

## DIAGNOSIS IN GENERAL PRACTICE

### Diagnostic strategies used in primary care

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The strategies used by general practitioners in making a diagnosis are being formally recognised; this article is the first in a series that will illustrate their application, and is accompanied by a case study (p 1006)

A clinician's ability to diagnose accurately is central in assessing prognosis and prescribing effective treatments. However, the strategies clinicians use to arrive at a diagnosis, particularly in primary care, make only a small contribution to current research and the medical curriculum.<sup>1</sup> Seminal research in the 1970s showed that the commonly taught sequential approach to history taking and examination, resulting in differential diagnosis and ultimately a final diagnosis, is not what practitioners do in reality.<sup>2,3</sup> Researchers observed that diagnostic hypotheses are made early in the consultation and guide subsequent history and examination, in a process of hypothetico-deductive reasoning.<sup>2</sup> This work sparked debate about our understanding of the complex strategies used in diagnostic reasoning,<sup>4,5</sup> but most work has been done away from the clinical setting.

This series of articles aims to set out the strategies and methods that are used by general practitioners (GPs) in routine clinical consultations. To check that these strategies were actually used in practice, we conducted a pilot of diagnostic consultations from our own practices (box).

#### Stages in reaching a diagnosis

We found that diagnostic reasoning can be split into a three stage model: initiation of diagnostic hypotheses; refinement of the diagnostic hypotheses; and defining the final diagnosis (fig 1). Different strategies are used in each stage. For example, the initial complaint, "spot" diagnosis (initial response), or pattern may trigger the possible diagnoses (hypotheses); then, specific elements of history or examination are elicited to rule in or rule out competing possibilities; finally, one or several strategies may be used to confirm the final diagnosis—for example, trial of treatment, test of time, or a definitive test.

More than one element may be considered during each stage. For instance, some rashes can be diagnosed with a visual spot diagnosis, while for others, spot diagnosis may be part of an overall pattern recognition

strategy with probabilistic reasoning—for example, a characteristic chicken pox rash in a child with a fever. In addition, for some diagnoses a high level of certainty at the initiation stage may lead straight to a final known diagnosis, missing out the refinement step—for example, diagnosing simple acne.

#### Strategies in the initiation stage

The first trigger for a diagnosis usually occurs early in the consultation.<sup>3</sup> We identified four possible strategies: spot diagnosis, self labelling, the presenting complaint, and pattern recognition trigger (fig 2).

"Spot" diagnosis arises from an unconscious recognition of a particular non-verbal pattern, usually visual (dermatological condition such as acne) or auditory (a barking cough). The spot diagnosis is almost instantaneous, relies on previous non-verbal experience of the condition, and does not require further history from the patient to trigger the possible diagnosis. Many consider a spot diagnoses as basically pattern recognition, and Sackett et al referred to spot diagnosis as the "Auntie Minnie" phenomenon: instant recognition of a relative, so that a stranger is not greeted by a hearty slap on the back.<sup>7</sup> It seems that the main determinant in the use of spot diagnosis is clinical experience with a given condition.<sup>8,9</sup> Examples in our series included eczema, moles, acne, molluscum, and infective conjunctivitis. Spot diagnosis was used in about 20% of cases, and, for 63% of these, no further diagnostic strategy was used.

*Self labelling*—The patient may tell you what they perceive to be the diagnosis. This may or may not be correct, and is often based on their own or an acquaintance's previous experience of a problem, but it immediately directs subsequent refinement of the diagnosis. An example in our series was "I have tonsillitis." In some conditions, but not all, self labelling can be accurate: a study of women with recurrent urinary tract infection showed that 84% of new infections (confirmed by culture) were correctly self diagnosed.<sup>10</sup> In our prospective evaluation, cases such as gout and chest infection were mislabelled by patients.

*Presenting complaint* (for instance, "I have abdominal pain" or "I have a headache") was used most often by our GPs (fig 2), and traditional textbooks and teaching recognise this step at the outset of the consultation.

*Pattern recognition trigger*—Elements in the history or examination, or both (sometimes related to the

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**Identifying and refining diagnostic strategies used in general practice**

We conducted two sessions of group discussion and a prospective evaluation of these strategies during primary care consultations.

In the pilot phase, a focus group composed of GPs and researchers in primary health care identified several possible diagnostic strategies, based on consensus opinion and the published literature. Use of these strategies was assessed in a consecutive series of 100 patients presenting with a new condition to one GP (CH). Strategies were recorded on a spreadsheet at the end of each consultation. The group of GPs then discussed these pilot results, and revised and refined the set of strategies.

We revised the data collection sheet and asked six GPs to record their diagnostic strategies for 50 new patients at the end of each consultation. The GPs were two partners (27 and 16 years' clinical experience), two registrars (8 and 4 years' experience), one part time assistant (29 years' experience), and one locum (7 years' experience). At a final focus session, the six GPs and one statistician reviewed data from these 300 consultations, using a consensus development approach,<sup>6</sup> and clarified definitions used for the diagnostic strategies.

presenting complaint) may trigger the hypothesis. For example, thirst, feeling unwell, and looking unwell in an adolescent triggers the possibility of type 1 diabetes.

