The BSR and BHPR guideline for the management of systemic lupus erythematosus in adults.

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Full Guideline

Scope and Purpose of the Guideline

Background

Systemic lupus erythematosus (SLE or lupus for short) is a multisystem, autoimmune disease, involving complex pathogenetic mechanisms that can present at any age. It most commonly presents in women in the reproductive age group although lupus is increasingly recognized after the age of 40 particularly in Europeans (1-3). Lupus affected nearly 1 in 1000 of the population in 2012 in the UK (4) and is most frequently observed in people of African-Caribbean and South Asian descent (4-6). The age-standardized incidence in the UK according to the Clinical Practice Research Datalink (CPRD) is 8.3/100,000/ year for females and 1.4/100,000/year for males in the UK (4). The highest incidence rates are seen in those of African-Caribbean descent, 31.4/100,000/year compared to 6.7/100,000/year for those of white European descent. The mean age at diagnosis was 48.9 years (4) but it is lower in those of African ancestry in the UK (4-6) and North America (2;7).

The disease is prone to relapses and remissions, resulting in considerable morbidity due to flares of disease activity and accumulated damage, with an increased risk of premature death mostly due to infection or cardiovascular disease (2;8-14). Death from active lupus is rare in the UK (15;16), however 10% mortality over 20 years with a mean age of death of 53.7 years was recently reported (16). About one third of SLE patients develop lupus nephritis (LN) in the UK (16-18). Patients of African ancestry tend to present young with LN in the UK as in the US and elsewhere (2;17;19) and are at considerable risk of developing end-stage renal disease (ESRD) and of dying prematurely. In another UK cohort, ESRD occurred in 20% LN patients within 10 years of diagnosis and the mean age at death in LN patients was 40.3 years with an average of 7.5 years between development of LN and death (18).

The mainstay of therapy for active lupus until recently has been non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, antimalarials such as hydroxychloroquine and immunosuppressants such as azathioprine (AZA) and cyclophosphamide, although only prednisolone and hydroxychloroquine are licensed for lupus (8;20). With the exception of LN, there were relatively few trials until the last 15 years and in 2011, belimumab became the first drug to be licensed for the treatment of active lupus for over 50 years (20). New therapies that will reduce the need for corticosteroids to control lupus activity and to reduce the development of damage and infection are needed to improve outcome (10-12;16;21). In the meantime it is important to manage patients optimally with treatment strategies that are available.
Need for the guideline
Despite some improvement in survival data over the last 40 years (2;13), lupus patients still die on average 25 years earlier than the mean for women and men in the UK (16). The disease can present with slowly or rapidly progressive active disease at any age and can be associated with the rapid accumulation of damage if not promptly diagnosed, appropriately treated and regularly monitored (2;8;14;19;20). An up to date comprehensive guideline to optimise these aspects of management and consistent with current evidence and NHS practice, is warranted to improve the outcome of this variable and potentially life-threatening disease that causes considerable morbidity. There have been no previous UK based guidelines for lupus. The European (EULAR) recommendations for the management of lupus in general were not very detailed and were published in 2008(22) although more specific recommendations were published for neuro-psychiatric lupus in 2010(23) and joint European League Against Rheumatism and European Renal Association-European Dialysis and Transplant Association (EULAR/ERA-EDTA) recommendations for lupus nephritis were published in 2012(24), as well as American College of Rheumatology (ACR) guidelines for the management of lupus nephritis in 2012(25).

Objectives of the guideline
The aim of this guideline was to produce recommendations for the management of adult lupus patients in the UK that cover the diagnosis, assessment, and monitoring of lupus and the treatment of mild, moderate and severe active lupus disease but that do not imply a legal obligation. The resulting recommendations are based on an extensive literature review up to June 2015 to produce evidence-based guidelines, particularly for the treatment of non-renal lupus, supplemented as necessary by expert opinion and consensus agreement (tables 1 and 2). The guideline development group recommend that patients with lupus nephritis are managed according to the EULAR/ERA-EDTA recommendations for lupus nephritis(24) and provide their levels of agreement with a summary of the most important items in those recommendations (table 3).

Target population, target audience and stakeholder involvement
The guidelines address the management of adult patients only and have been developed by a multidisciplinary guideline development group set up by the BSR and led by CG, consisting of academic (CG, INB, DDC, MK, DJ) and NHS consultants in rheumatology (MA, BG) and nephrology (DJ, LL), rheumatology trainees (MG, KS), a GP (BE) and a clinical nurse specialist (SB), a patient representative (YN) and a lay member (PN). All participants declared any conflicts of interest and these are listed at the end of this article. The target audience includes rheumatologists and other clinicians such as nephrologists, immunologists and dermatologists, trainees in these specialties and emergency medicine, GPs, clinical nurse specialists, and other allied health professionals involved in the care of adult lupus patients. Opinions of
other key stakeholders such as other consultant members of the BSR, additional trainees, podiatrists, nurse specialists and representatives of Lupus UK were sought during the preparation of these guidelines.

The areas that the guideline does not cover
This guideline does not cover the evidence for topical or systemic therapy for isolated cutaneous lupus nor does it discuss paediatric lupus as there is relatively little literature on paediatric lupus. As the disease tends to come on after puberty, most of the recommendations are likely to be appropriate for children/adolescents with suitable dose modifications. We provide only summary advice about the use of drugs in the management of pregnant lupus patients and refer to the extensive review of drugs used in pregnancy and breast-feeding that have been recently published (26;27). The management of complications of lupus including chronic fatigue, cardiovascular risk, osteoporosis, infection, and cancer risk are not discussed in detail as these issues should be managed as for other patients with similar risk factors according to national and international guidelines. Management of thrombosis will depend on whether or not the criteria for antiphospholipid syndrome are met (28).

Rigor of development

The selection of questions for the literature review and statement of extent of previous NICE, RCP or SIGN guidelines.
A multidisciplinary guideline development group was formed and followed the BSR Protocol for Guidelines and EULAR standardized operating procedures to define the focus of the work, the target population and the target audience. Discussions were supplemented by consensus building strategies including a modified Delphi technique to reduce and clearly define the list of research questions to be addressed by the literature search (supplementary information 1). There are no BSR, RCP, National Institute for Health and Care Excellence (NICE) or Scottish Intercollegiate Guidelines Network (SIGN) guidelines or recommendations for the management of lupus in the UK to help improve the outcome of this variable and potentially life-threatening disease but lupus has been included in the on-line resource Map of Medicine.

Literature review, eligibility criteria, limitations of the search
A systematic search of MEDLINE (PubMed) and the Cochrane Database of Systematic Reviews was performed, and all publications in peer-reviewed English language journals up to June 2015 were considered. A detailed search was performed using an array of relevant terms (supplementary information 1) and papers were screened for eligibility based on their title, abstract and/or full content. Studies were eligible if they had studied at least 50 patients for prevalence and prognosis of manifestations, 10 patients for diagnosis and monitoring and 5 patients for therapy.
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Studies on animals, children, review articles, commentaries, conference abstracts or statements, and expert opinion statements were excluded. Narrative review articles and existing guidelines were checked for references but only meta-analyses and systematic reviews were included with original research articles in the analysis. Over 8,000 articles were identified during the literature search and over 600 were deemed eligible for detailed review by at least 2 members of the group. There was considerable overlap in the topics covered by the papers that were reviewed by different members of the group.

Development of the guideline: levels of evidence and consensus agreement

The recommendations were developed in line with the BSR's Guidelines Protocol using RCP, SIGN and AGREE II methodology to assess the level of evidence and grade of recommendation. Papers selected for review and the evidence obtained from them was categorized by at least 2 members of the group according to study design using the Scottish Intercollegiate Guidelines Network (SIGN) methodology (appendix 2) and the level of the evidence was graded by combining information on the design and validity of the available data to provide the grade of recommendation for each component of each statement. The results of the literature search were summarized, aggregated and distributed to the expert committee by 3 of us (CG, MG, MA), and the grade of recommendation for each item was ratified by the expert committee. Draft recommendations were discussed and rephrased at a face to face meeting and subsequently by email following an updated literature review. The level of evidence and the grade of recommendation for the data supporting the guideline recommendations are shown in tables 1 and 2. Finally the 6 recommendations for the management of SLE and the main items in the EULAR/ERA-EDTA recommendations for lupus nephritis (24) (table 3) were voted on by clinical members of the guideline development group. For each recommendation the strength of agreement of all clinical members of the group was sought on a scale of 1 (no agreement) to 10 (complete agreement) and the mean percentage agreement was calculated and is shown after each recommendation (all >90% and supported by other members of the group). The guideline will be reviewed in 5 years.

The Guideline

Eligibility criteria

This guideline is designed to cover the management of adult patients with systemic lupus erythematosus by healthcare professionals. These recommendations are based on the literature review covering the diagnosis, assessment, monitoring and treatment of mild, moderate and severe lupus including neuropsychiatric disease. The focus of the literature review is on non-renal disease as the EULAR/ERA-EDTA recommendations for lupus nephritis (see below) were published close to the time that we started work on this guideline.

Exclusion criteria

Management of paediatric lupus, renal lupus, topical treatment for cutaneous lupus and drug treatment in pregnancy have been excluded from our literature search and guideline development. BSR guidelines on the
use of drugs in pregnant patients with rheumatic diseases including lupus have been developed in parallel with this guideline.

**Introduction to the recommendations and supporting evidence**

For each question addressed by the literature review (supplementary information 1) we provide first the recommendations with the overall level of evidence (LOE), grade of recommendation (GOR) and strength of agreement (SOA), followed by the rationale consisting of a summary of the evidence supporting the statements (including cautions in the case of drug therapy) organised by topic including some key points about the studies leading to the recommendations and a conclusion for each topic discussed. The number of studies and types of studies with references leading to the LOE and GOR are summarised in table 1 for the items contributing to the recommendations on diagnosis, assessment and monitoring of lupus and in table 2 for the treatment and prevention of mild, moderate and severe non-renal lupus. In table 3 we provide our SOA with key points of the EULAR/ERA-EDTA recommendations for the management of lupus nephritis(24), so that the management of the most important aspects of lupus are covered by this guideline in a single document.

1. **Recommendations for clinical and serological features prompting consideration of a diagnosis of SLE**

1.0 SLE is a multi-system autoimmune disorder. The diagnosis requires a combination of clinical features and the presence of at least one relevant immunological abnormality. If there is a clinical suspicion of lupus, blood tests including serological markers should be checked. (LOE 2++, GOR B, SOA 98%)

1.1 ANA are present in about 95% of SLE patients. If the test is negative, there is a low clinical probability of the patient having SLE. A positive ANA occurs in approximately 5% of the adult population and alone has poor diagnostic value in the absence of clinical features of autoimmune rheumatic disease. (2++/B, SOA 96%)

1.2 The presence of anti-dsDNA antibodies (2++/B), low complement levels (2+/C) or anti-Smith (Sm) antibodies (2+/C) are highly predictive of a diagnosis of SLE in patients with relevant clinical features. Anti-Ro/La and anti-RNP antibodies are less specific markers of SLE (2+/C) as they are found in other autoimmune rheumatic disorders as well as SLE (2+/C). (SOA 95%)

1.3 Antiphospholipid antibodies should be tested in all lupus patients at baseline, especially in those with an adverse pregnancy history or arterial/venous thrombotic events (2++/B). Confirmatory tests for antiphospholipid syndrome are positive lupus anticoagulant, anti-cardiolipin antibodies (IgG, IgM)
and/or anti-beta-2 glycoprotein-1 (IgG, IgM) on two occasions at least 12 weeks apart (2+ by B) (SOA 97%)

Rationale

Clinical manifestations

SLE is a multi-system autoimmune disease(1;8) with considerable heterogeneity. This makes the diagnosis, assessment and monitoring a challenging process(10;29-32). Delays in diagnosis are well recognised and remain a concern(33). Some of the most typical features and their cumulative incidence are shown in suppl table 1(7;10;29-31;34). It is important to ensure that the diagnosis of lupus is appropriate before considering treatment (32,35). Given the variety of clinical manifestations that can occur, lupus should be considered in the differential diagnosis of many acute and sub-acute presentations particularly, but not exclusively, in individuals at increased risk of the disease, such as women from African, South Asian or Chinese backgrounds(2;36). Lupus can affect men as well, resulting in severe disease including renal involvement and greater risk of damage compared with women in some but not all reports (15;16;37;38).

Renal and neurological involvement are major causes for morbidity and mortality in SLE(15;16) (2;39) (7;40). Renal disease is clinically silent and must be actively sought to prevent renal damage as discussed below. A working party of the ACR distinguished 19 neuropsychiatric manifestations that may occur in SLE patients(41). Not all are directly attributable to the SLE disease process and the true incidence of these manifestations is hard to ascertain as most of them are uncommon(23;42). Gastrointestinal and hepatic features occur in 39-67% of patients(43;44) and are often not recognised as being due to lupus. As with cardio-respiratory features they must be distinguished carefully from infection, adverse events from drugs and co-morbid conditions. Ophthalmic manifestations of lupus are rare but potentially sight-threatening and need careful evaluation by an experienced ophthalmologist(45-47).

Serological (immunological) manifestations

The clinical features of acute lupus are mostly due to inflammatory processes triggered by the formation of immune complexes involving autoantibodies and complement consumption, although thrombosis associated with anti-phospholipid antibodies may contribute to the pathogenesis in some patients(1,8;10). With a clinical suspicion of SLE, an initial autoantibody screen should be performed. Approximately 95% of lupus patients are ANA positive and 98% of patients will have a positive anti-nuclear antibodies (ANA) and/or anti-dsDNA antibodies(29;48;49). ANA tests although sensitive are not specific for the diagnosis of lupus and ANA can occur in a variety of other conditions including Sjögren’s syndrome, systemic sclerosis, dermatomyositis, viral infections (eg infectious mononucleosis) and malignancy(32;48). The ANA test can increase in titre over time or can become negative in treated patients and the results can vary with different assays(49;50).
If patients have a strong clinical likelihood of having lupus, anti-dsDNA antibody testing should be done(51). Anti-dsDNA and anti-Sm antibodies are much more specific for lupus, being very rare in other conditions(48) but they are less sensitive than ANA (suppl table 1 ) (10;29;31;34;52). Both the Farr and the ELISA methods are acceptable for measuring anti-dsDNA antibodies, with the former yielding higher sensitivity and specificity rates(24;53;54). The *Crithidia luciliae* immunofluorescence test (CLIF) also has a high specificity for SLE. Additional routine serological tests are the complement C3 and C4 levels(55). C3 generally has a higher sensitivity than serum C4 for active lupus nephritis, but both tests have modest specificity and their clinical utility lies on their high negative predictive value (>90%) to exclude active disease, especially renal disease(24;56-58).

Anti-Ro (SSA) and anti-La (SSB) antibodies and anti-RNP antibodies are less specific markers for the presence of SLE as they are found in other autoimmune rheumatic disorders(32). Anti-Ro and anti-La are most strongly associated with primary Sjögren’s syndrome but do occur in lupus patients, especially those with photosensitivity and subacute cutaneous lupus. Anti-Ro and anti-La antibodies can cause neonatal lupus syndrome including congenital heart block in children born to mothers with these antibodies (see section below on monitoring)(59;60). Anti-RNP antibodies are found in overlap conditions such as mixed connective tissue disease(32).

All lupus patients should be tested for anti-phospholipid antibodies as this indicates a group at increased risk of arterial/venous thrombotic events and adverse pregnancy outcomes(28;61;62). As APS and SLE often overlap and APS sometimes evolves in to SLE, the presence of APS should also prompt assessment for lupus. Confirmatory tests for antiphospholipid syndrome are positive lupus anticoagulant, anti-cardiolipin antibodies (IgG, IgM), and/or anti-beta-2 glycoprotein-1 (IgG, IgM) antibodies on two occasions at least 12 weeks apart(28;61). The lupus anticoagulant test is the most specific of the 3 tests and is associated with a higher positive predictive value. The most high-risk aPL profile (triple positivity including positive lupus anticoagulant, anticardiolipin, and anti-β2-glycoprotein-1 antibodies) is associated with a cumulative incidence of thrombosis after 10 years of 37.1%(63).

### Classification criteria for lupus

Based on the American College of Rheumatology (ACR; previously the American Rheumatism Association) revised criteria for SLE published in 1982(64) and the 1997 modification(65), a patient may be classified as having SLE if they have 4 or more of 11 criteria present (table 4). However, not all patients that meet these criteria have lupus and not all patients diagnosed clinically with lupus have 4 or more of these criteria, which may appear or disappear over time(7;40;66;67). There has been a tendency to consider patients that meet the ACR classification criteria for lupus to have the disease even if they only have certain clinical features without evidence of one or more immunological abnormalities that are the hallmark of this autoimmune
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disease. Conversely sometimes the disease has been diagnosed on the basis of auto-antibodies and haematological features without consideration of whether the whole clinical and serological picture is consistent with lupus being the most likely diagnosis.

To address these and some other issues, the Systemic Lupus International Collaboration Clinics (SLICC) group devised alternative classification criteria for lupus(68). These criteria introduced a requirement for at least one clinical and one immunological criterion and two others from an expanded list of items (table 5) compared to the ACR criteria (table 4)(65). They also allowed biopsy proven lupus nephritis in the presence of ANA or anti-dsDNA antibodies to be classified as lupus without the need for other criteria(68). The serological criteria include low complement (C3 and/or C4) as this item reflects complement consumption due to formation of immune complexes in active lupus disease.

These revised SLICC lupus criteria have been accepted by the European Medicines Agency (EMA), the US Food and Drug Administration (FDA) and NHS England as being suitable for the inclusion of patients in clinical trials and in the commissioning policy for rituximab. They are more intuitive that the previous ACR classification criteria when considering a diagnosis of lupus and allow a larger number of patients to meet criteria, however diagnosis should not be restricted to patients that meet the classification criteria as it can encompass other manifestations in the appropriate serological context(69). The SLICC criteria have been tested in a number of cohorts and in most studies have shown an increase in sensitivity and reduced specificity, so care is needed if features are better explained by an alternative diagnosis(70-73).

Conclusions

When considering a patient with a possible diagnosis of lupus, a detailed clinical history and examination is required to identify relevant clinical features including assessment of haematological and renal parameters. The diagnosis should not be made without evidence of at least one autoantibody or low complement levels to support the diagnosis of this autoimmune disease consistent with the SLICC classification criteria. The ACR (table 4) and SLICC (table 5) classification criteria are not diagnostic criteria but may be helpful when considering the diagnosis, however they do not cover all the clinical manifestations of lupus. The levels of evidence and grades of recommendation for parameters supporting the diagnosis of lupus are shown in table 1.

