Cardiac disease in pregnancy

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Outline

- Epidemiology
- Cardiac arrest in pregnancy
- Women with mechanical heart valves
- Management of the 3rd stage

Declaration of interest

Member of the UK National Institute of Clinical Excellence guideline development group on high risk intrapartum care

Prevalence of smoking before and during pregnancy and changes in this habit during pregnancy in Northwest Russia: a Murmansk county birth registry study

Olga A. Kharkova[1,2*], Alexandra Krettek[1,3,4], Andrej M. Grjibovski[2,5,6,7], Evert Nieboer[8] and Jon Øyvind Odland[1,9]

RUSSIAN SOCIETY OF CARDIOLOGY

May 04 2018 - 16:05

Russia's Obesity Rate Up Almost 50% in 5 Years, Health Ministry Say

Bulletin of the World Health Organization

Maternal mortality in St. Petersburg, Russian Federation

Mortalité maternelle à Saint-Pétersbourg (Fédération de Russie)

dad materna en San Petersburgo, Federación de Rusia

Natalia A Gurina[I,1]; Siri Vangen[II]; Lisa Forsén[II]; Johanne Sundby[III]

[I]St. Petersburg Medical Academy of Postgraduate Studies, Department of Family Medicine, School of Public Health, St. Petersburg, Russian Federation 194291
[II]Norwegian Institute of Public Health, Division of Epidemiology, Oslo, Norway
[III]Institute of Community Medicine, University of Oslo, Oslo, Norway

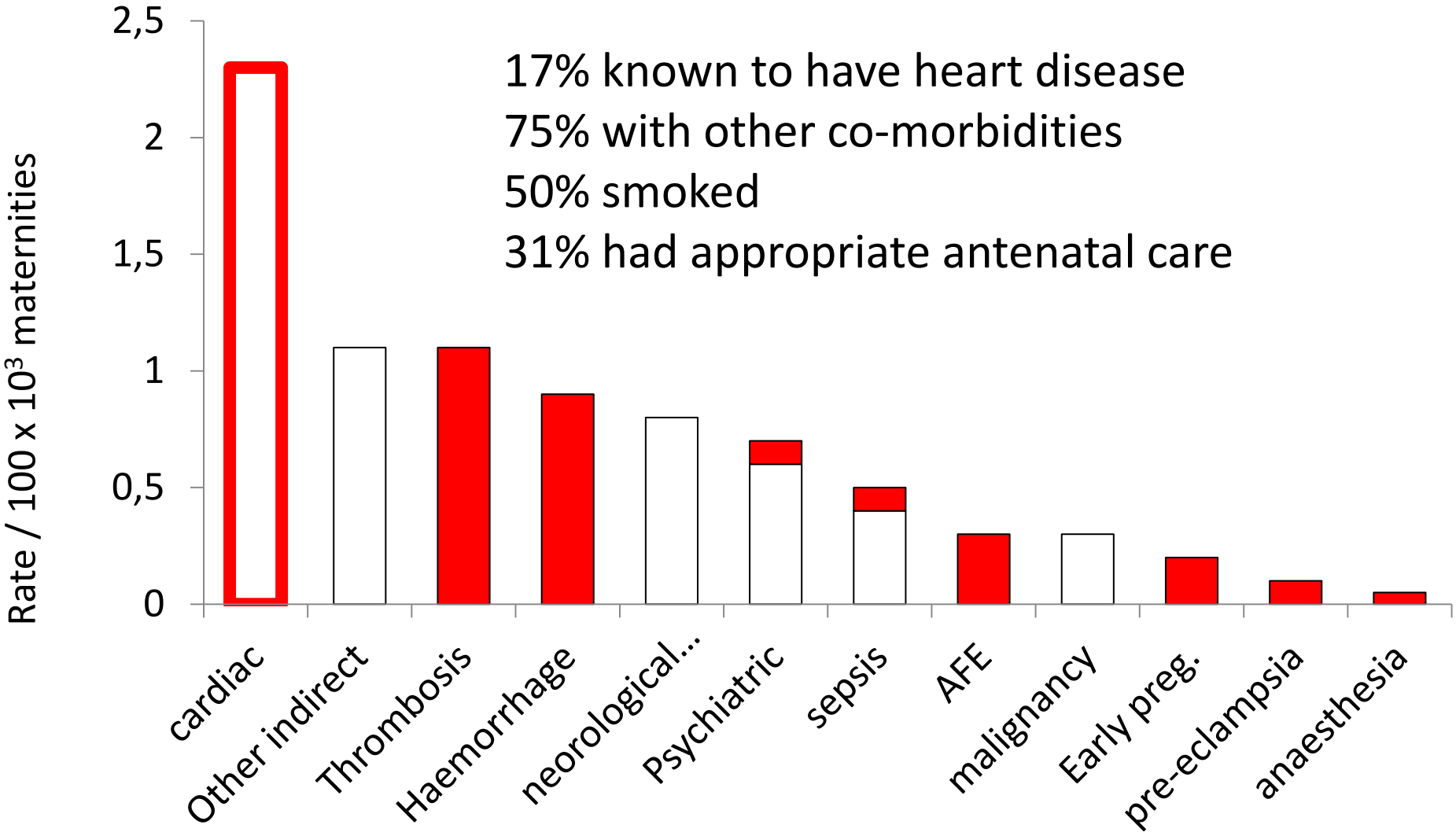
Table 2.7: UK Maternal deaths and mortality rates per 100,000 maternities by cause 1985–2014 (Maternal deaths by suicide classified as indirect for comparability)

Cause of death	Numbers										Rates per 100,000 maternities									
	1985-87	1988-90	1991-93	1994-96	1997-99	2000-02	2003-05	2006-08	2009-11	2012-14	1985-87	1988-90	1991-93	1994-96	1997-99	2000-02	2003-05	2006-08	2009-11	2012-14
All Direct and Indirect deaths	223	238	228	268	242	261	295	261	253	200	9.83	10.08	9.85	12.19	11.4	13.07	13.95	11.39	10.63	8.54
Direct deaths																				
Sepsis																				0.29
Pre-ec eclamp																				0.08
Throm thromb																				0.85
Amnio																				0.68
Early p																				0.29
Haemo																				0.56
Anaest																				0.09
Other Direct[1]	27	17	14	7	7	8	4	4	0	0	1.19	0.72	0.60	0.32	0.33	0.40	0.19	0.17	-	-
All direct	139	145	128	134	106	106	132	107	82	67	6.13	6.14	5.53	6.10	4.99	5.31	6.24	4.67	3.49	2.86
Indirect deaths																				
Cardiac disease	23	18	37	39	35	44	48	53	51	51	1.01	0.76	1.60	1.77	1.65	2.20	2.27	2.31	2.14	2.18
Other Indirect causes	43	45	38	39	41	50	50	49	72	38	1.90	1.91	1.64	1.77	1.93	2.50	2.37	2.14	3.03	1.62
Indirect neurological conditions	19	30	25	47	34	40	37	36	30	22	0.84	1.27	1.08	2.14	1.60	2.00	1.75	1.57	1.26	0.94
Psychiatric causes	†	†	†	9	15	16	18	13	13	18	†	†	†	0.41	0.71	0.80	0.85	0.57	0.55	0.77
Indirect malignancies	†	†	†	†	11	5	10	3	4	4	†	†	†	†	0.52	0.25	0.47	0.13	0.17	0.17
All Indirect	84	93	100	134	136	155	163	154	170	133	3.70	3.94	4.32	6.10	6.40	7.76	7.71	6.59	7.15	5.68
Coincidental	26	39	46	36	29	36	55	50	22	41	1.15	1.65	1.99	1.64	1.37	1.80	2.60	2.18	0.98	1.75

