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## THE UKRAINIAN EXPERIENCE FOR EFFECTIVE MANAGEMENT OF SEVERE PREECLAMPSIA

*Hypertensive disorders of pregnancy are a leading cause of maternal morbidity and mortality worldwide, accounting for more than 70,000 maternal deaths each year. Of all maternal deaths, 10–15% are directly associated with preeclampsia (PE) and eclampsia.*

*The new version of the Ukrainian National Clinical Guideline and Clinical Protocol «Hypertensive disorders during pregnancy, childbirth and the postpartum period» 2022 presents a synthesis of the scientific evidence that is relevant to the concerning severe PE treatment strategies.*

*It was presented the new algorithm of clinical management for severe pre-eclampsia «CALM DOWN» that implemented to the new Ukrainian clinical protocol of primary, secondary (specialized) and tertiary (highly specialized) medical care. CALM DOWN is the special mnemonic that means «step by step strategy» for the medical teamwork.*

*Conclusions. The algorithm «CALM DOWN» have been proposed for the optimal timing of severe PE, offers to systematize the participation of each member of the team in the provision of emergency care and should be implemented in clinical practice based on the peculiarities of the specifics of work, resources, functioning and localization of the maternity facilities when forming personal route of the patient.*

**Key words:** pregnancy, preeclampsia, clinical management, algorithm «CALM DOWN»

Hypertensive disorders of pregnancy are a leading cause of maternal morbidity and mortality worldwide, accounting for more than 70,000 maternal deaths each year. Of all maternal deaths, 10–15% are directly associated with preeclampsia (PE) and eclampsia. PE is main cause of morbidity and mortality both mother and fetus. Preeclampsia occurs in 3- 12% of pregnancy and that was no changed during the last century. Advances in obstetrics and neonatology have substantially mitigated many of the adverse pregnancy outcomes related to PE. The PE encompasses 2% to 8% of pregnancy-related complications, greater than 50,000 maternal deaths, and over 500,000 fetal deaths worldwide. According to Ukraine statistic data for 2020: the incidents of hypertension in pregnancy in 21,004 women (74.57 per 1,000 births), including preeclampsia and eclampsia in 11,075 women (39.32 per 1,000 births), of which severe preeclampsia and cases of eclampsia in 1,573 women (5.58 per 1,000 births). The early

multi-disciplinary management are essential to prevent morbidity and mortality associated with preeclampsia.

### MATERIAL AND METHODS

The new version of the Ukrainian National Clinical Guideline and Clinical Protocol «Hypertensive disorders during pregnancy, childbirth and the postpartum period» 2022 presents a synthesis of the scientific evidence that is relevant to the concerning severe PE treatment strategies. The current algorithm was performed at the National Pirogov Memorial Medical University, Vinnytsya, Ukraine, under budget grant No. 0121 U109141.

### RESULTS

We presented the new algorithm of clinical management for severe pre-eclampsia «CALM DOWN» that implemented to the new Ukrainian clinical protocol of primary, secondary (specialized) and tertiary (highly specialized) medical care.

CALM DOWN is the special mnemonic that means «step by step strategy» for the medical teamwork (Table 1).

C» is Calling for help (duty doctors, anaesthetist, and paediatrician (as required), with fixation of actual time) - 1-3 min.

«A» is Assessment (assess the airway, auscultation, re-measure blood pressure, pulse rate, oxygen saturation, fetal heartbeats, assess the patient consciousness) - 3-5 min. Measuring BP using different blood flow sounds - Korotkoff phase IV (K4, softer, muffled sound) compared with Korotkoff phase V (K5, when the sound disappears) to measure diastolic BP. There may be little to no difference between using K4 or K5 to diagnose pre-eclampsia - the evidence is uncertain.

«L» is Low blood pressure (antihypertensive

therapy, commence if: sBP  $\geq$  160 or dBP  $\geq$  110 mmHg and consider if: sBP is persistently greater 140 or dBP is persistently greater 90 mmHg. Aim for gradual and sustained lowering of BP, so blood flow to the fetus is not compromised. Infusions of glyceryl trinitrate are recommended only when other treatments have failed and birth is imminent) - 5-10 min. There is a general appreciation that the goal of antihypertensive therapy for severe hypertension is not normalisation of blood pressure, but rather, lowering of blood pressure to a non-severe level of hypertension that decreases the risk of stroke. Also, there is recognition that lowering of blood pressure, even to levels that remain outside the hypertensive range has the potential to precipitate fetal distress and fetal heart rate monitoring (FHR) monitoring is advised.

