# Management of Lupus nephritis

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MD, DM (Pediatric Nephrology, AIIMS)

# Childhood SLE

Onset < 16 years: **20%**

Onset < 10 years: **3-5%**

F:M (prepubertal) **2:1**

F:M (adolescence) **4.5:1**

**More severe disease**

**4 criteria**
**(1 clinical and 1 immunological)**

**OR**

**Biopsy proven lupus nephritis with ANA or anti-dsDNA antibodies**

**SLICC (Systemic Lupus Erythematosus Collaborating Clinics) criteria-2012**

| Clinical criteria | Immunological criteria |
|---|---|
| Acute cutaneous lupus | ANA |
| Chronic cutaneous lupus | Anti dsDNA |
| Oral or nasal ulcers | Anti Sm |
| Non-scarring alopecia | Antiphospholipid antibody |
| Synovitis | Low complement |
| Serositis | Direct coomb's test |
| Renal involvement | |
| Neurological involvement | |
| Hemolytic anemia | |
| Leucopenia | |
| Thrombocytopenia | |

# 2019 European League Against Rheumatism/American College of Rheumatology

**Entry criteria + score of 10 or more**

| | | |
|---|---|---|
| ***EULAR/ ACR Criteria*** | **Sensitivity** | **98.2 %** |
| | **Specificity** | **93.2 %** |
| ***SLICC criteria*** | **Sensitivity** | **94.6 %** |
| | **Specificity** | **98.6 %** |

**Earlier recognition of patients with single or major organ involvement**

Cheng 2022

**Entry criterion**

Antinuclear antibodies (ANA) at a titer of ≥1:80 on HEp-2 cells or an equivalent positive test (ever)

↓

If absent, do not classify as SLE
If present, apply additive criteria

↓

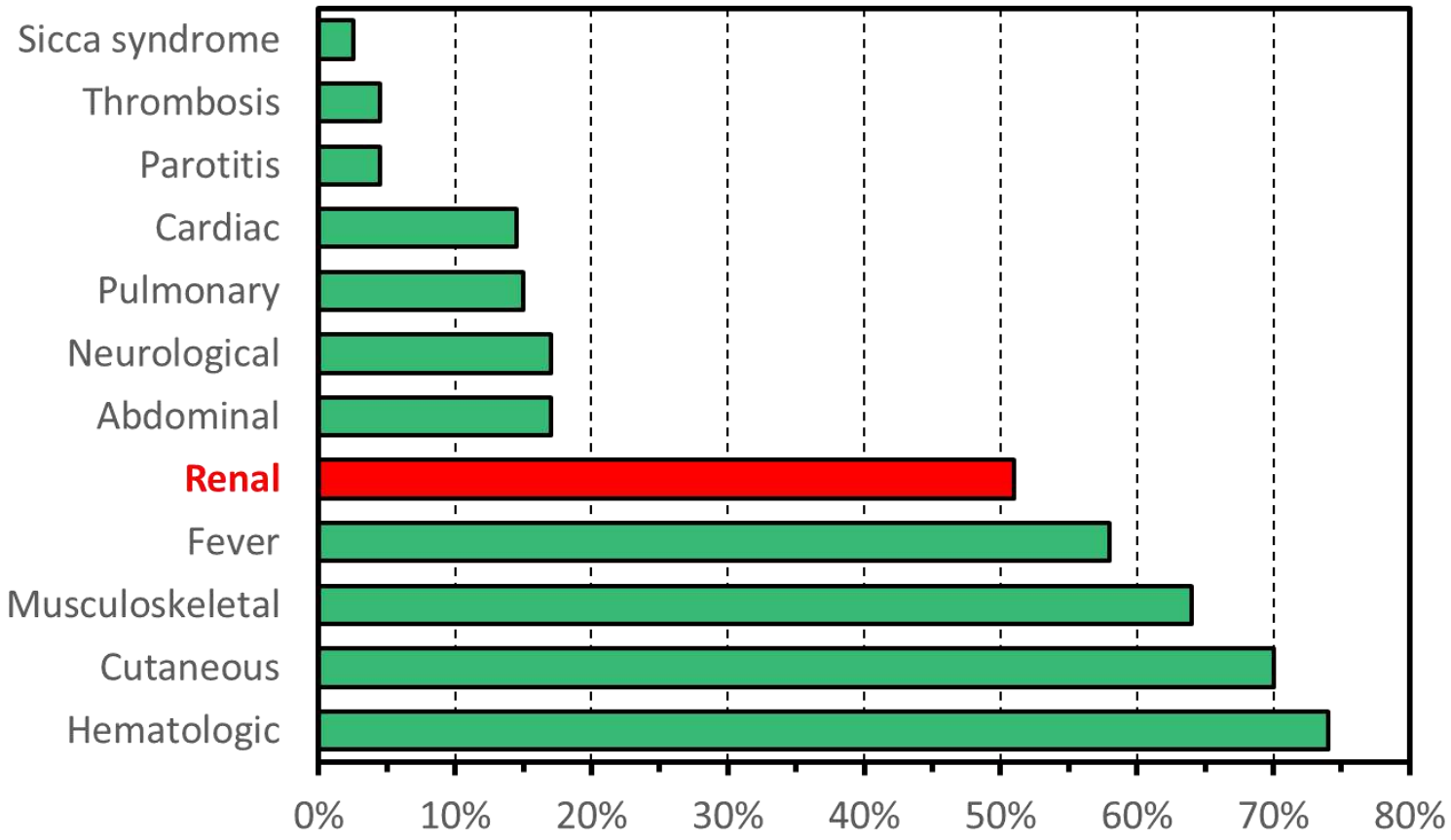
**Additive criteria**

**Do not count a criterion if there is a more likely explanation than SLE.**
**Occurrence of a criterion on at least one occasion is sufficient.**
**SLE classification requires at least one clinical criterion and ≥10 points.**
**Criteria need not occur simultaneously.**
**Within each domain, only the highest weighted criterion is counted toward the total score§.**

| Clinical domains and criteria | Weight |
|---|---|
| ***Constitutional*** | |
| Fever | 2 |
| ***Hematologic*** | |
| Leukopenia | 3 |
| Thrombocytopenia | 4 |
| Autoimmune hemolysis | 4 |
| ***Neuropsychiatric*** | |
| Delirium | 2 |
| Psychosis | 3 |
| Seizure | 5 |
| ***Mucocutaneous*** | |
| Non-scarring alopecia | 2 |
| Oral ulcers | 2 |
| Subacute cutaneous OR discoid lupus | 4 |
| Acute cutaneous lupus | 6 |
| ***Serosal*** | |
| Pleural or pericardial effusion | 5 |
| Acute pericarditis | 6 |
| ***Musculoskeletal*** | |
| Joint involvement | 6 |
| ***Renal*** | |
| Proteinuria >0.5g/24h | 4 |
| Renal biopsy Class II or V lupus nephritis | 8 |
| Renal biopsy Class III or IV lupus nephritis | 10 |

| Immunology domains and criteria | Weight |
|---|---|
| ***Antiphospholipid antibodies*** | |
| Anti-cardiolipin antibodies OR | |
| Anti-β2GP1 antibodies OR | |
| Lupus anticoagulant | 2 |
| ***Complement proteins*** | |
| Low C3 OR low C4 | 3 |
| Low C3 AND low C4 | 4 |
| ***SLE-specific antibodies*** | |
| Anti-dsDNA antibody* OR | |
| Anti-Smith antibody | 6 |

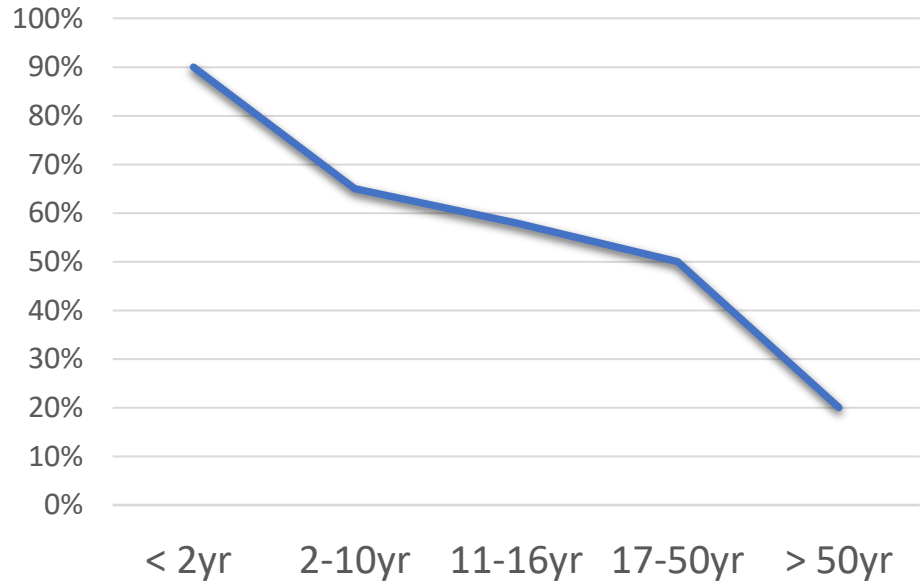
# Lupus nephritis is observed in 40-80% of children with SLE




## Renal involvement more common in childhood

Metanalysis of 16 studies

**OR 1.62 (1.2-2.2)**




**High prevalence in Asian children**

East and South-East Asian 34-86%

Indian 61%

Egyptian 83%

Bader-Meunier et al, J Pediatr 2005

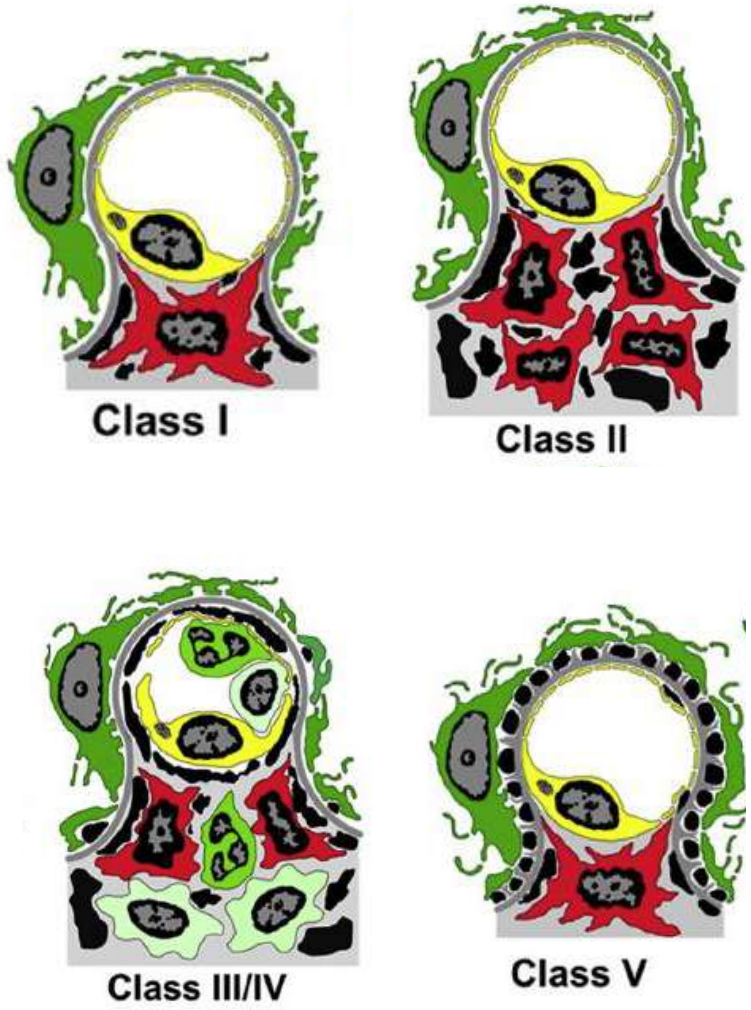
Pluchinotta et al, Lupus 2007

Livingston et al, Lupus 2011

# Abbreviated ISN/RPS classification of Lupus Nephritis

| Class | Description |
|---|---|
| **Class I** | **Minimal mesangial lupus nephritis** |
| **Class II** | **Mesangial proliferative lupus nephritis** |
| **Class III** | **Focal lupus nephritis** [a,b] |
| **Class IV** | **Diffuse lupus nephritis** [a,b] |
| Class IV-S | Diffuse segmental proliferative lupus nephritis |
| Class IV-G | Diffuse global proliferative lupus nephritis |
| **Class V** | **Membranous lupus nephritis** |
| **Class VI** | **Advanced sclerosing lupus nephritis** |

