IMOET National Meeting
Tuesday 30th September 2014
Dublin Castle

Standardisation of multidisciplinary obstetric emergency training nationally.

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

IMOET
Irish Multidisciplinary
Obstetric Emergency Training

Maternal sepsis

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Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

IMOET
Irish Multidisciplinary
Obstetric Emergency Training

Maternal sepsis in the UK

- Mortality late 1980s: 0.4/100,000 maternities
- Mortality 2006-8: 1.13/100,000 maternities
- Leading cause of direct death
- Increase mainly community – acquired Group A streptococcus postpartum

(CMACE, 2011)

Challenges of maternal “sepsis”

- Terminology and classification
- Incidence
- Early diagnosis
- Effective management
- Pregnancy considerations

Terminology

- Maternal sepsis?
- Obstetric sepsis?
- Puerperal sepsis?
- Maternal septicaemia?
- Maternal infection?

Incidence of infection

- Success of prevention/vaccinations?
- Population served?
- Diagnostic criteria?
- Healthcare resources?
- Incidence of obstetric interventions?
- Coding/IT systems?
- Hospital or community?

Sepsis (ICD-10 8th Edition)

- Clinical syndrome
- Infection and systemic inflammatory response (SIRS)
- Blood culture may not be helpful

(DOH, 2015)

Maternal infection

- Infections specific to pregnancy
- Infections aggravated by pregnancy
- Infections incidental to pregnancy

Pregnancy-specific infections

1. Chorioamnionitis
2. Endometritis ± retained products
3. Perineal infections
4. CS wound infections
5. Lactational mastitis

- May progress to bacteraemia or sepsis

Chorioamnionitis/Endometritis

- Clinically subtle or florid
- Site of infection not visible
- Microbiological access difficult
- Microbiology may be unhelpful
- Placental bed vulnerable to bacteraemia
- Associated with cervical dilatation and PSROM
- Oligo-hydramnios decreases antibiotic tissue levels
- Timing of delivery (or ERPC) challenging

Wound, perineal, breast infections

- Associated with pain, discharge
- Erythema, swelling visible
- Diagnosis can be made early
- Microbiological cultures feasible
- Sepsis is rare
- Physiological changes resolving
- Choice of antibiotics easier
- Often present in community setting

Pregnancy non-specific infections

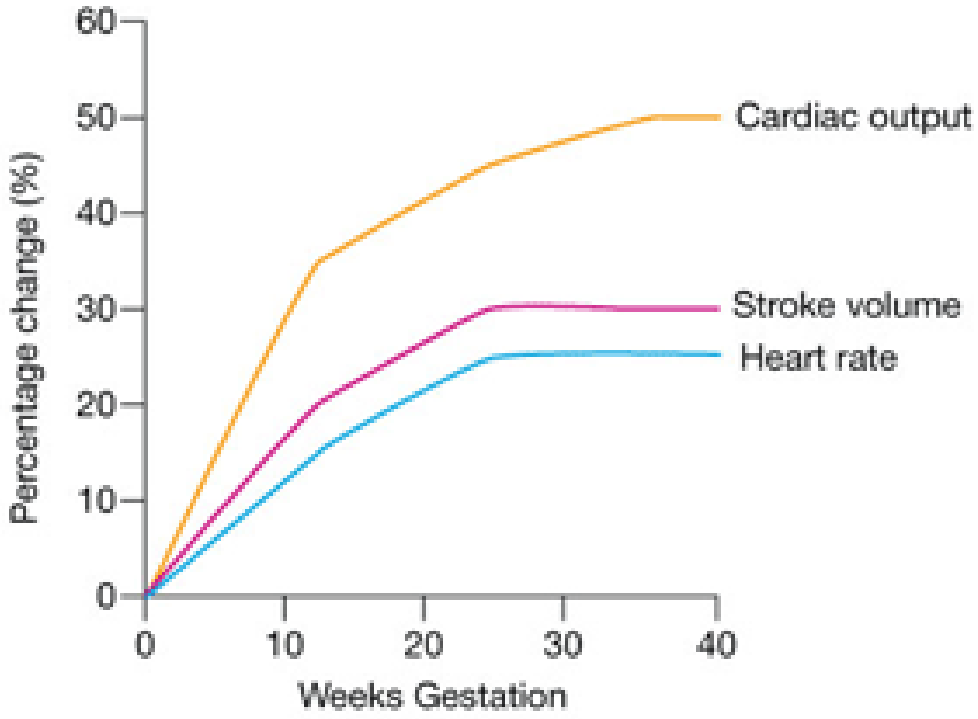
- Increased susceptibility e.g. urinary tract
  toxoplasmosis
  listeria
- Increased severity e.g. influenza, varicella
- Hesitancy e.g. prophylaxis, treatment
- Emerging organisms

(Jamieson et al, 2006)

Challenges in pregnancy

- Physiological changes may alter recognition
- Changes alter diagnostic criteria
- Modulation of immune system
- Altered pharmacokinetics
- Risks to the fetus
- Aorto-caval compression
- Vulnerability of uterine cavity

