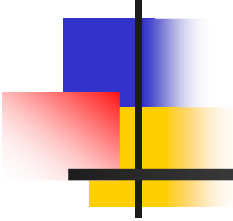


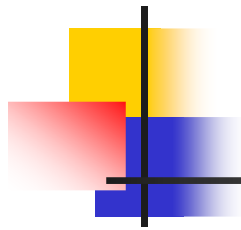
O&G Postgraduate Study Day Seminar

Care of Critically Ill Obstetric Patients in Intensive Care Unit



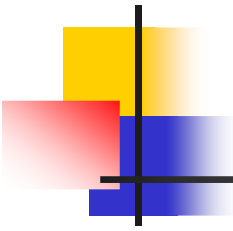
Yan Wing Wa
Department of Intensive Care
Pamela Youde Nethersole Eastern Hospital

12 April 2010



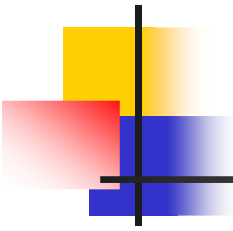
Scope

- Physiologic changes during pregnancy
- Our obstetric patients in ICU, PYNEH, from Jan 1998 to Dec 2007
 - Obstetric related
 - Non-obstetric related
- Key areas of ICU care – “FAST HUG”
- Pandemic (H1N1) 2009



Physiologic Changes in Pregnancy

- Aim: Expand maternal blood volume and support placental blood flow and fetal growth
- Blood Vol: +30-50% by 3rd trimester
- HR +10-30% by 32 weeks
- BP (slight decline in DBP, 5-10mmHg, lowest 20-26 weeks)
- CO increase 40%, highest 20-24 weeks
- $BP = CO \times SVR \rightarrow$ marked decrease in SVR
- Aortocaval compression: $\downarrow$ preload, $\uparrow$ afterload (supine hypotension syndrome)
- Large variation in CO, SV (uterine contraction)



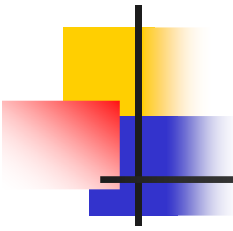
Pregnancy Physiology

Respiratory Physiology

- FRC decrease: decrease oxygen reserve
- TV increase → minute ventilation increase → lower PaCO_2
- HbO_2 dissociation curve: L shift

Renal Physiology

- GFR, Cr clearance: Increase 45%
- Creatinine production similar → lower [urea], [creatinine]



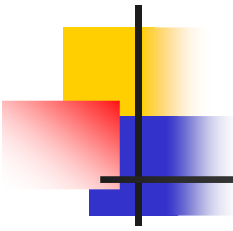
Pregnancy Physiology

GI & Liver

- Constipation, gastro-oesophageal reflux
- Deranged LFT: increase alk. phosphatase; slight decrease in albumin/globulin ratio

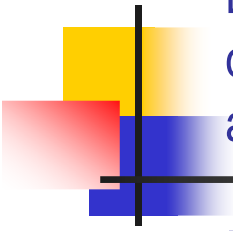
Haematologic:

- Lower Hgb (trough at 3rd trimester)
 - RBC increase (20-30%) < blood vol. increase(40-50%)
→ haemodilution of pregnancy
- Increase WCC (polymorphs)
- Increase in factor VII, X, fibrinogen (hypercoagulable state)
- Decrease in fibrinolytic activity



Other Changes

- Oral cavity mucosal edema, hyperaemic → difficult airway
 - Increase gastric acidity, cardiac sphincter relax, decrease in oesophageal & gastric motility → aspiration risk
 - Ligament laxity and pelvic discomfort
 - Anxiety and Depression
-
- All these physiological changes of pregnancy are important in interpretation of clinical information and provision of care!



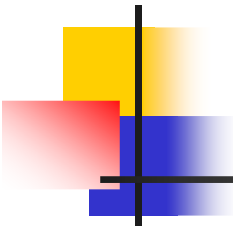
Leung YW, Lau CW, Chan KC, Yan WW. Clinical characteristics and outcomes of obstetric patients admitted to the Intensive Care Unit: a 10-year retrospective review. Hong Kong Med J 2010;16:18-25

From January 1998 to December 2007, total 50 pregnant patients were admitted to ICU of PYNEH.

0.65% of total ICU admissions (50/7,692)

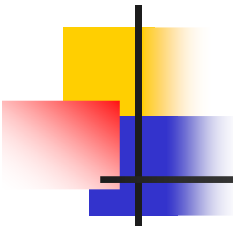
0.13% of all deliveries (50/37,505)

Diagnosis	No. of patients
Obstetric (n=35)	
Postpartum haemorrhage	19 (38%)
Pregnancy-induced hypertension	
Eclampsia	2 (4%)
Severe pre-eclampsia	3 (6%)
HELLP* syndrome	2 (4%)
Amniotic fluid embolism	3 (6%)
Ruptured ectopic pregnancy	2 (4%)
Peripartum cardiomyopathy	1 (2%)
Antepartum haemorrhage	1 (2%)
Sepsis-related	
Septic abortion	1 (2%)
Retained placenta with shock	1 (2%)



