth weight 801g-1500g:



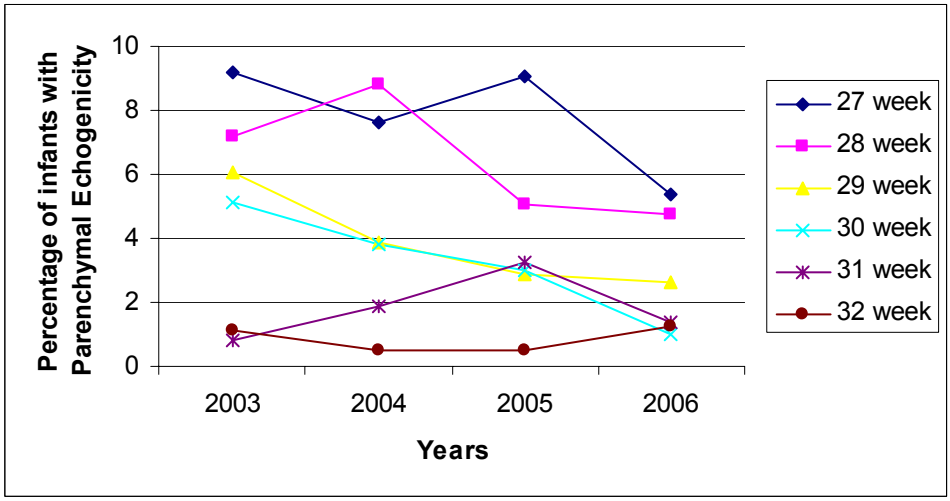
COMMENT: There was a decline in the percentage of infants who received surgical ligation for PDA among 501-700g BW and 901-1250g BW over the last 4 years.

Presentation #65
Parenchymal echogenicity

a1. 23-26 weeks:



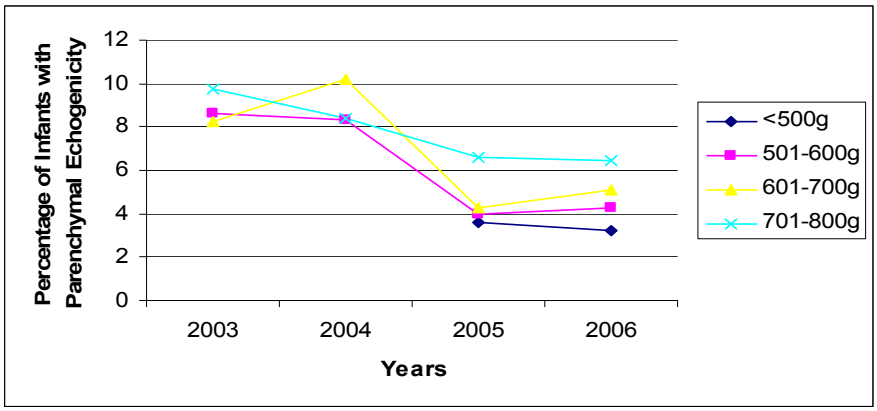
a2. 27-32 weeks:



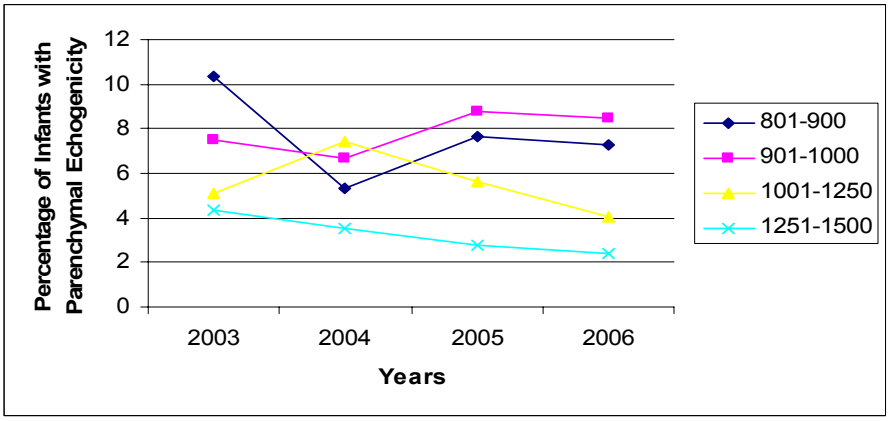
COMMENT: There was a decline in the incidence of parenchymal echogenicity among infants 24-30 weeks GA over the last 4 years.

Presentation #65 *(continued)*
Parenchymal echogenicity

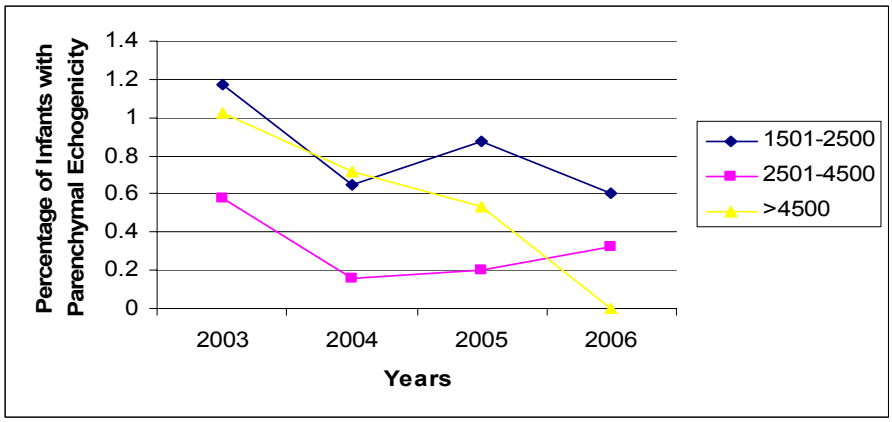
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



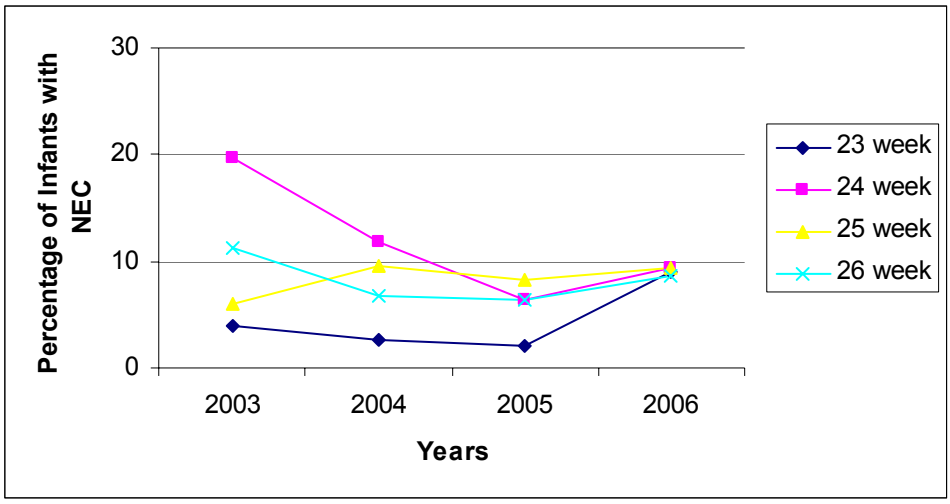
b3. Birth weight >1500g:



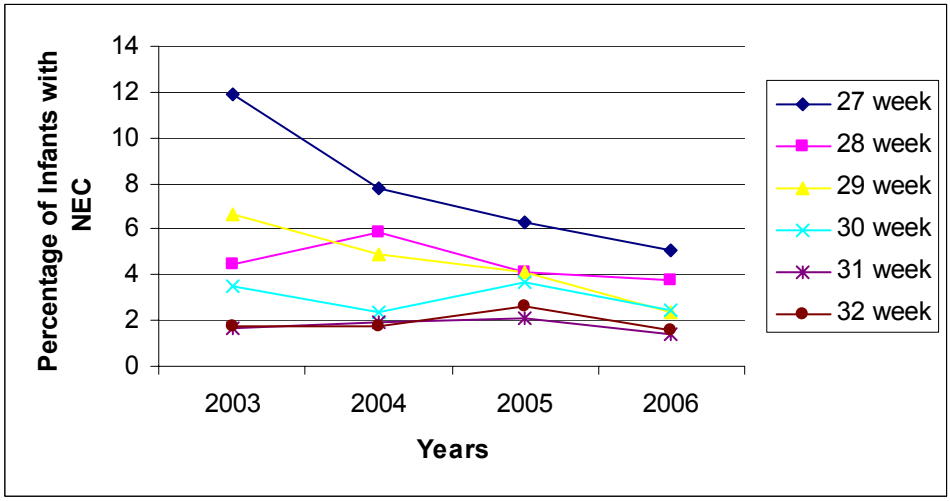
COMMENT: There was a decline in the incidence of parenchymal echogenecity among all BW categories of infants over the last 4 years (except for infants with BW 901-1000g).

Presentation #66
Necrotizing enterocolitis

a1. 23-26 weeks:



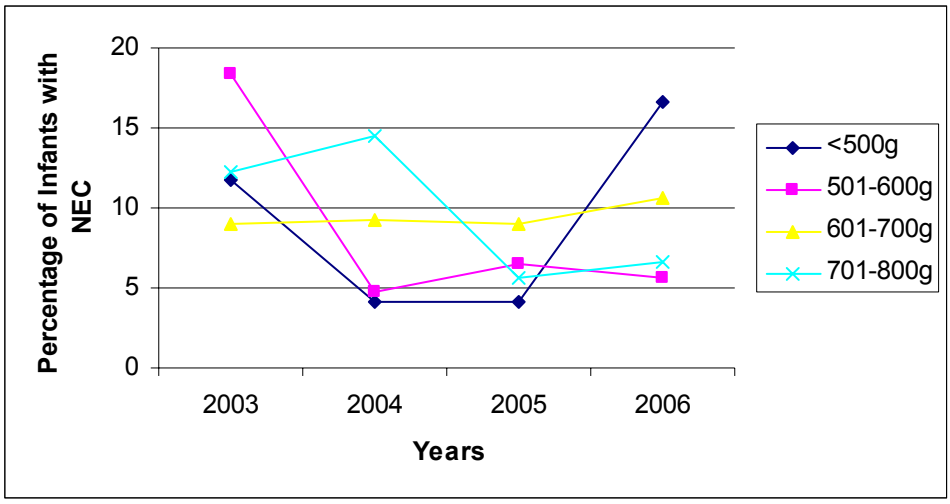
a2. 27-32 weeks:



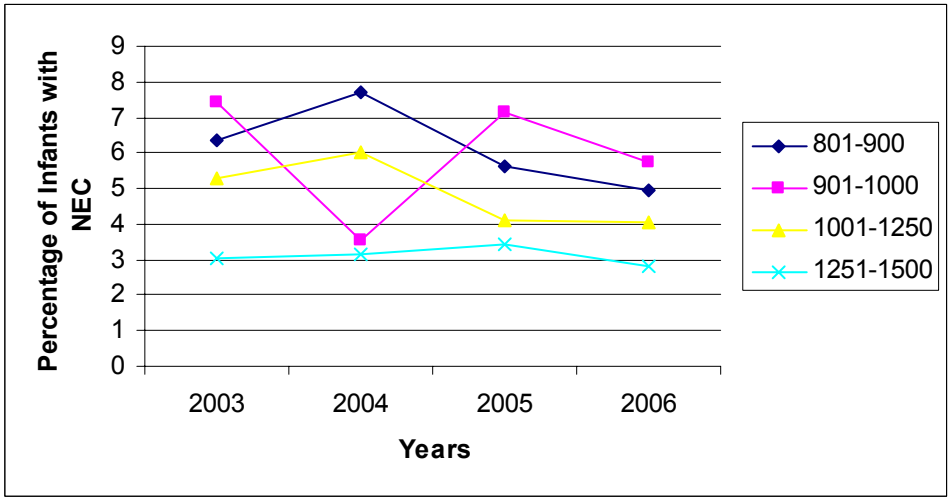
COMMENT: There was a decline in the incidence of NEC among infants with GA 24, 27, 28, 29 weeks GA, no change in the incidence among infants 26, 30, 31, 32 weeks GA and marginal increase in infants of 25 weeks GA (may be reflective of improved survival) over the last 4 years. There was an increase in the incidence of NEC among infants with GA 23 weeks.

Presentation #66 *(continued)*
Necrotizing enterocolitis

b1. Birth weight less than 800g:



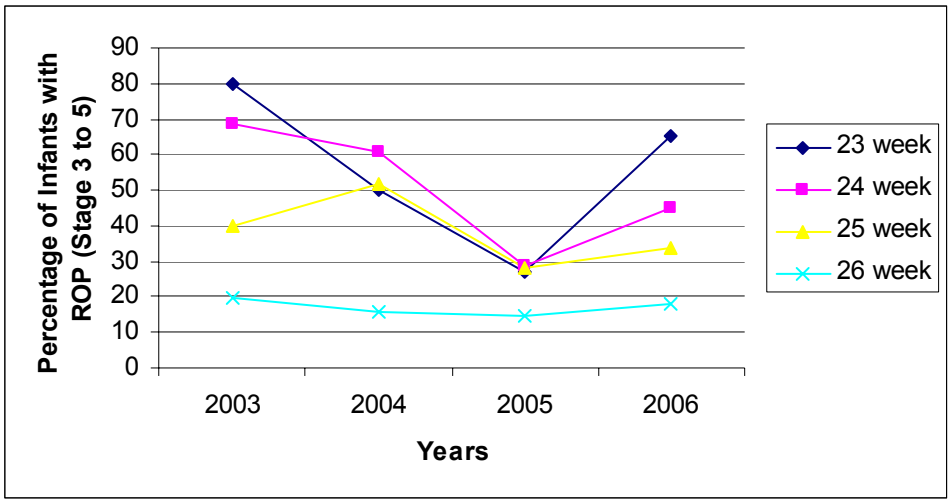
b2. Birth weight 801g-1500g:



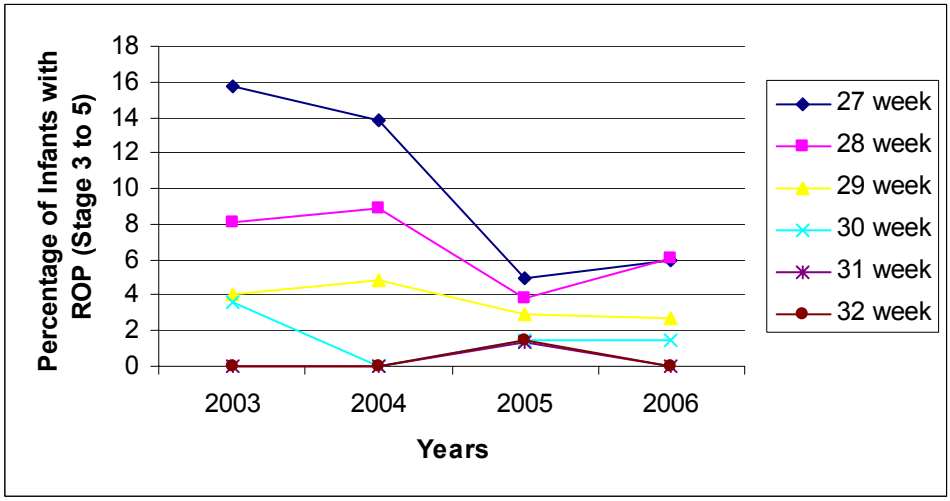
COMMENT: There was decline in the incidence of NEC among infants with BW 501-600g and 701-1250g over the last 4 years.

Presentation #67
Retinopathy of prematurity: Stage 3, 4 and 5

a1. 23-26 weeks:



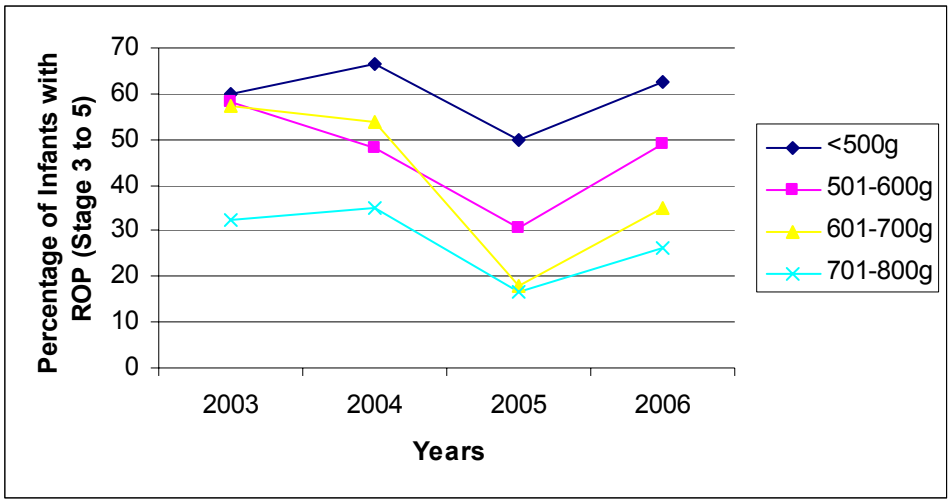
a2. 27-32 weeks:



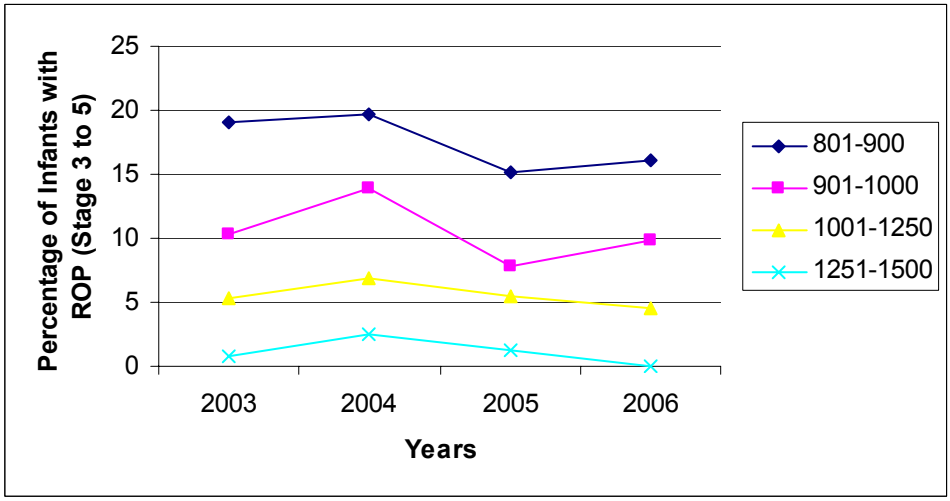
COMMENT: There was a decline in the incidence of stage 3, 4 or 5 ROP among infants of 23-30 weeks GA over the last 4 years (except for infants with 26 weeks GA). There was no change in the incidence among 31 and 32 weeks GA infants probably due to very small number of infants who developed stage 3, 4 or 5 ROP in this group over the last 4 years.

Presentation #67 *(continued)*
Retinopathy of prematurity: Stage 3, 4 and 5

b1. Birth weight less than 800g:



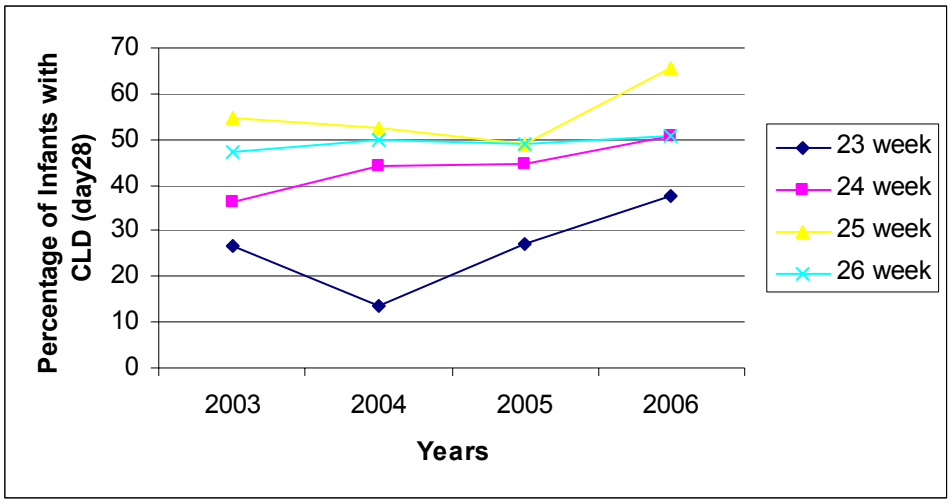
b2. Birth weight 801g-1500g:



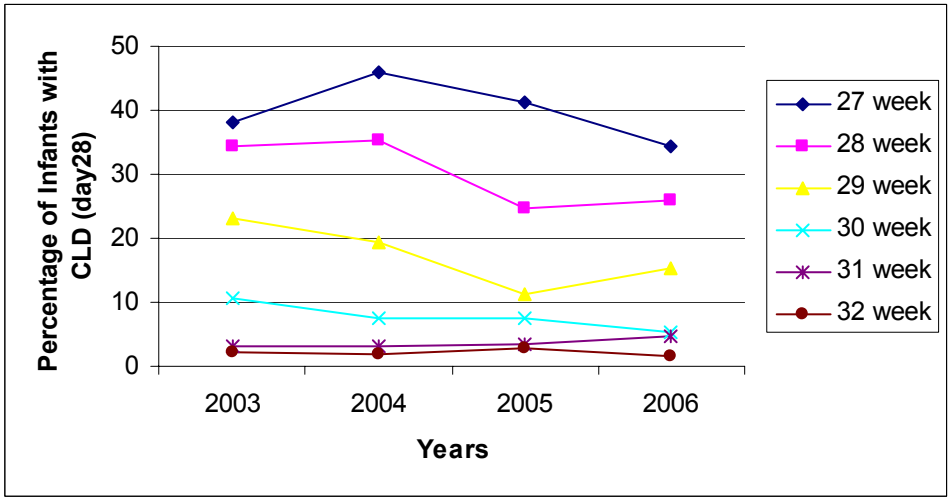
COMMENT: There was a decline in the incidence of ROP among infants with BW of 501-1000g over the last 4 years.