Maternal Cardiovascular Changes



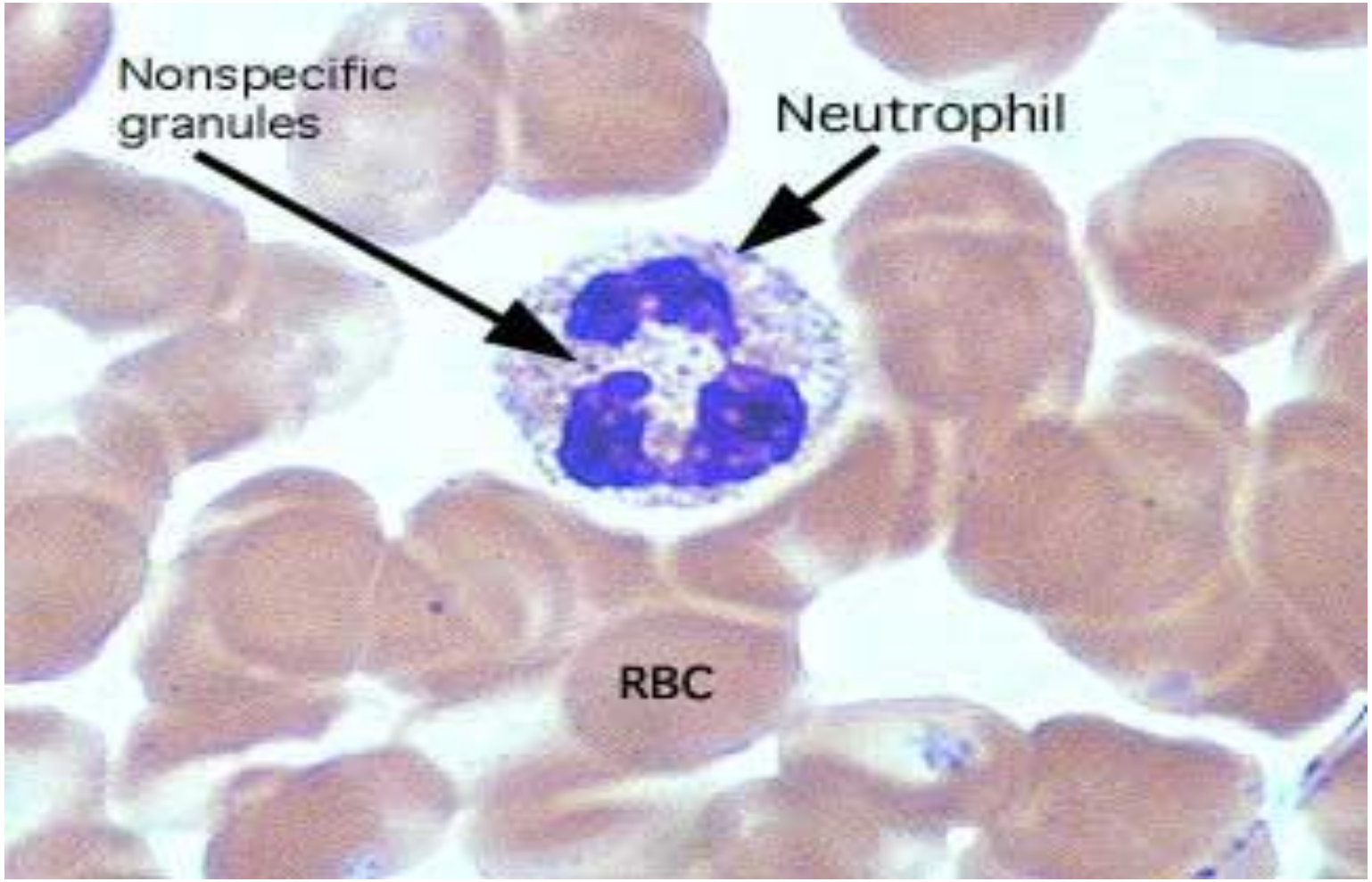
AnaesthesiaUK

Vital signs in pregnancy

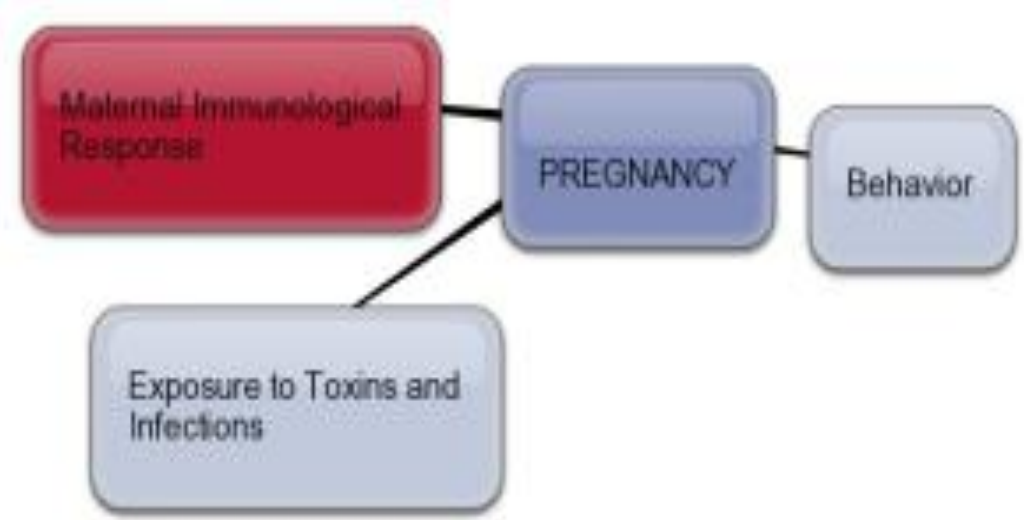
- HR: ↑ by 15 – 20 /min by T3
- Temperature: no change
- BP: diastolic decreases up to 28 weeks
- RR: increased 1 – 2/min