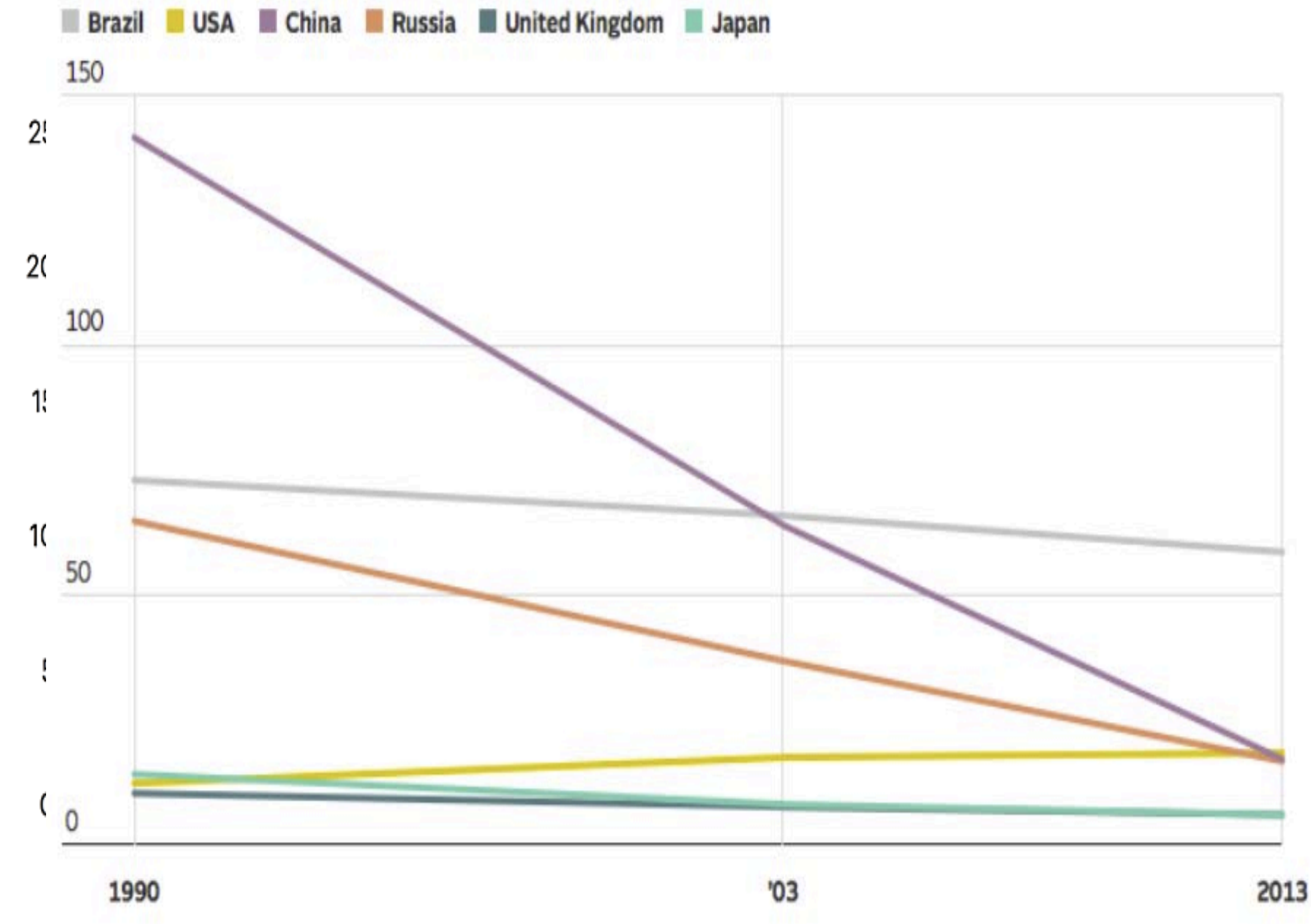
1985 – 7 23 cases [1.01/100 000 maternities]

2012 – 14 51 cases [2.18/100 000 maternities]

