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Primary care

The pre-eclampsia community guideline (PRECOG): how to screen for and detect onset of pre-eclampsia in the community

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Why is a guideline needed?

Pre-eclampsia is a major cause of poor outcome in pregnancy: the category “hypertensive diseases of pregnancy” remains a leading cause of direct maternal deaths in the United Kingdom; pre-eclamptic conditions represent one in three cases of severe obstetric morbidity; hypertension and/or proteinuria is the leading single identifiable risk factor in pregnancy associated with stillbirth (one in five stillbirths in otherwise viable babies); and pre-eclampsia is strongly associated with fetal growth restriction, low birth weight, preterm delivery, respiratory distress syndrome, and admission to neonatal intensive care. In 46% of maternal deaths and 65% of fetal deaths due to pre-eclampsia reported through the Confidential Enquiries into Maternal Deaths and Deaths in Infancy, different management would reasonably have been expected to alter the outcome. There was a failure to identify and act on known risk factors at booking and to recognise and respond to signs and symptoms from 20 weeks’ gestation.

No guidelines exist for the screening and early detection of pre-eclampsia in the community, and there is no uniformity in referral thresholds and assessment procedures.

What can be done?

We developed the pre-eclampsia community guideline (PRECOG) under the auspices of the charity Action on Pre-eclampsia, following the National Institute for Clinical Excellence’s recommendations for the development of guidelines. Our guideline is supported by the Royal College of Obstetricians and Gynaecologists, the Royal College of Midwives, the Royal College of General Practitioners, and the National Childbirth Trust. Box 1 lists the definitions used in the guideline; pre-eclampsia is defined as new hypertension and proteinuria (see bmj.com for definition of levels of evidence).

The pre-eclampsia community guideline provides an evidence based risk assessment, with criteria for early referral for specialist input, a two tiered schedule for monitoring women in the community after 20 weeks’ gestation, and referral criteria for step-up care.

Box 1: Definitions of terms used in the pre-eclampsia community guideline

- **Fetal compromise**: Reduced fetal movements
- **New hypertension**: Diastolic blood pressure of ≥ 90 mm Hg
- **New proteinuria**: Presence of proteinuria as shown by ≥ + (300 mg/l) on dipstick testing, a protein to creatinine ratio of ≥ 30 mg/mmol on a random sample, or a urine protein excretion of ≥ 300 mg in 24 hours
- **Quantified proteinuria**: Urine protein excretion ≥ 300 mg in 24 hours
- **Superimposed pre-eclampsia**: Development of features of pre-eclampsia in the presence of pre-existing hypertension or pre-existing proteinuria, or both
be taken into account when developing individual care plans and we recognise the benefit of continuity of care.

Complementing existing recommendations

Our guideline complements NICE's antenatal guidelines for the routine care of healthy women. Our guideline also provides advice for women excluded from the NICE remit because of risk factors or concurrent medical conditions and recommends test result thresholds and actions for step-up assessment for all women who have antenatal care in the community. Our guideline applies to midwife led or general practitioner led care in the community and is applicable from first contact with a health professional until delivery.

The evidence behind our guideline can be used to adapt other antenatal guidelines, both within the United Kingdom and worldwide, as local circumstances and needs dictate.

The recommendations

Risk assessment early in pregnancy

Before developing an antenatal care plan, women should be assessed for the factors listed in box 2. From meta-analysis and systematic review, the unadjusted relative risks of developing pre-eclampsia were: presence of antiphospholipid antibodies (9.72, 95% confidence interval 4.34 to 21.75), history of pre-eclampsia (7.19, 5.85 to 8.83), pre-existing diabetes (3.56, 2.54 to 4.99), multiple pregnancy (2.93, 2.04 to 4.21), nulliparity (2.91, 1.28 to 6.61), family history of pre-eclampsia (2.90, 1.70 to 4.93), women aged ≥ 40 (nulliparous women, 1.68, 1.23 to 2.29; multiparous women, 1.96, 1.54 to 2.87), and a raised body mass index at booking (1.55, 1.28 to 1.88). The risk of pre-eclampsia is also increased with pre-existing hypertension and renal disease, a pregnancy interval of ≥ 10 years, a raised diastolic blood pressure at booking, and confirmed proteinuria. The data did not show an increased risk for young women of ≤ 19, ≤ 17, or ≤ 16.

For the continuous variables, such as age and body mass index, we selected conservative thresholds for action available from the data. Below these cut-off points there is still an increased risk of pre-eclampsia. Data were insufficient to calculate absolute risk for each factor, to see how two factors interact, or to comment on migraine or change of partner. We did not consider donor egg and donor insemination.

