Public Health England

Protecting and improving the nation's health

Managing suspected infectious diarrhoea

Quick reference guidance for primary care

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

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Contents

Foreword – aims and adaptations

Audience:

- primary care prescribers in general practice and out of hours settings including doctors, nurses and pharmacists
- those providing first point of contact for infections

Aims:

- to provide a simple, effective, economisal and empirical approach to the treatment of infectious diarrhoea
- to target the use of antibiotics and antifungals in primary care
- to minimise the emergence of bacterial resistance in the community

Implication:

- the guidance should lead to more appropriate antibiotic use
- use of this guidance may increase or decrease laboratory workload
- change in laboratory workload may have financial implications for laboratories and primary care commissioners

Production:

- the templates have been produced in consultation with GPs and specialists in the field
- they are in agreement with other guidance, including Clinical Knowledge Summaries, the Scottish Intercollegiate Guidelines Network and NICE
- the guidance is fully referenced and graded
- the guidance is not all-encompassing as it is meant to be 'quick reference'
- if more detail is required we suggest referral to the websites and references quoted
- the guidance is updated every three years or more frequently if there are significant developments in the field

Poster presentation of guidance:

- the summary tables are designed to be printed out as posters to use in the surgery
- the rationale and evidence is designed to be used as an educational tool for you and your colleagues to share with patients as needed

Local adaptation:

- we would discourage major changes to the guidance but the Word format allows minor changes to suit local service delivery and sampling protocols
- to create ownership agreement on the guidance locally, dissemination should be taken forward in close collaboration between primary care clinicians, laboratories and secondary care providers

This guidance is based on the best available evidence but professional judgement should be used and patients should be involved in the decision.

Quick guide and sample collection instructions

	OVERVIEW
B/ C	**Acute diarrhoea is usually defined as:** 3 or more episodes a day, <14d and stool takes shape of pot.[1,2,3,4,5 B+, 11 C] **Infectious diarrhoea is common (affecting a quarter of us annually[7B+]) but should be viewed as a differential diagnosis** [4] alongside other potential causes of diarrhoea as no infectious agent is found in 60% of diarrhoeal illnesses.[25] **Most infectious diarrhoea is a self-limited, usually viral illness[3, 7 B+]**. Nearly half of episodes last less than one day.[2] **If diarrhoea has stopped, culture is rarely indicated unless there is a public health indication.**[7] **Do not give empirical antibiotics unless *Clostridium difficile*[13, 16, 27] or *Campylobacter spp.*[20] are suspected.**

	WHEN TO SEND a faecal specimen in cases of diarrhoea [6,9, 10,11, 12, 26]	
C	**1. SYMPTOMS/SIGNS OR CLINICAL INDICATIONS** Patient systemically unwell needs hospital admission and/or antibiotics OR is immunocompromised.[26, 31] Blood, mucus or pus in stool. [4] In children who have acute painful, or bloody diarrhoea to exclude verotoxigenic *E.coli* infection including O157. [8 12] Recent antibiotics, [27] PPI or hospitalisation (*C. difficile*).[11, 13] Diarrhoea after 'exotic' foreign travel (state *countries);* you should request ova, cysts and parasites (OCP).[1,2] Specifically when amoebae, Giardia or cryptosporidium are suspected [21, 29] especially if there is recurrent or prolonged diarrhoea (over 14 days) or travel to at-risk areas. To exclude infectious diarrhoea in the differential diagnosis, eg patient has severe abdominal pain, exacerbations of inflammatory bowel disease or irritable bowel syndrome.[4] Request virology where a definitive diagnosis is needed.[12,26]	**2. PUBLIC HEALTH INDICATIONS** [9,10, 11, 12] Suspected food poisoning eg barbecue, restaurant, eggs, chicken, shellfish[9] - give details. Diarrhoea in high-risk situations for example: food handlers, health or child care workers, children at nurseries or after farm visits (*E. coli O157*),[8] elderly residents in care homes. [9, 10, 11, 12] Contact with other affected individual(s) or outbreaks of diarrhoea in: care home (norovirus), community, family, etc when isolating an organism may help pinpoint cause. [9] Contacts of patients where there may be serious sequelae[9] (*E. coli* 0157 or *C. difficile*). Close household contacts of Giardia cases.

	WHAT TO SEND (see next page for patient information on how to collect) **Only send loose stools as formed stools will not be examined by the laboratory.** **To ensure correct tests are performed please include travel destination and reason for sending sample on laboratory request form**
C	For routine microbiology investigation send a single specimen (a quarter full specimen pot is the minimum needed)
B	If the diarrhoea is post exotic foreign travel, prolonged or recurrent, you should give details and specifically request ova, cysts and parasites (OCP) and send three specimens at least two days apart, [28 B-] as OCP are shed intermittently.

