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Chronic Kidney Disorders in Pregnancy Guideline

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Contents

1. Introduction

Chronic Kidney Disease (CKD) can be associated with adverse maternal and fetal outcomes. The key to achieving optimum outcome in these women depends on effective preconception counselling and management by a multidisciplinary team.

CKD is classified into 5 stages based on e Glomerular Filtration Rate (eGFR).

Stage 1: Normal GFR; GFR >90 but urine findings or structural abnormalities or genetic traits point to kidney disease
Stage 2: Mild impairment; GFR 60-89 and other findings point to kidney disease (as for stage 1).
Stage 3: Moderate impairment; GFR 30-59
Stage 4: Severe impairment: GFR 15-29
Stage 5: Established renal failure (ERF): GFR < 15 or on dialysis

Renal function in pregnancy should be assessed using serum creatinine.
Estimated GFR (eGFR) is not valid for use in pregnancy.

2. Joint Renal Obstetric Services across Greater Manchester and Eastern Cheshire

The Renal Hypertension Antenatal Clinic (RHANC) and Manchester Antenatal Vascular Service (MAViS) at St.Mary's Hospital are jointly run by Obstetricians with special interest in renal disease (Dr Jenny Myers, Dr R Samangaya, Dr T Kelly, Dr S Rahman), Renal Physician (Dr L Ebah) and Specialist Midwives (Pippa Rix, Amy Sloane).

For any queries regarding the ongoing care of women with established or suspected renal disease in pregnancy please contact the specialist midwives on 0161 7014871 or 0161 276 6116 (or email jenny.myers@mft.nhs.uk).

Women with a history of vasculitis or systemic lupus erythematous (SLE) should be referred to Dr Clare Tower (0161 276 6427 or anna.martin@mft.nhs.uk). Further details of the renal service at Saint Mary's Hospital are included in appendices.

3. Pre-pregnancy counselling and support

- Pre conceptual review is important to fully evaluate renal disease and other co-morbidities and optimise medication and planning of antenatal care
- Safe and effective contraception should be prescribed for women taking teratogenic medication, women with active glomerulonephritis, women within 1 year of renal

transplantation or acute graft rejection, and any women with CKD who does not wish to conceive.

- Women with CKD should be referred for pre-pregnancy counselling before receiving assisted reproductive technology
- Single-embryo transfer is recommended to reduce risk of complications of multifetal pregnancies.

3.1 Assessment

- Previous history including previous surgical intervention.
- Co-morbidities
- Previous obstetric history
- Assessment of current disease status (BP, renal function, proteinuria to facilitate provision of information about pregnancy risks)

3.2 Optimisation

- Renal disease which could be improved should be actively managed by the renal team with treatment plans made in preparation for a pregnancy
- Blood pressure and glycaemic control should be optimised where necessary
- In all conditions, it is usually advisable to delay conception until the disease and drug regime are stable.
- Lifestyle modification and folic acid supplementation.

3.3 Medication

Document a plan for medication in the run up to and during pregnancy. Women and health care professionals should agree a plan for the continuation or discontinuation of specific medications.

- Medications considered safe in pregnancy include: Calcium channel blockers (including nifedipine and amlodipine), methyldopa, hydralazine, labetalol, propranolol, prednisolone, azathioprine, tacrolimus, cyclosporine, hydroxychloroquine, aspirin and Heparin
- Metformin can be used in pregnancy for women with a pre-pregnancy eGFR>30mls/min/1.73m2 and stable renal function during pregnancy

- Medications contraindicated in pregnancy include:
  - ACE inhibitors (captopril, enalapril) and Angiotensin II receptor blockers (candesartan, losartan). These medications are associated with an increased risk of congenital malformations and fetal renal dysfunction. For women with proteinuric kidney disease (including women with diabetic nephropathy) where there is a significant benefit to these treatments, a plan should be documented to discontinue these medications once a pregnancy is confirmed (ideally < 9 weeks gestation).
- Mycophenolate mofetil, methotrexate and cyclophosphamide are teratogenic and should be avoided in pregnancy. They should be discontinued 3-6 months

before pregnancy. Ideally women should be switched to an alternative immunosuppressant medication with a period of at least 3 months stability.

- Sirolimus and everolimus - limited evidence of safety in pregnancy and should be substituted with an alternative therapy before pregnancy where possible.
- There is no evidence of teratogenicity with rituximab but exposure in pregnancy can result in neonatal B cell depletion and long-term outcome is unknown.
- There is no evidence of teratogenicity with eculizumab and the benefits of use in pregnancy for organ threatening disease outweigh possible risk.