**Strategies in the refinement stage**

Once the initial possible diagnoses are formed, other strategies are used to narrow the possibilities. These strategies are not mutually exclusive. We found that five strategies were used in the refinement stage: restricted rule out process, stepwise refinement, probabilistic reasoning, pattern fit, and clinical prediction rule (fig 3).

*Restricted rule outs*—also called Murtagh's process.<sup>11</sup> This diagnostic strategy depends on learning the most common cause of the presenting problem (the "probability diagnosis") and a shortlist of serious diagnoses which must be ruled out. For instance, in headache the common causes are tension-type headache and migraine, but malignant hypertension, temporal arteritis, and subarachnoid haemorrhage must routinely be ruled out, even if these diagnoses have not been triggered by the presentation. This strategy is aimed at preventing errors in clinical practice.<sup>12</sup>

*Stepwise refinement* is based on either the anatomical location of the problem or the putative underlying pathological process. Arm pain might be further refined to the wrist and then to the radial side of the wrist, for example

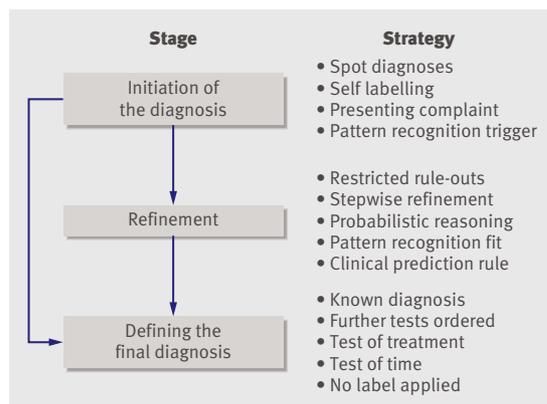


Fig 1 | Stages and strategies in arriving at a diagnosis

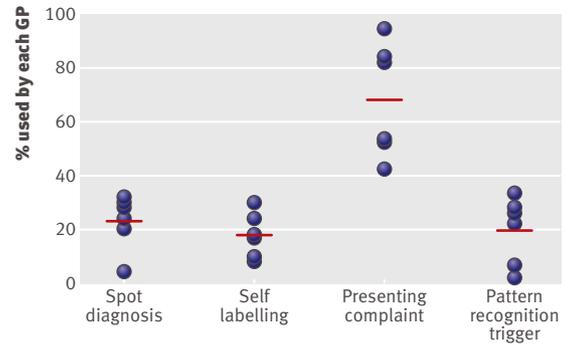


Fig 2 | Strategies used by general practitioners in making an initial diagnosis. Bars indicate means

in diagnosing deQuervain's tenosynovitis. An example of refinement based on the underlying disease is deciding whether conjunctivitis is allergic or infectious.

*Probabilistic reasoning* is the specific but probably imperfect use of symptoms, signs, or diagnostic tests to rule in or rule out a diagnosis. Probabilistic reasoning requires knowing the degree to which a positive or negative result of a test adjusts the probability of a given disease.<sup>13</sup> Examples include the examination of the temporal artery in the diagnosis of temporal arteritis, use of urinary dipstick in urinary tract infections, and use of electrocardiograms in the assessment of chest pain.

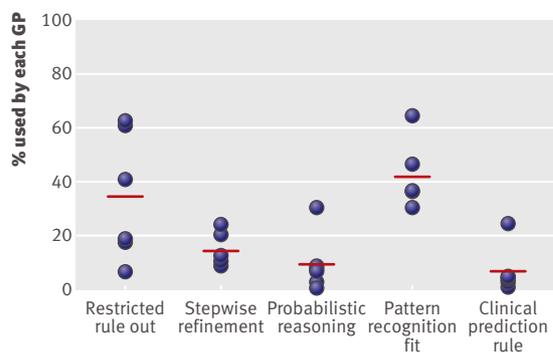
*Pattern recognition fit*—symptoms and signs are compared with previous patterns or cases, and a disease is recognised when the actual pattern fits. This is the refinement strategy most commonly used by GPs (fig 2). Its use relies on memory of known patterns, but no specific rule is used. Some conditions may have various patterns—for example, acute myocardial infarction.

*Clinical prediction rule* is a formal version of pattern recognition based on a well defined and widely validated series of similar cases. The GPs used the Ottawa ankle rules,<sup>14</sup> streptococcal sore throat rules,<sup>15</sup> ABCD score for stroke risk,<sup>16</sup> HAD score for depression,<sup>17</sup> Wells rule for deep vein thrombosis,<sup>18</sup> and chest infection rules.<sup>19,20</sup> Which rules are useful and how they can best be used in practice remains an important unanswered question.

**Strategies in the final definition stage**

Less than 50% of cases resulted in the certainty of a "known diagnosis" without further testing. Thus GPs use other strategies in the final stage of diagnosis, including ordering further tests, test of treatment, and test of time. In some cases the final diagnosis could not be given a label (fig 4).