Interpreting the laboratory report	
B+	A bacterial pathogen is found in only 2–5% of specimens submitted.[1,5,7] OCP reported only if looked for.
C	**Salmonella, shigella, clostridium, campylobacter, E.coli O157 and cryptosporidium** are routinely sought and reported.[26]
	As viruses, OCPs and other uncommon but potential pathogens are not routinely sought, a negative report does not mean that all infections have been excluded,[26] eg there are no routine methods for detecting enterotoxigenic *E. coli*, the commonest cause of traveller's diarrhoea.
Antibiotic management of suspected and proven infectious diarrhoea	
B	Antibiotics are not usually recommended for adults with diarrhoea of unknown pathology.[19] The lab will happily advise.
	Most patients in whom pathogens including salmonella and shigella are detected will not require specific treatment [19] unless systemically unwell or treatment is advised by a microbiologist or consultant in communicable disease control.
A	**VTEC *E. coli* eg O157:** can cause haemolytic uraemic syndrome. Recommend urgent referral to secondary care all previously healthy children with acute painful, bloody diarrhoea or confirmed cases. Do *not* give antibiotics for ***E. coli*** 0157 as this increases risk of HUS.[8,10,12]
B/ C	***Clostridium difficile****:* Discuss with microbiologist. Stop unnecessary antibiotics and/or PPIs to re-establish normal flora. Prescribe 10-14 days metronidazole 400mg oral three times/day. 70% of patients respond after 5 days; 94% in 14 days. Monitor >85 year olds as mortality is increased.[11, 13, 16]
	If severe *C. difficile* (characterised by T >38.5; WCC >15; rising creatinine or signs/symptoms of severe colitis), or if recurrent within 30 days and +ve for *C. difficile* toxin prescribe vancomycin 125mg oral qds for 10-14 days.[13, 16]
A+	**Campylobacter**: Antibiotic therapy shortened duration of symptoms by 41 hours: if given within 3 days of illness (course duration 2.4 versus 4.1 days).[20] If still unwell consider clarithromycin 250-500mg oral BD for 5-7days. [24]
A+	***Giardia lamblia***: metronidazole 400mg oral TDS for 7-10 days' [21, 29, 30 A+.] ***Entamoeba histolytica:*** metronidazole 800mg every 8 hours for 5 days followed by diloxanide furoate, 500mg oral TDS for 10 days.[19, 21]
C	**Blastocystis**, **Cryptosporidium** and ***Dientamoeba fragilis*** do not usually require treatment in otherwise healthy adults unless symptoms persist. [21,22,23C]
WHEN TO SEND a repeat specimen	
C	Usually **unnecessary** unless OCP suspected, or advised by a microbiologist or consultant in public health, eg management of *E. coli* O157or *Salmonella typhi* or to confirm clearance in the high risk situations outlined above.[9, 12]

KEY	A	B	C	D	Indicates grade of recommendation

This evidence-based guidance was developed by the PHE Primary Care Unit in collaboration with Clinical Knowledge Summaries (CKS), GPs, the BIA and other experts. It is in line with PHE SOPs, CKS and SIGN.

Grading of guidance recommendations

The strength of each recommendation is qualified by a letter in parenthesis.

Study design	Recommendation grade
Good recent systematic review of studies	A+
One or more rigorous studies, not combined	A-
One or more prospective studies	B+
One or more retrospective studies	B-
Formal combination of expert opinion	C
Informal opinion, other information	D

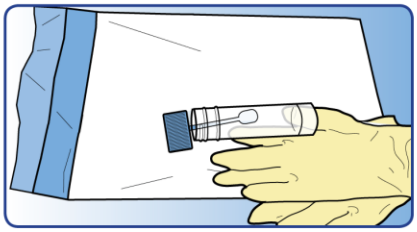
For ease of use in practices a 'Quick guide and sample collection instruction' single sheet has been developed as Appendix A to complement this document which can be found at: https://www.gov.uk/government/publications/infectious-diarrhoea-microbiological-examination-of-faeces

Stool/Poo Sample Collection Instructions

Step 1

Before you start:

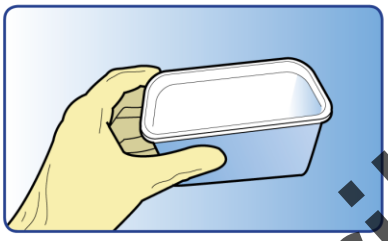
1 Purchase a pair of disposable gloves from your local supermarket/pharmacist.
2 Fill in your details on the label on the outside bottle using a permanent pen



