The Canadian Pediatric Surgery Network
Le Réseau Canadien de Chirurgie Pédiatrique

2011 Annual Report

Improving pediatric surgical care through national, collaborative research.

CAPSNet

Version 1
September 18, 2011

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Introduction to The Network

The Canadian Pediatric Surgery Network (CAPSNet) is a multi-disciplinary group of Canadian health researchers working together on research issues concerning pediatric surgical care. To date there are 28 network members, including 19 pediatric surgeons, 5 perinatologists/ maternal fetal medicine specialists and 4 neonatologists.

The main objectives of the network are to:

- ✓ Maintain a national pediatric surgical database, providing an infrastructure to facilitate and encourage collaborative national research.
- ✓ Identify variations in clinical practices across Canadian centres and identify those practices which are associated with favourable and unfavourable outcomes.
- ✓ Disseminate new knowledge through effective knowledge translation, and study impact of practice change.
- ✓ Study the economic impact of clinical practice decisions to enable identification of treatment strategies that are efficacious and cost-effective.

Currently CAPSNet is in the 6th year of data collection and we are pleased to report that the Network has 14 manuscripts published, 2 in press and 8 submitted. To date, there have been 29 conference proceedings (podium or poster presentations) at national and international conferences. For a complete list of all past and current CAPSNet projects, please see Appendix II.

Recent Network Activity

New CAPSNet Coordinator

Halla Elmobayad has joined the CAPSNet team as its new network coordinator. In addition, she serves as the Canadian Neonatal Follow-up Network (CNFUN) coordinator, thereby creating a critical link between the two networks. She has worked hard to "learn the ropes" and will be attending the CAPS meeting in Ottawa. Please take a moment to introduce yourself and welcome Halla to CAPS.

CAPSNet Data Abstraction Costs

One of the exciting changes we have seen over the last year is the number of centres who have found alternate sources of funding for CAPSNet data collection. This is an important milestone in the progression of CAPSNet from a research network to a valuable source of data for national benchmarking, leading to improved health services for CDH and gastroschisis (and hopefully other birth defects in the near future). It will also lead to a reduction in CAPSNet's infrastructural costs, resulting in more resources available for the conduct of research. Congratulations to all the centres that have made this successful transition. As of August, 2011, the centres now paying for their own data abstraction are:

SITE		$
BC Children's Hospital	BCCH	Y
Alberta Children's Hospital	ACH	Y
McMaster Children's Hospital	HHSC	Y
Children's Hospital of Eastern Ontario	CHEO	Y
Montreal Children's Hospital	MCH	Y

CIHR Grant Submissions

Two new CIHR grants were submitted in 2011. One entitled "Secondary Analysis of The CAPSNet Database" (PI Skarsgard, co-PI Brindle and others) proposes to use linked CAPSNet and StatsCan data to explore the incidence and impact of CDH and gastroschisis in the Canadian Aboriginal population. In collaboration with a Geographic Information System (GIS) epidemiologist at U of T, spatial mapping and GIS techniques would be used to explore the incidence and epidemiology of gastroschisis in Canada. The budget for this grant application is $100,000 over 2 years. A second submitted grant to the recent Emerging Teams for Rare Diseases competition is "The CDH Health Services Coalition" (PI Skarsgard, co-PI Puligandla and others). This 5 year team grant proposes to develop national standards for CDH health services from prenatal diagnosis to long term follow-up, and would include standardized 36 month follow-up for all CDH survivors. A primary grant aim is the development of "best evidence" practices that would be implemented across CAPSNet centres targeting mortality reduction and improved quality of survival. Other grant aims include an ethical framework for prenatal counselling and the offering of novel therapies (including fetal surgery), Cost effective analyses, and the development of a CDH-specific quality of life measuring instrument. The requested 5 year budget for this grant is $1.63M.

CAPSNet Database Revision

Your steering committee and site abstractors have been working hard on the annual database upgrade that has seen some changes to both gastroschisis and CDH data fields. These changes include the addition of observed/expected LHR and TLV (for cases with fetal MRI) fields to the CDH prenatal database, as well as the addition of a "thoracoscopic CDH repair" surgical treatment field and modification of pulmonary vasodilator fields, providing more detail on type and duration of vasodilator therapy. Abstractors and Site Investigators will receive formal notification of these changes when they "go live".

Addition of New Conditions to The CAPSNet Database

During the WinterCAPS CAPSNet meeting at Whistler in January of this year, there was considerable discussion on the possibility of adding a new conditions to the CAPSNet database. Some of the birth defects considered for inclusion are esophageal atresia, biliary atresia, cystic lung lesions and myelomeningocele. Final decisions and a plan for implementation will take place this fall. Watch for an announcement through the CAPSNet website.

Acknowledgements

We would like to acknowledge the CAPSNet Steering Committee members for their leadership and commitment to the Network over the past year:

Dr. E. Skarsgard, Children's and Women's Health Centre of BC, Vancouver; Dr. S. Bouchard, Hôpital Ste-Justine, Montréal; Dr M. Brindle, University of Calgary, Calgary; Dr S. Himidan, Hospital for Sick Children, Toronto; Dr. J-M. Laberge, Montréal Children's Hospital, Montréal; Dr. S. K. Lee, MiCare, University of Toronto, Toronto; Dr. Aideen Moore, Mount Sinai Hospital, Toronto-Neonatology; Dr. P. Puligandla, Montréal Children's Hospital, Montréal; Dr. G. Ryan, Mount Sinai Hospital, Toronto-Perinatology; Dr. N. Yanchar, IWK Health Centre, Halifax; Dr. D. Wilson, U of Calgary, Calgary-Perinatology

Many thanks to Mr. Sonny Yeh, MiCare System Administrator at Mount Sinai Hospital for his work in compiling the national dataset which was used to produce this report. Thanks also are due to Ms. Alana Gaumont, Halla Elmobayad and Jennifer Claydon for their involvement in coordinating Network activities over the last year. A special thanks to Alana for "coming out of retirement" to help with the production of the 2011 Annual report.

We also acknowledge each of our Data Abstractors, whose attention to detail and high quality work serves as the foundation for the database. Many thanks to: Alda DiBattisa, Andrea Secord, Charlene Cars, Debbie Arsenault, Ellen Townson, Faye Hickey, Jocelyne Vallee, Kruti Patel, Lizy Kodiattu, Lola Cartier, Margaret Ruddy, MaryJo Ricci, Natalie Condron, Nathalie Fredette, Nima Mirakhur, Rashmi Raghavan, Robin Knighton, Susan Wadsworth, Tanya McKee, Ullas Kapoor, Megan Clark, Valerie Cook, Richa Metha and Wendy Seidlitz.

We also acknowledge the many trainees, their site sponsors and the CAPSNet Steering Committee members who have and are currently utilizing the data for analyses (for a full list of ancillary projects to date see Appendix II).

CAPSNet is grateful for the financial support received from the Canadian Institutes of Health Research (CIHR), the Executive Council of the Canadian Association of Pediatric Surgeons (CAPS), the Maternal, Infant, Child and Youth Research Network (MICYRN) and the Maternal-Infant Care team (MiCare) as well as in-kind contributions from CNN.

2011 Data Analysis

Cases included in this report were contributed by the CAPSNet centres listed below. All cases meet the CAPSNet eligibility criteria of a diagnosis of Gastroschisis (GS) or Congenital Diaphragmatic Hernia (CDH) made prenatally or within 7 days of life.

Data from the CAPSNet database has been cleaned by the CAPSNet coordinating centre and checked with abstractors in the event of a possible discrepancy. Data from the CNN database has been cleaned by the CNN coordinating centre.

This version of the CAPSNet Annual Report combines data from two versions (2004 and 2010). Changes in data definitions and variable formatting meant that some variables previously reported may be reported or analyzed in different ways. In instances where data was entered in both versions of CNN, the information in CNN 2010 was used for this report.

Individual cases are attributed to the centre in which the surgery took place (i.e., if a baby was admitted at CAPSNet centre **A** but transferred to CAPSNet centre B for surgery, the baby is included as a case for CAPSNet centre **B**). Finally, information from transfers within CAPSNet or CNN have been linked where possible in order to provide as complete of a picture as possible for the baby's complete course of hospital care.

Contributing Centres for The 2011 Annual Report

Victoria General Hospital, Victoria, BC
Children's and Women's Health Centre of British Columbia, Vancouver, BC
Alberta Children's Hospital, Calgary, AB
University of Alberta Hospital, Edmonton, AB
Royal University Hospital, Saskatoon, SK
Winnipeg Health Sciences Centre, Winnipeg, MB
in cooperation with St. Boniface General Hospital, Winnipeg, MB
Hospital for Sick Children, Toronto, ON
in cooperation with Mount Sinai Hospital, Toronto, ON
McMaster Children's Hospital, Hamilton, ON
London Health Sciences Centre, London, ON
Kingston General Hospital, Kingston, ON
Children's Hospital of Eastern Ontario, Ottawa, ON
in cooperation with The Ottawa Hospital, Ottawa, ON
Montréal Children's Hospital, Montréal, QC
in cooperation with McGill University Health Centre, Montréal, QC
Hôpital Ste-Justine, Montréal, QC
Centre Hospitalier de L'Université Laval, Ste-Foy, QC
IWK Health Centre, Halifax, NS
Janeway Children's Health and Rehabilitation Centre, St. John's, NL

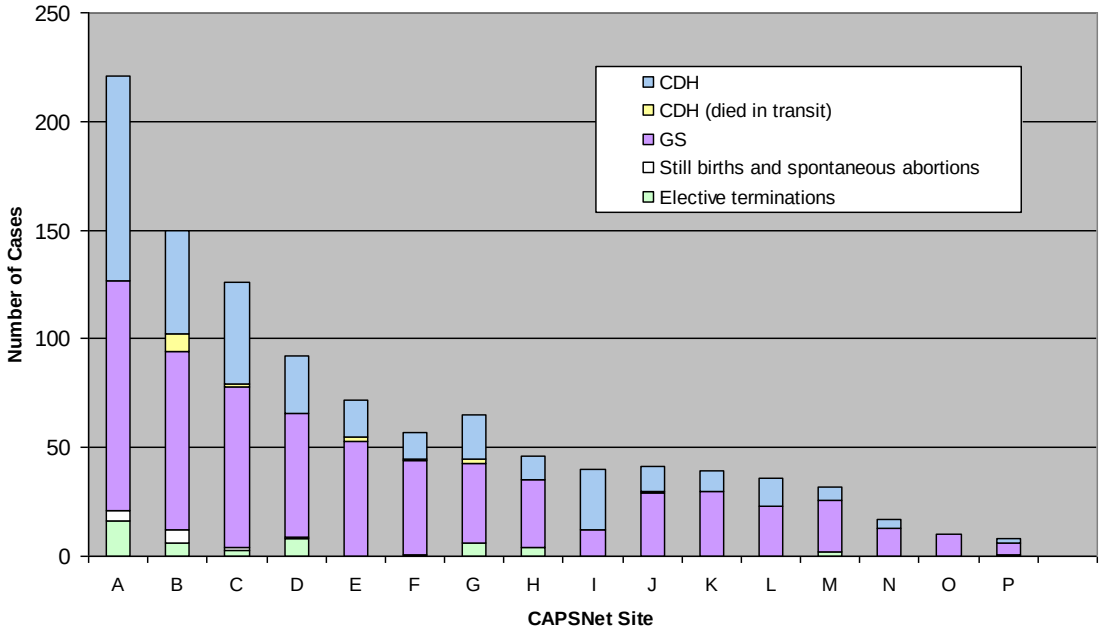
Summary of Data by Diagnosis and Birth Outcomes

