Complications Around Childbirth:

Pre-eclampsia Toxaemia

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This essay will firstly look at the diagnosis of pre-eclampsia toxaemia (PET) in the case study of Lucy and describe the subsequent care she received. The pathophysiology section will explore the causes of this progressive disease and then analyse the role of the midwife in caring for a woman with PET, with particular consideration given to why taking accurate blood pressures is so pivotal. The use of Magnesium Sulfate (MgSO4) in caring for pre-eclamptic women will then be discussed before moving onto how the midwife can look after a woman's psychological wellbeing at this stressful time in her life.

The table below demonstrates that Lucy had an uncomplicated pregnancy up until her routine 34 week appointment with her community midwife.

Age	41
Gravida	2
Parity	1
Booking blood pressure (BP)	122/70 mmHg
Booking Body Mass Index	24
Booking Haemoglobin (Hb)	125 g/L
28/40 Hb	110 g/L
Booking Platelets	350 10^{9}/L
28/40 platelets	300 $10^{9/}$L
Family history	Her sister had PET, although Lucy herself has no relevant medical history
Ultra sound scans (USS)	All normal, no apparent abnormalities and growth within normal range. Singleton pregnancy.

It was at the 34 week appointment the midwife found Lucy's BP was raised at 157/104mmHg and she had +++ protein in her urine. Lucy also commented that her hands and feet were swollen but she thought it was caused by the heat. The midwife referred Lucy to the Day Assessment Unit (DAU), where midwives took her blood,

attached her to a cardiotocograph (CTG), sent a Protein-Creatinine Ratio and did her observations. A Registrar was bleeped to review Lucy and arrived when her blood results were back, as displayed in this table. The abnormal results are highlighted.

BP	159/108mmHg
Temperature	36.7'C
Pulse	95 beats per minute
Respiration rate	17
Hb	120 g/L
Platelets	250 10^9/L
Alanine Transaminase	71 IU/L
Alkaline Phosphate	142 IU/L
Albumin	54 g/L
Bilirubin	23 umol/L
Urea	4 mmol/L
Sodium	146 mmol/L
Potassium	4.3 mmol/L
Serum creatinine	76 umol/L
Serum uric acid	0.41 umol/L
International Normalised Ratio	2
Blood group	A positive

The trace on the CTG was considered reassuring so the Registrar admitted Lucy to the antenatal ward and prescribed 200mg Labetalol twice daily. BP readings were taken 4 times a day and ranged from 146/88-151/92. Lucy consented to a course of Dexamethasone to mature her baby's lungs should she deliver early. She wore anti-embolic stockings and was prescribed Tinzaparin once daily to reduce the risk of thrombosis, which is in line with Royal Berkshire Foundation Trust (RBFT) (2015) guidance. Lucy had an USS that showed consistent growth, a good volume of amniotic fluid surrounding the baby and normal umbilical artery Doppler's.

Despite RBFT (2015) and the National Institute for Health and Clinical Excellence (NICE) (2011) guidelines advising that CTG tracing should not be carried out more than weekly if fetal monitoring results are normal, Lucy was attached to the monitor

for 30 minutes every morning. The traces were all reassuring. 3 times a week Lucy had blood taken for Urea and Electrolytes, Liver Function Tests and a Full Blood Count, as per RBFT (2015) protocol stipulates. The results remained steady and Lucy was otherwise well so the Registrar decided to continue with conservative management, as a Cochrane review by Churchill et al (2013) found that delaying delivery is more beneficial for the baby.

The RBFT guideline (2015) advises USS every 2 weeks for women with PET, so at 36 weeks gestation Lucy had an USS. It was found that fetal growth was now on the 20th percentile when it had previously been on the 64th. The Doppler's also showed some degree of impairment. Lucy complained of grossly swollen feet that did not improve even when elevated. She felt nauseous and reported epigastric pain, a headache and blurred vision. Her observations were as follow:

Blood pressure	180/118mmHg
Pulse	110 beats per minute
Respiration rate	20 breaths per minute
Temperature	37'C
Urinalysis	++++ protein
Fetal movements	Reduced
CTG trace	Reduced variability despite multiple changes in maternal position

The Consultant was called to review and by the time he arrived bloods had been taken and the results back:

Hb	120 g/L
Platelets	170 10^9/L
Alanine Transaminase	78 IU/L
Alkaline Phosphate	149 IU/L
Albumin	60 g/L
Bilirubin	27 umol/L
Urea	4.6 mmol/L
Sodium	152 mmol/L
Potassium	4.6 mmol/L