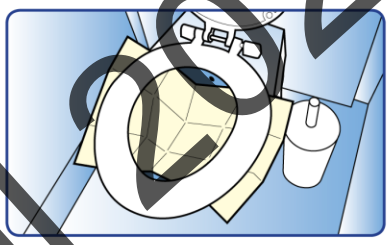
Step 2

To prevent the poo sample from falling into the toilet either

Option A
Place a wide mouth container (clean empty plastic food container e.g. margarine tub) in the toilet bowl

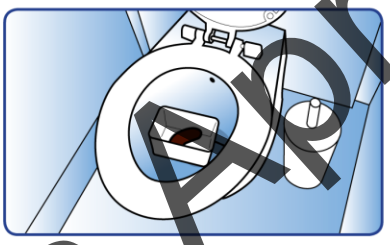


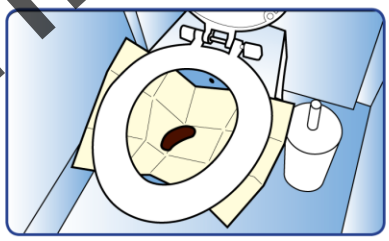
or Option B
Place clean newspaper over the toilet seat opening under the lid (this might not be suitable for a runny sample)



Step 3

Pass the poo sample either into the container or onto the newspaper.

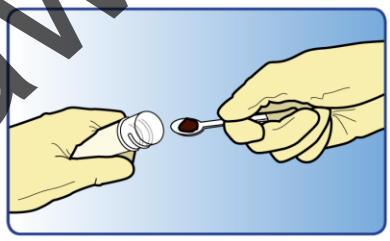




Step 4

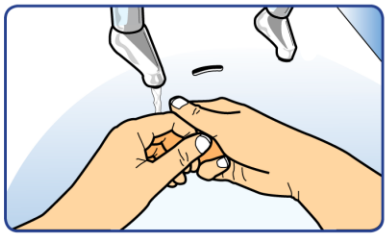
Using the spoon built into the cap of the collection tube, collect small scoops of stool from each end and the middle. Half fill the tube. Replace cap and make sure it is tightly closed.

Disposal: Dispose of remaining stool down the toilet. Wrap the container or newspaper and gloves in clean newspaper and dispose of in a plastic bag.



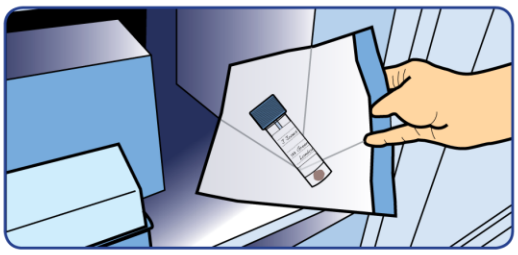
Step 5

Wash hands with soap and warm water



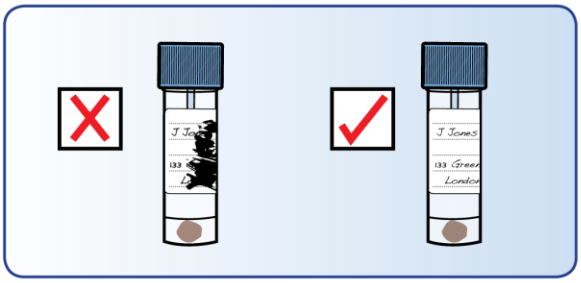
Step 6

Place the sample container in the bag provided and then Place the sealed envelope in a cool place until you are able to get to your GP practice or hospital laboratory. The sample must be returned withing 24hrs of collection.



Step 7

Please check that your details are still clearly visible on the outside of the collection bottle before returning the sample. If not, ask the receptionist for a new label, write your details on this clearly and stick over the old label.



References

This guidance was produced in 2007 by the South West GP Microbiology Laboratory Use Group in collaboration with the Association of Medical Microbiologists, GPs and experts in the field. This guidance was reviewed and updated in 2013 by Dr Gerry Morrow at Clarity Informatics with substantial input from Dr Cliodna McNulty and Dr Philippa Moore. The guidance was reviewed by ARHAI; BSAC; BIA; RCN, GPs and experts in the field and is in line with other UK GP guidance including Clinical Knowledge Summaries.