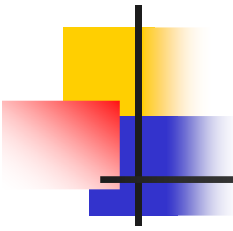
Postpartum haemorrhage

- The commonest cause of ICU admission 38%
 - Another HK study 13 years ago
- Causes
 - Placenta previa, 10 (53%)
 - Uterine atony, 7 (37%)
 - Intraperitoneal bleeding, 1 (5%)
 - Retention of placenta, 1 (5%)
 - Uterine inversion, 1 (5%)



Postpartum haemorrhage (2)

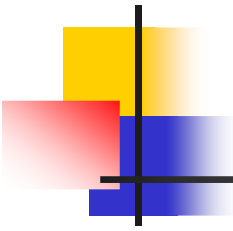
- Arterial embolisation 13 (65%)
 - 5 (38%) failed
 - 2 underwent hysterectomy
 - 2 rFVIIa
 - 1 rFVIIa + hysterectomy
- Hysterectomy 7 (35%)
 - vs. 85% in previous HK study
- 'Off-label' use of rFVIIa (NovoSeven) 3 (15%)



Pregnancy related hypertension

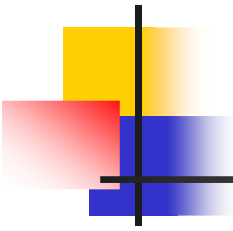
- 2nd commonest cause of ICU admission
 - 7/50 (14%)
 - Similar to Tang's study 13 year ago
 - But low when compared with other Chinese studies ~30%
- 0.019% (7/37,505) of all deliveries vs. 0.29% (115/40,176) in QEH*
 - ? related to QEH being a referral centre for whole Kowloon population
 - Mean APACHE II scores (16+/-9 vs. 8.8+/-4)

* Ng GWY, A retrospective study of clinical characteristics and outcomes of obstetric patients with pre-eclampsia or eclampsia who required intensive care in a regional hospital of Hong Kong, CCM Exit dissertation 2008



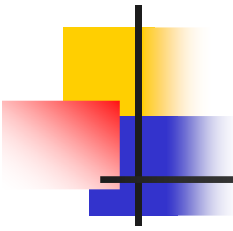
Pregnancy related hypertension (2)

- Supportive and bed-rest
- Termination of pregnancy
- Replace contracted intravascular volume
- MgSO_4 infusion
- Control BP with labetalol, hydralazine, nifedipine, methyldopa, diltiazem
- Renal replacement therapy (continuous veno-venous haemofiltration, CVVH)



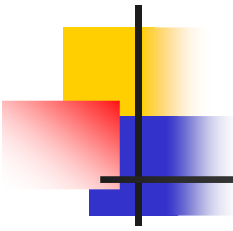
Pregnancy related hypertension (3)

- 1 patient with eclampsia & intracranial haemorrhage died
- 2 (4%) with HELLP syndrome
 - Mild
 - Responded to conservative treatment & BP control
 - No steroid
 - No plasmaphoresis



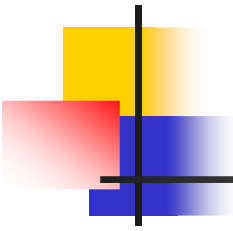
Amniotic Fluid Embolism

- 3 (6%)
 - No mortality
 - vs. usual maternal mortality 18-33%, Chinese study ~50%
- Management
 - Early diagnosis
 - Intensive peri-partum monitoring
 - Timely CS
 - Postpartum ICU care



Cardiac failure in pregnancy

- Not uncommon condition in ICU obstetric patients
- Complication of pregnancy related hypertension
- Peripartum cardiomyopathy
- Amniotic fluid embolism
- Sepsis
- Pre-existing cardiac disease



Cardiac failure in pregnancy (2)

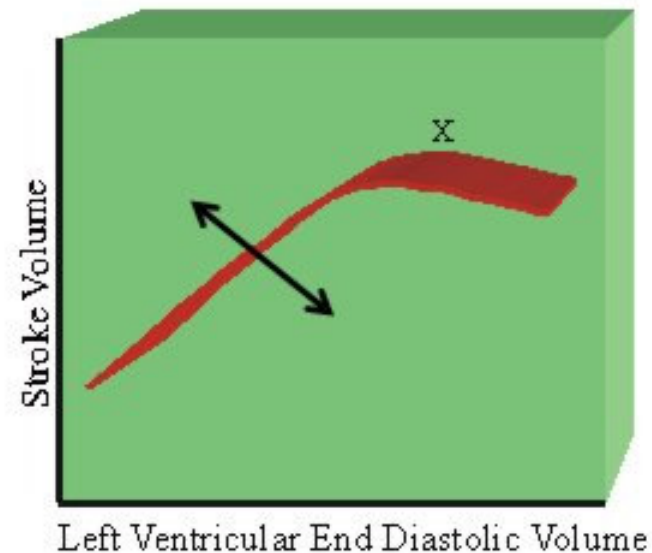
- Management
 - Preload
 - Diuretics
 - Afterload
 - Vasodilators (not in cardiogenic shock)
 - IPPV with PEEP
 - With good sedation, patient/ventilator synchrony
 - Decrease both preload and afterload
 - Improve PaO₂ and SaO₂
 - Transfer blood supply from respiratory muscle to other vital organs