	Congenital Diaphragmatic Hernia (CDH)	Gastroschisis (GS)	CAPSNet total
Complete live births	348	629	**977**
Incomplete live births Represents cases for which there are known live-births, but the infant was still in hospital or data entry was incomplete as of April 30, 2011. Incomplete live births are not included in any other analyses.	19	47	**66**
Died prior to CAPSNet admission Represents live births where the infant did not survive to admission at a CAPSNet tertiary pediatric centre (e.g., live births in a community setting where the baby did not survive transfer, or live births at a non-CAPSNet with a planned palliative approach).	15	2	**17**
Elective terminations	51	11	**62**
Still-births and spontaneous abortions	5	10	**15**
Total Case Incidence	**438**	**699**	**1137**

Antenatal Misdiagnoses

- ✓ 2 cases of suspected CDH were confirmed at birth as "other".
- ✓ 7 cases of suspected GS were confirmed at birth as Omphalocele (*n*=5) or "other" (*n*=2).

Figure A: Distribution of cases by centre



Gastroschisis Descriptive Analyses

Table 1.0: Patient population

GS complete live births ***n* = 629**	
Overall survival rate	96.5%
Inborn rate*	76.5%
Mean birth weight	2551.4 grams
Proportion of males	52.7%
Proportion of males with undescended testis/testes	15.8%
Isolated defect**	69.2%
SNAP-II scores***	
Mean – survivors (*n*= 607)	9.02
Mean – non-survivors (*n*=22)	17.31
Median – survivors (*n*=607)	5
Median – non-survivors (*n*=22)	13

* Inborn includes those cases in which a baby with a prenatal diagnosis is transferred from a linked tertiary hospital to a CAPSNet centre as per the delivery plan.
** An isolated defect determined based on the absence of other congenital anomalies as entered in the CNN database.
***SNAP-II: Score for Neonatal Acute Physiology, version II. See Appendix I for definitions.

Table 1.1: Survival by centre volume

This table shows the survival rate grouped by centre volume. *Low volume* centres are those that see an average of <3 GS cases per year, *high volume* centres see an average ≥ 9 GS cases per year; and *mid volume* centres includes all those in between.

			SNAP-II		GS Prognostic Score (GPS)*	
Centre volume	Count (*n*)	Survival (%)	Median	Range	Mean	Range
High (5 centres)	372	97%	5	0-64	1.4	0-12
Mid (7 centres)	217	96%	7	0-68	1.2	0-10
Low (4 centres)	40	93%	6	0-50	1.6	0-9

* For a description of the GPS, see page 12.

GS Ultrasound Measurements

Bowel dilation and bowel wall thickness measurements were recorded on up to four ultrasounds taken at varying time points:

1. First ultrasound taken at the tertiary CAPSNet centre;
2. Last ultrasound taken between 23+0 and 31+6 weeks;
3. Last ultrasound taken between 32+0 and 34+6 weeks; and
4. Last ultrasound before delivery

The data presented reflects the worst (i.e., greatest) measurement reported on any of the above ultrasounds. *Not measured* indicates that at least one ultrasound was taken, but the variable was not measured; *no ultrasound* indicates that there were no reported ultrasounds.

Figure 1.2: Maximum bowel dilation reported on antenatal ultrasound

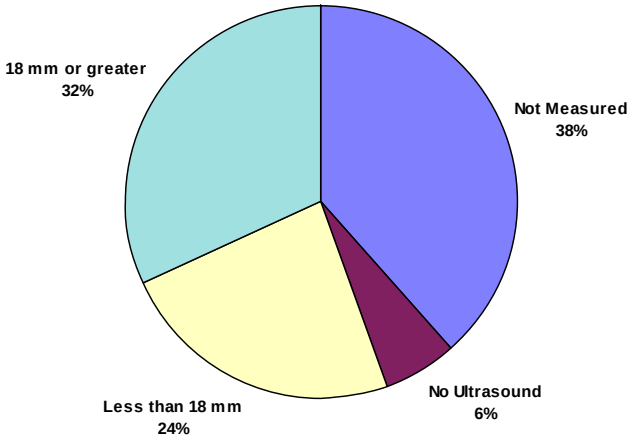


Figure 1.3: Maximum bowel wall thickening reported on antenatal ultrasound

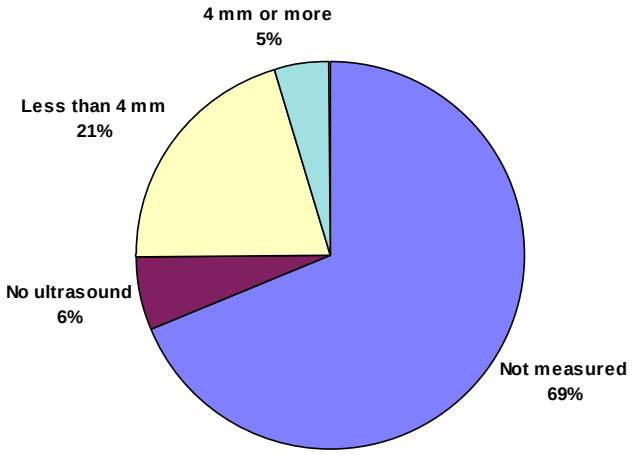


Figure 1.4: Early vs. late antenatal diagnosis

Not referred means that the mother was not referred to a tertiary centre prior to delivery. Of the cases that were not referred (*n*=50), 32% (*n*=16) had a prenatal diagnosis.

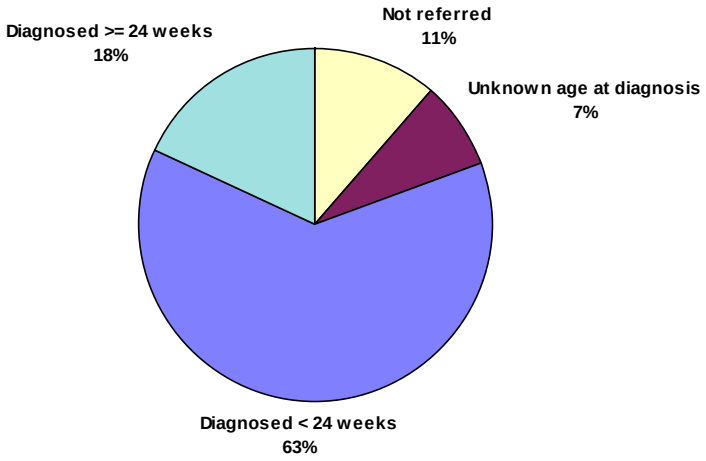


Figure 1.5: Gestational age at birth

Gestational age is in complete weeks and calculated according to the CNN algorithm, which considers both pediatric and obstetric estimates.

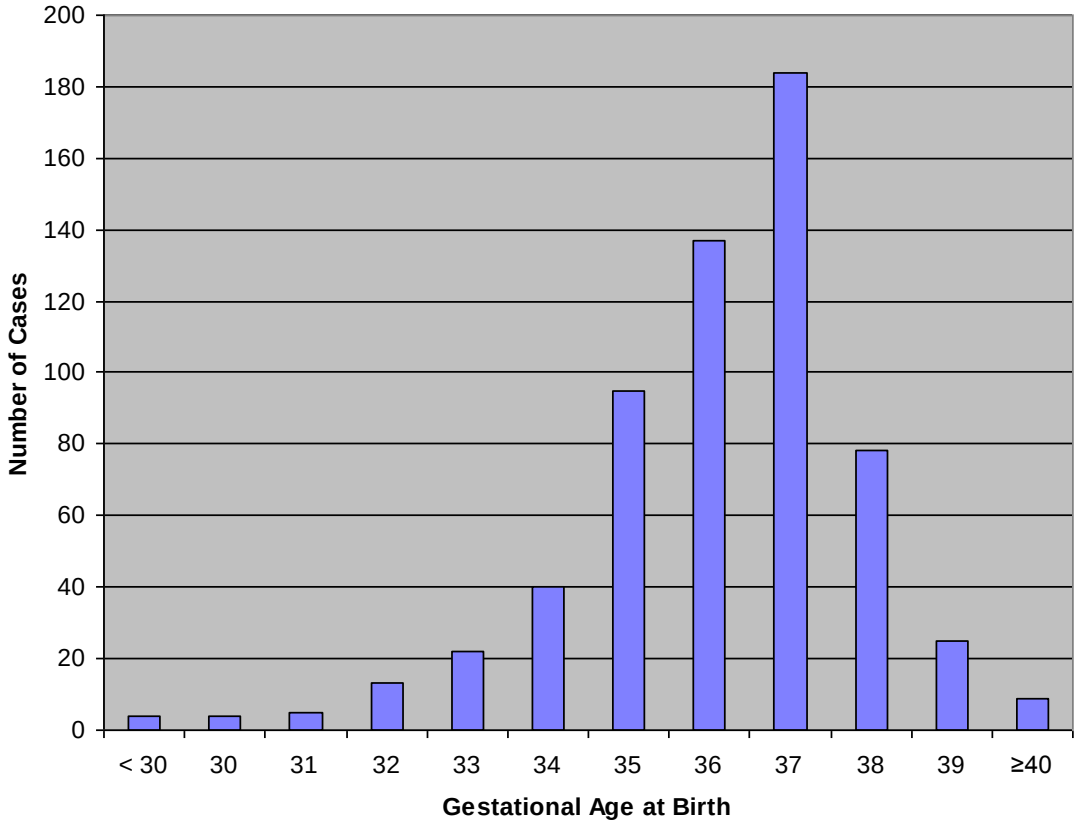


Table 1.6: Antenatal plan for delivery as of 32 weeks GA

	n	%
No pre-determined plan	120	19%
Spontaneous vaginal delivery	190	30%
Elective caesarean-section	44	7%
Induction	230	36%
Other	6	1%
Unknown	44	7%

*This graph includes all live births and all cases were the infant died before CAPSNet admissions (*n* =634).