Presentation #68
Infants with CLD (28 days)

a1. 23-26 weeks:



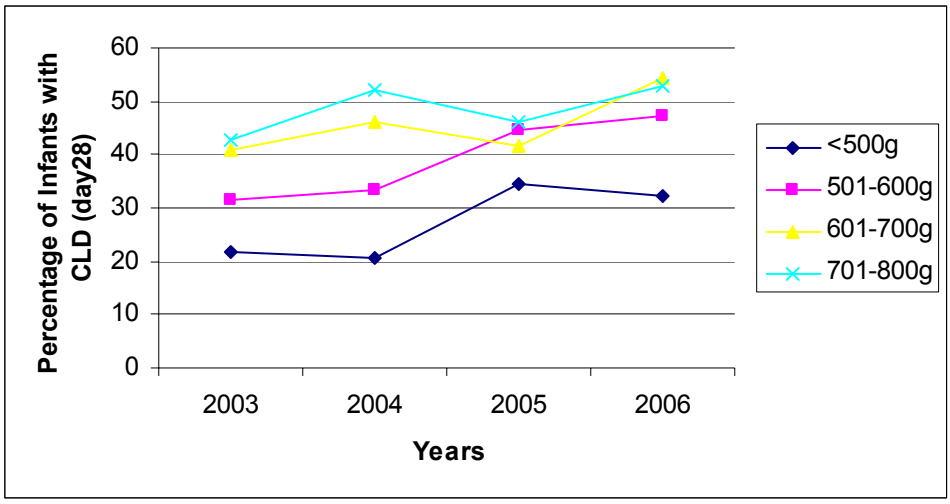
a2. 27-32 weeks:



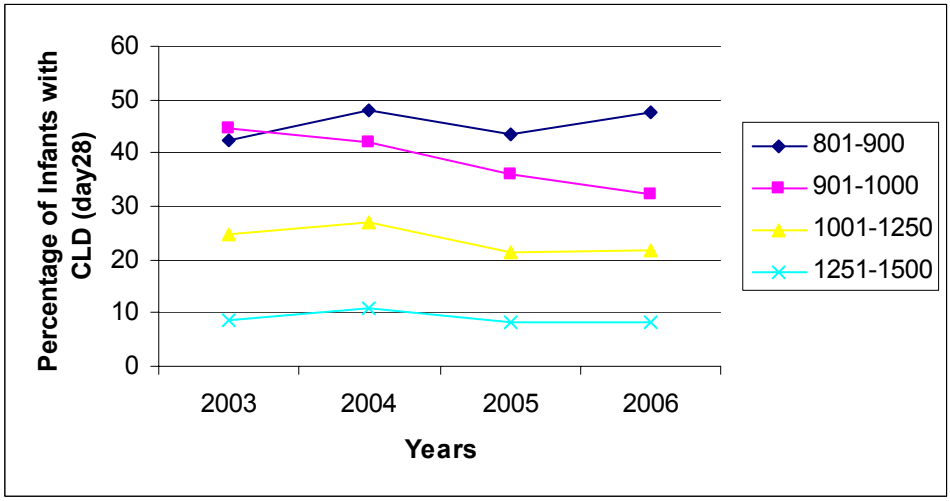
COMMENT: There was an increase in the incidence of CLD at 28 days among infants 23-25 weeks GA, a decrease in the incidence of CLD at 28 days among infants 27-30 weeks GA and no change in the incidence among infants of 26 and 31-32 weeks GA over the last 4 years.

Presentation #68 *(continued)*
Infants with CLD (28 days)

b1. Birth weight less than 800g:



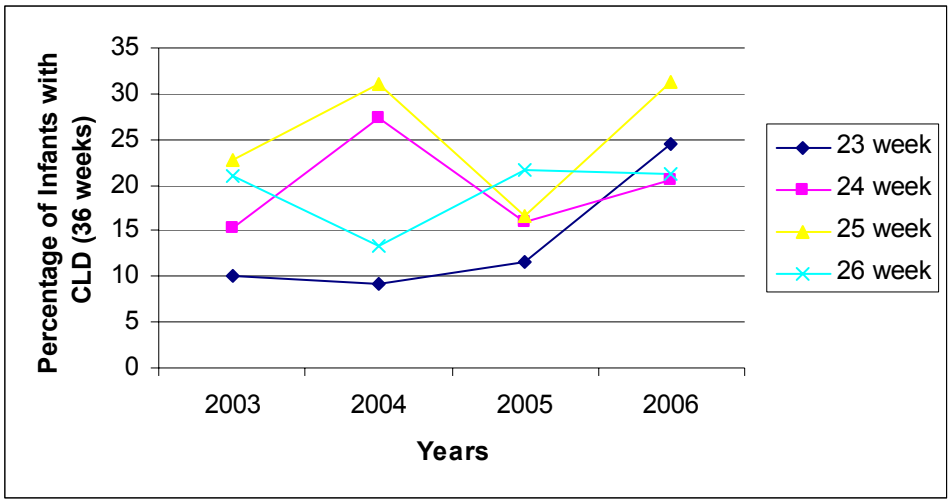
b2. Birth weight 801g-1500g:



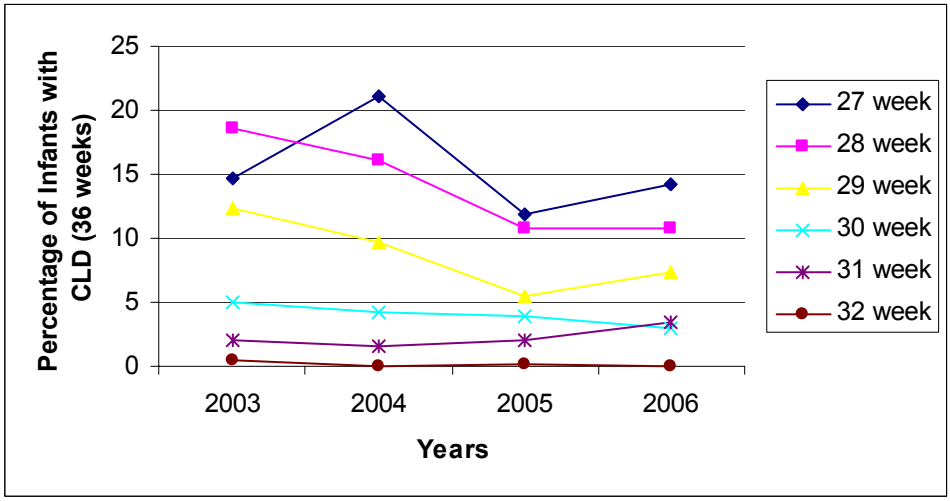
COMMENT: There was an increase in the incidence of CLD at 28 days among infants with BW of <500 to 900g, a decrease in the incidence of CLD at 28 days among infants with BW of 901-1250g and no change in the incidence among infants with BW >1250g over the last 4 years.