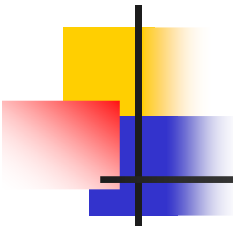
Cardiac failure in pregnancy (3)

Increase in ITP $\rightarrow$ decrease VR (LVEDV = Preload)

Figure 2. Starling's Law

Increasing the filling volume of the ventricle leads to a progressive increase in stroke volume, until a point is reached (X), where overstretching of muscle occurs and stroke volume falls. The arrow in the diagram indicates what happens with cardiac failure (downwards to the right) – the muscle is less effective, and with inotropes (upwards to the left) – muscle contractility is improved. This diagram is the basis of much of cardiac therapeutics.





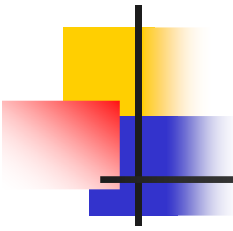
Cardiac failure in pregnancy (4)

Afterload == LV Wall Tension

Law of Laplace:

$$\text{Tension} = \frac{\text{Pressure across LV} \times \text{LV radius (r)}}{\text{LV wall thickness (h)}}$$

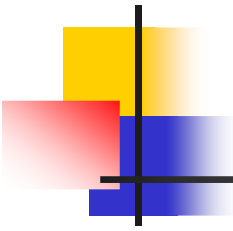
$$= \frac{(\text{LVP} - \text{ITP}) \times r}{h}$$



Non obstetric 15 (30%)

Non-obstetric (n=15)

Sepsis	
Urinary tract infection	3 (6%)
Chest infection	4 (8%)
Cardiac-related	
Chronic rheumatic heart disease	1 (2%)
Primary pulmonary hypertension	1 (2%)
Central nervous system-related	
Viral encephalitis	1 (2%)
Meningitis	1 (2%)
Intracranial haemorrhage	1 (2%)
Trauma	
Road traffic accident	1 (2%)
Thrombocytopenia for postoperative monitoring	2 (4%)



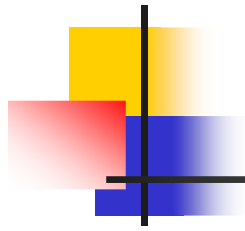
Key aspects in General Intensive Care

“FAST HUG”

- Feeding
- Analgesia
- Sedation
- Thromboembolic prophylaxis

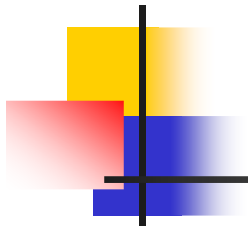
- Head-of-bed elevation
- Stress Ulcer prevention
- Glucose control

Crit Care Med 2005; 33: 1225-9
Jean-Louis Vincent



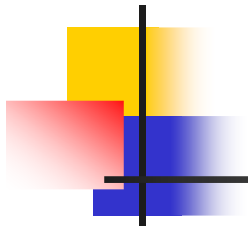
Fast Hug

- Does not cover all aspects of patient care
- May not be applicable to every patient
- Just serve as a checklist



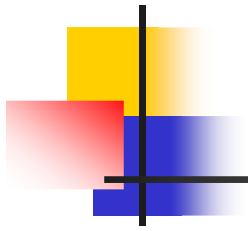
Feeding

- Can the patient be fed orally?
- If not enterally?
- If not, should we start parenteral feeding?



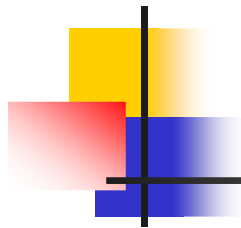
Feeding

- Usually not a problem in obstetric patients
- Fasting period is usually limited
- Calorie
 - 25 to 35 Cal/kg/day
- Nitrogen / protein
 - 1 - 1.5g/kg/day



Analgesia

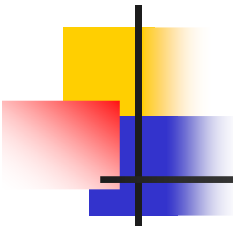
- Patient should not suffer pain
- Excessive analgesia should be avoided
- Which drugs
 - Morphine, pethidine, paracetamol, NSAIDs
- Continuous iv/epidural infusion or repeated small boluses or nerve block
- As required doses
 - Patient control
 - Nurse control



Analgesia

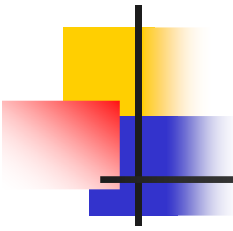
TABLE 5. Interventions undertaken in obstetric patients admitted to intensive care unit

Intervention*	No. of patients
Arterial line insertion	33 (66%)
Mechanical ventilation (total)	29 (58%)
Invasive mechanical ventilation	26 (52%)
Non-invasive mechanical ventilation	3 (6%)
Central venous catheter	26 (52%)
Radiological intervention	
Arterial embolisation	13 (26%)
Radiological imaging	
Ultrasound abdomen	7 (14%)
CT brain	6 (12%)
MRI brain	1 (2%)
CT thorax	3 (6%)
CT abdomen	1 (2%)
Angiogram	13 (26%)
Inotropic support	8 (16%)
Echocardiogram	8 (16%)
Magnesium sulphate infusion	4 (8%)
Renal dialysis	1 (2%)