Figure 1.7: Actual mode of delivery by centre

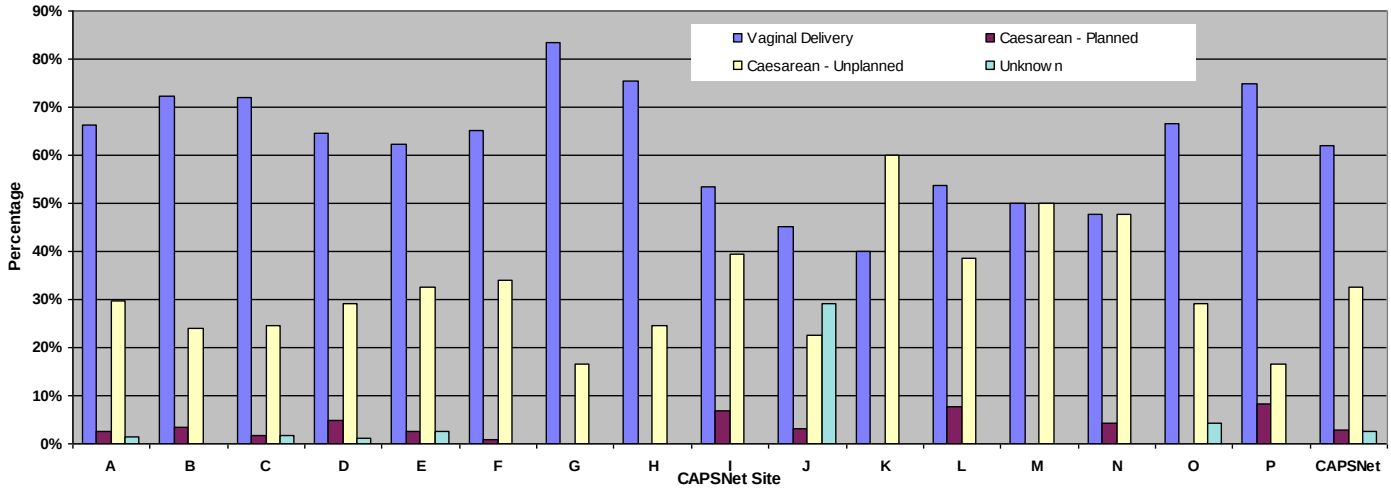


Figure 1.8a: Pre-operative bowel protection

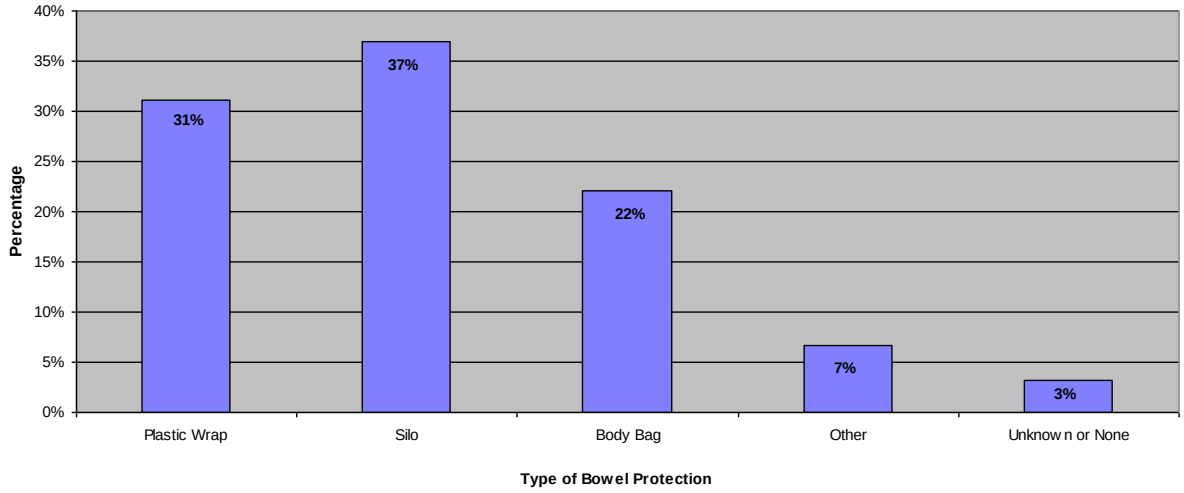


Figure 1.8b: Time elapsed until pre-operative bowel protection

	n	%
≤ 1 hour	432	69%
1-4 hours	123	20%
> 4 hours	43	7%
Unknown	26	4%
No bowel protection (not applicable)	5	1%

Figure 1.9a: Timing of gastroschisis closure

The denominator in this figure is the number of cases in which surgery was performed (i.e., *n*=624).

	n	%
< 6 hours	300	48%
6-12 hours	63	10%
12-24 hours	21	3%
> 24 hours	233	37%
Unknown	7	1%

Figure 1.9b: Surgeon's treatment intent by centre

The denominator in this figure is the number of cases in which surgery was performed (i.e., *n*=624). Across all centres, the surgeon's treatment intent was to perform an urgent primary closure in 55% (*n*=349) of cases, and elective primary closure (enabled by a silo) in 42% (*n*= 264). In the remaining 2% (*n*=11) of cases, the surgeon's treatment intent is unknown.

The CAPSNet definition of *urgent primary closure* is early repair of the defect. *Elective primary closure* is delayed repair of the defect facilitated by silo placement.

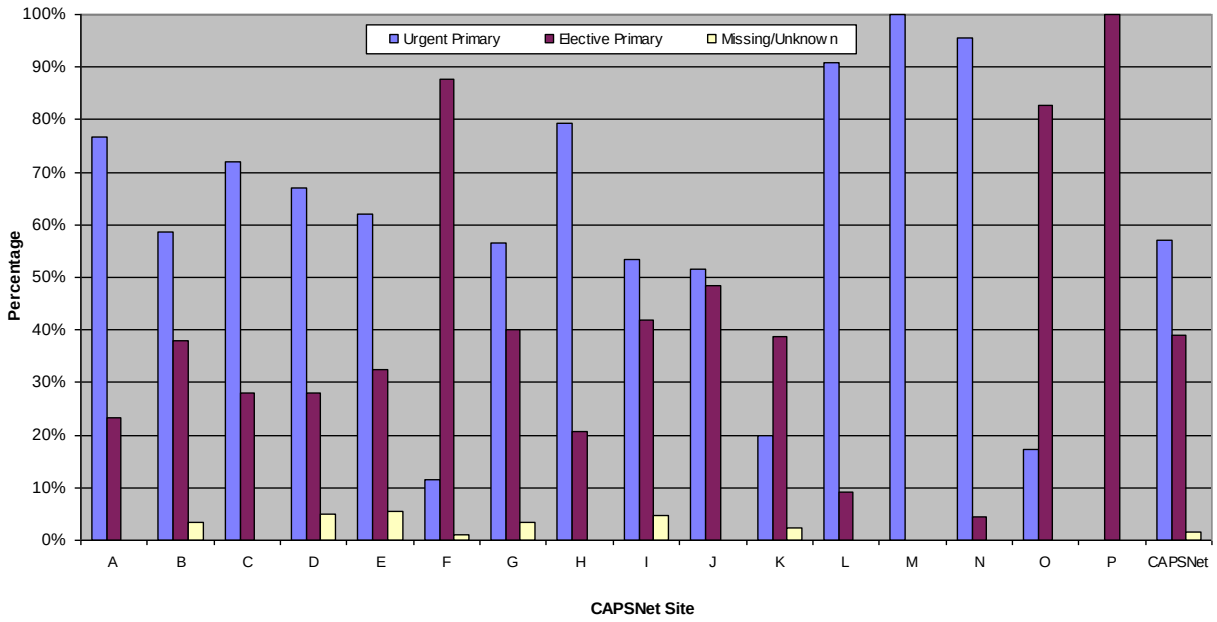


Figure 1.10a: Method of surgical closure

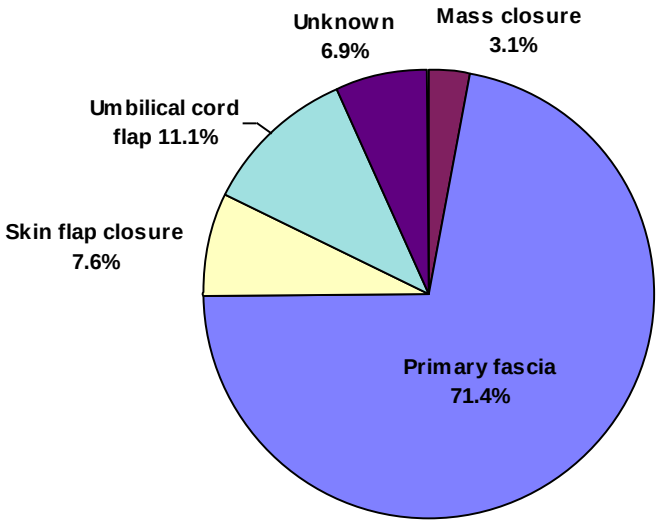
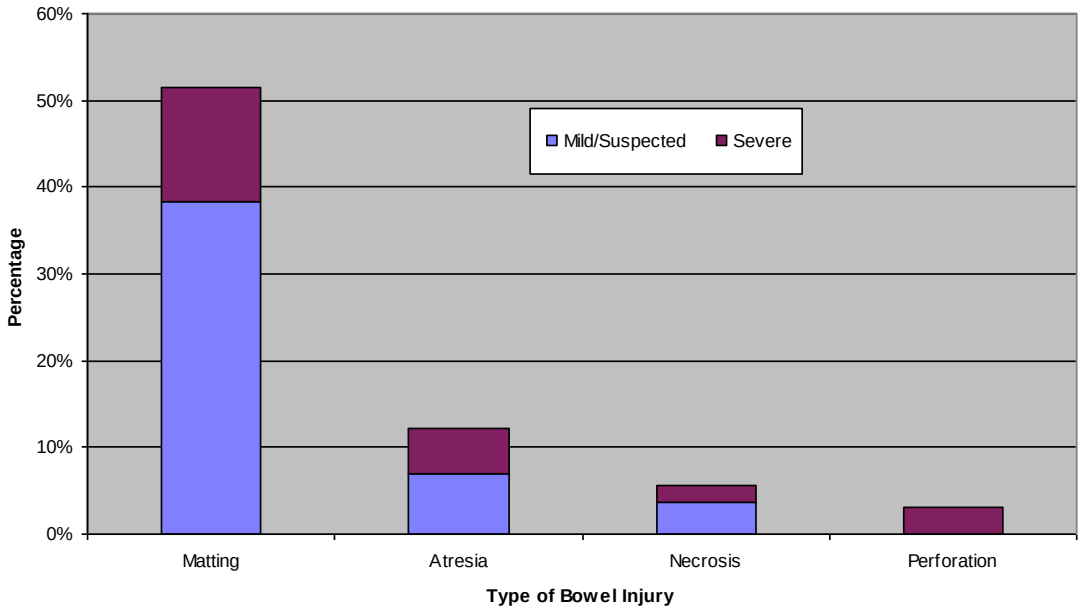


Figure 1.10b: Operative success

Of 624 primary operations, 82% were recorded as successful. The 18% reported as failed initial closures were for the following reasons:

	n	%
Bowel not reducible	72	64%
Bowel would reduce, but IPP or PIP too high to close	11	10%
Bowel would reduce, but seemed too tight to close	20	18%
Unknown	9	8%

Figure 1.11a: Proportional Bowel Injury Severity Scoring



Severity Categories: Matting: mild (blue) or severe; Atresia: suspected (blue) or present; Necrosis: focal (blue) or diffuse; Perforation: present (maroon)

Figure 1.11b: Gastroschisis Prognostic Score (GPS) risk group by centre volume

The Gastroschisis Prognostic Score (GPS) was developed by Cowan et al[1] using CAPSNet data collected at the time of the surgeon's first visual assessment of the bowel. The bowel injury variables (matting, atresia, necrosis, perforation) were weighted based on a regression analysis, thus creating the GPS, which was validated using the CAPSNet database (patients born May 2005–May 2009).

