Health Service Research

Consultations for gastroenteritis in general practice and out-of-hours services in Norway 2006–15

Knut Erik Emberland,† Knut-Arne Wensaa,† Sverre Litleskaare,† and Guri Rortveit†

†Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway and †Research Unit for General Practice, NORCE Norwegian Research Centre, Bergen, Norway

*Correspondence to K. E. Emberland, Kalfarveien 31, N-5018 Bergen, Norway; E-mail: knut.erik.emberland@uib.no

Abstract

Background. Most of the patients with gastroenteritis seeking health care services are managed in primary care; yet, little is known about these consultations. Syndromic-based surveillance of gastrointestinal infections is used in several countries, including Norway.

Aim. To investigate the extent of, and explore characteristics associated with, consultations for gastroenteritis in primary care and to compare consultations in daytime general practice and out-of-hours (OOH) services in Norway.

Design and Setting. Registry-based study using reimbursement claims data from all consultations in general practice and OOH services in Norway over the 10-year period, 2006–15.

Methods. The main outcome variable was whether the consultation took place in general practice or OOH services. Possible associations with patient age and sex, time and use of point-of-care C-reactive protein (CRP) testing and sickness certificate issuing were investigated.

Results. Gastroenteritis consultations (n = 1 281 048) represented 0.9% of all consultations in general practice (n = 140 199 637), of which 84.4% were conducted in general practice and 15.6% in OOH services. Young children and young adults dominated among the patients. Point-of-care CRP testing was used in 36.1% of the consultations. Sickness certificates were issued in 43.6% of consultations with patients in working age. Age-specific time variations in consultation frequencies peaking in winter months were observed.

Conclusions. The proportion of gastroenteritis consultations was higher in the OOH services when compared with daytime general practice. Young children and young adults dominated among the patients. The seasonal variation in consultation frequency is similar to that shown for gastroenteritis caused by norovirus.

Key words: Epidemiology, gastroenteritis, general practice, health services research, primary health care.

Background

Gastroenteritis is an inflammation of the gastrointestinal tract caused by a pathogenic microbe. A common, symptom-based definition of a gastroenteritis case is an individual who experiences ≥3 loose stools, or any vomiting, in 24 hours, excluding cases where these symptoms are explained by known noninfectious reasons (1). Gastroenteritis is one of the leading causes of morbidity and mortality in low-income countries (2). In high-income countries, gastroenteritis is rarely lethal, and most patients experience self-limiting symptoms without seeking medical care (3–6). Still, in these countries, gastroenteritis has considerable socioeconomic costs (3, 7) and is of public health interest as the condition tends to appear in outbreaks (8–10).
Consultations for gastroenteritis in primary care in Norway

Key Messages

- Consultations for gastroenteritis represented 0.9% of all consultations.
- Young children and young adults were the most common patients.
- Number of consultations for gastroenteritis was higher in winter months.

The agents causing gastroenteritis include a variety of viruses, bacteria, parasites and toxins. Stool samples are generally not submitted from primary care as most infections resolve in a few days without treatment. When stool samples are submitted, the infective agent is most commonly either viral or not identified (11–14). Spread of infections through international travel is of concern (15), and several of the microbes known to cause gastroenteritis are on the WHO priority list of antibiotic-resistant bacteria (16). Previous studies describe trends in seasonality for different agents causing gastroenteritis (17–23), although studies of seasonal trends in gastrointestinal infections in primary care are lacking.

Infectious disease surveillance systems are traditionally based on laboratory-confirmed cases. However, near real-time syndromic-based surveillance systems based on data from primary care that are not laboratory confirmed are established in several European countries, including Norway (24, 25). In the Norwegian Syndrome Surveillance System (NorSySS), gastroenteritis is defined by the ICPC codes ‘D11 Diarrhoea’, ‘D70 Gastrointestinal infection’ and ‘D73 Gastroenteritis, presumed infection’.