*Known diagnosis*—a sufficient level of certainty of the diagnosis to start appropriate treatment or to rule out serious disease without further testing—for example, viral upper respiratory infection, acne, or a wart. The level of certainty required by a GP may differ from that in a hospital consultation. For example, a GP's job is to suspect an acute coronary event, and start appropriate treatment and referral, whereas in hospital the diagnosis relies on the precise classification of acute coronary syndrome for appropriate management.<sup>21</sup> Sometimes it is not practical to diagnose a specific microbiological or



**Fig 3** | Strategies used by general practitioners in refining a diagnosis. Bars indicate means

pathological cause. For example, conjunctivitis requires culture and polymerase chain reaction to identify the infective agent in 80% of children; however, this does not affect clinical management, and GPs are adept at identifying acute infective conjunctivitis, differentiating it from other causes of red eye, and initiating appropriate management.<sup>22</sup>

*Ordering further tests*—a standard test can sometimes be used to rule in or rule out the disease—for example, mid-stream urine (MSU) in urinary tract infection. In addition, further tests were used in response to “red flags” and when the diagnoses did not fit any obvious pattern of disease.

*Test of treatment*—when the diagnosis is uncertain, the response to treatment is often used to refute or confirm it. Examples included the use of inhalers in nocturnal cough.

*Test of time*—the course of the disease is used to predict when a person should be better or worse; a “wait and see” strategy allows the diagnosis to become more obvious. For example, in a patient with abdominal pain, diarrhoea, and no red flags, and who is diagnosed as having viral gastroenteritis, most GPs would wait one or two weeks before considering other disease or testing.

*No label applied*—where no diagnostic label could be assigned to the patient, presentations were often vague and didn't fit a recognisable pattern. Various strategies can be used: recalling the patient for further review, using an exploratory investigation, sharing uncertainty with the patient, or referral to secondary care for a second opinion.

#### Positive red flag

Red flags are specific symptoms or signs that may be volunteered by the patient (central crushing chest pain, for example) or may need to be elicited in the history or examination to rule out a serious condition (for example, checking for neck stiffness in a patient with headache to rule out meningitis). If the symptom or sign cannot be ruled out, it triggers action, which can range from a more detailed physical examination to hospital referral.

#### Discussion

We have illustrated the strategies that a sample of GPs used in their clinical consultations. GPs agreed on the stages and the strategies used, but how they used them

differed. For instance, one GP used clinical prediction rules for common cases such as chest infection<sup>19,20</sup> and sore throat<sup>15</sup>; others used them in rarer, more serious conditions seen in primary care, such as deep vein thrombosis.<sup>18</sup>

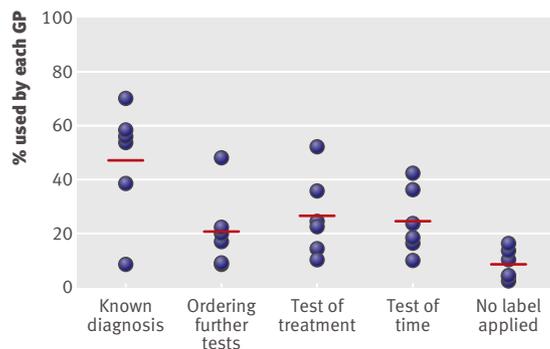
Murtagh's restricted rule out process proved the most controversial of the definitions. Some GPs used a cognitive forcing strategy, whereby plausible alternative diagnoses were not considered once a diagnosis had been reached (a common cause of diagnostic error).<sup>23</sup> Others were unaware of or avoided this strategy.

Few GPs formally recognised their use of probabilistic reasoning. This is in line with previous studies which indicate most practising physicians do not use formal recommended quantitative methods.<sup>24</sup> For the final diagnosis, tests of treatment and time were used on average for a quarter of consultations, despite there being a poor evidence base informing this process.

The data we present have limitations: we cannot tell whether the difference in the use of strategies results from the case mix or the doctors. Both probably are a factor, with cases varying more than the individual GP's use of a given strategy. In addition, selective bias in the reporting of strategies may result from using the collection sheets and recall. During consultations the GPs tended to record the main problem only, leading to a selective under-reporting of secondary problems.<sup>25</sup> Thus the doctors in our study may have under-reported using a second or third strategy.

None of the diagnostic strategies discussed here is new. What is new is the formal recognition of these strategies in the stages of making a diagnosis and how commonly they are used in primary care. Expertise in diagnosis is not a matter of acquiring an all-inclusive reasoning strategy, as several strategies may lead to the same diagnosis. The recognition of the strategies in all medical practice should encourage the use of experience to guide our search for the correct diagnosis.<sup>26</sup> Throughout this series we will illustrate the principles presented here with a number of clinical presentations, expanding on the reasoning and the justification for these diagnostic strategies.

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**Fig 4** | Strategies used by general practitioners in defining the diagnosis. Bars indicate means

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## DIAGNOSIS IN GENERAL PRACTICE

# Excluding serious illness in feverish children in primary care: restricted rule-out method for diagnosis

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Two children presenting to general practice with fever show how general practitioners use restricted rule-out, one of the strategies to make a diagnosis set out by Heneghan and colleagues (p 1003)

### Case scenarios

Consider two common scenarios in primary care.

