NICE National Institute for Health and Care Excellence

NICE Pathways

Renal and ureteric stones overview

NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

http://pathways.nice.org.uk/pathways/renal-and-ureteric-stones
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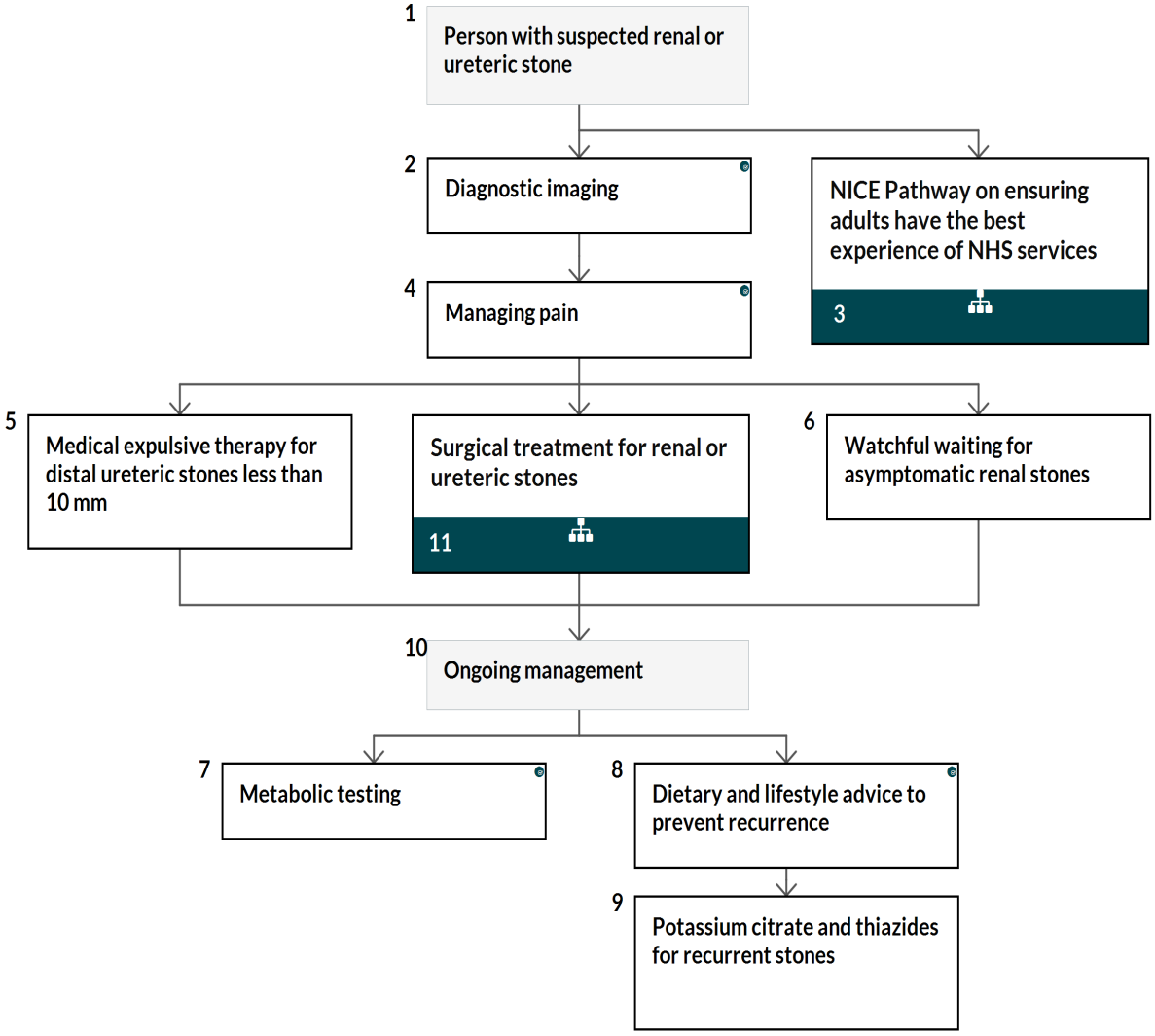
This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.



1 Person with suspected renal or ureteric stone

No additional information

2 Diagnostic imaging

Offer urgent (within 24 hours of presentation) low-dose non-contrast CT to adults with suspected renal colic. If a woman is pregnant, offer ultrasound instead of CT.

Offer urgent (within 24 hours of presentation) ultrasound as first-line imaging for children and young people with suspected renal colic.