**65%**



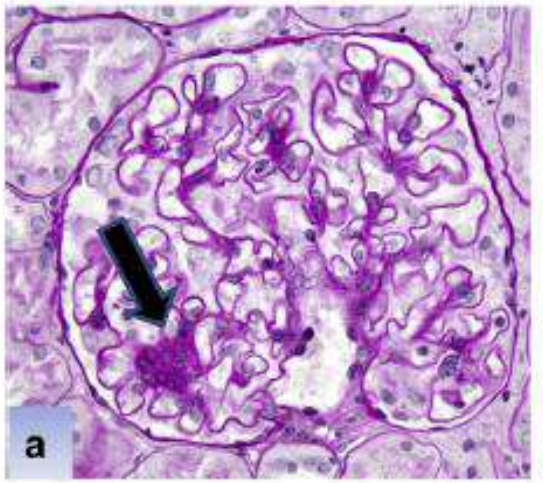

a. Indicate the proportion of glomeruli with active and with sclerotic lesions.
b. Indicate the proportion of glomeruli with fibrinoid necrosis and/or cellular crescents.
**(A): Active lesions - (A/C): Active and chronic lesions - (C): Chronic inactive lesions.**

*Kidney International, Vol. 65 (2004), pp. 521–530*

# Revised ISN/RPS classification: 2018

**Minimal mesangial lupus nephritis**

**Mesangial proliferative lupus nephritis: hypercellularity ≥4 cells in mesangial area**

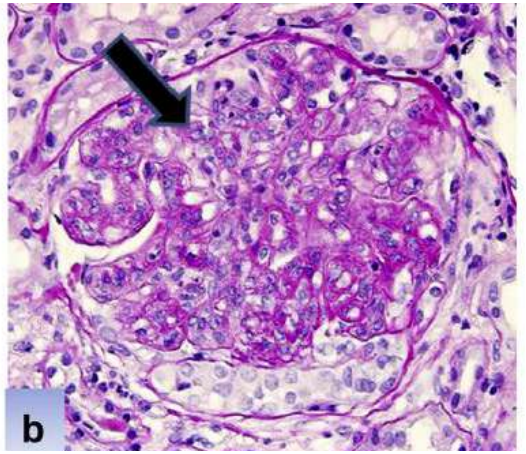


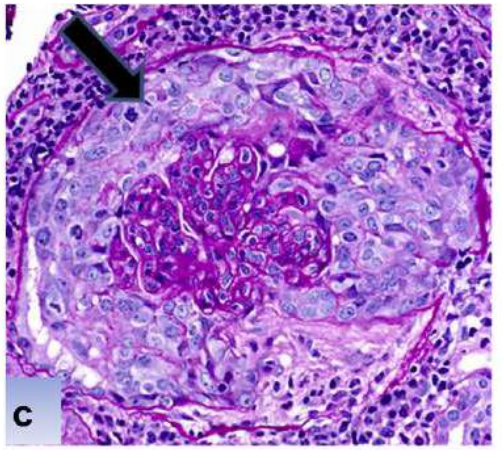

**Class III and IV: elimination of S/G and A/C**

- **Crescents: 10% of glomerular capsular circumference**
- **Fibrinoid necrosis**
- **Adhesions**

| Modified NIH activity index |
|---|
| Endocapillary hypercellularity |
| Neutrophils/karyorrhexis |
| Fibrinoid necrosis |
| Hyaline deposits |
| Cellular/fibrocellular crescents |
| Interstitial Inflammation |

| Modified NIH chronicity index |
|---|
| Total glomerulosclerosis score |
| Fibrous crescents |
| Tubular atrophy |
| Interstitial fibrosis |

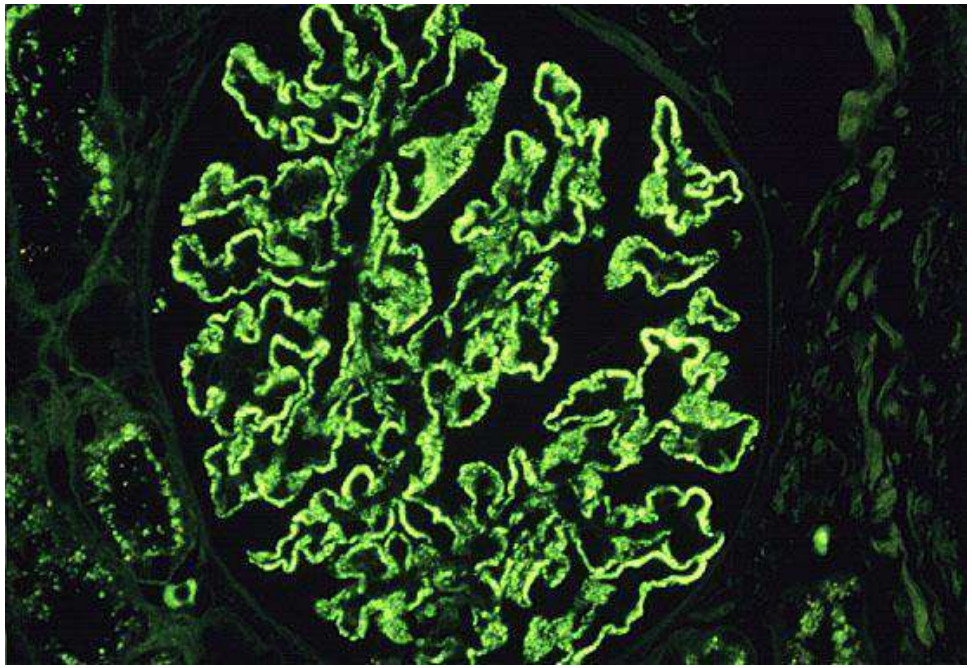


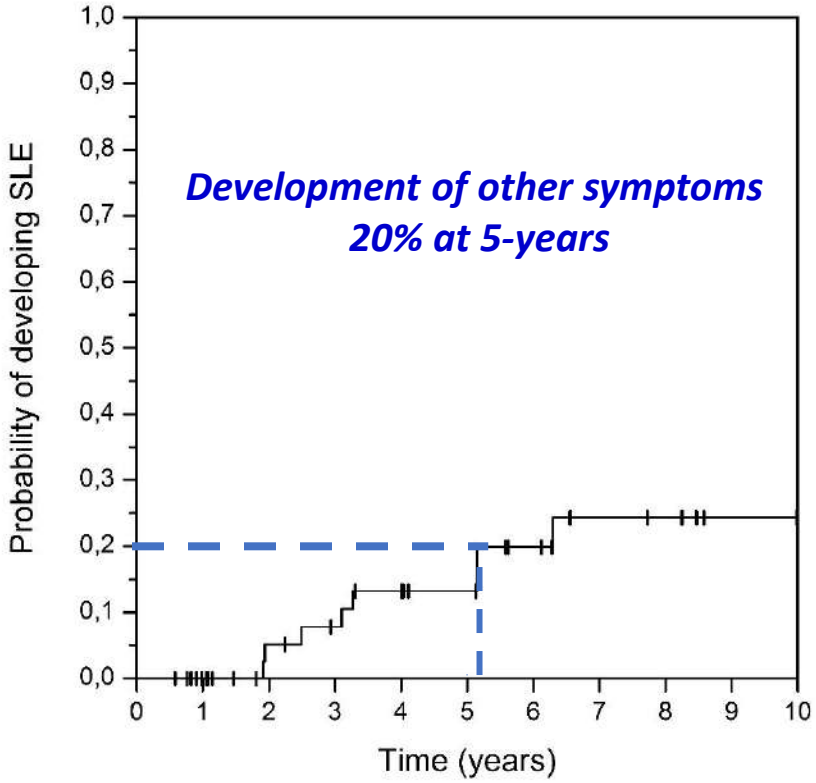

*Kidney International* (2018) **93,** 789–796;

# Immunofluorescence: “Full house” staining (C3, C1q, IgA, IgM, IgG)

**Approximately 40% of children present with a “lupus-like nephritis” but lack other diagnostic criteria for the diagnosis of SLE**



**Development of SLE in patients with FHN**



# Can clinical features predict extent of renal involvement?

| N=244 | Class II | Class III | Class IV | Class V |
|---|---|---|---|---|
| Hypertension | 43% | 47% | 78% | 56% |
| Microscopic hematuria | 57% | 63% | 74% | 33% |
| Nephrotic range proteinuria | - | 37% | 38% | 59% |
| Acute Renal failure | 2% | 13% | 37% | 16% |

| N=22 | Class II | Class III | Class IV | Class V |
|---|---|---|---|---|
| Isolated hematuria | 56% | 18% | 18% | 5% |
| Isolated pyuria | 50% | 33% | 17% | 0% |

Rahman Lupus 2001

**EULAR/EDTA recommendation 2012:**

**Any sign of renal involvement should be an indication for renal biopsy.**

**Renal biopsy is indispensable since in most cases, clinical, serological or laboratory, tests cannot accurately predict renal biopsy findings**

# Indication of renal biopsy

Suspected lupus AND

Proteinuria 1+ or more or up/uc ≥ 0.2mg/mg

OR

microscopic hematuria (confirmed on 2 occasions, one week apart)