**Child 1:** A mother calls the out of hours service in the early evening about her 3 year old son. He was seen earlier in the week with cough and runny nose, and the general practitioner (GP) diagnosed an upper respiratory tract infection. He has been getting more miserable and irritable, is lying on the sofa reluctant to move, looks “washed out,” and has a fever. His mother is worried: “Could it be meningitis, doctor?”

**Child 2:** A 2 year old girl is brought to your morning surgery with a history of a fever that started during the night. You have already seen several children this morning with a non-specific but seemingly mild viral illness.

### The diagnostic dilemma

The list of possible diagnoses for febrile children seen in primary care is long. Identifying children who may have a serious illness can be difficult and is at the heart of decisions to prescribe, investigate, and refer to hospital. Serious infections (including pneumonia, meningitis, septicaemia, appendicitis) account for less than 1% of children presenting to primary care,<sup>12</sup> yet they are leading causes of morbidity and mortality in children. One of the key challenges for primary care practitioners is trying to balance the risk of missing a serious disease against unnecessary investigation or referral. The diagnostic process hinges on the need to rule out (exclude) serious illnesses.

### The diagnostic approach: the restricted rule-out

Many doctors come to use some variant of the restricted rule-out method, which recognises that we cannot rule out all of the alternative diagnoses for each presenting complaint, but that there is a short list of serious ones that we absolutely must rule out. The method involves constructing a limited list of serious diagnoses to be ruled out, in addition to constructing a conventional

**Box 1: Early “red flags” for meningococcal disease**

**Lethargy**—most patients with meningococcal disease will be drowsy or unusually lethargic

**Confusion**—nearly half of older children and adults will be acutely confused

**Headache**—less than half of children overall will have headache, but this symptom is more common in older children and adults<sup>4-17</sup>

**Leg pain** occurs in approximately one third of preschool age children and up to two thirds of older children and young adults with meningococcal disease.<sup>4,18</sup> These pains are often so severe that the patient is reluctant to move or walk

**Cold hands or feet**—peripheral perfusion may be impaired; about half of children will have cold hands and feet (even though they have a fever), and about a fifth will have abnormal skin colour, such as pallor or cyanosis<sup>4</sup>

list of the most likely differential diagnoses.<sup>3</sup> This process utilises features from the history, examination, and investigations.

In the above scenarios of children with febrile illness, consider the processes that GPs use to exclude a rare yet serious illness such as meningococcal disease. Although imperative to rule out, this condition is difficult to diagnose at an early stage as it starts with non-specific clinical features before progressing rapidly to invasive disease.<sup>4,5</sup> Accordingly, about half of children with meningococcal disease do not receive an accurate diagnosis at first consultation in primary care,<sup>4,6,7</sup> and complications and mortality rates are lower if meningococcal disease can be recognised and treated expeditiously.<sup>7,8</sup>

**History**

The history provides the initial critical information to build up a mental list of possible diagnoses, and establishes whether serious infections are considered. The evolution of the symptoms may help identify disease—for example, Child 1’s recent history of sore throat and runny nose might help to rule out meningococcal disease, whereas unusual or possible “red flag” symptoms (such as a rash or laboured breathing) could suggest serious infection. The speed of onset of illness can be helpful: meningococcal disease, for example, progresses rapidly—nearly 90% of children with it are admitted to hospital 24-48 hours after onset of symptoms.<sup>4</sup> The long history of illness of Child 1 makes meningococcal disease less likely (although pneumonia often presents over several days, and other forms of bacterial meningitis can develop over a couple of days). The short illness in Child 2 is of concern, or it could simply indicate an “overly concerned” parent. Previous consulting behaviour and eliciting particular concerns from the parent about this illness being “different from others” can be important.<sup>9</sup>

**Overall assessment of severity of illness**

Observing the overall or “global” appearance of the child from the moment he or she enters the consultation room can alert us to the possibility of severe illness. A

survey of GPs reported that the features that they use most often to assess overall severity of illness are related to the child’s activity or behaviour.<sup>10</sup> These included level of alertness, response to social interaction (including eye contact or engaging with the doctor), and interest in their surroundings, such as playing or moving around the consultation room. Other helpful features in this initial assessment include skin colour (pallid, mottled, blotchy, cyanosed), temperature, respiratory rate, increased work of breathing, hydration, and peripheral circulation (such as capillary refill time, cold extremities, heart rate).<sup>4,5,10</sup> These features should prompt a more comprehensive assessment to search for specific features of serious infections. Absence of these features is not sensitive enough to exclude serious infection. When Child 1 is reviewed at the evening out of hours surgery, he walks into the examination room and immediately heads for the toy box, smiling occasionally—indications that serious infection is less likely. Child 2 is carried in by her parent, does not look at you, and seems less alert than usual, observations that raise the possibility of serious illness and the need to try to exclude this.