The following references were used when developing these guidelines

1. Baldi F, Bianco MA, Nardone G, Pilotto A, Zamparo E. Focus on acute diarrhoeal disease. *World J Gastroenterol.* 2009 Jul 21; 15(27):3341-8. Available from: http://www.wjgnet.com/1007-9327/full/v15/i27/3341.htm (accessed 18.11.14). *A review article which provides an outline of the diagnostic criteria in acute diarrhoea and the likely pathogens which cause the problem worldwide. The rational approach to treatment describes the following approach to the use of antimicrobials "Since in over 90% of cases of diarrhoea the pathogen may not be identified, the clinical benefit of an empiric antibiotic treatment should be evaluated taking into account the risk of adverse event reactions and the risk of harmful eradication of normal flora."*
2. Castaneda Pomeda M, Bragulat Baur E. Traveller's diarrhoea. *Emergencias* 2008; 20: 260-268. Available from: http://www.semes.org/revista/vol20_4/8_ing.pdf (accessed 18.11.14). *A review article which defines travellers' diarrhoea as three soft stools in 24 hours during or shortly after a journey which affects 20-50% of travellers and at least 11 million people annually. Symptoms often begin on the second or third day of travel and in more than 90% of cases in the first two weeks. Almost 20% require bed rest for 1-2 days, symptoms usually last 3-5days, although 5-10% the duration of illness persists for 2 weeks or more. 1% of patients require hospital admission. Prevention, supportive measures and antibiotic treatment regimens for three days in patients with severe symptoms (described as those with incapacitating symptoms, fever or blood in stools). The antibiotics recommended are azithromycin, fluroquinolone and rifaximin.*
3. Thielman NM, Guerrant RL. Acute infectious diarrhoea. *N Eng J Med* 2004; 350(1): 38-47. Abstract available from: http://www.nejm.org/doi/full/10.1056/NEJMcp031534 *A review article of the epidemiology, assessment, clinical features and recommendations for treatment of acute infectious diarrhoea. This paper provides a definition of acute diarrhoea as passing three stools per day for less than 14 days.*
4. Jones R and Rubin G. Acute diarrhoea in adults. *BMJ* 2009; 338: b1877. Available from: http://www.bmj.com/content/338/bmj.b1877 *A review article outlining the epidemiology and diagnostic approach in acute diarrhoea in primary care in the UK. It affects almost every adult in the UK every year. Viruses are the most common infectious cause and campylobacter (12%) and rotavirus (8%) are the organisms most commonly isolated among patients who consult a general practitioner. Red flags in differential diagnosis and in discriminators of serious illness are listed as rectal bleeding, weight loss, systemic illness and dehydration. These are the significant symptoms and signs to consider in a differential diagnosis of acute diarrhoea.*
5. Wheeler JG, Sethi D, Cowden JM, Wall PG, Rodrigues LC, Tompkins DS, et al on behalf of the Infectious Intestinal Disease Study Executive. Study of infectious intestinal disease in England: rates in the community, presenting to general practice, and reported to national surveillance. *BMJ* 1999; 318: 1046-50. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC27838/pdf/1046.pdf (accessed 18.11.14). *A population based community cohort study to establish the incidence and aetiology of infectious intestinal disease and comparison to cases reaching national laboratories. The proportion of cases not recorded by national surveillance is large and varies widely by microorganism. The ratio of cases in the community to cases reaching national surveillance was lower for bacterial pathogens*

(salmonella 3.2:1, campylobacter 7.6:1) than for viruses (rotavirus 35:1, Norovirus 1562:1). There were many cases for which no organism was identified.

