Ashford and St. Peter's Hospitals
NHS Foundation Trust

Approach to Paediatric Proteinuria

Author: Dr Khallad Shoaib, Paediatric ST4

Supervisor: Dr Tatiana Hyde, Paediatric Consultant

Contact details: tatiana.hyde@nhs.net

Guideline History		
Date	**Comments**	**Approved By**
May 2024	New guidelines	Paediatric Guidelines Group

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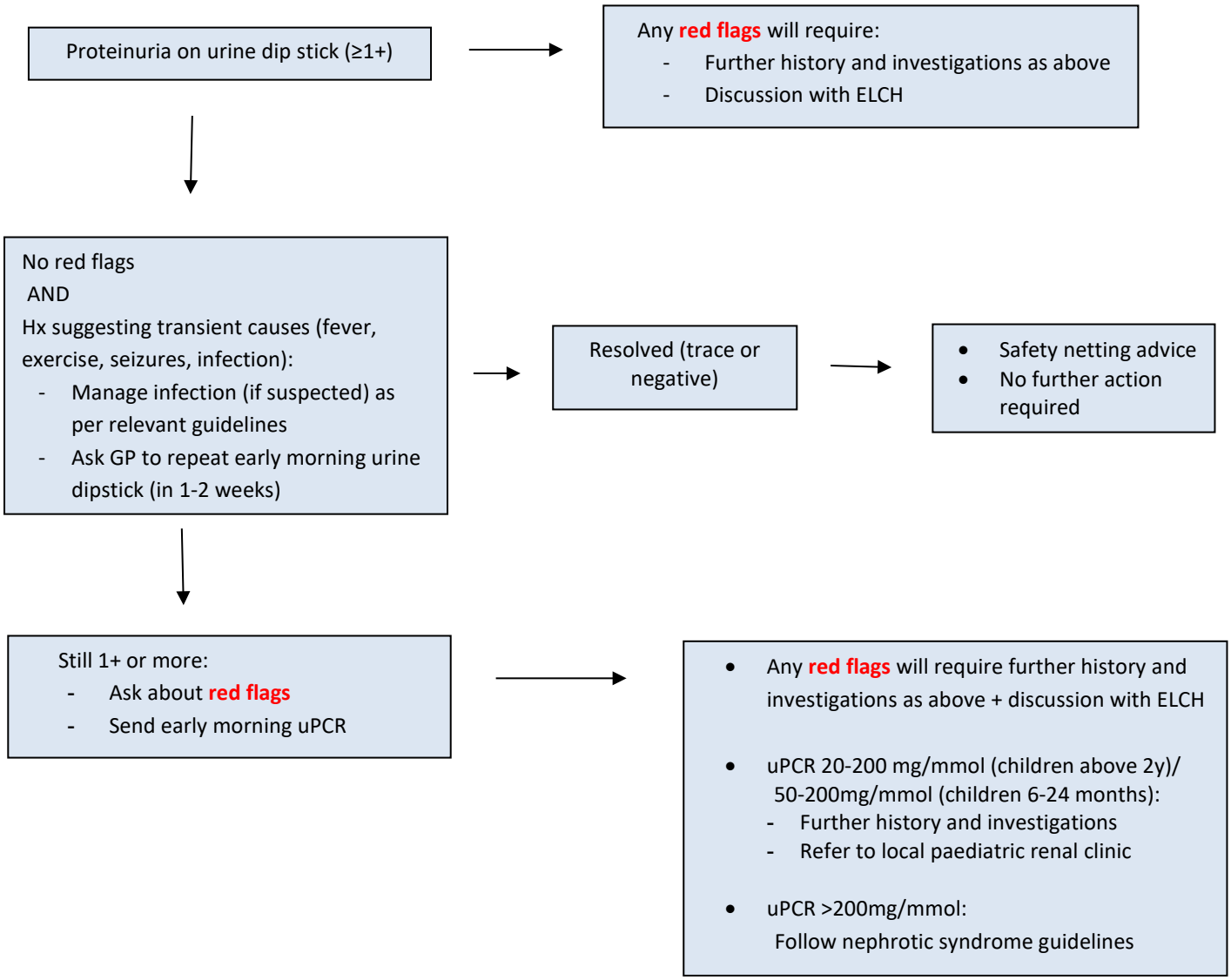
Proteinuria Flowchart