2. Recommendations for the assessment of SLE patients

2.0 Clinical manifestations in SLE patients may be due to disease activity, damage, drug toxicity or the presence of co-morbidity. In the case of disease activity it is important to ascertain whether this is due
to active inflammation or thrombosis, as this will define treatment strategies. (LOE 2++, GOR B, SOA 97%)

2.1 Clinical assessment of a lupus patient should include a thorough history and review of systems, full clinical examination and monitoring of vital signs, urinalysis, laboratory tests, assessment of health status and quality of life and measurement of disease activity and damage using standardised SLE assessment tools (2+/B). Imaging (4/D), renal (2+/B) and other biopsies (4/D) should be performed where indicated. (SOA 100%)

2.2. Disease activity is categorised into mild, moderate and severe, with the occurrence of flares (2+/C). Mild disease activity is clinically stable lupus with no life-threatening organ involvement, mainly arthritis, mucocutaneous lesions and mild pleuritis. Patients with moderate disease activity have more serious manifestations, and severe disease is defined as organ or life threatening (4/D). SOA 93%)

Rationale

Assessment of lupus
A systematic approach should be taken because of the diversity and complexity of clinical and laboratory manifestations (suppl table 1)(74-76). Clinical manifestations may be due to one or any combination of the following: disease activity from active inflammation or thrombosis, acute drug toxicity, chronic damage due to the effects of the disease or its treatment such as lung fibrosis or atherosclerosis, or co-morbidity for example infection. It is important to take a detailed history and to perform a clinical examination including vital signs and urinalysis to establish the likely differential diagnoses and then to organise the relevant investigations as suggested in table 6 depending on the circumstances. In addition, when assessing disease activity with a view to planning treatment it is necessary to determine the circumstances that may have led to a “lupus flare”, such as exposure to sunlight, concurrent or recent infection, hormonal changes, timing of previous disease related therapeutic change as this will guide further investigation, treatment change including non-drug measures and disease monitoring required thereafter.

Validated instruments for the assessment of lupus
The most reliable way of assessing disease activity is to use a defined instrument for this purpose that has been validated and is available with an appropriate glossary and scoring instructions(75;76). For example, the NHS England interim commissioning policy for rituximab in lupus published in 2013 (http://www.england.nhs.uk/wp-content/upSOAps/2013/09/a13-psa.pdf) recommended the use of two lupus specific disease activity indices: the British Isles Lupus Assessment Group (BILAG) index and the SLE disease activity index (SLEDAI). For such purposes the currently recommended revised versions are the BILAG-2004 index(77;78) (see supplementary information 4 a, b, c for the form, glossary and scoring or provide a link to the documents already on Rheumatology journal website) and SLEDAI-2K(79) or the
SELENA-SLEDAI(80) (supplementary information 5a and 5b respectively). Modifications have been made for use in pregnancy(81;82). For optimal performance, training in the use of these instruments is advised. There is one validated instrument for assessing damage, the SLICC/ACR Damage Index (SDI)(83). It is recommended that patients’ assessment of their disease be captured using health status or quality of life questionnaires such as the generic Short-form36 (SF-36) which has been validated for use in lupus patients(84) or a lupus specific questionnaire such as the LupusQoL(85). There is agreement that for best practice these instruments should be used(86;87) although there are no data that confirms that their use improves the outcome of patients. Better outcomes are achieved if lupus in-patients are managed in centres with experience of managing lupus(88-91).

Definitions of mild, moderate and severe lupus
For the purpose of planning appropriate treatment, disease activity has been broadly categorised into mild, moderate and severe(8), and worsening disease activity is termed flare which can be similarly categorised in to mild, moderate and severe(92;93). Examples are shown in table 7. The term mild disease activity reflects clinically stable disease with no life-threatening organ involvement and that is not likely to cause significant scarring or damage. Examples of scores for such patients when using formal assessment tools would include a SLEDAI-2K score of <6(79) and/or one BILAG B score (78). Patients with moderate disease have more serious manifestations that left untreated would cause significant chronic scarring. Examples of scores for such patients when using formal assessment tools would include a SLEDAI-2K score in the range of 6-12(79) and/or two or more BILAG B scores (78). Severe disease is defined as organ or life threatening and reflects the most serious forms of systemic disease that requires potent immunosuppression. Examples of scores for such patients when using formal assessment tools would include a SLEDAI-2K score of >12(79) and/or at least one BILAG A score (78).

Conclusions
The assessment of a patient with lupus, as with making the initial diagnosis, is dependent on a careful history and examination of the patient with relevant haematological, biochemical and immunological testing as well as other investigations as necessary (shown in table 6) to establish the degree of disease activity, accumulation of chronic damage and to identify other complications or co-morbid conditions that will influence the treatment plan. The levels of evidence and grades of recommendations for the components of the assessment and monitoring of lupus disease are shown in table 1.

3. Recommendations for monitoring of SLE

3.0 Patients with lupus should be monitored on a regular basis for disease manifestations, drug toxicity and co-morbidities. (LOE 2++, GOR B, SOA 99%)
3.1 Those with active disease should be reviewed at least every 1-3 months (2+, C/D) with blood pressure (1+/A), urinalysis (1+/A), renal function (1+/A), anti-dsDNA antibodies (2++/B), complement levels (2+/C), and CRP (2+/C), full blood count (3/C), and liver function tests (4/D) forming part of the assessment and further tests as necessary (4/D). Patients with stable low disease activity or in remission can be reviewed less frequently eg 6 to 12 monthly (4/D). (SOA 99%)

3.2 The presence of antiphospholipid antibodies is associated with thrombotic events, damage and adverse outcomes in pregnancy (2+/A). If previously negative, they should be re-evaluated prior to pregnancy or surgery, and in the presence of a new severe manifestation or vascular event (4/D). (SOA 96%)

3.3 Anti-Ro and La antibodies are associated with neonatal lupus (including congenital heart block) and should be checked prior to pregnancy (1+/A). (SOA 100%)

3.4 Patients with lupus are at increased risk of co-morbidities, such as atherosclerotic disease, osteoporosis, avascular necrosis, malignancy and infection (2+/C). Management of modifiable risk factors including hypertension, dyslipidaemia, diabetes, high body mass index and smoking should be reviewed at baseline and at least annually (4/D). (SOA 98%)

3.5 Immunosuppressive therapy may lead to toxicities. Close monitoring of drugs by regular laboratory tests and clinical assessment should be performed in accordance with drug monitoring guidelines (4/D). (SOA 98%)

**Rationale**

**Frequency of monitoring lupus/follow-up visits**

There are no RCTs comparing different monitoring strategies in terms of frequency and details of assessments performed, however data from various cohort studies have informed our expert opinion and previous guidelines in this respect(22;86;87;94). Patients should be told to report to clinicians if they develop any new or significant worsening of clinical manifestations. In most patients with active clinical disease, clinic visits should be approximately every 4 weeks initially, reducing gradually down to about 3 monthly reviews as the disease comes under control. There remains a significant risk of flare and the development of damage even for patients who achieve early remission(95). For most patients with mild features including those who are clinically quiet but serologically active, three monthly visits are adequate(96). Review should become more frequent if the disease becomes more active, especially if there is renal involvement, as the patients will require clinical, renal and serological evaluation (see below)(97). For patients with inactive disease, without previous renal involvement or organ damage (that can predict increased risk of further active disease and damage) review may be less frequent, for example every 6 months providing treatment is stable and suitable drug monitoring is in place(86). Patients should be seen
Reasons for clinical monitoring in lupus patients

Regular monitoring of clinical and laboratory features of active disease should take place with additional investigations as necessary (table 6) to assess and monitor changes in disease activity, the development of chronic damage, to detect the presence and changes in co-morbid conditions that may be confused with lupus (such as fibromyalgia, hypothyroidism, iron deficiency anaemia, infection) and drug-induced conditions (22, 75, 86). Levels of evidence for the laboratory parameters are shown in table 1. Proteinuria and renal function in particular (24), high disease activity scores (16; 98-100), new and different types of cutaneous lesions (101), arthritis (95), neuropsychiatric disease (16; 102) and cytopenias (103; 104) have been shown to correlate with disease severity and can predict future flares and the development of damage (11; 39; 105-107).

Only measurement of proteinuria and renal function have been shown to have strong predictive value for outcome (22-24; 108). CXR, ECG and other specific tests such as lung function, echocardiography and neurophysiology should be repeated during the course of the disease as necessary. When major organs are involved, additional imaging (such as brain MRI) and pathology (renal/skin biopsy) can add significant prognostic information, particularly with renal biopsy, and may need to be repeated to assess response to treatment (22-24; 109; 110).

Interpretation of haematological, renal and other biochemical parameters (see table 1 for LOE and GOR, and table 6 for a suggested monitoring protocol)

Lymphopenia is a common manifestation of lupus (suppl table 1) and some patients will have leucopenia and neutropenia regularly with active disease (104). This needs to be remembered when monitoring patients on cytotoxic therapy as a fall in cell counts may signify the need to increase therapy for lupus rather than reduce or discontinue therapy if drug toxicity is suspected. It also means that the usual drug monitoring “limits of tolerance” may need to be reviewed and personalised in the context of an individual with SLE. Thrombocytopenia may be acute and indicative of a disease flare or low grade and chronic as part of lupus and/or associated with antiphospholipid syndrome (111).

Erythrocyte sedimentation rate (ESR) is often raised in active SLE (112) but can also reflect persistent polyclonal hypergammaglobulinaemia and is not a reliable marker of disease activity. C-reactive protein (CRP) is usually normal (113-115) or slightly elevated in the presence of serositis or arthritis (116). A significantly raised CRP is more likely to indicate infection and patients with raised CRP will need therefore to be thoroughly screened for infection given that infection is the commonest cause of death in lupus patients. In contrast a raised ESR does not discriminate between active lupus and infection (116). Immune complexes of CRP and anti-CRP antibodies may form in lupus patients, possibly explaining the low levels of CRP observed with active disease (114).
Proteinuria should be quantified using urine protein:creatinine ratio or 24-hour urine collection. Microscopic examination of the urine to look for red cells and red cell casts is useful for identifying active renal disease and renal flares but the assessment of casts is now rarely done (24;117;118). When assessing haematuria, it is important to exclude infection, menstrual blood loss and calculi. White cells in the urine are most often due to urine or vaginal infection and can be hard to interpret but, as an otherwise unexplained finding, are associated with active tubulointerstitial inflammation.

Serum immunoglobulins should be measured prior to starting drugs such as MMF, cyclophosphamide and rituximab which have the most risk of inducing immunoglobulin deficiency that might increase the risk of infection. The initial repeat of the serum immunoglobulins should take place about 3-6 months later and can then be spaced out to annual checks (86;119-122). Specific antibodies, eg pneumococcal antibodies, may be assessed if available to assess the need for and response to immunisation. Screening for chronic infections (such as TB, hepatitis B and C, HIV, HPV) is recommended before starting immunosuppressants and repeated if reactivation of infection is suspected.

Creatinine kinase is important at baseline and to follow in patients with myositis or myalgias that might be due to lupus or statins used to prevent atherosclerosis (123). Monitoring of cholesterol and other lipids and remaining vigilant for and treating the development of diabetes mellitus and features of the metabolic syndrome, that may increase cardiovascular risk particularly in patients on glucocorticoids, are important and should be as successful as in the general population (86;94;124). Additional monitoring investigations should include Vitamin D3 which is often low, as a consequence of sun avoidance and/or chronic kidney disease (125). Vitamin D is required for optimal bone health especially in patients on chronic glucocorticoid therapy and/or following the menopause (126). Clinicians should have a low threshold for assessing thyroid function as hypothyroidism can present with similar features to lupus and co-exists with lupus in about 7% of patients and thyroid antibodies are found in 14% (127-129).

Monitoring of lupus autoantibodies and complement

Serial anti-dsDNA antibodies and C3 and C4 levels are useful as rising, high anti-dsDNA antibodies and falling, low complement levels are associated with flare (105;130), particularly in patients with lupus nephritis (24). In general concomitantly rising anti-dsDNA titres (53;55;58;105;131;132) and decreasing C3 and/or C4 levels (55-58) are more important predictors of current or impending flares than the absolute levels, and levels of anti-dsDNA antibodies may actually fall at the time of flare (133).

It can be helpful to combine a sensitive but less specific anti-dsDNA antibody assay (eg ELISA) with one that only measures more specific, high affinity or high avidity antibodies (such as Farr radioimmunoassay or the Crithidia test), as only tests measuring high affinity and high avidity antibodies are strongly associated
with renal disease but other ELISAs can be used to monitor disease activity\(^{(54)}\). Stable active serology without clinical features does not necessarily warrant therapy\(^{(94)}\) but patients need to be followed closely with individual care decisions made to prevent over or under treatment. Many physicians would avoid reducing therapy in this situation as patients may develop renal disease\(^{(134)}\) but the serological tests do not always predict flare\(^{(94;135;136)}\). About 40% of lupus patients do not have anti-dsDNA antibodies, so for this group of patients, they are not useful for monitoring disease activity\(^{(137)}\). Some patients are heterozygous for the C4 allele and due to a null allele have a persistently low C4 level at about 50% of normal without having active disease, but C4 levels can still fluctuate with disease activity.

**ANA, anti-Smith and anti-RNP antibodies** should be done at baseline and do not need to be repeated at each visit as levels do not fluctuate with disease activity.

**Anti-Ro and anti-La antibodies** should be measured in women planning pregnancy or in early pregnancy as they may be transferred across the placenta and are associated congenital heart block in about 1-2% of babies\(^{(59;60)}\). Fetal heart rate monitoring should be instituted from week 16 of pregnancy and continued throughout pregnancy in women with either of these antibodies. Neonatal lupus rash develops in about 10% of babies born to mothers with these antibodies (especially if exposed to UV light) and laboratory abnormalities (cytopenias and abnormal liver function tests) have also been observed in babies exposed to these antibodies\(^{(59)}\).

**Antiphospholipid antibodies** should be assessed at baseline and if previously negative, they should be re-evaluated in the presence of a new vascular event, adverse pregnancy outcome or other new manifestation that might have a thrombotic component, as well as prior to a planned pregnancy\(^{(28;61;62;138)}\). Positive tests for antiphospholipid syndrome include lupus anticoagulant, anti-cardiolipin antibodies (IgG, IgM) and/or anti-beta-2 glycoprotein 1(IgG,IgM) and these tests should be repeated after 12 weeks to confirm positivity\(^{(28;61)}\), although lupus anticoagulant cannot be evaluated if anticoagulation has been started as this would interfere with the assay.

### Monitoring for the development of co-morbidities

Patients with lupus are at increased risk of co-morbidities\(^{(86;94)}\), such as infection, premature cardiovascular and peripheral vascular disease, osteoporosis, avascular necrosis, and some malignancies (non-Hodgkin’s lymphoma, cervical, vulval, lung and thyroid cancer\(^{(139;140)}\)). The management of these issues is beyond the scope of this guideline and should follow national/international guidelines for each condition and include appropriate vaccinations\(^{(22;86;87;94)}\). Nevertheless, screening for and managing these conditions is an integral part of the assessment and regular monitoring of lupus patients as described in the EULAR recommendations for monitoring patients with SLE in clinical practice and in observational studies\(^{(86)}\). A preventative approach should be adopted since the commonest causes of death in lupus patients in the UK...
are infection and cardio-vascular disease followed by malignancy(15;16;18). Modifiable risk factors for co-morbidities to address include vaccination status, hypertension, dyslipidaemia, diabetes, high body mass index and smoking. These should be reviewed at baseline and at least annually thereafter(22;24;86;94). These co-morbidities may occur at a younger age than in the normal population and clinicians should screen regularly for them, even though there are no RCTs to suggest that more intense screening than that applied in the general population improves outcome in lupus patients(22;24;86;94). Routine cancer screening (particularly for cervical cancer given the increased risk of HPV infection in lupus patients(141)) should not be forgotten due to emphasis on lupus disease management (142).

**Monitoring of drugs**

This should be similar to that for drugs used in other rheumatic diseases but due to the occurrence of cytopenias and abnormal renal and liver function due to lupus disease itself, monitoring tests may need to be undertaken more frequently and the interpretation of laboratory results is more difficult. Adherence to drugs may be confirmed by measuring drug levels (for example for ciclosporin, tacrolimus, mycophenolate(143) and hydroxychloroquine(144)) but are not widely available (except for tacrolimus which is tested to guide optimal dosing and to prevent renal toxicity). There is little lupus specific data about target drug levels and detailed discussion is beyond the scope of these recommendations but this topic has been reviewed for rheumatic diseases in general(145) as well as for lupus(146). It should be noted that, like other chronic conditions, adherence levels are suboptimal in lupus and therefore specific consideration of this issue is needed in patients showing poor response to therapy(147).

**Conclusions** It is important to monitor lupus patients regularly to assess and monitor changes in disease activity, chronic damage, drug-induced co-morbid conditions that may be confused with lupus and that are associated with an increased risk of death. The levels of evidence and grades of recommendations for the main components of monitoring of lupus patients are shown together in table 1 and a suggested protocol is shown in table 6.

### 4. Recommendations for the management of mild SLE

**4.0 Treatments to be considered for the management of mild non-organ threatening disease include the disease modifying drugs hydroxychloroquine (1+/A) and methotrexate (1+/A), and short courses of non-steroidal anti-inflammatory drugs (3/D) for symptomatic control. These drugs allow for the avoidance of or dose reduction of corticosteroids. (SOA 94%)**

**4.1 Prednisolone treatment at a low dose of up to 7.5mg/day or less may be required for maintenance therapy (2+/C). Topical preparations may be used for cutaneous manifestations and intra-articular injections for arthritis (4/D). (SOA 93%)**
4.2 High factor UV-A and UV-B sunscreen are important in the management and prevention of UV radiation-induced skin lesions (2+/B). Patients must also be advised about sun avoidance and the use of protective clothing (4/D). (SOA 97%)
Hydroxychloroquine and other anti-malarial agents

Summary: There is good evidence (table 2) for the efficacy and safety of hydroxychloroquine, the most commonly prescribed anti-malarial agent and one of the few licensed drugs for lupus. Providing that the patient has normal renal and liver function, hydroxychloroquine can be used at doses up to 6.5 mg/kg/day and is compatible with pregnancy and breast-feeding. It is used (table 7) for skin and joint involvement, myalgia, fever, fatigue, pleurisy, to reduce the development of renal disease and chronic damage (14;150) and for its steroid-sparing properties (even in patients with more severe disease)(94). Chloroquine is used if hydroxychloroquine is not available or not tolerated, however there is less evidence for benefit and it has a greater risk of retinal toxicity than hydroxychloroquine(150). Mepacrine (quinacrine) is used predominantly for cutaneous lupus and has the least risk of ocular toxicity(109;151-153).

Evidence: The benefits of antimalarials on lupus activity were reported in 4 RCTs(154-157), 5 prospective cohort studies(158-162), 3 retrospective cohort studies(163;164) (165) and an open label extension of the first RCT(166). There have been 2 other double blind RCTs confirming that lupus rashes significantly improve with hydroxychloroquine(167) and chloroquine(168). The cohort studies have shown that response often takes 3-4 months(165) but at 6 months only 60% of patients with discoid rash showed some response(165). Another study showed that 20% of patients with an adequate response lose it within 2 years and need other therapies(169). Higher drug levels were associated with increased cutaneous response in a prospective study (170). In a double blind RCT(144) low drug levels were associated with increased disease activity. Systemic features and smoking are also associated with an increased risk of poor response (165;171;172).