6. Farthing M, Feldman R, Finch R, Fox R, Leen C, Mandal B, et al. The management of infective gastroenteritis in adults: A consensus statement by the British Society for the Study of Infection. *J Infect* 1996; 33: 143-52. *Empirical treatment for patients well enough to be managed in primary care is not recommended because the majority of illnesses seen in the community do not have an identifiable bacterial cause. In addition, an RCT of quinolones as empiric therapy found no benefit in patients whose stool cultures were negative.*
7. Tam CC, Rodrigues LC, Viviani L, Dodds JP, Evans MR, Hunter PR, et al on behalf of the IID2 Study Executive Committee*. Longitudinal Study of Infectious Intestinal Disease in the UK (IID2 study): incidence in the community and presenting to general practice. *Gut* 2012 10.1136/gut.2011.238386. Available from: http://gut.bmj.com/content/61/1/69 *A community based cohort study conducted between April 2008 and August 2009, which estimates that there are 17 million sporadic community cases of IID and 1 million GP consultations per year in the UK. Norovirus was the most common cause of sporadic IID (3 million) followed by sapovirus (1.6 million) and rotavirus (0.8 million). Campylobacter was the most common bacterial cause (0.6 million) followed by enteroaggregative E.coli (0.4 million). Pathogens were cultured for Campylobacter jejuni/coli (9.3 cases per 1000 person years), Escherichia coli 0157 (0.3 cases), Listeria monocytogenes, Salmonella (0.6 cases), Shigella and Yersinia enterocolitica.*
8. The Griffin Report. Review of the major outbreak of *E. coli* O157 in Surrey, 2009. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/342361/Review_of_major_outbreak_of_e_coli_o157_in_surrey_2009.pdf (accessed 18.11.14). *An evaluation of the outbreak of E.coli 0157 and its management, with a consideration of the regulatory framework and control of risks relating to open farm, it provides 43 recommendations to reduce the risks of future farm-related E. Coli 0157 outbreaks.*
9. Working Group of the former PHLS Advisory Committee on Gastrointestinal Infections. Preventing person-to-person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers. *Commun Dis Public Health* 2004; 7(4): 362-84. Available from: http://webarchive.nationalarchives.gov.uk/+/http://www.hpa.org.uk/cdph/issues/CDPHVol7/no4/guidelines2_4_04.pdf *Consensus guidance advice for public health physicians on preventing transmission of gastrointestinal infections with an emphasis on general measures, enteric precautions, exclusion from work and school. It is focused on the predominant and commonly presenting organisms in the UK. The most common causes of food poisoning are bacteria such as Campylobacter, Salmonella, Clostridium perfringens and Staphylococcus aureus. Norovirus (previously termed small round structured virus) can also be foodborne. The key guidance in relation to faecal testing relates to groups that pose an increased risk of spreading infection which are; persons with doubtful person hygiene, pre-school children, and people involved in the preparation of food and clinical and social care staff. These individuals should have microbiological clearance testing after suffering infections with Vero cytotoxin-producing E. coli and typhoid/paratyphoid.*
10. Public Health England (August 2014) Vero cytotoxin-producing Escherichia coli (VTEC): guidance, data and analysis. Available from: https://www.gov.uk/government/collections/vero-cytotoxin-producing-escherichia-coli-vtec-guidance-data-and-analysis *This guidance provides advice on the diagnosis and public health management of infection with Verotoxigenic Escherichia coli (VTEC). VTEC infection is a relatively rare cause of gastrointestinal illness in England, with around 800 cases diagnosed annually. The most frequently reported VTEC strain to cause illness in England and Wales is E. coli O157. Symptoms can range from mild gastroenteritis through to severe bloody diarrhoea. Bloody diarrhoea is seen in 50% of cases of VTEC O157 cases in England and Wales. The illness is usually self limiting and resolves within 7 days. Children less than 5 years of age are the group most at risk of developing VTEC related HUS. A surveillance study of 3,464 VTEC cases in the US found that the proportion of cases who developed HUS was 15.3% among patients under 5 years, 7.9% among those aged 5–9 years, 3.4% among those aged 10–17 years, 1.2% among those aged 18–59 years, and 3.8% among those aged ≥60 years. However, this study found that those aged >60 years had the highest rate of death due to VTEC, whether or not they developed*

HUS. They also report that data reviewed from 90 published outbreaks from around the world found that statistically significant higher rates of secondary transmission were found in outbreaks with a median age of <6 years, and those with secondary transmission via person to person spread in nurseries.

11. Department of Health (March 2012) Updated guidance on the diagnosis and reporting of *Clostridium difficile.* Available from: https://www.gov.uk/government/publications/updated-guidance-on-the-diagnosis-and-reporting-of-clostridium-difficile *This document outlines the scope of who to test (symptomatic patients, those in hospital over the age of 2 years, all those in the community of the age of 65 and above and those younger than 65 where clinically indicated). This defines diarrhoea as three episodes or more of loose stools which is clearly not attributable to an underlying condition or therapy. Samples should be tested for C. difficile from hospital patients aged 2 and over and in community patients aged 65 and over. The stool specimen must take on the shape of the container and ideally be at least one quarter filled, to indicate that the patient has diarrhoea. A decision algorithm is contained in the text including the advice that no test or combination of tests is infallible and that the clinical condition of the patient should always be taken into consideration when making management and treatment choices.*

12. NICE (April 2009) Diarrhoea and vomiting in children younger than 5 years (NICE guideline) Available from http://www.nice.org.uk/guidance/CG84/NiceGuidance/doc/English *This guideline applies to children younger than 5 years who present to a healthcare professional for advice in any setting. It covers diagnosis, assessment of dehydration, fluid management, nutritional management and the role of antibiotics and other therapies. It provides recommendations on the advice to be given to parents and carers, and also considers when care should be escalated from home management through to hospital admission. Main recommendations include advice to perform stool microbiological investigations if septicaemia is suspected or there is blood and/or mucus in the stool or the child is immunocompromised. Advise parents, carers and children that washing hands with soap (liquid if possible) in warm running water and careful drying is the most important factor in preventing the spread of gastroenteritis. Hands should be washed after going to the toilet (children) or changing nappies (parents/carers) and before preparing, serving or eating food. Towels used by infected children should not be shared, children should not attend any school or other childcare facility while they have diarrhoea or vomiting caused by gastroenteritis, children should not go back to their school or other childcare facility until at least 48 hours after the last episode of diarrhoea or vomiting, children should not swim in swimming pools for 2 weeks after the last episode of diarrhoea. In children with Escherichia coli 0157:H7 infection, seek specialist advice on monitoring for haemolytic uraemic syndrome.*