3.4 Information

Individualised information should be provided to the woman and her family about the risks of pregnancy to her long term health and CKD. This counselling should be provided by a clinical team with expertise in kidney disease in pregnancy.

- For women with CKD 3/5 the risk of transient or permanent deterioration of background renal function, risk of requiring dialysis, acute transplant rejection and situations where termination of pregnancy is offered should be discussed
- Information should be provided to the woman and her family regarding the potential complications of pregnancy and the need for additional antenatal surveillance. Counselling should be tailored to a woman's individual risk factors and should cover the risks of pre-eclampsia, fetal growth disorders, gestational diabetes, venous thromboembolism, preterm birth and Caesarean section.
- Women with known or suspected inheritable renal diseases should be offered genetic counselling and genetic testing when appropriate.
- A clear explanation of what a pregnancy will entail, the risks and possible outcomes and the intensity of monitoring and the frequency of appointments should be provided.
- There must be written communication with the renal team and GP including discussion about medication plans.
- Women and their care givers must be provided with clear information on how to access specialist antenatal services in the event of a positive pregnancy test/confirmed ongoing pregnancy

3.5 Termination of Pregnancy

- Rapid access to termination of pregnancy services should be facilitated, if for whatever reason a woman chooses this.
- The assurance that clinicians will be non-judgemental and supportive of a decision to terminate a pregnancy is important.

4. Pregnancy Care Management Plan

Clinicians should tailor antenatal care according to both the status of renal disease and obstetric history using the flow chart below. It is important to consider the risk of deterioration

in renal function and where/how this should best be monitored and what thresholds would trigger interventions such as LMWH, specialist referral and/or iatrogenic preterm birth. Simultaneously, the risk of placental disease should also be considered and where appropriate mid gestation screening to tailor antenatal care and scan frequency in the third trimester should be offered.

The principles of specialist care in women with CKD should include the following:

- Provision an individualised, holistic and adaptive package of care through the entire peripartum period
- Optimisation of renal function (where possible) and maintenance of urea <15mmol/L
- Optimisation of blood pressure
- Early detection and management of deterioration in CKD and background disease pathophysiology
- Prevention of placental disease (e.g. aspirin)
- Risk assessment and prophylaxis for VTE
- Access to routine antenatal screening as required (e.g. aneuploidy screening, GTT, preterm labour clinic etc)
- Early detection/diagnosis of placental disease (fetal growth restriction and/or pre-eclampsia
- Delivery care planning including MDT input where necessary
- Safe transition back to primary/secondary care post pregnancy

4.1 Antenatal Care

- Women should be referred as early as possible following a positive pregnancy test.
- Pregnancy care must be planned and managed by a multidisciplinary team including obstetricians, midwives and nephrologists with expertise in the risk assessment and management of women with CKD in pregnancy.
- Women should be provided with a direct contact point for the specialist team.
- Individualised care plans for the pregnancy and delivery must be formulated and documented. It is important that additional medical and surgical needs are identified as early as possible to facilitate multidisciplinary care planning

- The likelihood of deterioration in renal function necessitating early intervention in women with chronic renal disease is influenced by the following factors:
    - the degree of renal impairment and the rate of decline
    - the nature of the underlying renal pathology and disease activity status
    - the presence of chronic hypertension
    - the presence of proteinuria

- The likelihood of pregnancy complications related to placental disease (pre-eclampsia/fetal growth restriction) in women with chronic renal disease is influenced by the following factors:
    - a previous pregnancy complicated by placental disease
    - the presence of chronic hypertension
    - the nature of the underlying renal pathology and disease activity status

- nulliparity
- obesity/diabetes
- the presence of proteinuria
- the degree of renal impairment and the rate of decline