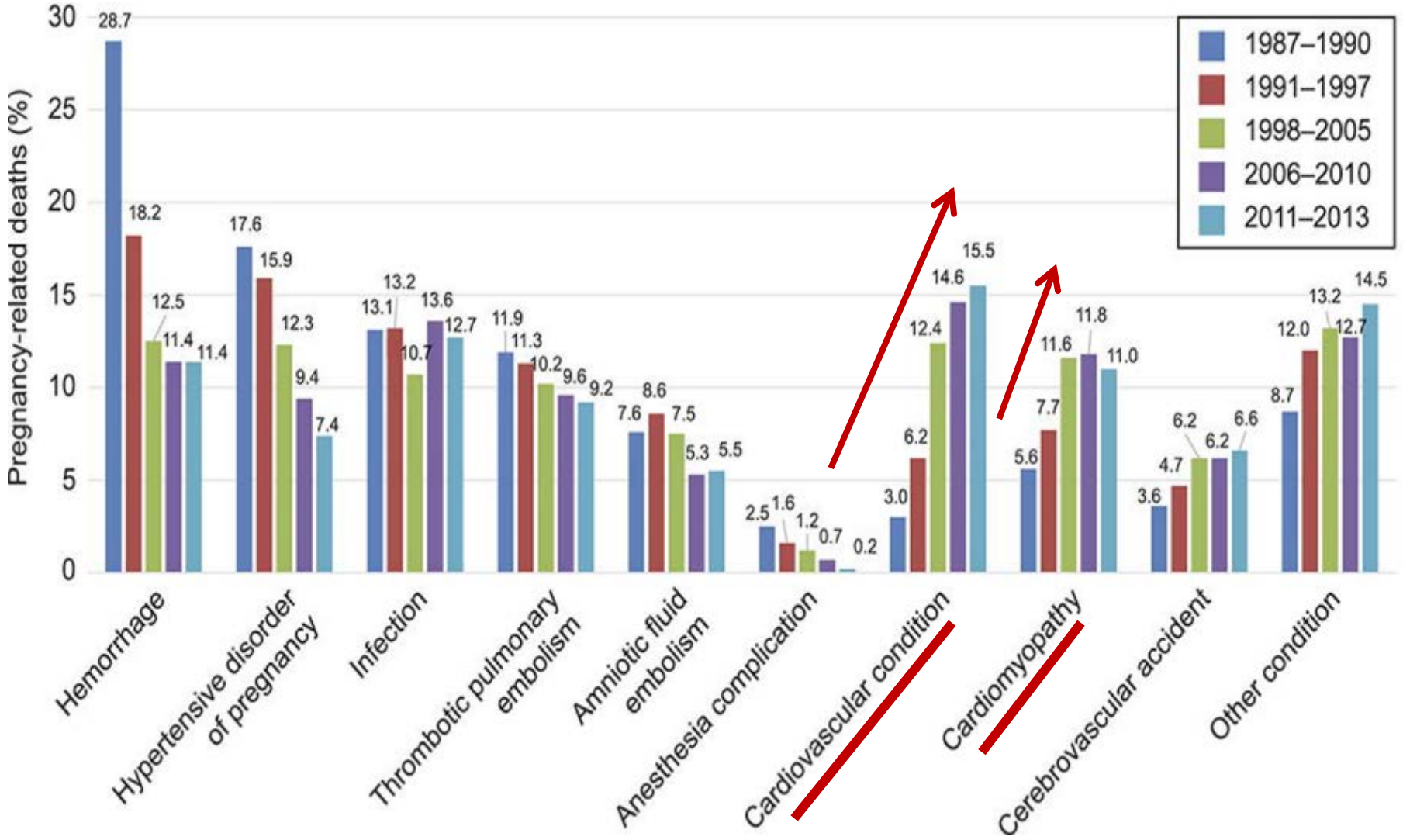
Causes of death 2013- 15



Maternal mortality rate per 100,000 livebirths

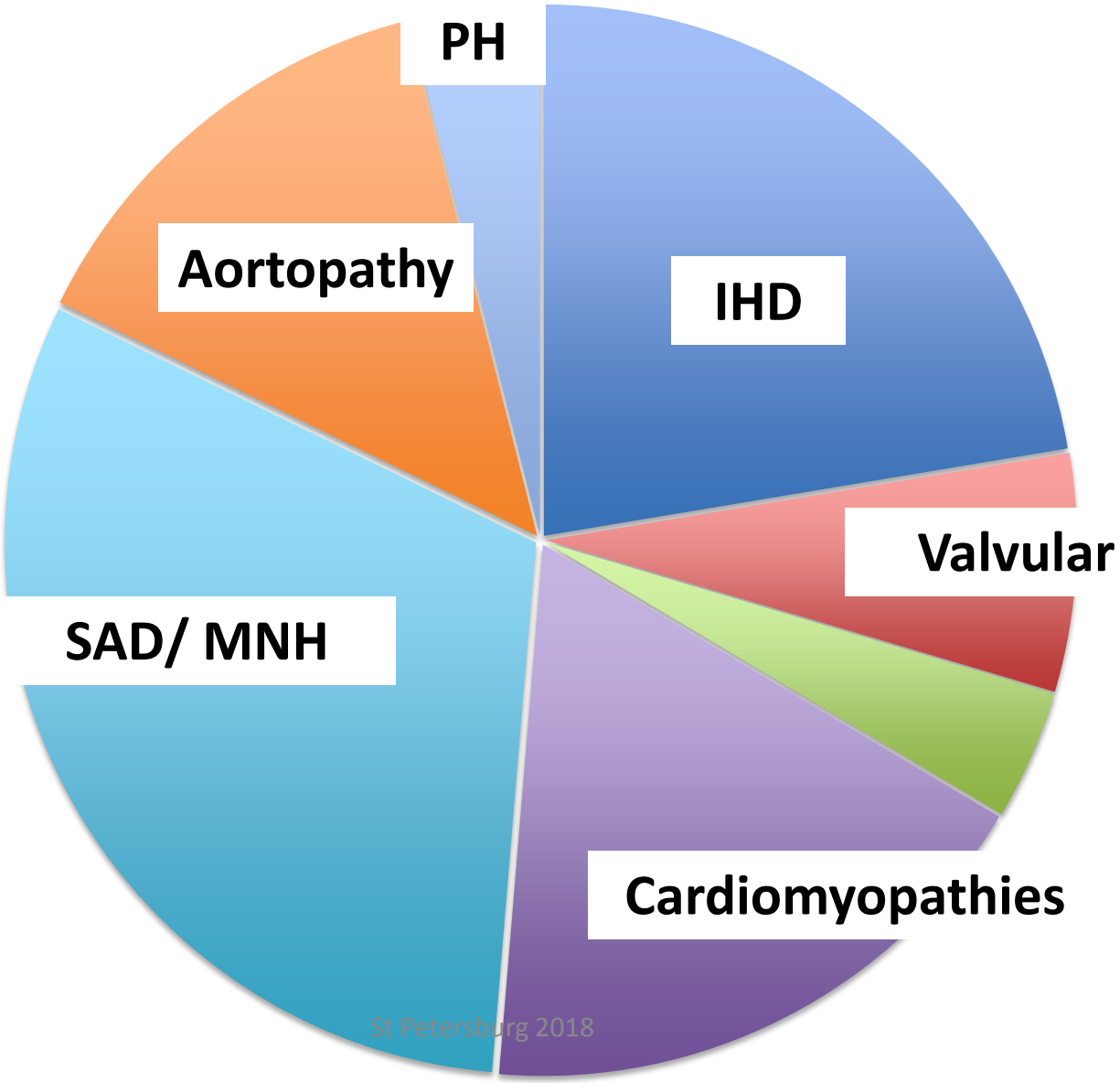


How Pregnant Women Die: United States, 1987–2013



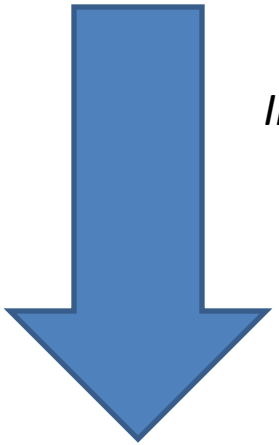
Creanga AA, et al. Obstet Gynecol 2015; 125: 5-12.