**Localising features**

Depending on findings during the first two stages, primary care practitioners will check for localising features of both serious and minor infections. In the early stages most patients with meningococcal disease have non-specific symptoms: fever, nausea, vomiting, decreased appetite, being miserable or lethargic.<sup>4,5,11,12</sup> It is difficult to exclude or confirm the presence of serious infection on the basis of these early clinical features. In general, rule-in features are missing for most diseases and typically we focus on rule-out features—for example the absence of tachypnoea in children presenting with respiratory symptoms largely excludes a diagnosis of pneumonia.<sup>13</sup> When no features in the history and overall assessment give concern, the search for an inflamed eardrum or chickenpox rash may be all that is needed. Child 2 presents with features in the history and initial assessment that could cause concern, and needs a more detailed assessment before serious illness can be ruled out.

**Early markers of possible meningococcal disease**

What can the primary care practitioner do at this stage to rule out serious infection? One aspect to consider is the speed with which the illness is evolving. As we mentioned previously, meningococcal disease progresses very rapidly, whereas typical upper respiratory tract infections can linger for 1-2 weeks. In addition it is worth looking for the early “red flag” features of meningococcal disease such as leg pain, confusion, cold extremities (box 1).<sup>4,14,15</sup> These are clinical features that primary care practitioners might consider as uncommon in self limiting infections, so may have some value at discriminating them from meningococcal disease.

**Classic features**

The classic “red flag” features of meningococcal disease such as neck stiffness, photophobia, and haemorrhagic rash are more common later in the clinical

**Box 2: Pitfalls in the classic features of meningococcal disease**

Non-blanching rash, most commonly haemorrhagic (including petechial or larger purpuric or ecchymotic lesions)

- Most patients with meningococcal disease develop a rash at some point in their illness, but in the early stages of the disease, the rash may be absent or may be a blanching macular or papular rash<sup>19</sup>
- Haemorrhagic lesions may be missed if they are sparse or in dark skinned patients, so it may be worth while to look in areas of pressure or the conjunctivae
- In primary care, petechiae are only rarely caused by meningococcal disease—most will have minor or self limiting causes<sup>20</sup>

**Photophobia**

- This is not common in children, occurring in only a quarter

**Fever, neck stiffness, and altered mental state in adults**

- All three symptoms occur in only 44-46% of those with bacterial meningitis (including meningococcal meningitis), although 95% will have at least two of these three<sup>16,17</sup>

## LEARNING POINTS

The restricted rule-out approach to diagnosis recognises that it is difficult for clinicians to rule out all alternative diagnoses for each presenting complaint

For any clinical presentation, a short list of rare serious diagnoses usually must be ruled out, as must a list of more common but less critical diagnoses, so thinking explicitly about serious diagnoses (and, for any plausible ones, checking for rule-out clinical features) and safety netting (explaining features to watch for, an appropriate timeframe for re-consultation, and how to access care), may be the best protection.

The case study of children presenting with febrile illness shows how primary care practitioners may rule out serious infections such as meningococcal disease by using clinical assessment and investigations and being aware of discriminatory factors such as the relative frequency and time course of clinical features in serious disease

course.<sup>4,5,11,12,14,16,17</sup> They are less common in younger children and infants, at least in the prehospital course of illness.<sup>4-15</sup> When they are present, they are helpful to rule in possible meningococcal disease—but even then, they are not highly specific in isolation: for example, only a small proportion of children presenting with petechial rash will have septicaemia.

When these features are absent it is difficult to be sure whether meningococcal disease is absent, or the symptom simply has not developed yet in the course of the evolving infection. Box 2 outlines some of the pitfalls of trying to use these features to rule out meningococcal disease.

#### The effect of age

Infants (under 1 year old) with meningococcal disease are more likely to present with non-specific features, such as cold hands and feet, an abnormal skin colour, or breathing difficulty rather than signs of meningeal irritation.<sup>4</sup> Preschool children (1-4 years old) also have non-specific features of infection, but nearly one third will have leg pain or neck stiffness, half will have cold hands and feet, and just under half will be confused. The presentation in older children and teenagers tends to be more similar to that of adults, who usually have a combination of headache, neck stiffness, or an altered mental state.<sup>4-17</sup>

#### Safety netting

The restricted rule-out process depends on being aware of the relative frequency and time course of clinical features in the serious diseases which need to be ruled out. Unfortunately, this process is not 100% sensitive; inevitably, some serious illnesses will be incorrectly ruled out (or not even considered) at an initial consultation. Specific advice for parents about which clinical features to look out for, an appropriate time-line for reconsultation, and information about how to access care are important components of safety netting.

#### Case review

At consultation, Child 1 appears generally well and playful, with no increased work of breathing or tachypnoea. The most likely diagnosis is a persisting upper respiratory tract infection, and the out of hours GP considers that pneumonia or meningitis should be ruled out. Focused examination confirms typical signs of an upper respiratory tract infection and no features that give concern, ruling out serious infections. Exploring the parents'

concerns and safety netting, with explanation of the clinical course of upper respiratory tract infections and what to watch for at home, are all that is needed.