Serum creatinine	90 umol/L
Serum uric acid	0.51 umol/L
International Normalised Ratio	3

The consultant transferred Lucy to delivery suite and gave 4g MgSO4 intravenously. She was attached to a CTG, which showed a prolonged deceleration of 3 minutes and so the decision was made to deliver the baby by Category 1 caesarean section under general anaesthetic. The APGARS were 7 at 1 minute and 9 at 5 minutes and there was meconium in utero. The estimated blood loss was 550ml and the 2.5kg baby was not admitted to Special Care.

Lucy was transferred to the high risk postnatal ward, where her BP medication was slowly reduced over 24 hours and her BP returned to pre-pregnancy values. She had a PET screen 48 hours post-delivery, as per RBFT (2015) protocol, the results of which were normal.

Occurring in an estimated 5% of pregnancies (National Health Service Choices 2015) and presenting after 20 weeks gestation, PET is an idiopathic condition characterised by proteinuria and hypertension (Robson et al 2014). Boyle and McDonald (2011) describe it as multi-organ affecting with progressive detrimental effects to both mother and fetus.

Although PET presents in the later stages of pregnancy, its origins lie in the earlier phases, with abnormal placentation. In normal placental implantation, trophoblast cells invade the decidua and myometrium and the spiral arteries' muscle coating is eroded, dilating them to ensure plentiful blood supply to the fetus (Bewley 2012). BP is lowered because maternal blood pools in the intervillous spaces of the placental bed (Bewley 2012). In PET spiral artery tone is retained, meaning they only dilate to 40% of what they should do (Stables and Rankin 2005). As the blood is forced through constricted arterioles, BP rises, the placenta becomes under perfused and the fetus may become hypoxic (Bothamley and Boyle 2009). This results in oxidative stress, which alters cell membranes and triggers the placenta to release cytokines which activate platelets, damage endothelial cells and cause capillary leakage (Coad

and Dunstall 2011). The platelets aggregate in the damaged blood vessels, putting the woman at an increased risk of thrombosis (Boyle and McDonald 2011). Oedema is caused by tissue fluid accumulating as the capillaries leak, meaning women with PET are at risk of fluid overload (Jordan 2010).

In pregnancy uncomplicated by PET, there is increased synthesis of prostacyclin, thromboxane A2 and nitric oxide, which alters homeostatic balance and ultimately causes uterine artery vasodilation. However, in PET there is an imbalance of these vasodilators due to the endothelial dysfunction that occurs as a consequence of poor placentation (Boyle and McDonald 2011). Prostacyclin is under-produced and thromboxane is relatively over-produced, encouraging vasospasm of the spiral arteries, which in turn leads to atherosclerosis and raised BP (Stables and Rankin 2005).

Due to the multisystem nature of PET and variability in presentation, endothelial damage can occur throughout the body, affecting multiple organs with the deposition of fibrin in the blood vessels (Jordan 2010). These fibrinous deposits cause further damage by stimulating the clotting cascade, meaning eventually clotting factors and platelets become depleted, leading to haemorrhage and disseminated intravascular coagulation (Morley 2004). The incoordination of the haematological system is further emphasised by haemoglobin levels appearing elevated due to haemocentration (Morley 2004). PET can quickly evolve into HELLP syndrome (haemolysis, elevated liver enzymes, low platelets), which is associated with poor maternal and neonatal outcome (Fraser and Cooper 2012), so they midwife must be mindful of this and alert to signs the woman is deteriorating.

One of the diagnostic manifestations of PET is proteinuria, caused by glomerular endothelial damage allowing plasma proteins to pass into the urine. The glomeruloendotheliosis occurs because hypertension induces vasospasm of the arterioles, equalling decreased blood flow and eventually hypoxia and oedematous endothelial cells in the glomerular capillaries (Fraser and Cooper 2012). Plasma urates rise and clearance of uric acid is reduced, showing that tubular function is damaged (Stables and Rankin 2005). Ultimately, PET can lead to acute renal failure if left untreated (Cowan 2011).

Raised liver enzymes in women with PET reflect the hepatic damage that occurs when the liver cells become hypoxic and oedematous due to vasoconstriction of the hepatic blood vessels (Fraser and Cooper 2012). Vasospasm within the liver is caused by small haemorrhages and hypoxic swelling, which the woman interprets as epigastric pain (Lavellee 2015).