Most of the consultations in primary care in Norway are carried out in the general practice surgery during opening hours, including daytime emergency consultations. Additionally, emergency medical services are organized as out-of-hours (OOH) services either with general practitioners on duty in the municipalities, or as 24-hour emergency services in some of the larger cities.

When individuals with gastroenteritis seek health care, they are generally managed in primary care. Yet, little is known about these consultations in terms of prevalence in primary care, patient characteristics and seasonal variations. Scientific knowledge about gastroenteritis in primary care is useful for clinicians, public health professionals interpreting surveillance data and for health service planners.

The aims of this study were to investigate the extent of, and explore characteristics associated with, consultations for gastroenteritis in primary care and to compare consultations in daytime general practice and OOH services in Norway.

Materials and methods

All residents in Norway are entitled to have a general practitioner (GP) as part of the national public health care system. The GPs are the first port of call, provide comprehensive care and act as gatekeepers to secondary care. Point-of-care C-reactive protein (CRP) testing is widely used in general practice and OOH services in Norway.

Doctors in general practice and OOH services send reimbursement claims electronically to the Norwegian Health Economics Administration (HELFO). The reimbursement claims include information about the doctor (ID-number) and patient (unique personal identifier and sex), date and time for the contact and diagnoses for each contact. The reimbursement claims also contain information on actions such as point-of-care CRP testing and issues of sickness certificate as part of the individual consultations, as these actions are reimbursed.

The data from the reimbursement claims are registered prospectively in real-time and collected in the national KUHR database. In this study, we used data from KUHR from all consultations by attendance in general practice and OOH services during the 10-year period, 2006–15. Daytime activity data from work days from the 24-hour emergency services in Bergen (the second largest city in the country) are not included in this study, as they are not registered in the KUHR database.

Variables

We defined a consultation as a patient’s physical encounter with a doctor, focusing on clinical cases being eligible to further examination and treatment. Consultations made electronically, by home visits or telephone were not included in this study. We defined a ‘gastroenteritis consultation’ as a consultation with one or more of the following ICPC codes: ‘D11 Diarrhoea’, ‘D70 Gastrointestinal infection’ and ‘D73 Gastroenteritis, presumed infection’, which are the codes defining gastroenteritis in NorSYSS (25).

The registry predefines type of service, and we could further categorize this variable into ‘general practice’ and ‘OOH service’. We categorized patient age into the following ten categories: 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years. Patient sex is predefined in the registry. Due to privacy concerns, the Norwegian Data Protection Authority would only accept quarter of a year as the most detailed level of the time variable for this study. Quarter refers to time period of year for the consultations as follows: January–March, April–June, July–September and October–December. We further categorized time period into summer (combining April–June and July–September quarters) and winter seasons (combining October–December and January–March quarters). For the analyses of sickness certificate issues, we included consultations with patients aged 20–67 years only.

Statistics

The data were analysed using Stata/MP 15.0 for Windows and Microsoft Excel 2010 for frequency and bivariate analyses.

We calculated the proportion of gastroenteritis consultations as the percentage of total consultations for any diagnosis. The main outcome variable was whether the consultations took place in general practice or in the OOH services. Possible associations with patient age and sex, time of year for the consultations, use of point-of-care CRP testing and sickness certificate issuing in the consultations were investigated by bivariate statistics. The high numbers of observations in the data material made even small differences and associations significant at the <.05 significance level.

Results

Over the 10-year period, 2006–15, there were 140 199 637 consultations in primary care in Norway. Of these, 127 389 382 (90.9%) were in general practice and 12 810 255 (9.1%) in OOH services. There were 1 281 048 gastroenteritis consultations: of these 1 081 774 (84.4%) were conducted in general practice and 199 274 (15.6%) in the OOH services. This constitutes 0.9% of all consultations in primary care, corresponding to 0.8% of consultations in general practice and 1.6% of consultations in the OOH services.
Female patients contributed to 57.9% of consultations for any diagnosis: 58.4% in general practice and 52.5% in OOH services. The sex difference was less pronounced in the gastroenteritis consultations, with 52.8% female patients: 53.2% in general practice and 50.5% in OOH services (Table 1).