(Tan and Tan, 2013)

White cell count



Immune modulation



C-reactive protein

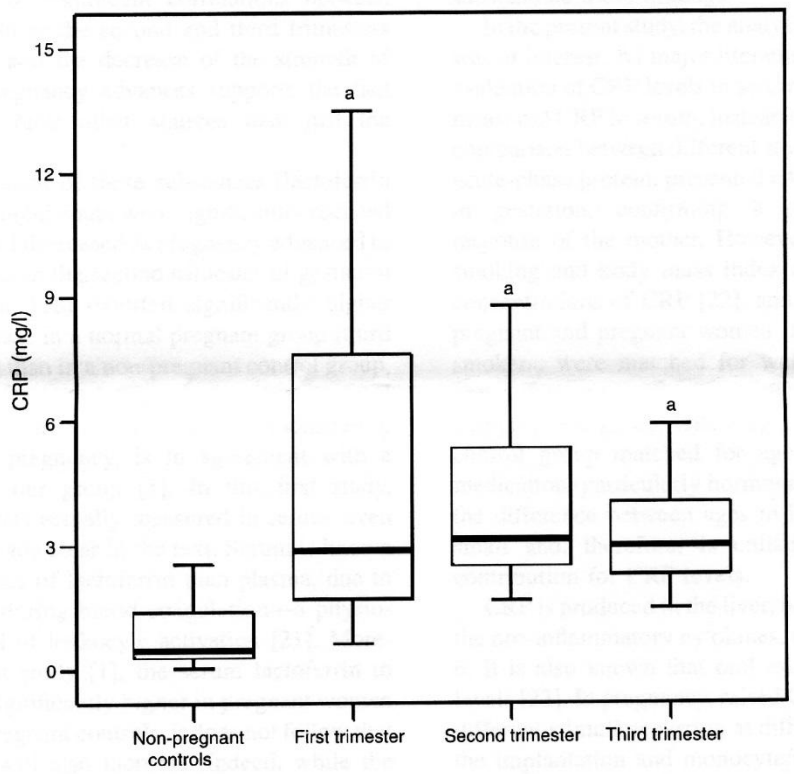
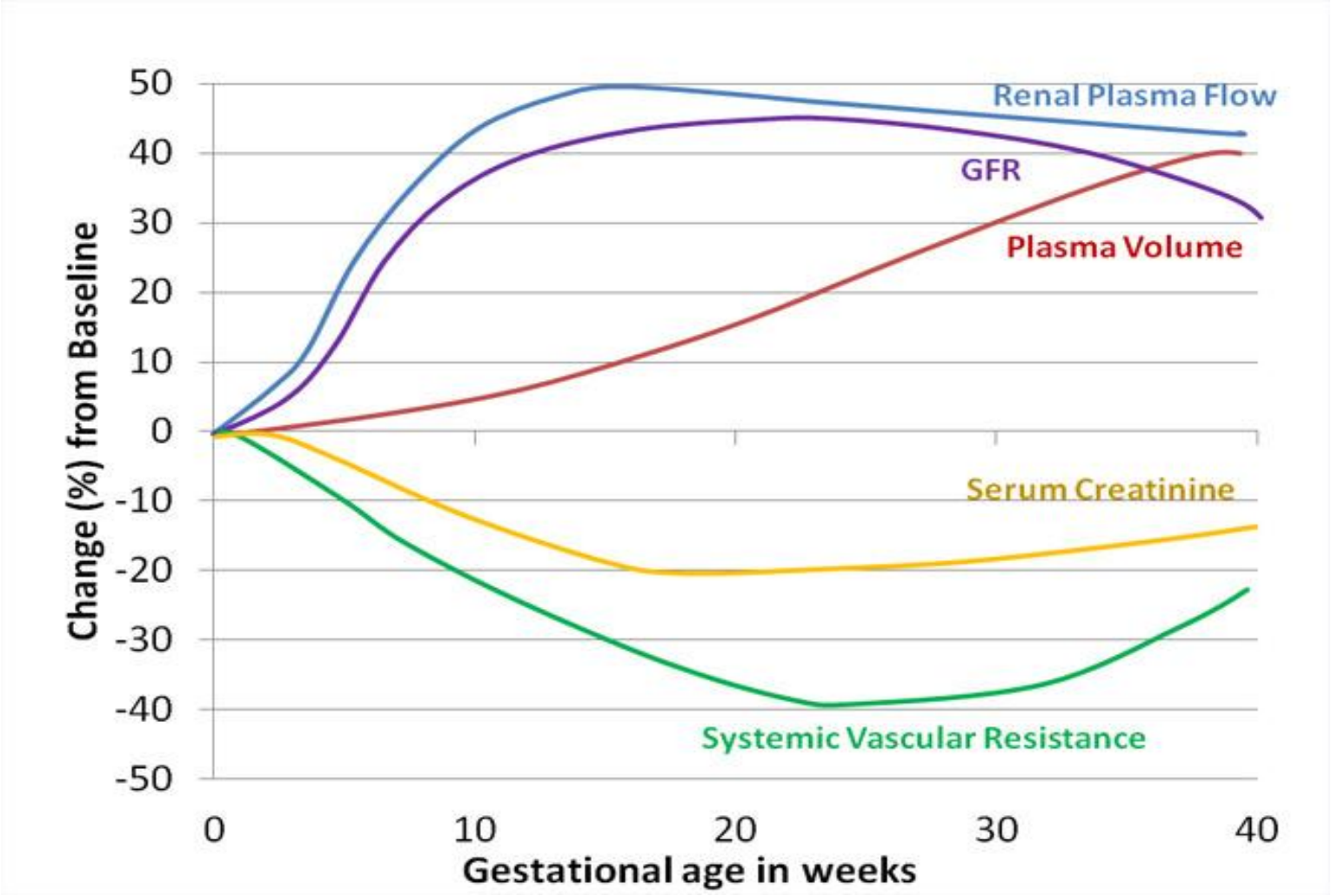
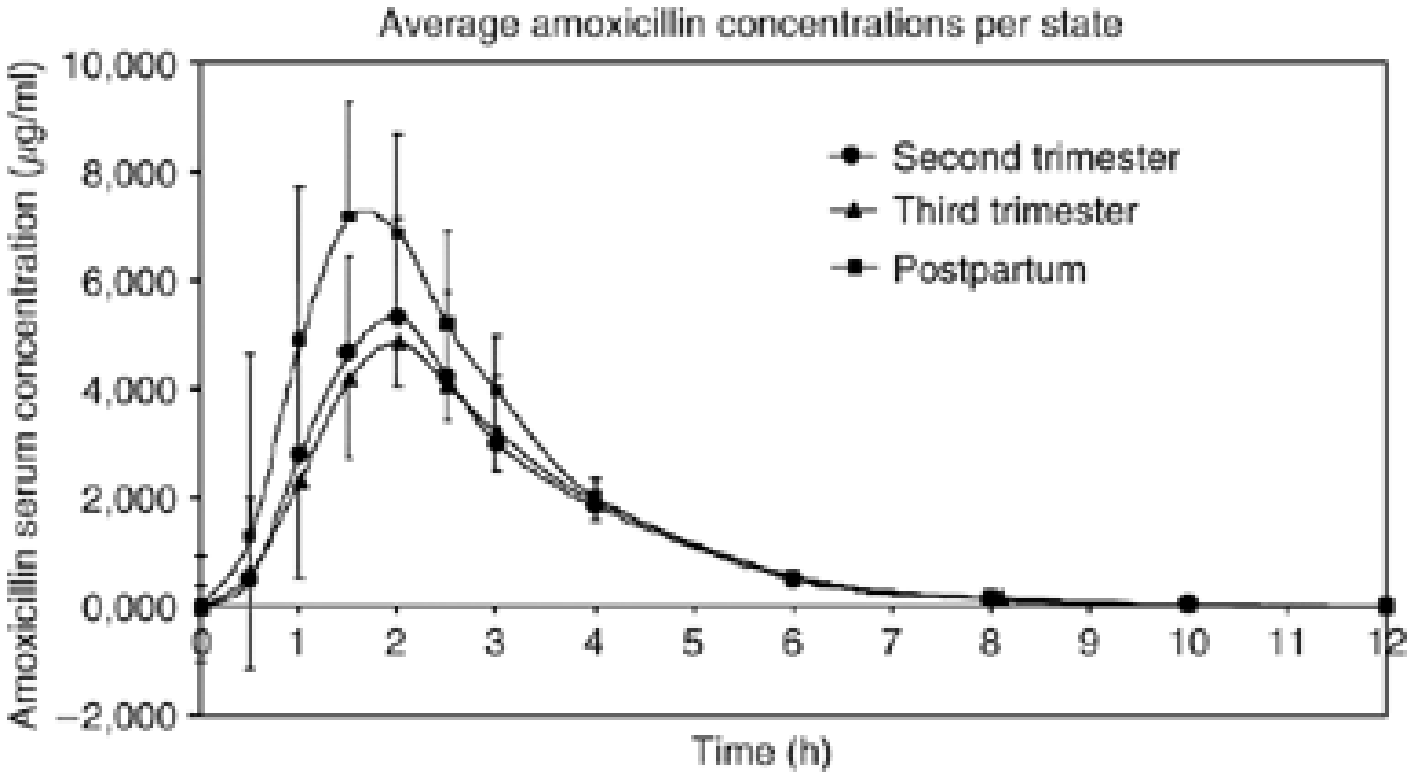


Fig. 1. Distribution of C-reactive protein (CRP) in non-pregnant controls and normal pregnant women in the first, second and third trimesters of gestation. The boxes represent the interquartile range (IQR), with the upper and lower edges of the boxes representing the 75th and 25th percentiles, respectively. The central horizontal lines within the boxes represent median levels for each group. The vertical whiskers above and below the boxes represent the range of outlying data points up to 1.5 times the IQR; (a) $P < 0.001$ vs. non-pregnant controls.