Due to acute cerebral complications, PET is largely responsible for the world's high maternal mortality rates (Zeeman 2009), although deaths from PET are at a record low (Nelson-Piercy et al 2014). Combined with cerebrovascular endothelial dysfunction, hypertension causes an impairment of the blood-brain barrier, allowing cerebral oedema and micro-haemorrhaging, which is characterised by visual disturbances and headaches (The Pre-eclampsia Community Guideline 2004).

In the first half of pregnancy fetal development will not be affected as maternal blood supply is sufficient. In the second half of a normal pregnancy the placenta increases the vascularisation of its villi, as oxygen demands increase. However, in a pregnancy complicated by PET, this mechanism cannot happen and this is where intrauterine growth restriction (IUGR) occurs (Reister and Kingdom 2004). Research shows that growth restricted fetuses adapt themselves to a limited nutrient supply, hereby altering their metabolism permanently and predisposing them to hypertension, cardiovascular disease and diabetes in later life (Lapidus 2011). IUGR often co-exists with Oligohydramnios, which can cause babies to become hypoxic in labour if the umbilical cord becomes compressed, the effects of which are heightened by the fact that the baby is already oxygen deprived to a certain degree due to the PET. This can cause the baby to become distressed and pass meconium in utero, putting them at risk of meconium aspiration (Coutts 2007).
Nelson-Piercy (2010) says PET is the commonest cause of iatrogenic preterm delivery, meaning many newborn complications are not specific to PET but rather the consequences of the disease, such as IUGR and prematurity, with the risks increasing the earlier the gestation.

As the primary caregivers for pregnant women, midwives are the practitioners most likely to initially suspect PET. A midwife should refer the woman to the hospital for further testing and Registrar review, as diagnosis of PET is outside the scope of

practice which a midwife works within (Nursing and Midwifery Council (NMC) 2015). One warning sign of PET is hypertension, defined by NICE (2011) as moderate when the diastolic is 100-109mmHg and the systolic 150-159mmHg. Lucy fit into this category when the midwife referred her to DAU. See appendix 2 for PET symptoms.

The British Hypertension Society (2012) advise it is best practice to measure arm circumference prior to taking BP to ensure the correct sized cuff is used, as a Cochrane review by Banner and Gravenstein (2011) found that using a cuff too small for the woman can increase the systolic value by up to 80mmHg. In a disease where the focus is hypertension, this false increase can greatly impact on the clinical decisions made by health care professionals and therefore outcomes for mother and baby. It is good practice to document in the notes the cuff size used (RBFT 2015) to ensure consistency and good communication with colleagues, which is in line with what the NMC (2015) say about working in partnership to deliver seamless care. Members of the multidisciplinary team all have the common objective of providing the best possible service for the woman (Day 2006). The safety of mother and baby depends on the midwife's knowledge and skills in recognising the abnormal and her ability to act on this, for example referring to a Registrar if BP becomes unstable & medication requires altering.
In community, where Lucy's hypertension was revealed, midwives take manual BP's but in hospital Dinamaps tend to be used because they are perceived as being easier and can be set to automatically take BP at set intervals, which frees up busy midwives' precious time. Greeff et al (2010) found Dinamaps to be accurate and recommends their use in pregnancy and PET. Another benefit of using a Dinamap is that it is more consistent than lots of different midwives taking the BP and this allows a trend to be shown. Dinamaps also monitor heart rate and oxygen saturation levels, which are vital for detecting fulminating pulmonary oedema (Robinson and Scullion 2009). Antihypertensive medication is often titrated against Mean Arterial Pressure, which is automatically calculated when a Dinamap takes a BP, therefore saving time and reducing the risk of calculation error occurring.

RBFT (2015) state that when BP rises above 160/110mmHg a loading dose of 4g $MgSO_4$ should be given intravenously for eclampsia and stroke prophylaxis.

Recommended as first-line treatment of eclampsia, it has a strong hypotensive effect, although its primary function is as an anticonvulsant (British National Formulary 2015).

Clotting bloods should be taken regularly as MgSO4 increases clotting times by slowing down platelet activity and reducing thrombin production, putting the woman at increased risk of haemorrhaging (Jordan 2010).