Mean patient age was 46.1 years for consultations for any diagnosis: 47.2 years in general practice and 35.1 years in OOH services (Table 1). Patients aged 55–64 years had the highest number of consultations (14.2%). Mean age was 32 years for the patients in gastroenteritis consultations: 33.6 years in general practice and 22.8 years in OOH services (Table 1). Children aged 0–4 years accounted for the highest number of gastroenteritis consultations, followed by young adults aged 25–34 years, in general practice and OOH services (Fig. 1).

Sex distribution by age for consultations with any diagnosis in primary care showed a majority of boys in the two lowest age categories 0–4 years (54.3%) and 5–14 years (50.7%): 54.0% and 50.4%, respectively, in general practice, and 55.2% and 52.2%, respectively, in OOH services. This finding was also observed for the gastroenteritis consultations in primary care (55.5% and 55.6% for the two age groups, respectively): both in general practice (55.9% and 56.4%) and OOH services (54.5% and 52.9%).

The numbers of all consultations for any diagnosis increased steadily every year over the 10-year period, from 12 295 867 consultations in 2006 to 15 185 884 consultations in 2015 (23.5% increase). This increase was seen in both general practice and OOH services until 2012, but in the following years, there was a slight decrease in the number of consultations in OOH services. Mean annual number of gastroenteritis consultations was 128 104, and the overall trend in number of gastroenteritis consultations was an increase from 120 624 in 2006 to 133 091 consultations in 2015 (10.3% increase). However, the proportion of gastroenteritis consultations decreased from 1% in 2006 to 0.9% in 2015, due to an even higher increase in consultations for any diagnosis.

The number and proportion of gastroenteritis consultations showed a bi-annual cycle through the whole period. This pattern of...
variation was observed for both general practice and OOH services (Fig. 2), and most pronounced for the age category 0–4 years in both service types (data not shown). To further investigate this pattern, we organized the data according to winter and summer seasons, as the shift of the year splits each winter season. These analyses did not show a similar bi-annual cycle from one winter season to the next (data not shown).

Quarterly distribution of consultations for any diagnosis in primary care was nearly equal throughout the four quarters, although slightly more of the consultations were observed during the months October–December (26.5%) and January–March (25.9%). In contrast, gastroenteritis consultations peaked during January–March (29.3%) followed by October–December (25.0%), both in general practice and OOH services (Table 1). This variation for gastroenteritis consultations by quarter was most evident for the age categories, 0–4, 5–14 and 25–34 years (Fig. 3). For other age groups, the number of gastroenteritis consultations in both service types was more equally distributed through the quarters.

Point-of-care CRP testing took place in 15.5% of the consultations for any diagnosis: in 13.8% of the consultations in general practice and in 32.2% of the consultations in the OOH services (Table 1). Among gastroenteritis consultations, point-of-care CRP testing was used in 36.1% of the consultations: in 32.2% of the consultations in general practice, when compared with 57.4% in OOH services (Table 1).

Among patients in the working age (age group 20–67 years), sickness certificates were issued in 23.1% of the consultations with any diagnosis: 24.2% in general practice and 9.3% in the OOH services (Table 1). Sickness certificates were issued in 43.6% of the gastroenteritis consultations: 45.9% in general practice and 24.6% in OOH services (Table 1). We observed an equal sex distribution among patients in gastroenteritis consultations with sickness certificates issued in both general practice and OOH services (data not shown).

Discussion

Summary

Gastroenteritis consultations represented 0.9% of all consultations by encounter in primary care in Norway during the years 2006–15, of which 84.4% took place in general practice and 15.6% in OOH services. The number of gastroenteritis consultations was higher during the winter months with little change from one winter season to the next. The most common patient was either a young child or young adult, with young children dominating even more so in the OOH services. These two age groups also contributed the most to the observed peak in number of gastroenteritis consultations in the winter months.