Many of the studies showing increased flare rates in patients that discontinued hydroxychloroquine involved pregnant patients. A RCT in lupus patients(157) and 2 prospective (158;161) cohort studies support the use of this drug before conception and in pregnancy to reduce flares in the mother. Although hydroxychloroquine can cross the placenta, exposure is not associated with significant adverse effects on the fetus (158;161;173-176). Hydroxychloroquine has anti-thrombotic as well as anti-inflammatory properties and by reducing disease activity in the mother may improve the outcome of the child by improving placental function (177;178). There is increasing evidence that hydroxychloroquine reduces the risk of congenital heart block in babies born to mothers with anti-Ro antibodies (179-181). Further evidence supporting the use of hydroxychloroquine in pregnant women as well as those planning pregnancy and breast-feeding is reviewed in the BSR Guidelines on drugs in pregnancy in the rheumatic diseases(26).

There is further evidence from high quality prospective and retrospective cohort studies that patients treated with antimalarials (particularly hydroxychloroquine) not only have lower levels of overall lupus activity and reduced rates of flare(144;154;157;160;161;166), but can be managed with lower doses of corticosteroids.
The patients are more likely to stay clinically quiescent if hydroxychloroquine is continued when the disease goes into remission(183). Patients on MMF are more likely to achieve renal remission if treated with hydroxychloroquine(164). Patients on hydroxychloroquine are less likely to develop serious renal disease and have delayed time to renal damage(182), lower frequency of seizures(184) and less neuropsychiatric damage(185), greater delay in integument damage(186), less overall damage(187;188) and most importantly improved survival(189;190). Some of the benefits on survival may be mediated by the beneficial effects of antimalarials on total cholesterol, LDL-cholesterol, triglycerides, glucose (191) and/or by the prevention of thrombosis (150;177;178) and atherosclerotic plaque formation (192).

Patients take hydroxychloroquine on average for about 6 years(193-196). In general hydroxychloroquine is well tolerated and better tolerated than chloroquine (150;168;193;194). The commonest adverse effects of anti-malarials are gastro-intestinal but a few patients stop because of headache, dizziness, itching, rash, non-retinal eye problems, hearing loss, myopathy or other rare neuro-muscular side-effects(109;150). The most serious adverse events are cardiac which are very rare(197) and retinopathy which is more common with chloroquine than hydroxychloroquine(150;198). Retinopathy is unpredictable but unlikely with less than 7 years treatment with hydroxychloroquine. It is more common thereafter(199) and with doses of hydroxychloroquine above 6.5mg/kg/day, renal or liver impairment. It requires active screening to detect it early when it is asymptomatic and is most likely to be reversible(198;199). Policies on screening for ocular toxicity vary between countries and local guidelines should be followed(198;200). In general in the UK, baseline and yearly optician eye tests are recommended initially, with more detailed ophthalmological screening after 5 years of therapy(201).

Conclusions: there are good data from 2 systematic reviews and a meta-analysis including 7 RCTs and 36 cohort studies supporting the use of hydroxychloroquine in lupus patients to reduce disease activity and as a steroid-sparing agent: overall LOE 1++, GOR A. Hydroxychloroquine should be given to all patients with mild lupus to prevent flares, the development of damage and to improve survival. It is recommended that hydroxychloroquine be continued or started, even in those developing disease severe enough to warrant immunosuppressive therapies, including lupus nephritis, (22;24;25). However patients with renal or liver dysfunction should have the dose reduced(198). It is compatible with conception, pregnancy and breastfeeding. Unfortunately it has a long half-life and takes at least 2 months to be effective(109;153). Patients need to be warned about this or they may discontinue the drug prematurely.

**Methotrexate in mild SLE**

**Summary:** Although not licensed for the treatment of lupus, low dose weekly methotrexate (< 25mg/week) has been used to reduce mild and moderate disease activity in lupus, particularly to control inflammatory arthritis and lupus skin rashes, originally on the basis of a variety of case series and cohort
Methotrexate was originally used in patients who had failed hydroxychloroquine and low dose corticosteroids but it can be used with hydroxychloroquine to avoid corticosteroids or to promote corticosteroid dose reduction. Caution has been advised on the use of methotrexate in patients with lupus nephritis, particularly as those with renal impairment will be at increased risk of methotrexate toxicity (202). It is contra-indicated in women trying to conceive or pregnant as it is teratogenic. For these patients azathioprine would be more suitable (see section on moderate lupus for evidence).

Evidence: A systematic review by Sakthiswary in 2014 (204) summarises the data from 3 controlled trials (2 double-blind, placebo-controlled trials (205;206), and a controlled open label trial comparing methotrexate and chloroquine(207), 5 observational studies (2 open prospective studies(208;209); a cross-sectional study(210); a retrospective case control cohort study(211); and an open label controlled study(212)). Another systematic review (213) includes 2 additional case series (214;215). These studies support the use of methotrexate to reduce mild and moderate lupus disease activity and some demonstrated steroid-sparing properties. Some of these studies showed benefit specifically in treating lupus arthritis, rashes, vasculitis, serositis, myositis and constitutional symptoms but there was little change in ESR, anti-dsDNA antibodies, C3 or C4 levels except in a study with longer duration than previous studies (212). The reduction in SLEDAI in the 5 controlled studies reporting these data included in the systematic review (204) was calculated to have OR 0.444 (95%CI 0.279-0.707, p=0.001). The analysis of the 4 controlled studies reporting steroid-sparing properties for methotrexate provided OR 0.335 (95%CI 0.202-0.558, p=0.001). Side-effects led to discontinuation in about 10% of patients but were not serious. It is teratogenic and should not be used in women within 3 months of planning to conceive, or who are pregnant or breast-feeding (26) nor in patients with renal impairment as reduced renal function increases the risk of adverse events particularly bone marrow suppression.

Conclusions: there are good data from 2 systematic reviews including 3 RCTs and 7 cohort studies supporting the use of methotrexate in lupus to reduce disease activity and as a steroid-sparing agent: overall LOE 1+, GOR A.

NSAIDs in mild SLE

Summary: There are no RCTs of NSAIDs in SLE. Publications support the cautious use of NSAIDs for short periods of time for symptom control in SLE (inflammatory arthralgia, myalgia, chest pain and fever) where potential benefit outweighs the known risks of NSAIDs and paracetamol has been insufficient or not tolerated. The risk of NSAID-induced acute renal failure is increased in patients with lupus nephritis and so NSAIDs should be avoided in patients with renal involvement. NSAID-induced allergic reactions, aseptic meningitis, cutaneous reactions and hepatotoxicity are increased in SLE patients. Caution is required in pregnancy (27).
Evidence: A review of the literature on non-selective Cox inhibitors and selective Cox-2 inhibitors (216) highlighted the potential increased risk of renal, hepatic and neurological toxicity in lupus patients. A retrospective case series assessing celecoxib with a detailed literature review of NSAIDs (217) and a more comprehensive systematic review addressing the risk benefit ratio of non-selective and selective inhibitors of cyclooxygenases in SLE patients were published subsequently (218). More recently it is has become clear that NSAIDs (except naproxen) can predispose to acute myocardial infarction in individuals with coronary heart disease (219) which is an additional reason for caution in lupus patients.

Conclusions: based on 1 systematic review of the evidence from case series and case reports, the overall LOE for NSAIDs in non-renal mild lupus is 3 and GOR is D.

High factor UV-A and UV-B sunblock in SLE

Summary: There is clear evidence that ultraviolet radiation (UV-A and UV-B) can induce various forms of cutaneous lupus (109). Patients with systemic lupus without cutaneous features have also been found to have an abnormal reaction to UV irradiation (220).

Evidence: Sunscreens were shown to prevent discoid and subacute cutaneous lupus rashes in a case series (221) and to reduce systemic features such as renal disease, thrombocytopenia and hospitalisation in a cohort study (222). Three open controlled trials (223-225), a retrospective case series (226), and a double blind, controlled trial (227) have shown that sunscreens that block UV-A and UV-B can reduce UV radiation-induced lesions of cutaneous lupus.

Conclusions: lupus patients should be advised about avoidance of sun and other sources of UV irradiation, the use of sunscreens (UV-A protection 5 stars and UV-B protection from SPF factor 30-50 products which can be prescribed on the NHS) and protective clothing. Overall the LOE is 2+ for sunscreens (1 small RCT and 6 other studies) in lupus patients to prevent cutaneous lesions and GOR is B.

5. Recommendations for the management of moderate SLE

5.0 The management of moderate SLE involves higher doses of prednisolone (up to 0.5 mg/kg/day) (2+/C), or the use of intramuscular (4/D) or intravenous doses of methylprednisolone (2+/C). Immunosuppressive agents are required often to control active disease and are steroid-sparing agents (2+/C). They can also reduce the risk of long-term damage accrual (4/D). (SOA 98%)
5.1 Methotrexate (1+/A), azathioprine (2+/C), mycophenolate mofetil (2+/B), ciclosporin (2+/C) and other calcineurin inhibitors (3/D) should be considered in cases of arthritis, cutaneous disease, serositis, vasculitis, or cytopenias if hydroxychloroquine is insufficient. (SOA 97%)

5.2 For refractory cases, belimumab (1+/B) or rituximab (2+/C) may be considered. (SOA 98%)

Rationale
Overview of the management of moderate lupus
Immunosuppressive cytotoxic agents should be used with corticosteroids, while continuing antimalarials and avoidance of UV radiation, to reduce disease activity in moderate lupus (table 7), prevent the risk of further flares and lower the risk of damage accrual due to disease and corticosteroids as they act as steroid-sparing agents. Despite their widespread use in clinical practice and as background standard of care therapy in clinical trials, there are only a few RCTs demonstrating the efficacy of corticosteroids and other immunosuppressive agents for the management of moderate lupus. Additional drugs should be considered if hydroxychloroquine is insufficient or not tolerated and can be used in addition to hydroxychloroquine. The evidence for methotrexate has been discussed above and the evidence for corticosteroids, azathioprine (AZA), mycophenolate mofetil (MMF), calcineurin inhibitors (ciclosporin and tacrolimus) and leflunomide, are discussed in this section. For patients that do not respond to these drugs the biologic drugs rituximab and belimumab may be considered. It should be noted that there is a specific NHS England 2013 interim clinical commissioning policy statement for rituximab in adult SLE patients (http://www.england.nhs.uk/wp-content/uploads/2013/09/a13-psa.pdf) and NICE guidance for the use of belimumab in active autoantibody-positive SLE in adults has been published in 2016 (https://www.nice.org.uk/guidance/TA397). Patients being considered for these drugs should be discussed with and/or seen by a specialist lupus centre with experience of using these drugs. The patients should meet specific criteria and be entered into the BILAG Biologics Register (see below and Figure 1). For patients not requiring biologics, suggested initial target dosing regimens for active disease (as used in most studies) and lower maintenance dosing regimens to prevent recurrence of disease once patients are stable are shown in table 7. The actual regimen used for individual patients will depend on the clinical picture and the treatment history. It is important to increase the dose and/or change treatment if patients fail to respond in the expected time frame. The levels of evidence and grades of recommendations for all the drugs used to treat lupus are summarised in table 2.

Corticosteroids for moderate lupus
Summary: Higher doses of oral corticosteroids are required initially than for mild lupus, for example up to prednisolone 0.5 mg/kg/day, and intermittent treatment with intramuscular 80-120mg methylprednisolone (MP) or even intravenous doses of MP (up to 250mg) are used as well as, or instead of, oral prednisolone to promote a quicker response with less total corticosteroid exposure. Prednisolone dosing should be
reduced as disease activity improves to the lowest possible maintenance dose and stopped if possible, as other immunosuppressive agents take effect over several weeks or months.

Evidence: There are no data comparing different oral corticosteroid regimens for the treatment of moderate lupus. Two controlled studies have shown that treating patients that are clinically stable but with serological deterioration with a short course of moderate-dose corticosteroids (eg 30mg/day) can prevent more flares than placebo and lead to improvement in serological markers(132;228). However, there is a risk of treating patients that will not flare and this approach is not recommended due to the side-effects of corticosteroids.

There are some data supporting the use of 100mg intravenous MP pulses in non-renal lupus as an alternative to 1000mg pulses(229) and for 1000mg pulses on 3 occasions in patients with moderate or severe lupus with very little oral prednisolone(230). The data supporting the use of intravenous pulses of 500mg or 1000mg are discussed further below in the section on the management of severe lupus (231;232). There is one open label RCT(233) comparing triamcinolone 100mg given as an intramuscular injection with a short course of oral MP tapered over one week. Overall there was little difference between the regimens but some improvement was seen more quickly with the triamcinolone injection.

Conclusions: Overall the level of evidence for corticosteroids by intramuscular or intravenous injection in non-renal moderate lupus is 2+ and grade of recommendation is C.

Azathioprine (AZA) for moderate lupus (non-renal disease)

Summary: AZA is not licensed for the treatment of lupus but has been used for over 40 years and it is the most frequently used cytotoxic agent(234) in lupus. AZA treatment (1-2.5mg/kg/day orally) has been associated with prevention of flares and a reduction in corticosteroid dosage (see below and table 2). It is usually started in patients with moderate lupus activity (table 7) in conjunction with corticosteroids, as it can take up to 3 months to be effective. It is also used for maintenance therapy after remission or significant response has been achieved with other agents used to treat severe lupus (such as cyclophosphamide) that are less suitable for long term therapy particularly in women desiring pregnancy, pregnant or breast-feeding(24-26;235). Most of the evidence (and the only double blind RCTs) supporting its use relate to the management of lupus nephritis (24;25). Only papers discussing the management of non-renal lupus with AZA are discussed here, although in some cases the studies included renal and non-renal patients. There is no evidence that it prevents atherosclerosis or other forms of damage(12;236).

Evidence: The first reports of AZA being used for renal and non-renal manifestations of lupus with corticosteroids appeared in the late 1960s and 1970s(237-242). Reduction in disease activity and flare rate and steroid sparing effects were demonstrated in most of these open controlled studies and in a case
series(243). AZA 200mg daily was associated with an increased risk of significant liver dysfunction. There was no increased risk of infection even starting at 3-4 mg/kg/day but subsequent studies have used 2-2.5mg/kg/day.

A prospective longitudinal open study(244) involving 17 SLE patients showed that AZA reduced lupus activity and anti-dsDNA antibody levels. Subsequently, in a retrospective study(245) with 61 SLE patients suppression of anti-dsDNA antibodies by AZA (2mg/kg/day) and low-dose prednisolone (7-12mg/day) was associated with efficacy and better long-term outcome. However the presence of renal disease, persistence of anti-dsDNA antibodies for at least 1 year after the beginning of treatment and reduction in AZA dosage to below 2 mg/kg/day predicted flares and was associated with a higher rate of lupus-related death.

An open-label, multi-centre, RCT studied 89 SLE patients requiring 15mg or more of prednisolone in which AZA (mean dose 2.1 mg/kg/day) was compared with ciclosporin (mean dose 2.2 mg/kg/day) for its steroid-sparing properties(246). The absolute mean change in prednisolone dose at 12 months adjusted for baseline prednisolone dose was not significantly different: 9.0 mg for ciclosporin (95% CI 7.2, 10.8) and 10.7 mg for AZA (95% CI 8.8, 12.7). There was no difference between groups in change in disease activity or number of flares, development of new damage, change in quality of life or numbers of patients discontinuing study drugs due to adverse events or lack of efficacy(246). The conclusion was that both drugs can be used in lupus for their steroid-sparing properties with appropriate monitoring.

AZA is usually well tolerated(247). The main adverse events are nausea and vomiting, diarrhoea, flu-like illness with fever, rash, leucopenia and hepatotoxicity(247-251). Side-effects can occur soon after starting AZA and may require drug withdrawal(251;252). Hepatic veno-occlusive disease is a rare adverse event but autoimmune hepatitis can improve on AZA so this is not a contra-indication to its use(248). AZA is not excreted by the kidney and it can be used in patients with renal impairment. Managing patients with lupus related leucopenia with AZA can be difficult(247;253). The enzyme thiopurine S-methyltransferase (TPMT) catalyses the inactivation of AZA. It is worth testing patients for TPMT(250) before starting AZA, as the very low level phenotype (homozygous deficiency that occurs in 0.3% Caucasians) is associated with potentially life-threatening bone marrow toxicity, otherwise weekly full blood counts are required as the dose is increased over several weeks (254). Those patients with intermediate TPMT levels due to a heterozygous state have an increased risk of leucopenia as well, and such testing does not remove the need for monitoring the effects of the drug on the full blood count(247;251) and liver function according to national or local guidelines(254).

AZA does not cause infertility and has not been found to be teratogenic in clinical practice despite theoretical concerns(255;256) and so can be used in women planning conception and is compatible with
pregnancy and breast-feeding(24;26;174). It may reduce the response to some immunisations(257-260) but
this is not a contra-indication to immunisation except with live viruses(86;261). There is no evidence that
AZA increases the risk of malignancy in lupus patients(262;263) but it may increase the risk of cervical
dysplasia(264).

Conclusions: although the data for AZA in non-renal lupus are much weaker than that for its use in lupus
nephritis (see below), there are 4 open label RCTs, 3 prospective cohort and 2 retrospective cohort studies
and 1 case series supporting the use of AZA for non-renal lupus: overall level of evidence 2+, grade of
recommendation C.

Mycophenolate mofetil (MMF) for moderate lupus (non-renal disease)
Summary: There are increasing data showing that MMF in combination with corticosteroids reduces
moderate and severe lupus disease activity, reduces renal and non-renal flares, is associated with
corticosteroid sparing properties and is tolerated well (see table 2, and table 7 for suggested treatment
strategies). However there are no placebo-controlled double blind RCTs specifically designed to assess
the use of MMF in non-renal lupus. It is teratogenic and is contra-indicated in women trying to conceive,
pregnant or breast-feeding.

Evidence: The first systematic review of MMF (2-3 g daily) in non-renal lupus was published by Mok in
2007 (265) and reviewed 20 papers in terms of the response of specific clinical features up to 2006 and
steroid-sparing properties. This systematic review included patients mostly refractory to other therapies
that were treated with MMF in uncontrolled studies for arthritis, renal, haematological and cutaneous
manifestations, a few with neuro-psychiatric manifestations and prevention of flare in a small prospective
study of patients with rising anti-dsDNA antibody levels(266-269).

A later systematic review(213) with a literature search up to end of October 2011 provided further
evidence that MMF treatment is associated with reductions in disease activity, flare rate and prednisone
dose and included data from 5 cohort studies (266;267;269-271) and data from the ALMS trial in lupus
nephritis that specifically reported on non-renal lupus manifestations (see below)(272). Further supporting
evidence for MMF comes from a small case series(273) and a study(274) showing that mycophenolic acid
(MPA) levels vary between patients and that higher trough levels were associated with less risk of disease
flare. MPA levels were more closely associated with efficacy and safety than the dose of MMF. This test
is available in some hospitals but the target trough level of 3.5 to 4.5 mg/l was recommended to be tested
in a controlled trial before being widely applied.
The beneficial effects of MMF on non-renal disease activity (275) were demonstrated in a 6 month open label RCT (the Aspreva Lupus Management Study, ALMS) that compared oral MMF (target dose 3g/day, median exposure 2.6g/day) with pulses of IV cyclophosphamide (IV CYC: 0.5-1.0g/month) as induction treatment for biopsy-proven lupus nephritis(276). All patients received prednisone starting at 60mg/day that was tapered to 10mg/day. There was induction of remission in over 80% of patients treated with MMF for active disease at baseline in mucocutaneous, musculoskeletal, cardio-respiratory, and vasculitis systems in addition to renal response in 56% (the primary end-point) (276). There were no flares in the patients on MMF, and complement levels and titers of anti-double-stranded DNA antibodies normalized. Very similar renal and non-renal responses were seen in those given CYC (275). However, more Black and Hispanic patients responded to MMF than IV CYC and further trials are required to assess the role of race, ethnicity and geographical region on treatment response(277).