Cardiac mortalities in UK



Prevalence of congenital heart disease in adults

1950 25% CHD neonates survived 1 year



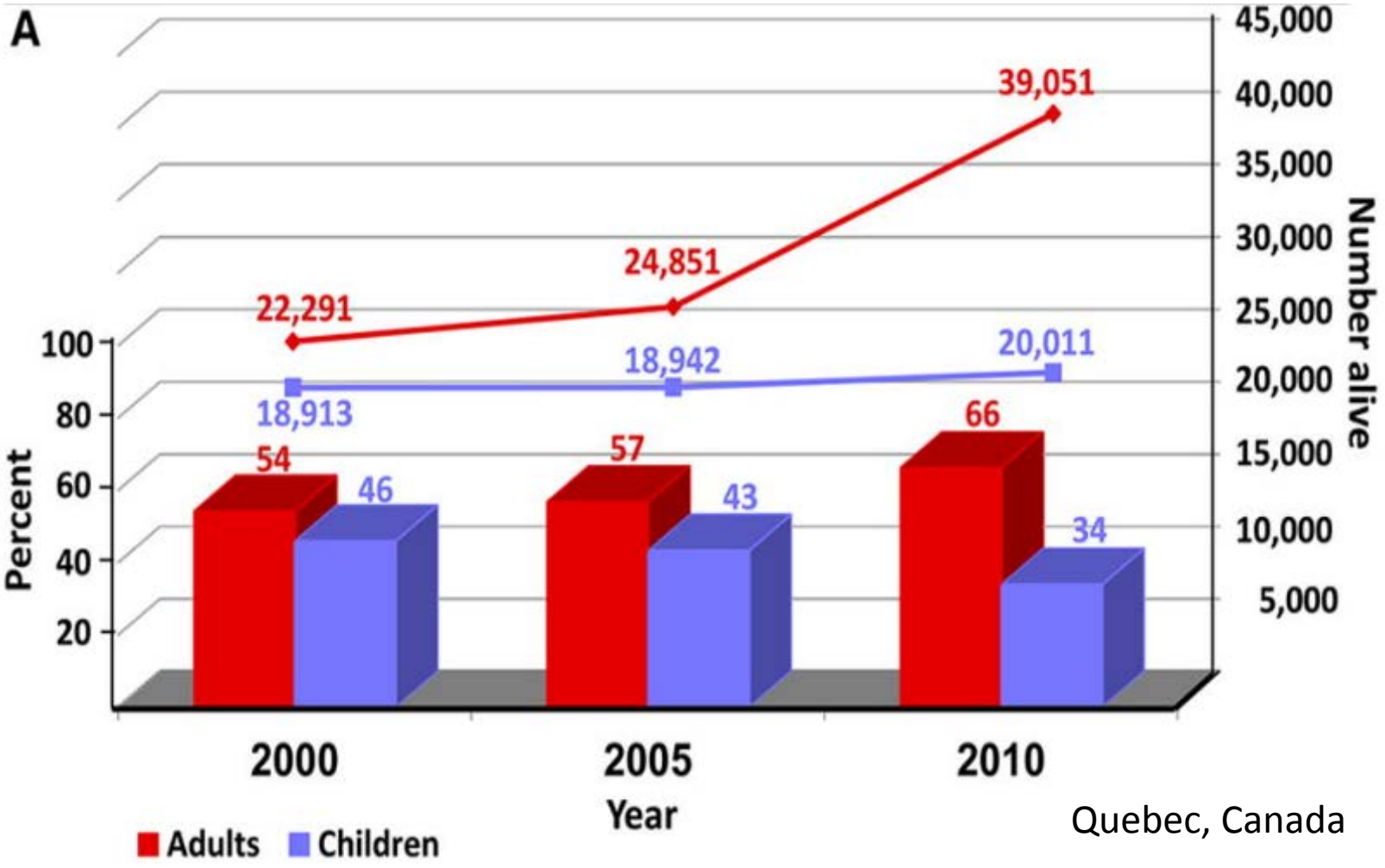
Improved surgical & medical management

2000 > 95% CHD neonates survive to adulthood

2015 *This population is entering reproductive age*

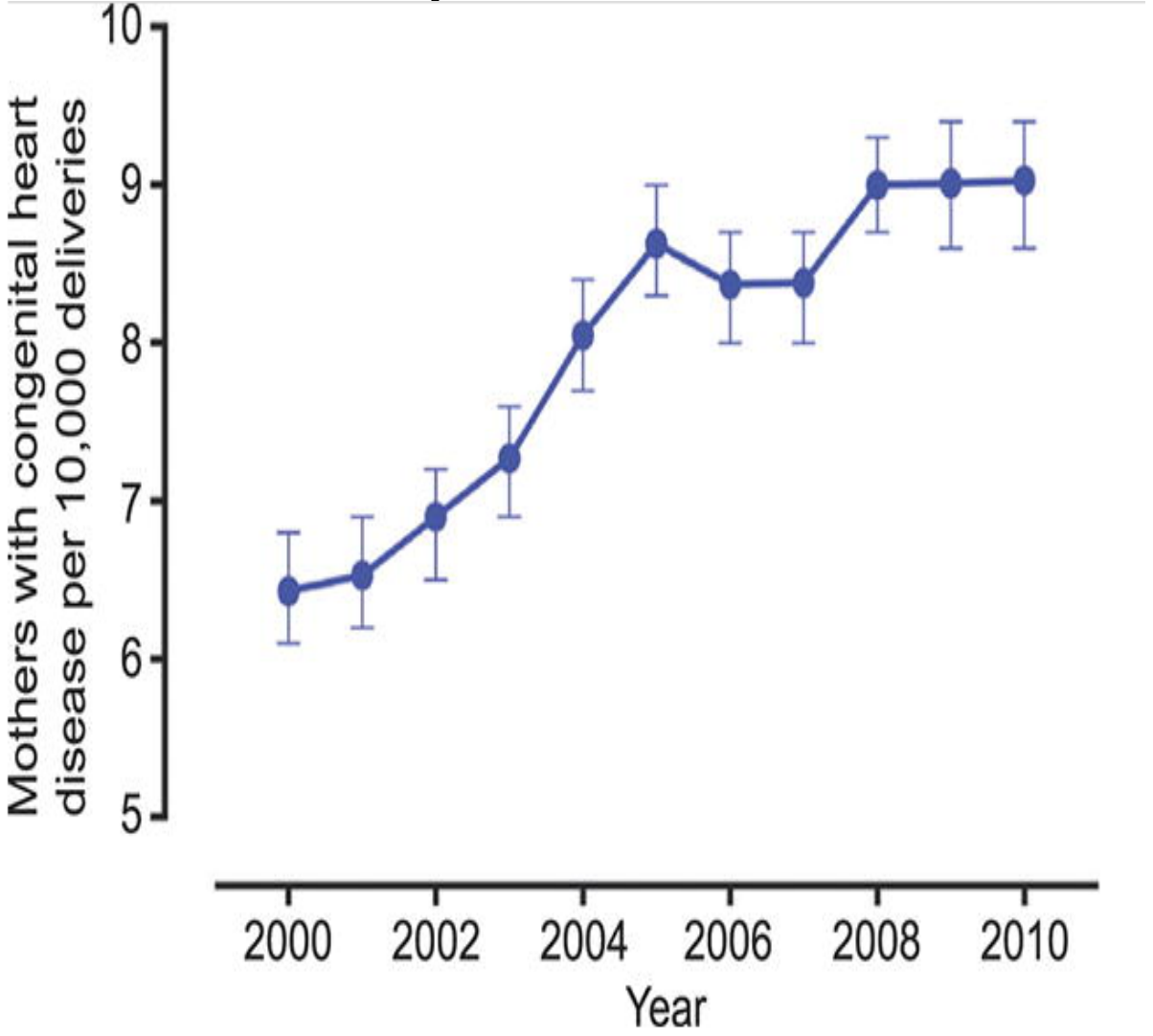
Warnes CA et al. JACC 2001; 37:1170-5.
Perloff JK, Warnes CA. Circ 2001; 84:1881-90

Prevalence of CHD in Adults



Quebec, Canada

Delivery hospitalizations among women with CHD per 10,000 deliveries



JL Thompson, et al. Obstet Gynecol, Aug 2015, 126: 346–354

Acquired heart disease in pregnancy

UK Maternal Mortality from AHD [1996]:

1996: **3.8** deaths per million maternities

2008: **21.8** deaths per million maternities

Increasing maternal: Age, Obesity, Chronic hypertension

The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving Mothers Lives: Reviewing Maternal Deaths to Make Motherhood Safer.

Characteristics of women dying from cardiac disease in the UK

- Other co-morbidities 75%
- Overweight / obese 50%
- ≥ 35 years 36%
- Smoker 26%

- Not known to have pre-existing cardiac disease **77%**
- Died in ambulance /ED **20%**

All clinicians must be alert to undiagnosed cardiac disease

Paramedics & ED staff must be trained in CPR + perimortem CS

MBBRACE-UK Dec 2016

Timing of death from cardiac disease

Time period of deaths in the pregnancy care pathway	Total (n=153)* Frequency (%)
Antenatal period/ still pregnant	24 (15)
Postnatal on day of delivery	32 (21)
Postnatal 1 to 42 days after delivery	52 (34)
Postnatal 43–91days	18 (12)
Postnatal 92–182 days	12 (8)
Postnatal 183–273 days	9 (6)
Postnatal 274–364 days	6 (4)

Risk of Arrest with Cardiac Disease in Pregnancy

Incidence and causes of maternal cardiac arrest?