Presentation #69
Infants with CLD (36 weeks)

a1. 23-26 weeks:



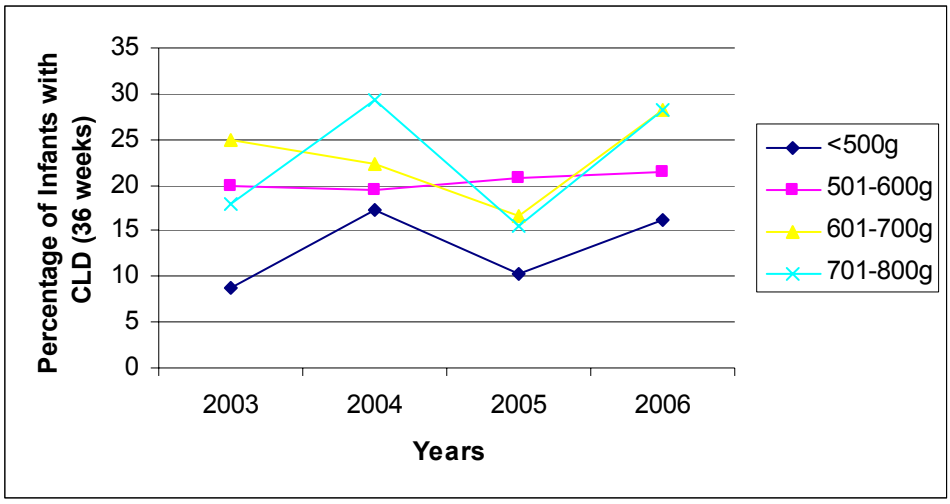
a2. 27-32 weeks:



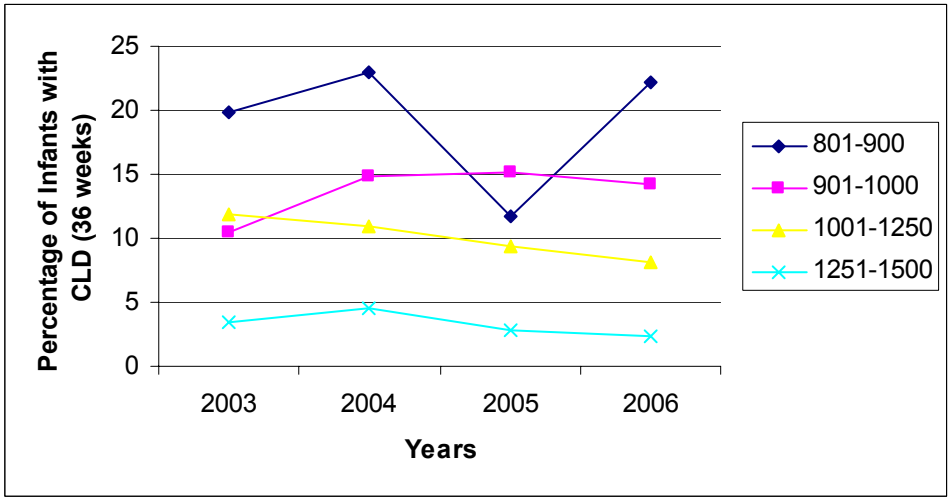
COMMENT: There was an increase in the incidence of CLD at 36 weeks among infants 23-25 weeks GA, no change in the incidence among infants of 26-27 weeks and 30-31 weeks GA, and a decrease in the incidence of CLD at 36 weeks among infants 28-30 weeks GA over the last 4 years.

Presentation #69 *(continued)*
Infants with CLD (36 weeks)

b1. Birth weight less than 800g:



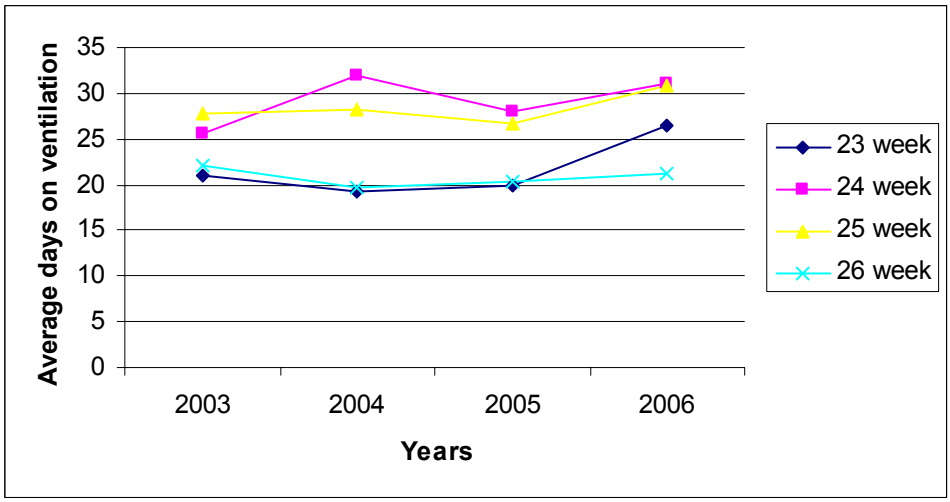
b2. Birth weight 801g-1500g:



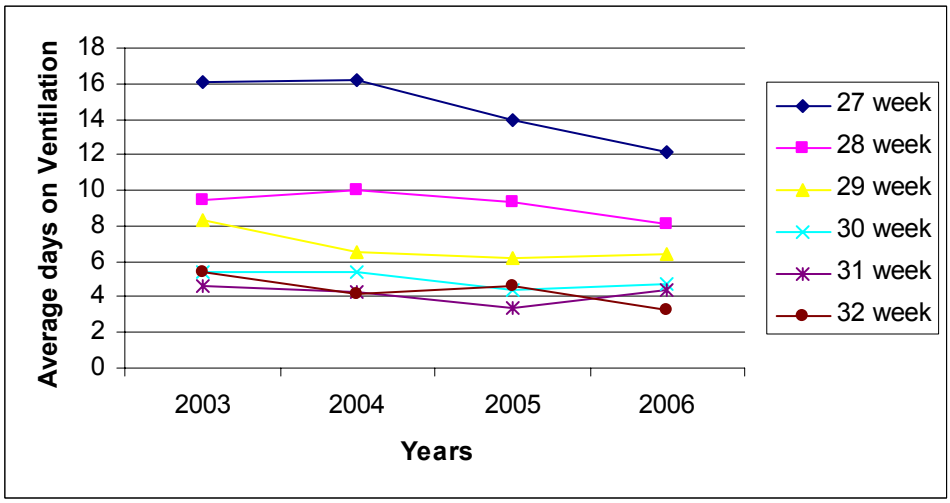
COMMENT: There was an increase in the incidence of CLD at 36 weeks among infants with BW of 701-1000g, a decrease in the incidence of CLD at 36 weeks among infants with BW of 1001-1500g over the last 4 years.