In the maintenance phase of ALMS(278), 227 patients from the 6 month induction study that met the renal clinical response criteria were randomised again to MMF (2g/day) or AZA (2 mg/kg/day) in a 36-month, double-blind, double-dummy, phase 3 RCT(278). Prednisolone ≤10 mg/day or its equivalent was allowed and was taken by 90% of the MMF group (n=116) and 87% of the AZA group (n=111). Secondary end-points included an analysis of non-renal severe flare. Severe non-renal flare rates did not differ between groups: 6.9% for the MMF group and 6.3% for the AZA group. There were no significant differences in the changes in anti-dsDNA antibodies or complement levels between groups. However, MMF was superior to AZA in various renal parameters related to maintaining a renal response and in preventing renal relapse in these lupus nephritis patients irrespective of which induction treatment had led to their initial response, race and geographical region(278). Adverse events were common in both groups (>95%), mostly minor infections and gastrointestinal disorders. Serious adverse events occurred in 24% of the MMF group and 33% of the AZA group (P = 0.11). Rate of withdrawal due to adverse events was lower with MMF than AZA (25% versus 40%, P = 0.02).

Another randomised open label controlled trial(279), in Caucasians predominantly, compared MMF (mean 2g/day) and AZA (mean 124 mg/day) for maintenance therapy over 36 months, starting at week 12 after induction with a short course of IV CYC (6 x 500mg over 10 weeks) for the management of biopsy proven proliferative lupus nephritis. All patients initially received 3 IV pulses of MP and were tapered from 0.5 mg/kg/day prednisone down to 5mg/day at week 52 and then tapered further and stopped if possible. Both regimens were well tolerated and there was comparable improvement in renal end-points and non-renal parameters including disease activity indices and C3 levels in both groups. There were less renal flares and less haematological adverse events with MMF than AZA (though not statistically significant in this study).
Since the systematic review, further studies reporting reduction in disease activity included a retrospective review of patients treated with MMF that found a significant reduction in mean weekly steroid dosage (from about 12.5 to 3mg/day prednisone) (280). A single centre retrospective cohort study involving 135 patients with SLE (50% with renal disease) and 45 patients with systemic vasculitis treated with MMF reported good responses in 46% of patients and mean prednisolone dosage was significantly reduced from 22mg/day to 8mg/day at 12 months. These and other studies have shown that adverse events occur in up to 44% of patients over 5 years: mostly gastrointestinal intolerance and infections, with leucopenia and hospitalization rare. In one study most patients tolerated the drug well with 73% of patients on the drug at 12 months and there was no relationship between adverse events and dose (250mg to 3g daily)(282). However, there have been increasing reports of teratogenicity and it should be stopped at least 6 weeks before a planned pregnancy and MMF should not be taken by women who are pregnant or breast-feeding(26).

Yahya reported in 2013 on a small open label prospective study of 14 non-renal lupus patients randomised to mycophenolate sodium (MS) or standard care and showed that MS treatment was safe and was associated with reduced disease activity. A randomised open label trial of 40 patients with primary systemic vasculitis or SLE compared MMF (2000mg/day) and enteric-coated MS (1440mg/day). The composite primary end point was treatment failure and/or drug intolerance over 12 months. MS was anticipated to be tolerated better but no difference in tolerance was observed. Although MS was associated with slightly better efficacy this may have been due to imbalance in factors affecting remission and relapse despite randomisation with minimisation. This study did not support the use of MS as a better tolerated and efficacious alternative to MMF for routine use but MS could be considered in patients with gastrointestinal side-effects from MMF.

Conclusions: the evidence that MMF reduces disease activity, lupus flare and has steroid-sparing properties in non-renal lupus comes from 2 systematic reviews, 3 open RCTs in lupus nephritis and 7 cohort studies: level of evidence 2++, grade of recommendation B. Mycophenolic acid/sodium (MS) may be considered in patients intolerant of MMF based on 2 studies (level of evidence 3, grade of recommendation D).

Ciclosporin and tacrolimus for moderate lupus (non-renal disease)

Summary: Ciclosporin and tacrolimus do not cause myelosuppression and have the ability to reduce moderate disease activity (tables 3 and 9). There is more evidence for ciclosporin in non-renal lupus and it has been particularly helpful in the treatment of cytopenias, where there is likely to be difficulty distinguishing cytopenias due to lupus from cytopenias due to drugs such as AZA, methotrexate and
Both ciclosporin and tacrolimus can be used in women planning pregnancy, and in those who are pregnant or breast-feeding at the lowest possible dose (26).

**Evidence:** There are 2 open RCTs (246;283) and 8 non-renal cohort studies supporting the use of ciclosporin at doses \( \leq 2.5 \text{mg/kg/day} \) in patients with normal renal function although a systematic review (284) that included details of two open RCTs and a brief summary about 6 of the cohort studies reported that there was not much evidence supporting the use of ciclosporin in lupus as there were no double blind, placebo-controlled RCTs.

Nevertheless the open RCTs suggested that ciclosporin reduced disease activity as well as AZA (246) and better than corticosteroids alone (283) and that ciclosporin treatment was associated with significant corticosteroid-sparing properties in both RCTs, equivalent to that of AZA in one trial (246) as reported previously by the cohort studies. These included two prospective cohort studies (285;286) that showed significant reduction in disease activity at 6 months, with most benefit in patients with renal and/or haematological manifestations, and response maintained to 24 months in one study (286). Three retrospective studies (287-289) reported a reduction in disease activity and/or flares (particularly haematological manifestations such as thrombocytopenia) and significant steroid sparing properties were reported in two of these studies (286;288).

In the first of 2 additional studies not mentioned in the systematic review, ciclosporin was shown to treat thrombocytopenia in 6 patients (290), 3 of whom were able to stop corticosteroids. In the second study (291), a retrospective cohort study, ciclosporin was used to manage 40 refractory lupus patients including 11 patients with neurological conditions and 7 with overlap syndromes as well as 18 with lupus nephritis. The study showed reduction in disease activity and only mild transient adverse events not requiring discontinuation.

Adverse events were the focus of another study (292) with doses up to 5mg/kg/day so it was not surprising that adverse events were reported in 63% but these led to discontinuation in only 16% and were reversible within 3 months of stopping the drug, consistent with many other reports. Ciclosporin treatment can cause hypertrichosis, gum hypertrophy, hypertension, paresthesia, tremor, gastro-intestinal symptoms, and impaired renal function especially at higher doses (>3mg/kg/day). It is best used at lower doses \( \leq 2.5 \text{mg/kg/day} \) as that is more tolerable and rarely causes permanent nephrotoxicity if carefully monitored. In the open label RCT (246), there were no unexpected adverse events and with appropriate monitoring of renal function and blood pressure (254), it was not discontinued due to adverse events or inefficacy more often than AZA.
There are 2 reports of tacrolimus in non-renal lupus and they were included in the systematic review (284).
The first was a small retrospective cohort study (293) with 10 non-renal patients showing significant reductions in SLEDAI and prednisolone over one year on 1-3mg daily. The second was an open label prospective study (294) with 21 mostly non-renal patients showing reduction in SLEDAI score over 6 months and no serious side-effects but 29% withdrew due to inefficacy and 10% due to adverse events.

Conclusions: Overall the level of evidence for ciclosporin in non-renal lupus from 2 open RCTs, 8 non-renal cohort studies and 1 systematic review is 2+ and grade of recommendation is C.
The level of evidence for tacrolimus from 2 studies in non-renal lupus and 1 systematic review is 3 and grade of recommendation is D.

Leflunomide in moderate lupus
Summary: The systematic review (284) and our search found little evidence for efficacy and safety of leflunomide in lupus patients with only 2 small studies in the literature. This drug can be considered in patients refractory to, not suitable for or intolerant of methotrexate, AZA, MMF and calcineurin inhibitors, for whom cyclophosphamide, rituximab and belimumab are not suitable or not available. It is not suitable for women considering pregnancy and a cholestyramine washout is required if pregnancy is desired or occurs while it is being taken (26).

Evidence: There was a randomised, double blind, placebo controlled trial in moderate SLE patients with only 6 patients in each group (295). A significant reduction in SLEDAI and prednisone occurred in both groups over 24 weeks. The leflunomide group showed significantly greater mean reduction in SLEDAI score, but there was no difference in steroid reduction between the groups. Side-effects included transiently abnormal ALT, leucopenia and hypertension. There was a retrospective analysis of 18 patients who received leflunomide (296) but 4 patients withdrew (3 due to adverse events including one with rash), and only 9/14 achieved lower SLEDAI scores after 2-3 months of therapy.

Conclusions: Overall the level of evidence for leflunomide for reducing non-renal lupus disease activity from 2 studies is 3 and the grade of recommendation is D. Caution is advised about its use in those with pre-existing subacute cutaneous lupus as this may worsen as observed in other non-lupus studies.

Rituximab for refractory moderate lupus
Summary: Rituximab can be prescribed and reimbursed in the UK currently according to the NHS England 2013 interim clinical commissioning policy statement for rituximab in adult SLE patients (http://www.england.nhs.uk/wp-content/uploads/2013/09/a13-psa.pdf) with 2 or more systems with
BILAG B scores as well as those with severe BILAG A level disease activity using the BILAG-2004 index\textsuperscript{(77;78)}, or SLEDAI-2K score\textsuperscript{(79)} over 6 if they have failed 2 or more immunosuppressive agents (due to inefficacy or intolerance), at least one of which must be MMF or cyclophosphamide, or if they need unacceptably high doses of steroids to achieve lower level of disease activity. The patients must be managed in conjunction with a specialist centre for lupus and be entered into the BILAG Biologics Register for standardised reporting of outcome (see Figure 1 flowchart for eligibility and response criteria). This is essential to provide more open label data in a prospective study with control patients treated with other immunosuppressive therapies, given the failure of the international double-blind, placebo controlled lupus trials to meet their primary end-points as discussed below (EXPLORER for active non-renal disease\textsuperscript{(297;298)} and LUNAR for lupus nephritis\textsuperscript{(299)}). This policy was agreed as a result of the increasing published evidence supporting the efficacy of rituximab in refractory lupus patients who are likely to be different to those recruited to the trials where there was no requirement to have failed conventional therapy. Pregnancy should be avoided for at least 6 months after exposure to rituximab\textsuperscript{(26)}.

\textbf{Evidence:} The current evidence supporting the efficacy and safety of rituximab in non-renal lupus was most recently reported in a systematic review\textsuperscript{(300)} in 2014 by Cobo-Ibanez with a literature search up to June 2013. This included the non-renal RCT EXPLORER\textsuperscript{(297)} and its exploratory analysis\textsuperscript{(298)}, 2 open phase I/II trials\textsuperscript{(301;302)} and 22 cohort studies which analysed 1231 patients in total\textsuperscript{(300)}. The two open label trials\textsuperscript{(301;302)} and 5 of the cohort studies had been discussed in a previous systematic review summarising off-label use in 188 cases (including non-renal and renal patients in 9 cohort studies and 26 case series/reports published up to December 2007\textsuperscript{(303)}).

The non-renal patients discussed in the systematic review by Cobo-Ibanez in 2014\textsuperscript{(300)} were heterogeneous but in general had active lupus disease unresponsive to steroids and/or immunosuppressants prior to treatment with rituximab. Treatment with rituximab was associated with a reduction in global disease activity over 3-9 months, with 64-91\% achieving response including patients with a reduction in complement and anti-dsDNA antibody levels, arthritis and thrombocytopenia. Evidence for a steroid-sparing effect was based on the 2 open trials and 10 of the cohort studies\textsuperscript{(300)}. There were few significant adverse events in the RCT, 2 open studies and 20 cohort studies\textsuperscript{(300)} but relapses/flare did occur at variable times (3.7-18 months) although in the RCT there were numerically fewer severe BILAG A flares and longer time to these flares in the rituximab group compared to the placebo group and this almost achieved statistical significance (Hazard ratio 0.61, \(p = 0.052\))\textsuperscript{(298)}. Better clinical response after a second course was observed in 2 of the cohorts that studied retreatment\textsuperscript{(300)} and a further report supported this observation and that steroid reduction occurred after each of two courses of rituximab\textsuperscript{(121)}. The evidence for rituximab treating mucocutaneous involvement was deemed weak\textsuperscript{(300)} and this may be explained by a recent report\textsuperscript{(304)} specifically addressing 26 SLE patients with various subtypes of lupus rash which observed that acute lupus rash responded whereas chronic cutaneous lupus, such as discoid rash, does not
respond to rituximab and new lesions with typical histology may appear despite confirmed B cell depletion.

Rituximab treatment early in the course of lupus disease followed by AZA was tried by Ezeonyeji et al. for its steroid-sparing effect specifically in a pilot study with 8 SLE patients whose results were compared with 23 matched historical control patients treated conventionally\(^{(305)}\). Reduction in disease activity, fall in anti-dsDNA antibodies and complement with significant lower cumulative prednisolone at 6 months compared with controls was observed. There is also an open lupus nephritis study suggesting that early rituximab with intravenous MP and followed by MMF may avoid the use of oral corticosteroids and this regimen is being tested currently in a controlled randomised RCT called RITUXILUP\(^{(306)}\).

The Duxbury systematic review and meta-analysis\(^{(307)}\) reported response rates for various disease activity measures for patients in the open studies of refractory lupus treated with rituximab also reviewed by Cobo-Ibanez\(^{(300)}\). The Duxbury review and meta-analysis did include a section on lupus nephritis (not discussed here) and included a few non-renal studies not in the Cobo-Ibanez review, although the latter also included a few not in the Duxbury review. The BILAG index was used in 188 patients treated with rituximab in 8 open studies (3 prospective, 4 retrospective and one small case control)\(^{(307)}\). The pooled global response in 7 of these studies was 83%. The complete response rate was 47% and the partial response rate was 38% in 6 studies. A significant reduction in anti-dsDNA antibodies was observed in 6 of 8 studies and a significant rise in complement was observed in 5 of 6 studies. Various versions of the SLEDAI were used in 513 patients treated with rituximab in 12 open studies: 5 prospective, 6 retrospective and 1 open label randomised trial, only one of which also analysed BILAG response. With SLEDAI the global response was 77% in 11 studies. In 6 studies the complete response rate was 57% and the partial response rate was 31%. Anti-dsDNA levels fell in 3 of 3 studies and complement rose in 2 of 3 studies\(^{(307)}\).

Publications from cohorts in Germany\(^{(308)}\), Italy\(^{(309)}\) and Japan\(^{(310)}\) have confirmed similar levels of efficacy with various disease activity measures and provided further safety data in another 264 patients. Long-term follow-up of 98 SLE patients treated with rituximab over a 12 year period has shown in a retrospective analysis that the group with longer duration of depletion (\(\geq 12\) months) was associated with a better response (greater decrease in BILAG score at 6 and 12 months) than those with shorter period of B cell depletion\(^{(311)}\).

The results of these open studies are much better than the response rates observed in the EXPLORER RCT (for rituximab versus placebo: complete 12% versus 16%, partial 17% versus 13%)\(^{(297)}\). However EXPLORER used more stringent BILAG response criteria than used in any other study\(^{(307)}\), but did observe a reduced rate and time to severe BILAG A flare\(^{(298)}\). High dose corticosteroids and background
immunosuppression were used in both arms of the EXPLORER trial and may have reduced the ability to discriminate benefit from rituximab(307). Patients on methotrexate as the background immunosuppressant derived more benefit from rituximab in a post-hoc analysis than those in the placebo group(297), and in contrast to those on background AZA or mycophenolate (297). Patients of Afro-American or Hispanic origin were also shown to benefit from rituximab in the RCT in contrast to Caucasians(297).

However 2 case series reports have suggested that repeat courses of rituximab may increase the risk of hypogammaglobulinaemia and infection(121;122). Progressive multifocal leukoencephalopathy (PML) has been reported in 17 SLE patients of whom 5 had been treated with rituximab. It seems likely that immunosuppression however it is achieved is the key factor in the development of PML. However lupus patients may be at increased risk of developing PML compared to other rheumatic diseases(312). The risk of rituximab causing PML in rheumatic diseases including rheumatoid arthritis and SLE has been estimated at 5/100,000 which is less than the risk observed with some other immunosuppressants in other diseases(313).

Conclusions: there is now considerable evidence for the ability of rituximab to reduce disease activity in refractory non-renal SLE of moderate and severe severity, albeit mostly from cohort studies. There have been relatively few concerns in the individual reports and systematic reviews about adverse events including infections in lupus patients on rituximab. There is increasing evidence that rituximab has steroid sparing properties but further evidence for its use early in the disease course is needed. Overall the level of evidence for rituximab from 3 systematic reviews including a meta-analysis and 30 studies including 1 RCT and 3 open trials for reducing disease activity and for steroid sparing properties is 2+ and grade of recommendation is C.

Belimumab for refractory moderate lupus

Summary: There have been two large phase III RCTs(314;315) investigating the use of Belimumab in moderate-severe seropositive lupus (mostly musculoskeletal and cutaneous disease; as severe active renal and NPSLE disease were exclusions). All patients received steroids, hydroxychloroquine and/or immunosuppressive drugs with specific criteria for dosing changes allowed or contra-indicated in the protocol. Both trials showed a significantly increased proportion of responders with belimumab 10mg/kg dose in addition to standard care. A variety of secondary endpoints were met and there were no significant differences in adverse events leading to the drug being approved and licensed by the FDA and the European Medicines Agency. NICE guidance for use of belimumab in active autoantibody-positive SLE in adults has been published (https://www.nice.org.uk/guidance/TA397) and is summarised in Figure 1. Patients must have positive anti-dsDNA antibodies, low complement and a SELENA-SLEDAI score ≥ 10 despite standard therapy. Patients should be recruited to the BILAG Biologics Register so that outcomes
can be recorded and treatment with belimumab should not be continues for more than 24 weeks unless the SELENA-SLEDAI score has improved by 4 points or more. Pregnancy should not occur while on belimumab but first trimester exposure is unlikely to be harmful(26).

Evidence: In the BLISS52 trial(314) at week 52 the response rate with placebo was 44%, with belimumab 1 mg/kg it was 51% (p=0.013) and with 10 mg/kg, it was 58% (p=0.001). In the BLISS76 trial(315), the placebo response rate at week 52 was 34%, with belimumab 1 mg/kg it was 41% (P = 0.089) and with 10 mg/kg it was 43% (P = 0.017). The response rates at week 76 were a little lower in all groups. A meta-analysis of the response at 52 weeks in the phase 2 trial of belimumab(316) as well as BLISS 52 and BLISS 76 trials showed benefit for belimumab with an odds ratio of 1.63 (95% CI 1.27 to 2.09) (317). Safety data from the phase 2 trial and its open label extension have not shown any significant concerns and continued benefit for up to 7 years(318;319). The most common side-effects have been upper respiratory tract and urinary tract infections, arthralgia, headaches, fatigue and nausea. Serious infusion reactions and infections have been rare(318;319). There have been 2 case reports of progressive multifocal leukoencephalopathy(320;321) but there is no evidence that belimumab increases the risk more than other immunosuppressive regimens in SLE patients(313).