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1. Approach to Paediatric Proteinuria

a. Introduction

- Proteinuria is a common finding in paediatrics
- It can be a 'benign' finding or a sign of kidney disease.
- It is important to have an approach to detect those who may have an underlying renal problem without 'over-medicalising' benign cases
- The normally low rate of urinary protein excretion is due to the restriction of filtration of proteins through the glomeruli and the reabsorptive capacity of the proximal convoluted tubules of low molecular weight (LMW) proteins
- Normal urinary protein excretion in children is up to **150 mg per day** (or 100 mg/m^2 per day). This is usually higher in neonates in view of reduced absorption of filtered proteins

- Normal urinary Protein Creatinine Ratio **(uPCR)** is:
    i. **<50 mg/mmol** in children aged 6-24 months
    ii. **<20 mg/mmol** in children above 2y

- **'Nephrotic range proteinuria'** term is used when:
    - protein excretion in urine is **>3.5 grams/day**
    - **uPCR: >200 mg/mmol**

- Methods of protein detection/measurement in urine are:
    - Urine dip: Only detects albumin.
      (Check the appendix for more details on urine dip interpretation).
    - Urinary Protein Creatinine Ratio (uPCR) in a spot sample
    - 24-hour urinary collection: challenging in paediatrics

- Proteinuria in children can present as:
    - **Transient:** most common, benign and self-resolving
    - **Orthostatic:** Benign. Urine dip negative on early morning urine samples
    - **Persistent:** Further investigations should be performed

b. Causes

<table>
<tr><th>Transient proteinuria</th><th colspan="2">Persistent proteinuria</th></tr>
<tr><td rowspan="4">1. Febrile proteinuria
2. Exercise induced proteinuria
3. Orthostatic proteinuria
4. Stress
5. Seizures
6. Hypovolaemia</td><td>1. Glomerular proteinuria</td><td>2. Tubular proteinuria</td></tr>
<tr><td>a) Primary glomerular disease
- Idiopathic childhood nephrotic syndrome
- Focal segmental glomerulosclerosis
- Mesangiocapillary Glomerulonephritis
- Congenital nephrotic syndrome
- Membranous nephropathy</td><td>a) Inherited
- Cystinosis
- Lowe syndrome
- Galactosemia
- Mitochondrial cytopathies
- Dent disease
- Wilson disease
- Tyrosinaemia
- Hereditary fructose intolerance</td></tr>
<tr><td>b) Secondary glomerular disease
- Post-infectious glomerulonephritis
- IgA vasculitis
- Lupus nephritis
- Alport syndrome
- Hepatitis B and C
- Human immunodeficiency virus Amyloidosis</td><td rowspan="2">b) Acquired
- Drug induced
- Pyelonephritis
- Acute tubular necrosis
- Heavy metal poisoning</td></tr>
<tr><td>c) Other glomerular diseases
- Hemolytic uremic syndrome
- Hypertension
- Diabetes mellitus
- Hyperfiltration</td></tr>
</table>

c. History

- Symptoms of urinary infection: dysuria, frequency, abdominal pain, fever
- Systemic symptoms e.g. fatigue, oedema, rash, arthralgia
- Previous history of proteinuria or haematuria
- Medication history (e.g. NSAIDs, rifampicin, metronidazole, nitrofurantoin, cyclophosphamide)
- Exercise-related
- Family history of renal problems/proteinuria or haematuria
- Family history of hearing loss

d. Examination

- Urinalysis
- Weight and height
- Blood pressure (manual) measurements: should be assessed according to age, gender & height centiles
- Physical examinations should include eyes, skin, genitalia, joint tenderness/swelling, organomegaly and signs of oedema