Presentation #70
Number of days on assisted ventilation, CPAP, and oxygen

Number of days of assisted ventilation:
a1. 23-26 weeks:



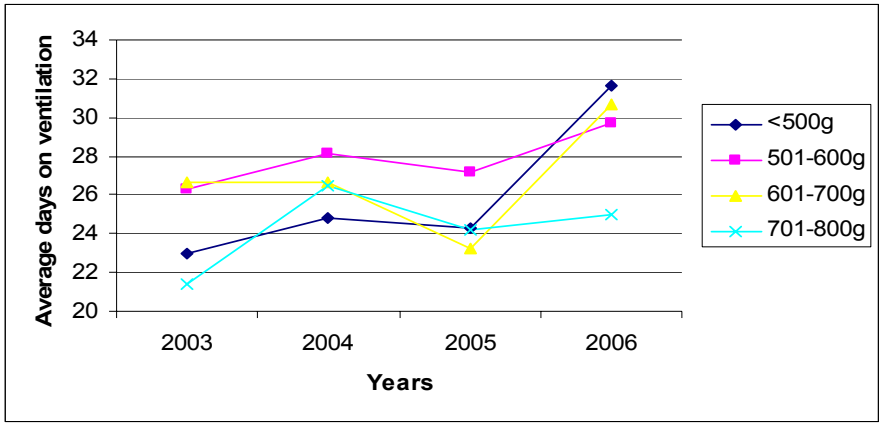
a2. 27-32 weeks:



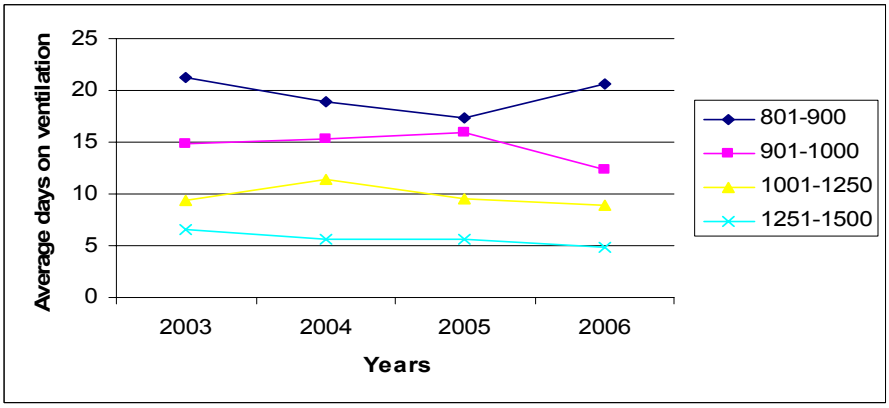
COMMENT: There was an increase in the duration of assisted ventilation for infants 23-25 weeks GA; no change in infants of 26, 30, 31 and 32 weeks GA and reduction in the duration of ventilation among infants of 27-29 weeks GA over the last 4 years.

Presentation #70 *(continued)*
Number of days on assisted ventilation, CPAP, and oxygen

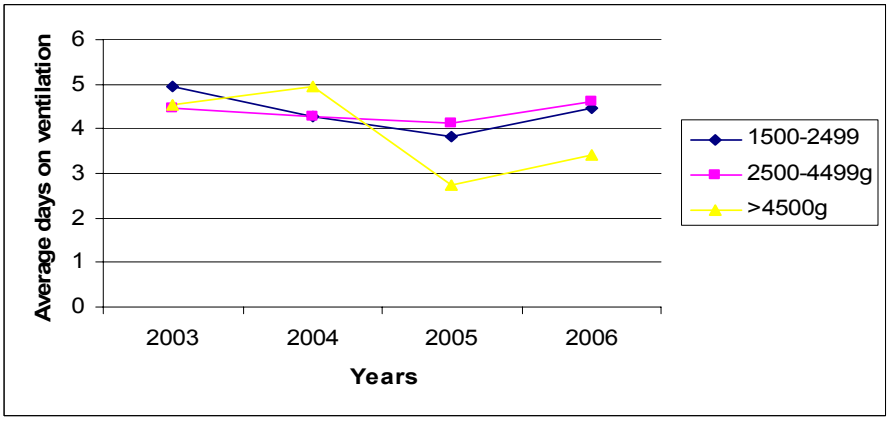
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



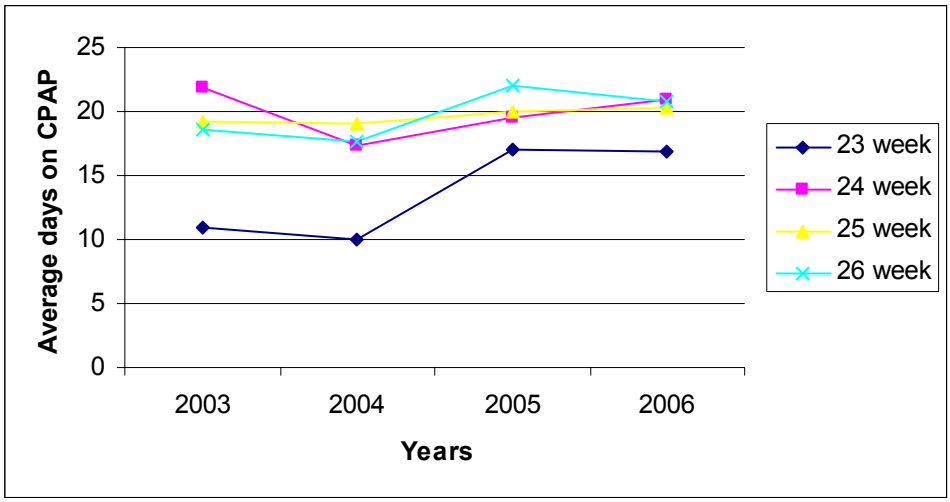
b3. Birth weight >1500g:



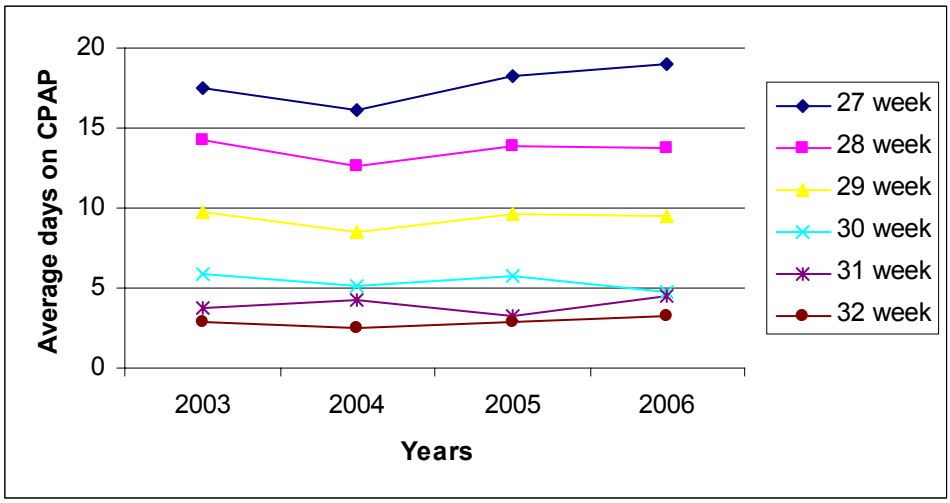
COMMENT: There was an increase in the duration of ventilation among infants with BW <800g and marginal reduction among infants 901-1500g BW over the last 4 years.