If there is still uncertainty about the diagnosis of renal colic after ultrasound for children and young people, consider low-dose non-contrast CT.

Rationale and impact

See why we made the recommendations on diagnostic imaging and how they might affect practice [See page 9].

Medtech innovation briefing

NICE has published a medtech innovation briefing on StoneChecker for kidney stone evaluation.

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

1. Diagnostic imaging

3 NICE Pathway on ensuring adults have the best experience of NHS services

See Patient experience in adult NHS services

4 Managing pain

Offer an NSAID by any route as first-line treatment for adults, children and young people with suspected renal colic.

Offer intravenous paracetamol to adults, children and young people with suspected renal colic if NSAIDs are contraindicated or are not giving sufficient pain relief.

Consider opioids for adults, children and young people with suspected renal colic if both NSAIDs and intravenous paracetamol are contraindicated or are not giving sufficient pain relief.

Do not offer antispasmodics to adults, children and young people with suspected renal colic.

See the NICE Pathway on medicines optimisation.

NICE has published information for the public on renal and ureteric stones: assessment and management.

Rationale and impact

See why we made the recommendations on managing pain and how they might affect practice [See page 9].

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

2. Pain management

5 Medical expulsive therapy for distal ureteric stones less than 10 mm

Consider alpha blockers[1] for adults, children and young people with distal ureteric stones less than 10 mm.

Rationale and impact

See why we made the recommendation on medical expulsive therapy for distal ureteric stones less than 10 mm and how it might affect practice [See page 11].

[1] At the time of publication (December 2018), alpha blockers did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's prescribing guidance: prescribing unlicensed medicines for further information.

6 Watchful waiting for asymptomatic renal stones

Consider watchful waiting for asymptomatic renal stones in adults, children and young people if:

- the stone is less than 5 mm **or**
- the stone is larger than 5 mm and the person (or their family or carers, as appropriate) agrees to watchful waiting after an informed discussion of the possible risks and benefits.

Rationale and impact

See why we made the recommendations on watchful waiting for asymptomatic renal stones and how they might affect practice [See page 12].

7 Metabolic testing

Consider stone analysis for adults with ureteric or renal stones.

Measure serum calcium for adults with ureteric or renal stones.

Consider referring children and young people with ureteric or renal stones to a paediatric nephrologist or paediatric urologist with expertise in this area for assessment and metabolic investigations.

See diagnostic testing in primary care in the NICE Pathway on primary hyperparathyroidism.

Rationale and impact

See why we made the recommendations on metabolic testing and how they might affect practice [See page 13].

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

4. Metabolic testing

8 Dietary and lifestyle advice to prevent recurrence

Discuss diet and fluid intake with the person (and their family or carers, as appropriate), and advise:

- adults to drink 2.5 to 3 litres of water per day, and children and young people (depending on their age) 1 to 2 litres
- adding fresh lemon juice to drinking water
- avoiding carbonated drinks
- adults to have a daily salt intake of no more than 6 g, and children and young people (depending on their age) 2 to 6 g
- not restricting daily calcium intake, but maintaining a normal calcium intake of 700 to 1,200 mg for adults, and 350 to 1,000 mg per day for children and young people (depending on their age).

See maintaining a healthy weight and preventing excess weight gain in the NICE Pathway on obesity.

Rationale and impact

See why we made the recommendations on dietary and lifestyle advice to prevent recurrence and how they might affect practice [See page 14].

Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

5. Dietary advice

9 Potassium citrate and thiazides for recurrent stones

Potassium citrate

Consider potassium citrate[1] for adults with a recurrence of stones that are predominantly (more than 50%) calcium oxalate.

Consider potassium citrate for children and young people with a recurrence of stones that are predominantly (more than 50%) calcium oxalate, and with hypercalciuria or hypocitraturia.

Thiazides

Consider thiazides[1] for adults with a recurrence of stones that are predominantly (more than 50%) calcium oxalate and hypercalciuria, after restricting their sodium intake to no more than 6 g a day.

Rationale and impact

See why we made the recommendations on potassium citrate and thiazides for recurrent stones and how they might affect practice [See page 15].

10 Ongoing management

No additional information

11 Surgical treatment for renal or ureteric stones

See Renal and ureteric stones / Surgical treatment for renal or ureteric stones

[1] At the time of publication (December 2018), potassium citrate did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's prescribing guidance: prescribing unlicensed medicines for further information.

[1] At the time of publication (December 2018), thiazides did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's prescribing guidance: prescribing unlicensed medicines for further information.