Urine output must be closely monitored and exceed 25ml/hour (RBFT 2015) to ensure infusion rate is in line with renal function. This is because PET causes renal impairment, reducing glomerular filtration rate and increasing the time it takes for the drug to be eliminated from the body, potentially causing toxicity (Fraser and Cooper 2012). Toxicity symptoms are varied due to MgSO4 affecting all body systems, but can include flushing, sweating, hypothermia, bradycardia, cardiac arrest and pulmonary oedema due to cardiac depression, hence the need for the woman to be continually monitored with an electrocardiogram, BP machine and pulse oximeter (RBFT 2015). MgSO4 affects the baby similarly to its mother, so should be continually monitored with a CTG (Guidelines and Audit Implementation Network 2012). Because MgSO4 inhibits muscle contraction, the midwife should be aware that fatigue and muscle weakness are initial signs of impending toxicity, necessitating the need for respiratory rate, consciousness and patellar reflex monitoring (Jordan 2010).

The midwife should record these vital signs on a High Dependency chart, as per RBFT (2015) protocol and document all events clearly in the notes (NMC 2015), staying forever alert to signs of deterioration and deviation from the norm. This ensures optimal communication between members of the multidisciplinary team caring for the woman, for example Registrars, Consultants and Anaesthetists, and promotes collaborative working with input from each area of expertise to provide safe, evidence-based care.

The midwife should look at the woman as an individual case and treat her accordingly, not just acting upon what is considered to be abnormal by the Trust's standards, but by the woman's personal history and what is normal for her. She can do this by referring to the woman's booking BP and blood results and how her observations have changed since.

The World Health Organisation (WHO) (2011) recommends women at risk of developing PET should take 75mg Aspirin daily from 12 weeks gestation as a Cochrane review by Duley et al (2010) found that doing so reduces the risk of PET by 17%, as pre-eclamptic women have increased coagulation systems in their blood, which can be inhibited by taking Aspirin (Action on Pre-eclampsia 2012). See Appendix 1 for risk factors for PET. Lucy did not receive optimal care because although she is at increased risk of acquiring PET because she is over 40 years old, her sister had PET and there is a 10 year age gap between this baby and Lucy's other child (Royal College of Obstetricians and Gynaecologists 2012), she was not advised to take low-dose Aspirin. This is not in accordance with what the NMC (2015) say about practising effectively using evidence-based guidelines and advising on medication administration to preserve the safety of patients.

Pre-eclamptic women might feel they are not in control of their lives and that their disease controls them and a multitude of health professionals are trying to control the disease, without perhaps, seeing the woman as a person. This could negatively affect an emotionally stressed woman who feels guilty she is putting her baby at risk. In conjunction with being told the realities of how dangerous PET can be, this may leave the woman fearful and feeling that achieving a healthy pregnancy is an impossible task.

Occurring in 1-2% of women postnatally, post-traumatic stress disorder (PTSD) is a psychological disorder that develops in response to experiencing or witnessing a traumatic event (The Birth Trauma Association 2015). It is characterised by intrusive flashbacks and nightmares of the event that leave sufferers feeling panicked, distressed and intensely fearful (Gamble and Creedy 2005). Alder (2006) found that 33% of women are affected by pregnancy/birth trauma, although they do not meet all the diagnostic criteria for PTSD, meaning they do not receive the help and support they need. Because PTSD symptoms must present for more than a month in order to make a diagnosis and midwives usually hand over care to the health visitor around 10 days postnatally, diagnosis usually takes place with other professionals, leading

to lack of awareness of the condition and possible misdiagnosis as postnatal depression (Hunter 2013). This could cause delay in treatment and potentially fatal consequences for mother and/or baby, as deaths from mental illness have now overtaken sepsis (Nelson-Piercy et al 2014). Fragmented postnatal care and lack of continuity only confound this as relationships between midwife and woman cannot be established. Mapp (2005) discusses how women may avoid engaging with health professionals for fear their baby will be removed if it is realised they are struggling. This can prevent women seeking medical help when they need it, so it is fundamental a partnership is formed with women in order to promote their health (International Confederation of Midwives 2014).

Ultimately, if health professionals are not aware of PTSD then they cannot know how to prevent it. Midwives need to work in conjunction with other health professionals to lessen the traumatising effects of emergency situations, in order to reduce the risk of PTSD occurring. WHO (2007) say health care professionals should preserve dignity and use supportive non-verbal communication to demonstrate they are listening, which will encourage the woman to allay her fears candidly. The supportive presence and advocacy role of the midwife can be reassuring for a woman and her family while dramatic events are unfolding. Cowan (2011) says that once a pregnancy becomes complicated and an array of health professionals become involved, the midwife can alleviate some anxieties by being honest, encouraging her to ask questions and explaining what will happen next. Mapp (2005) says women are understanding that emergencies arise but the effect of them can be lessened by receiving sensitive care and being kept updated so that stress and overall negative impact of the situation is reduced.