OR

deranged renal function tests

**Low threshold for biopsy**

# What is remission?

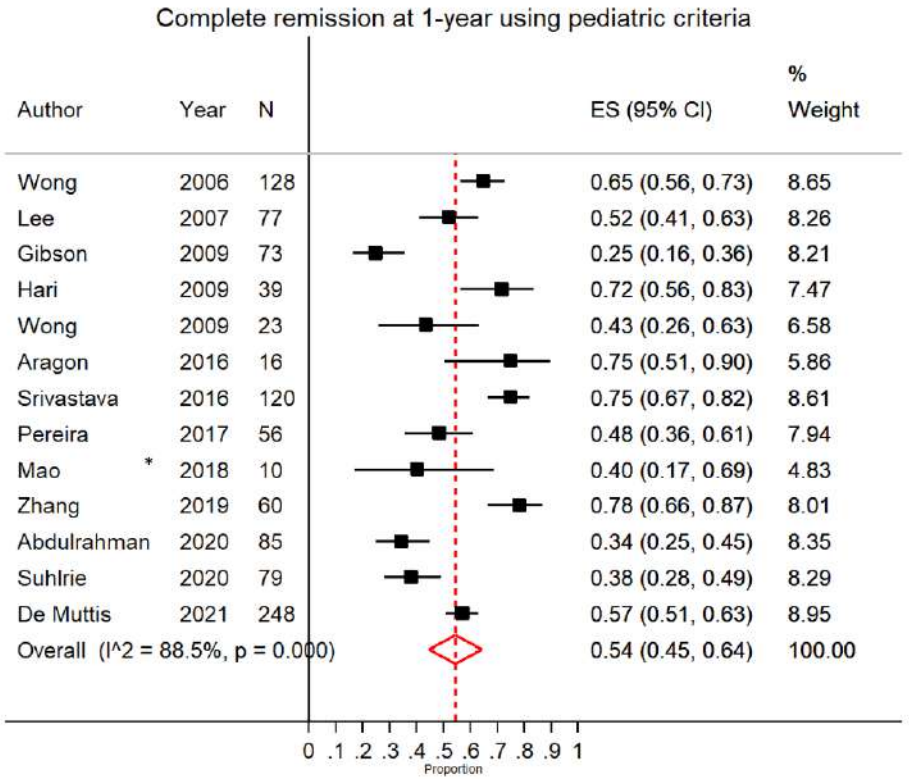
| Criteria | Definition |
|---|---|
| Complete response* | • Reduction in proteinuria <0.5 g/g (50 mg/mmol) measured as the PCR from a 24-h urine collection<br>• Stabilization or improvement in kidney function (±10%–15% of baseline)<br>• Within 6–12 mo of starting therapy, but could take more than 12 mo |
| Partial response | • Reduction in proteinuria by at least 50% and to <3 g/g (300 mg/mmol) measured as the PCR from a 24-h urine collection<br>• Stabilization or improvement in kidney function (±10%–15% of baseline)<br>• Within 6–12 mo of starting therapy |

**CARRA guidelines, KDIGO 2021**

- **Normal renal function**
- **Proteinuria (up/uc <0.2) or 24-hour urine protein <500 mg/1.73 $m^2$/day or <300 mg/$m^2$/day**
- **Inactive urinary sediment <5 RBC/WBC & no casts**

# Remission in pediatric LN

| | Low- or middle-income countries | | High income countries | | Overall | |
|---|---|---|---|---|---|---|
| | Patients; studies (N) | Pooled proportion (95% CI) | Patients; studies (N) | Pooled proportion (95% CI) | Patients; studies (N) | Pooled proportion (95% CI) |
| CR at last follow-up[a] | 2108; 31 | 58% (49-66%)[d] | 1330; 29 | 56% (42-69%) | 3686; 61[c] | 57% (49-64%) |
| PR at last follow-up[a] | 1398; 16 | 19% (11-28%)[d] | 833; 19 | 26% (18-35%) | 2479; 36[c] | 22% (16-28%) |
| Flare (renal or non-renal)[b] | 1053; 20 | 27% (20-35%) | 745; 18 | 35% (27-44%) | 1798; 38 | 31% (25-37%) |




Khandelwal, Pediatr Nephrol 2022

# Why is it important to achieve complete remission?

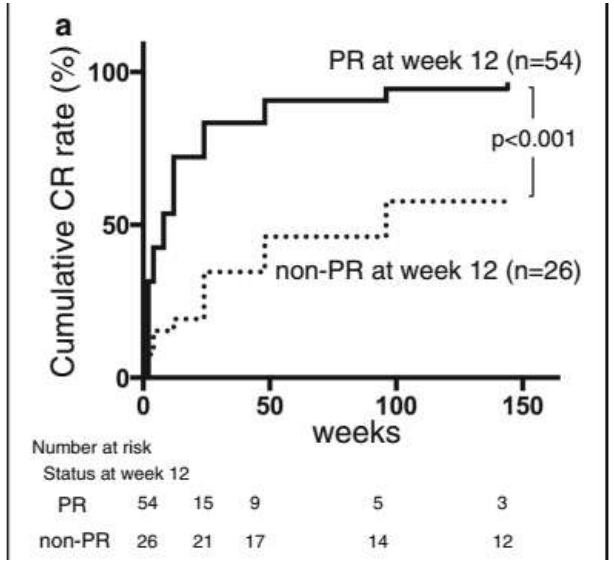
**Patients with CR or PR**

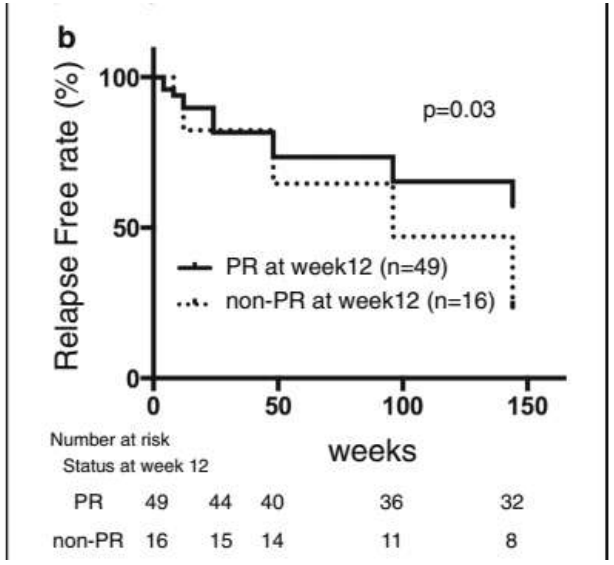
- **Better renal survival**
- **Better overall survival**
- **Better relapse free survival**

## Risk of flare

**5.5 times more likely with partial remission**

**44% with partial remission versus 5% with complete remission**



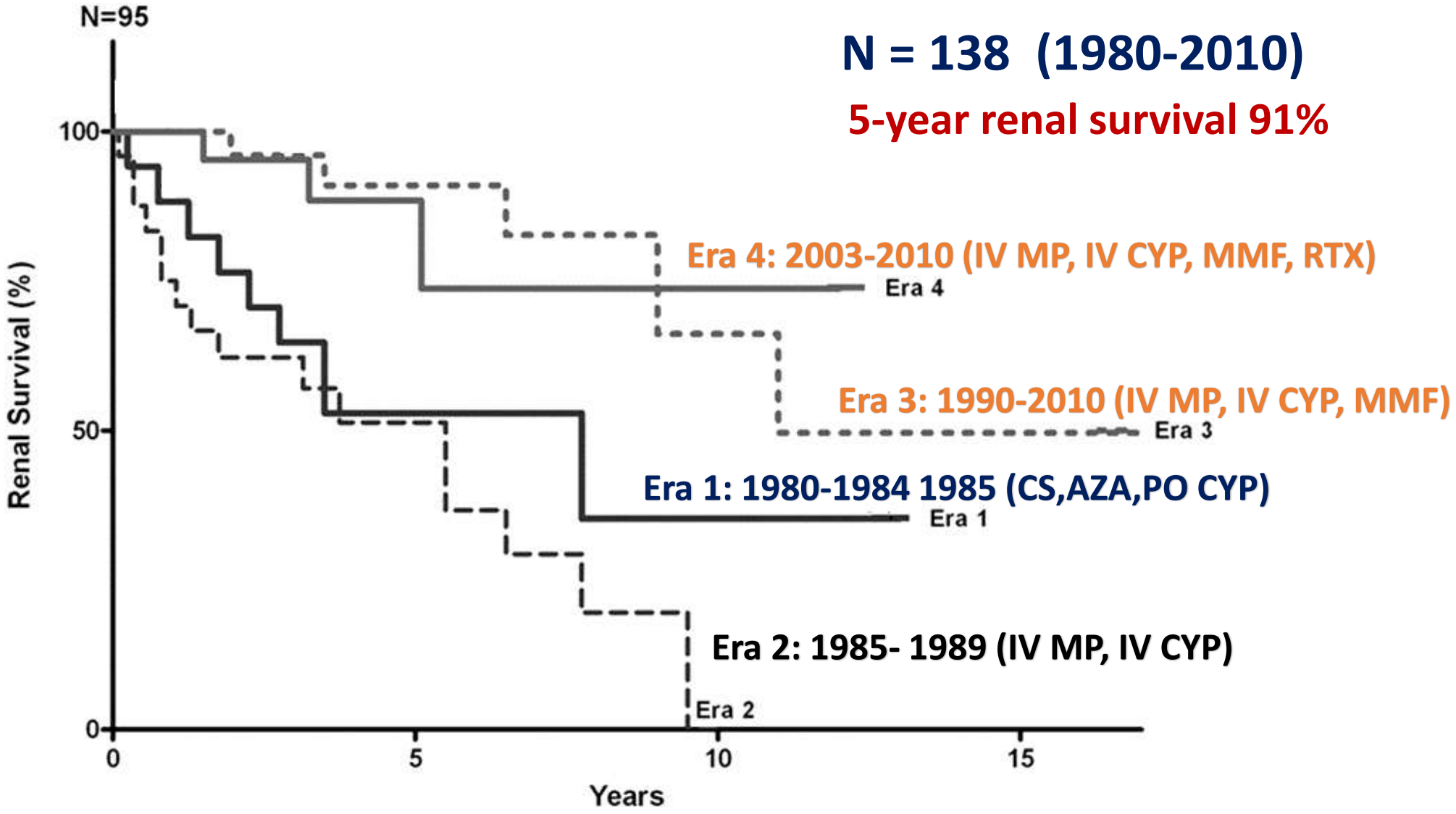

**No partial remission at 3-months**

**3 times less likely for CR at 6 months**

**2 times more likely to relapse**

Hanoka, Arthriris research and therapy 2017
Hui 2013
Abdularahman 2020

# Three decades of therapy of Pediatric lupus nephritis




**N = 138 (1980-2010)**

**5-year renal survival 91%**

**Era 4: 2003-2010 (IV MP, IV CYP, MMF, RTX)**

**Era 3: 1990-2010 (IV MP, IV CYP, MMF)**

**Era 1: 1980-1984 1985 (CS,AZA,PO CYP)**

**Era 2: 1985- 1989 (IV MP, IV CYP)**

Pereira, Zilleruelo, CJASN 2011

# Management: class II LN

**Low quality evidence**
**Immunosuppression if significant proteinuria**

| EULAR/ERA-EDTA | ACR | KDIGO | GEAS | DWP | CARRA |
|---|---|---|---|---|---|
| Proteinuria >1 g/24 h despite RAAS inhibition, especially in the presence of glomerular haematuria; oral glucocorticoids (0.25-0.5 mg/kg/d) alone or in combination with AZA (1-2 mg/kg/d) | No immunosuppressive treatment **(C)** | Proteinuria (low level): treat as dictated by extrarenal manifestations<br>Proteinuria (NS): corticosteroids + another agent **(practice point)** | Significant proteinuria (>1-2 g/24 h despite renal protective treatment) and/or deteriorated renal function that is not attributable to functional factors; steroids up to 0.5 mg/kg/d, possibly plus AZA or MMF for 6-12 months **(2D)** | Not provided | Not provided |