Rationale and impact: diagnostic imaging

Rationale

Limited evidence showed that MRI, ultrasound and plain abdominal radiograph were not as good as non-contrast CT for detecting renal and ureteric stones in adults. CT is more expensive than ultrasound or plain abdominal radiograph but the extra cost is likely to be outweighed by avoiding additional investigations when a first test misses the diagnosis. The committee agreed that CT should be performed as soon as possible because renal function can decline quickly. However, they acknowledged that it could be delayed for up to 24 hours if needed (for example, in some locations and when first presentation is out of hours). The committee agreed that CT should not be offered to everyone with abdominal pain, only those with suspected renal colic. They also noted that CT should not be used for pregnant women because of the radiation exposure, and agreed that ultrasound is the preferred imaging modality in this group.

Limited evidence on the use of ultrasound showed that it was not as good as CT for detecting renal and ureteric stones in children and young people. There is known to be widespread variation in the quality of ultrasound. The committee acknowledged that although CT is a better test, there is serious concern about radiation exposure in children and young people and they were keen to minimise this. They agreed that ultrasound should be offered first, and that low-dose non-contrast CT should only be considered if there is still uncertainty about the diagnosis after ultrasound.

Impact

The recommendation reflects current practice so the committee agreed there should be no change.

For more information see the evidence review on imaging for diagnosis in the NICE guideline on renal and ureteric stones.

Rationale and impact: managing pain

Rationale

Evidence showed that non-steroidal anti-inflammatory drugs (NSAIDs) reduced the need for rescue medication compared with opioids, antispasmodics and intravenous paracetamol. NSAIDs also reduced pain and had fewer adverse effects. NSAIDs had a better balance of

benefits and costs, so the committee agreed that these should be offered as a first-line treatment for people with suspected renal colic.

The committee discussed the route of administration for NSAIDs and noted that most studies used intravenous or intramuscular NSAIDs. They agreed that oral or rectal NSAIDs are more commonly used in UK practice. The committee were concerned that there was very little evidence that oral or rectal NSAIDs were as effective as intravenous or intramuscular NSAIDs, and were reluctant to recommend a significant change in practice that would have resource implications. Therefore, they were not able to specify a particular route of administration of NSAIDs, but did agree to make a research recommendation on route of administration to inform future practice.

Some evidence showed a benefit of paracetamol for pain relief when compared with opioids. The committee noted that most of the evidence was based on intravenous paracetamol, which differs from other routes of administration in terms of potency and speed of action. They agreed this benefit could not be generalised to other routes of administration, such as oral. This difference in mechanism of action was not believed to be as strong for other drugs such as NSAIDs. They recommended that intravenous paracetamol should be offered if NSAIDs cannot be used or have not been effective.

There was no benefit of opioids for pain relief over NSAIDs or paracetamol. The committee noted concerns around opioid use in terms of dependency and misuse. However, opioids showed a benefit compared with antispasmodics in terms of pain relief, and there was no difference between opioids and most comparators in terms of adverse events. The committee agreed that opioids could only be considered if both NSAIDs and intravenous paracetamol were contraindicated or not effective.

Antispasmodics offered no benefit in terms of pain relief when compared with NSAIDs. The committee also highlighted that in the studies antispasmodics were given intravenously, whereas in clinical practice an oral route is often used. The committee discussed how antispasmodics can be more difficult to administer intravenously, because of an increased risk of adverse events and a need for intensive monitoring. They agreed that antispasmodics should not be offered to people with suspected renal colic.

Very limited evidence from small single studies showed some benefit of a combination of NSAIDs and oral paracetamol, for pain relief, and no increase in adverse events. The committee noted that in practice 2 drugs would not be given at the same time, but a second would usually be given in a staged manner if the first drug hadn't worked. They noted that

people with recurrent stones may self-manage with both oral paracetamol and NSAIDs and so it is important to ask people presenting with suspected renal colic about previous analgesia use. Overall, they agreed that there was not enough convincing evidence for any of the combination treatments.

All the identified evidence was for adults with renal or ureteric stones. However, the committee agreed that it would be reasonable to extrapolate the evidence on pain relief to children and young people and to include this age group in the recommendations.

Impact

Currently, intravenous paracetamol is not used routinely for managing pain in people with acute renal colic, but is used in other areas of secondary care (for example, analgesia during surgery). Extending its use into other clinical areas (for example, emergency departments and surgical assessment units) will mean changes in policy and additional training for staff. Therefore this recommendation will require a change from current practice by most or all providers. The use of intravenous paracetamol may also have some implications for practice if more hospital attendances are required to administer the treatment.