13. Public Health England (May 2013). Wilcox MH. Updated guidance on the management and treatment of *Clostridium difficile* infection. Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/321891/Clostridium_difficile_management_and_treatment.pdf *A comprehensive paper providing diagnostic categories of mild, moderate and severe CDI and treatment recommendations for each. Assessment of severity is advised daily and stratified as follows; Mild disease, normal WCC and frequency less than 3 stools daily (Bristol stool chart types 5-7), prescribe oral metronidazole 400-500mg 10-14 days, Moderate disease WCC less than 15 and stools 3-5 times daily, prescribe metronidazole 400-500mg tds for 10-14 days, Severe disease WCC greater than 15 or rising creatinine 50% above baseline or temperature higher than 38.5C, prescribe oral vancomycin 125mg qds for 10-14 days, consider prescribing fidaxomicin 200mg bd as an alternative.*

14. Dial S, Delaney JAC, Barkun AN, Suissa S. Use of gastric acid-suppressive agents and the risk of community-acquired *Clostridium difficile*-associated disease. *JAMA* 2005; 294(23): 2989-95. Available from: http://jama.jamanetwork.com/article.aspx?articleid=202048 (accessed 18.11.14). *Report of two population based case-control studies in UK primary care, one matching all cases of C. difficile to controls, the other focussed on community acquired infections. The adjusted rate ratio of C. difficile with proton pump inhibitor use was 2.9 and with H-2 receptor antagonists the rate ratio was 2.0.*

15. Forward LJ, Tompkins DS, Brett MM. Detection of *Clostridium difficile* cytotoxin and *Clostridium perfringens* enterotoxin in cases of diarrhea in the community. *J Med Microbiol* 2003; 52:753-

57..Abstract available from: http://www.ncbi.nlm.nih.gov/pubmed/12909650 *A prospective study to evaluate the existing methods of testing for clostridium of primary care patients and to determine the frequency of Clostridium difficile cytotoxin and Clostridium perfringens enterotoxin in stool specimens. Additional information was provided on the demographics of patients suffering these infections. From this the authors suggest that as age over 60 years was a factor associated with Clostridium perfringens enterotoxin, this group may be targeted for such testing.*

16. Bauer MP, Kuijper EJ, van Dissel JT. European Society of Clinical Microbiology and Infectious Diseases (ESCMID): treatment guidance document for *Clostridium difficile* infection (CDI). *Clin Microbiol Infect* 2009; 15: 1067–1079. Available from: http://www.escmid.org/fileadmin/src/media/PDFs/4ESCMID_Library/2Medical_Guidelines/ESCMID_Guidelines/fulltext_treatment_guidance_Clostridium_difficile_infection.pdf *A European guideline which evaluates the available literature provides criteria for categorising Clostridium difficile infection (CDI) severity and provides recommendations for treatment. Specifically their recommendations are 1. Antiperistaltic agents and opiates should be avoided. 2. In general, strive to use antibiotics covering a spectrum no broader than necessary and narrow the antibiotic spectrum of treatment after results of cultures and/or susceptibility tests become known. 3. Mild CDI (stool frequency < 4 times daily; no signs of severe colitis), clearly induced by the use of antibiotics, may be treated by stopping the inducing antibiotic. Observe patients closely for any signs of clinical deterioration and place on therapy immediately if this occurs.4. Treatment for an initial episode and a first recurrence of CDI: If oral therapy is possible: • non-severe: metronidazole 500 mg three times daily orally for 10 days, severe: vancomycin 125 mg four times daily orally for 10 days. If oral therapy is impossible:• non-severe: metronidazole 500 mg tid intravenously for 10 days • severe: metronidazole 500 mg tid intravenously for 10 days + intracolonic vancomycin 500 mg in 100 mL of normal saline every 4–12 h (C-III) and/or vancomycin 500 mg qid by nasogastric tube*

17. Health Protection Agency. *Clostridium difficile* Ribotyping Network (CDRN) for England and Northern Ireland 2009/10 Report, page 26. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/347168/CDRN_2009_10_Report.pdf *This report shows a multivariate analysis of factors associated with mortality in a 24 month period 2008-2010. Age >60 vs <60 yrs had over 2.5-fold mortality; severe CDI had 5-fold mortality; ribotype 027 had 2-fold mortality.*