[1] Cowan KN, Puligandla PS, Laberge JM, Skarsgard ED, Bouchard S, Yanchar N, Kim P, Lee SK, McMillan D, von Dadelszen P, and the Canadian Pediatric Surgery Network. The Gastroschisis Prognostic Score: Outcome prediction in Gastroschisis. *J Pediatr Surg* (submitted).

The GPS risk group is assigned based on the composite GPS score. For scores of <2, the patient is considered low risk. Patients are considered at high risk if the score is ≥ 2; scores of 2 or 3 indicate a high risk of morbidity, whereas scores ≥ 4 indicate a high risk of mortality. The following graph uses the current GS dataset to demonstrate the proportion of GS cases assigned to each risk category grouped by centre volume. The denominator for this graph is all GS live-births (*n*= 629). Actual rates of mortality and selected morbidity are shown.

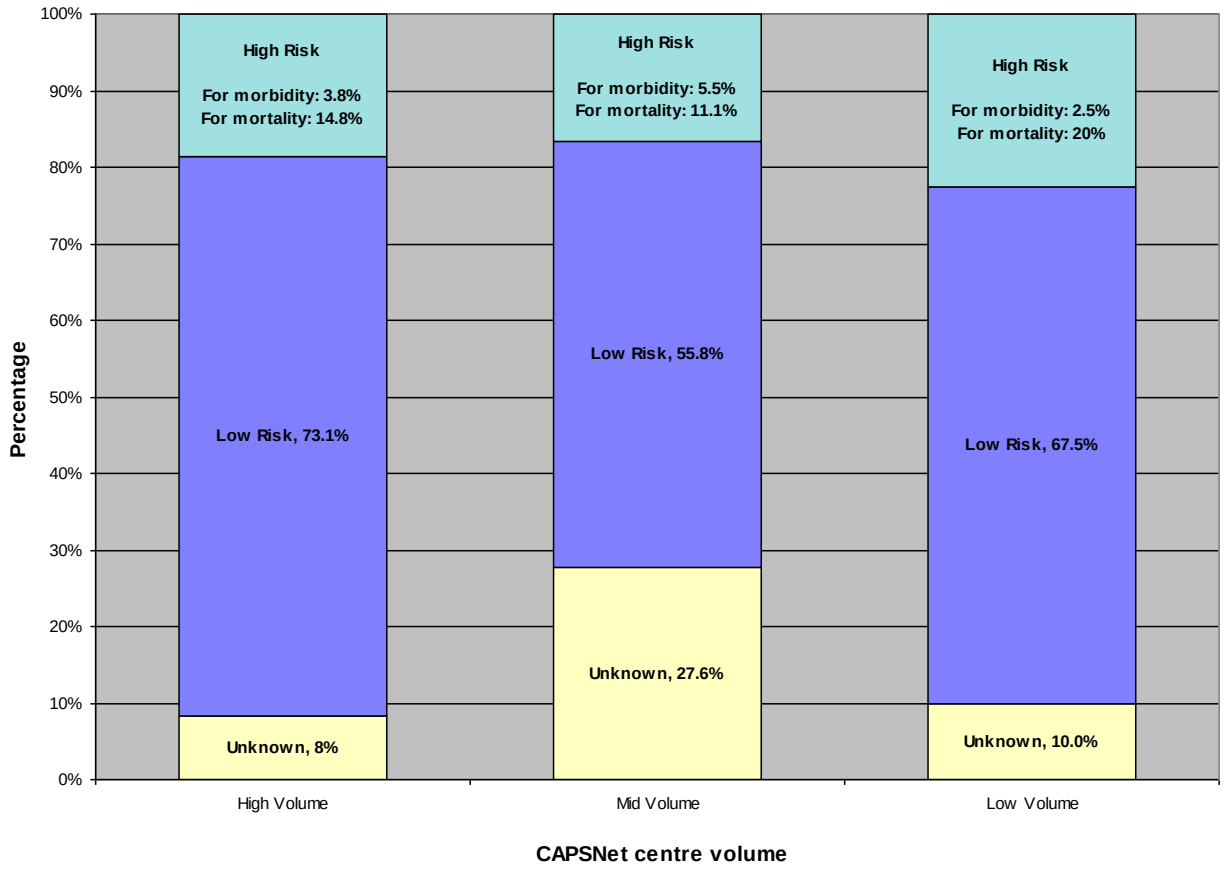


Figure 1.12: Selected neonatal complications

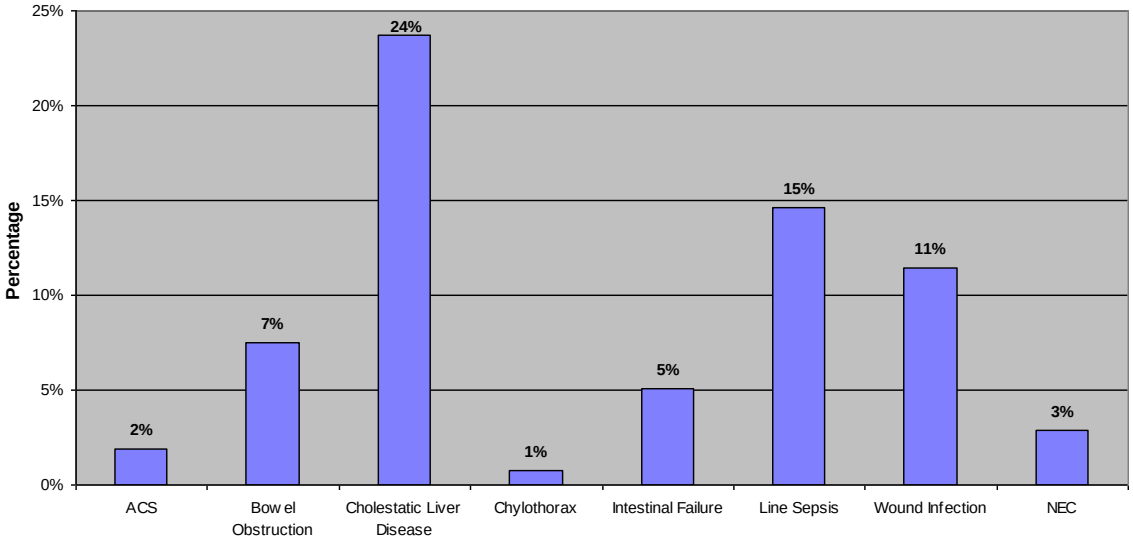


Figure 1.13a: Selected neonatal outcomes

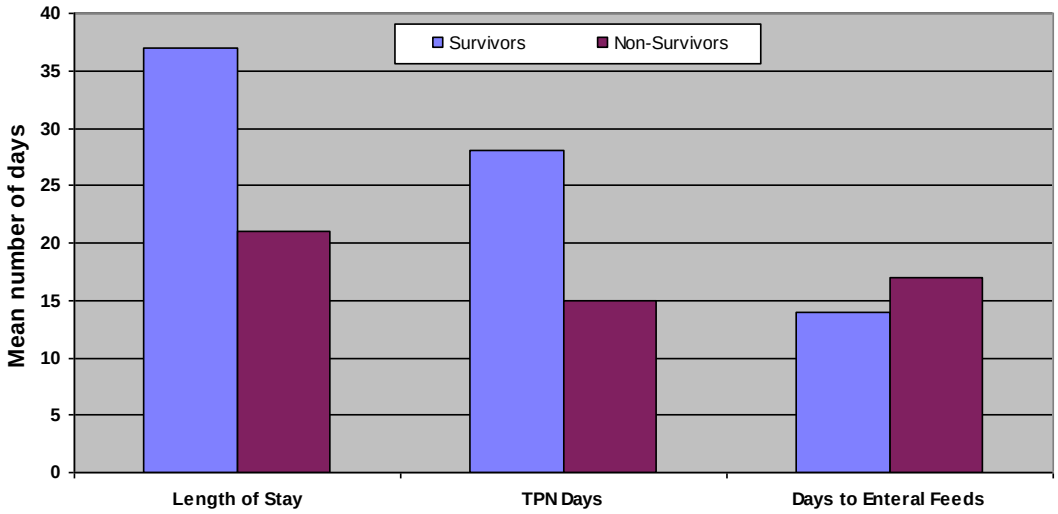


Table 1.13b: Selected neonatal outcomes

	Survivors (*n* =607)			Non-survivors (*n* =22)		
	Median	Mean	Range	Median	Mean	Range
Length of stay (days)	37.0	58.3	1*-627	21.0	55.2	2-272
TPN days	28.0	45.5	5-604	15.0	44.9	2-207
Days to enteral feeds	14.0	18.0	2-216	17.0	29.4	2-86

*Three infants had a length of stay of 1 day because they were discharged to a non-CNN/CAPSNet hospital for ongoing care and no further data was available.

Congenital Diaphragmatic Hernia Descriptive Analyses

Table 2.0: Patient population

CDH complete live births ***n* = 348**	
Overall survival rate	79.3%
Inborn rate*	56.3%
No prenatal diagnosis	31.0%
Mean birth weight	3059.3 grams
Proportion of males	59.2%
Isolated defect**	55.5%
Proportion requiring ECMO	8.0%
Proportion with left-sided defect	69%
SNAP-II scores***	
Mean – survivors (*n*= 276)	13.7
Mean – non-survivors (*n*= 72)	34.8
Median – survivors (*n*=276)	12
Median – non-survivors (*n*=72)	32

* Inborn includes those cases in which a baby with a prenatal diagnosis is transferred from a linked tertiary hospital to a CAPSNet centre as per the delivery plan.
** An isolated defect determined based on the absence of another congenital anomalies as entered in the CNN database.
***SNAP-II: Score for Neonatal Acute Physiology, version II. See Appendix I for definitions.