For more information see the evidence review on pain management in the NICE guideline on renal and ureteric stones.

Rationale and impact: medical expulsive therapy

Rationale

Evidence showed that in adults, both alpha blockers and calcium channel blockers improved passage of distal ureteric stones of less than 10 mm compared with no treatment. Alpha blockers also improved stone passage when compared with placebo. Alpha blockers offered more benefit than calcium channel blockers in terms of stone passage, and had some benefits in terms of hospital stay and pain, but there was no difference in time to stone passage and quality of life. Evidence was mixed in terms of adverse events. The committee agreed that alpha blockers could be considered for adults with small (less than 10 mm) distal ureteric stones.

Limited evidence in children showed that alpha blockers improved stone passage and time to stone passage, and decreased pain compared with no treatment or placebo. They were not associated with any more adverse events so the committee agreed that alpha blockers could be considered for children and young people with distal ureteric stones less than 10 mm.

There was not enough evidence for the committee to make recommendations for proximal or mid-ureteric stones in adults, children and young people.

Medical expulsive therapy (MET) is low cost, and the savings from interventions avoided because of this therapy are likely to offset the cost of the therapy.

Impact

Current practice is varied, but many healthcare professionals do not offer alpha blockers for managing symptomatic ureteric stones. Up to 2015, MET was recommended practice in the UK to aid the passage of small ureteric stones. This changed after the SUSPEND trial (Pickard et al. 2015), the largest randomised controlled trial on this subject, concluded that there was no benefit in using alpha blockers.

The committee reviewed all the available evidence, some of which was more recent than the SUSPEND trial, and agreed that alpha blockers can help the passage of small ureteric stones and the management of pain.

For more information see the evidence review on medical expulsive therapy in the NICE guideline on renal and ureteric stones.

Rationale and impact: watchful waiting for people with asymptomatic renal stones

Rationale

The committee noted that in current practice, watchful waiting may be used for people with asymptomatic renal stones, because these stones are not likely to affect quality of life and may pass spontaneously without intervention. This is particularly the case for stones less than 5 mm, but may also apply to larger stones. The committee noted that larger stones are more likely to have risks associated with watchful waiting. For example, the stone's location may change and cause obstruction, there may be infection or bleeding, or the person may become symptomatic. The committee agreed that watchful waiting may be particularly beneficial for people with complex comorbidities that make surgery a higher risk. They agreed that watchful waiting should be considered for those with asymptomatic renal stones less than 5 mm, and for stones larger than 5 mm as long as the possible risks and benefits have been discussed with the patient.

Impact

The recommendations reflect current practice.

For more information see the evidence review on stenting before surgery in the NICE guideline on renal and ureteric stones.

Rationale and impact: metabolic testing

Rationale

Stone analysis and blood testing (serum calcium) allows the diagnosis of treatable conditions such as cystinuria, uric acid stones and primary hyperparathyroidism. Urine testing allows for the identification of metabolic abnormalities that can be treated, and so reduces the risk of future stones.

Evidence showed that there is effective treatment for hypercalciuria and hypocitraturia, and the committee noted that these conditions would be diagnosed with a 24-hour urine test. This suggests that understanding underlying metabolic diseases can lead to prevention of stone recurrence. However, no evidence for 24-hour urine testing was identified, so the committee agreed that they could not make a practice recommendation. They agreed to make a research recommendation on the clinical and cost effectiveness of a full metabolic investigation to inform future guidance.

No evidence was found on stone analysis or blood tests in people who have or have had renal or ureteric stones. It is not clear which tests are most useful and whether tests should be offered to all people with a stone or just those at high risk of stone recurrence. However, the committee also considered the high prevalence of primary hyperparathyroidism in people with renal stones and noted that this could be identified with serum calcium testing, which is an inexpensive test. Therefore, the committee agreed that serum calcium should be measured for adults and stone analysis considered.

The committee agreed that current practice for children and young people is variable. All paediatric patients should have a metabolic assessment. The nature of this assessment varies nationally. Referral to a paediatric nephrologist or urologist with expertise in testing for metabolic conditions should be considered.

Impact

Current practice is varied with a full range of metabolic tests being done in some areas and fewer tests in others. Therefore, the recommendations may mean a change in practice for some providers. However, the committee agreed that existing centres should have the resources to cope with an increased demand for stone analysis, which is relatively easy to do and is not urgent.