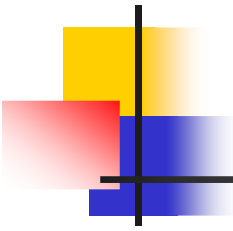
Sedation

- Patient should not experience discomfort
- Especially important in patients with heart failure and high intracranial pressure
- Excessive sedation should be avoided
 - ↑ venous thrombosis
 - ↓ GI motility
 - Hypotension
 - Prolonged mech. ventilation
 - ↑ ICU length of stay
 - ↑ cost
- Which drug?
 - Midazolam, lorazepam, propofol, dexmedetomidine



Thrombo-embolic prophylaxis

- Not uncommon in Chinese
 - Most ICU patients are at risk
 - Age > 40 years
 - High dose estrogen
 - Thrombophilia
 - Myeloproliferative disorder
 - Paraproteinaemia
 - Medical diseases e.g. CHF
 - Immobility (bed rest > 4 days)
 - Pregnancy & puerperium
- Severe obesity
 - Previous DVT or PE
 - Homocystinaemia
 - Nephrotic syndrome
 - PNH
 - Cancer



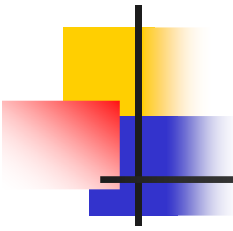
Thrombo-embolic prophylaxis

- Means
 - TED stocking
 - Sequential compression device
 - Heparin – UFH, LMWH

- Early mobilization

TED stocking and Sequential Compression Device

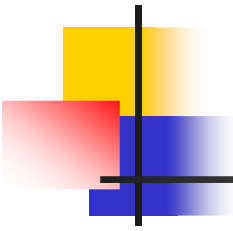




Head of Bed Elevation

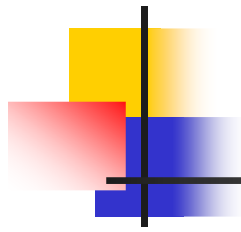
- 30° to 45° unless contraindication
 - hypotension
 - severe sore buttock
 - hip surgery
- ↓ Incidence of gastroesophageal reflux in mechanically ventilated patients
- ↓ ventilator associated pneumonia rate
- ICU performance indicator





Stress Ulcer Prevention

- For high risk only, not all ICU patients
 - Respiratory failure requiring IPPV
 - Bleeding tendency
 - Steroid use
 - Past history of peptic ulcer/GIB
- H₂ antagonist
- Proton pump inhibitor
- Antacid
- Sucralfate



Glucose Control

Van de Berghe et al

- Intensive insulin therapy in the critically ill patients

N Engl J Med 2001; 345: 1359-67

- RCT, mainly post cardiac surgery patients
 - Not very ill, median APACHE II 9
 - Target [glucose]: 4.4 – 6.1 mmol/L
- ↓ mortality