18. Miller M, Gravel D, Mulvey M, Taylor G, Boyd D, Simor A, et al. Health care-associated *Clostridium difficile* infection in Canada: patient age and infecting strain type are highly predictive of severe outcome and mortality. *Clin Infect Dis* 2010; 50:194-201. Abstract available from: http://www.ncbi.nlm.nih.gov/pubmed/20025526 *This Canada-wide 2005 study collected data in 1008 patients with C. difficile. Patients 60-90 years were twice as likely to experience a severe outcome; this was increased if the infection was due to ribotype 027*

19. Clinical Knowledge Summaries. Gastroenteritis. Available from: http://cks.nice.org.uk/gastroenteritis#!scenariorecommendation:19 *This decision support site advises that antidiarrhoeal drugs are not usually necessary for the management of gastroenteritis and that antibiotics are not recommended for adults with acute diarrhoea of unknown pathology. This recommendation is based on a review of the literature and current guidelines.*

20. Ternhag A, Asikainen T, Giesecke J, Ekdahl K. A meta-analysis on the effect of antibiotic treatment on duration of symptoms caused by infection with Campylobacter species. *Clin Infect Dis* 2007; 44: 696-700. Available from: http://cid.oxfordjournals.org/content/44/5/696.full.pdf *This meta-analysis (11 trials; n = 479) provides evidence that, when compared with placebo, treating diarrhea caused by campylobacter with erythromycin, norfloxacin or ciprofloxacin shortens the duration of diarrhea by 1.32 days (95% CI, 0.64-1.99; p<0.001). Duration of symptoms was 41 hours shorter [2.4 vs 4.1 days] if treated within 3 days of start of symptoms versus ≥ 3 days.)*

21. Katz DE, Taylor DN. Parasitic infections of the gastrointestinal tract. *Gastroenterology Clinics of North America* 2001; 30: 797-815. *An article which outlines the diagnosis and treatment of intestinal parasitic infections in immunocompetent adults in developed countries. Specific pathogens discussed are Giardia lamblia and Dientamoeba fragilis, Entamoeba histolytica, Entamoeba dipar, Blastocystis hominis, Cyclospora cayetanensis, and Cryptosporidium parvum.*

22. Lagacé-Wiens PR, VanCaeseele PG, Koschik C. *Dientamoeba fragilis:* an emerging role in intestinal disease. *CMAJ* 2006; 175(5): 468-9. Available from: http://www.cmaj.ca/content/175/5/468.full *A paper outlining the epidemiology, life cycle and potential treatment options of Dientamoeba fragilis. From this Canadian paper it emerges that Dientamoeba is a commonly found pathogen in young people with 10.3% of boys aged 11-15 and 9.6% of girls of this age having positive stool specimen testing. In adults over the age of 20 incidence rates were much lower at 0.6-2% of stool specimens proving positive for D. fragilis. Treatment options discussed include doxycycline, iodoquinol and secnidazole. Authors suggest excluding a diagnosis of D. fragilis when investigating IBS.*

23. Tan KSW. Blastocystis in humans and animals: new insights using modern methodologies. *Vet Parasitol* 2004; 126:121-44. Abstract available from: http://www.sciencedirect.com/science/article/pii/S0304401704004091 *A review article describing the epidemiology, morphology and treatment of the waterborne protozoal parasite Blastocystis.*

24. Blaser MJ and Allos BM (2009) Chapter 213: *Campylobacter jejuni* and related species. Mandell, Douglas, and Bennett's principles and practice of infectious diseases. ISBN 978-0-4430-6839-3. Record Number 20123332465. Online 8th edn.

25. de Wit MAS, Marion PG, Koopmans LM, Kortbeek, van Leeuwen NJ, Vinjé J, et al. Etiology of Gastroenteritis in Sentinel General Practices in The Netherlands. *Clin Infect Dis*. (2001) 33 (3): 280-288. Doi: 10.1086/321875 Available from: http://cid.oxfordjournals.org/content/33/3/280.full *A primary care based case-control study on patients presenting with gastroenteritis and the pathogens causing diarrhoea. In this study, in patients under the age of 5 years the predominant pathogen was rotavirus. In patients aged 5years and over Campylobacter species was the commonest infective pathology. Overall, ⩾1 pathogen was detected in 303 (37.5%) of 809 case patients and 52 (9.8%) of 532 control patients. This means that in over 60% of patients in this study no infective cause was found. Among case patients, this percentage decreased with age, from 17 (53%) of 32 patients in the youngest age group to 28 (27%) of 92 patients in the oldest. The highest percentage of control patients who were infected with a pathogen was observed among those who were aged 5–14 years, mainly because most of the pathogens that were detected in the control patients were parasites. Among case patients <1 year old, almost all infections were viral (mostly infections with rotavirus and Norovirus.*