Strengths and limitations

A main strength of this study was the use of complete registry data from nearly all consultations in general practice and OOH services in
Norway, thereby considerably reducing selection bias. Reimbursement claims data have been shown to be informative in monitoring disease activity in primary care, and promising in syndromic surveillance of gastrointestinal disease but yet having low sensitivity and low positive predictive value in detecting outbreaks (14, 26, 27). The current study has some limitations. A part of reimbursement claims from the 24-hour emergency services in Bergen (daytime consultations from work days) are not reported, leading to a minor underreporting of consultations in OOH services. Further, claims from consultations by e-mail, home visits and telephone were not included in the current study. Due to the nature of gastroenteritis as a contagious disease, we believe that the use of telephone consultations is considerable, but probably more for administrative purposes, such as sickness certificates, than for disease management. The lack of telephone consultations and home visits may challenge the external validity specifically in the context of syndromic surveillance, as our findings do not reflect the total activity in primary care. However, this study was designed to analyze the face-to-face consultation activity concerning gastroenteritis. Another limitation is the lack of precision in the time variable. Ideally for the analyses of seasonality, we should have had information about the exact date or week number for the consultations.

Possible misclassification of the disease (gastroenteritis) may challenge the internal validity. Awareness of different coding behaviour in general practice and OOH services, as well as specific diagnosis being chosen to justify actions (e.g. sickness certificate), is important in interpreting the data. Our definition of a gastroenteritis consultation including D11 ‘Diarrhoea’, but not D10 ‘Vomiting’, is not completely in line with a common definition (1), but was chosen to be in line with the definition used by the Norwegian Syndromic Surveillance System (25). As a result, consultations for diarrhoea of other causes than gastroenteritis are included, but gastroenteritis consultations coded with D10 ‘Vomiting’ are missed. Studies on the validity of these diagnoses and the diagnostic algorithm are lacking.

The perspective of this study was from the health care services, and the entity in the study was the consultation for (not patients with) gastroenteritis. Thus, it cannot be used for estimating the prevalence of gastroenteritis in the Norwegian population nor in primary care. Also, it cannot be used to precisely estimate the extent of absence from work due to gastroenteritis.

**Interpretation/comparison with existing literature**

Many gastrointestinal infections exhibit some kind of seasonality (28) and the mechanisms of seasonality are thought to vary for the different pathogens (20), including factors such as variability in temperature and humidity, start of school year, geographical localization on either Northern or Southern Hemisphere and level of country development (19, 21, 23). Norovirus infections seem to have a seasonal pattern with peaks in the cooler months, i.e. December through February in the Northern Hemisphere and June through August in the Southern Hemisphere (17, 29). The present study includes gastroenteritis due to all possible pathogens, but the observed pattern of seasonality is in line with that known for norovirus infection on the European continent (30). Also, our findings of high consultation numbers for gastroenteritis among young children, and that the boys account for the majority of gastroenteritis consultations among those under the age of 15 years, are in line with a Dutch study of norovirus infection in primary care (14). Studies from Sweden (3) and the UK (13, 31) also present highest consultation rates among the youngest children. Our findings of young adults as the second most common patient group suggest transmission between child and carer supported by findings from an Australian population-based study of the risk of gastroenteritis (20). Rotavirus infection should be considered as one major cause of gastroenteritis among children under 2 years of age. In older children and in adults, rotavirus most often presents as asymptomatic or subclinical reinfections. A Norwegian study of hospitalized children reported rotavirus infections peaking in March through May (18). Rotavirus vaccination was introduced in Norway in 2014 at the end of our study period; thus, we were not able to evaluate any potential effect of the vaccine introduction based on 1 year of observations only.

We observed a bi-annual variation in gastroenteritis consultations, but this was not seen when organizing the data according to winter–summer variation. This likely reflects whether the main impact of winter vomiting disease (probably norovirus) hit the population before or after the shift of each year.