National Inpatient Sample (U.S.):

- 56,900,512 deliveries, 1998-2011
- 4,843 cardiac arrests

- 8.5 per 100,000 → **1 in 12,000**

59% overall survived to Discharge

Mhyre JM, Tsen LC, et al. Anesthesiology 2014; 120: 810-8

Risk of Arrest with Cardiac Disease in Pregnancy

Medical condition	adjusted OR
Pulmonary hypertension	13.3
Malignancy	12.5
Ischemic heart disease	7.6
Liver disease	5.5
Congenital heart disease	4.2
Systemic lupus	4.1
Cardiac valvular disease	3.8

Mhyre JM, Tsen LC, et al. Anesthesiology 2014; 120: 810-8

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BJOG An International Journal of Obstetrics and Gynaecology

DOI: 10.1111/1471-0528.14521
www.bjog.org

The CAPS Study: incidence, management and outcomes of cardiac arrest in pregnancy in the UK: a prospective, descriptive study

VA Beckett,[a] M Knight,[b] P Sharpe[c]

Virginia Beckett[1], Marian Knight[2], Paul Sharpe[3]

1 Bradford Teaching Hospitals NHS Foundation Trust
2 National Perinatal Epidemiology Unit, Oxford
3 University Hospitals of Leicester

Study design

Prospective, nation- wide, July 2011 – 14

UKOSS methodology

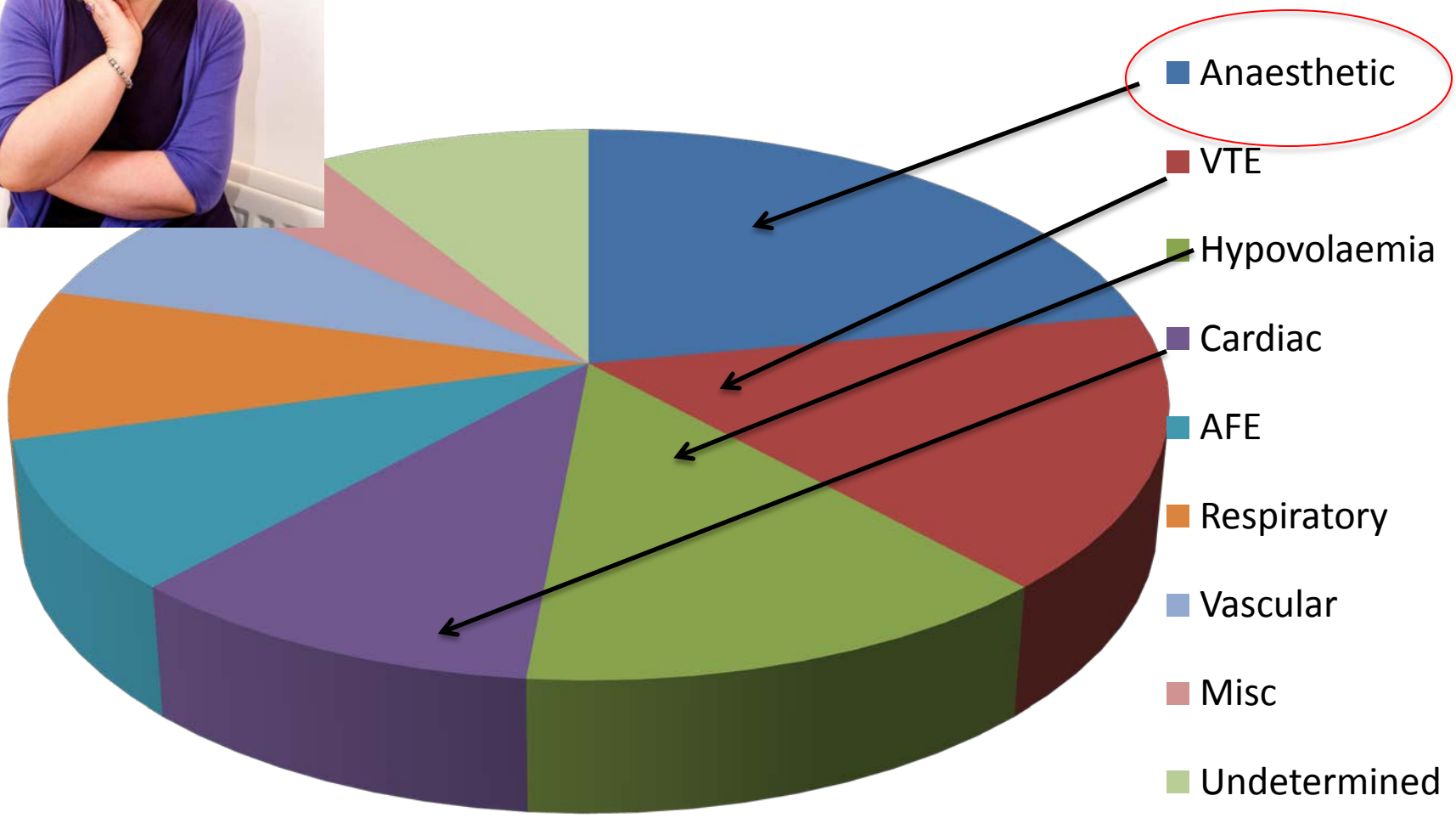
All pregnant women receiving BLS

Results

66 cases

Incidence 6.3 per 100 000 maternities		[8.5%]
ROSC	80%	
Maternal survival to discharge	68%	[59%]
Neonatal survival [>24/40]	80%	

Causes of CA


Anaesthetic
VTE
Hypovolaemia
Cardiac
AFE
Respiratory
Vascular
Misc
Undetermined

Anaesthetic cause of arrest

n = 16

Intubation difficulties	3
High block	13
Epidural top-up	3
Total spinal	10
Other	1

Survival = 100% [22% overall]