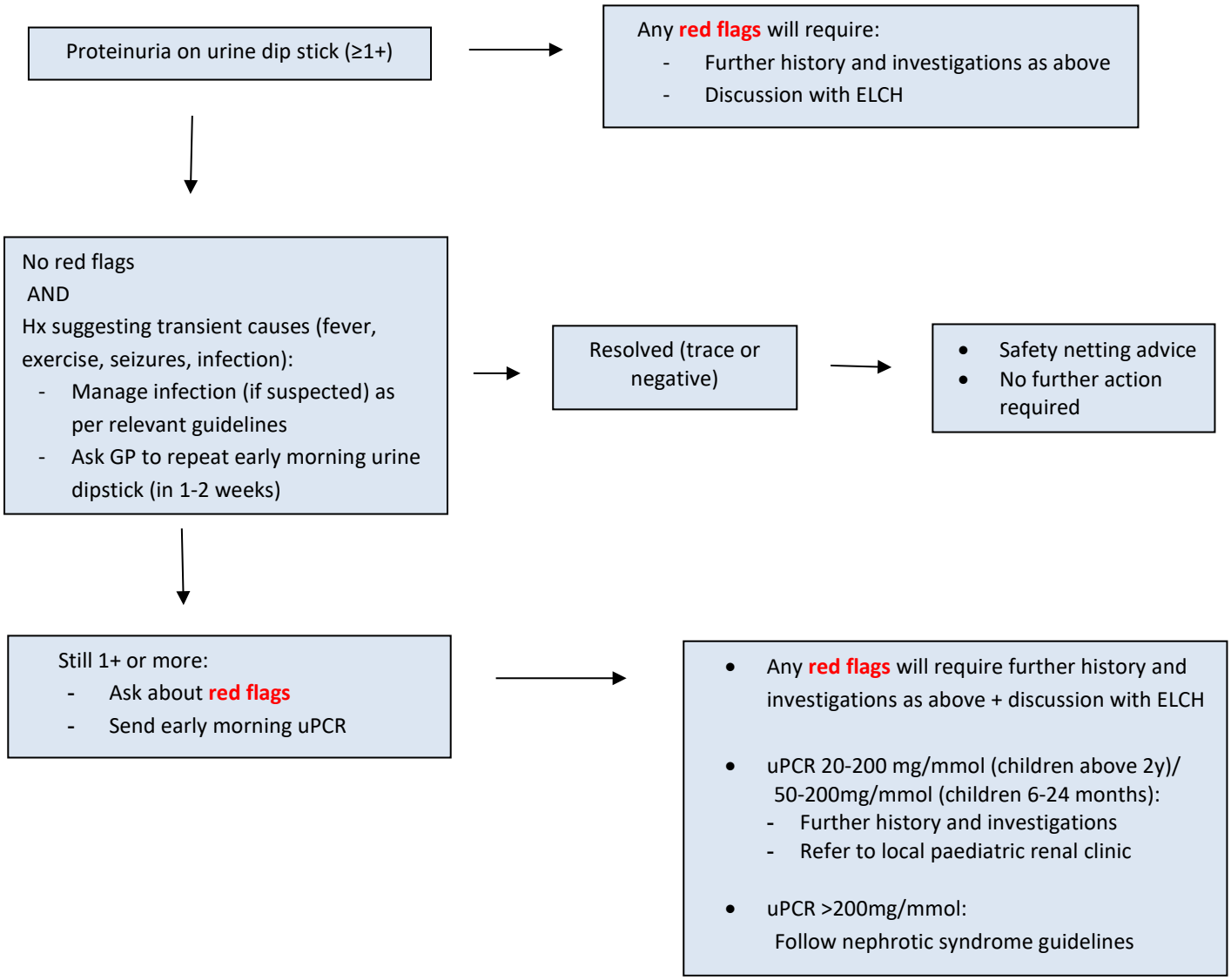
e. Red flags (warrant a discussion with ELCH):

- Hypertension
- Macroscopic haematuria
- Microscopic haematuria with other systemic features such as: rash, joint pain/swelling
- Oedema, ascites
- Signs of fluid overload (tachycardia, hypertension, increased JVP) or underload (cool peripheries, prolonged CRT, abdominal pain, tachycardia)
- Flank/abdominal pain
- Immuno-compromised
- Deranged renal function
- Abnormal nephritis screen (i.e C3, C4, ANA, anti-dsDNA, ANCA, anti-GBM)
- Abnormal renal ultrasound
- Family history of renal disease

f. Investigations

- FBC
- Basic biochemistry including renal profile, bone profile, liver functions + gas
- Complement: C3 and C4
- ANA, ASOT, ANCA, anti-dsDNA, anti-GBM
- Hepatitis B and C serology
- Renal ultrasound
- Early morning uPCR (if not done)

g. Management



h. Referrals

ELCH Nephrology Referrals

Monday-Friday, 9am-5pm:

- Renal SpR on 07990800587 or on 02071887188 (bleep 1141)

For out of hours referrals:

- Paediatric Specialities SpR on 07514719077 or on 02071887188 (bleep 1139)
- A paediatric nephrologist is on call and can be contacted via the hospital switchboard on 02071887188.

i. Appendix: Urine Dipstick Results

- Urine dipstick findings interpretation:
  - Negative
  - Trace – 0.15-0.30g/L (15-30 mg/dL)
  - 1+: 0.3-1g/L (30-100 mg/dL)
  - 2+: 1-3g/L (100-300 mg/dL)
  - 3+: 3-10g/L (300-1000 mg/dL)
  - 4+: >10g/L (>1000 mg/dL)

- False-positive urine dipstick results for proteinuria:
  - Alkaline urine (pH > 8),
  - Concentrated urine (specific gravity >1.030),
  - Gross haematuria,
  - Pyuria,
  - Bacteriuria,
  - Prolonged immersion of reagent strip in the urine,
  - Placement of reagent strip directly in the urine stream, and
  - Presence of phenazopyridine or quaternary ammonium compounds in the urine

- False-negative urine dipstick results for proteinuria:
  - Acidic urine (pH < 4.5),
  - Dilute urine (specific gravity < 1.010), and
  - Presence of proteins other than albumin in the urine.