# Management: class II LN

**Class II lupus nephritis with non-nephrotic proteinuria**

Up/Ucr ratio 0.2 to 0.5 mg/g

No steroids unless indicated for extrarenal manifestations

**Class II lupus nephritis with nephrotic range proteinuria**

Up/Ucr ratio >0.5 mg/g

**Oral prednisolone** 1 mg/kg/day *X* **4-6 weeks**

**+**

**MMF** (1200 mg/$m^2$) OR **AZA** 1-2 mg/kg/day

# Treatment of class III or IV LN

## INDUCTION

## 3-6 months

**IV Methylprednisolone** 30 mg/kg (max 1g) *x* 3-6 days
Oral steroids @ 1 mg/kg/d (max 60 mg) *X* 4 weeks
Taper to ~7.5 to 10 mg/day by 6 months

**Inj Cyclophosphamide**
500 mg/m$^2$ q 4 weekly for 6 doses

**MMF**
600 mg/m$^2$ q BD for 6 months

Remission?

Average time to CR/PR:
8 mo (95% CI 4-12)

**Oral steroids**
(A/D once dose is <10 mg)

## Refractory disease

**Switch induction agents**
**Tacrolimus**
**OR IV Rituximab**

## MAINTENANCE

## Duration?

**MMF**
800-1000 mg/m$^2$/day
**(preferred)**

**AZA**
1.5 - 2.5mg/kg/d

# NIH trials: Cytotoxic therapy improved renal survival

**Monthly IV CYP (0.5g-1g/$m^2$) x 6 + every 4 months for 2 years**

| | Austin et al NEJM 1986 | Boumpas et al Lancet 1992 | Illei et al Int Med 2001 |
|---|---|---|---|
| **Years of follow-up** | 10 | 5 | 10 |
| **Deaths** | 20% | N/A | 18% |
| **Herpes Zoster** | 25% | 5% | 28% |
| **Other infections** | 10% | 5% | 33% |
| **Avascular Bone necrosis** | NA | 28% | 29% |
| **Premature ovarian failure** | 45% | 39% | 56% |

# MMF for induction of class III, IV and V LN

| | | | | |
|---|---|---|---|---|
| Chan et al 2000 | **N=42** | MMF 2 g/day vs. oral CYC (2.5 mg/kg) for 6 months | 1 yr | **CR: 81% (MMF) = 76% (CP)**<br>CP: Infections (33%), amenorrhoea (23%), hair loss (19%), death (10%) leucopenia (10%) |
| Chan et al 2005 | | | 5 yr | Similar rates of ESRD and relapse |
| Ginzler et al 2005 | **N=140** | MMF 1-3g/day vs HD CP | 6 mo | **CR: MMF (22.5%) > CP (5.8 %)**<br>Treatment lower, less infections |
| Appel at al 2009 **(ALMS)** | **N=370** | MMF 2.6 g/d vs HD CP | 6 mo | **CR: 56% (MMF) = 53% (CP)**<br>**MMF:**<br>▪ **Equal infection rate**<br>▪ **More GI side effects**<br>▪ **Frequent withdrawals due to AE**<br>▪ **Less frequent ovarian failure**<br>▪ **Less frequent alopecia**<br>▪ **Less frequent leukopenia** |

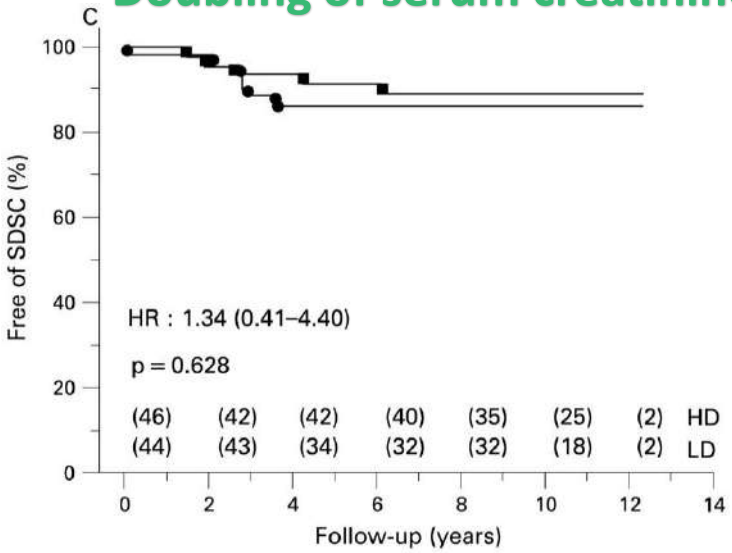
# Euro-Lupus trial: non-inferiority of low dose IV CP at 10-years follow-up

| | HD | LD |
|---|---|---|
| IV MP | 3 x 750 mg | 3 x 750 mg |
| IV CYP | (6+2) x 750 mg/m$^2$ | 6 x 500 mg |
| Cumulative CYP dose | 8.5 gr | 3 gr |
| Complete remission | 54% | 71% |
| Severe infections * | 22% | 11% |
| Renal flares | 29% | 27% |

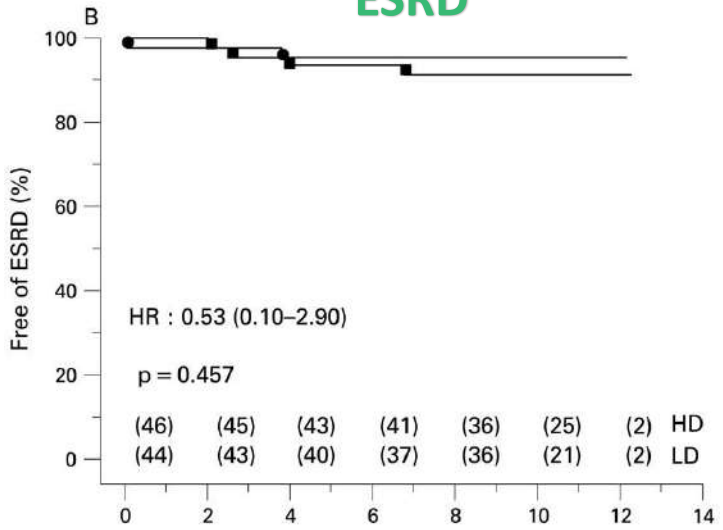
**The majority of patients:**
- Less severe LN (↑creat: 22%; NS: 28%)
- Caucasians