4.2 Monitoring of renal disease and blood pressure

- A baseline renal profile, liver function, full blood count, assessment for proteinuria (PCR or ACR) should be performed.
- Creatinine > 80mmol/L or significant proteinuria (PCR>30mg/mmol in the absence of a urinary tract infection) < 20 weeks should be managed as CKD. Normal serum Creatinine level in pregnancy is <65 umol/l .
- Blood pressure (BP) should be measured at regular intervals during pregnancy with an appropriately sized cuff and an automated device validated for use in pregnancy. Manual BP measurements are acceptable but subject to significant reporting error and bias.
- Individual BP targets must be documented for all women with CKD. For most women the target BP is <140/90mmHg. In some cases of severe CKD, a lower BP target may be desirable and where necessary this should be documented. BP treatment should not usually lower BP below 120/70mmHg.
- For women requiring tight BP control or in women with high BP clinic readings, home BP monitoring either with 24 hour ambulatory monitoring or supported daily self-monitoring should be considered. This should also be considered if there is a suspicion of hypertension or if a woman with CKD has not had 24 hour monitoring done previously. Where practicable, three BP measurements should be obtained at each clinical assessment. This is mandatory if a change in BP medications is being considered.
- The frequency of BP measurement should be dictated by clinical need and is usually necessary at 2-4 weekly intervals after 20 weeks. For women with a blood pressure in target at 10-12 weeks, it is likely that the blood pressure will fall towards 20 weeks requiring less frequent surveillance and often cessation of medication before 20 weeks.
- Renal function including bicarbonate measurements should be assessed according to clinical need and guided by baseline renal function, e.g. every 4 weeks in CKD 2, every 2 weeks in CKD 3 and 4. In women with CKD 1, the frequency of testing should be planned at booking (usually each trimester).
- In women where a change in proteinuria may indicate a change in disease activity or modify the VTE risk assessment (see below), serial quantitative proteinuria assessments should be undertaken.

- In women with a history of structural urinary tract abnormalities, a history of reflux nephropathy and/or recurrent UTIs, routine dipstick analysis should include nitrites and blood and regular mid stream urine samples should be obtained. In women with recurrent UTIs in pregnancy or in women where antibiotic prophylaxis has previously been recommended, prophylactic antibiotics should be considered and offered where the benefit of antibiotics is considered to outweigh the risks. Ideally this should

involve discussion with a microbiologist, particularly if uncommon or resistant microbes are detected.

- Urinary tract ultrasound should be offered to women with a new diagnosis of CKD in pregnancy, known structural abnormalities particularly single kidney, hydropnephrosis and/or nephropathy secondary to renal calculi.

4.3 Prevention, screening and detection of placental disease – pre-eclampsia and FGR

- Low-dose aspirin (75-150 mg) taken at night is recommended from 12 weeks until 36 weeks gestation to reduce the risk of placental disease. Earlier prescription of aspirin should be considered if the benefits are considered to outweigh the risks
- If indicated (see flow chart), uterine artery Doppler +/- placental biometry should be offered at 22–24 weeks. In women with normal (<95th centile) uterine artery Doppler, fetal biometry >10th centile and normal placental biometry (i.e. a 'negative placental screen'), and stable CKD 1/2, routine fetal growth surveillance may be delayed until >30 weeks (unless there is a history of a previous preterm birth (<32 weeks).
- In women with stable CKD 1/2, stable renal function and a negative placental screen, fetal growth surveillance should be carried out every 4 weeks unless signs of placental disease are suspected (abnormal growth trajectory, oligohydramnios, abnormal umbilical artery Doppler). In women with CKD 3 or worse, routine surveillance (usually 4 weekly) is indicated from 26-28 weeks.
- In women with a positive placental screen at 22-24 week screen more frequent ultrasound surveillance should be offered (usually 2-3 weekly)
- In women with abnormal umbilical artery Dopplers and/or severe early-onset fetal growth restriction (<3rd centile) <32 weeks, fetal surveillance by a specialist obstetrician should be offered (see FGR pathway). If this cannot be facilitated locally, referral to a specialist unit who can provide advanced surveillance (including fetal Dopplers) should be offered.

4.4 Additional antenatal screening considerations

- In all women with CKD, a full and dynamic risk assessment for the risk of VTE should be conducted at booking and reviewed at 28 weeks, birth and if there is a change in the clinical condition (e.g. development/deterioration of proteinuria, development of suspected pre-eclampsia, falling serum albumin). In women with nephrotic syndrome/nephrotic range proteinuria, LMWH should be offered until 6 weeks postpartum if there are no contraindications. In women with lower grade proteinuria (e.g. PCR 50-500mg/mmol) and or low serum albumin (<20g/dl), LMWH should be offered if considered to be appropriate, particularly in women who have other VTE risk factors.
- The dosing of thromboprophylaxis should follow local VTE prophylaxis guidelines for Xa/dose monitoring and delivery care planning (adjusted weight-based doses may be necessary in women with CKD).
- A glucose tolerance test (GTT) at 24-28 weeks should be offered to all women prescribed steroids or calcineurin inhibitors (e.g. tacrolimus) or with risk factors for GDM (see NICE guidelines). In women with additional risk factors for the

development of gestational diabetes, an earlier GTT should be considered (previous GDM, BMI>40).