Obese = 12

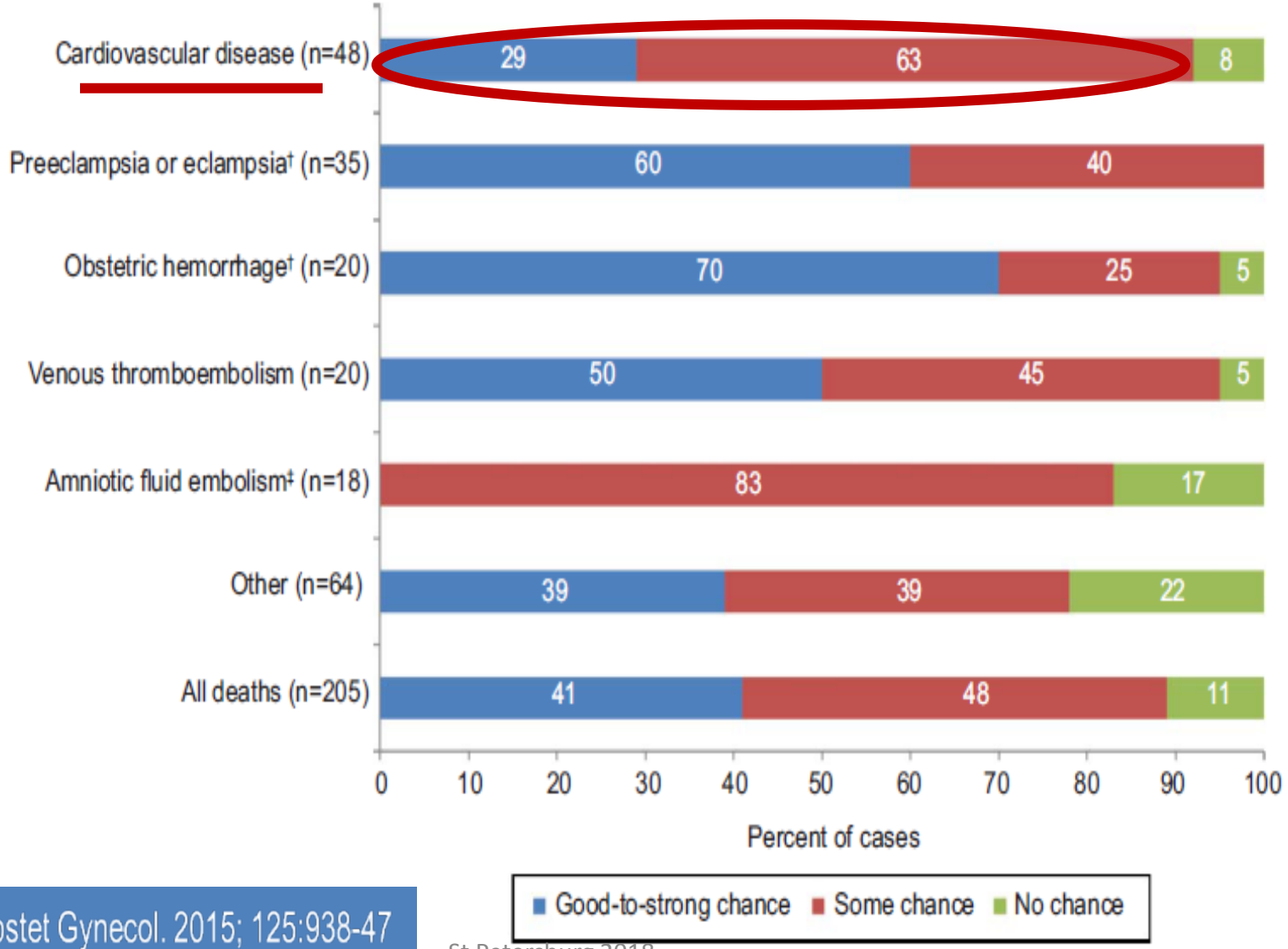
Classification of care

	Women who died N (%) (n=11)
Good care	3 (27)
Improvements to care which would have made no difference to outcome	1 (9)
Improvements to care which may have made a difference to outcome	7 (64)

Classification of care

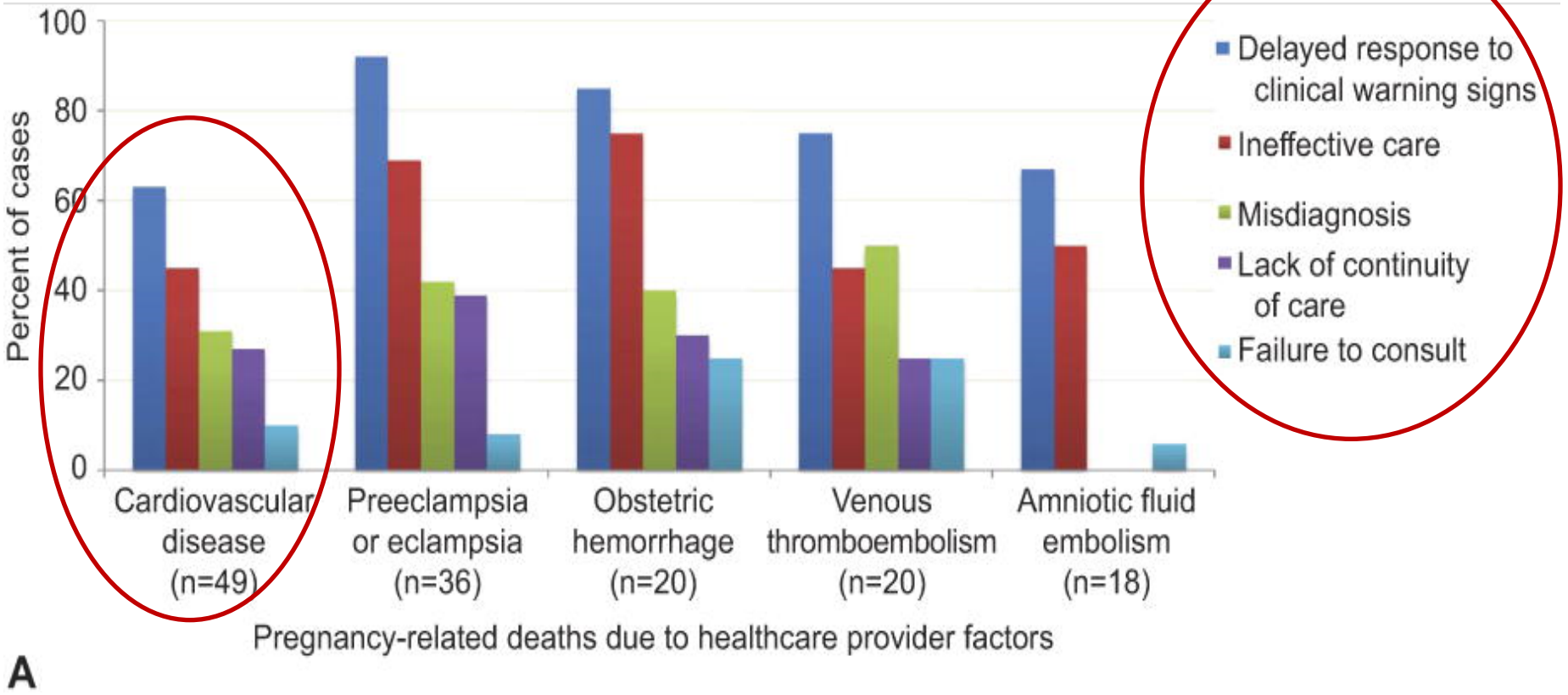
	Women who died N (%) (n=11)	Women who survived N (%) (n=32)
Good care	3 (27)	17 (53)
Improvements to care which would have made no difference to outcome	1 (9)	5 (16)
Improvements to care which may have made a difference to outcome	7 (64)	10 (31)

Chance to alter outcome among 205 causes of pregnancy related death, California, 2002–2005.