Table 2.1: Survival by centre volume

Table shows the survival rate grouped by centre volume. *Low volume* centres are those that see on average <1 CDH cases per year, *high volume* centres see an average ≥ 5 CDH cases per year; and *mid volume* centres includes all those in between.

	Count (*n*)	Survival (%)	SNAP-II Median	SNAP-II Range
High volume (5 centres)	243	79%	14	0-77
Mid volume (5 centres)	69	77%	16	0-68
Low volume (5 centres)	36	86%	22	0-53

Figure 2.2: Maximum lung-head ratio (LHR) reported on antenatal ultrasound of fetuses with an antenatal diagnosis

Measurements are recorded on up to four ultrasounds taken at varying time points:

1. First ultrasound taken at the tertiary CAPSNet centre;
2. Last ultrasound taken between 23+0 and 27+6 weeks;
3. Last ultrasound taken between 28+0 and 32+6 weeks; and
4. Last ultrasound before delivery

The data presented here reflects the best (i.e., greatest) measurement reported on any one of the above ultrasounds. *Not measured* indicates that at least one ultrasound was taken, but the lung-head ratio was not measured.

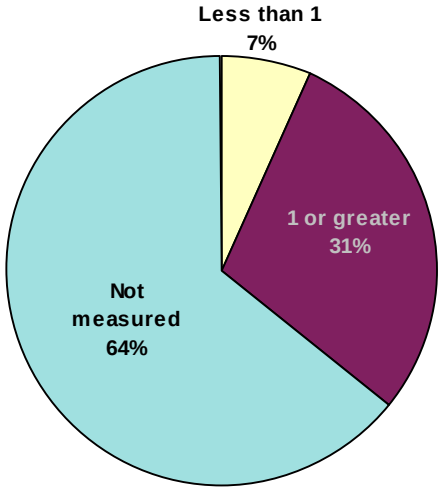


Figure 2.3: Early vs. late antenatal diagnosis

Not referred means that the mother was not referred to a tertiary centre prior to delivery. Of the cases that were not referred (*n*=110), 14.5% (*n*=16) had a prenatal diagnosis.

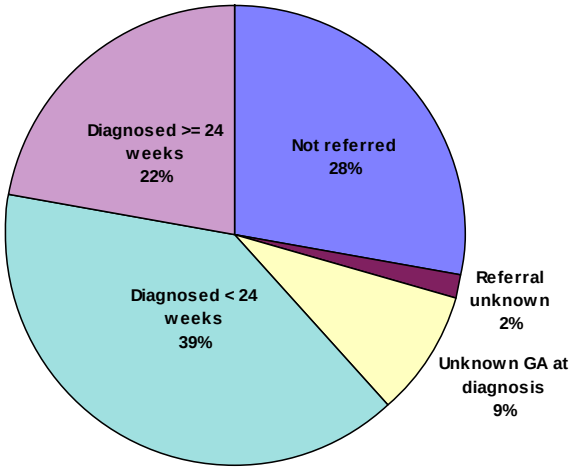


Figure 2.4: Gestational age at birth

Gestational age is in complete weeks and calculated according to the CNN algorithm, which considers both pediatric and obstetric estimates.

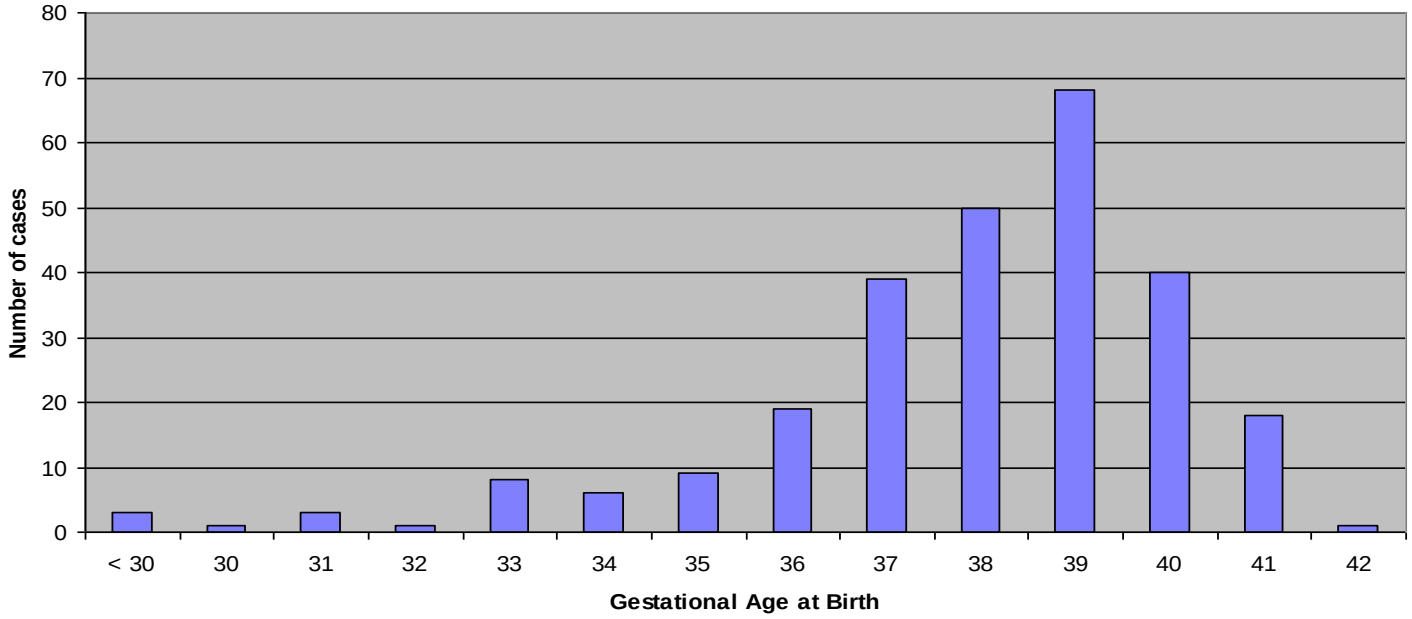


Figure 2.5: Mode of delivery by centre

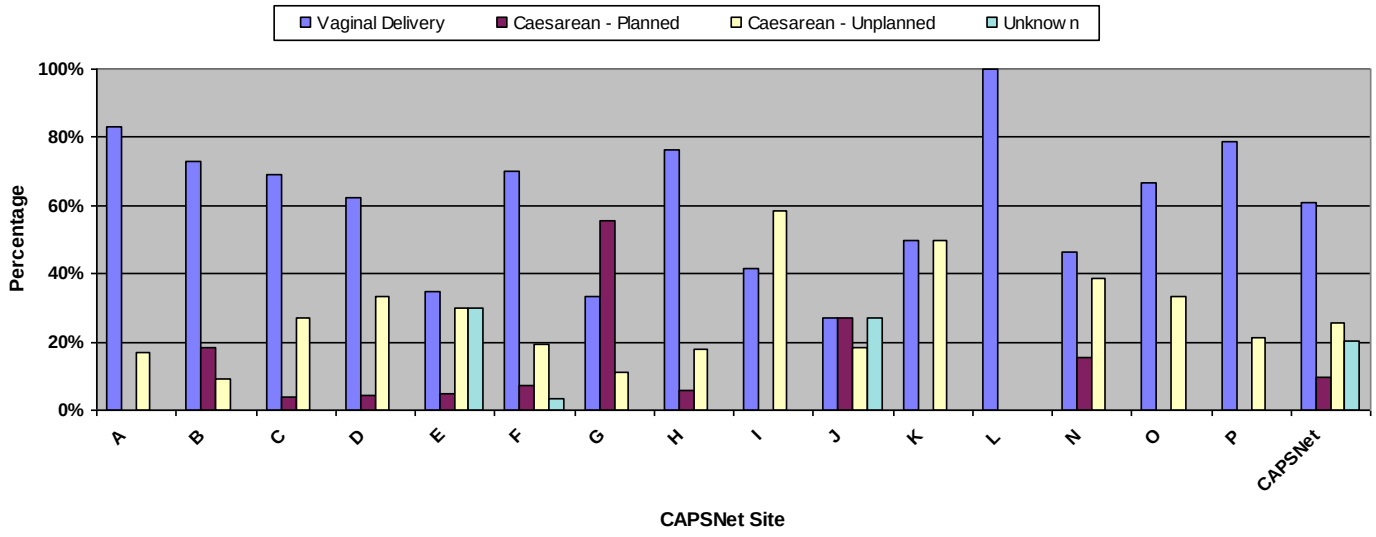


Figure 2.6: Mean age at surgical repair by centre

The denominator in this figure indicates only those cases in which surgery was performed (i.e., *n* =294).