- Women with CKD should have access to usual trisomy screening with specialist interpretation of high-risk results
- The need for antenatal anaesthetic referral should be considered for all women with CKD, especially those with comorbidities.
- Routine screening and treatment of anaemia, including a booking ferritin, should be offered to all women with early iron replacement as indicated. In women with CKD, decreased erythropoietin and shortened red cell survival are common. Where indicated, following discussion with the specialist renal/anaemia team, erythropoietin treatment should be offered to improve anaemia; IV iron replacement to achieve a serum ferritin >200 is usually required prior to EPO therapy.
- Women with CKD who are vitamin D deficient should be given vitamin D supplementation in pregnancy. Calcimimetics and phosphate binders should be discontinued in pregnancy.

4.5 Development of complications in the antenatal period

The following signs indicate a potential deterioration in maternal systemic/kidney disease and/or the development of placental disease and should trigger a change in the frequency of monitoring. In some cases antenatal admission may be necessary.

- Blood pressure above the documented target, requiring instigation of medication or an escalation in treatment
- Deterioration in biochemical renal function
- New identification or significant and persistent escalation in proteinuria (NB proteinuria is extremely variable in pregnancy and often an unreliable clinical sign)
- The development of other systemic symptoms or signs which could indicate a disease flare (particular important in women with systemic disease with renal involvement such as vasculitis and SLE)
- Suspected placental insufficiency indicated by a change in fetal growth velocity, oligohydramnios and/or abnormal umbilical artery Doppler
- The need for antenatal admission should be determined by individual circumstances. Factors to be considered include: the severity of the abnormality detected, viability and/or likelihood of early preterm birth being necessary, co-existence of additional risk factors/comorbidities and compliance with outpatient monitoring (including home BP monitoring/urinalysis).
- Assessment by a specialist multidisciplinary team should endeavour to diagnose the cause of the deterioration – the use of angiogenic marker tests (see NICE guidance) should be used where possible, especially if delivery <34 weeks is being considered. In cases where there is uncertainty regarding the diagnosis (i.e. pre-eclampsia secondary to placental disease or primary maternal disease deterioration), involvement of the tertiary care team should be considered.
- In women presenting with preterm labour, steroids should be administered in line with the preterm labour guideline.
- In women with CKD where an iatrogenic preterm birth is considered, a full discussion with the MDT should be undertaken before steroids are administered

for fetal lung maturity, especially <32 weeks. The major benefits associated with steroid administration in very preterm infants (prevention of death and IVH) rapidly diminish 48 hours after steroid administration; timing of steroids is therefore crucial and should only be given once the decision for iatrogenic preterm birth has been confirmed.

- Polyhydramnios may complicate pregnancies where the maternal urea level is greater than 10 µmol/l; this is secondary to fetal polyuria due to the osmotic load from the high urea level. The risk of fetal death is increased in women with a urea >15 µmol/l and significantly increased above 20µmol/l.

4.6 Planning birth

- Timing/mode of birth should be guided by obstetric factors in women with stable kidney disease CKD 1/2 – in the presence of associated hypertension, birth should be offered by 39 weeks. Earlier induction may be associated with improved maternal and fetal outcomes in women with CKD 3 or more or in women with deterioration in renal function.
- In pregnancies complicated by SGA, gestational hypertension or pre-eclampsia, timing/mode of birth should be based on clinical judgement and maternal preference but should be offered 37-38 weeks, if not indicated sooner.
- A care plan should be documented prior to 36 weeks in women where there are special considerations likely to affect birth/post partum management. These include:
    - The need for senior/additional surgical support in the event of a caesarean section
    - Anaesthetic considerations
    - Care plan for the management of LMWH
    - Plan for IV hydrocortisone where indicated
    - Plan for insulin therapy
    - Additional considerations in women with CKD who are at risk of volume depletion or volume overload.
    - A plan for medications in the immediate postnatal period

4.7 Intrapartum management

- Vaginal birth should be the mode of choice. Lower segment caesarean section should be performed for obstetric reasons.
- Continuous electronic fetal monitoring is recommended for women with CKD.
- All women with CKD should have observations taken and documented during any hospital admission. This includes temperature, heart rate, blood pressure, respiratory rate, oxygen saturation, and level of consciousness. An early warning score should be calculated and actioned appropriately.
- There is no contraindication to the use of labour analgesia including epidural. For women prescribed LMWH, a haematology care plan should be documented at 36 weeks or earlier if necessary.
- Additional assessment should be undertaken for women with an elevated early warning score, for women considered to be high risk, and for any women in whom there is any clinical concern. This includes jugular venous pressure, chest

auscultation and urine output monitoring (in-dwelling catheter not usually required) in addition to routine parameters.