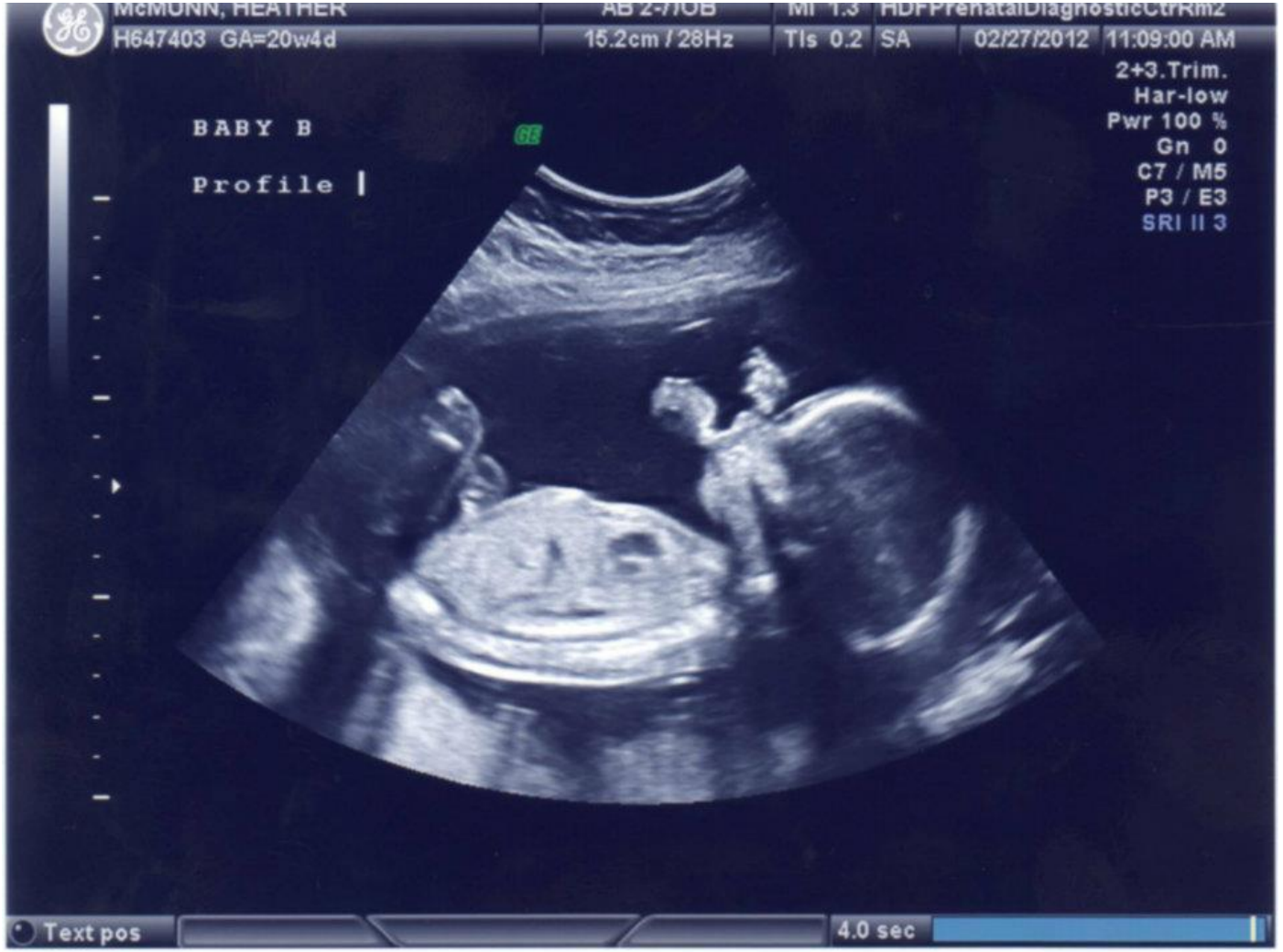
Renal changes



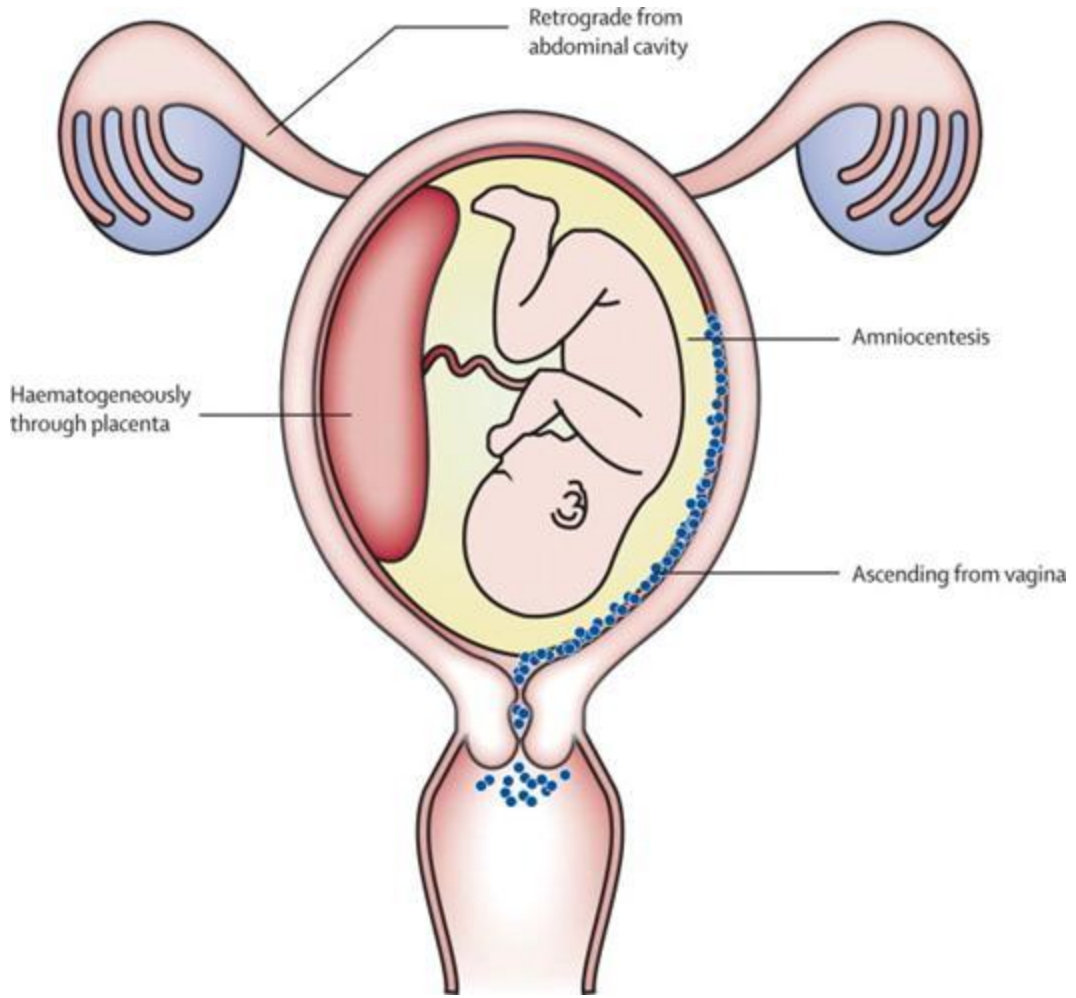
Antibiotic pharmacokinetics



Two patients



Uterine infection



Maternal vital signs

- Recordings dispersed throughout records
- No trending of vital signs
- Measurements not simultaneous
- Potential for omissions
- RR not recorded
- Lack of standardisation of EWS
- No audit or validation

Document Number (eg. 1, 2):

Booking BP: /

Gestation at Booking (weeks):

IMEWS Triggers Key

IMEWS Trigger	Normal Values	Yellow Zone	Pink Zone
Respiratory rate (bpm)	11-19	20-24	≤10 or ≥25
SpO_2 (%)	96-100	-	≤95
Temperature (°C)	36.0-37.4	35.1-35.9 or 37.5-37.9	≤35 or ≥38
Maternal HR (BPM)	60-99	50-59 or 100-119	<50 or ≥120
Systolic BP (mmHg)	100-139	90-99 or 140-159	<90 or ≥160
Diastolic BP (mmHg)	50-89	40-49 or 90-99	<40 or ≥100
AVPU	Alert	-	Voice, Pain or Unresponsive

Contact appropriate doctor for early intervention if the woman triggers one PINK or two YELLOW zones at any one time

Year:	Date :																			
	Time :																			
Resp. Rate per min	≥25																			≥25
	20-24																			20-24
	11-19																			11-19
	≤10																			≤10
SpO_2 Pink/Red Triggers	96-100%																			96-100%
	≤95%																			≤95%
Temp °C	≥38.0																			≥38.0
	37.5-37.9																			37.5-37.9
	36.0-37.4																			36.0-37.4
	35.1-35.9																			35.1-35.9
	≤35.0																			≤35.0
Maternal Heart Rate	120																			120
	110																			110
	100																			100
	90																			90
	80																			80
	70																			70
	60																			60
	50																			50
Systolic Blood Pressure	170																			170
	160																			160
	150																			150
	140																			140
	130																			130
	120																			120
	110																			110
	100																			100
	90																			90
	80																			80
	70																			70
Diastolic Blood Pressure	110																			110
	100																			100
	90																			90
	80																			80
	70																			70
	60																			60
	50																			50
	40																			40
Urine	Protein																			Protein
	Glucose																			Glucose
	Other																			Other
Pain Score 0-10																				Pain Score
AVPU Neuro Response	Alert (A)																			A
	Voice (V)																			V
	Pain (P)																			P
	Unresponsive (U)																			U
Total Yellow Zones																				Total yellow zones
Total Pink Zones																				Total pink zones
Initials																				Initials