Referral in early pregnancy for specialist input

Women should be offered specialist input before 20 weeks if they have one of the criteria listed in box 3. Input may concern further specialist investigation, clarification of risk, or advice on early intervention or pharmacological treatment. We do not prescribe subsequent obstetric care, which will be determined on an individual basis and may be led by specialists, general practitioners, or midwives, or by shared care.

Previous pre-eclampsia is associated with higher rates of moderate, severe, and early onset pre-eclampsia and adverse perinatal outcomes associated with preterm delivery. Recurrent pre-eclampsia occurs, on average, between zero and four weeks later than in the first pregnancy. We recommend that women who have asymptomatic proteinuria at booking, if persistent or confirmed by a 24 hour sample, be investigated for possible underlying renal disease.

Box 2: What to do before developing an antenatal care plan

Action: identify the presence of any of the following factors that predispose women in a given pregnancy to pre-eclampsia (grade B/C):

- First pregnancy
- Previous pre-eclampsia
- ≥ 10 years since last baby
- Age ≥ 40 years
- Body mass index ≥ 35
- Family history of pre-eclampsia (mother or sister)
- Booking diastolic blood pressure ≥ 80 mm Hg
- Proteinuria at booking (≥ + on more than one occasion or ≥ 300 mg/24 h)
- Multiple pregnancy
- Underlying medical conditions:
  - Pre-existing hypertension
  - Pre-existing renal disease
  - Pre-existing diabetes
  - Presence of antiphospholipid antibodies

Box 3: What to do after the risk assessment

Action: offer women referral before 20 weeks for specialist input to their antenatal care plan if they have one of the following (grade D/good practice point):

- Previous pre-eclampsia
- Multiple pregnancy:
- Underlying medical conditions:
  - Pre-existing hypertension or booking diastolic blood pressure ≥ 90 mm Hg
  - Pre-existing renal disease or booking proteinuria (≥ + on more than one occasion or ≥ 300 mg/24 h)
  - Pre-existing diabetes
  - Presence of antiphospholipid antibodies
- Any two other factors from box 2

Box 4: What to do after 20 weeks (content of assessment)

Action: at every assessment identify the presence of any of the following signs and symptoms of the onset of pre-eclampsia and act according to table 2 (grade B and C):

- New hypertension
- New proteinuria
- Symptoms of headache or visual disturbance, or both
- Epigastric pain or vomiting, or both
- Reduced fetal movements, small for gestational age infant

See box 1 for definitions
Table 1 What to do after 20 weeks’ gestation*

<table>
<thead>
<tr>
<th>Frequency levels</th>
<th>Criteria†</th>
<th>24-32 weeks’ gestation</th>
<th>32 weeks to delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Women with none of factors in box 2</td>
<td>As per local protocols and NICE antenatal guideline for low risk multiparous women</td>
<td>As per local protocols and NICE antenatal guideline for low risk multiparous women</td>
</tr>
<tr>
<td>Level 2</td>
<td>Women with one predisposing factor in box 2 and no factor that requires referral in early pregnancy (box 3)</td>
<td>Minimum standard no more than three week interval between assessments, adjusted to individual needs and any changes during pregnancy†</td>
<td>Minimum standard no more than two week interval between assessments, adjusted to individual needs and any changes during pregnancy‡</td>
</tr>
</tbody>
</table>

*By definition pre-eclampsia cannot be diagnosed before 20 weeks’ gestation.
†Women who have been referred early in pregnancy (see box 3) do not qualify for either level of monitoring.
‡Corresponds to NICE antenatal guideline for primiparous women.

Actions to be taken by midwife or general practitioner when women present with signs and symptoms

Table 2 Actions to be taken by midwife or general practitioner when women present with signs and symptoms