Women like Lucy do not anticipate to go through potentially traumatising emergency events, particularly if they have had a low-risk pregnancy before, but having PET and an emergency caesarean (EMCS) may alter their ability to cope with stress and put them at risk of PTSD. 14.1% of women at RBFT had an EMCS between 2013-2014 (RBFT 2014), which is a lot of women at increased risk of developing PTSD. Women may experience inner conflict between expectations and reality and withhold

emotions from health care professionals as they are perceived as the ones having caused this trauma. Connell (2015) says health care providers use medical jargon and abbreviations that women do not understand, leaving them feeling powerless, isolated, vulnerable and not involved in decisions made about their care, hence why informed consent is so important. Instead, information needs to be offered through a platform women can engage with so she understands what is happening to her and why (Sully and Dallas 2010). The feeling of helplessness is only fuelled by lack of continuity of care and care appearing clinical and not person-centred, as health professionals tend to focus on physical wellness, with less consideration given to psychological and emotional wellbeing (Hunter 2013). Health care professionals have targets to meet in terms of successful births, but success is measured by low rates of physical mortality rather than psychiatric morbidity, which is not the best approach (Hunter 2013).

Women may feel detached and find it difficult to bond with their baby because they associate their baby with the trauma they experienced (BTA 2015), which can impact negatively on the physical and psychological development of the baby. They may struggle to breastfeed, adding to feelings of failure that they couldn't have a healthy pregnancy or vaginal birth. NICE (2015) advise women should not be offered formal debriefing because it has been suggested that they may be soothed and placated while having their experience relayed to them in medical terms in order to avoid litigation for health care professionals.

It is clear that this poorly understood, multisystemic, multifactorial disease has no one cause, although treatment is always the same: delivery of the baby and placenta. It is the responsibility of the midwife to work in conjunction with other members of the multiprofessional team to provide individualised care that will optimise outcome for women and babies. However, psychological wellbeing should not be ignored and simple measures can be taken by all involved in her care to minimise the risk of lasting impact of what could otherwise be a truly traumatic experience.

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Appendix 1 – risk factors for developing PET

- If a woman's sister or mother had PET then she is 40% more likely to develop the disease herself
- A three-fold risk if there has been a 10 year age pregnancy interval
- Multiple pregnancy
- Risk is doubled if over 40 years old
- Under 16 years old
- First pregnancy

- First pregnancy with new partner
- Previous pre-eclampsia
- Body Mass Index of 35 or above at booking
- Hypertensive disease in a previous pregnancy
- Chronic hypertension
- Renal disease
- Type 1 or 2 diabetes
- Autoimmune disease, for example Lupus or Antiphospholipid syndrome
- Connective tissue disease, form example rheumatoid arthritis
- Donor egg pregnancy
- Sickle cell disease
- Rhesus incompatibility
- Molar pregnancy

Billington and Stevenson (2007)

NICE (2011)

RBFT (2013)

Symptoms of PET

- Headache which tends to be frontal and not alleviated by over the counter analgesia
- Visual disturbances such as flashing lights and blurred vision
- Liver tenderness and epigastric pain that can be specifically left-sided
- Vomiting

- Hypertension
- Oedema in the face, hands and feet
- Proteinuria
- Abnormal liver enzymes
- Falling platelet count
- Reduced fetal movements
- A baby that is small for gestational age and may have impaired Doppler's

Bothamley and Boyle 2009

Coad and Dunstall 2011

Appendix 3 – peer review feedback from case study presentation

1. Was the handover communicated in a clear and logical manner?

Excellent

2. Did the handover contain all the pertinent information required?

Excellent

3. Were the key aspects of the case covered in the presentation of the case study?

Excellent

4. What aspect of care (physical or psychosocial) was discussed?

PTSD very good and in depth (X3)

5. Were the relevant aspects of midwifery care included?

Excellent

6. Were key references provided?

Excellent

7. Any suggestions for improvement that may help in preparation for your essay

- Very good! (X2)
- Highlight ‘abnormal blood results