Maternal vital signs post-IMEWS

- Recording consolidated
- Trends obvious
- Measurements contemporaneous
- Omissions obvious
- Recordings improved especially RR
- Charts, escalation standardised
- National audits

(Maguire et al, in press)

Surviving Sepsis Campaign (SSC)

- First guideline published 2004
- Literature updated autumn 2012
- Critical Care Medicine 2013;41:580
- NCEC guideline for adult sepsis Nov. 2014

Definition of Sepsis

Sepsis is a systemic inflammatory response (SIRS) due to confirmed or suspected infection

(SSC, 2013)

Surviving Sepsis Campaign

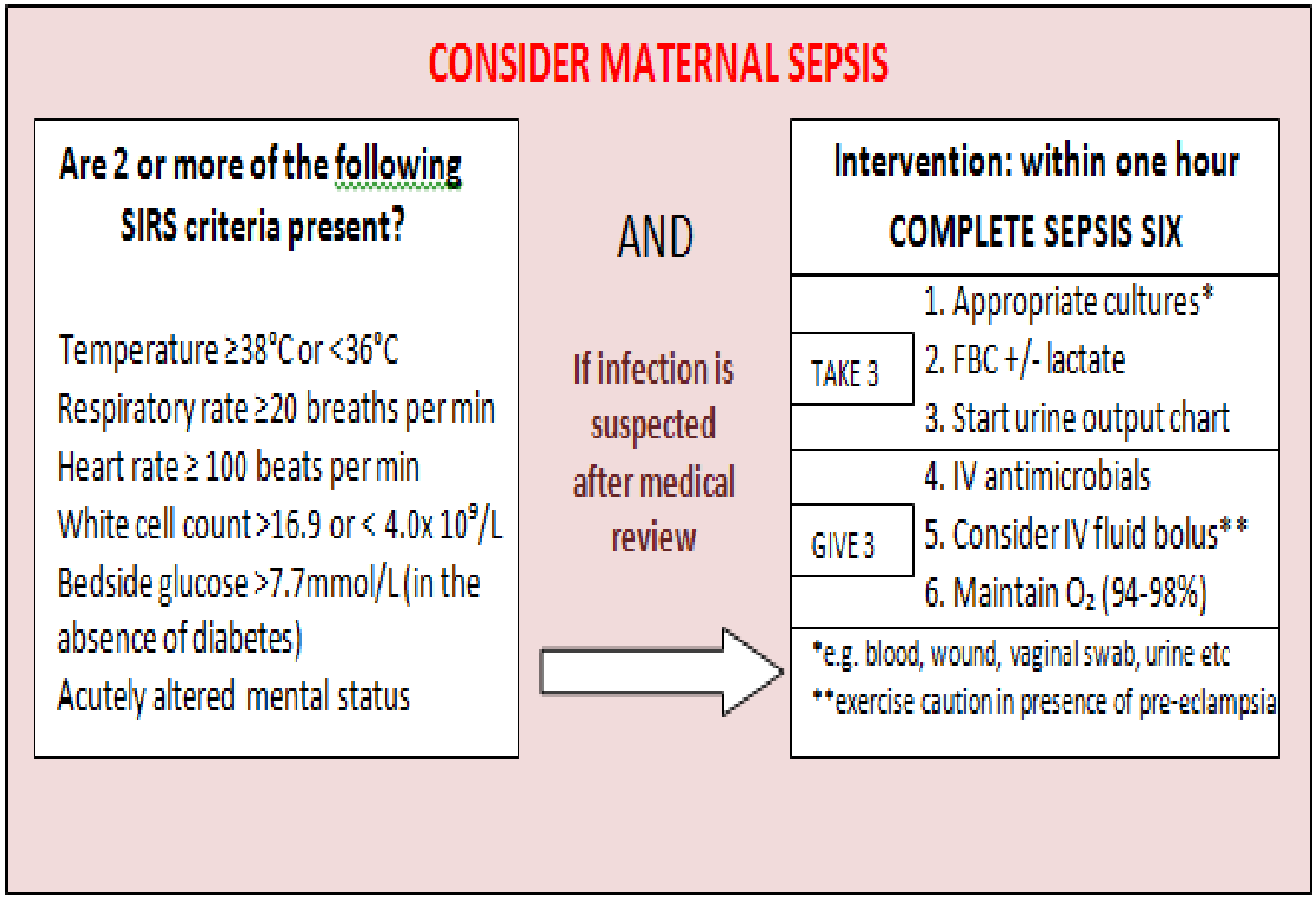
- Definitions were agreed for the non-pregnant adult patient
- Special considerations for paediatric patients
- No considerations for pregnancy
- No agreed criteria for SIRS in pregnancy!

