Edinburgh International Conference of Medicine

Past, Present & Future

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Maternal Medicine

Past: Overview

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What is Maternal Medicine

• Maternal Medicine obstetricians/physicians are
  – high-risk pregnancy experts
  – specializing in the un-routine.
  – pregnant women with chronic health problems
• Extra skills
• Work with other specialists
• Ask a friend
Pregnancy was full of surprises

- Knew about
  - Eclampsia
  - Haemorrhage
  - Sepsis
- But not what to do
• There are known knowns.
  • These are things we know that we know

• There are known unknowns.
  • That is to say, there are things that we know we don't know.

• But there are also unknown unknowns.
  • There are things we don't know we don't know.

Donald Rumsfeld
Dr Ignac Semmelweis

- 1840’s, Vienna
- Realised risk factors for Puerperal Sepsis
Medical trainees came from the dissection room
Dr Ignac Semmelweis

- Cadaverous poisoning
- Should wash hands
- Chlorinated lime solutions
Puerperal Sepsis

Puerperal fever
Monthly mortality rates 1841-1849

Percent of patients

Chlorine handwash

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James Young Simpson

Ether

Chloroform

1847
John William Ballantyne

- Born 1861, Edinburgh
- Antenatal Pathology and Hygiene: The Embryo and Foetus, published in two volumes in 1902-4.2
- Father of modern Maternal Medicine
John William Ballantyne

• Chapter on fetal poisoning
  – sections on lead, mercury, phosphorus, arsenic, copper, sulphuric acid, coal gas, chloroform, ether, morphine, alcohol, and tobacco.
  – evil effect of nicotism in cutting short antenatal life
  – large infantile mortality in postnatal life
John William Ballantyne

• Chapter on fetal Infection
  – Maternofetal transmission of disease
  – Transmission of immunity
    • Some evidence of this passage of immunising materials has been found in the vaccination of pregnant women

• Advice on hygiene, diet, occupation, exercise and dress
A Plea for a Pro-Maternity Hospital

By: J. W. Ballantyne, M.B.

Ballantyne article in the BMJ, April 6, 1901

This hospital would have 2 main purposes:

- to treat cases of pathological pregnancy
- to practice ‘antenatal therapeutics’ (treating the fetus through the mother), especially in cases where the mother’s behavior might be endangering the fetus.

Along side the great lying in hospitals
John William Ballantyne

- Ballantyne's plea was answered.
- A single bed was funded at the Royal Maternity Hospital in 1901.
- By 1917 it had grown, under his direction, into a whole antenatal department.
- He wrote on the risk of pyrexia to the fetus
- Birth marks not a beginning but a stage in life's journey
- The fetus as a patient
Interventions: Antenatal Care

- Antenatal care clinics started in US, Australia, Scotland between 1910–1915
- New concept - screening healthy women for signs of disease
- By 1930’s large number (1200) ANC clinics opened in UK
- No reduction in maternal mortality
The early part of the 20th century

• In 1921 in the USA
  – childbirth was the second leading cause of death for women
  – 20% of children died in first year of life and 33% in first five years.
• Low income was an important factor in these mortality rates.
• Causes were known but what could be done
Figure 3. Maternal mortality from 1870 to 1993 in Sweden, the USA and England & Wales
1940 - UK

- Maternal death rate 2.9 per 1000
  - Puerperal fever
  - Haemorrhage
  - Convulsion
- Sulphonamides/antibiotics
- Ergometrine
- Blood transfusion
- Safe anaesthetics
- Skilled doctors
Dougal Baird       James Walker
Aberdeen          Dundee

Developed the concepts of perinatal audit
Perinatal Audit

• In Scotland stillbirths were counted from 1939
• The causes and prevention of stillbirths and first week deaths. III.
  – A classification of deaths by clinical cause; the effect of age, parity and length of gestation on death rates by cause.
  – Baird D, Walker J, Thomson AM

Maternal Mortality Reports

1952-54

2006-08

Savings Mothers’ Lives
Reviewing maternal deaths to make motherhood safer: 2006-2008

March 2011

The Eighth Report of the Confidential Enquiries into Maternal Deaths on the United Kingdom

LONDON
HER MAJESTY’S STATIONERY OFFICE
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The Audit Surveillance Cycle

1. Identify cases
2. Collect information
3. Analyse the results
4. Recommendations for action
5. Implement
6. Evaluate and refine

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Maternal Medicine

- Medical problems are responsible for over half the direct deaths
  - Sepsis
  - Thrombo-embolism
  - Hypertensive disorders