During the 10-year period, there was a small increase in the absolute number of gastroenteritis consultations. This corresponds mainly with the increase in the Norwegian population during the same period.

Our finding of a higher proportion of point-of-care CRP testing in consultations for gastroenteritis in OOH services when compared with general practice has also been described in a previous Norwegian study (32). We find the use of CRP surprisingly high, but we do not have clinical information about the reason for the testing, nor the results of these tests.
Implications for clinical care and research
To the best of our knowledge, this is the first study to present complete national registry data on gastroenteritis patients’ encounters with primary care doctors over a 10-year period. The results of this study are highly relevant when interpreting data for syndromic surveillance of gastroenteritis based on routine data from primary care. Increased knowledge of the typical patients (age and sex) expected to be seen in consultations for gastroenteritis throughout the year and service type would be useful for the doctors managing the patients in primary care. We think that our results are generalizable at least to countries in the Northern Hemisphere with a primary care system similar to Norway. Future research should study illness trajectories in patients with gastroenteritis managed in primary care. More detailed information about time and geography of the consultations would be useful in future studies of the syndromic surveillance of gastroenteritis. Adding clinical data from the consultations, such as symptoms and severity, and information about stool sampling and results, would further improve the understanding of gastroenteritis in primary care. Also, further research is needed to investigate any benefits of point-of-care CRP-testing for gastroenteritis.

In conclusion, the proportion of gastroenteritis consultations was higher in the OOH services when compared with daytime general practice. The most frequent patients with gastroenteritis in primary care were young children and young adults, with young children dominating even more so in the OOH services. The observed seasonal variation in consultations frequency is similar to that shown for gastroenteritis caused by norovirus on the Northern Hemisphere. These results should be useful for health service planners as well as surveillance systems and clinicians in countries with a comprehensive primary care system.

Acknowledgements
Parts of the work were carried out at the Biostatistics and Data analysis core facility (BIOS) and were thus supported by the Faculty of Medicine at the University of Bergen and its partners. Dagrun Dalvete Slettebo was particularly helpful in this work.

Declaration
Funding: Faculty of Medicine at the University of Bergen. NORCE Norwegian Research Centre, Research Unit for General Practice.
Ethical approval: Regional Committee for Medical and Health Research Ethics, REC West (project number 2016/559). The Norwegian Data Protection Agency (project number 16/01083).
Conflict of interest: None.