- Fluid balance should be managed with the aim of maintaining normal fluid volume and avoiding dehydration and pulmonary oedema, with input from clinicians with expertise in fluid balance and renal disease if necessary.
- A specific assessment of the increased risk of pulmonary oedema should be undertaken in women with CKD and pre-eclampsia.
- In women taking >7.5mg of prednisolone daily then intravenous hydrocortisone 100mg should be given in labour 6 hourly until oral medication can be recommenced.
- An arterial line may be indicated and this should be specified in the anaesthetic care plan.
- Blood loss should be assessed as accurately as possible.
- Limitation of second stage is not needed.
- Ergometrine and syntometrine are often contraindicated due to pre-existing hypertension and/or pre-eclampsia.
- Magnesium sulphate prophylaxis should be used in severe pre-eclampsia and for neuroprotection in pregnancies where birth is expected before 34 weeks. $MgSO_4$ is renally excreted and therefore clinicians should be alert to the possibility of magnesium toxicity in women with impaired renal function and consider using lower doses for maintenance $MgSO_4$ therapy
- Atosiban can be used for tocolysis. There is no evidence for the use of atosiban in CKD but renal impairment is unlikely as only small amounts excreted in urine.

4.8 Postnatal care

- Women with CKD should be encouraged to breast feed and should be prescribed medications that are compatible with breastfeeding whenever possible
- Drugs which can be continued/commenced during breastfeeding: α and β blockers, nifedipine, amlodipine, ACE inhibitors (captopril, enalapril), hydralazine, prednisolone, azathioprine, ciclosporin, tacrolimus.
- Drugs which should be avoided in breastfeeding include: mycophenolate, mycophenolic acid
- Methyldopa is contraindicated in all postnatal women because of the risk of depression
- Immunosuppressive treatment does not need to be routinely increased in the post-partum period
- LMWH should be continued for 6 weeks postpartum in women with significant risk factors for VTE or where antenatal VTE prophylaxis was recommended
- Non-steroidal anti-inflammatories should not be given to women with CKD.
- Women with moderate and high risk CKD (see appendix) should have a planned early postpartum renal review.
- Women should continue their established care with the nephrology team and be seen at a postnatal combined clinic.
- Women with a new diagnosis of CKD during pregnancy should be referred to a nephrology clinic and advised of the possibility of requiring a renal biopsy.

- Women should be informed about the risks in future pregnancies and the importance of pre-conception care when planning future pregnancies.
- Women should be given advice about contraception and how to access services rapidly when they become pregnant.
- Contraception: All types of contraception are generally safe, tolerated, effective with minimal interactions.
    - Emergency contraception is safe in CKD and transplant.
    - LNG-IUS is safe & effective in immunosuppressed
    - Combined OCP 3rd line but not excluded.
    - Depot progestogens can have variable interaction with tacrolimus and cyclosporine.

4.9 Specific renal conditions

4.9.1 Solid organ transplants

- All pregnant women with renal transplant should be managed at the tertiary unit.
- Transplant complications (infection, rejection, urological) are more during the first year post-transplantation and more aggressive immunosuppressive treatment is used during this period. Women with renal transplants should wait until their kidney function is stable on medications safe in pregnancy before conceiving, which is usually more than one year after transplantation
- The miscarriage rate and the incidence of congenital anomalies are similar to the general population.
- Potential pregnancy complications in kidney transplant recipients include hypertension, pre-eclampsia, FGR (20–40%), preterm delivery (45–60%), increased risk of infections due to immunosuppression and anaemia.
- Approximately 10–18% of women will have a temporary or permanent deterioration of kidney function
- Acute rejection in pregnancy occurs in 9–14% of women but the incidence of serious episodes of rejection is 5%, which is similar to the rates observed in non-pregnant transplant patients.
- Immunosuppressant therapy should be managed and monitored frequently in conjunction with the specialist transplant team
- The features of acute rejection include:
    - deteriorating renal function
    - fever
    - oliguria
    - graft swelling and tenderness
    - altered echogenicity of renal parenchyma and blurring of corticomedullary junction on ultrasound.
- Plans for delivery in women who have undergone renal transplantation should be discussed with the local surgical transplant team

- There is a risk of injury to the transplant kidney during Caesarean section. The location of the transplanted kidney must be available prior to Caesarean section.
- Renal transplant surgeon should ideally be present at Caesarean section.