- Nearly all the indirect maternal deaths occurring in the UK
  - Cardiac disease
  - CNS
  - Other
Maternal Medicine

• Specialises in the dealing with physical health problems in pregnant women
  – that precede the pregnancy (such as epilepsy, asthma or heart disease)
  – develop during pregnancy (such as gestational diabetes, and hypertension)
Obstetric Medicine

• Effect of pregnancy on medical condition
• Effect of medical condition on pregnancy
• Adaption to pregnancy
  – Pregnancy changes
  – Fetal effects
  – Labour/Post partum risk remains
Pregnancy Changes
Weight Gain

**Figure 10-1** Pattern and components of average maternal weight gain during pregnancy. (From Pitkin.)
CVS

Intravascular fluid volume: + 35%
  Plasma volume: + 45%
  Erythrocyte volume: + 20%

Cardiac Output: + 40%
  Stroke volume: + 30%
  Heart rate: + 15%

 Peripheral Circulation:
  Systolic BP: - 15%
  Diastolic BP: - 15%

Systemic Vascular Resistance: - 15%
Femoral Venous Pressure: + 15%
Physiologic Changes in Pregnancy

- **Plasma Volume (ml)**
  - Non-Pregnant: 2250
  - 4 weeks: 2500
  - 8 weeks: 2750
  - 12 weeks: 3000
  - 16 weeks: 3250
  - 20 weeks: 3500
  - 28 weeks: 3750
  - Post-delivery: 2250

- **Heart Rate (bpm)**
  - Non-Pregnant: 70
  - 4 weeks: 70
  - 8 weeks: 80
  - 12 weeks: 80
  - 16 weeks: 80
  - 20 weeks: 80
  - 28 weeks: 90
  - Post-delivery: 70

- **Stroke Volume (ml)**
  - Non-Pregnant: 60
  - 4 weeks: 60
  - 8 weeks: 60
  - 12 weeks: 60
  - 16 weeks: 60
  - 20 weeks: 60
  - 28 weeks: 60
  - Post-delivery: 60

- **Cardiac Output (l/min)**
  - Non-Pregnant: 4
  - 4 weeks: 4
  - 8 weeks: 4
  - 12 weeks: 4
  - 16 weeks: 4
  - 20 weeks: 6
  - 28 weeks: 8
  - Post-delivery: 4

- **Gestation (Weeks)**
  - Gestation: 0 to 36 weeks

**Graph Legend:**
- **Red Line**: Plasma Volume
- **Blue Line**: Heart Rate
- **Green Line**: Cardiac Output and Stroke Volume
Cardio-respiratory

Main problems are throughput problems
Stenotic lesions
Cardiac function abnormalities
“Heart strain”

Times of risk - 1st trimester

Labour/puerperial period
Respiratory System

Minute Vent:
- Tidal Vol: + 40%
- Resp Rate: + 10%

Functional RC:
- End Resp Vol: - 20%
- Residual Vol: - 20%

Oxygen consumption:
- + 20%
Respiratory changes

• Main problem are throughput problems
  – Bronchial restriction – Asthma, COPD.
  – Restrictive disease - fibrosis
  – “Respiratory strain”

• Times of risk – 3rd trimester
• Labour/puerperial period
Renal Changes
Renal system

- ↑ RBF, GFR & Creatinine clearance
- ↑ Tubular reabsorption rate
- Blood Urea Nitrogen 40% ↓

- Gradient to allow nitrogen waste from fetus
- Ability to respond depends on reserve
Maternal Medicine

- Cardiovascular disease
- Psychiatric causes
- Neurological disease
- Respiratory disease
- Haematology
- Renal disease
- Hepatic disease
- Endocrine disease
- Thrombophilias
- Infection
- Connective Tissue disorders
Maternal Medicine

- Cardiovascular disease
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Development of combined clinics
Obstetrician/Physician

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Indirect deaths recommendations 3

- Health workers who are caring for women in pregnancy with conditions that they are not familiar with **should consult experts** if necessary by telephone.
- Training of obstetricians following the advanced training skills module in maternal medicine and MFM subspecialisation should reflect the **importance of heart disease as a cause of maternal death**.
- **Physicians** who do not work directly with pregnant women **should know more** about the interaction between the conditions that they are treating and pregnancy.
Maternal Medicine

- UK has been slow in developing a proper curriculum for training
  - Obstetricians in Medicine
  - Physicians in Obstetrics
Michael de Swiet

Cathy Nelson Piercy

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Keeping the mother and baby safe