Presentation #70 *(continued)*
Number of days on assisted ventilation, CPAP, and oxygen

Duration of CPAP support:
a1. 23-26 weeks:



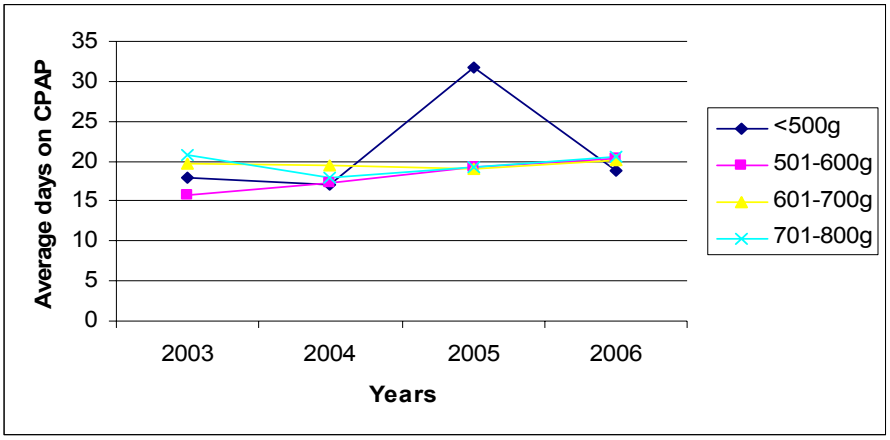
a2. 27-32 weeks:



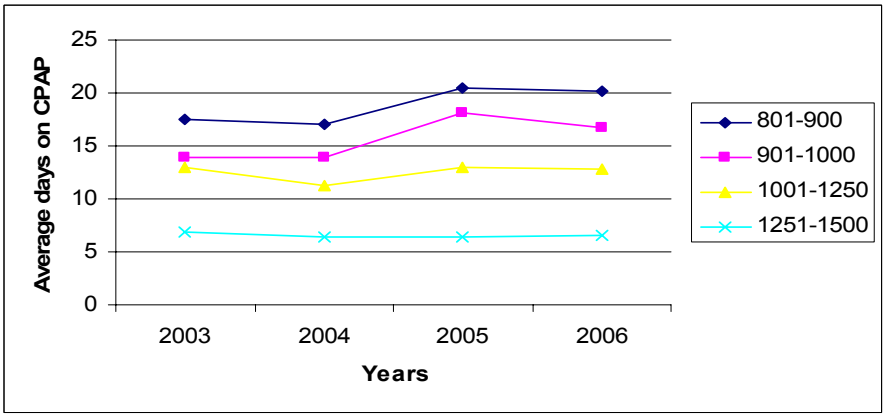
COMMENT: There was no change in the duration of CPAP support among infants 24-32 weeks GA over the last 4 years. There was an increase in the number of days of CPAP support among infants of 23 weeks GA.

Presentation #70 *(continued)*
Number of days on assisted ventilation, CPAP, and oxygen

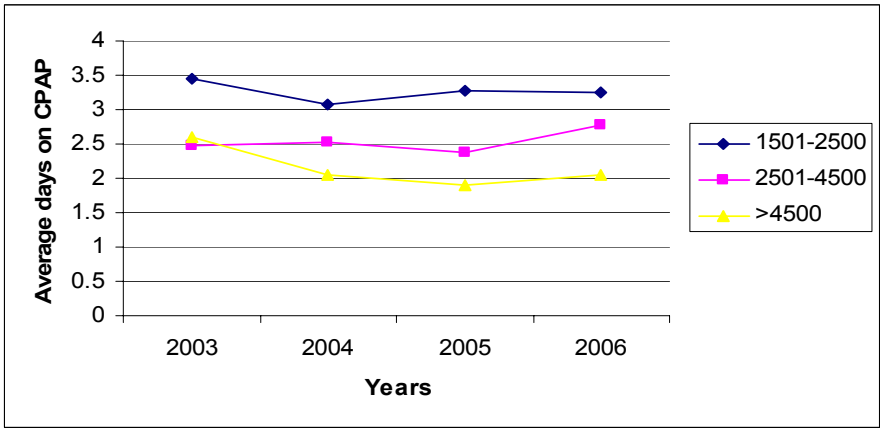
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



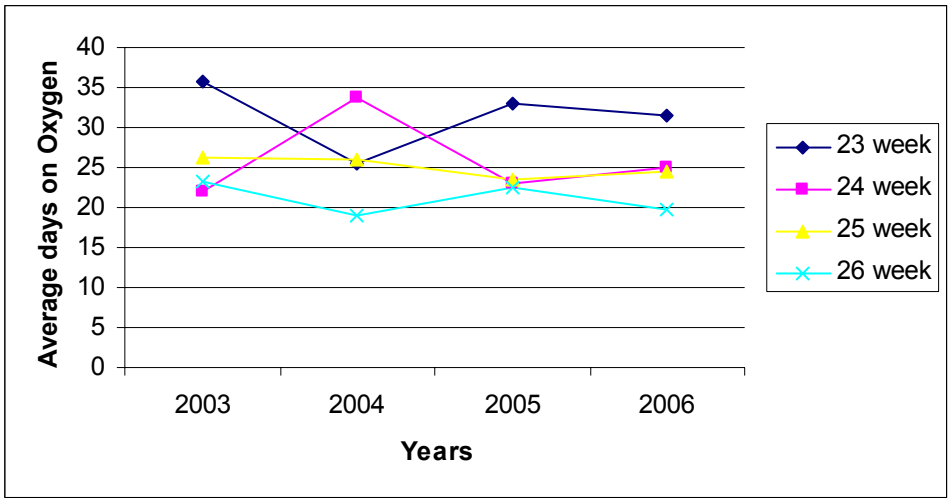
b3. Birth weight >1500g:



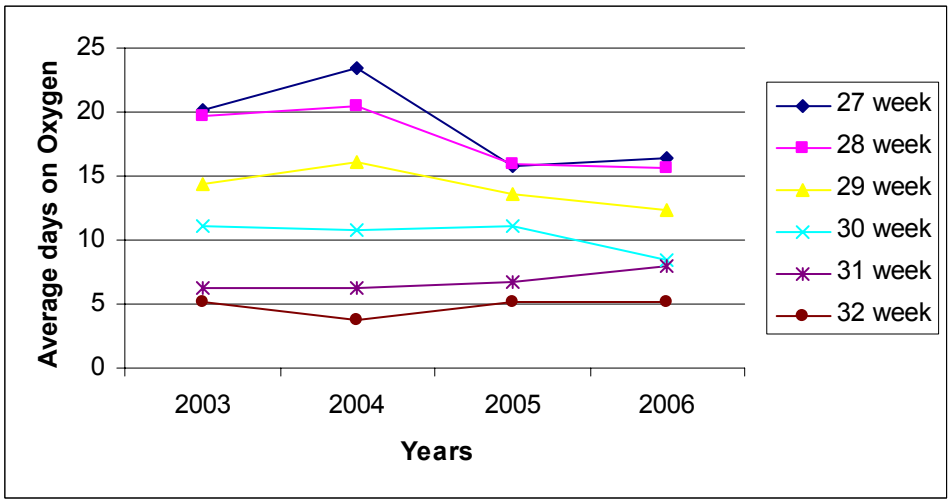
COMMENT: There was some variability in the duration of CPAP support among all BW groups over the last 4 years.