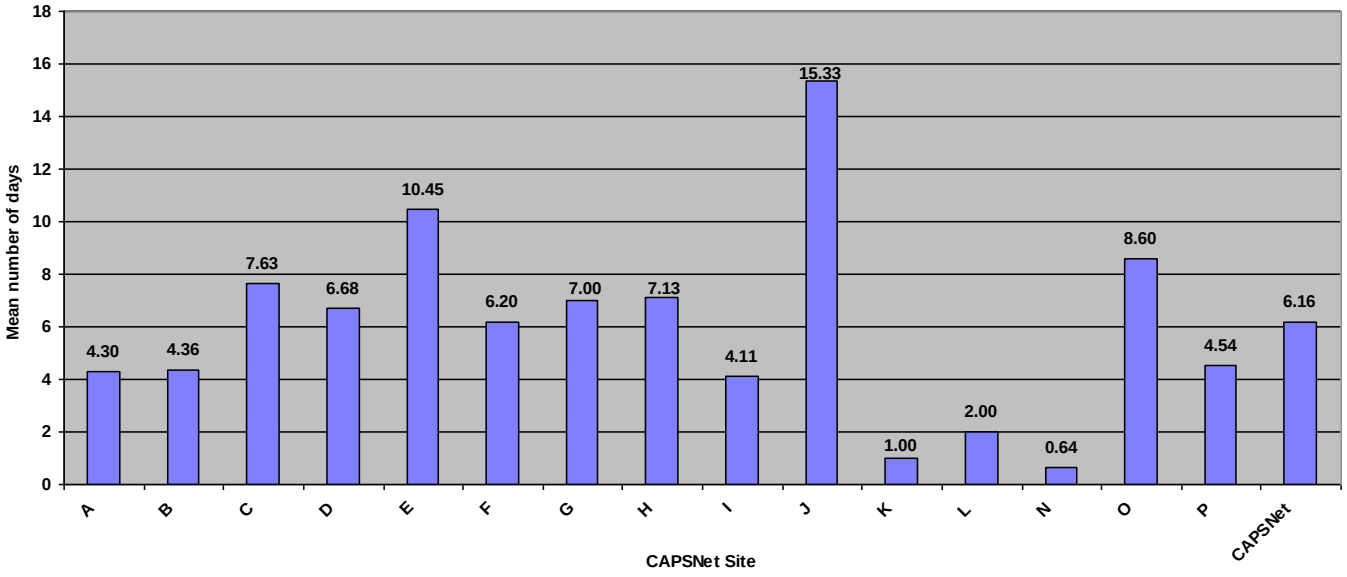


Figure 2.7: Method of surgical closure

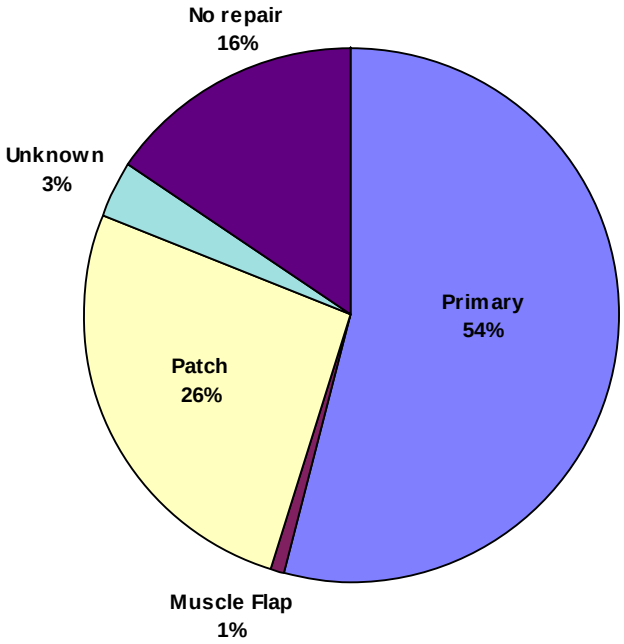


Figure 2.8: Size of CDH defect

Starting in January 2010, CAPSNet added a variable to its data collection asking for the relative size of the CDH defect. Of 73 eligible cases to date, 17 had a size of defect indicated.

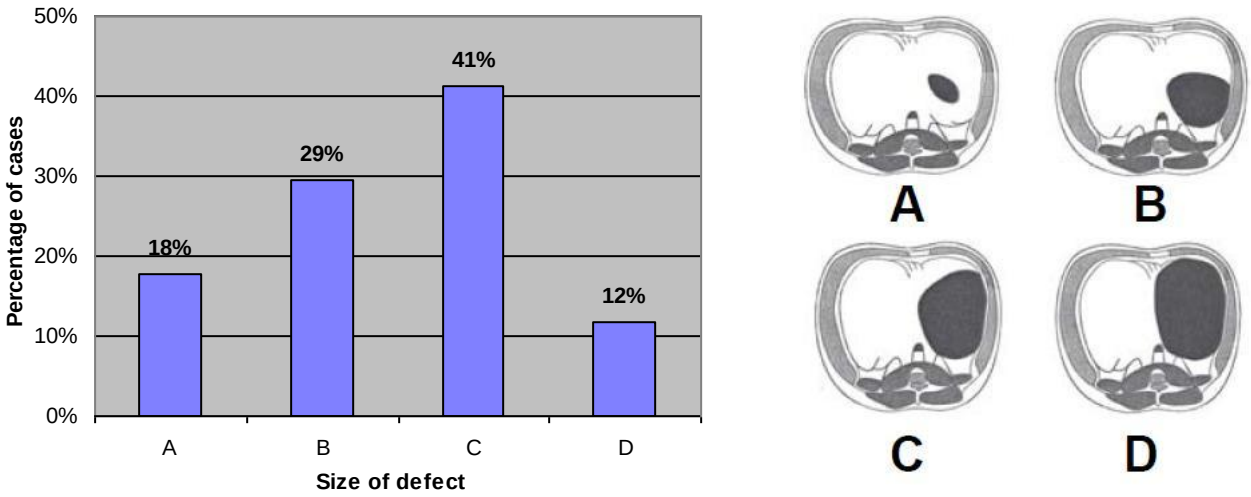


Figure 2.9: Selected neonatal complications

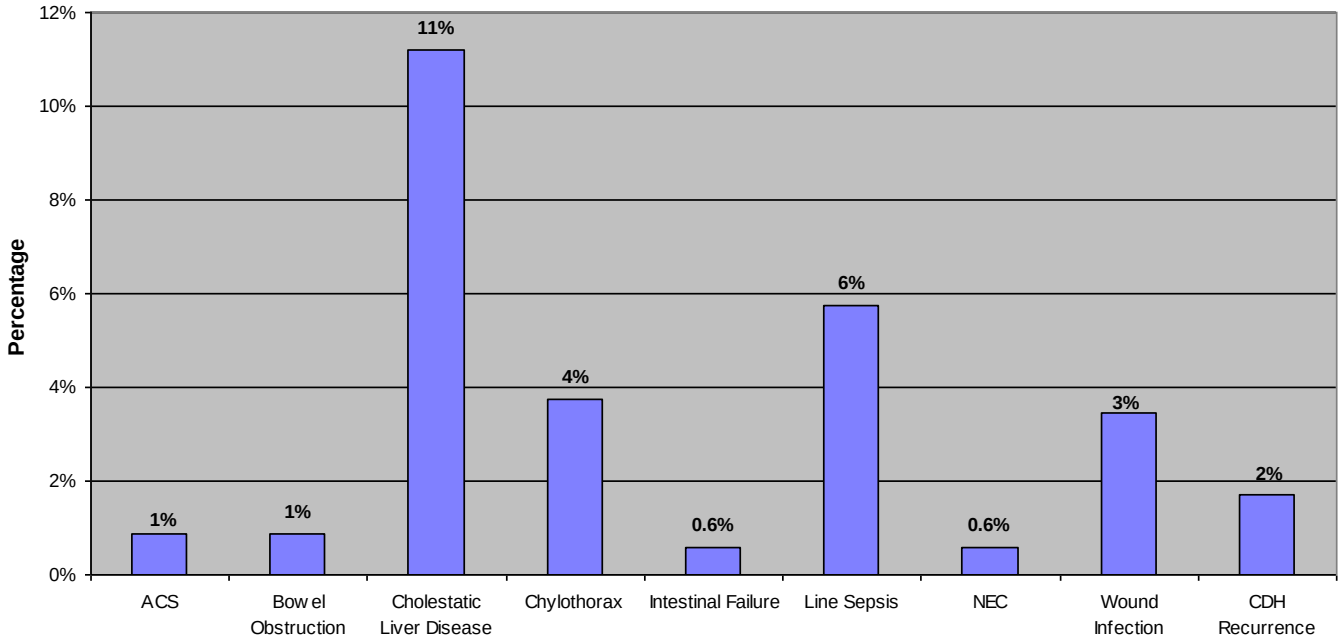


Figure 2.10a: Selected neonatal outcomes

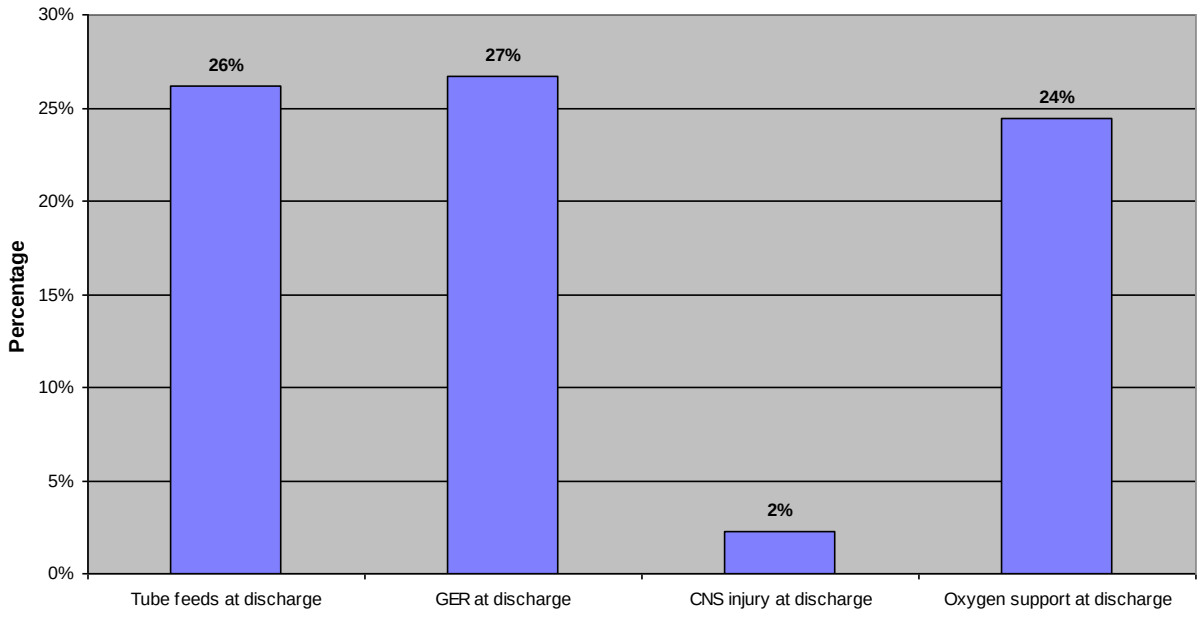


Table 2.10b: Selected neonatal outcomes

	Survivors (*n* =276)			Non-survivors (*n* = 72)		
	Median	Mean	Range	Median	Mean	Range
Length of stay (days)	29	40.4	2*-341	9.5	18.0	1-139
TPN days	17	22.8	4-185	18	22.2	2-139
Days to enteral feeds	10	11.9	1-64	18	20.8	5-36
Ventilation days (if required)	10	13.0	1-90	9	16.0	1-86
ECMO days (if required)	11	13.4	3-32	14.5	13.1	1-30
Supplemental O_2 days (if required)	9	22.8	1-341			

*One infant has a length of stay of 2 days because they were transferred to a non-CNN/CAPSNet hospital for ongoing care and no further data is available.

APPENDIX I: DEFINITIONS

CAPSNET POPULATION DEFINITION: The CAPSNet database captures:

- ✓ All cases of confirmed or suspect Congenital Diaphragmatic Hernia (CDH) and Gastroschisis (GS) diagnosed antenatally and referred to one of the participating tertiary perinatal centres for ongoing prenatal care of the fetus, regardless of the final outcome of pregnancy; and
- ✓ All cases of CDH and GS diagnosed postnatally up to 7 days of life who were either born at or transferred after birth to one of the participating centres.