Child 2 has a high temperature and seems withdrawn and much less alert than usual. She does not have a rash, difficulty breathing, or any obvious focus of infection on examination. Dip stick urine testing is negative and probably excludes urinary infection, but the GP is unable to rule out serious infection, which in this child would include meningococcal disease. The child is referred urgently to the paediatric team for assessment, and she is admitted to hospital for further investigation.

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## GUIDELINES

## Diarrhoea and vomiting caused by gastroenteritis in children under 5 years: summary of NICE guidance

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## Why read this summary?

Gastroenteritis is common, with many children having more than one episode a year. The characteristic symptoms—sudden onset of diarrhoea with or without vomiting—are unpleasant and affect both the child and family or carers. Although the illness usually resolves without treatment and can be managed in the community, many children are admitted to hospital each year.<sup>1,2</sup> In the absence of national guidance, clinical practice is thought to vary considerably across the United Kingdom, with a major effect on the use of healthcare resources.<sup>3</sup> This article summarises the most recent recommendations from the National Institute for Health and Clinical Excellence (NICE) on the diagnosis, assessment, and management of diarrhoea and vomiting caused by gastroenteritis in children under 5 years.<sup>4</sup>

## Recommendations

NICE recommendations are based on systematic reviews of best available evidence. When minimal evidence is available, recommendations are based on the Guideline Development Group's opinion of what constitutes good practice. Evidence levels for the recommendations are in the full version on [bmj.com](http://bmj.com).

## Diagnosis

## Clinical diagnosis

- Suspect gastroenteritis if stools suddenly change to a loose or watery consistency or onset of vomiting occurs suddenly (or both). In suspected cases, ask about recent contact with someone with acute diarrhoea or vomiting (or both), exposure to a known source of enteric infection (possibly contaminated water or food), and recent travel abroad. Notify and act on the advice of the public health authorities if you suspect an outbreak of gastroenteritis.
- Any of the features given below are possible indicators of diagnoses other than gastroenteritis:
  - Fever:
    - Temperature of 38°C or higher in children under 3 months
    - Temperature of 39°C or higher in children aged 3 months or more.
  - Shortness of breath or tachypnoea
  - Altered state of consciousness

- Neck stiffness
- Bulging fontanelle in infants
- Non-blanching rash
- Blood or mucus in stool
- Bilious (green) vomit
- Severe or localised abdominal pain
- Abdominal distension or rebound tenderness.

## Laboratory investigations

- Microbiological investigation of stools:
  - Consider this if the child has recently been abroad, diarrhoea has not improved by day seven, or the diagnosis of gastroenteritis is uncertain
  - Perform this if you suspect septicaemia, if blood or mucus is present in the stool, or the child is immunocompromised.
- Blood culture:
  - Perform this if you are planning to give antibiotics.
- Monitoring for haemolytic uraemic syndrome:
  - Seek specialist advice on monitoring for this syndrome in children with *Escherichia coli* O157:H7 infection.

## Assessing dehydration and shock

## Clinical assessment

- The following children are at increased risk of dehydration:
  - Children under 1 year, particularly those younger than 6 months
  - Infants whose birth weight was low
  - Children who have passed more than five diarrhoeal stools in the previous 24 hours
  - Children who have vomited more than twice in the previous 24 hours
  - Children who have not been offered or have not been able to tolerate supplementary fluids before presentation
  - Infants who have stopped breast feeding during the illness
  - Children with signs of malnutrition.
- Use fig 1 to detect clinical dehydration and shock after taking into account the risk factors for dehydration.
- Suspect hypernatraemic dehydration if any of the following are present:
  - Jittery movements

This is one of a series of *BMJ* summaries of new guidelines, which are based on the best available evidence; they highlight important recommendations for clinical practice, especially where uncertainty or controversy exists. Further information about the guidance; the members of the Guideline Development Group and the members of the technical team at the National Collaborating Centre for Women's and Children's Health; and the supporting evidence statements are in the full version on [bmj.com](http://bmj.com).

- Increased muscle tone
- Hyper-reflexia
- Convulsions
- Drowsiness or coma.

*Laboratory investigations*

- Do not routinely perform blood biochemical testing.
- Measure plasma sodium, potassium, urea, creatinine, and glucose concentrations if intravenous fluids are needed or clinical features suggest hypernatraemia.

**Fluid management**

- Use the flow chart (fig 2) to help in the fluid management of a child with gastroenteritis.

*Fluid management after rehydration*

- Encourage breast feeding, other milk feeds, and fluid intake.

- Consider giving 5 ml/kg oral rehydration salt (ORS) solution after each large watery stool to:
  - Children younger than 1 year (especially those younger than 6 months)
  - Infants who were of low birth weight
  - Children who have passed six or more diarrhoeal stools in the past 24 hours
  - Children who have vomited three times or more in the past 24 hours.
- If dehydration recurs, start oral rehydration therapy again.

**Nutritional management**

- During rehydration treatment:
  - Continue breast feeding
  - Do not give solid foods
  - In children with red flag symptoms or signs, do not give oral fluids other than ORS solution
  - In children without red flag symptoms or signs, do not routinely give oral fluids other than ORS solution; however, consider supplementation with the child’s usual fluids (including milk feeds or water, but not fruit juices or carbonated drinks) if they consistently refuse ORS solution.
- After rehydration:
  - Give full strength milk straight away
  - Reintroduce the child’s usual solid food
  - Avoid giving fruit juice and carbonated drinks until the diarrhoea has stopped.