26. Public Health England (2013) UK Standards for Microbiology Investigations: Investigation of Faecal Specimens for Enteric Pathogens. S 7 Issue 1. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/343955/B_30i8.1.pdf *This guidance is issued by PHE and is a collection of recommended algorithms for initial test selection and testing methods and confirmatory strategies. UK SMIs also contain guidance notes that describe the recommended standard set of investigations consistent with current good practice in different infective disease presentations, as well as examples. The scope of this document is to describe which infections and relevant associated tests should be considered according to the different clinical presentations consistent with gastroenteritis and diarrhoea infection in adults and children, (including the under 5 age group) in social and healthcare settings, who are either immunocompetent or immunocompromised. The document defines patients who are immunocompromised as "those with inherited or acquired abnormalities of the immune system and patients who have had organ transplant, immunosuppressive therapy, or steroid treatment." The authors recommend, "Discussion with a clinician is required to establish the degree to which the patient is immunocompromised, and therefore the relevance of each test.*"

27. Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA) Cohen SH, Gerding DN, Johnson S, Kelly CP, Loo VG, McDonald LC, et al. Infect Control Hosp Epidemiol 2010 May; 31(5): 431-55. Available from: http://www.dhhr.wv.gov/oeps/disease/AtoZ/Documents/clostridium%20difficile/SHEA-CDiff-Guidelines.pdf *This is a comprehensive American guideline document on the epidemiology, diagnosis and treatment of Clostridium difficile. From this guideline the recommendation is made that "When severe or complicated CDI is suspected, initiate empirical treatment as soon as the diagnosis is suspected." Additional recommendations include advice on testing patients with*

diarrhoea when antibiotics have been recently prescribed. The authors advise, "The most important modifiable risk factor for the development of CDI is exposure to antimicrobial agents. Virtually every antimicrobial has been associated with CDI through the years. Receipt of antimicrobials increases the risk of CDI because it suppresses the normal bowel flora, thereby providing a "niche" for C. difficile to flourish. Both longer exposure to antimicrobials, as opposed to shorter exposure, and exposure to multiple antimicrobials, as opposed to exposure to a single agent, increase the risk for CDI. Nonetheless, even very limited exposure, such as single-dose surgical antibiotic prophylaxis, increases a patient's risk of both C. difficile colonization and symptomatic disease".

28. Cartwright C. Utility of Multiple-Stool-Specimen Ova and Parasite Examinations in a High Prevalence setting. J Clin Microbiol 1999; 37(8): 2408-2111. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC85240/ *This retrospective analysis in a high prevalence population of parasitic infections provides a conclusion where two independently collected stool specimens should be subject to ova and parasite examination to ensure diagnostic sensitivity. The authors conclude that "The frequency of parasite detection was significantly higher in patients from whom more than one stool specimen was submitted for examination than in individuals from whom only a single specimen was received (49.4 versus 19.8%; P, <0.001)." The median length of time between specimens in this study was four days. The authors assert that the examination of more than one stool specimen has diagnostic utility. In a low prevalence setting such as the UK, sending three stool specimens is advised by microbiologists who recommend this as good clinical practice in order to diagnose giardiasis.*
29. Gardner TB and Hill DR. Treatment of Giardiasis. Clin Microbiol Rev 2001; 14(1): 114-128. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC88965/ *A review article which outlines the lifecycle of G. lamblia and the longer duration of the diarrhoeal illness 7-10 days at the time of presentation. The treatment using metronidazole is presented as most effectively given orally for more than three days using a dosages of 400mg three times daily for adults.*
30. Granados CE, Reveiz L, Uribe LG, and Criollo CP. Drugs for treating giardiasis. The Cochrane library. Published online 12/12/2012. Available from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD007787.pub2/full *A Cochrane review of the drugs used to treat giardiasis. A meta-analysis of the available drugs to treat giardiasis metronidazole, tinidazole and albendazole. The authors conclude, "once-daily albendazole is probably equivalent to metronidazole given three times daily at achieving parasitological cure" with fewer side effects. Tinidazole (single dose) given in comparison to metronidazole three times daily for 7-10 days was not significantly better in effecting parasitological cure or clinical improvement.*
31. BHIVA guidelines on opportunistic infections in Patients with HIV. Available from: http://www.bhivaguidelines.org/#cs-diarrhoea *BHIVA guidelines cover the diagnosis and management of diarrhoea in patients with HIV. They suggest stool analysis for ova, cysts and parasites (including special stains for HIV associated pathogens), stool culture and sensitivity, C. difficile toxin, enteric viruses and faecal elastase if malabsorption is suspected. Sigmoidoscopy, colonoscopy and duodenoscopy (including aspirate) may be required. Biopsies can be sent for CMV and HSV PCR testing, TB culture/PCR (in saline), and for histology. Blood cultures should be included in the workup of an HIV positive patient with diarrhoea.*

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