SNAP-II (SCORE FOR NEONATAL ACUTE PHYSIOLOGY): is an illness severity scoring system which stratifies patients according to cumulative severity of physiologic derangement in several organ systems within the first 12 hrs of admission to the intensive care unit. This scoring system has been shown to be highly predictive of neonatal mortality and to be correlated with other indicators of illness severity including therapeutic intensity, physician estimates of mortality risk, length of stay, and nursing workload. SNAP provides a numeric score that reflects how sick each infant is. The scoring system is modeled after similar adult and pediatric scores, which are already widely in use. For more information, see: D K. Richardson et al . SNAP-II and SNAPPE-II: Simplified newborn illness severity and mortality risk scores. *J Pediatr* 2001; 138: 92-100

If more than 65% of the SNAP score data elements were missing, SNAP-II scores cannot be computed and were thus excluded from any analyses.

GASTROSCHISIS BOWEL DILATION: refers to the maximum internal (i.e. endoluminal) diameter measured from inner wall to inner wall along the short axis of the bowel loop at the most dilated segment of the extruded bowel in millimeters (mm).

GASTROSCHISIS BOWEL WALL THICKENING: refers to the maximum bowel wall thickness measured from the inner wall to the outer wall of the thickest portion of the small bowel in millimeters (mm).

CDH LUNG-HEAD RATIO (LHR): refers to the maximum recorded lung to head ratio measured from a transverse axial image through the chest demonstrating the four-chamber view of the heart with associated shift to the contralateral side. The contralateral lung is observed and the longest diameter measured (in millimeters). A line perpendicular to the first is then drawn and measured again in millimeters (mm).

Appendix II: List of Publications, Presentations and Ongoing Projects

PUBLICATIONS - SUBMITTED

2011

Baird R, Puligandla P, Skarsgard ED, Laberge JM; Canadian Pediatric Surgery Network. Infectious complications in Gastroschisis: A CAPSNet Study. *Pediatr Surg Int* (submitted).

Van Manene M, Bratu I, Narvey M, Rosychuk RJ; Canadian Pediatric Surgery Network. Use of paralysis in silo-assisted closure of gastroschisis. *J Perinatol* (submitted).

Akhtar J, Skarsgard ED; Canadian Pediatric Surgery Network. Associated Malformations and the "Hidden Mortality" of Gastroschisis. *J Pediatr Surg* (submitted).

Safavi A, Skarsgard ED; Canadian Pediatric Surgery Network. Antenatal Ultrasound Predictors of Bowel Injury in Gastroschisis. *J Pediatr Surg* (submitted).

Safavi A, Synnes AR, O'Brien KK, Chiang M, Skarsgard ED, Chiu P; Canadian Pediatric Surgery Network. Multi-institutional follow up of congenital diaphragmatic hernia (CDH) patients reveals severe disability and variations in practice. *J Pediatr Surg* (submitted).

Mills J, Safavi A, Skarsgard ED; Canadian Pediatric Surgery Network. Chylothorax Following Congenital Diaphragmatic Hernia Repair: A Population-based Study. *J Pediatr Surg* (submitted).

Brindle ME, Flageole H, Wales PW. Influence Of Maternal Factors And Aboriginal Status On Health Outcomes In Gastroschisis: A Canadian Population-based Study. *J Perinatol* (submitted).

Cowan KN, Puligandla PS, Laberge JM, Skarsgard ED, Bouchard S, Yanchar N, Kim P, Lee SK, McMillan D, von Dadelszen P, and the Canadian Pediatric Surgery Network. The Gastroschisis Prognostic Score: Outcome prediction in Gastroschisis. *J Pediatr Surg* (submitted).

PUBLICATIONS – IN PRESS

2011

Jansen LA, Safavi A, Lin Y, MacNab YC, Skarsgard ED; and the Canadian Pediatric Surgery Network. Pre-closure Fluid Resuscitation Influences Outcome in Gastroschisis. *Am J Perinatol* (in press).

Safavi A, Skarsgard ED, Butterworth SA; Canadian Pediatric Surgery Network. Bowel Defect

Disproportion in Gastroschisis: Does the need to extend the fascial defect predict outcome? *Pediatr Surg Int* (in press).

PUBLICATIONS – PUBLISHED

2011

Nasr A, Langer JC; Canadian Pediatric Surgery Network. Influence of location of delivery on outcome in neonates with congenital diaphragmatic hernia. *J Pediatr Surg* 2011 May;46(5):814-6.

Baird R, Eeson G, Safavi A, Puligandla P, Laberge JM, Skarsgard ED; Canadian Pediatric Surgery Network. Institutional practice and outcome variation in the management of congenital diaphragmatic hernia and gastroschisis in Canada: a report from the Canadian Pediatric Surgery Network. *J Pediatr Surg* 2011 May;46(5):801-7.

Brindle ME, Brar M, Skarsgard ED; and the Canadian Pediatric Surgery Network (CAPSNet). Patch repair is an independent predictor of morbidity and mortality in congenital diaphragmatic hernia. *Pediatr Surg Int* 2011 Sep;27(9):969-74. Epub 2011 May 18.

2010

Brindle ME, Ma IWY, Skarsgard ED. Impact of target blood gases on outcome in congenital diaphragmatic hernia (CDH). *Eur J Pediatr Surg* 2010 Sep;20(5):290-3.

Mills JA, Lin Y, MacNab YC, Skarsgard ED and the Canadian Pediatric Surgery Network. Does overnight birth influence treatment or outcome in Congenital Diaphragmatic Hernia? *Am J of Perinatol* 2010; 27 (1): 91-95.

Mills J, Lin Y, MacNab Y, Skarsgard ED JM and the Canadian Pediatric Surgery Network. Perinatal predictors of outcome in gastroschisis. *J Perinatol* 2010 Dec;30(12):809-13.

Safavi A, Lin Y, Skarsgard ED; Canadian Pediatric Surgery Network. Perinatal management of congenital diaphragmatic hernia: when and how should babies be delivered? Results from the Canadian Pediatric Surgery Network. *J Pediatr Surg* 2010 Dec;45(12):2334-9.

2009

Boutros J, Regier M, Skarsgard ED and the Canadian Pediatric Surgery Network. Is timing everything? The influence of gestational age and intended and actual route of delivery on treatment and outcome in Gastroschisis. *J Pediatr Surg* 2009; 44:912-7.

Grushka JR, Laberge JM, Puligandla P, Skarsgard ED and the Canadian Pediatric Surgery Network. The effect of hospital case volume on outcome in Congenital Diaphragmatic Hernia. *J Pediatr Surg* 2009; 44:873-6.

2008

Skarsgard ED, Claydon J, Bouchard S, Kim P, Lee SK, Laberge JM, McMillan D, von Dadelszen P, Yanchar N and the Canadian Pediatric Surgery Network. Canadian Pediatric Surgical Network: a population-based pediatric surgery network and database for analyzing surgical birth defects: The first 100 cases of gastroschisis. *J Pediatr Surg* 2008; 43(1):30-4.

Baird R, MacNab YC, Skarsgard ED, and the Canadian Pediatric Surgery Network. Mortality prediction in congenital diaphragmatic hernia. *J Pediatr Surg* 2008;43(5):783-7.

Weinsheimer RL, Yanchar NL, Bouchard S, Kim P, Laberge JM, Skarsgard ED, Lee SK, McMillan D, von Dadelszen P, and the Canadian Pediatric Surgery Network. Gastroschisis closure – does method really matter? *J Pediatr Surg* 2008;43(5):874-8.

Weinsheimer RL, Yanchar NL and the Canadian Pediatric Surgical Network. Impact of maternal substance abuse and smoking on children with Gastroschisis. *J Pediatr Surg* 2008; 43(5):879-83.

2006

Skarsgard E. Networks in Canadian pediatric surgery: Time to get connected. *Paediatr Child Health* 2006; 11(1):15-18.

CONFERENCE PROCEEDINGS

2011

Nasr A, Langer JC; Canadian Pediatric Surgery Network. Influence of Location of Delivery on Outcome of Neonates with Gastroschisis. Presented at the 42nd Annual Meeting of the American Pediatric Surgical Association, Palm Springs, CA. May 22-25, 2011.

Akhtar J, Skarsgard ED; Canadian Pediatric Surgery Network. Associated Malformations and the "Hidden Mortality" of Gastroschisis. To be presented at the 43rd Annual Meeting of the Canadian Association of Pediatric Surgeons, Ottawa, Canada. Sept 22-25, 2011.

Safavi A, Skarsgard ED; Canadian Pediatric Surgery Network. Antenatal Ultrasound Predictors of Bowel Injury in Gastroschisis. To be presented at the 43rd Annual Meeting of the Canadian Association of Pediatric Surgeons, Ottawa, Canada. Sept 22-25, 2011.

Mills J, Safavi A, Skarsgard ED; Canadian Pediatric Surgery Network. Chylothorax Following

Congenital Diaphragmatic Hernia Repair: A Population-based Study. To be presented at the 43rd Annual Meeting of the Canadian Association of Pediatric Surgeons, Ottawa, Canada. Sept 22-25, 2011.

Brindle ME, Flageole H, Wales PW. Influence Of Maternal Factors And Aboriginal Status On Health Outcomes In Gastroschisis: A Canadian Population-based Study. A Population-based Study. To be presented at the 43rd Annual Meeting of the Canadian Association of Pediatric Surgeons, Ottawa, Canada. Sept 22-25, 2011.

Moore AM, Madhoo P, Himidan S, Ryan G, Skarsgard ED; Canadian Pediatric Surgery Network. Examining the Hidden Mortality of Congenital Diaphragmatic Hernia. To be presented at the 52nd Annual Meeting of the European Society for Pediatric Research, Newcastle, UK. October 14-17, 2011.

Moore AM, Madhoo P, Himidan S, Ryan G, Skarsgard ED; Canadian Pediatric Surgery Network. Health Care Utilisation for Pregnancies Complicated by Fetal Gastroschisis. Presented at the 88th Annual Meeting of the Canadian Pediatric Society, June 15-18, 2011. Quebec City, CA.

Safavi A, Synnes AR, O'Brien KK, Chiang M, Skarsgard ED, Chiu P; Canadian Pediatric Surgery Network. Multi-institutional follow up of congenital diaphragmatic hernia (CDH) patients reveals severe disability and variations in practice. To be presented at the 43rd Annual Meeting of the Canadian Association of Pediatric Surgeons, Ottawa, Canada. Sept 22-25, 2011.

Cowan KN, Puligandla PS, Laberge JM, Skarsgard ED, Butter A, Bouchard S, Yanchar N, Kim P, Lee SK, McMillan D, von Dadelszen P and the Canadian Pediatric Surgery Network. The gastroschisis bowel score predicts outcome in gastroschisis (updated numbers). To be presented at the Surgical Section of the American Academy of Pediatrics, NCE, Boston MA. October 15-18, 2011.