4.10 Pregnancy and dialysis

- Pregnant women on dialysis should be managed at the tertiary centre.
- Women established on dialysis planning a pregnancy should receive preconception counselling which includes the options of postponing pregnancy until transplantation (when feasible), long frequent dialysis prior to and during pregnancy, egg preservation, surrogacy and adoption
- Conception is more likely in women with residual renal function and those just beginning dialysis. The incidence of pregnancy is lower in women on peritoneal dialysis than on haemodialysis.
- Pregnancy outcomes in women receiving dialysis are poor but can be improved with intensive dialysis.
- Women established on haemodialysis prior to pregnancy should receive long, frequent haemodialysis either in-centre or at home to improve pregnancy outcomes
- Women established on peritoneal dialysis prior to pregnancy should be considered for transition to haemodialysis during pregnancy
- Commencement of haemodialysis should be considered in women with CKD stage 5 or deteriorating CKD stage 4 in order to improve pregnancy outcome
- Women receiving dialysis during pregnancy should have dialysis dose prescribed accounting for residual renal function, aiming for a pre-dialysis urea <15mmol/l

4.10.1 Glomerular disease and vasculitis

- Women with lupus nephritis have a higher risk of pregnancy complications compared to women with a comparable level of renal function due to another cause.
- Women with lupus or vasculitis should be advised to wait until their disease is quiescent for at least 6 months before conceiving.
- Women with active lupus, hypertension, proteinuria, reduced kidney function or positive lupus anticoagulant should be advised that pregnancy has a greater likelihood of complication requiring preterm birth.
- All women with lupus should be advised to take hydroxychloroquine in pregnancy to improve neonatal outcomes unless it is contraindicated.
- Lupus disease activity should be monitored at least monthly during pregnancy.
- Women who are positive for anti-Ro (SSA) or anti-La (SSB) antibodies should have the fetal heart monitored weekly after 16 weeks gestation in view of the increased 1-2% risk of heart block. Women should be referred for a fetal echo if the heart rate is less than 110bpm.

4.10.2 Diabetic nephropathy

- Women with diabetic nephropathy are likely to have a higher risk of adverse pregnancy outcome compared to women with a comparable level of renal function due to another cause.
- Women with diabetic nephropathy should continue ACE inhibitors for nephroprotection until conception