Further post-hoc analyses(322;323) on the pooled datasets from BLISS 52 and BLISS 76 trials have demonstrated that belimumab therapy was associated with significantly more patients showing improvements than with placebo in the most commonly affected musculoskeletal and mucocutaneous systems and more immunological abnormalities normalised with placebo(322). Improvement was reported less consistently in other systems that were less often affected(322). There was less worsening in haematological, immunological and renal parameters in those patients on belimumab than in those on placebo(322) but, as with improvement, effects were not always dose related. Serological improvements with reduction in anti-dsDNA antibodies and increase in C3/C4 levels without reduction in memory T or B cell numbers or levels of anti-pneumococcal and anti-tetanus toxoid antibodies have been reported(324). This is consistent with the low rate of serious infections in the long term open label study of belimumab(318;319).

Another pooled analysis of BLISS 52 and BLISS 76 trials identified that belimumab had most therapeutic benefit compared with standard therapy alone in patients with higher disease activity (SELENA-SLEDAI ≥10), positive anti-dsDNA antibodies, low complement or corticosteroid treatment at baseline(325). Week 52 response rates in the low complement/anti-dsDNA-positive subgroup were 32% for placebo, 42% for belimumab 1 mg/kg (p=0.002) and 52% for belimumab 10 mg/kg group (p=0.001). For the SELENA-SLEDAI ≥10 subgroup, the response rates were 44%, 58% (p<0.001) and 63% (p<0.001) respectively. Belimumab was shown also to reduce severe flares and corticosteroid use and to improve health-related quality of life most in these more severe subgroups(325). These analyses contributed to the
decision by the European Medicines Agency to limit the market authorisation for belimumab (Benlysta) to: “as add-on therapy in adult patients with active autoantibody-positive systemic lupus erythematosus (SLE) with a high degree of disease activity (e.g. positive anti-dsDNA and low complement) despite standard therapy.


Conclusions: treatment with belimumab in addition to standard therapy in autoantibody-positive SLE patients was associated with some improvements in clinical, laboratory and patient-reported outcome measures compared with placebo in addition to standard therapy and had a low risk of serious side-effects. Based on the results of the 2 RCTs and the post-hoc analyses belimumab is considered by NICE to be cost-effective in the UK only for patients that meet the specific criteria above (see summary above and https://www.nice.org.uk/guidance/TA397), so availability is limited. The drug is being used in other countries particularly the USA where the license covers patients with moderate disease activity, and only specifies that patients must have active, autoantibody-positive lupus and be receiving standard therapy (such as corticosteroids, antimalarials, immunosuppressives, and nonsteroidal anti-inflammatory drugs) http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm246489.htm; http://www.accessdata.fda.gov/drugsatfda_docs/label/2014/125370s053lbl.pdf. Overall the level of evidence for belimumab in non-renal lupus from a meta-analysis, one phase 2 study, 2 phase 3 RCTs, their open label extension study and post-hoc analyses combining the data from the 2 RCTs is 1+ and grade of recommendation is B.

6. Recommendations for the management of severe SLE

6.0 Patients who present with severe SLE including renal and neuropsychiatric manifestations need thorough investigation to exclude other aetiologies including infection (4/D). Treatment is dependent on the underlying aetiology (inflammatory and/or thrombotic) and patients should be treated accordingly with immunosuppression and/or anticoagulation respectively (4/D). (SOA 98%) 6.1 Immunosuppressive regimens for severe active SLE involve IV methylprednisolone (2+/C) or high dose oral prednisolone (up to 1 mg/kg/day) (4/D) to induce remission either on their own or more often as part of a treatment protocol with another immunosuppressive drug (4/D). (SOA 98%)

6.2 Mycophenolate mofetil or cyclophosphamide are used for most cases of lupus nephritis and for refractory severe non-renal disease (2+/B). (SOA 98%)
6.3 Biologic therapies belimumab (1+/B) or rituximab (2+/C) may be considered, on a case-by-case basis, where patients have failed other immunosuppressive drugs due to inefficacy or intolerance. (SOA 98%)

6.4 Intravenous immunoglobulin (2-/D) and plasmapheresis (3/D) may be considered in patients with refractory cytopenias, thrombotic thrombocytopenic purpura (1+/B), rapidly deteriorating acute confusional state and the catastrophic variant of antiphospholipid syndrome. (SOA 93%)

Rationale

Overview of the management of severe lupus

Patients who have serious manifestations with organ or life-threatening disease require treatment with intensive immunosuppression followed by a prolonged period of less aggressive maintenance therapy to prevent relapse (summarised with suggested dosing regimens in table 7). In some cases there may be a thrombotic component to the clinical features that requires anticoagulation, for example in patients with anti-phospholipid syndrome as well as lupus. There is most evidence for the management of lupus nephritis, less for neuro-psychiatric disease and very little for other specific organ-specific manifestations.

The authors of this guideline have not reviewed the evidence for the management of lupus nephritis as they suggest that the EULAR/ERA-EDTA recommendations for the management of adult and paediatric lupus nephritis (24) are followed. The main recommendations and levels of agreement with them are shown in table 3. Further details about these recommendations and the evidence for them have been published(24).

For the management of severe non-renal SLE, the evidence for treatment with high dose corticosteroids, AZA, cyclophosphamide (CYC), MMF, rituximab, intravenous immunoglobulin and plasma exchange (plasmapheresis) is discussed below. The evidence for belimumab and for the calcineurin inhibitors ciclosporin and tacrolimus, particularly for cytopenias due to lupus, has already been reviewed above.

Suggested initial target dosing regimens and lower maintenance regimens to prevent flares once patients are stable are shown in table 7. The actual regimen used for individual patients will depend on the clinical picture and the treatment history. Patients with refractory disease especially those being considered for belimumab and rituximab should be discussed with and/or seen by a specialist lupus centre (see Figure 1 flowchart for eligibility and response criteria). It is important to review the response regularly and to increase the dose and/or change the treatment if patients fail to respond.

Corticosteroids for severe SLE

Summary: The emphasis in the last 10 years has been on finding steroid sparing regimens using other immunosuppressants to treat severe lupus in conjunction with corticosteroids either orally, intravenously...
or both to induce and maintain response with least risk of adverse events particularly infection. In general, there is an increasing tendency to use oral prednisolone at a dose of 0.5mg/kg/day with IV MP pulses (3x 500mg-750mg) rather than higher doses of IV MP pulses and/or higher dose oral prednisolone (eg 0.75-1 mg/kg/day) as done in the past for all severe manifestations of lupus.

**Evidence:** Intravenous methylprednisolone (IV MP) pulses as an alternative to, or in addition to, high dose oral prednisolone was first reported as a treatment for lupus nephritis(24,231,232). IV MP pulses were introduced for the management of non-renal lupus in the early 1980s(326). An open cohort study(230) and an open label trial(327) with using IV MP pulses followed by alternate day oral corticosteroids found that pulse therapy led to rapid improvement in clinical symptoms and anti-dsDNA and C3 levels but that an alternate day oral regimen was associated with relapses. A small double blind, placebo controlled RCT with mostly non-renal SLE patients(328) found that 3 IV MP pulses resulted in faster and more complete improvement in the first 2 weeks in 12 patients with SLE but there was no significant difference in efficacy or safety parameters at 4 weeks or 6 months compared with the placebo group however all patients received 40-60mg of oral prednisolone daily(328).

A double blind RCT(329) comparing 3 daily IV MP pulses of either 1000mg or 100mg in 21 patients with SLE causing fever, cardio-respiratory, renal or neuropsychiatric manifestations with individualised outcomes based on entry manifestations suggested no difference in efficacy between the regimens. A retrospective study compared a “low dose” IV MP pulses (<1500 mg over 3 days) with “high dose” pulses (3-5 g over 3-5 days) for the treatment of severe flares (330). This study suggested that the lower dose was sufficient and safer for controlling SLE flares than the high-dose regimen which was associated with an increased number of infections(330).

**Conclusions:** there is limited evidence for any particular corticosteroid regimen for specific manifestations of severe non-renal lupus. Overall the level of evidence for IV MP pulses and oral prednisolone in non-renal severe lupus is 2+ and the grade of recommendation is C.

**Azathioprine in severe SLE**

**Summary:** AZA (2-3mg/kg/day) is sometimes used as first line therapy with corticosteroids in severe non-renal lupus (see table 7) based on the evidence discussed in the section on the use of AZA for the management of moderate lupus. It is most often used in women planning pregnancy or pregnant, as it is much safer in pregnancy than cyclophosphamide or mycophenolate which are contra-indicated in such situations(26).
Evidence: There was only one open controlled trial with 24 patients with severe (life-threatening) multisystem manifestations of lupus(241) that showed no definite benefit from the addition of AZA compared with 40-60mg prednisone alone for 6 months before tapering over the next 18 months, although there was some steroid sparing benefits seen at 12 months. It has been used as primary treatment at a dose of 2mg/kg/day as an alternative to mycophenolate or cyclophosphamide in low risk renal patients without adverse prognostic factors and when these drugs are contra-indicated, not tolerated or unavailable(24).

AZA has been used more often as maintenance therapy after a course of cyclophosphamide for severe lupus based on the evidence from studies undertaken in patients with lupus nephritis(24;25). The rate of major extra-renal flares in the maintenance phase of the ALMS study was low in the AZA group at 6.3% (7/111) and similar to the frequency of 6.9% (8/116) in the MMF group(278). There is some evidence that AZA may be less effective at preventing renal flare in patients in this lupus nephritis study than MMF as discussed in the section on MMF (278). However in a predominantly Caucasian lupus nephritis population, in the MAINTAIN study, no difference in number or time to severe systemic flare in the AZA group (4/43) compared with the MMF group (3/53) was seen (279). There are no trials or controlled studies addressing AZA as a primary treatment for neuro-psychiatric lupus or any other specific serious non-renal manifestations of lupus but it has been used after cyclophosphamide for the treatment and prevention of recurrence of lupus psychosis in 13 patients(235).

The systematic review of non-biologic immunosuppressants in non-renal SLE by Pego-Reigosa in 2013(213) only considered the unblinded RCT showing no benefit from 1975(241) and a cohort study showing a reduced rate of flare(245) in patients on AZA and concluded that there was little evidence to support the use of AZA in non-renal lupus.

Conclusions: Overall the level of evidence for AZA in non-renal severe lupus is 2+ and the grade of recommendation is C.

Cyclophosphamide in severe SLE including lupus nephritis and neuro-psychiatric lupus
Summary: CYC, although not licensed for lupus, has been used for the treatment of severe lupus particularly lupus nephritis and organ or life-threatening non-renal disease since the late 1960s with the first open trial in lupus nephritis reported in 1971(331). Oral CYC is associated with an increased risk of bladder cancer and has been replaced by IV CYC pulses in the management of severe lupus. There is most experience with IV CYC pulses in lupus nephritis and NPSLE (table 7). CYC is teratogenic and is contra-indicated in women trying to conceive, pregnant or breast-feeding. It is gonadotoxic and can cause infertility and men should not father children while on CYC(26).
Evidence: The first controlled trial comparing prednisone with CYC in lupus nephritis, non-renal lupus and polymyositis was reported in 1973(332) and a similar design was used to compare oral CYC and AZA in lupus not responsive to 15mg prednisolone(333) but numbers were small and the aim of matching individual patients and comparing their outcomes was unsuccessful. Since then studies have used different trial designs and evidence supporting the use of various doses of oral and later intravenous (IV) pulse CYC regimens to reduce disease and prednisolone dosage and to improve outcomes in patients with lupus nephritis and non-renal lupus. The best known regimens are based on the National Institutes for Health (NIH) IV CYC protocol (monthly IV CYC at 500-1000 mg/m2 body surface area for 6 months followed by 3 monthly IV CYC later for 2 years)(334) and the Euro-Lupus protocol which uses lower doses (500 mg fixed dose IV CYC 2 weekly for a total of 6 doses followed by oral AZA)(335) and appears to be as effective and safer for lupus nephritis in Europe than high dose regimens(336). In recent years, the 3 monthly IV CYC maintenance pulses for 2 years in the NIH protocol have been replaced by oral MMF or AZA (25;337).

IV CYC pulses were the most widely used regimes for all but the mildest cases of acute proliferative glomerulonephritis until MMF was found to be comparable in efficacy and safer(24;25). It should be noted that neither of these drugs is licensed for the treatment of lupus nephritis but both are supported as appropriate treatment for the management of lupus nephritis in the EULAR/ERA-EDTA recommendations for the management of adult and paediatric lupus nephritis(24) (table 3) and the ACR guidelines for screening, treatment, and management of lupus nephritis(25).

Treatment regimens tested in lupus nephritis have often been applied to severe non-renal lupus disease as there are fewer non-renal studies and they include heterogeneous patient populations. A systematic review(213) evaluated 29 studies, including 4 unblinded RCTs, that included 3742 patients with non-renal lupus treated with a variety of cyclophosphamide regimens. There are more data on efficacy and safety of cyclophosphamide in non-renal lupus than for any other drug treatment, however there are fewer high quality studies than in lupus nephritis and diverse end-points have been used making it hard to compare studies.

Data from the ALMS RCT comparing IV CYC (0.5-1.0g/m² monthly x6) and MMF (target 3.0g/day) as induction therapy for lupus nephritis(272) showed that IV CYC therapy was associated with almost 95% response in all of the non-renal systems apart from haematology which was confounded by drug-induced cytopenias and anemia of uncertain cause. There was no difference in response between IV CYC or MMF in any of the systems studied including renal.

Some of the best evidence supports the use of pulse IV CYC in neuropsychiatric (NP) lupus with one small RCT that favoured an IV CYC regimen over IV MP alone(338). This trial used more corticosteroids
than we would recommend now and was based on a previous retrospective cohort study that suggested that IV CYC was useful in the management of NPSLE(339). The RCT(338) recruited 32 SLE patients with active severe NP manifestations without thrombosis, such as seizures, optic neuritis, peripheral or cranial neuropathy, coma, brainstem disease, or transverse myelitis that had developed within the previous 15 days. All of the patients received prednisolone 1mg/kg/day for up to 3 months and then tapered depending on response, and 1 g of IV MP daily for 3 days followed for 12 months by either monthly IV CYC 0.75g/m² or IV MP 1g monthly for 4 months then bimonthly for 6 months, and finally the same treatment in each group every 3 months for another year. The primary end point was at least 20% improvement from baseline using clinical, laboratory, or specific neurological criteria and was met in 18/19 (95%) receiving CYC and 6/13 (46%) receiving MP(338). A Cochrane systematic review of the treatment of NPSLE(340) calculated a relative risk of 2.05 (95% CI 1.13-3.73) for 20% response at 24 months with CYC therapy, but most patients responded by 5 months. CYC treatment was associated also with greater improvement in other lupus manifestations, a significant reduction in SLEDAI score at 6 and 12 months, greater reduction in prednisolone dosage and more patients completing the protocol compared with the MP group. There was no difference in adverse events including infections and deaths. Recruitment to the study was stopped early due to the higher failure rate of the MP arm. Although the RCT is not of high quality(340) due to the small number of patients studied, the heterogeneity of the neuropsychiatric events, the variable outcome measures used for their assessment, and potential confounding by variable oral corticosteroid dosing, it is clear that the IV MP regimen was not sufficient and that CYC was better at controlling active NPSLE and preventing relapse.

Further evidence for CYC in NPSLE comes from a previous open, controlled, pilot study on the use of low dose of IV CYC in 37 NPSLE patients with a mean dose of 21 mg/day oral prednisone compared with oral prednisone alone in 23 patients (mean dose 21mg/day)(341) and a cohort study(342) in which a low dose regimen of IV CYC was used in 25 patients with NPSLE with benefit and a low risk of adverse events. A case series(235) found that treating 13 patients with lupus psychosis with oral prednisolone starting at 1mg/kg/day for 8 weeks and oral CYC (1-2mg/kg/day) for 6 months followed by oral AZA (1-2mg/kg/day) led to improvement within a mean of 44 days and only one relapse with psychosis after 2 years, but 23% developed other NP features and 38% had non-NP flares over mean follow up of 7 years. Anti-psychotic agents were used in 9 patients for a mean of 6 months. Evidence for CYC and other treatments in neuro-ophthalmic manifestations of lupus have been reviewed in a systematic review(343) but the data on treatment is mostly based on case reports and small case series, for example cases with neuromyelitis optica treated with or without CYC(343).

In contrast to the studies assessing low dose regimens, high-dose CYC has been studied as well in the hope of achieving better responses in severe lupus. An open uncontrolled study (344) reported the initial safety and efficacy of high-dose CYC (50 mg/kg x 4 days) without stem cell transplantation in 14 patients
with refractory moderate to severe SLE despite corticosteroids and at least one immunosuppressant. A prospective RCT (345) designed to compare the efficacy and safety of a widely used standard IV CYC regimen (monthly IV CYC at 750 mg/m² body surface area for 6 months followed by 3 monthly IV CYC for 2 years) and this high-dose IV CYC regimen followed. Entry criteria included moderate-to-severe lupus with renal (22 patients), neurologic (14 patients), or other organ system involvement (11 patients). There was no evidence that response differed between the regimens but non-responders to monthly IV CYC could be rescued with high-dose IV CYC. There was no difference in serious adverse events, infections, premature ovarian failure or deaths between the 2 groups. Leuprolide (a gonado-tropin releasing hormone analogue) was not used to protect against ovarian failure (346). This should be considered with IV CYC moderate and high dose regimens (345), as amenorrhoea and ovarian failure are dose and age-related adverse events of CYC (337;347), but are rare with the European low dose IV CYC regimen (500mg 2 weekly for 3 months only) recommended for lupus nephritis (24).

The remaining data (213) supporting the use of CYC for other serious non-renal manifestations of lupus are obtained predominantly from a variety of cohort studies, small case series and case reports including 5 patients with systemic lupus vasculitis (348), 11 patients with myocardiitis (349), and 5 patients with heart failure due to myocardiitis (350). There is one open RCT comparing IV CYC with enalapril for 6 months in the treatment of pulmonary hypertension that showed greater benefit from CYC but an increased risk of infection and gastro-intestinal side-effects (351).

Conclusions: there is considerable evidence supporting the use of IV CYC to reduce disease activity and corticosteroid usage in severe lupus, both renal and non-renal disease including NPSLE. There is no evidence that CYC prevents chronic damage and all regimens are teratogenic, but there is less risk with the Euro-Lupus regimens of adverse events such gastro-intestinal side-effects, alopecia, infection, amenorrhoea, and infertility due to ovarian failure than higher dose regimens (12;16;24;25;213;340). Overall the level of evidence for CYC in non-renal severe lupus including NPSLE from 1 systematic review including 29 studies and 1 systematic Cochrane review of NPSLE is 2+ and the grade of recommendation is B.

Mycophenolate mofetil in severe SLE

Summary: There is considerable evidence supporting the use of MMF in the management of lupus nephritis (table 7) which has been discussed in the Joint EULAR/ERA-EDTA recommendations for the management of adult and paediatric lupus nephritis (24) and the American College of Rheumatology guidelines for screening, treatment, and management of lupus nephritis (25). The mean level of agreement of all of the authors of this guideline with each of the main EULAR/ERA-EDTA recommendations for the management of lupus nephritis is shown in table 3. There is very little evidence for the use of MMF in NPSLE but it is being used to reduce other types of moderate and severe non-renal lupus disease activity
(table 7), to prevent flare and for its steroid-sparing properties as an alternative to CYC or AZA, especially in cases where inefficacy, drug intolerance and concerns about toxicity arose. It is not compatible with conception, pregnancy or breast-feeding (26).