<table>
<thead>
<tr>
<th>Definition</th>
<th>Action by midwife or general practitioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>New hypertension without proteinuria (grade C)</td>
<td>Blood pressure:</td>
</tr>
<tr>
<td>Diastolic ≥90 and &lt;100 mm Hg</td>
<td>Refer for hospital step-up assessment within 48 hours</td>
</tr>
<tr>
<td>Diastolic ≥90 and &lt;100 mm Hg with any symptom from box 4</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>Systolic ≥160 mm Hg</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>Diastolic ≥100 mm Hg</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>New hypertension with proteinuria (grade A)</td>
<td>Blood pressure:</td>
</tr>
<tr>
<td>Diastolic ≥90 mm Hg and new proteinuria ≥+ on dipstick</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>Diastolic ≥110 mm Hg and new proteinuria ≥+ on dipstick</td>
<td>Arrange immediate admission</td>
</tr>
<tr>
<td>Systolic ≥170 mm Hg and new proteinuria ≥+ on dipstick</td>
<td>Arrange immediate admission</td>
</tr>
<tr>
<td>New proteinuria without hypertension (grade C)</td>
<td>Reading on dipstick:</td>
</tr>
<tr>
<td>≥+ with any symptom from box 4</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>≥+ with any symptom from box 4</td>
<td>Arrange immediate admission</td>
</tr>
<tr>
<td>Maternal symptoms or fetal signs and symptoms without hypertension or proteinuria (grade C)</td>
<td>Symptoms along with diastolic blood pressure &lt;90 mm Hg and trace or no protein:</td>
</tr>
<tr>
<td>Headache, visual disturbances, or both</td>
<td>Follow local protocols for investigation. Consider reducing interval before next PRECOG assessment</td>
</tr>
<tr>
<td>Epigastric pain</td>
<td>Refer for same day hospital step-up assessment</td>
</tr>
<tr>
<td>Reduced movements or small for gestational age infant</td>
<td>Follow local protocols for investigation. Consider reducing interval before next full pre-eclampsia assessment</td>
</tr>
</tbody>
</table>

PRECOG=Pre-eclampsia community guideline.

Data were lacking on the effect of two predisposing factors on the overall likelihood of developing pre-eclampsia. We recommend that women with two such factors be referred for early specialist input, individual assessment, and discussion of obstetric risk.

Community monitoring after 20 weeks’ gestation

A Cochrane review comparing schedules of antenatal care does not provide evidence to recommend a particular schedule for women who do not qualify for early referral; no study was powered to identify differences in mortality, or serious outcomes associated with pre-eclampsia. We found absence of antenatal care to be strongly associated with eclampsia and fetal death. A UK study showed that reducing the frequency of antenatal care shifts costs to neonatal care, resulting in higher overall costs. Serious morbidity associated with pre-eclampsia can occur from 20 weeks’ gestation to after delivery: placental abruption; haemolysis, elevated liver enzymes, and low platelet count syndrome; and renal failure are more common before 32 weeks, whereas eclampsia is most common at term. Onset before 32 weeks has the most serious outcome and the interval between diagnosis and delivery is on average 14 days (range 0-62 days), with a substantial number of women requiring delivery within 72 hours. We therefore recommend (see table 1) that before 32 weeks, women with one risk factor (and none from box 3) are seen at least once every three weeks, and then at least once every two weeks, until delivery.

Women with no risk factors for pre-eclampsia may still develop the condition. NICE recommends assessments for pre-eclampsia at weeks 16, 28, 34, 36, 38, 40, and 41 for healthy parous women with a single fetus. Given that pre-eclampsia can progress to a life threatening situation in, on average, two weeks from diagnosis, we recommend that these women are told that pre-eclampsia can develop between antenatal assessments, are made aware of symptoms, and know how to contact their healthcare professionals at all times.

Content of the assessment

After 20 weeks’ gestation, women should be assessed for the signs and symptoms of pre-eclampsia (see box 4). Any one of these may be the first indication of pre-eclampsia. The method of measuring blood pressure is critical: errors have been implicated in maternal deaths. Our recommendations concur with...
NICE's guideline in the community. Fetal compromise is usually assessed by asking women about reduced fetal movements or by estimating a small for gestational age fetus. The guideline of the Royal College of Obstetricians and Gynaecologists provides evidence based recommendations. Thresholds for step-up assessment (see table 2) are based on the association with poor outcome and rates of progression. Oedema is not predictive, and weight change does not reliably precede other signs.

Women with new hypertension before 32 weeks have a 50% chance of developing pre-eclampsia at 24-28 weeks, new hypertension is predictive of severe pre-eclampsia. On average a rise in diastolic blood pressure that does not reach 90 mm Hg at any time during pregnancy is associated with an uncomplicated pregnancy. Eclampsia is not always associated with severe hypertension; in a UK population study, 34% of eclamptic women had a maximum diastolic blood pressure of ≤ 100 mm Hg.

New proteinuria with new hypertension is strongly associated with poor fetal and maternal outcome. Women may progress rapidly; 25-55% of women with hypertension of ≥ 160 mm Hg systolic or ≥ 110 mm Hg diastolic with new proteinuria (≥ +) required delivery within 48 hours of admission. Quantified protein excretion is independently associated with undiagnosed underlying medical conditions and a poor obstetric outcome. The most reliable method for quantifying protein excretion is urine collection over 24 hours. Although NICE's guideline allows the use of protein creatinine ratios to quantify protein, more recent data suggest that although the test is useful for screening (≥ 30 mg/mmol on a random sample) local confirmation of performance is required for quantification, as the results may be modified by the method used to measure the proteinuria.