**Tailored to the severity of the disease**

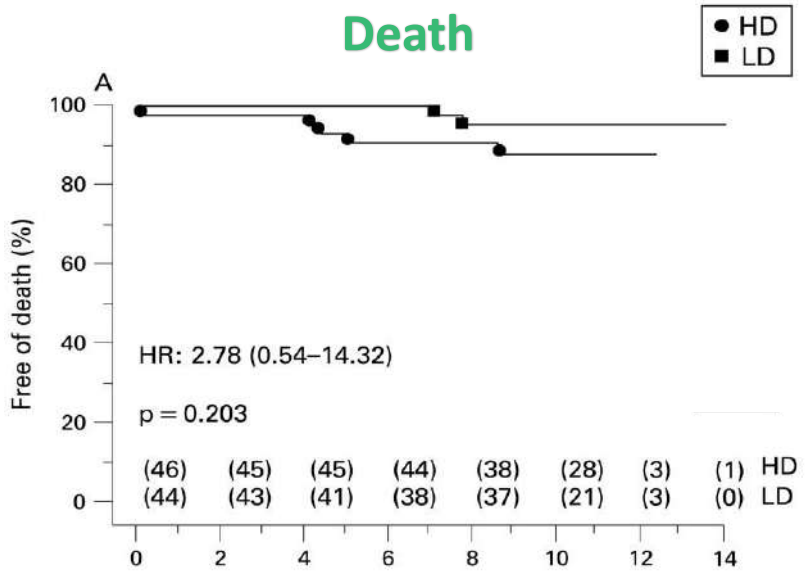
## Doubling of serum creatinine




## ESRD

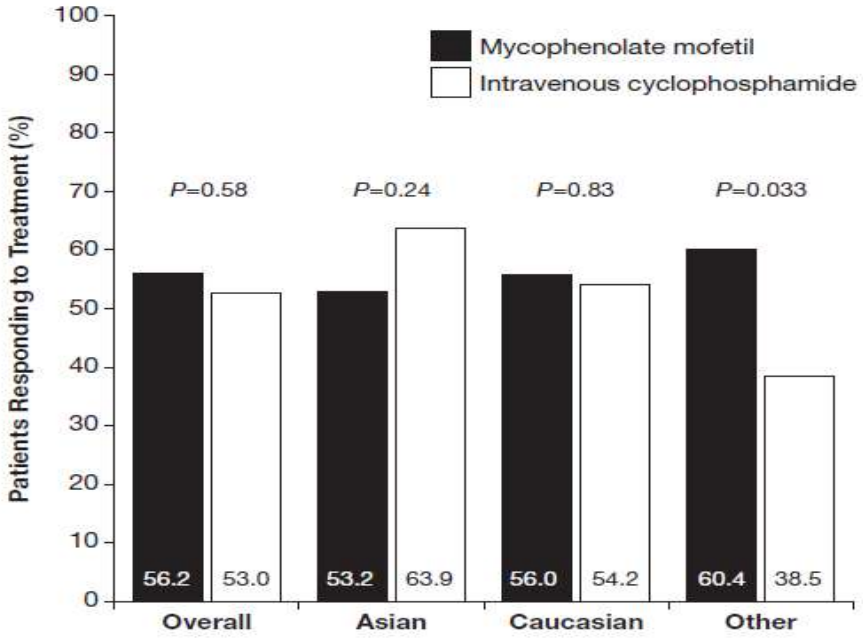



## Death




Houssiau Ann Rheum Dis, 2010

# Effect of ethnicity or response criteria?



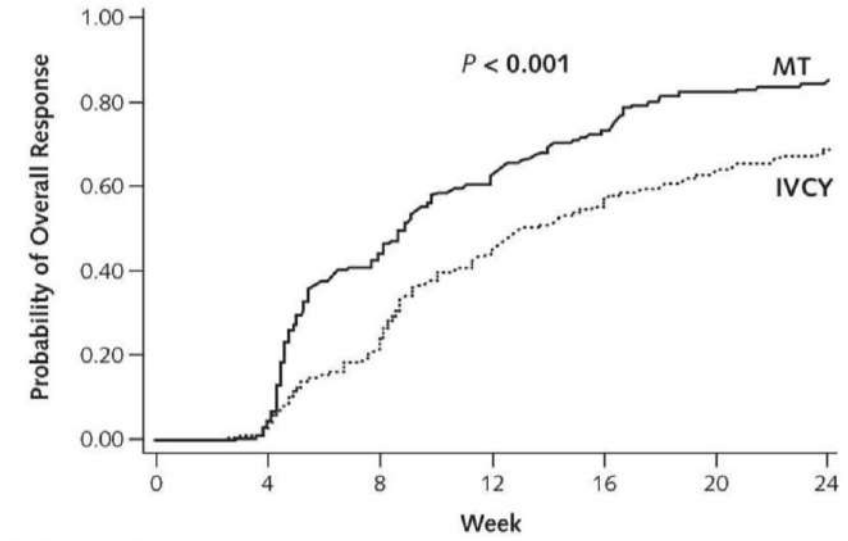

ALMS trial

**Table 3. Rates of complete response in the ELNT, ACCESS trial and ALMS, determined using the same response criteria**

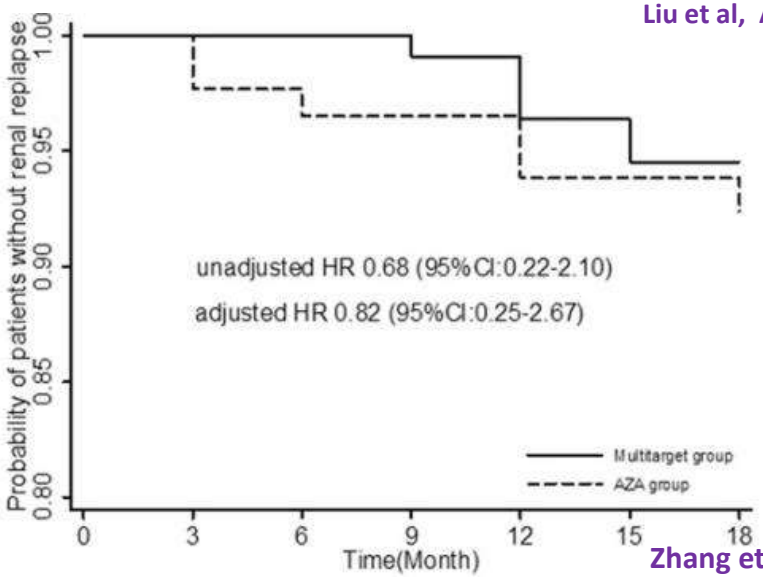
| Treatment regimen | % with proteinuria >3 g/24 h at baseline[a] | Complete response rate (%) at 6 months[b] |
|---|---|---|
| ELNT, low dose ($n = 36$) | 42 | 25 |
| ELNT, high dose ($n = 38$) | 45 | 24 |
| ACCESS ($n = 66$) | 52 | 23 |
| ALMS, MMF ($n = 169$) | 57 | 21 |
| ALMS, CYC ($n = 171$) | 60 | 22 |

# “Multitarget therapy” for induction treatment of LN

| | Multitarget | Standard CYP |
|---|---|---|
| N | 181<br>**Mt: 101** | 181<br>**Mt: 64** |
| Serum creat mg/dl | 0.78 | 0.82 |
| Proteinuria g/day | 3.4 | 3.7 |
| GFR ≥30,<60 ml/min | 18% | 19% |
| Class V | 17% | 20% |
| **Treatment** | **3 x IV MP 500 mg**<br>**PDN 0.6 mg/Kg/d**<br>**TAC 4 mg/d,**<br>**3mg 6 mo, 2mg 1 yr**<br>**MMF 1 g/d**<br>**750mg/d 6mo, 500 mg 1 yr** | **3 x IV MP 500 mg**<br>**PDN 0.6 mg/Kg/d**<br>**CYP 0.5-1 g/m²/m**<br>**AZA 2mg/kg/d** |
| Complete rem. at 6 m. | 46% | 26% |
| Median time to response | 9 weeks | 13 weeks |
| Renal relapse | 5.5% | 7.6% |
| Adverse events | 50% | 52% |




Liu et al, Ann Int Med 2015




Zhang et al, JASN 2017

# Multitarget therapy may be better at inducing remission

**Immunosuppressive treatment for proliferative lupus nephritis (Review)**

Cochrane Library

Tunnicliffe DJ, Palmer SC, Henderson L, Masson P, Craig JC, Tong A, Singh-Grewal D, Flanc RS, Roberts MA, Webster AC, Strippoli GFM

**Induction:** 67 trials; N=4791

**Complete remission**

**MMF + CNI** **2.38 (95% CI 1.07 to 5.30) vs IVCP**

**MMF** **1.17 (95% CI 0.97 to 1.42) vs IVCP**

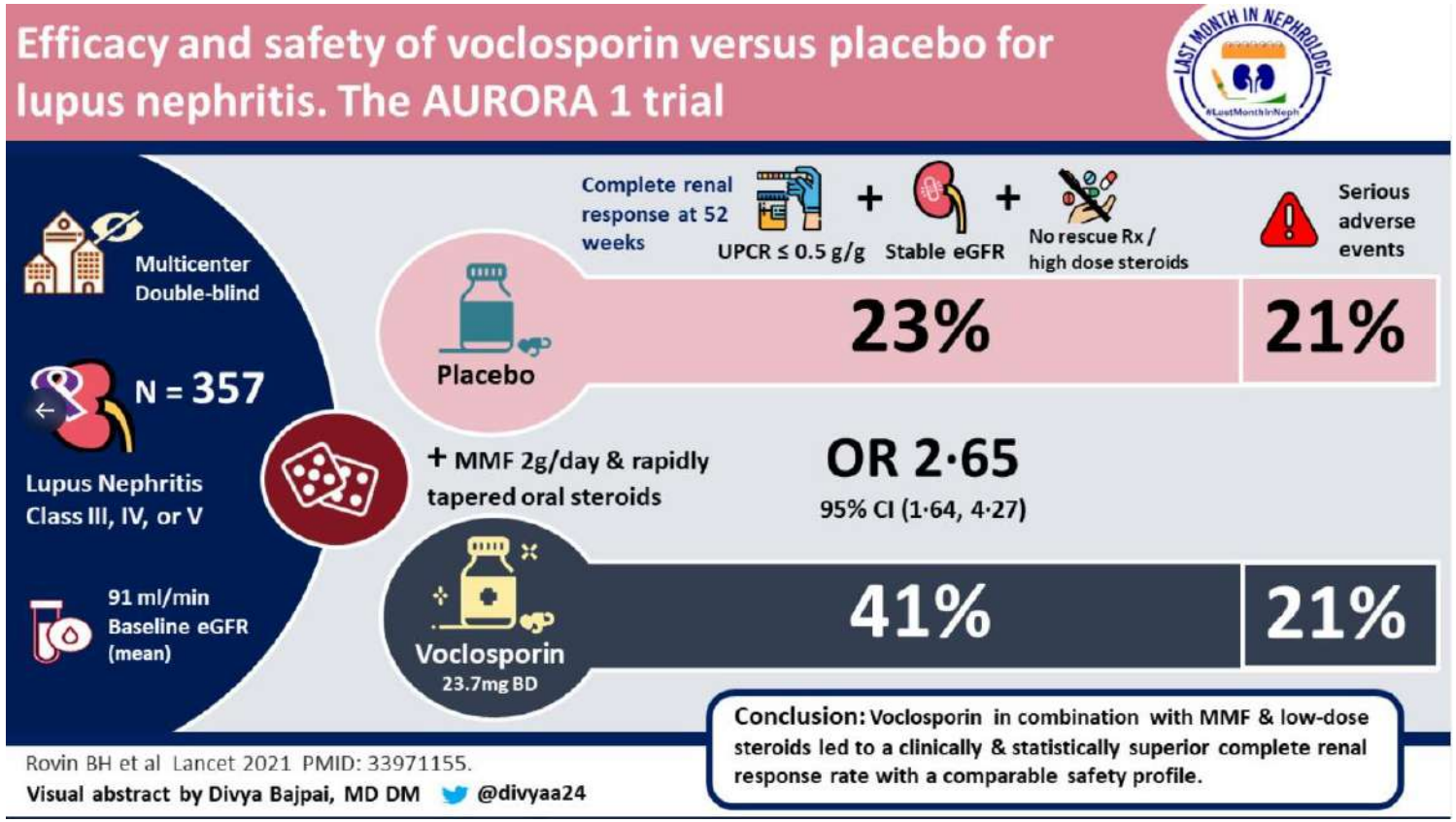
MMF less likely to cause **alopecia** (RR 0.29, 95% CI 0.19 to 0.46), **increase diarrhea** (RR 2.42, 95% CI 1.64 to 3.58)

**Maintenance:** 9 trials; N=767

MMF superior to AZA

# Voclosporin: A new drug on the horizon

Aurinia Urinary Protein Reduction Active - Lupus With Voclosporin (AURA-LV): phase 2 RCT of 265 subjects




**2 doses of IV MP (500 mg/dose) followed by 20–25 mg prednisone rapidly tapered to 2.5 mg/d by 16 weeks**

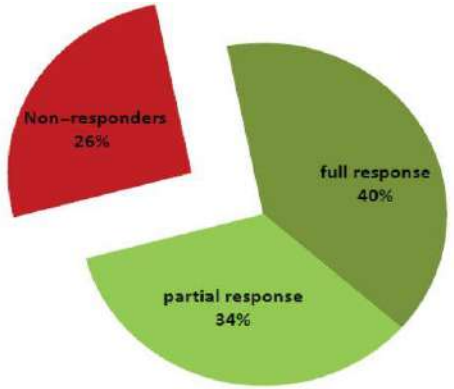
**Pooled analysis**

*N=534*

Renal response of 44% at 1 year vs. 23% in placebo

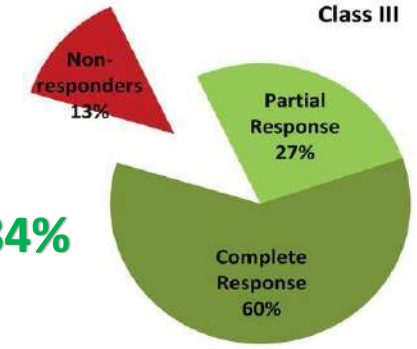
**FDA approval in adults with LN II/IV/V with eGFR >45 ml/min/1.73m$^2$**