Evidence: As mentioned in the section on moderate lupus, there is a systematic review of non-biologic immunosuppressants in non-renal SLE (213) that summarises data from 8 papers covering 768 patients with moderate/severe lupus that assessed the efficacy and safety of MMF in the treatment of non-renal SLE including the ALMS RCT comparing MMF to CYC as induction therapy for lupus nephritis (272), and 7 cohort studies including 6 discussed above (266;267;269-271;282) and an abstract that does not meet the criteria for this guideline.

Conclusions: Overall the level of evidence for MMF in non-renal lupus from 2 systematic reviews, 2 open RCTs in lupus nephritis and 7 cohort studies is 2++ and grade of recommendation is B.

Rituximab in severe SLE

Summary: According to the NHS England interim commissioning policy statement for rituximab in SLE (http://www.england.nhs.uk/wp-content/upSOAds/2013/09/g13-gsa.pdf), rituximab may be considered in patients with severe or moderate SLE (BILAG system category A or ≥ 2B system scores, or SLEDAI >6) who fail treatment with MMF or CYC, either because of lack of effect or due to adverse events providing they have already failed another immunosuppressant or it would be contra-indicated, or they require unacceptably high long term corticosteroid dosing to control their lupus activity (see Figure 1 flowchart for eligibility and response criteria).

Evidence: Clinical examples of severe lupus are shown in table 7 and the evidence for rituximab is summarised in table 2. The systematic reviews by Duxbury (307) and Cobo-Ibanez(300) provide evidence for rituximab for non-renal severe manifestations of lupus such as neuropsychiatric involvement (5 cohort studies(352-356)), haematological manifestations (6 cohort studies(354;356-360)) and at least 10 other cohort studies(353;354;356;358;361-366)). The data for improvement in NPSLE are still limited and uncontrolled but showed 73-100% response in small numbers of patients. There is some evidence for improvement (50-100%) in mostly refractory lupus patients and idiopathic autoimmune thrombocytopenia and haemolytic anemia. There are some specific reports on the use of rituximab in neuro-ophthalmological cases in a systematic review of these conditions (367) and pooled data from European cohorts(368) on the effects of rituximab in lupus nephritis as mentioned in the EULAR/ERA-EDTA recommendations for the management of adult and paediatric lupus nephritis (24). There are insufficient data to comment on other specific severe lupus manifestations at present but rituximab is accepted to have steroid-sparing properties (3 open studies(121;301;302)).
Conclusions: Overall the level of evidence for rituximab from 3 systematic reviews and 30 studies including 1 RCT and 3 open trials for reducing lupus disease activity and for steroid –sparing properties is 2++ and grade of recommendation is B.

Intravenous immunoglobulin in severe SLE

Summary: IV immunoglobulin (IVIG) has been used most in patients with refractory cytopaenias, thrombotic thrombocytopenic purpura and the catastrophic variant of antiphospholipid syndrome. It can be used in pregnancy (but does not prevent heart block or fetal loss) and in patients with infection. It is rarely indicated as there is not much evidence for its use (table 2).

Evidence: Much of the initial data are from case reports or small case series reporting treatment of acute events in small numbers of patients(369-372). A systematic review and meta-analysis covering 3 controlled and 10 observational studies in SLE concluded that IVIG led to a reduction in SLE disease activity scores and a rise in complement levels in 31% of patients (P = 0.001, 95 CI 22.1-41.3) . There were insufficient data to assess response using other outcome measures although serious adverse events were rare and mild(373). The observational studies often did not report concomitant medication and used a variety of outcome measures and treatment regimens as discussed below.

IVIG at a dose of 400 mg/kg/day for 5 consecutive days was used monthly for 6-24 months with some benefit in an open uncontrolled trial with 12 refractory SLE patients(374). Another open study(375), assessed 13 female SLE patients with a flare that received 0.4 g/kg body weight IVIG daily for 5 days. Short term benefit was seen irrespective of concomitant therapy. IVIG-related adverse effects were mild and rare and there was no worsening of renal function(375).

Low dose IVIG was used to treat histologically confirmed cutaneous lupus in 12 patients starting with doses of 1 g/kg x2, followed by 400 mg/kg monthly until disease remission or for 6 months(376). Five patients showed complete or almost complete (>75%) clearing of their skin lesions, 2 had partial improvement (>50%) and 3 had poor responses (<50%). There were few side effects in this study but they avoided renal patients as nephrotoxicity has been reported in other studies(377).

A retrospective chart review of 62 patients treated with low dose IVIG (approximately 0.5g/kg) on average every 5 weeks for a mean of 6 courses and found a steady reduction in SLEDAI score over 8 months(378). Fever, rash, mucosal ulcers, pleurisy, pericarditis and urinary casts and red cells did respond in over 50% of cases but only 30% of arthritis cases responded. Thrombocytopenia, vasculitis and alopecia did not respond. Another group also found a disappointing response to IVIG in thrombocytopenia(379) in a
retrospective analysis of 59 patients with immune-mediated severe thrombocytopenia, 44 of whom had definite lupus. A transient response to IVIG was reported in 3 patients with haemolytic anemia in another study (380).

The effect of high dose IVIG (30 g of sulfonated IVIG on days 1-4 and 21-24) in 12 mild to moderate active lupus patients (381) was only temporary in most patients. High dose IVIG treatment in 17/20 (85%) SLE patients given 1-8 treatment courses consisting of 2 g/kg monthly given over 5 days (382) led to some improvement in arthritis, fever, thrombocytopenia, and neuropsychiatric lupus (382). A retrospective chart review of 17 patients (including 11 with SLE) with mean follow-up of 30 months and long-term high dose IVIG treatment monthly for 6 months then 2-3 monthly (383) found that there was a significant reduction in SLEDAI score with significant steroid-sparing effects and remission was achieved in 12 patients (383).

A case control study (384) compared 12 pregnant SLE patients with a history of recurrent spontaneous abortions treated with high-dose IVIG (0.5g/kg every 3 weeks to 33 weeks) with 12 similar patients treated with prednisolone and NSAIDs. Patients in the IVIG group stopped prednisolone (n=4) and NSAIDs (n=9). Disease activity decreased by the end of pregnancy (P < 0.0001) and there was a reduction in autoantibodies and normalisation of complement levels in the IVIG group. Such improvements were not seen in the control group and there were 3 fetal losses due to spontaneous abortion in this group compared with none in the IVIG group. However, other studies have not confirmed that IVIG can prevent fetal loss (26) and it is possible that NSAIDs contributed to fetal loss in the control group (27).

A multicenter, prospective, open-label study of pregnant women with anti-SSA/Ro antibodies in the mother and birth of a previous child with CHB/neonatal lupus rash was undertaken to determine whether IVIG (400 mg/kg) given every 3 weeks from week 12 to week 24 of gestation could prevent the development of congenital heart block (CHB) (385). CHB was detected at 19, 20, and 25 weeks in 3 babies at a stage when 20 mothers had completed the IVIG protocol before the trial was stopped. An additional child without CHB developed a transient rash consistent with neonatal lupus (385). Another European prospective study showed similar results (386).

A large retrospective, single-centre cohort study was published by Camara in 2014 (387) that included 52 SLE patients with predominantly cutaneous, haematological, neuropsychiatric and cardiac manifestations that received at least one cycle of IVIG (400 mg/kg/day for 5 days). IVIG was given to 27 patients with infection and active lupus disease and 17 (63%) patients showed some response. In 18 (69%) of 26 patients with refractory active disease without infection some response was seen also. This study was too recent to be included in a comprehensive review on the use of IVIG in rheumatic diseases (388) that covered the case control study in pregnancy by Perricone (384), 4 prospective open
Conclusions: IVIG, particularly the high dose regimen, can have some beneficial effects in the short term on disease activity but has to be continued with intermittent courses for sustained benefit to be seen and only then has steroid sparing properties. It has a low rate of adverse events in non-renal patients but can cause nephrotoxicity especially with pre-existing renal disease. The evidence is weak compared with other treatments that are cheaper and easier to administer, so it should be reserved for patients in whom other treatments are contra-indicated or have failed. Overall the level of evidence for IVIG in non-renal severe lupus from 2 systematic reviews including a meta-analysis, 3 open trials, 10 cohort studies and 4 case series is 2-3 and the grade of recommendation is D.

Plasma exchange (plasmapheresis) for severe SLE

Summary: Plasma exchange in SLE has been used in small numbers of patients with conflicting results since the late 1970s. A systematic review was published while this paper was in preparation (389). It is rarely indicated as there is inadequate data to support its use except in thrombotic thrombocytopenic purpura (TTP) (table 2).

Evidence: The evidence for plasma exchange which is expensive and often difficult to organise, remains poor except for thrombotic thrombocytopenic purpura (390;391), the catastrophic variant of antiphospholipid syndrome (389), and refractory neuro-psychiatric, haematological and renal lupus (389). Even for rapidly progressive glomerulonephritis (RPGN) the evidence is limited (392).

Studies have shown that plasmapheresis can reduce immune complexes and anti-dsDNA antibodies but there is a rapid rebound of complexes and antibody to pre-treatment levels, as shown originally in 5/8 patients (393). Marked improvement after plasma exchange was seen in 7/11 (64%) SLE patients in another study (394) lasting up to 3 years, but one (9%) patient with a severe relapse died and plasma exchange was ineffective in 3 (27%) patients. In another small study of 9 patients, 5 (56%) improved, 2 (22%) progressed to end-stage renal failure and 2 (22%) died due to complications of severe SLE (395).

There was less support for plasma exchange in SLE after a trial comparing plasma exchange in combination with CYC and corticosteroids with standard therapy revealed no benefit from the plasma exchange for 40 patients with severe lupus nephritis (396). However, to avoid the rebound increase in autoantibodies after plasma exchange a synchronized protocol was developed by the Lupus Plasmapharesis Study Group (LPSG) consisting of plasmapheresis (3 x 60 ml/kg) followed by high-dose pulse CYC (36 mg/kg) then 6 months of oral immunosuppression. This treatment led to rapid
improvement in disease activity in the initial 14 patients with various severe SLE manifestations, sufficient for immunosuppressants including corticosteroids to be withdrawn in 12 (86%) patients at 6 months. Treatment-free clinical remission was sustained in 8 (57%) patients for a mean of 5.6 years(397). However there has been concern that improvements seen in this and 2 other uncontrolled studies(398;399) with 23 patients may have been due to the concomitant immunosuppressants. It is notable that the LPSG never reported on the final disappointing results of a randomized international multicenter trial comparing their synchronized protocol(397) with the administration of pulse CYC alone.

The evidence for treating patients with diffuse alveolar haemorrhage, thrombotic thrombocytopenic purpura (TTP), or catastrophic APS with lupus is predominantly from case reports and small case series(390;400;401). Given the high mortality in TTP in general but especially with lupus(390;391), it is essential that patients with TTP are referred early for plasma exchange and specialist care(391;402). Further details about the experience and potential use of plasma exchange and immunoadsorption in lupus and anti-phospholipid syndrome, including lupus nephritis covered by the systematic review(389).

Conclusions: there remains a need for further research to define better the patients that are most likely to benefit from plasma exchange, but in general this remains TTP, severe refractory disease and patients with contra-indications to conventional treatment including pregnancy. Overall the level of evidence for plasma exchange for the treatment of non-renal severe lupus from 1 systematic review and 9 studies is weak (2-3) and the grade of recommendation is D, but for TTP it is strongly recommended (grade B) as for non-lupus patients with TTP.

Applicability and Utility

Implementation

Diagnosis and assessment of lupus can be difficult due to multi-system involvement and variable laboratory and serological test results. These guidelines will increase knowledge and raise the standard of care for patients with lupus. Only hydroxychloroquine, corticosteroids and belimumab are licensed treatments for lupus. The evidence for the treatment options discussed in this guideline, which reflect current best practice, has increased considerably in the last 10 years although there is still relatively little evidence from high quality RCTs. There should be no barriers to implementation apart from limitations on the funding for rituximab and belimumab discussed in the relevant sections. The guidelines will be widely presented at local, regional and national meetings for health professionals and patients, carers and supporters of relevant charities.

Key standards of care
Lupus patients should be referred to a physician with experience of managing lupus who can confirm the diagnosis, assess the level of disease activity and provide advice on treatment and monitoring of the disease, its complications and side-effects of therapy. Managing immunosuppressive therapies and their potential toxicities in patients with lupus can be a considerable challenge due to the risk of infection, difficulties with attribution of cytopenias to lupus or cytotoxic drugs, and difficulties in distinguishing manifestations of lupus disease activity from damage and co-morbid conditions. Input from a multi-disciplinary team including nurse specialists and physiotherapists is usually required, and management may involve a variety of specialists including rheumatologists, nephrologists, dermatologists, haematologists, cardiologists, chest physicians, neurologists, obstetricians, podiatrists and occupational therapists working as part of collaborative clinical networks involving regional specialist centres, local hospitals and GPs.

It is important to get patients to a low level of disease activity if not remission (94) using hydroxychloroquine, immunosuppressants and the least amount of corticosteroids possible, in order to reduce cumulative damage from the disease and its treatment with corticosteroids (94). If drug treatment is not working within the expected time frame, it is important to consider adherence to treatment and adjusting the therapy to reduce the accumulation of chronic damage.

Patients need personalised advice, written information and education about the disease and its drug treatment from members of the multi-disciplinary team including specialist nurses and an individual to contact in the event of new symptoms. Additional topics covered should include sun avoidance, adequate vitamin D intake, weight control, exercise, not smoking and other measures to reduce atherosclerotic risk factors, as well as cancer screening, contraception and pregnancy planning when the disease is under good control on appropriate treatment for conception.

**Future research agenda**

1. More data is required and is being collected by the BILAG Biologics Register to assess the efficacy and safety of rituximab for refractory lupus disease administered according to the NHS England interim commissioning policy statement.
2. This study should also provide some data on the use of MMF in non-renal lupus patients which is currently needed to support data from renal trials.
3. It is difficult to know which immunosuppressive drug will work best for an individual so more research in to stratified and personalised medicine and the cost-effectiveness of such approaches is warranted.
4. Trials addressing immunosuppressive regimens and the development of biological therapies that will significantly reduce the need for corticosteroids are needed in renal and non-renal lupus patients.
5. Cost-effectiveness and value of monitoring drug levels in improving adherence/compliance and outcome in terms of reduced disease activity, damage and steroid usage should be investigated (eg hydroxychloroquine, MMF as well as tacrolimus).

6. The role of IVIG and plasma exchange requires further evaluation.

7. More data are required on the long term outcome of children born to mothers with lupus that were exposed to drugs used pre-conception, while pregnant and breast-feeding.

**Mechanism for audit of the guideline**

To assess compliance with these guidelines an audit proforma is available as supplementary information on line and on the British Society for Rheumatology website.

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C.G. has undertaken consultancies and received honoraria from Bristol-Myers Squibb, Eli-Lilly, GlaxoSmithKline, MedImmune, Merck Serono, Parexel, Roche and UCB, has been a member of the speakers' bureau for GlaxoSmithKline, UCB and Lilly and has received research grant support from Aspreva/Vifor Pharma in the past and UCB currently.

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D.I. has received funding for his unit for local meetings from ABBVIE, Bristol-Myers Squibb, Internis, and Merck Serono and has received funding to attend scientific advisory board meetings or honoraria have been paid in to a local charity from Eli-Lilly, GlaxoSmithKline, Merck Serono, XLT Bio and UCB.
List of Tables and supplementary information

Table 1: Levels of evidence and grades of recommendation for diagnosis, assessment and monitoring of non-renal SLE

Table 2: Levels of evidence and grades of recommendation for medications used in the treatment of non-renal SLE

Table 3: Strength of agreement (SOA) of authors with Joint European League Against Rheumatism and European Renal Association-European Dialysis and Transplant Association (EULAR/ERA-EDTA) recommendations for the management of lupus nephritis (24).

Table 4: The ACR criteria for classification of systemic lupus erythematosus

Table 5: Clinical and Immunologic Criteria Used in the SLICC Classification Criteria for SLE

Table 6: Assessment & Monitoring of SLE in lupus patients

Table 7: SLE treatment strategies for examples of mild, moderate and severe non-renal lupus

Figure 1: NHSE and NICE guidance for the use of belimumab and rituximab (RTX) in patients with SLE

Supplementary information 1: Questions about the management of lupus developed by the guideline development group to be addressed by the literature review and search strategy

Supplementary information 2: SIGN revised grading system for recommendations in evidence based guidelines (403)

Supplementary information 3: BSR SLE Guidelines audit tool.