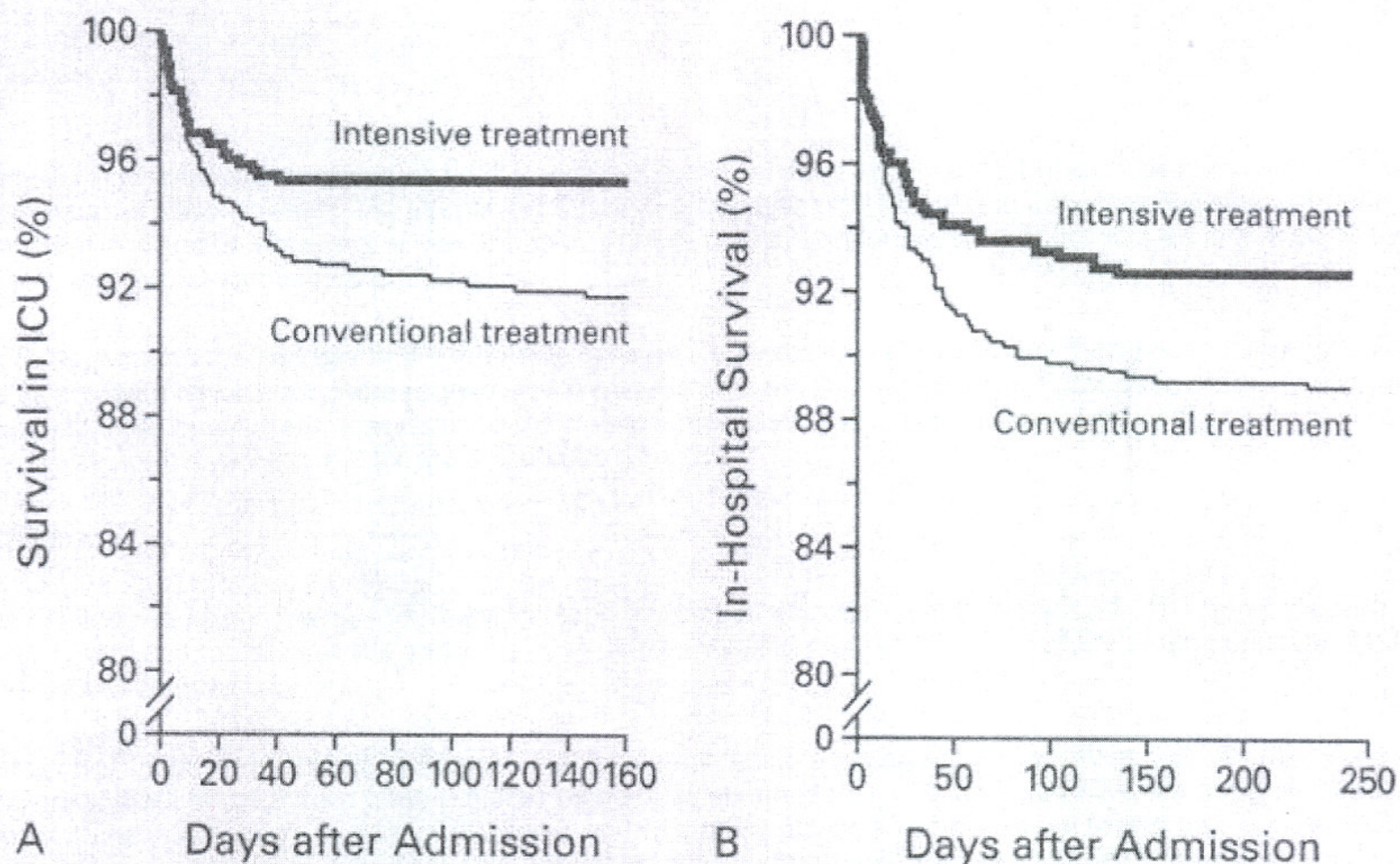
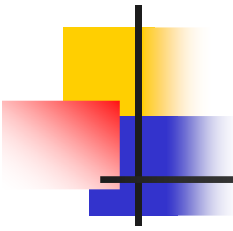


Figure 1. Kaplan-Meier Curves Showing Cumulative Survival of Patients Who Received Intensive Insulin Treatment or Conventional Treatment in the Intensive Care Unit (ICU).

Patients discharged alive from the ICU (Panel A) and from the hospital (Panel B) were considered to have survived. In both cases, the differences between the treatment groups were significant (survival in ICU, nominal $P=0.005$ and adjusted $P<0.04$; in-hospital survival, nominal $P=0.01$). P values were determined with the use of the Mantel-Cox log-rank test.

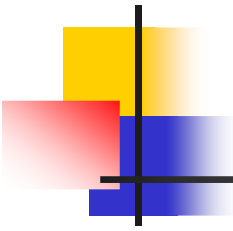


NICE SUGAR study

The ANZICS NICE-SUGAR Study Investigators, NEJM 2009,360:1283-1297

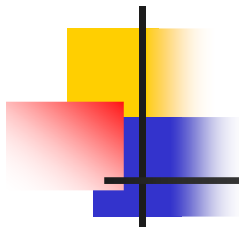
■ Aim

- To compare the effect of two blood glucose targets on 90-day all cause mortality in patients who are predicted to stay at ICU > 3 days
- glucose range of 4.5-6.0 mmol/L (intensive)
- <10.0 mmol/L (conventional)