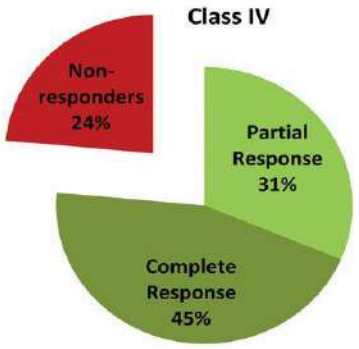
# Rituximab beyond the LUNAR trial




All 74%

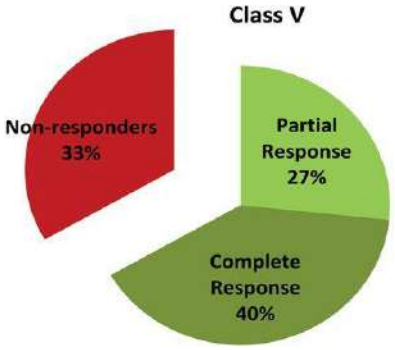
Class III: 84%

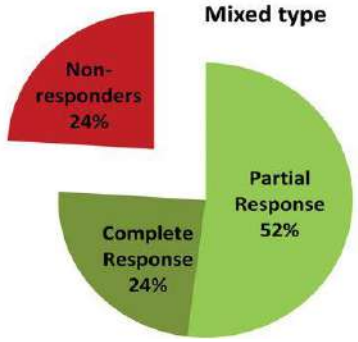



Class IV:76%

Class V: 67%




Mixed: 76%

Weidenbusch et al, Nephrol Dial Transpl 2013

# Steroid minimization and withdrawal may hold promise

**RITUXILUP protocol**

**IV MP** (500 mg/1.73 m2)
**RTX** (1000 mg/1.73m2) at days 1 and 15
**MMF** (1200 mg/m2/day)

Steroids tapered rapidly
Median dose **0.3 at 3 months**, 0.10 at 6 months and **0 by 12 months**

***N=50***

**At 12-months: 52% CR and 34% PR**

No relapse
***FU: 24 months***

Hogan, Pediatric nephrology, 2018
KDIGO 2021

# Belimumab: The BLISS-LN trial

## Does addition of belimumab to standard therapy improve kidney outcomes in lupus nephritis?

#NephJC

### Methods and Cohort

Multicentre, double-blind RCT, n=448

Lupus Nephritis Class III to V

GFR >30 ml/min/1.73 m^2

Mean age 33.4±10.6 yrs

Females: 88%

50% Asian
30% White
14% Black

### Intervention

Placebo

versus

Belimumab

Study duration = 104 weeks

### Partial Renal response

32%

OR 1.6
95% CI 1.0 to 2.3
p = 0.03

43%

### Complete Renal Response

20%

OR 1.7
95% CI 1.1 to 2.7
p = 0.02

30%

**Conclusions:** In active lupus nephritis, more patients who received belimumab plus standard therapy had a primary efficacy renal response than those who received standard therapy alone

Reference: Furie R, Rovin BH *et al*.Two-Year, Randomized, Controlled Trial of Belimumab in Lupus Nephritis. NEJM, 2020

VA by Swasti Chaturvedi @SwastiThinks

# NOBILITY: Obinutuzumab (anti-CD20) Phase 2 Trial in LN

- Obi was added to standard therapy of MMF + steroids
- Steroids were tapered starting Day 16, reducing to 7.5 mg/d by Week 12
- Rescue with high-dose steroids was allowed
- Primary objective: evaluate the effect of Obi compared with PBO when added to MMF in patients with class III or IV LN as assessed by the proportion of patients who achieve CRR at week 52

| | Obi + MMF N = 63 | Placebo + MMF N = 62 | Difference, % (80% CI) | *P* Value |
|---|---|---|---|---|
| CRR, n (%) | 22 (34.9) | 14 (22.6) | 12.3 (2.1 to 22.6) | .1145 |
| Overall response (CRR or PRR), n (%) | 35 (55.6) | 22 (35.5) | 20.1 (8.9 to 31.3) | .0246 |
| mCRR, n (%) | 25 (39.7) | 16 (25.8) | 13.9 (3.2 to 24.5) | .0900 |

Furie R, et al. *Arthritis Rheumatol*. 2019;71(suppl 10): Abstract 939.



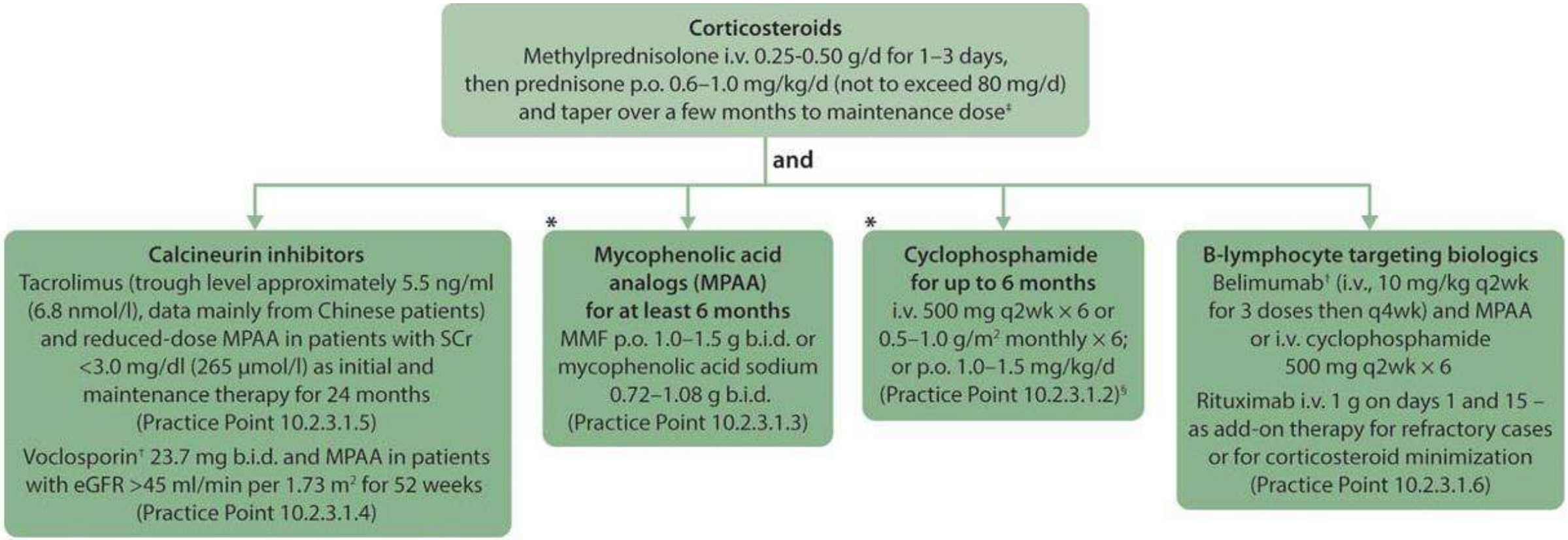


**An ongoing phase III study of Obinutuzumab (REGENCY trial)….**

# What is the BEST therapy?

- MMF is equivalent to low-dose cyclophosphamide for induction
- Issues of compliance
- GI intolerance with very high dose in children
- Lack of RCTs in children
- plLack of long-term data in severe disease
- TAC/voclosporin + MMF: probably better in controlling proteinuria
- Need more long-term data for CNI-based therapies
- Option of belimumab..

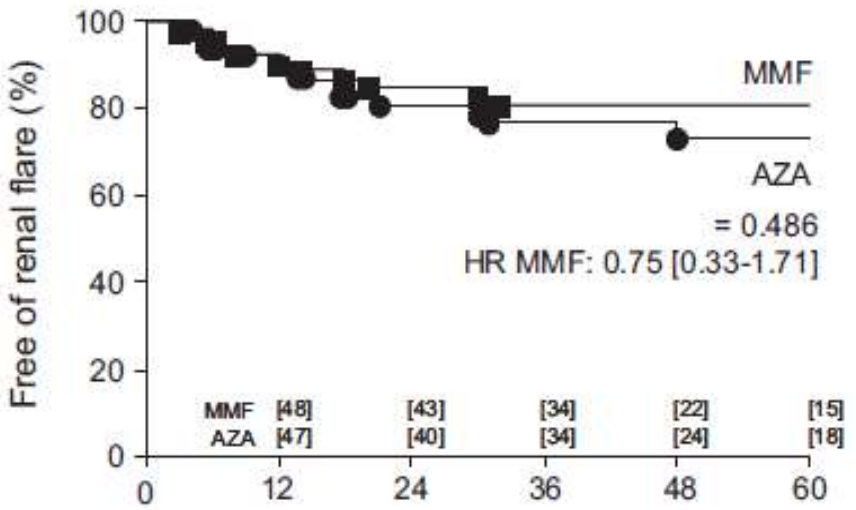
# What is the BEST therapy?



# Maintenance therapy

## MAINTAIN

Primary end point
time to renal flare



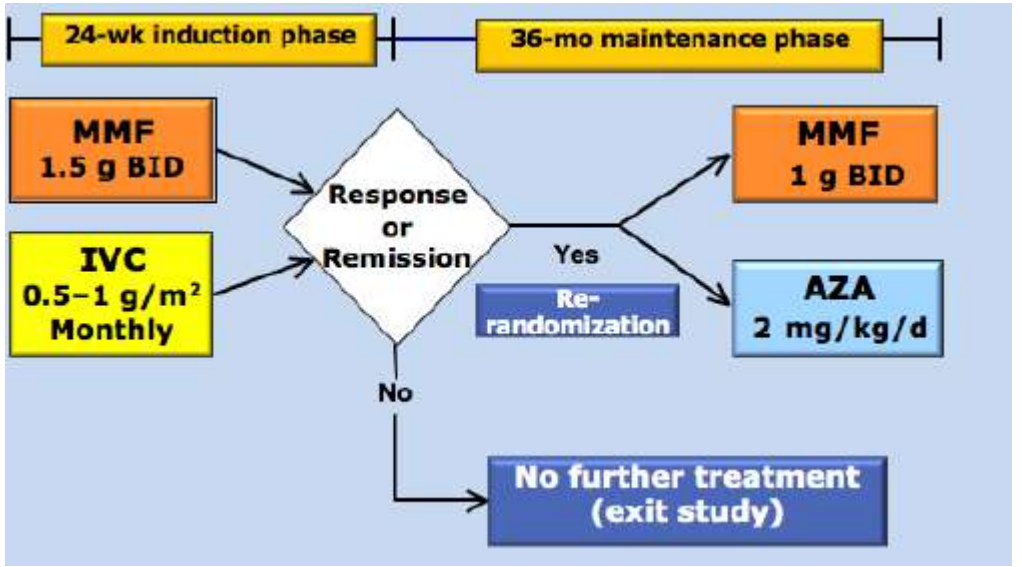

AZA

MMF

**MMF=AZA**

## ALMS

Primary end points
Death, ESRD, sustained doubling of
Creatinine, renal flare, rescue CS
Secondary end points
Time to event, CR, major extra renal flare
And adverse events