2. Supporting References

- Uptodate.com: Evaluation of proteinuria in children
- Approach to the Child with Hematuria and/or Proteinuria | SpringerLink
- J Pediatr. 1982 Nov;101(5):661-8. (doi: 10.1016/s0022-3476(82)80287-4)
- Evelina London Children's Hospital (ELCH) clinical guidelines
- ELCH's online learning platform (Ocean2sky.uk)

3. Supporting relevant trust guidelines

- Approach to Primary Nephrotic Syndrome in Paediatrics
- Approach to Paediatric Haematuria

4. Guideline Governance

a. Scope

This guideline is relevant to all staff caring for all children from 0-18 years old across the emergency department, inpatient ward and outpatient department.

b. Purpose

i. This guideline aims to facilitate a common approach to the management of children. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.

ii. This guideline is subject to regular review to ensure ongoing evidence-based practice.

c. Duties and Responsibilities

All healthcare professionals responsible for the care of all children 0-18years should be aware of practice according to this guideline.

d. Approval and Ratification

This guideline will be approved and ratified by the Paediatric Guidelines Group.

e. Dissemination and Implementation

i. This guideline will be uploaded to the trust intranet 'Paediatric Guidelines' page and thus available for common use.
ii. This guideline will be shared as part of ongoing education within the Paediatric Department for both medical and nursing staff.
iii. All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

f. Review and Revision Arrangements

a. This policy will be reviewed on a 3-yearly basis by the appropriate persons.
b. If new information comes to light prior to the review date, an earlier review will be prompted.
c. Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Paediatric Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

g. Equality Impact Assessment

Background • Who was involved in the Equality Impact Assessment
Author and the supervising consultants.
Methodology • A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) • The data sources and any other information used • The consultation that was carried out (who, why and how?)
All groups of staff and patients were taken into consideration and there is no bias towards or against any particular group.
Key Findings • Describe the results of the assessment • Identify if there is adverse or a potentially adverse impacts for any equalities groups
There is no evidence of discrimination.
Conclusion • Provide a summary of the overall conclusions
There is no evidence of discrimination.
Recommendations • State recommended changes to the proposed policy as a result of the impact assessment • Where it has not been possible to amend the policy, provide the detail of any actions that have been identified • Describe the plans for reviewing the assessment
This guideline is appropriate for use.

h. Document Checklist

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document:

Policy (document) Author:

Executive Director: N/A

		Yes/No/ Unsure/NA	Comments
1.	**Title**		
	Is the title clear and unambiguous?	**Y**	
	Is it clear whether the document is a guideline, policy, protocol or standard?	**Y**	
2.	**Scope/Purpose**		
	Is the target population clear and unambiguous?	**Y**	
	Is the purpose of the document clear?	**Y**	
	Are the intended outcomes described?	**Y**	
	Are the statements clear and unambiguous?	**Y**	
3.	**Development Process**		
	Is there evidence of engagement with stakeholders and users?	**Y**	
	Who was engaged in a review of the document (list committees/ individuals)?	**Y**	**Paediatric guideline group – consultants, governance team and nursing staff**
	Has the policy template been followed (i.e. is the format correct)?	**Y**	
4.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?	**Y**	

		Yes/No/ Unsure/NA	Comments
	Are local/organisational supporting documents referenced?	**Y**	
5.	**Approval**		
	Does the document identify which committee/group will approve/ratify it?	**Y**	
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?	**Y**	
6.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	**Y**	
	Does the plan include the necessary training/support to ensure compliance?	**Y**	
7.	**Process for Monitoring Compliance**		
	Are there measurable standards or KPIs to support monitoring compliance of the document?	**Y**	
8.	**Review Date**		
	Is the review date identified and is this acceptable?	**Y**	
9.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?	**Y**	
10.	**Equality Impact Assessment (EIA)**		
	Has a suitable EIA been completed?	Y	

Committee Approval (Paediatric Guidelines Group)			
If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner			
Name of Chair	**Alexandra Jones**	**Date**	**27/5/2024**
Ratification by Management Executive (if appropriate)			
If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner			
Date: n/a			