Table 1.

**Clinical management of severe preeclampsia Ukrainian experience**

Mne-monic	Definition	Action of personnel	Optimal time
C	Calling for help	Calling on duty doctors, an anesthesiologist at the onset of symptoms of severe preeclampsia, with fixation of actual time.	1-3 min
A	Assessment	Check the airway, auscultation of the lungs, re-measure blood pressure, heart rate, assess the oxygen saturation, fetal heart beats, assess the patient's consciousness.	3-5 min
L	Low blood pressure	Antihypertensive therapy: nifedipine 10 mg p.o., urapidil 10 mg IV	5-10 min
M	Magnesium sulfate	Intravenous therapy is with a loading dose of 4 g of diluted magnesium sulphate (in 50 ml).	10-15 min
	Pause	Evaluate the effectiveness of prescribed medications. Target BP: sBP range of 130 to 150 mmHg; dBP range 80 to 90 mmHg.	5-10 min
D	Decision	Decide about further management. Transfer to the intensive care unit or operating theatre or delivery room, depending on gestational age and patient' condition.	5-10 min
O	Oliguria	Women with severe preeclampsia immediately prior to regional anesthesia or immediate delivery: 250 mL bolus. Fluid restriction in pre-eclampsia is recommended no more than 60-80 mL/h of IV fluids.	5-10 min
W	Fetal Well being	Continuous CTG monitoring and Doppler assessment.	10-30 min
N	Parturition	All women with severe pre-eclampsia or eclampsia should be delivered within 24 hours, regardless of gestational age.	

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lowering of blood pressure to a non-severe level of hypertension that decreases the risk of stroke. Also, there is recognition that lowering of blood

pressure, even to levels that remain outside the hypertensive range has the potential to precipitate fetal distress and fetal heart rate monitoring (FHR) monitoring is advised. Based on extrapolation of the approach outside pregnancy, hypertensive emergencies should be treated with short-acting antihypertensive agents and an arterial line when possible aimed at lowering mean arterial blood pressure by no more than 25% over minutes to hours; this is equivalent to taking a blood pressure of 220/130 mm Hg to 165/98 over 1½ hours, and then further lowering blood pressure below 160/100 mm Hg over the next 2 hours

«M» is Magnesium. The treatment of choice for the prevention of eclampsia is the intravenous administration of magnesium sulphate which is indicated in severe preeclampsia, especially where there are central nervous system symptoms, as a significant reduction in the risk if eclampsia can be achieved with magnesium sulphate. Intravenous therapy is with a loading dose of 4 g of diluted magnesium sulphate (in 50 ml) administered over 10-15 min via syringe driver or short infusion and continued with a maintenance dose of 1 g/h.

Pause is evaluated on the effectiveness of prescribed medications (target BP: sBP range of 130 to 150 mmHg; dBP range 80 to 90 mmHg) - 5-10 min.

D» is Decision (decide about further management: transfer to the intensive care unit or operating theatre or delivery room, depending on gestational age and patient's condition.

Consider magnesium sulfate therapy, and corticosteroids where appropriate prior to transferring women with severe pre-eclampsia or HELLP syndrome) - 5-10 min.

«O» is Oliguria (fluid restriction in preeclampsia is recommend no more than 60-80 mL/h of IV fluids. Consider additional fluid administration only prior to intravenous urapidil, regional anaesthesia, immediate delivery, or in oliguric patients where a volume deficit is suspected. If no fluid deficit is apparent and if no other complications (e.g. postpartum haemorrhage), restrict post-birth intravenous crystalloids to 1500 mL in the first 24 hours) - 5-10 min. Multiple guidelines recommend against plasma volume expansion (SOGC, NICE, SOMANZ). Fluid restriction in pre-eclampsia is recommended by two guidelines (SOGC, NICE), one of which recommends administration of no more than 60-80 mL/h of IV fluids (NICE). Although maternal plasma volume is often reduced in women with