Presentation #70 *(continued)*
Number of days on assisted ventilation, CPAP, and oxygen

Duration of Oxygen support:
a1. 23-26 weeks:



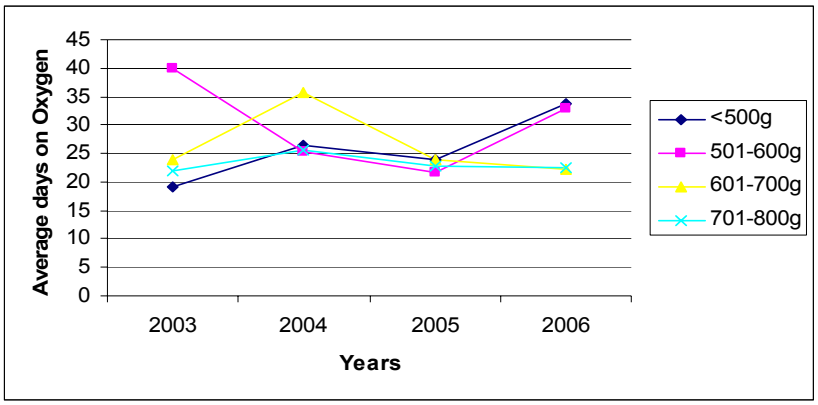
a2. 27-32 weeks:



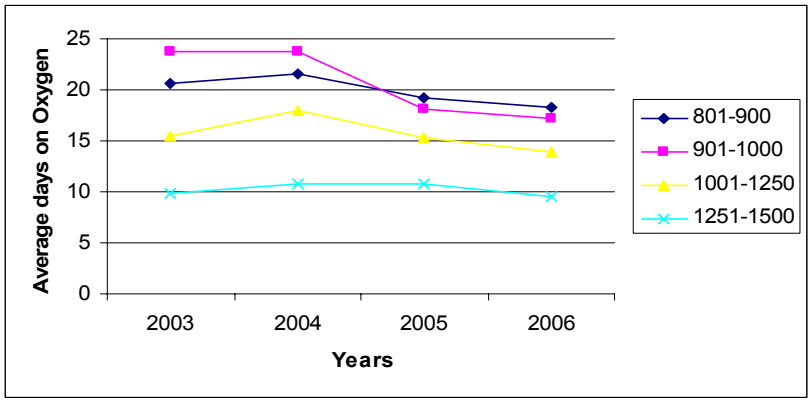
COMMENT: There was no change in the duration of oxygen support among infants of 23-25 weeks GA and 31-32 weeks GA, but some decline among infants of 26-30 weeks GA over the last 4 years.

Presentation #70 *(continued)*
Number of days on assisted ventilation, CPAP, and oxygen

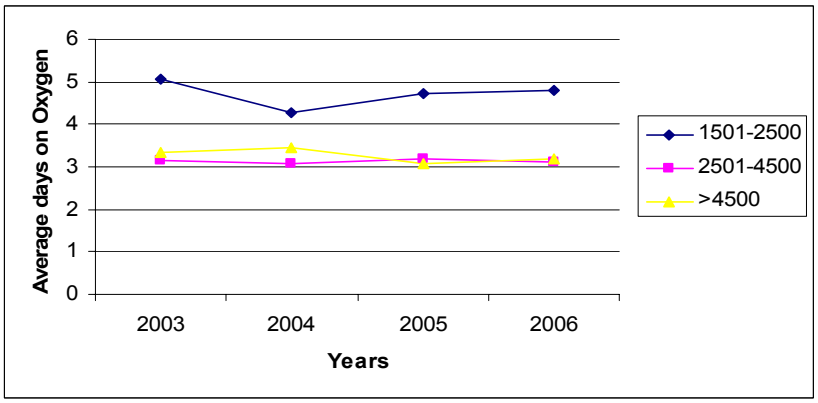
b1. Birth weight less than 800g:



b2. Birth weight 801g-1500g:



b3. Birth weight >1500g:



COMMENT: There was no change in the duration of oxygen support among infants with BW <800g, a decline in the duration of oxygen support among infants 801-1000g and no change among infants >1001g over the last 4 years.

I. Conclusions

The Canadian Neonatal Network™ has been established since 1995. The number of NICUs participating in the national database has continued to increase, now with 24 sites participating in data collection for this report. Currently there are 28 centres participating across the country.

The data demonstrate continuing variations in risk-adjusted outcomes and practices, and provide benchmarking information for Canadian NICUs. Individual hospitals have the opportunity to review their outcomes and launch strategies for improving care.
The addition of trending of common neonatal outcomes to this report provides information for understanding changing NICU population and outcomes. This will help for better organization of services that might be needed for these neonates (improved survival at lower gestational ages may need more resources when these children are older).

CNN researchers continue to utilize the database and produce numerous publications that will have significant impact on neonatal care and policy in Canada and internationally. With the participation of additional NICUs for 2006 - 2007, we anticipate that the CNN will strive to produce NICU population-based data on outcomes and practices, and apply quality improvement strategies.

J. Future Plans

- **Database Improvements**: Major improvements are planned for data collection for the CNN database. Over time this will include:

  - Report on population-based information and follow-up of all infants equally by capturing information from hospitals to which infants are transferred.
  - Enhance the data management capabilities on both data server and client application to facilitate individual hospital analyses of their own data.
  - Streamline the data process for data integration for the Annual Report.
  - Provision of multiple options in data capture and management to meet the unique needs of individual sites.
  - After taking into consideration the input from abstractors and database review committee, certain variables will be improved, deleted or added to database to incorporate changing needs from the database.

- **Expansion of Collaborative Efforts:** The CNN is in the process of establishing collaborative ties with other Neonatal Networks around the world. Data from our network will be compared with those from international networks and potential areas for change/improvement will be sought.

REFERENCES

[1]Richardson DK, Corcoran JD, Escobar GJ, and Lee SK and the Canadian NICU Network. SNAP-II and SNAPPE-II: simplified newborn illness severity and mortality risk scores. J Pediatr 2001; Jan (138)1: 92-100.

[2]Gray JE, Richardson DK, McCormick MC, Workman-Daniels K, and Goldmann DA. Neonatal therapeutic intervention scoring system: a therapy-based severity-of-illness index. J Pediatr 1992; Oct (90)4: 561-7.

[3]Lee SK, Zupancic JA, Pendray M, Thiessen P, Schmidt B, Whyte R, Shorten D, Stewart S and the Canadian Neonatal Network. Transport risk index of physiologic stability: a practical system for assessing infant transport care. J Pediatr 2001; Aug(139)2: 220-6.