While + proteinuria with new hypertension is associated with poor outcome and should be considered as pre-eclampsia until otherwise confirmed, a + result on dipstick testing on its own is prone to false positives. Factors affecting the result include reader error (which can be minimised by training, or the use of automated readers) and concentration errors (avoided by the use of the protein creatinine ratio test). Accuracy is not increased by repeating the test on a new sample. A + result on dipstick testing is unlikely to be due to infection, unless the woman has symptoms.

In the presence of pre-eclampsia, headache is an independent risk factor for eclampsia, and epigastric pain and vomiting are independent risk factors for serious morbidity in women with severe pre-eclampsia. These symptoms should always be followed up immediately, by an assessment of blood pressure and proteinuria as a minimum.

Fetal compromise can be the first clinical indication of pre-eclampsia and should always be followed up by an assessment of blood pressure and proteinuria as well as following local management protocols.

**Summary points**

Many maternal and fetal deaths from pre-eclampsia are associated with substandard care

Poor management includes failure to assess or act on risk at booking or to act on signs and symptoms after 20 weeks' gestation

Our community guideline provides an evidence based risk assessment, a list of factors suitable for early referral, and a two tiered schedule of assessment and step-up referral for signs and symptoms of pre-eclampsia

This is a practical extension of NICE's antenatal guideline

**Resource implications**

We have produced an audit tool for managers to assess the resource implications of implementing our guideline. We anticipate limited impact, depending on the degree to which NICE's guideline on antenatal care has already been implemented and on local circumstances and facilities. In most local circumstances the guideline is most effectively and efficiently introduced at trust level.

We thank the contributors, who gave their time and expertise without payment. Travel expenses, accommodation, and ad hoc expenses were paid, when appropriate. An adoption, training, and implementation package is available through Action on Pre-eclampsia (www.apec.org.uk).

**Contributors:** The Pre-eclampsia Community Guideline Development Group, chaired by CR and JW, conceived the article. The design of the recommendations and analysis of data were a consensus from that group. References were based on literature searches conducted by FM, CR, JW, PB, SR, Kirsten Duckitt, AS, and JW for sections of the paper, with additional studies from Robyn North (independent reviewer). All studies were independently graded by Kirsten Duckitt and DM. FM wrote the paper; she is guarantor. All authors critically reviewed the paper for intellectual content.

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**Competing interests:** None declared.

**Ethical approval:** Not required.


A memorable patient

The miracle of "sudden renal failure"

One of the advantages of being a neonatologist is that former patients come to visit the clinic and wonder how the children are doing years after their initial stay, and I can follow up their development. However, sometimes a visiting patient can also bring a bad conscience back.

A few months ago, a lovely 8 year old boy visited our neonatal intensive care unit with his parents. He seemed impressed by the sight of the little babies and their parents. He seemed interested in the work we do and showed me the patient’s bladder. The bladder was filled to the brim, and I suddenly realised my mistake. After a urinary catheter was placed, the infant passed 55 ml of urine; his tidal volume increased substantially, and respiratory support could be reduced. The baby was discharged home, to the delight of his parents and the ward staff, and he left our unit in good condition. I still remember the senior consultant’s comment: “The first step of renal failure work up is to verify that there really is no urine.”

Fortunately, the night was almost over by then, and the senior consultant appeared. I described the sequence of events and discussed the miracle of sudden renal failure. He carefully listened to my report and glanced at the infant in the incubator. With no further comment, he started the ultrasound scanner and showed me the patient’s bladder. The bladder filled the entire screen, and I suddenly realised my mistake. After a urinary catheter was placed, the infant passed 55 ml of urine; his tidal volume increased substantially, and respiratory support could be reduced. The baby was discharged home, to the delight of his parents and the ward staff, and he left our unit in good condition. I still remember the senior consultant’s comment: “The first step of renal failure work up is to verify that there really is no urine.”

Since then, I have always remembered the side effects of fentanyl. I usually increase the analgesia in sphincter tonus, and any other piece conveying the same type of information which would be helpful for someone with intractable pain.

Mario Rüdriger senior consultant, Department for Neonatology, Medical University Innsbruck, Austria (mario.ruediger@uibk.ac.at)

We welcome articles up to 600 words on topics such as A memorable patient, A paper that changed my practice, My most unfortunate mistake, or any other piece conveying insight, pathos, or humour. Please submit the article online at http://submit.bmj.com Permission is required from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for “Endpieces,” consisting of quotations of up to 80 words (but no more than 100 characters), from any source, ancient or modern, which have appealed to the reader.