**MMF>AZA**

# MMF superior to AZA regardless of induction treatment

## Treatment for lupus nephritis: an overview of systematic reviews and meta-analyses

Six studies MMF vs AzA

MMF: **lower relapse rate** RR = 0.70, 95% CI 0.49–1.00

& **leucopenia rate** RR = 0.12, 95% CI 0.04-0.39

No differences in ESKD and mortality rate

Chen, Rheumatol Int. 2017

# Pure Membranous Lupus Nephritis

## Membranous Lupus Nephritis: The Same, But Different

*Frank Ward, MB, BCh, and Joanne M. Bargman, MD, FRCPC*

AJKD, 2016

| | | |
|---|---|---|
| **IV CP** | **40-70%** | **5 RCT, 3 observational** |
| **MMF** | **40-70%** | **5 RCT, 2 observational** |
| **CNI** | **40-83%** | **3 RCT, 3 observational** |

| EULAR/ERA-EDTA | ACR | KDIGO |
|---|---|---|
| MMF 3 g/d **(2B)**<br>High dose IVCP **(2A)**<br>Cyclosporin **(2A)**<br>Tacrolimus **(3B)**<br>Rituximab **(4C)** | MMF 2-3 g/d **(A)** | **MMF/CNI/IV CP/RTX**<br>**(practise point)**<br>**40-60% response** |

# Can we ever stop all therapy?

**Table 1** Results of the studies in which the maintenance therapy of lupus was reduced or stopped

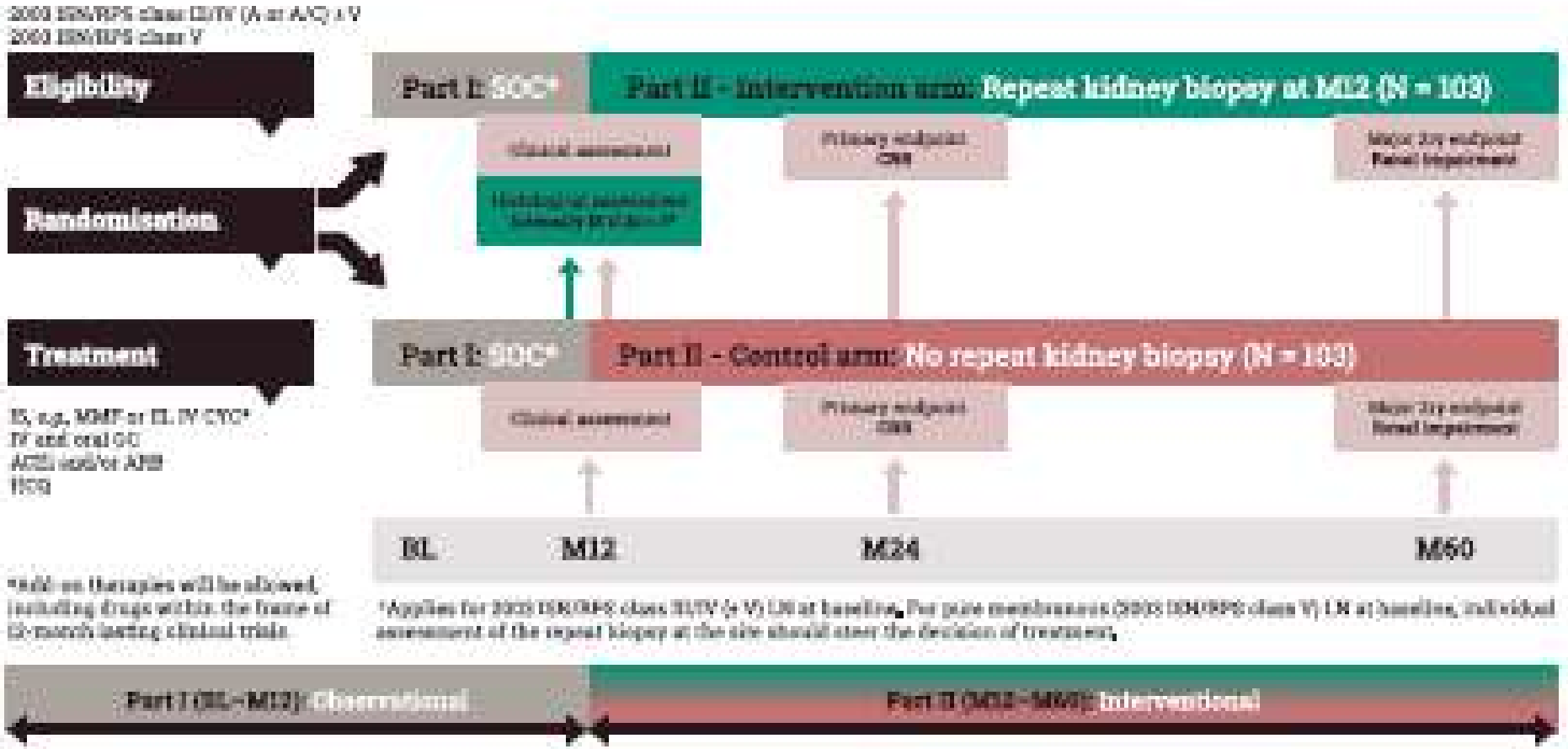
| Authors [Refs.] | Induction therapy | Maintenance therapy | Patients | Follow-up months | Remission | Flares |
|---|---|---|---|---|---|---|
| Condon et al. [29] | RTX 1 g × 2<br>MPP 1 g × 2 | MMF 2 g/day | 50 | 40.7 | 90 % | Renal 22 %<br>Extra renal 12 % |
| Roccatello et al. [30] | RTX 375 mg/m/2 × 6<br>MPP 15 mg/kg × 3<br>iv Cy 750 mg × 2<br>prednisone 50 mg/day | Prednisone 5 mg/day | 8 | 36.2 | 100 % | Renal 12.5 %<br>Extra renal 12.5 % |
| Pablos et al. [31] | Oral Cy 2–3 mg/kg/day for 35–45 months + prednisone 1 mg/kg/day | Prednisone 10 mg/day | 11 | 49.5 ± 20 | 100 % | Renal 36 % |
| Mosca et al. [32] | MPP 1 m2 g × 3<br>iv Cy 750 mg/m2 × 6–9 | Prednisolone 4–8 mg/day | 33 | 51 | Remission 39 %, response 61 % | Renal 45 % |