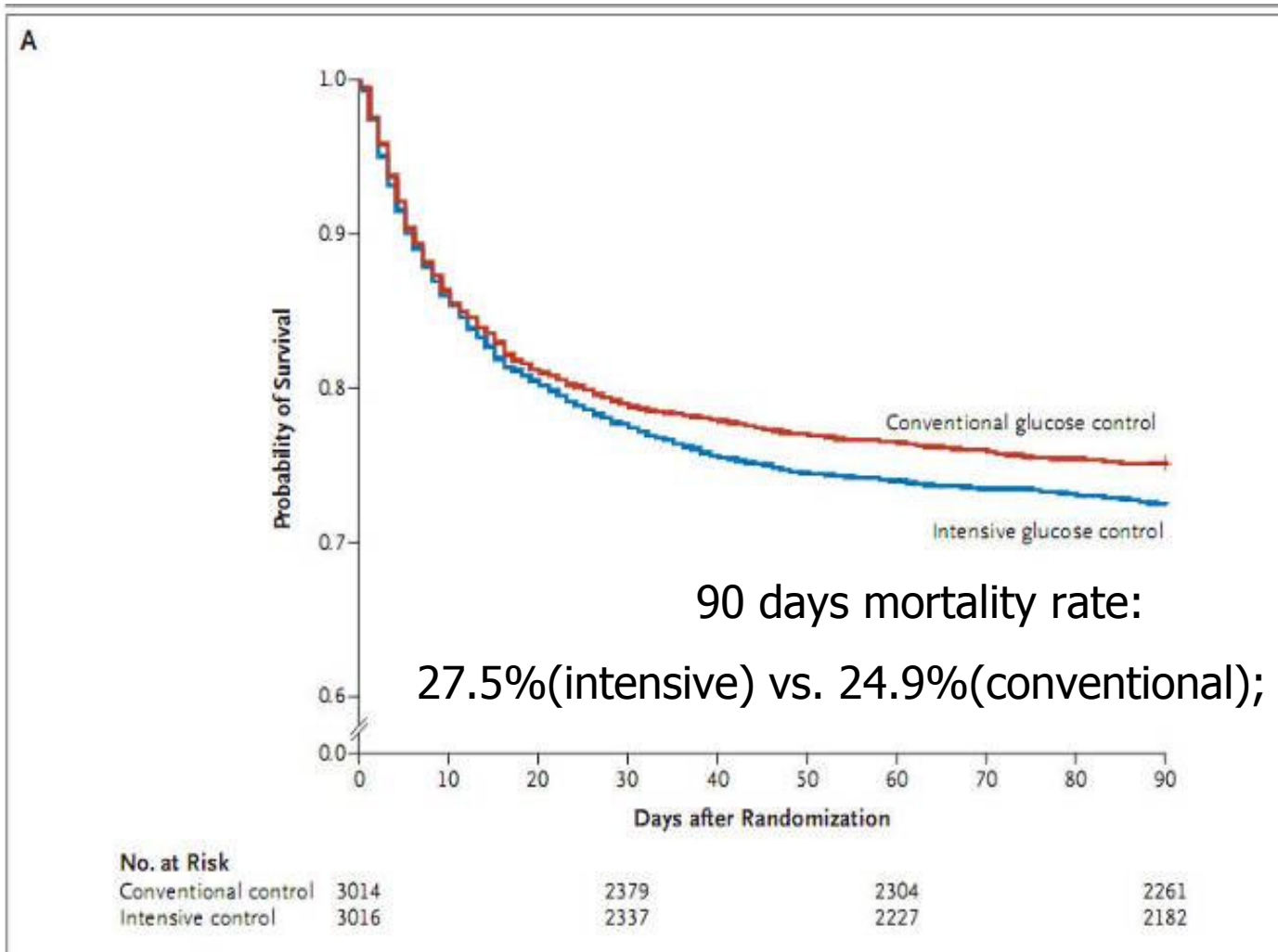


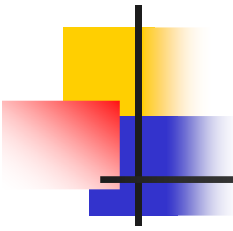
Severe hypoglycaemia (≤ 2.2 mmol/L)

	Intensive glucose control	Conventional glucose control	Odd ratio (95% CI)	
Patients	206/3016 6.8%	15/3014 0.5%	14.7 (9.0-25.9)	P<0.001



Survival

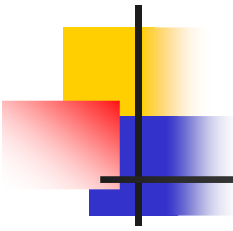




NICE SUGAR study

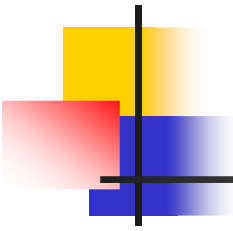
The ANZICS NICE-SUGAR Study Investigators, NEJM 2009,360:1283-1297

- Blood glucose target of 4.5-6.0 mmol/L resulted in increased mortality compared to a target of <10.0 mmol/L
- On the basis of these results we **do not** recommend targeting normoglycaemia in critically ill patients



Pandemic (H1N1) 2009

- Pregnancy
 - Especially during 3rd trimester
- Respiratory disease (asthma)
- Cardiovascular disease
- Diabetes mellitus
- Immunosuppression
- Obesity
- Neurological disease (children)