Supplementary information 4: BILAG 2004 disease activity index (form, glossary and scoring)- or provide online link to publication already in Rheumatology

Supplementary information 5: SLEDAI-2K and SELENA-SLEDAI data entry forms with different definitions for some items
Supplementary table 1: Cumulative incidence of SLE manifestations in lupus cohorts
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<td>- anti-Ro/La for neonatal lupus</td>
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<td>2++</td>
<td>B</td>
<td>59;60;113-116</td>
</tr>
<tr>
<td>CRP low or normal unless infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESR correlates with active lupus</td>
<td>2</td>
<td>2+</td>
<td>C</td>
<td>112;116</td>
</tr>
<tr>
<td>Prognostic value of lupus disease activity and damage indices</td>
<td>&gt;60</td>
<td>2++</td>
<td>B</td>
<td>Reviewed in 12 and 94, 11;14-16;39;95;99</td>
</tr>
<tr>
<td>Monitoring &amp; treating cardiovascular risk factors in SLE patients</td>
<td>6</td>
<td>2+</td>
<td>C</td>
<td>Reviewed in 22;86;94, 123,124</td>
</tr>
<tr>
<td>Frequency of monitoring SLE:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- for active disease, every 1 to 3 months after diagnosis or flare</td>
<td>2</td>
<td>2+</td>
<td>C</td>
<td>95;96</td>
</tr>
<tr>
<td>- low/no disease activity, stable treatment: 6 to 12 monthly</td>
<td></td>
<td></td>
<td></td>
<td>Expert opinion</td>
</tr>
<tr>
<td>Monitoring for drug toxicity/levels</td>
<td>2</td>
<td>2+</td>
<td>C</td>
<td>145;147</td>
</tr>
<tr>
<td>Treatment (recommended target dosage)</td>
<td>Main uses (unless contra-indications)</td>
<td>Total number of papers</td>
<td>Overall SIGN level of evidence</td>
<td>Grade of recommendation</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Antimalarials:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydroxychloroquine ≥6.5 mg/kg/day</td>
<td>mild lupus, prevent flare in all patients, prevent damage, steroid-sparing</td>
<td>45</td>
<td>1++</td>
<td>A</td>
</tr>
<tr>
<td>Methotrexate ≥25 mg/week</td>
<td>mild and moderate lupus, prevent flare, steroid sparing</td>
<td>12</td>
<td>1+</td>
<td>A</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>symptom control in mild non-renal lupus only</td>
<td>1</td>
<td>3</td>
<td>D</td>
</tr>
<tr>
<td>Sunscreen (high factor UV-A and UV-B)</td>
<td>prevents UV-induced rashes and other manifestations</td>
<td>7</td>
<td>2++</td>
<td>B</td>
</tr>
<tr>
<td>Low dose oral prednisolone (&lt;7.5 mg or less)</td>
<td>mild lupus and to prevent flares</td>
<td>0</td>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td>Higher doses of oral prednisolone ≤ 0.5 mg/kg/day</td>
<td>moderate lupus and prevention of flares</td>
<td>0, 2</td>
<td>4, 2+</td>
<td>D, C</td>
</tr>
<tr>
<td>Intramuscular triamcinolone</td>
<td>moderate lupus</td>
<td>1</td>
<td>2+</td>
<td>C</td>
</tr>
<tr>
<td>IM methylprednisolone (80-120 mg)</td>
<td>moderate lupus</td>
<td>0</td>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td>Therapy</td>
<td>Indication</td>
<td>Strengths</td>
<td>Evidence</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------</td>
<td>---------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>IV methylprednisolone</td>
<td>moderate lupus</td>
<td>1</td>
<td>2+</td>
<td></td>
</tr>
<tr>
<td>(100-250mg)</td>
<td></td>
<td>C/D</td>
<td>1 blind RCT for 100mg v 1000mg (229)</td>
<td></td>
</tr>
<tr>
<td>IV Methylprednisolone</td>
<td>moderate and severe lupus</td>
<td>6</td>
<td>2+</td>
<td></td>
</tr>
<tr>
<td>(500mg-1g) x 1-3 pulses</td>
<td></td>
<td>C</td>
<td>2 small blind RCTs (328;329); 1 open trial (327); 3 cohort studies (230;326;330)</td>
<td></td>
</tr>
<tr>
<td>Azathioprine (if TPMT* normal)</td>
<td>moderate lupus, prevent flare, steroid sparing</td>
<td>10</td>
<td>2+</td>
<td></td>
</tr>
<tr>
<td>2-3 mg/kg/day</td>
<td></td>
<td>C</td>
<td>4 open RCTs (238;240;241;246); 5 cohort studies (237;244;245;247;251) 1 case series (243)</td>
<td></td>
</tr>
<tr>
<td>Mycophenolate mofetil</td>
<td>moderate/severe lupus, prevent flare, steroid sparing</td>
<td>13</td>
<td>2++</td>
<td></td>
</tr>
<tr>
<td>2-3 g/day</td>
<td></td>
<td>B</td>
<td>3 open RCTs (272;278;279); 7 cohort studies (266-267;269-271;280;281); 1 case series (273) 2 SRs (213;265)</td>
<td></td>
</tr>
<tr>
<td>Mycophenolic acid/sodium</td>
<td>for patients intolerant of MMF</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1.44 - 2.16g/day</td>
<td></td>
<td>D</td>
<td>1 open RCT (143); 1 cohort study (Yahya 2013)</td>
<td></td>
</tr>
<tr>
<td>Ciclosporin</td>
<td>moderate/severe lupus, prevent flare, steroid sparing</td>
<td>11</td>
<td>2+</td>
<td></td>
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<tr>
<td>≤2.5 mg/kg/day</td>
<td></td>
<td>C</td>
<td>2 open RCTs (246;283); 8 cohort studies (285-292); 1 SR (284)</td>
<td></td>
</tr>
<tr>
<td>Tacrolimus</td>
<td>moderate/severe lupus, steroid-sparing</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1-3mg/day (assess drug levels)</td>
<td></td>
<td>D</td>
<td>2 cohort studies (293;294); 1 SR (284)</td>
<td></td>
</tr>
<tr>
<td>Leflunomide</td>
<td>moderate lupus without subacute rash</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>(20mg/day)</td>
<td></td>
<td>D</td>
<td>1 small blind RCT (295); 1 cohort study (296); 1 SR (284)</td>
<td></td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>severe lupus including NPSLE, prevent flare, steroid-sparing</td>
<td>30</td>
<td>2++</td>
<td></td>
</tr>
<tr>
<td>(see text for dosing)</td>
<td></td>
<td>B</td>
<td>4 open RCTs (338;341;345;351) 25 cohort studies covered by 1 SR (213)</td>
<td></td>
</tr>
<tr>
<td><strong>Rituximab</strong> 1000mg x 2</td>
<td>refractory severe and moderate lupus; steroid-sparing</td>
<td>33</td>
<td>2+</td>
<td>C</td>
</tr>
<tr>
<td><strong>Belimumab</strong> 10mg/kg/4 weeks</td>
<td>refractory moderate/severe lupus; prevent flare &amp; steroid-sparing (not NPSLE)</td>
<td>5</td>
<td>1+</td>
<td>B</td>
</tr>
<tr>
<td><strong>IVIG</strong> (see text)</td>
<td>refractory severe lupus (including catastrophic APS)</td>
<td>19</td>
<td>2-/3</td>
<td>D</td>
</tr>
<tr>
<td><strong>Plasmapharesis</strong></td>
<td>TTP; refractory severe SLE</td>
<td>10</td>
<td>2++ for TTP; 3 otherwise</td>
<td>B for TTP; D otherwise</td>
</tr>
</tbody>
</table>

*TPMT = thiopurine S-methyltransferase (see text)
Management of SLE patients with renal involvement

**Assessment of renal involvement**

7.0 Any sign of renal involvement – in particular, urinary findings such as reproducible proteinuria $\geq 0.5\text{g/24-}$hr especially with glomerular haematuria and/or cellular casts – should be an indication for renal biopsy. Renal biopsy is indispensable since in most cases, clinical, serologic or laboratory tests cannot accurately predict renal biopsy findings.

7.1 The use of the ISN/RPS 2003 classification system is recommended with assessment not only of active and chronic glomerular and tubulointerstitial changes, but also of vascular lesions associated with antiphospholipid antibodies/syndrome.

**Treatment of renal involvement**

7.2 Initiation of immunosuppressive treatment should be guided by a diagnostic renal biopsy. Immunosuppressive agents are recommended in class III$\alpha$ or III$\alpha\lambda$ ($\leq V$) and IV$\alpha$ or IV$\alpha\lambda$ ($\leq V$) nephritis, and also in pure class V nephritis if proteinuria exceeds 1g/24-hr despite the optimal use of renin-angiotensin-aldosterone system blockers.

7.3 The ultimate goals of treatment in lupus nephritis are long-term preservation of renal function, prevention of disease flares, avoidance of treatment-related harms, and improved quality of life and survival. Treatment should aim for complete renal response with UPCR <50mg/mol and normal or near-normal (within 10% of normal GFR if previously abnormal) renal function. Partial renal response, defined as $\geq 50\%$ reduction in proteinuria to sub-nephrotic levels and normal or near-normal renal function, should be achieved preferably by 6 but no later than 12 months following initiation of treatment.

**Initial treatment**

7.4 For patients with proteinuria (UPCR >50mg/mmol) or hypertension ACE-inhibitors or angiotensin receptor blockers are indicated.

7.5 In lupus patients with APS-associated nephropathy: hydroxychloroquine, and/or antiplatelet/anticoagulant treatment should be considered.

7.6 For patients with class III$\alpha$ or III$\alpha\lambda$ ($\leq V$) and class IV$\alpha$ or IV$\alpha\lambda$ ($\leq V$) lupus nephritis mycophenolic acid (MPA) (mycophenolate mofetil [MMF] target dose: 3g/day for 6 months, or mycophenolic acid sodium at equivalent dose) or low-dose intravenous cyclophosphamide (CY) (total dose 3g over 3 months) in combination with glucocorticoids, are recommended as initial treatment as they have the best efficacy/toxicity ratio.
7.7 In patients with adverse prognostic factors (acute deterioration in renal function, substantial cellular crescents and/or fibrinoid necrosis), similar regimens may be used but CY can also be prescribed monthly at higher doses (0.75-1g/m²) for 6 months or orally (2-2.5mg/kg/day) for 3 months.

7.8 To increase efficacy and reduce cumulative glucocorticoid doses treatment regimens should be combined initially with 3 consecutive pulses of IV methylprednisolone 500-750mg, followed by oral prednisone 0.5mg/kg/day for 4 weeks, reducing to ≤10mg/day by 4-6 months.

7.9 In pure class V nephritis with nephrotic-range proteinuria MPA (MMF target dose 3g/day for 6 months) in combination with oral prednisone (0.5mg/kg/day) may be used as initial treatment based on better efficacy/toxicity ratio. CY or calcineurin inhibitors (ciclosporin, tacrolimus) or rituximab are recommended as alternative options or for non-responders.

7.10 As an alternative to MPA or CY in selected patients without adverse prognostic factors (as defined above), or when these drugs are contra-indicated, not tolerated or unavailable azathioprine (2mg/kg/day) may be considered. Azathioprine use is associated with a higher flare risk.

**Subsequent treatment**

7.11 In patients improving after initial treatment, subsequent immunosuppression is recommended with either MPA at lower doses (initial target MMF dose 2g/day) or AZA (2mg/kg/day) for at least 3 years, in combination with low dose prednisone (5-7.5mg/day). Gradual drug withdrawal, glucocorticoids first, can then be attempted.

7.12 Patients who responded to initial treatment with MPA should remain on MPA unless pregnancy is contemplated, in which case they should switch to AZA at least three months prior to conception.

7.13 In pure class V nephritis calcineurin inhibitors can be considered.

**Refractory renal disease**

7.14 For patients who fail treatment with MPA or CY either because of lack of effect (as defined above) or due to adverse events, we recommend that the treatment is switched from MPA to CY, or CY to MPA, or rituximab be given.

**Management of end-stage renal disease in lupus nephritis**

7.15 All methods of renal replacement treatment can be used in lupus patients, but there may be increased risk of infections in peritoneal dialysis patients still on immunosuppressive agents and vascular access thrombosis in patients with antiphospholipid antibodies.

7.16 Transplantation should be performed when lupus activity has been absent, or at a low level, for at least 3-6 months, with superior results obtained with living donor and pre-emptive transplantation. Anti-phospholipid antibodies should be sought during transplant preparation because they are associated with an increased risk of vascular events in the transplanted kidney.
### Table 4: The ACR criteria for classification of systemic lupus erythematosus*

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Malar rash</td>
<td>Fixed erythema, flat or raised, over the malar eminences, tending to spare the nasolabial folds</td>
</tr>
<tr>
<td>2. Discoid rash</td>
<td>Erythematous raised patches with adherent keratotic scaling and follicular plugging; atrophic scarring may occur in older lesions</td>
</tr>
<tr>
<td>3. Photosensitivity</td>
<td>Skin rash as a result of unusual reaction to sunlight, by patient history or physician observation</td>
</tr>
<tr>
<td>4. Oral ulcers</td>
<td>Oral or nasopharyngeal ulceration, usually painless, observed by a physician</td>
</tr>
<tr>
<td>5. Arthritis</td>
<td>Non-erosive arthritis involving 2 or more peripheral joints, characterized by tenderness, swelling, or effusion</td>
</tr>
<tr>
<td>6. Serositis</td>
<td>a) Pleuritis—convincing history of pleuritic pain or rub heard by a physician or evidence of pleural effusion OR</td>
</tr>
<tr>
<td></td>
<td>b) Pericarditis—documented by ECG or rub or evidence of pericardial effusion</td>
</tr>
<tr>
<td>7. Renal disorder</td>
<td>a) Persistent proteinuria greater than 0.5 grams per day or greater than 3+ if quantitation not performed OR</td>
</tr>
<tr>
<td></td>
<td>b) Cellular casts—may be red cell, haemoglobin, granular, tubular, or mixed</td>
</tr>
<tr>
<td>8. Neurologic disorder</td>
<td>a) Seizures—in the absence of offending drugs or known metabolic derangements; e.g., uremia, ketoacidosis, or electrolyte imbalance OR</td>
</tr>
<tr>
<td></td>
<td>b) Psychosis—in the absence of offending drugs or known metabolic derangements, e.g., uremia, ketoacidosis, or electrolyte imbalance</td>
</tr>
<tr>
<td>9. Hematologic disorder</td>
<td>a) Haemolytic anaemia with reticulocytosis OR</td>
</tr>
<tr>
<td></td>
<td>b) Leukopenia—&lt; 4,000/mm$^3$ total on 2 or more occasions OR</td>
</tr>
<tr>
<td></td>
<td>c) Lymphopenia—&lt; 1,500/mm$^3$ on 2 or more occasions OR</td>
</tr>
<tr>
<td></td>
<td>d) Thrombocytopenia—&lt; 100,000/mm$^3$ in the absence of offending drugs</td>
</tr>
<tr>
<td>10. Immunologic disorder</td>
<td>a) Anti-DNA: antibody to native DNA in abnormal titre OR</td>
</tr>
<tr>
<td></td>
<td>b) Anti-Sm: presence of antibody to Sm nuclear antigen OR</td>
</tr>
<tr>
<td></td>
<td>c) Positive finding of anti-phospholipid antibodies on: (i) an abnormal serum level of IgG or IgM anticardiolipin antibodies</td>
</tr>
<tr>
<td></td>
<td>(ii) a positive test result for lupus anticoagulant using a standard method, or (iii) a false positive-test result for at least 6 months confirmed by Treponema pallidum immobilization or fluorescent treponemal antibody absorption test</td>
</tr>
<tr>
<td>11. Antinuclear antibody</td>
<td>An abnormal titre of antinuclear antibody by immunofluorescence or an equivalent assay at any point in time and in the absence of drugs known to be associated with “drug-induced lupus” syndrome</td>
</tr>
</tbody>
</table>

*The proposed classification is based on 11 criteria. For the purpose of identifying patients in clinical studies, a person shall be said to have systemic lupus erythematosus if any 4 or more of the 11 criteria are present, serially or simultaneously, during any interval of observation (64,65).
### Table 5: Clinical and Immunologic Criteria Used in the SLICC Classification Criteria for SLE*

<table>
<thead>
<tr>
<th>Clinical Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Acute cutaneous lupus including:</td>
</tr>
<tr>
<td>- lupus malar rash (do not count if malar discoid)</td>
</tr>
<tr>
<td>- bullous lupus</td>
</tr>
<tr>
<td>- toxic epidermal necrolysis variant of SLE</td>
</tr>
<tr>
<td>- maculopapular lupus rash</td>
</tr>
<tr>
<td>- photosensitive lupus rash</td>
</tr>
<tr>
<td>in the absence of dermatomyositis</td>
</tr>
<tr>
<td>or subacute cutaneous lupus</td>
</tr>
<tr>
<td>(nonindurated psoriasis and/or annular polycyclic lesions that resolve without scarring, although occasionally with postinflammatory dyspigmentation or telangiectasias).</td>
</tr>
<tr>
<td>2. Chronic cutaneous lupus including:</td>
</tr>
<tr>
<td>- classical discoid rash</td>
</tr>
<tr>
<td>- localized (above the neck)</td>
</tr>
<tr>
<td>- generalized (above and below the neck)</td>
</tr>
<tr>
<td>- hypertrophic (verrucous) lupus</td>
</tr>
<tr>
<td>- lupus panniculitis (profundus)</td>
</tr>
<tr>
<td>- nodular lupus</td>
</tr>
<tr>
<td>- lupus erythematosus tumidus</td>
</tr>
<tr>
<td>- chilblains lupus</td>
</tr>
<tr>
<td>- discoid lupus/lichen planus overlap</td>
</tr>
<tr>
<td>3. Oral ulcers:</td>
</tr>
<tr>
<td>- palate</td>
</tr>
<tr>
<td>- buccal</td>
</tr>
<tr>
<td>- tongue</td>
</tr>
<tr>
<td>or nasal ulcers</td>
</tr>
<tr>
<td>in the absence of other causes, such as vasculitis, Behcet’s disease, infection (herpes viruses), inflammatory bowel disease, reactive arthritis, acidic foods</td>
</tr>
<tr>
<td>4. Nonscarring alopecia (diffuse thinning or hair fragility with visible broken hairs)</td>
</tr>
<tr>
<td>in the absence of other causes such as alopecia areata, drugs, iron deficiency and androgenic alopecia</td>
</tr>
<tr>
<td>5. Synovitis involving two or more joints, characterized by swelling or effusion or tenderness in 2 or more joints and thirty minutes or more of morning stiffness.</td>
</tr>
<tr>
<td>6. Serositis</td>
</tr>
<tr>
<td>- typical pleurisy for more than 1 day</td>
</tr>
<tr>
<td>or pleural effusions</td>
</tr>
<tr>
<td>or pleural rub</td>
</tr>
<tr>
<td>typical pericardial pain (pain with recumbency improved by sitting forward) for more than 1 day</td>
</tr>
<tr>
<td>or pericardial effusion</td>
</tr>
<tr>
<td>or pericardial rub</td>
</tr>
<tr>
<td>or pericarditis by EKG</td>
</tr>
<tr>
<td>in the absence of other causes, such as infection, uremia, and Dressler’s pericarditis</td>
</tr>
<tr>
<td>7. Renal</td>
</tr>
<tr>
<td>Urine protein:creatinine ratio (or 24 hr urine protein) representing 500 mg of protein/24 hr</td>
</tr>
<tr>
<td>or</td>
</tr>
<tr>
<td>Red blood cell casts</td>
</tr>
</tbody>
</table>
8. Neurologic
- seizures
- psychosis
- mononeuritis multiplex
  - in the absence of other known causes such as primary vasculitis
- myelitis
- peripheral or cranial neuropathy
  - in the absence of other known causes such as primary vasculitis, infection, and diabetes mellitus
- acute confusional state
  - in the absence of other causes, including toxic-metabolic, uremia, drugs

9. Hemolytic anemia

10. Leukopenia (< 4000/mm³ at least once)
  - in the absence of other known causes such as Felty’s, drugs, portal hypertension
  OR
  - Lymphopenia (< 1000/mm³ at least once)
  - in the absence of other known causes such as corticosteroids, drugs and infection

11. Thrombocytopenia (<100,000/mm³) at least once
  - in the absence of other known causes such as drugs, portal hypertension, TTP

### Immunologic Criteria

1. ANA level above laboratory reference range
2. Anti-dsDNA antibody level above laboratory reference range (or > 2 fold the laboratory reference range if tested by ELISA)
3. Anti-Sm
4. Antiphospholipid antibody: any of the following
   - lupus anticoagulant
   - false-positive rapid plasma regain (RPR)
   - medium or high titer anticardiolipin antibody level (IgG, IgM or IgA)
   - anti-β2 glycoprotein I (IgG, IgM or IgA)
5. Low complement
   - low C3
   - low C4
   - low CH50
6. Direct Coombs’ test in the absence of hemolytic anemia

* Patients can be classified as having SLE if they satisfy 4 of the clinical and immunological criteria including at least one clinical criterion and one immunologic criterion, OR if they have biopsy-proven nephritis compatible with SLE in the presence of ANAs or anti-dsDNA antibodies (68).
Table 6: Assessment & Monitoring of SLE in lupus patients