**At least CR for 3 years**
**At least maintenance for 5 years**

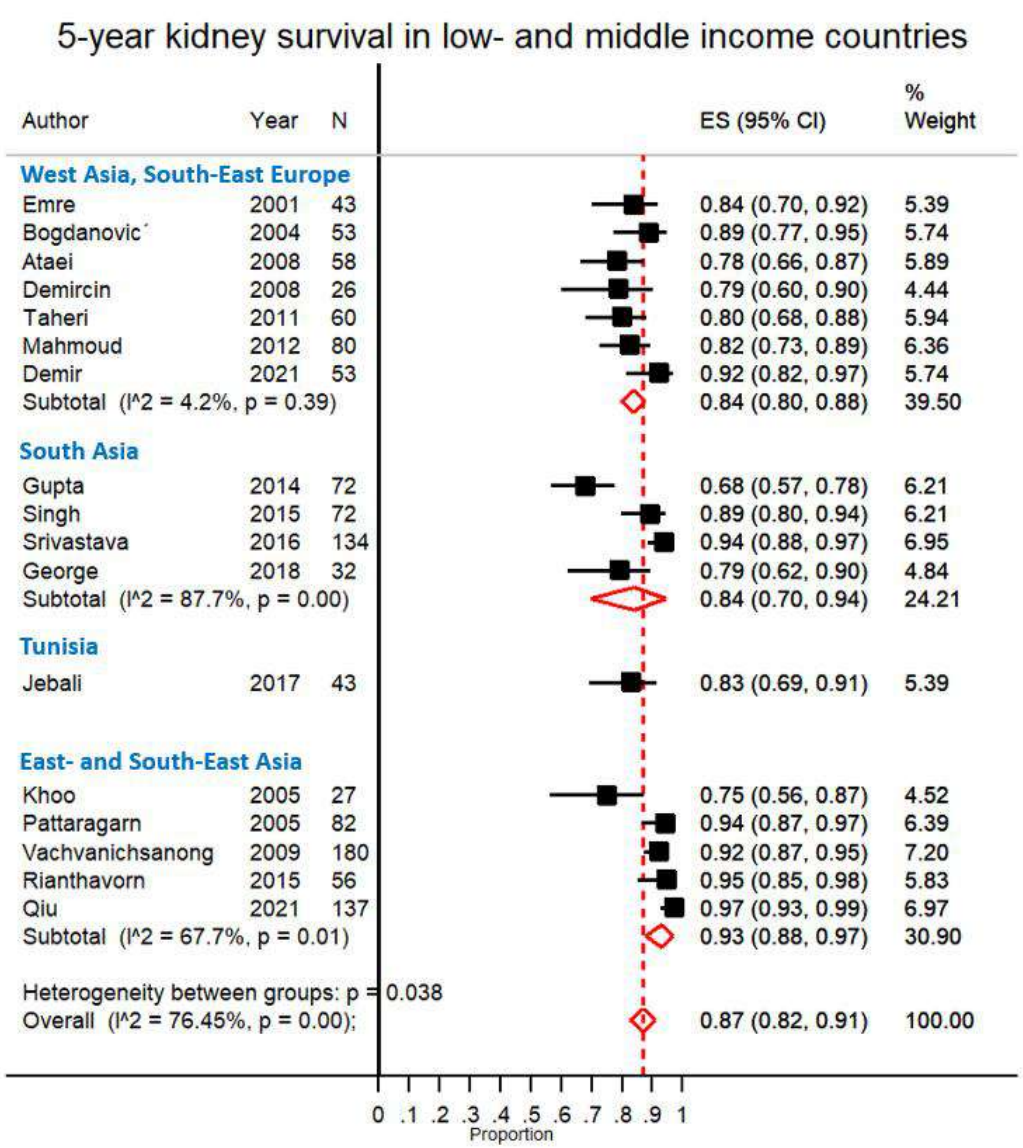
KDIGO 2021
Moroni, 2016

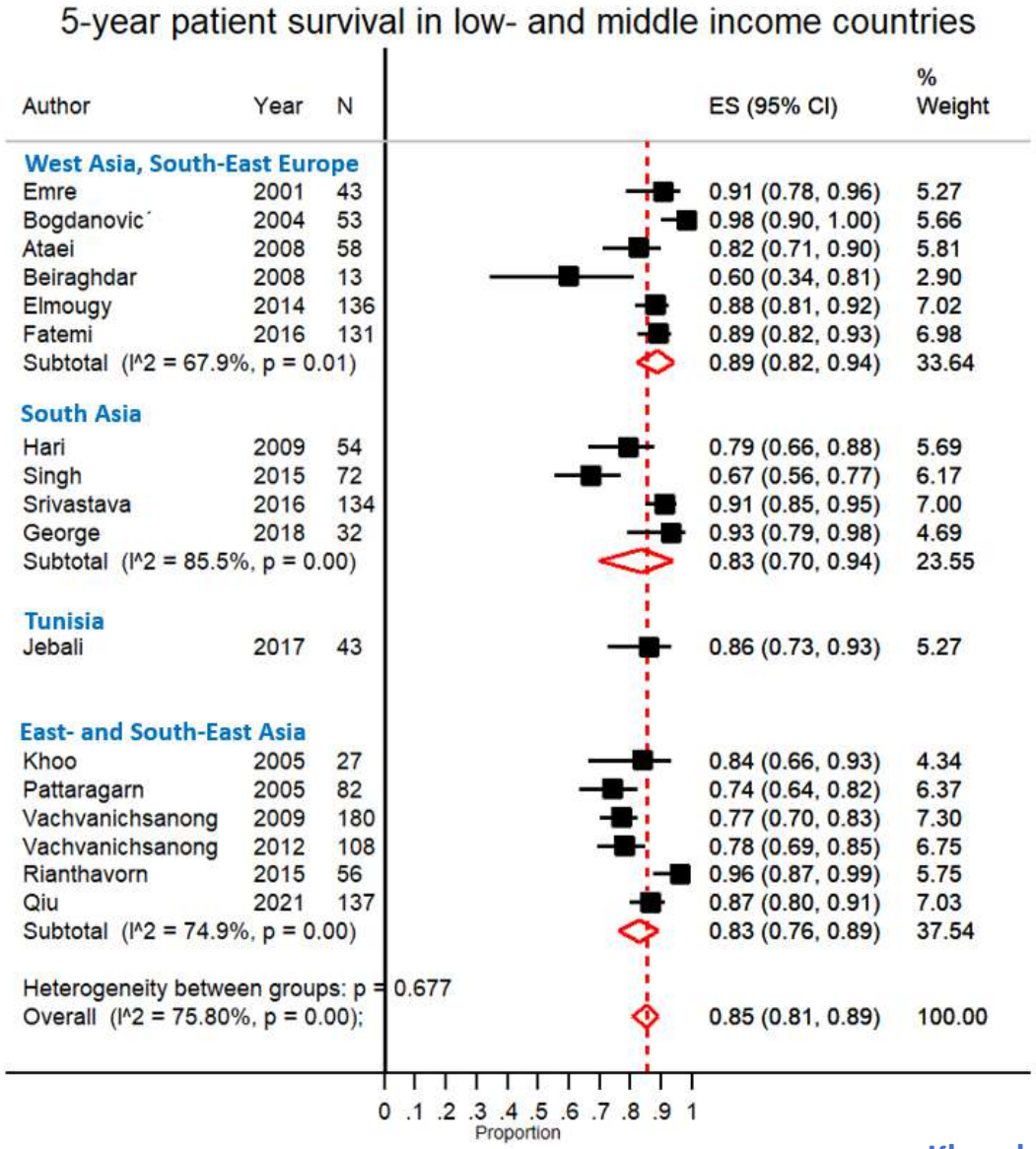
# Re Bio Lup

## Per-protocol repeat kidney biopsy in incident cases of lupus nephritis



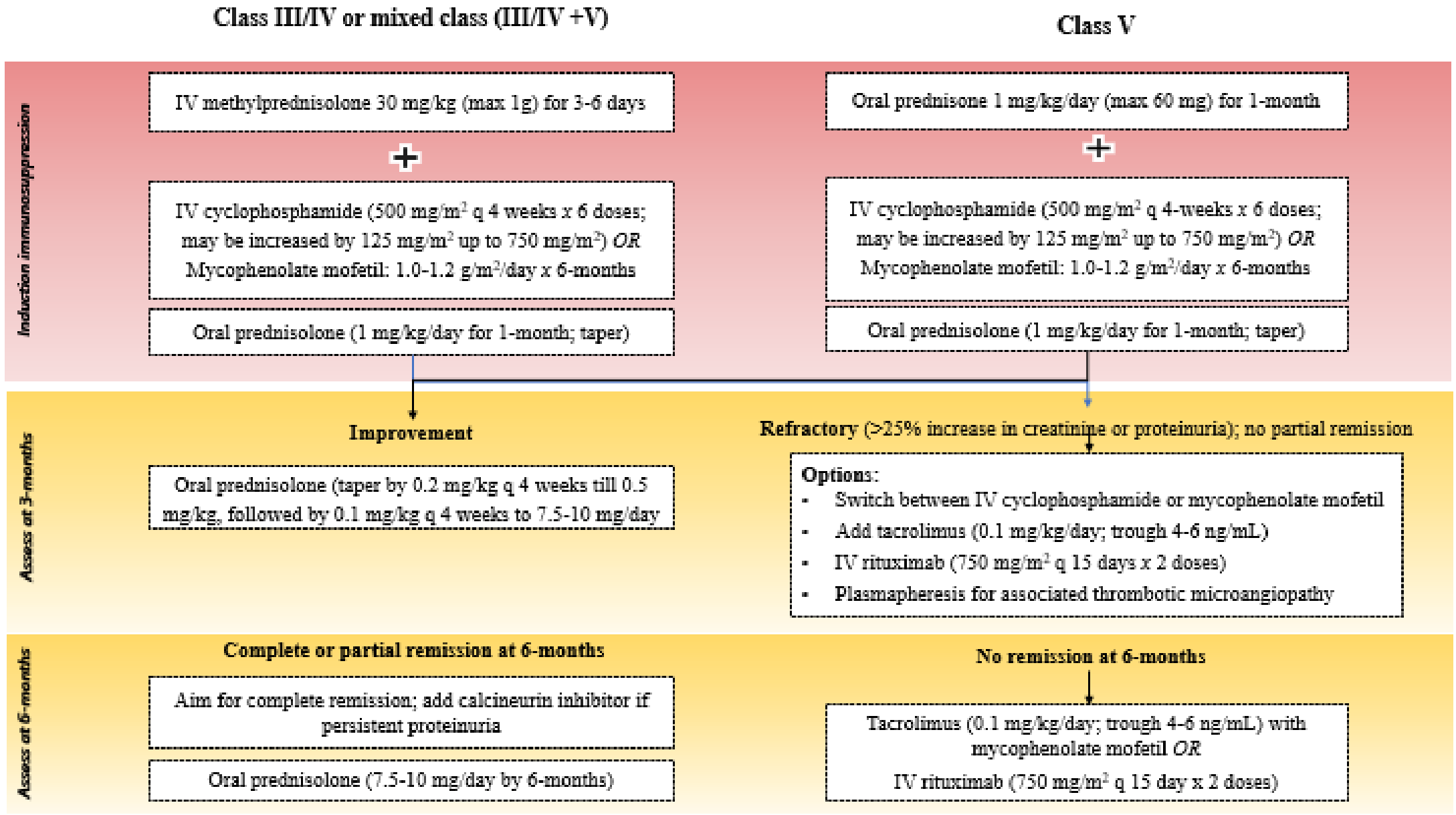
# Outcomes of pediatric LN



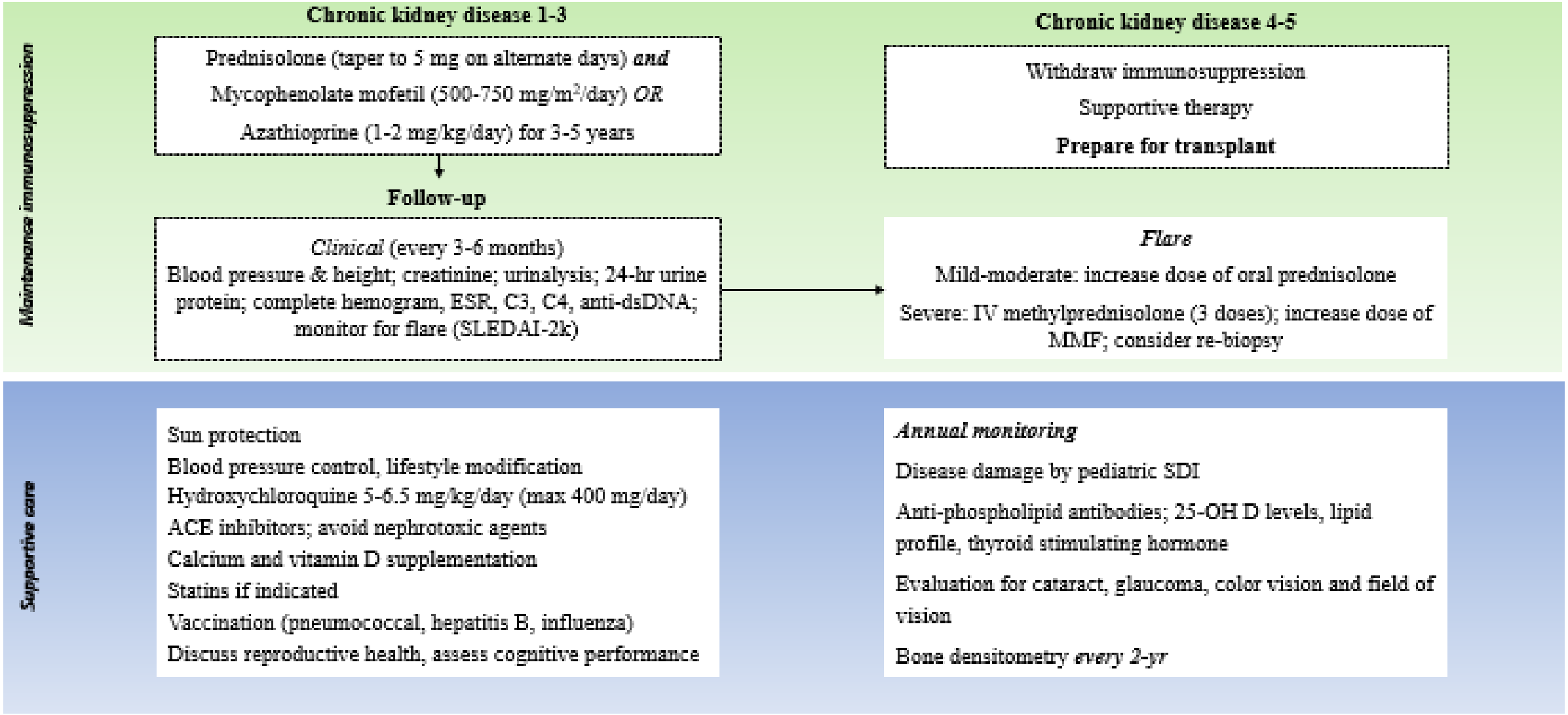




Khandelwal 2022

# Summary of management



# Early recognition of flares & supportive therapy



# Key Points

Intensive treatment in younger children

MMF similar to low-dose cyclophosphamide (side effect profile, cost, compliance)

Calcineurin inhibitors may have a role in induction therapy; multitarget therapy promising

B-cell inhibition might be useful, in refractory disease

Focus on steroid minimization

Target: complete remission

MMF better for maintenance

Withdrawal of all immunosuppression is debatable

Monitor for disease flare, HCQ, bone health, sun protection, APLA, vitamin D

Thank you