**Treatment with antibiotics**

- Do not routinely give antibiotics to children with gastroenteritis.
- Give antibiotics to all children:
  - With suspected or confirmed septicaemia
  - With extraintestinal spread of bacterial infection
  - Younger than 6 months with *Salmonella* gastroenteritis
  - Who are malnourished or immunocompromised with *Salmonella* gastroenteritis
  - With *Clostridium difficile* associated pseudomembranous enterocolitis, giardiasis, dysenteric shigellosis, dysenteric amoebiasis, or cholera.
- Seek specialist advice for children who have recently been abroad.

**Other treatments**

- Do not use anti-diarrhoeal drugs. [Based on moderate quality meta-analysis of RCTs and moderate quality RCTs]

**Escalation of care**

*During remote assessment*

- Arrange emergency transfer to secondary care for children with symptoms suggesting shock

Take risk factors for dehydration into account when interpreting symptoms and signs. More numerous and more pronounced symptoms or signs of clinical dehydration indicate greater severity. For clinical shock, one or more symptoms or signs would be present.

Red flag (■) symptoms and signs may help to identify children at increased risk of progression to shock. If in doubt, manage as if there are red flag symptoms or signs. Fields are blank if the clinical features in question do not specifically indicate shock.

		Increasing severity of dehydration →		
		No clinically detectable dehydration	Clinical dehydration	Clinical shock
<b>Symptoms</b> (remote and face to face assessments)	Appears well		■ Appears to be unwell or deteriorating	
	Alert and responsive		■ Altered responsiveness (for example, irritable, lethargic)	Decreased level of consciousness
	Normal urine output		Decreased urine output	
	Skin colour unchanged		Skin colour unchanged	Pale or mottled skin
	Warm extremities		Warm extremities	Cold extremities
<b>Signs</b> (face to face assessments)	Alert and responsive		■ Altered responsiveness (for example, irritable, lethargic)	Decreased level of consciousness
	Skin colour unchanged		Skin colour unchanged	Pale or mottled skin
	Warm extremities		Warm extremities	Cold extremities
	Eyes not sunken		■ Sunken eyes	
	Moist mucous membranes (except after a drink)		Dry mucous membranes (except for “mouthbreather”)	
	Normal heart rate		■ Tachycardia	Tachycardia
	Normal breathing pattern		■ Tachypnoea	Tachypnoea
	Normal peripheral pulses		Normal peripheral pulses	Weak peripheral pulses
	Normal capillary refill time		Normal capillary refill time	Prolonged capillary refill time
	Normal skin turgor		■ Reduced skin turgor	
Normal blood pressure		Normal blood pressure	Hypotension (indicates decompensated shock)	

Fig 1 | Symptoms and signs of clinical dehydration and shock

- Refer the following children for face to face assessment:
  - Those with symptoms suggesting an alternative serious diagnosis
  - Those at high risk of dehydration after taking into account the risk factors
- Those with symptoms of clinical dehydration
- Those whose social circumstances make remote assessment unreliable.
- Provide a “safety net” for children who do not need referral, including information for parents or carers on how to:

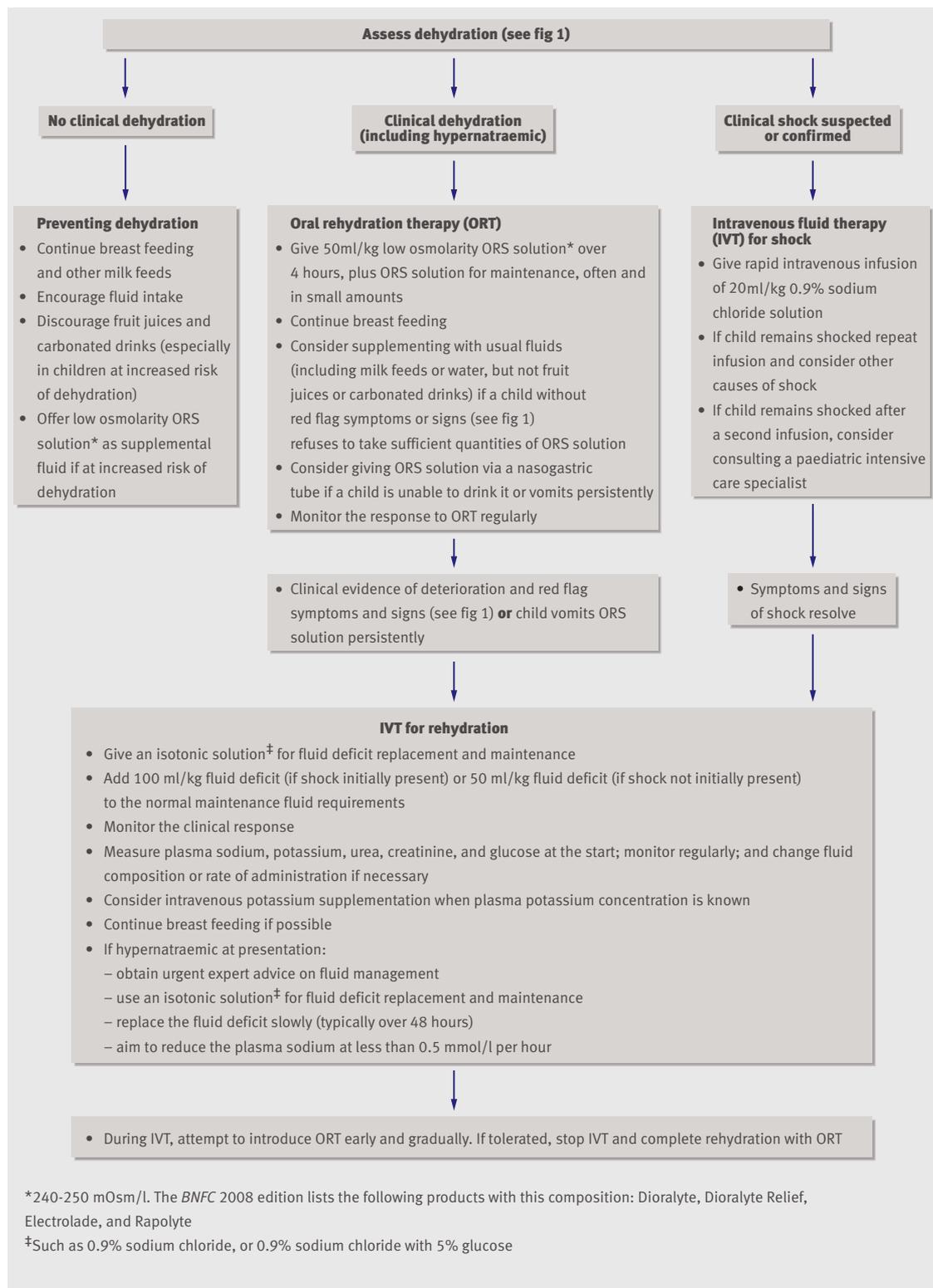


Fig 2 | Flow pathway for fluid management of children with gastroenteritis. ORS=oral rehydration salt

- Recognise developing red flag symptoms
- Get immediate help from an appropriate healthcare professional if red flag symptoms develop.

#### *During face to face assessment*

- Arrange emergency transfer to secondary care for children with symptoms or signs of shock
- Consider repeat face to face assessment or referral to secondary care for children:
  - With clinical features suggesting an alternative serious diagnosis
  - With red flag features
  - Whose social circumstances require continued involvement of healthcare professionals.
- Provide a safety net for children who will be managed at home, including:
  - Information for parents and carers on how to recognise developing red flag symptoms
  - Information on how to get immediate help from an appropriate healthcare professional if red flag symptoms develop
  - Arrangements for follow-up at a specified time and place, if necessary.

#### Advice for parents and carers

##### *Caring for a child at home*

- Advise parents and carers:
  - That most children with gastroenteritis can be safely managed at home, with advice and support from a healthcare professional if necessary
  - About symptoms that may indicate dehydration, and that they should contact a healthcare professional if such symptoms develop
  - About fluid management and nutritional management when treating dehydration and in the post-rehydration phase, and that they must take into account the risk factors for dehydration and the clinical assessment (fig 1)
  - About the usual duration of diarrhoea (five to seven days, with most cases resolving within two weeks) and vomiting (one or two days, with most cases resolving within three days), and to seek advice from a specified healthcare professional if symptoms do not resolve within these time frames.

##### *Preventing primary spread of gastroenteritis*

- Advise parents, carers, and children that:
  - Washing hands with soap (liquid if possible) in warm running water and carefully drying them afterwards are the most important factors in preventing spread
  - Hands should be washed after going to the toilet (children) or changing nappies (parents and

carers) and before preparing, serving, or eating food

- Children with gastroenteritis should not share towels
- Children should not attend school or another childcare facility while they have diarrhoea or vomiting; they should not return until at least 48 hours after the last episode of diarrhoea or vomiting
- Children should not swim in a swimming pool for two weeks after the last episode of diarrhoea.

#### Overcoming barriers

The new approach to clinical assessment of dehydration is innovative and unfamiliar to clinicians: it does not imply that the degree of dehydration is uniform but acknowledges the difficulties in accurately assessing the severity of dehydration. It also links directly to fluid management; it recommends a standardised fluid regimen for all (non-shocked) children with dehydration, with subsequent adjustments based on regular reassessment during rehydration. This approach is simple, easy to implement, and it provides the clinical information necessary for appropriate fluid management. By emphasising oral rehydration with low osmolarity ORS solution (given orally or via a nasogastric tube) as the firstline treatment of dehydration and limiting intravenous fluids to selected children, the guideline will help avoid the complications and distress associated with intravenous cannulation and reduce hospital costs. It also standardises advice on nutritional management during and after the episode of gastroenteritis and the escalation of care from the community to various hospital settings.

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