preeclampsia, there is no maternal or fetal benefit to maintenance fluid therapy. The choice between colloid and crystalloid remains controversial as previous trials generally excluded pregnant women. Fluid should not be routinely administered to treat oliguria (< 15 mL/hr for 6 consecutive hours). Administration of fluid at a rate greater than normal requirements should only be considered for: 1. Women with severe preeclampsia immediately prior to regional anaesthesia or immediate delivery: 250 mL bolus. 2. Initial management in women with oliguria where there is a suspected or confirmed deficit in intravascular volume: 300 mL challenge, repeat with careful assessment. As vascular permeability is increased in women with preeclampsia, administration of large volumes of intravenous fluid before or after delivery may cause pulmonary edema and worsen peripheral edema. This tendency is further aggravated by hypoalbuminemia. Appropriate blood product replacement is necessary when there has been haemorrhage, as in cases of placental abruption. Post-partum oliguria is a regular accompaniment of preeclampsia and care must be taken to avoid its over treatment. Persistent oliguria beyond 24 hours post-partum with rising plasma creatinine suggests the possibility of post partum renal failure. There is no evidence that fluid manipulation is able to prevent this rare complication.

«W» is fetal Wellbeing (continuous CTG monitoring and Doppler assessment) - 10-30 min. Signs of fetal compromise: umbilical artery (UA) flow Doppler - UA pulsatility index greater than 95th centile (early or late FGR), severe if absent or reversed end diastolic flow; Ductus venosus Doppler - absent or reversed "a" wave, identification of an abnormal ductus venosus waveform is not diagnostic in isolation when there is no other Doppler abnormality; middle cerebral artery Doppler - cerebral redistribution (decreased resistance or 'brain sparing effect'), paradoxically the flow can revert back to a high resistance pattern when the pathology has not yet resolved—this is a very poor prognostic sign and not diagnostic when used in isolation.

«N» is parturition, timing of birth is dependent on the severity of the disease and the gestational age at which it presents (birth, regardless of gestational age (prolongation of pregnancy carries no benefit for the woman but may be desirable at early gestations to improve the fetal outcomes and prognosis), is the definitive management and is followed by resolution of all

components of pre-eclampsia, generally over a few days but may take up to 3 months. Recommend vaginal birth unless a caesarean section is required for other obstetric indications. If vaginal birth is planned and the cervix is unfavourable, recommend cervical ripening to increase the chance of successful vaginal birth). Requires a multidisciplinary team approach with continual consultation and agreement with the woman.

## CONCLUSION

We have proposed the algorithm «CALM DOWN» for the optimal timing of severe PE, offers to systematize the participation of each member of the team in the provision of emergency care and should be implemented in clinical practice based on the peculiarities of the specifics of work, resources, functioning and localization of the maternity facilities when forming personal route of the patient.

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## РЕЗЮМЕ

### УКРАЇНСЬКИЙ ДОСВІД ЕФЕКТИВНОГО ВЕДЕННЯ ВАЖКОЇ ПРЕЕКЛАМПСІЇ

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*Гіпертонічні розлади під час вагітності є основною причиною материнської захворюваності та смертності у всьому світі, щороку спричиняє понад 70 000 материнських смертей. З усіх материнських смертей 10–15% безпосередньо пов'язані з преєклампсією (ПЕ) та еклампсією.*

*Нова редакція Української національної клінічної настанови та клінічного протоколу «Гіпертонічні розлади під час вагітності, пологів та післяпологового періоду» 2022 представляє синтез наукових доказів, які мають відно-*

*шення до стратегій лікування важкої ПЕ.*

*Було представлено новий алгоритм клінічного ведення важкої преєклампсії «CALM DOWN», який імплементований до нового українського клінічного протоколу первинної, вторинної (спеціалізованої) та третинної (високоспеціалізованої) медичної допомоги. CALM DOWN — це спеціальна мнемоніка, яка означає «покрокову стратегію» для медичної командної роботи.*

**Висновки.** Алгоритм «CALM DOWN» запропонований для оптимального визначення термінів важкої ТЕЛА, пропонує систематизувати участь кожного члена бригади в наданні невідкладної допомоги та має бути впроваджений у клінічну практику з урахуванням особливостей специфіки роботи, ресурсів, функціонування та локалізації пологових закладів при формуванні особистого маршруту пацієнта.

**Ключові слова:** вагітність, преєклампсія, клінічне ведення, алгоритм «CALM DOWN»