2010

Laberge JM and the Canadian Pediatric Surgery Network. Congenital Diaphragmatic Hernia: Results and factors affecting outcomes in the Canadian Pediatric Surgery Network. Presented at the 3rd World Congress of Pediatric Surgery; New Delhi, India. October 21-24, 2010.

Eeson G, Safavi A, Skarsgard E, and the Canadian Pediatric Surgery Network. Practice and outcome variation in CDH in Canada. Presented at the 42nd annual meeting of the Canadian Association of Pediatric Surgeons; Saskatoon, Saskatchewan. September 23-28, 2010.

Nasr A, Langer JC and the Canadian Pediatric Surgery Network. Influence of location of delivery

on outcome in neonates with congenital diaphragmatic hernia. Presented at the 42nd annual meeting of the Canadian Association of Pediatric Surgeons; Saskatoon, Saskatchewan. September 23-28, 2010.

Baird R, Puligandla, Laberge JM and the Canadian Pediatric Surgery Network. Practice and outcome variation in Gastroschisis in Canada. Presented at the 42nd annual meeting of the Canadian Association of Pediatric Surgeons; Saskatoon, Saskatchewan. September 23-28, 2010.

Safavi A, Lin Y, Skarsgard ED and the Canadian Pediatric Surgery Network. Perinatal management of congenital diaphragmatic hernia: When and how should babies be delivered? Presented at the 43rd Annual Meeting of the Pacific Association of Pediatric Surgeons; Kobe, Japan. May 23-27, 2010.

Wilson D and the Canadian Pediatric Surgery Network. The Canadian Pediatric Surgery Network (CAPSNet): Targeting national outcome improvement for structural birth defects through collaborative knowledge synthesis and evidence-based practice change. Presented at the 18th Annual Western Perinatal Research Meeting; Banff, Alberta. February 11-14, 2010.

Jansen L, Lin Y, MacNab Y, Skarsgard ED, Puligandla PS and the Canadian Pediatric Surgery Network. Pre-closure fluid resuscitation influences outcome in gastroschisis. Presented at the 41st Annual Meeting of the American Pediatric Surgical Association; Orlando, Florida. May 16-19, 2010.

Cowan KN, Puligandla PS, Laberge JM, Skarsgard ED, Butter A, Bouchard S, Yanchar N, Kim P, Lee SK, McMillan D, von Dadelszen P and the Canadian Pediatric Surgery Network. The gastroschisis bowel score predicts outcome in gastroschisis. Poster presented at the 2010 Annual Meeting of the Pediatric Academic Societies; Vancouver BC. May 1-4, 2010.

Gover A, Albersheim S, Sherlock R, Claydon J, Butterworth S, Kuzeljevic B and the Canadian Pediatric Surgery Network. Does a multidisciplinary team improve outcome of gastroschisis patients? Poster presented at the 2010 Annual Meeting of the Pediatric Academic Societies; Vancouver BC. May 1-4, 2010.

Gover A, Albersheim S, Sherlock R, Claydon J, Butterworth S, Kuzeljevic B and the Canadian Pediatric Surgery Network. Early stratification of gastroschisis patients: Are we there yet? Poster presented at the 2010 Annual Meeting of the Pediatric Academic Societies; Vancouver BC. May 1-4, 2010.

2009

Cowan KN, Puligandla PS, Bütter A, Skarsgard ED, Laberge JM and the Canadian Pediatric

Surgery Network. The Gastroschisis Bowel Score Predicts Outcome in Gastroschisis. Presented at the 4th Annual Academic Surgical Congress; Fort Myers, Florida. Feb 2009.

Baird R, Skarsgard ED, Laberge J-M, Puligandla PS, and the Canadian Pediatric Surgical Network. The Use of Antibiotics in the Management of Gastroschisis-Canadian Practice Patterns. Presented at the 40th Annual Meeting of the American Pediatric Surgical Association; Fajardo, Puerto Rico. May 28-30, 2009.

Brindle M, Ma IW, Skarsgard ED and The Canadian Pediatric Surgery Network. Impact of Target Blood Gases on Outcome in Congenital Diaphragmatic Hernia (CDH). Presented at the 40th Annual Meeting of the American Pediatric Surgical Association; Fajardo, Puerto Rico. May 28-30, 2009.

Brindle M, Oddone E, Skarsgard ED and The Canadian Pediatric Surgery Network. Need for Patch Repair Influences Outcome in Congenital Diaphragmatic Hernia (CDH). Presented at the 40th Annual Meeting of the American Pediatric Surgical Association; Fajardo, Puerto Rico. May 28-30, 2009.

Mills J, Lin Y, MacNab Y, Skarsgard ED JM and the Canadian Pediatric Surgery Network. Perinatal Predictors of Outcome in Gastroschisis. Presented at the 40th Annual Meeting of the American Pediatric Surgical Association; Fajardo, Puerto Rico. May 28-30, 2009.

Grushka JR, Laberge JM, Puligandla P, Skarsgard ED and the Canadian Pediatric Surgery Network. The Effect of Prenatal Diagnosis on the Contemporary Outcome of CDH. Presented at the 40th Annual Meeting of the American Pediatric Surgical Association; Fajardo, Puerto Rico. May 28-30, 2009.

Butterworth SA, Brant R, Skarsgard ED and the Canadian Pediatric Surgery Network. Is the need for fascial defect extension a predictor of adverse outcome in gastroschisis? Presented at the 41st Annual meeting of the Canadian Pediatric Surgery Association; Halifax, Nova Scotia. October 1-4, 2009.

2008

Mills J, MacNab Y, Skarsgard ED and the Canadian Pediatric Surgery Network. Does Overnight Birth Time Influence Surgical Management of Outcome in Neonates with Gastroschisis? Presented at the 79th Annual Meeting of the Pacific Coast Surgical Association; San Diego, California. Feb 16, 2008.

Brindle M, Mills J,Lin Y, MacNab Y, Skarsgard ED and the Canadian Pediatric Surgery Network. Influence of Birth Time on Surgical Management and Outcomes of Neonates with Gastroschisis. Presented at the 2008 Joint Meeting of the Pediatric Academic Societies and the Society for Pediatric Research. Honolulu, HI, May 2008.

Pressey TP, Skarsgard ED, Claydon J, von Dadelszen P, and the Canadian Pediatric Surgery Network. Antenatal Ultrasound Detection of Abnormal Amniotic Fluid Volume Predicts Adverse Perinatal Outcomes. Presented at the 14th International Conference on Prenatal Diagnosis and Therapy. Vancouver, Canada, June 2008.

Laberge JM, Skarsgard ED and the Canadian Pediatric Surgical Network. CAPSNET: The Canadian Pediatric Surgical Network. Presented at the Pan-African Pediatric Surgical Association Meeting; Ghana, Africa: August 14-22, 2008.

Laberge JM and the Canadian Pediatric Surgery Network. Contemporary outcome of CDH: Results from the Canadian Pediatric Surgery Network (CAPSNet). Presented at the International Fetal Medical and Surgical Society (IFMSS), Athens, Greece, September 11-14, 2008.

Boutros J, Regier M, Skarsgard ED and the Canadian Pediatric Surgery Network. Is timing everything? The influence of gestational age and intended and actual route of delivery on treatment & outcome in Gastroschisis. Presented at the 2008 Annual Meeting of the Canadian Association of Pediatric Surgeons. Toronto, Canada, September 2008.

Grushka JR, Laberge JM, Puligandla P, Skarsgard ED and the Canadian Pediatric Surgery Network. The effect of hospital case volume on outcome in Congenital Diaphragmatic Hernia. Presented at the 2008 Annual Meeting of the Canadian Association of Pediatric Surgeons. Toronto, Canada, September 2008.

2007

Baird R, MacNab YC, Skarsgard ED, and the Canadian Pediatric Surgery Network. Mortality prediction in congenital diaphragmatic hernia. Presented at the 2007 Annual Canadian Association of Pediatric Surgeons Meeting; St. John's, Newfoundland. Aug 25, 2007.

Skarsgard ED, Claydon J, Bouchard S, Kim P, Lee SK, Laberge JM, McMillan D, von Dadelszen P, Yanchar N and the Canadian Pediatric Surgery Network. Canadian Pediatric Surgical Network: a population-based pediatric surgery network and database for analyzing surgical birth defects: The first 100 cases of gastroschisis. Presented at the 38th Annual Meeting of the American Pediatric Surgical Association. May 2007. Also presented at the 26th Annual Meeting of the International Fetal Medicine and Surgery Society. Apr 30, 2007, Aruba.

Pressey TP, Skarsgard ED, Claydon J, von Dadelszen P and the Canadian Pediatric Surgery Network. Ultrasound Predictors of Outcome in Antenatally Diagnosed Gastroschisis. Presented at the 26th Annual Meeting of the International Fetal Medicine and Surgery Society. Apr 30, 2007, Aruba.

Weinsheimer RL, Yanchar NL, Bouchard S, Kim P, Laberge JM, Skarsgard ED, Lee SK, McMillan D, von Dadelszen P, and the Canadian Pediatric Surgery Network. Gastroschisis Closure – Does Method Really Matter? Presented at the 2007 Annual Canadian Association of Pediatric Surgeons Meeting; St. John's, Newfoundland. Aug 25, 2007.

Weinsheimer RL, Yanchar NL and the Canadian Pediatric Surgical Network. Impact of Maternal Substance Abuse and Smoking on Children with Gastroschisis. Presented at the 2007 Annual Canadian Association of Pediatric Surgeons Meeting; St. John's, Newfoundland. Aug 25, 2007.

ADDITIONAL ONGOING PROJECTS

Dr Ahmed Nasr, Dr Jacob Langer. *Influence of Location of Delivery on Outcome of Neonates with Gastroschisis.*

Dr. Ravi Bhargava, Dr Radha Chari and Dr. Gordon Lees: *Predication of outcome of fetal CDH by lung to liver signal intensity ratios by fetal MRI.*

Dr. Mary Brindle, Dr Helene Flageole and Dr Paul Wales: *Maternal features associated with the development of gastroschisis and its outcome in the Canadian population.*

Dr. Sonia Butterworth and Dr. Erik Skarsgard: *Preoperative predictors of unfavourable outcome in CDH-comparing the utility of delta SNAP-II, ventilation mode and persistent ductal saturation gradient*.

Dr. Aideen Moore, Dr Greg Ryan, Dr. Malikah Al-Farak, Dr. Ahmed Nasr and Dr. Sharifa Himidan: *Are we really population-based? Comparison of CAPSNet and FAN data.*

Dr. Arash Safavi, Dr Anne Synnes and Dr Erik Skarsgard: *Long-term follow-up and outcomes of infants born with CDH in Canada.*

Dr. Sherif Emil and Dr. Abdullah Alshehri: *Early versus late intestinal procedures for complex gastroschisis.*