(SSC, 2004)

Sepsis Six Box

	NEWS	IMEWS
Temperature (C)	> 38.3°	> 37.9
RR/min	> 20	> 19
HR/min	> 90	> 99
WCC (x 10^9/L)	> 12.0	> 16.9
Hyperglycaemia (not DM)	√	√
Altered mental state	√	√

(HSE/RCPI, 2014)


CONSIDER MATERNAL SEPSIS
Are 2 or more of the following SIRS criteria present?
Temperature ≥38°C or <36°C
Respiratory rate ≥20 breaths per min
Heart rate ≥ 100 beats per min
White cell count >16.9 or < 4.0x 10⁹/L
Bedside glucose >7.7mmol/L (in the absence of diabetes)
Acutely altered mental status
AND
If infection is suspected after medical review
Intervention: within one hour
COMPLETE SEPSIS SIX
TAKE 3
1. Appropriate cultures*
2. FBC +/- lactate
3. Start urine output chart
GIVE 3
4. IV antimicrobials
5. Consider IV fluid bolus**
6. Maintain O2 (94-98%)
*e.g. blood, wound, vaginal swab, urine etc
**exercise caution in presence of pre-eclampsia

(HSE, 2014)

Hospital Name: .....

Ward: .....

Woman's Name:
Date of Birth:
Healthcare Record No:
Addressograph

Irish Maternity Early Warning System (IMEWS)
Escalation Guideline

Version 1.1

ALL IMEWS TRIGGERS

Consider context and complete full clinical assessment.
Implement measures to reduce triggers if appropriate.
Complete a full set of observations on IMEWS immediately.
Inform the Midwife in charge.

1 YELLOW	*2 YELLOWS OR 1 PINK*	*>2 YELLOWS OR ≥2 PINKS*
Repeat full set of observations on IMEWS after 30 and before 60 minutes.	Call the obstetrician to review. Repeat a full set of observations after 30 minutes.	Call the obstetrician and request immediate review. Repeat a full set of observations within 15 minutes or monitor continuously.

ALL IMEWS TRIGGERS

Liaise with the Midwife in charge
Document all communication including:
- **Redefined plan of care**
- **Ongoing frequency of observations**

IMPORTANT:

1. **If concerned about a woman, escalate care regardless of triggers.**
2. **If action is not carried out as above, CMM/Midwife in charge must contact the senior obstetrician on duty.**
3. **Document all communication and management plans in notes.**

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AND

If infection is suspected after medical review

Intervention: within one hour
COMPLETE SEPSIS SIX

TAKE 3	1. Appropriate cultures*
	2. FBC +/- lactate
	3. Start urine output chart
GIVE 3	4. Maintain O_2 (94-98%)
	5. Consider IV fluid bolus**
	6. IV antibiotics

*e.g. blood, wound, vaginal swab, urine etc
**exercise caution in presence of pre-eclampsia

Maternal bacteraemia (Coombe)

- 37584 women (2009-12)
- 58 cases (0.15%)
- No deaths, two septic shock
- Four miscarriages, two stillbirths

(O'Higgins et al, 2014)

Maternal bacteraemia (Coombe)

- Antepartum (n=19): Urinary tract
  E. coli
- Intrapartum (n=20): Genital tract
  GBS
- Postpartum (n=19): Genital tract
  E. coli

(O'Higgins et al, 2014)

Maternal bacteraemia (Coombe)

Place of birth	Bacteraemia (n=58)	Rest (n=37584)
Ireland	47%	69%
Rest of Europe	12%	17%
Africa	16%	4%
Asia	24%	7%
Other	0%	4%

(O'Higgins et al, 2014)

Maternal bacteraemia (Coombe)

- Incidence low
- Severe sepsis rare (2/58 cases)
- Clinical outcomes usually good
- Increased risk in non-EU women

(O'Higgins et al, 2014)

Maternal sepsis in the UK

- June 2011 – May 2012
- 365 confirmed cases: 4.6/100,000
- 61% confirmed in laboratory
- Genital tract commonest (31%)
- *E. coli* (20%)
- Group A streptococcus (11%)

(UKOSS Report, 2013)

Severe sepsis (USA): mortality

	Adjusted OR
Rescue cerclage	9.8
Prophylactic cerclage	3.4
Retained products	4.5
PPROM	2.5
Multiple pregnancy	1.8
African – American	2.1

(Bauer et al, 2013)

Development of maternal sepsis strongly associated with ascending genital infection

Maternal infection

- Constant vigilance e.g. IMEWS
- Fetal monitoring prenatally
- Caution in ward setting
- Clinical judgement key to Sepsis Six
- Early escalation to medical team
- Implement care decisively
- High-dose appropriate antibiotics quickly
- Pregnancy-specific sepsis preventable

Thank you

- Nursing and Midwifery
- Anaesthetists
- Obstetricians
- NEWS and IMEWS Teams
- Project and Programme Managers

Weblinks

http://www.hse.ie/eng/about/who/clinical/natclinprog/obsandgynaeprogramme/mewsguidev1.pdf

http://www.hse.ie/eng/about/Who/clinical/natclinprog/criticalcareprogramme/standards/

http://www.hse.ie/eng/about/Who/clinical/natclinprog/criticalcareprogramme/sursepguide.pdf

http://www.hse.ie/eng/about/Who/clinical/natclinprog/criticalcareprogramme/publications/guidelines.pdf

http://www.hse.ie/eng/about/Who/clinical/natclinprog/obsandgynaeprogramme/obstetricsgyneprog.html