For more information see the evidence review on metabolic investigations in the NICE guideline on renal and ureteric stones.

Rationale and impact: dietary and lifestyle advice

Rationale

Some evidence showed a benefit of a high water intake in reducing stone recurrence in adults. Limited evidence from a single study in adults showed a benefit of lemon juice in terms of urine calcium and pH but no difference in urine oxalate. Lemon juice is high in citrate leading to higher concentrations of citrate in urine. This may stop calcium from binding to other stone constituents and so prevent stone formation and recurrence. The committee agreed to recommend a high water intake and the addition of lemon juice to water. Evidence showed a benefit of avoiding carbonated drinks in terms of stone recurrence, and so the committee agreed to recommend that these should be avoided.

Evidence on diet was mixed but the committee agreed that a normal calcium intake and a low salt intake may help to prevent stone recurrence. Evidence on avoiding a high protein diet was inconclusive, but the committee acknowledged that this is the advice currently given.

Impact

The recommendations on diet broadly reflect current practice. They emphasise the importance of dietary advice in preventing further stone episodes. Dietary advice should be given in conjunction with lifestyle advice.

For more information see the evidence review on dietary interventions in the NICE guideline on renal and ureteric stones.

Rationale and impact: potassium citrate and thiazides for recurrent stones

Rationale

Potassium citrate

Evidence showed that potassium citrate could reduce the recurrence of calcium oxalate and calcium oxalate/calcium phosphate stones in adults. However, there were adverse events associated with the use of potassium citrate and the committee agreed that there may be concerns about high levels of potassium in the blood (hyperkalaemia) in some groups. Despite this, the committee agreed that the benefits in terms of stones avoided are likely to outweigh any harms. Potassium citrate is currently used in UK practice and so the committee agreed it could be considered to prevent stone recurrence in adults with calcium oxalate stones.

Limited evidence in children showed that potassium citrate reduced stone recurrence after PCNL and SWL. There was no information on adverse events or on the type of stone or results of urine testing. The committee noted that in UK practice, potassium citrate is used for children based on the levels of calcium or citrate in urine. They agreed that it could be considered for children with recurrence of calcium oxalate stones and with hypercalciuria or hypocitraturia.

Thiazides

Limited evidence showed that thiazides reduced stone recurrence in adults with high levels of calcium in urine (hypercalciuria) compared with no intervention. There was no benefit for adults with normal levels of urinary calcium, and evidence was mixed when the biochemical abnormality was mixed or not defined. The committee agreed that thiazides tend to be well tolerated but should only be used after salt has been restricted. They agreed that thiazides could be considered for adults with hypercalciuria and recurrent calcium oxalate stones, but only after reducing salt intake to recommended levels.

There was not enough evidence for the committee to make recommendations on allopurinol or combined therapy of allopurinol and thiazides. Although limited evidence suggested a potential benefit of magnesium, the committee knew from their experience that magnesium may cause adverse effects. The committee agreed that the limited evidence and potential for adverse events did not justify a recommendation.

Limited evidence from a single study of thiazides compared with placebo in people who had had previous SWL showed some benefit of thiazides in reducing the need for further SWL and for

stone growth. The committee agreed that this is not usual practice and that further research would be beneficial.

Impact

The committee considered the impact the recommendations would have on practice, including metabolic laboratory testing. Identifying stone composition or metabolic abnormalities would be a prerequisite to the recommendations and this would have a cost as well as potential service impact.

Recommending the interventions also has a monitoring impact. There is variation in current practice in terms of the use of thiazides and potassium citrate for people with renal or ureteric stones.

For more information see the evidence review on dietary interventions in the NICE guideline on renal and ureteric stones.

Glossary

NSAID

non-steroidal anti-inflammatory drug

Sources

Renal and ureteric stones: assessment and management (2019) NICE guideline NG118

Your responsibility

Guidelines

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility

to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Technology appraisals

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, health professionals are expected to take these recommendations fully into account, alongside the individual needs, preferences and values of their patients. The application of the recommendations in this interactive flowchart is at the discretion of health professionals and their individual patients and do not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Commissioners and/or providers have a responsibility to provide the funding required to enable the recommendations to be applied when individual health professionals and their patients wish to use it, in accordance with the NHS Constitution. They should do so in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Medical technologies guidance, diagnostics guidance and interventional procedures

guidance

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take these recommendations fully into account. However, the interactive flowchart does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the recommendations, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this interactive flowchart should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.