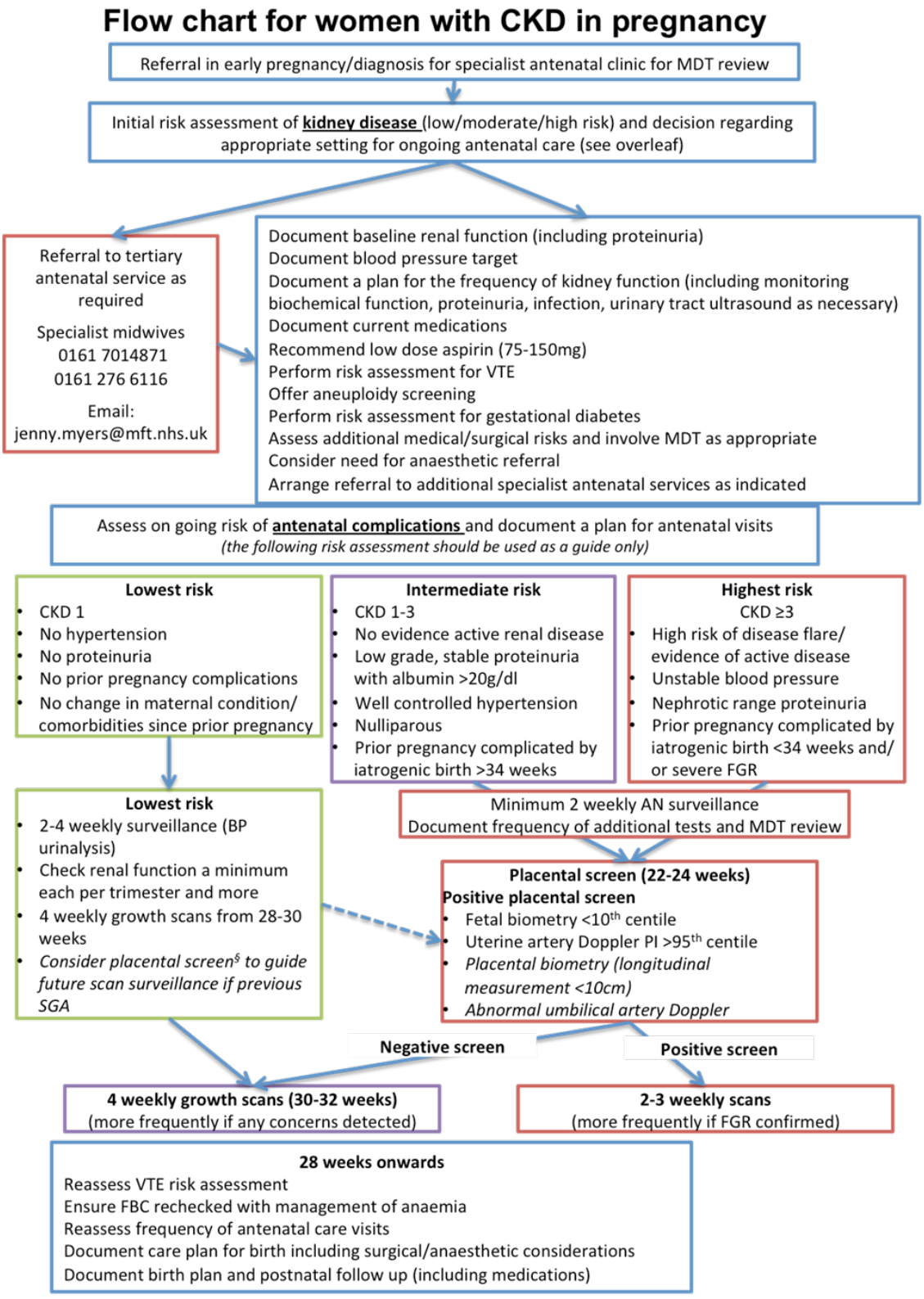
4.10.3 Reflux nephropathy

- Women with diabetic nephropathy are likely to have a higher risk of adverse pregnancy outcome compared to women with a comparable level of renal function due to another cause.
- Women with diabetic nephropathy should continue ACE inhibitors for nephroprotection until conception

4.10.4 New diagnosis CKD in pregnancy (raised serum creatinine and/or proteinuria <22 weeks)

- Initial investigations should include:
  - MSSU to exclude UTI
  - PCR to quantify proteinuria
  - Baseline FBC, U&Es, LFTs, antinuclear antibodies, DS-DNA, lupus anticoagulant, (complement and immunogbulin analysis may also be indicated).
  - Renal USS
- Review VTE risk and consider LMWH if significant proteinuria
- Treat hypertension to maintain BP <140/90mmHg
- Document a plan for fetal growth surveillance as per CKD guidelines
- Consider renal biopsy in the first and early second trimester pregnancy if a histological diagnosis will change management. The risks of renal biopsy after 22 weeks usually outweigh the benefits
- Offer birth at 37-38 weeks unless indicated sooner.
- Ensure postnatal follow up is arranged to confirm/exclude persistent proteinuria and appropriate renal referral.

Appendix 1: Flowchart for Pregnancy Management



§If placental screen not available routine ultrasound surveillance from 26-28 weeks depending on risk status

Appendix 2: Categorisation of kidney disease in pregnancy

Low Risk

- Usually CKD 1 outside pregnancy
- Serum creatinine < 120 µmol/l
- uPCR <100 mg/mmol

Care and delivery in local hospital, with escalation if clinical deterioration.
Significant renal function loss is unlikely so long as blood pressure and proteinuria are managed prior to conception and during pregnancy.