<table>
<thead>
<tr>
<th></th>
<th>Initial assessment</th>
<th>Assessment (active disease)</th>
<th>Monitoring (stable disease)</th>
<th>Pregnancy counselling &amp; follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>History &amp; Examination</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed history</td>
<td>X</td>
<td>focused history</td>
<td>focused history</td>
<td>obstetric history</td>
</tr>
<tr>
<td>Clinical examination</td>
<td>X</td>
<td>X</td>
<td>X*</td>
<td>X</td>
</tr>
<tr>
<td>Vital signs (Blood pressure, heart rate, weight)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Drug Review including vaccination status</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Bleds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Blood Count</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other tests for anaemia</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
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<tr>
<td>Renal function</td>
<td>X</td>
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<tr>
<td>Bone Profile</td>
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<td>X*</td>
<td>X*</td>
<td>X*</td>
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<tr>
<td>Liver function tests</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
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<tr>
<td>Creatine kmase</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
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<tr>
<td>CRP</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
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<tr>
<td>Vitamin D3</td>
<td>X</td>
<td>-</td>
<td>Annually</td>
<td>X</td>
</tr>
<tr>
<td>Thyroid function</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td><strong>Immunology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-nuclear antibodies</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X*</td>
</tr>
<tr>
<td>Anti-dsDNA titre, C3/C4 level</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Antiphospholipid antibodies (Lupus anticoagulant, anti-cardiolipin antibodies, anti-beta2-glycoprotein)</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>Repeat if negative in the past</td>
</tr>
<tr>
<td>Anti-Ro/La, anti-RNP and anti-Sm antibodies</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>Repeat if negative in the past</td>
</tr>
<tr>
<td>Immunoglobulins</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X*</td>
</tr>
<tr>
<td>Direct Coombs’ Test</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td><strong>Urine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Urinalysis</strong> (screen for proteinuria, haematuria, leucocyturia and nitrites to exclude infection)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine random protein:creatinine ratio Or 24-hour urine collection for protein</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td>Urine microscopy (and culture)</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td><strong>Other investigations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microbiology (other)</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td>Biopsy (eg skin, kidney)</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X**</td>
</tr>
<tr>
<td>Lung function tests</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td>Neurophysiology</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td>ECG</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
</tr>
<tr>
<td><strong>Imaging</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest x-ray</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X**</td>
</tr>
<tr>
<td>Other Imaging (US, CT, MRI)</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X**</td>
</tr>
<tr>
<td><strong>Modifiable cardiovascular risk factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X*</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X</td>
</tr>
<tr>
<td>High BMI</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X</td>
</tr>
<tr>
<td>Smoking</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X</td>
</tr>
<tr>
<td><strong>Disease activity &amp; damage scores</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BILAG (BILAG 2004 index) or SLEDAI (SLEDAI 2K or SELENA SLEDAI)</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>BILAG2004P*</td>
</tr>
<tr>
<td>SLICC/ACR Damage Index</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>SLEPDAI</td>
</tr>
<tr>
<td><strong>Quality of life questionnaires</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Form 36 or LupusQoL</td>
<td>X</td>
<td>X*</td>
<td>Annually</td>
<td>X*</td>
</tr>
</tbody>
</table>

* when indicated; ** when indicated & benefit>risks; # BILAG 2004 pregnancy version; ~ SLEDAI pregnancy version
Table 7. SLE treatment strategies for examples of mild, moderate and severe lupus (adapted from (8)).

<table>
<thead>
<tr>
<th>Mild activity/flare</th>
<th>Moderate activity/flare</th>
<th>Severe activity/flare (non-renal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BILAG C scores or single B score; SLEDAI &lt; 6</td>
<td>BILAG 2 or more systems with B scores, SLEDAI 6-12;</td>
<td>BILAG 1 or more A scores; SLEDAI &gt; 12;</td>
</tr>
</tbody>
</table>

**Typical manifestations attributed to lupus**

- Fatigue, malar rash, diffuse alopecia, mouth ulcers, arthralgia, myalgia, platelets 50-149 x 10^9/l
- Fever, lupus related rash up to 2/9 body surface area, cutaneous vasculitis, alopecia with scalp inflammation, arthritis, pleurisy, pericarditis, hepatitis, platelets 25-49 x 10^9/l
- Rash involving >2/9 body surface area, myositis, severe pleurisy and/or pericarditis with effusion, ascites, enteritis, myelopathy, psychosis, acute confusion, optic neuritis, platelets <25 x 10^9/l

**Initial typical drugs and target doses if no contraindications**

<table>
<thead>
<tr>
<th>Mild activity/flare</th>
<th>Moderate activity/flare</th>
<th>Severe activity/flare (non-renal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corticosteroids* topical preferred or oral prednisolone ≤20mg daily for 1-2 weeks or IM or intra-articular methylprednisolone 80-120mg</td>
<td>Prednisolone* ≤0.5 mg/day or IV methylprednisolone ≤250mg x 1-3 or IM methylprednisolone 80-120mg</td>
<td>Prednisolone* ≤0.5 mg/day and/or IV methylprednisolone 500mg x 1-3 or prednisolone ≤0.75-1mg/kg/day</td>
</tr>
<tr>
<td>and Hydroxychloroquine ≤6.5mg/kg/day and/or methotrexate 7.5-15mg/week and/or NSAIDs (for days to few weeks only)</td>
<td>and AZA 1.5-2.0 mg/kg/day or methotrexate (10-25 mg/week) or MMF 2-3 g/day or ciclosporin ≤2.0mg/kg/day and hydroxychloroquine ≤6.5mg/kg/day</td>
<td>and AZA 2-3 mg/kg/day or MMF 2-3 g/day or cyclophosphamide IV or ciclosporin ≤2.5mg/kg/day and Hydroxychloroquine ≤6.5mg/kg/day</td>
</tr>
<tr>
<td>Activity/flare</td>
<td>Prednisolone* ≤ 7.5 mg/day</td>
<td>Prednisolone* ≤ 7.5 mg/day</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Mild activity/flare</td>
<td>and AZA 50-100 mg/day</td>
<td>and AZA 50-100 mg/day</td>
</tr>
<tr>
<td>Mild activity/flare</td>
<td>or methotrexate 10 mg/week</td>
<td>or methotrexate 10 mg/week</td>
</tr>
<tr>
<td>Mild activity/flare</td>
<td>or MMF 1 g/day</td>
<td>or MMF 1 g/day</td>
</tr>
<tr>
<td>Mild activity/flare</td>
<td>or ciclosporin 50-100 mg/day</td>
<td>or ciclosporin 50-100 mg/day</td>
</tr>
<tr>
<td>Mild activity/flare</td>
<td>and hydroxychloroquine 200 mg/day</td>
<td>and hydroxychloroquine 200 mg/day</td>
</tr>
</tbody>
</table>

*the lowest effective dose of prednisolone or other corticosteroids should be used at all times

NSAIDs= non-steroidal anti-inflammatory drugs; AZA= azathioprine; MMF= mycophenolate mofetil; IV CYC= intravenous cyclophosphamide
Supplementary information 1: search strategy

a) Questions about the management of lupus developed by the guideline development group to be addressed by the literature review

1. What clinical and serological features should prompt consideration of a diagnosis of SLE?
2. How should SLE patients be assessed?
3. How should SLE patients be monitored in the non-acute setting?
4. What is the evidence for the management of mild SLE?
5. What is the evidence for the management of moderate SLE?
6. What is the evidence for the management of severe SLE?

b) Systematic search with terms below

PubMed and the Cochrane Database of Systematic Reviews

English language only

Excluded

- Purely animal studies
- Pediatric studies
- Narrative review articles (except systematic reviews)
- Commentaries
- Conference abstracts or statements
- Expert opinion statements
  - Guidelines (although papers manually checked for additional relevant references)

Included only papers with following numbers of patients (with search terms as described below)

Background: Prevalence & prognosis  minimum 50 SLE patients
Diagnosis, assessment & monitoring  minimum 10 patients
Therapy  minimum 5 patients
(included systematic reviews with or without meta-analysis)

Search terms

1. Diagnosis and background (see 2 below as well as overlap)

  SLE OR Systemic Lupus Erythematosus OR Lupus AND
  (a) For Clinical
  - Diagnosis
  - Clinical manifestations/ Manifestations
  - Clinical features
  - Presentation
  - Classification
  (b) For Serologic
  - Immunology/Immunological
  - Antibody/auto-antibody/serological
  - Anti-nuclear antibodies, ANA, anti-dsDNA, anti-Ro, anti-Sm, C3, C4, anti-phospholipid, antiphospholipid, anti-cardiolipin, anticardiolipin, lupus anticoagulant
  (c) Lupus manifestations including differences between lupus in males and females

  • SLE Or Lupus AND male/men/man
  • Gender differences
  • SLE activity
  • Disease Damage
  • Mortality
Presentation
Outcome
• SLE Or Lupus AND male/man AND ACR Criteria
  - Malar rash
  - Discoid Rash
  - Photosensitivity
  - Oral Ulcers
  - Nonerosive arthritis
  - Pleuritis or Pericarditis
  - Proteinuria OR Cellular casts
  - Neuropsychiatric
  - Haemolytic anaemia OR Leucopenia/Leukopenia OR Lymphopenia OR Thrombocytopenia
  - anti-double stranded DNA OR anti-Sm OR antiphospholipid antibodies OR anti-phospholipid antibodies OR ANA

2. For assessment and monitoring (in addition to items above in 1.)
SLE OR Systemic Lupus Erythematosus OR Lupus AND
  - Assess/assessment
  - Activity/disease activity/BILAG/SLEDAI
  - Monitoring
  - Damage/SLICC
  - Prognosis
  - Quality indicators
  - Recommendations

SLE OR Lupus AND Neuropsychiatric AND
  - Prevalence
  - Risk factors
  - Screening
  - Diagnosis
  - Monitoring
  - Prevention
  - Prognosis

SLE OR Lupus AND Cancer OR Malignancy AND
  - Mortality
  - Lymphoma
  - HPV OR cervical dysplasia OR cervical
  - Lung
  - Prostate
  - Endometrial
  - Ovarian
  - Screen*

SLE OR Lupus AND Infection Risk AND/OR
  - Death
  - Antibiotic prophylaxis
  - vaccin*
  - Bacteria* Infections
  - CMV
  - HPV
  - Varicella Zoster virus
  - Hepatitis B AND C
  - Hepatitis vaccin*
3. For Treatment

SLE OR Systemic Lupus Erythematosus OR Lupus AND
Therapy NAME (see below) AND (treatment or therapy or trial or study or management) AND/OR
- Mild or Moderate or Severe
- Activity or damage or flare
- BILAG or SLEDAI or ECLAM or SLAM or disease activity index
- Efficacy or safety or outcome
- Non-renal
- Constitutional
- Rash or macocutaneous or dermatol*
- Vasculitis
- Arthritis or musculoskeletal
- Cardiac or respiratory or cardio-respiratory or gastro-intestinal
- Neuro-psychiatric or neuro*

Therapies studied:
- Hydroxychloroquine/chloroquine/mepacrine
- Methotrexate
- NSAIDs
- Sunscreen/sunblock
- Prednisolone/prednisone/methylprednisolone/methylprednisone/triamcinolone/corticosteroid*
- Azathioprine
- Ciclosporin/cyclosporin/cyclosporine/tacrolimus
- Mycophenolate mofetil/mycophenolic acid
- Leflunomide
- Rituximab
- Belimumab
- Intra-venous immunoglobulin/intravenous immunoglobulin/IVIG
- Plasma exchange/plasmapheresis
**Supplementary information 2: SIGN revised grading system for recommendations in evidence based guidelines (403)**

<table>
<thead>
<tr>
<th>SIGN Levels of evidence</th>
<th>SIGN Grades of recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1++ High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias</td>
<td>A At least one meta-analysis, systematic review, or RCT rated as 1++ and directly applicable to the target population or a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results</td>
</tr>
<tr>
<td>1+ Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias</td>
<td>B A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results or Extrapolated evidence from studies rated as 1++ or 1+</td>
</tr>
<tr>
<td>1− Meta-analyses, systematic reviews or RCTs, or RCTs with a high risk of bias</td>
<td>C A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results or Extrapolated evidence from studies rated as 2+</td>
</tr>
<tr>
<td>2++ High quality systematic reviews of case-control or cohort studies or High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal</td>
<td>D Evidence level 3 or 4 or Extrapolated evidence from studies rated as 2+</td>
</tr>
<tr>
<td>2+ Well conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal</td>
<td></td>
</tr>
<tr>
<td>2− Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal</td>
<td></td>
</tr>
<tr>
<td>3 Non-analytic studies, e.g. case reports, case series</td>
<td></td>
</tr>
<tr>
<td>4 Expert opinion</td>
<td></td>
</tr>
</tbody>
</table>
Supplementary information 3: Mechanism for audit of the guideline

The following specific topics may be audited. The purpose of this audit tool is to ensure that the BSR Management of SLE guidelines are being followed. The audit should be undertaken on a sample of lupus patients attending clinic.

1. Baseline diagnosis and assessment
   a. The diagnosis requires a combination of relevant clinical features and the presence of at least one lupus related immunological abnormality.
   b. Baseline tests for serological markers including ANA, anti-dsDNA, anti-Ro/La, anti-Sm, anti-RNP antibodies and low complement (C3 +/- C4).
   c. Baseline tests for antiphospholipid antibodies (at least lupus anticoagulant and IgG and IgM anti-cardiolipin antibodies) with positives confirmed at least 12 weeks apart.
   d. Assessment of disease activity including thorough history and review of systems, full clinical examination and monitoring of BP, urinalysis and renal function, and other laboratory tests, imaging and biopsies including renal and other areas if indicated.
   e. Assessment of disease activity and categorisation into mild, moderate and severe.
   g. Assessment of health status and quality of life

2. Monitoring of lupus patients on a regular basis for disease manifestations, drug toxicity and comorbidities.
   a. Patients with active disease to be reviewed at least every 1-3 months (including blood pressure, urinalysis, renal function, full blood count, liver function tests, complement levels, anti-dsDNA antibodies and ESR/CRP and other assessments below intermittently as for stable disease).
   b. Patients with stable low disease activity or in remission to be monitored less frequently e.g. 6 to 12 monthly with assessments above and those below.
      i. Measurement of disease activity and damage using standardised SLE assessment tools
      ii. Assessment of health status and quality of life
      iii. Re-evaluation of aPL prior to pregnancy or surgery and in the presence of a new severe manifestation or a vascular event.
      iv. Anti-Ro and La antibody status to be assessed prior to pregnancy.
   c. Assessment of co-morbidities, such as atherosclerotic disease, osteoporosis, avascular necrosis, malignancy and infection with annual review of modifiable risk factors (i.e. hypertension, dyslipidaemia, diabetes, high body mass index and smoking).

3. Management of mild SLE
   i. Use of hydroxychloroquine and/or methotrexate
   ii. Only short courses (not long term maintenance therapy) with non-steroidal anti-inflammatory drugs for patients with mild lupus (and non-organ threatening manifestations).
   iii. Prednisolone treatment at a low dose of 7.5mg/day or less for maintenance therapy.
   iv. Recommendation of high factor UV-A and UV-B sunscreen to patients with cutaneous manifestations.

4. Management of moderate SLE
   i. Treatment with higher doses of prednisolone (up to 0.5 mg/kg/day) an/or IA, IM or IV pulses of methyl prednisolone for flare.
   ii. Treatment with methotrexate, azathioprine, mycophenolate mofetil, ciclosporin or tacrolimus depending on clinical situation in those refractory to/intolerant of hydroxychloroquine.
   iii. For cases refractory to at least 2 immunosuppressives to assess whether patients have been considered for rituximab according to NHS England policy.
5. Management of severe SLE

i. Immunosuppressive regimens for severe SLE including IV methylprednisolone or high dose oral prednisolone (up to 1 mg/kg/day) (either on their own or more often as part of a treatment protocol with an immunosuppressive drug).

ii. MMF or cyclophosphamide or azathioprine used in the management of lupus nephritis and for refractory severe non-renal disease (unless contra-indication).

iii. Biologic therapies considered in patients who have failed other immunosuppressive drugs due to inefficacy or intolerance.

iv. Intravenous immunoglobulin and plasmapheresis considered for patients with refractory cytopenias, thrombotic thrombocytopenic purpura, rapidly deteriorating acute confusional state and catastrophic APS.
Supplementary information 4: the BILAG 2004 index
(may be replaced by a link to the Rheumatology paper and documents)

Separate files to be added for form, glossary and scoring.

Supplementary information 5;
SLEDAI-2K

Separate file to be added
## Supplementary Table 1: Cumulative incidence of SLE manifestations in lupus cohorts

<table>
<thead>
<tr>
<th>System</th>
<th>Manifestation</th>
<th>Worral (n=100)</th>
<th>Pons (n=1214)</th>
<th>Font (n=600)</th>
<th>CerveraLim (n=1000)</th>
<th>Lim (n=1156)</th>
<th>Isenberg (n=500)</th>
<th>Cumulative incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systemic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fever</td>
<td>57</td>
<td>42</td>
<td>17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>57%</td>
</tr>
<tr>
<td></td>
<td>Weight loss</td>
<td>27</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>Lymphadenopathy</td>
<td>15</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Cutaneous</strong></td>
<td>Alopecia</td>
<td>27</td>
<td>58</td>
<td>18</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>Oral/nasal ulcers</td>
<td>36</td>
<td>42</td>
<td>30</td>
<td>13</td>
<td>22</td>
<td>26</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>Photosensitivity</td>
<td>48</td>
<td>56</td>
<td>41</td>
<td>23</td>
<td>26</td>
<td>35</td>
<td>37%</td>
</tr>
<tr>
<td></td>
<td>Malar rash</td>
<td>61</td>
<td>54</td>
<td>31</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>Discoid rash</td>
<td>90</td>
<td>12</td>
<td>6</td>
<td>8</td>
<td>23</td>
<td>62</td>
<td>62%</td>
</tr>
<tr>
<td></td>
<td>Subacute cutaneous</td>
<td>3</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Raynaud’s phenomenon</td>
<td>28</td>
<td>22</td>
<td>16</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>24%</td>
</tr>
<tr>
<td><strong>Musculoskeletal</strong></td>
<td>Arthralgia/Arthritis</td>
<td>94</td>
<td>93</td>
<td>83</td>
<td>48</td>
<td>67</td>
<td>94</td>
<td>82%</td>
</tr>
<tr>
<td></td>
<td>Myalgia/myositis</td>
<td>-</td>
<td>18</td>
<td>7</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Cardiorespiratory</strong></td>
<td>Pericarditis</td>
<td>57</td>
<td>17</td>
<td>28</td>
<td>16</td>
<td>43</td>
<td>43</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>Pleurisy</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>Pneumonitis</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Myocarditis</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Endocarditis</td>
<td>3</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Neurological</strong></td>
<td>Seizures</td>
<td>8</td>
<td>12</td>
<td>19</td>
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- not reported
* confirmed arthritis only (usually non-erosive)
** all neurological features associated with lupus
* possible failure of ascertainment but patients met >4 ACR criteria
^ met ACR criteria for immunological involvement
Reference List


(57) Illei GG, Takada K, Parkin D, Austin HA, Crane M, Yarboro CH et al. Renal flares are common in patients with severe proliferative lupus nephritis treated with pulse immunosuppressive


(272) Ginzler EM, Wofsky D, Isenberg D, Gordon C, Lisk L, Dooley MA. Nonrenal disease activity following mycophenolate mofetil or intravenous cyclophosphamide as induction treatment for