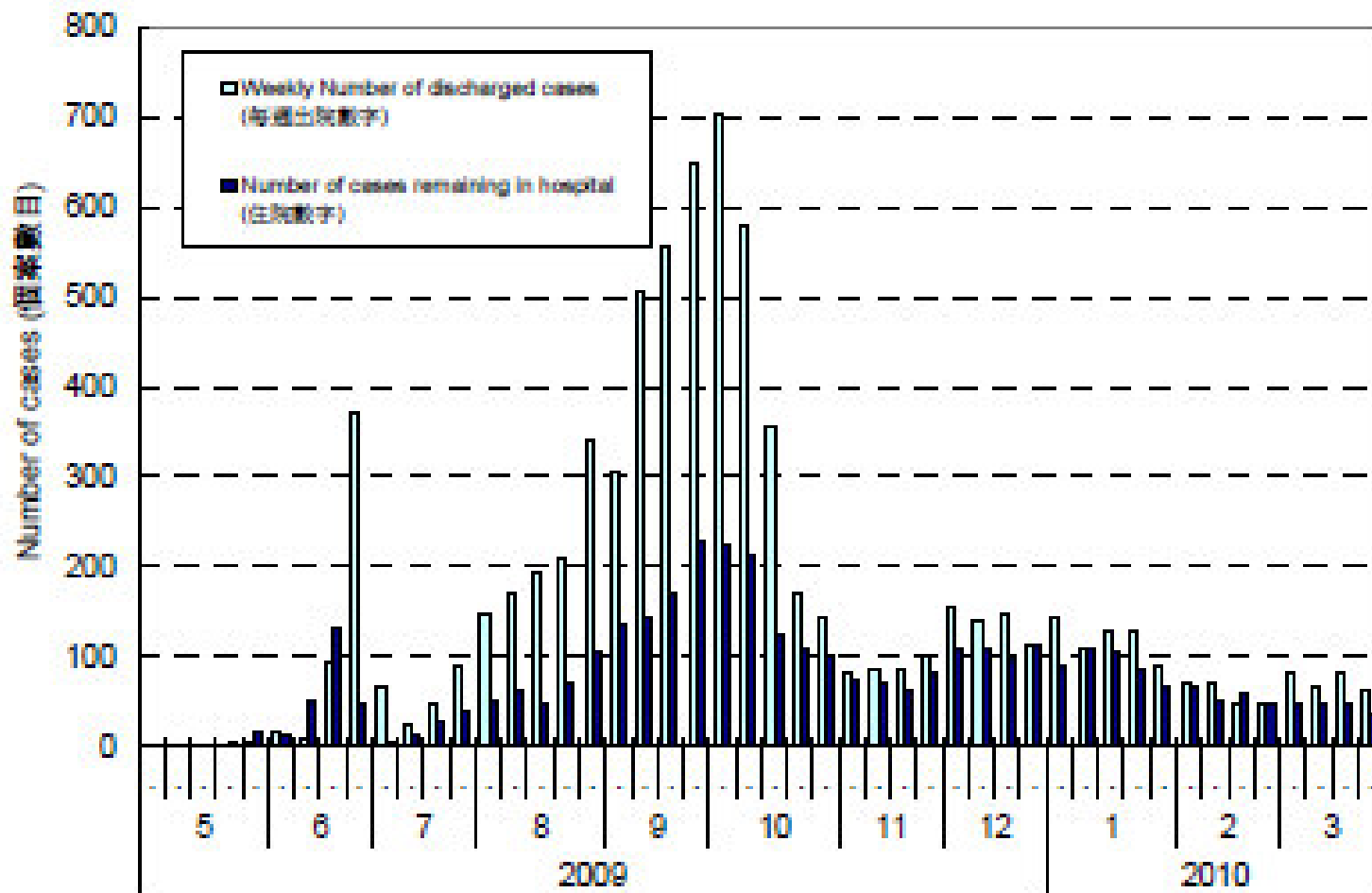
Critical illness due to 2009 A/H1N1 influenza in pregnant and postpartum women: population based cohort study

The ANZIC Influenza Investigators and Australasian Maternity Outcome Surveillance System

- Between 1 June 2009 to 31 August 2009, n=64
- Mortality 7 (11%)
- Relative risk (compared with non-pregnant women of childbearing age **7.4** (95% CI: 5.5-10.0)
 - For gestation age >20 weeks **13.2** (95% CI: 9.6-18.3)
- Mechanical ventilation 44 (69%)
- ECMO 9 (14% of overall)
 - **20%** of those failed mechanical ventilation
 - Compared with 9.4% in general population

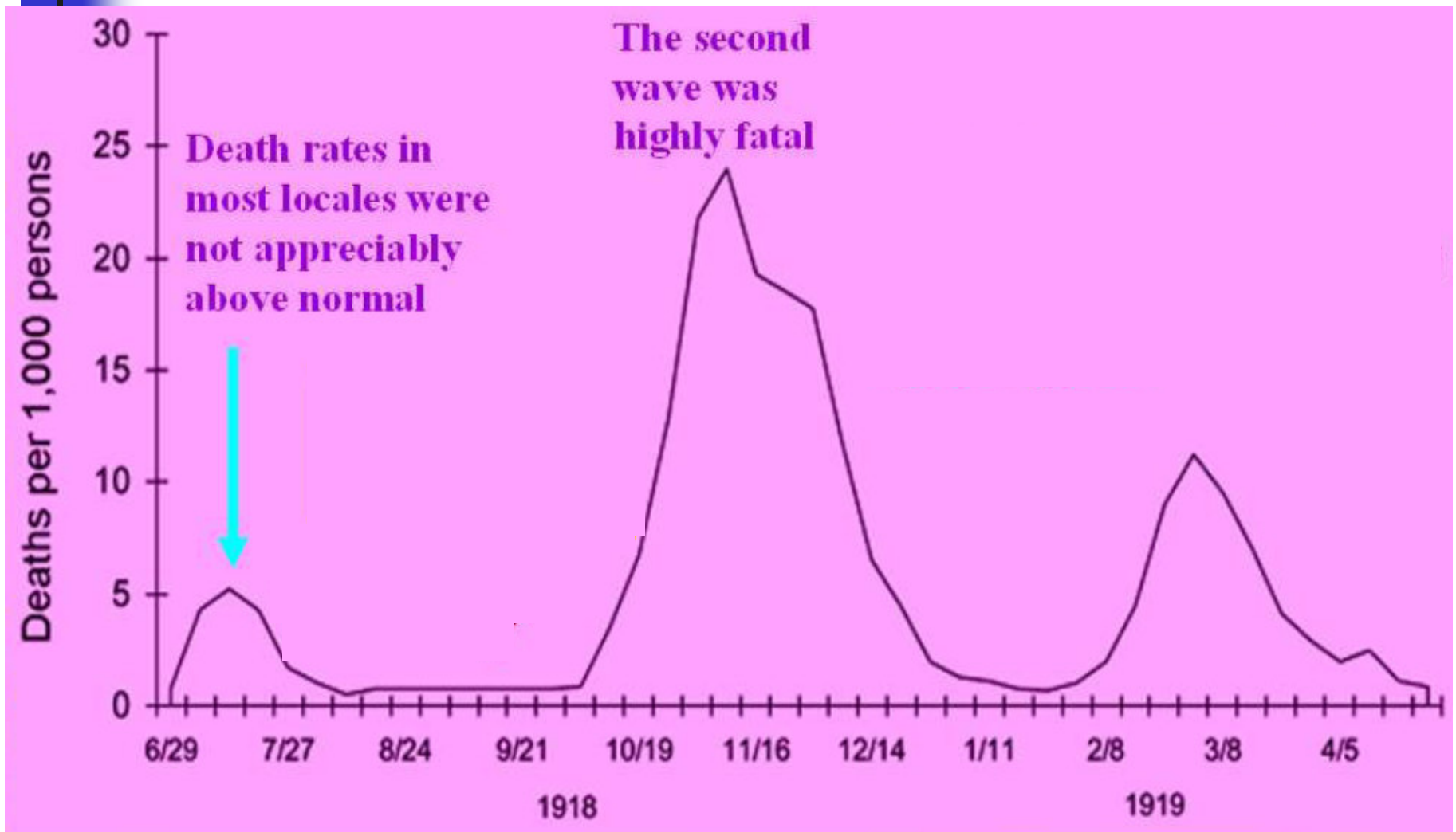
BMJ 2010;340:c1279 doi:10.1136/bmj.c1279