Moderate Risk

- Usually CKD 2 outside pregnancy
- Serum creatinine <250 µmol/l
- uPCR >100mg/mmol under 20 weeks

Moderate increased risk of maternal or fetal mortality or morbidity.
Shared care between local hospital and RANC/MAViS– refer to tertiary unit to be seen before 16 weeks for management plan

High Risk

- Diagnosis of CKD 3 or worse outside of pregnancy
- Lupus nephritis or vasculitis with CKD 2 or worse and or other organ involvement – refer to the LIPS clinic
- Previous flare of CKD in pregnancy
- Renal transplant/ renal + pancreas transplant
- On dialysis/ requiring dialysis
- New serum Creatinine >250 µmol/l
- New uPCR >300mg/mmol

High risk of maternal or fetal mortality or morbidity.

Refer to tertiary unit.

Appendix 3: Specialist services for women with kidney disease

Renal ANC

The RHANC is a specialised service for women with kidney disease or severe hypertension who are pregnant, or who are thinking about having a baby. Women from across the North West of England, North Wales and the Isle of Man use this service. A large team of clinicians contribute to this service including obstetricians, nephrologists and specialist midwives. The service provides pre conceptual, antenatal, intrapartum and postnatal care. The aim is to provide pregnancy individualised, woman centred care.

How does the service work?

The team run a clinic on every Thursday afternoon seeing women for pre conceptual advice, antenatal care and postnatal care. If women are admitted to hospital they are cared for by the same team on the ward.

Where does the clinic run?

The clinic is held in the Antenatal clinic on the ground floor of Saint Mary's Hospital, Manchester.

Who should be referred to the clinic?

Any women with known or suspected kidney disease should be referred for pre conceptual advice. Women already booked at Saint Mary's Hospital who has known kidney disease should be referred as early in pregnancy as possible. Women with moderate or high risk kidney disease who are booked at other hospitals should be referred, although some may continue their care in their local hospital if this seems appropriate.

How do I refer a woman to RHANC?

Please contact the specialist midwives on (0161 7014871/0161 276 6116 or email jenny.myers@mft.nhs.uk) or fax a referral letter it to 0161 276 6143. Please include as much detail as possible. If you need urgent clinical advice please contact Dr Myers, Dr Samangaya, Dr Kelly, Dr Rahman or Dr Ebah via the hospital switchboard 0161 276 1234.

Appendix 4: Relevant published guidance

KDIGO Clinical Practice Guideline for the Evaluation and Management of CKD, 2012

KDIGO Clinical Practice Guideline for Glomerulonephritis, 2012

KDOQI Clinical Practice Guideline for Haemodialysis, 2015.

KDIGO Guideline for the Care of Kidney Transplant Recipients, 2009.

NICE Antenatal Care for Uncomplicated Pregnancies [CG62], 2008, updated 2017.

NICE Hypertension in Pregnancy: diagnosis and management [CG107], 2011.

NICE Diabetes in Pregnancy: management from pre-conception to the post-partum period [NG3], 2015.

NICE Vitamin D supplement use in specific population groups [PH56], 2017

MBBRACE Confidential Enquiry into Maternal Deaths and Morbidity: lessons learned to inform maternity care (triennial reports)

RCOG Good Practice and Green Top Guidelines

www.european-renal-best-practice.org/content/erbp-documents (overlap with KDIGO - please check nothing additional)

EBPG Expert Group on Renal Transplantation European best practice guidelines for renal transplantation. Section IV: long-term management of the transplant recipient. IV.10. Pregnancy in renal transplant recipients Nephrol Dial Transplant 2002 17 Suppl 4 50–55.

Appendix 5: Additional Information

Renal Disease	Effects
Chronic glomerulonephritis and focal glomerular sclerosis	Pregnancy may trigger a flare If there has not been a flare during a prior pregnancy then prognosis is improved. If previous flare in pregnancy, high chance of recurrence
IgA nephropathy	Risk of uncontrolled hypertension, flare and nephrotic syndrome
Polycystic kidney disease	Autosomal dominant Risk of pre-eclampsia, UTI Minimal adverse long term associated with pregnancy
Lupus nephritis	Refer to LIPS clinic High risk for flare in pregnancy especially if disease active at conception May manifest for 1st time in pregnancy Prognosis better if remission >6months preconception
After nephrectomy, solitary/pelvic kidney	Maybe associated with other malformations Increased risk of pre-eclampsia especially in nulliparous women Dystocia rare with pelvic kidney
Granulomatosis with polyangiitis	Proteinuria, hypertension common from early pregnancy. High risk in pregnancy for disease flare Often have granulomas in lung, throat, nose requiring MDT care
Periarteritis nodosa	Fetal prognosis poor, risk of maternal death
Renal artery stenosis	May present as chronic hypertension or recurrent pre-eclampsia