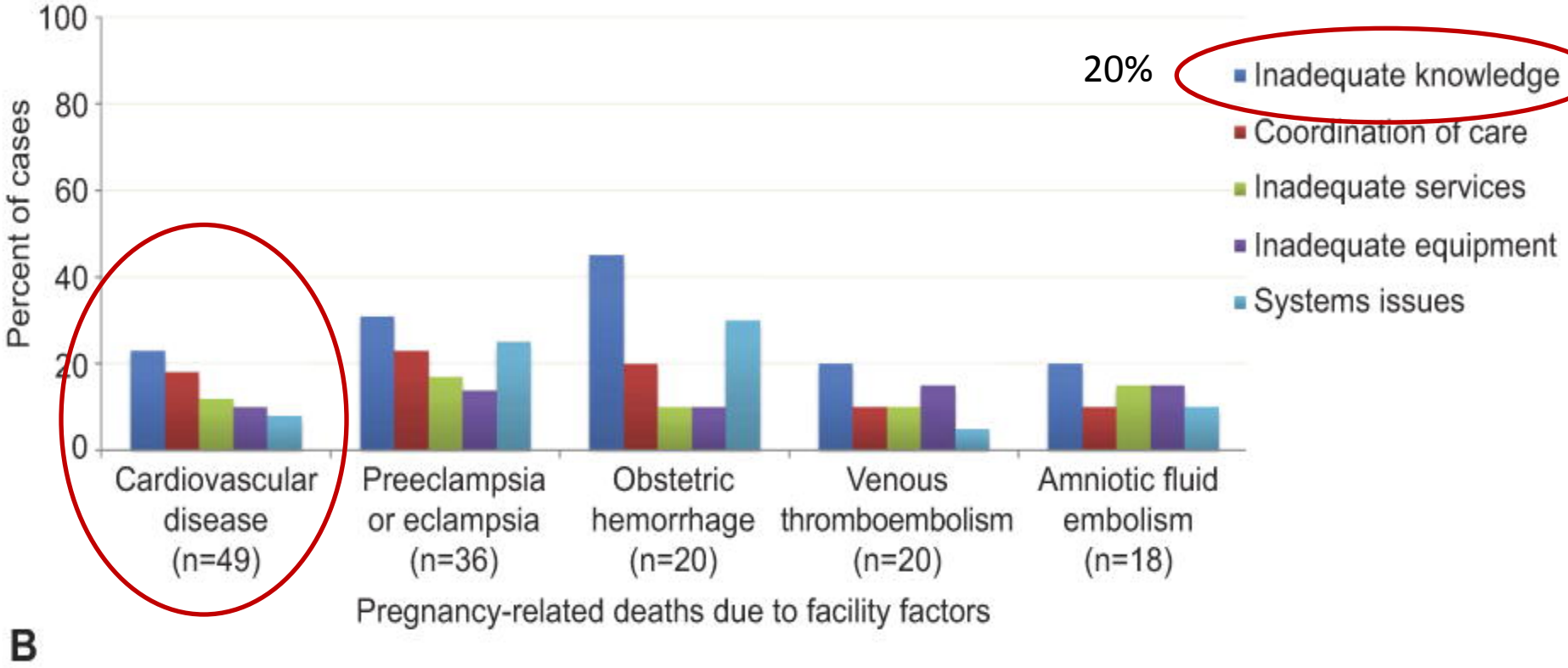
Main EK et al. Obstet Gynecol. 2015; 125:938-47

Pregnancy-related deaths due to healthcare provider factors



Main EK et al. Obstet Gynecol. 2015; 125:938-47

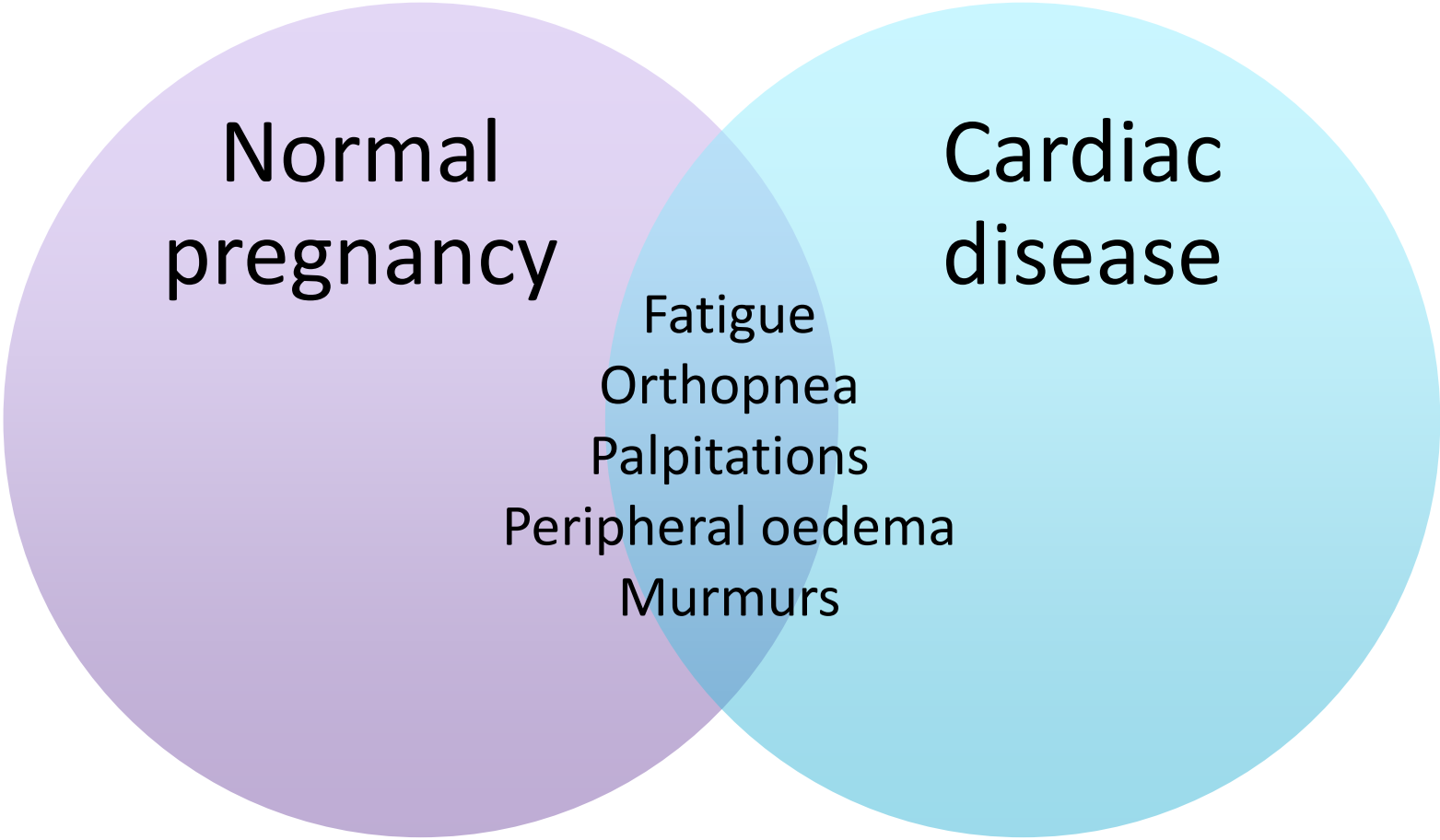
Pregnancy-related deaths due to facilities factors



Main EK et al. Obstet Gynecol. 2015; 125:938-47

How do we care for cardiac patients in labor and delivery?

Physiology or pathology?



Anaesthetic management

- Early involvement
- Maintained involvement throughout pregnancy
- Plan delivery
- Care after delivery
- Have a plan B

Early assessment

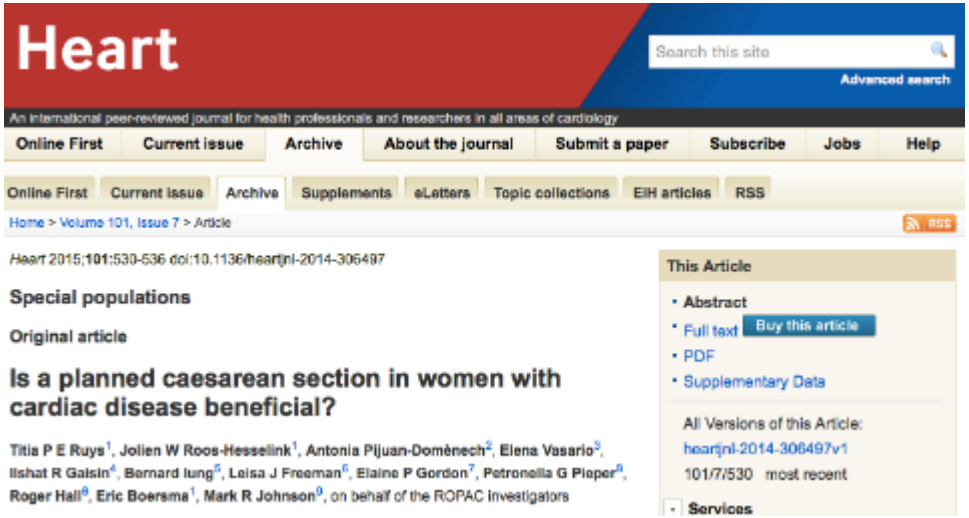
- Every patient with a history of
  - cardiac disease
  - family history
  - disease associated with cardiac manifestations
    - Marfans
    - Ehlers-Danlos