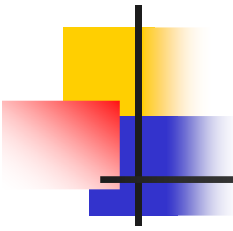
Number of discharged HSI cases and number remained in hospital



Three pandemic waves:

Weekly combined influenza and pneumonia mortality,
United Kingdom, 1918-1919

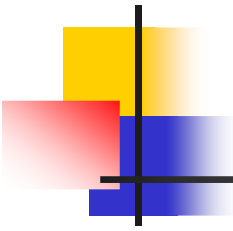




Recommendations on Human Swine Influenza (HSI)

Vaccination www.chp.gov.hk

- health care workers;
 - persons with chronic illnesses and pregnant women;
 - children between the age of 6 months and less than 6 years;
 - elderly persons aged 65 years or above; and
 - pig farmers and slaughterhouse workers.
-
- However, the vaccination rate is low!



Clinical management of H1N1

- Antivirals
 - Oseltamivir (enteral route)
 - Zanamivir (inhalation route)
 - +/- Zanamivir/Peramavir (intravenous route)
- Empirical antibiotics
- +/- Convalescent serum
- +/- Hyperimmune globulin
- +/- Selenium, zinc, high dose N-acetylcysteine
- Mechanical ventilation
- ECMO

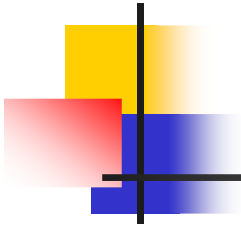
ECMO studies	Hong Kong*	Australia & New Zealand#	Canada+	China^
Number of cases	7	61	6	5
Comorbidities				
Hypertension	2 (29%)	---	---	---
Diabetes mellitus	1 (14%)	9 (15%)	---	---
Chronic lung diseases	1 (14%)	18 (30%)	---	---
Pregnancy or postpartum	0 (0%)	10 (16%)	---	---
Liver diseases	2 (29%)	---	---	---
Duration of ECMO (days)	5.9 [5.7 – 9.7]	10 [7 – 15]	15 [14 – 15]	7.4 [2.0-13.8]
ICU length of stay (days)	19.2 [17.9 – 29.6]	27 [16 – 37]	28 [18.5 – 37.5]	---
Hospital death	1 (14%)	14 (21%)	2 (33%)	1 (20%)

* KKC Chan, KL Lee, PKN Lam, KI Law, GM Joynt, WW Yan, Hong Kong's Experience on the Use of Extracorporeal Membrane Oxygenation for the Treatment of Influenza A (H1N1) In press

ANZIC Influenza Investigators. Extracorporeal Membrane Oxygenation for 2009 Influenza A(H1N1) Acute Respiratory Distress Syndrome. JAMA 2009;302:1888-95.

+ Freed DH, Henzler D, White CW, et al. Extracorporeal lung support for patients who had severe respiratory failure secondary to influenza A (H1N1) 2009 infection in Canada. Can J Anaesth 2010

^ Duan DW et al, The use of extracorporeal membrane oxygenation in sustaining pulmonary function patients with influenza A H1N1. Zhongguo Wei Zhong Bing Ji Jiu Yi Xue 2010 Mar; 22(3); 161-3.



Thank you for your attention.