NEEDS RISK ASSESSMENT EARLY ON

Management during pregnancy

- Lead clinician to co-ordinate care
- What investigations/monitoring is required
  - ECHO
  - Fetal assessment growth scans
- Cardiac medication
  - Altered pharmacokinetic
  - Impact on fetus
- Management of thromboprophylaxis

Mode of delivery



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Heart 2015;101:530-536 doi:10.1136/heartjnl-2014-306497

Special populations

Original article

Is a planned caesarean section in women with cardiac disease beneficial?

Titia P E Ruys[1], Jolien W Roos-Hesselink[1], Antonia Pijuan-Domènech[2], Elena Vasario[3], Ilshat R Galsin[4], Bernard Iung[5], Leisa J Freeman[6], Elaine P Gordon[7], Petronella G Pieper[8], Roger Hall[8], Eric Boersma[1], Mark R Johnson[9], on behalf of the ROPAC Investigators

This Article

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heartjnl-2014-306497v1

101/7/530 most recent

Services

1262 deliveries, between January 2007 and June 2011

- CS was planned in 31% of women
- Vaginal delivery planned in 69% of women
- Perinatal mortality and low apgar score were not significantly different Gestational age & birth weight were lower in women delivered by CS
- No difference in maternal mortality, postpartum heart failure or haemorrhage

Anaesthesia

- Neuraxial if no contraindication
  - Low dose epidural analgesia
  - CSE for caesarean section
  - Induction of labour may be appropriate in order to optimize the timing of delivery in relation to anticoagulation

A woman with a metallic prosthetic aortic valve for congenital AS became pregnant after pre-conception counseling. During pregnancy she had frequent, regular multidisciplinary review by senior clinicians. The heart valve function deteriorated. She underwent successful elective CS at term, with intensive monitoring of her anticoagulation

Developing individualised, multidisciplinary care plans requires good organization, effective administration and a lot of time.

Of 11 death, 9 involved metallic heart valves

Pregnancy in women with prosthetic heart valves

BJOG An International Journal of Obstetrics and Gynaecology

DOI: 10.1111/1471-0528.14478 Maternal medicine

58 cases

3.7 / 100 000

5 deaths

Complications in women with prosthetic heart valves

- 29% haemorrhagic complications – no difference between CS and VD
- 25 % thrombotic complications
- 9% mortality
- 41% serious mat morbidity
- 47% poor fetal outcome
- Good outcome for both 28%

Women who died

Type and cause of death	2003–05	2006–08	2009–14
Stenosis or other valve dys	3	0	4
Thrombosed valve	0	2	4
Infective endocarditis	2	2	2
Cerebrovascular accident	-	-	1

Sources: CMACE, MBRRAC

Women who survived m

Maternal complications	
Bleeding complication	*11*
CVA	*2*
Valve thrombosis	*3*

A multiparous woman who spoke little English had had a mechanical valve replacement as a child. She had aortic regurgitation and left ventricular dilatation.

She was prescribed 1 x day LMWH but did not see an obstetrician until the 2nd trimester. She was not reviewed by a consultant or had an ECHO until the 3rd trimester.

LMWH was stopped prior to induction of labour. She was discharged home 1 day after vaginal delivery and advised to book an appointment at the haematology clinic.

She was admitted 2 weeks later with valve thrombosis and suffered a thrombotic CVA

Pregnancy in women with prosthetic heart valves

- Women with prosthetic heart valves are at extremely high risk and should be referred to specialist centres at the earliest opportunity. They need expert obstetric, haematology, cardiology and anaesthetic input
- 88% women required more LMWH than non-pregnant dose by 10 weeks gestation
- Anti Xa should be 0.9 – 1.2 units/ml

- New onset of cardiorespiratory symptoms and/ or absence of valve clicks in women with prosthetic heart valves should prompt careful echocardiography and early review by a senior cardiologist to exclude the possibility of thrombosis

Management of uterine atony in women with cardiac disease

Some women with heart disease are particularly vulnerable to PPH

Uterotonic agents are vasoactive & can have adverse cardiovascular effects

The risk of using uterotonic agents must be weighed against the risk of bleeding

Senior clinicians

Cardiac conditions in which PPH would be poorly tolerated

[but also vasodilation & tachycardia]

Fixed, low cardiac output / unable to increase CO

Pre-load dependent circulation

- Severe systemic ventricular dysfunction [EF <30%]
- Severe valvular stenosis
- Hypertrophic cardiomyopathy + diastolic dysfunction/ outflow tract obstruction
- Pulmonary arterial hypertension
- Fontan circulation
- Cyanotic heart disease

Cardiovascular effects of uterotonics

Oxytocin

Dose related systemic hypotension due to vasodilation

Chest pain, ?coronary spasm

Maximum bolus dose 5 units/ 10 mins [Yentis 2006]

3 units/ 15 seconds [Tsen 2010]

Infusion

Cardiovascular effects of uterotonics

Prostaglandin PGF_{2a}

Increased pulmonary vascular resistance

Brochoconstriction

Pulmonary oedema

Avoid in asthma, increased pulmonary arterial pressure, single ventricle and shunt lesions. [Mohan 2014]

Avoid in significant heart disease [Yentis 2006]

Cardiovascular effects of uterotonics

Ergometrine

Systemic & pulmonary hypertension

Bronchoconstriction

Coronary artery spasm, pulmonary oedema

Contraindicated in hypertensive disorders, coronary artery disease, aortic aneurysm

Cardiovascular effects of uterotonics

Misoprostal

Less vasoactive [Ramsay 2000]

Angina, myocardial infarction and stroke at higher doses [Prescrire 2015]

Has been used for 3rd stage but not in heart disease [Conde-Agudelo 2017].

Aortopathy

1st line	2nd line	Risks
Oxytocin	Misoprostal	Aortic dissection/rupture
	PGF_{2a}	Ergometrine

contraindicated

Marfans
Aortic dilatation >45mm
Previous disection

Low/ fixed output states

1st line	2nd line	Risks
Oxytocin infusion	Misoprostal PGF_{2a}	Decompensation Avoid carbetocin

EF < 30%
Severe valve stenosis
Hypertrophic cardiomyopathy with systolic dysfunction
PT
Fontan circulation
Cyanotic heart disease

Coronary artery disease

1st line	2nd line	Risks
Oxytocin	Misoprostal	Coronary ischaemia Avoid ergometrine

Summary

- Cardiac disease in pregnancy is increasing globally
- It is often poorly managed resulting in avoidable mortality
- It can only be successfully managed by a multidisciplinary team of senior clinicians

The obstetric anaesthetist as

PERI-PARTUM PHYSICIAN

our role for the future

Thank you for your attention