References
1. Majowicz SE, Hall G, Scallan E et al. A common, symptom-based case definition for gastroenteritis. Epidemiol Infect 2008; 136: 886–94.
2. Troeger C, Forouzanfar M, Rao PC, Khalil I, Brown A, Reiner RC, Jr., et al. Estimates of global, regional, and national morbidity, mortality, and aetologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study 2013. Lancet Infect Dis 2017;17:909–48.
3. Edelstein H, Mekh H, Deogang C, Carnahan A, Wallenstein A. Quantifying the incidence and cost of acute gastrointestinal illness in Sweden, 2013-2014. Epidemiol Infect 2016; 144: 2831–9.
4. Hansdotter FI, Magnusson M, Kühnmann-Berenson S et al. The incidence of acute gastrointestinal illness in Sweden. Scand J Public Health 2015; 43: 340–7.
5. Kuusi M, Aavitsland P, Gondrosen B, Kapperud G. Incidence of gastroenteritis in Norway— a population-based survey. Epidemiol Infect 2003; 131: 591–7.
6. Müller L, Korsgaard H, Ethelberg S. Burden of acute gastrointestinal illness in Denmark 2009: a population-based telephone survey. Epidemiol Infect 2012; 140: 290–8.
7. Friesema IH, Lugnér AK, van Duynhoven YT; GEops Working Group. Costs of gastroenteritis in the Netherlands, with special attention for severe cases. Eur J Clin Microbiol Infect Dis 2012; 31: 1895–900.
8. Nygård K, Schimmin B, Substad Ø et al. A large community outbreak of waterborne giardiasis-delayed detection in a non-endemic urban area. BMC Public Health 2006; 6: 141.
9. Emberland KE, Ethelberg S, Kuusi M et al. Outbreak of Salmonella Weltevreden infections in Norway, Denmark and Finland associated with alfalfa sprouts, July–October 2007. Euro Surveill 2007; 12: E071129.4.
10. Gunzma-Herrador B, Carlander A, Ethelberg S, Freiesleben de Blasio B, Kuusi M, Lund V, et al. Waterborne outbreaks in the Nordic countries, 1998 to 2012. Euro Surveill 2013;20: 1–10.
11. de Wit MA, Koopmans MP, Kortbeek LM et al. Sensor, a population-based cohort study on gastroenteritis in the Netherlands: incidence and etiology. Am J Epidemiol 2001; 154: 666–74.
12. Hilmarssdotter I, Baldvinsdottir GE, Harardottir H, Briem H, Sigurdsson SI. Enteropathogens in acute diarrhea: a general practice-based study in a Nordic country. Eur J Clin Microbiol Infect Dis 2012; 31: 1501–9.
13. Tam CC, Rodrigues LC, Liviana I et al.; 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; 61: 69–77.
14. Verstraeten T, Cattaert T, Harris J, Lopman B, Tam CC, Ferreira G. Estimating the burden of medically attended norovirus gastroenteritis: modelling linked primary care and hospitalization datasets. J Infect Dis 2017; 266: 957–65.
15. Emberland KE, Nygård K, Aavitsland P. Salmonellosis and charter tourism: epidemiology and trends of imported human cases to Norway from the Canary Islands and Thailand, 1994–2008. Epidemiol Infect 2012; 140: 1655–62.
16. Tacconelli E, Carrara E, Savoldi A et al.; WHO Pathogens Priority List Working Group. Discovery, research, and development of new antibiotics: the WHO priority list of antibiotic-resistant bacteria and tuberculosis. Lancet Infect Dis 2018; 18: 318–27.
17. Ahmed SM, Lopman BA, Levy K. A systematic review and meta-analysis of the global seasonality of norovirus. PLoS One 2013; 8: e75922.
18. Flem E, Vainio K, Dollner H et al. Rotavirus gastroenteritis in Norway: analysis of prospective surveillance and hospital registry data. Scand J Infect Dis 2009; 41: 753–9.
19. Ghazani M, FritzGerald G, Hu W, Toloo GS, Xu Z. Temperature variability and gastrointestinal infections: a review of impacts and future perspectives. Int J Environ Res Public Health 2018;15: 1–12.
20. Hall GV, Kirk MD, Ashbott R, Stafford B, Lalar K. Frequency of infectious gastrointestinal illness in Australia, 2002: regional, seasonal and demographic variation. Epidemiol Infect 2006; 134: 111–8.
21. Kraut RY, Snedeker KG, Babenko O, Honish L. Influence of school year on seasonality of norovirus outbreaks in developed countries. Can J Infect Dis Med Microbiol 2017; 2017: 9258140.
22. MacDonald E, White R, Mexia R, Bruun T, Kapperud G, Brandal LT, et al. The role of domestic reservoirs in domestically acquired Salmonella infections in Norway: epidemiology of salmonellosis, 2000–2015, and results of a national prospective case-control study, 2010–2012. Epidemiol Infect 2018;1–8. [Epub ahead ofprint]
23. Patel MM, Pitzer VE, Alonso WJ et al. Global seasonality of rotavirus disease. Pediatr Infect Dis J 2013; 32: e134–47.
24. Project TS. Assessment of syndromic surveillance in Europe. Lancet 2011;378:1833–4.
25. Norwegian Syndromic Surveillance System (NorSySS). https://www.fhi.no/en/hn/statistics/NorSySS/ (last accessed on 17 June 2018).
26. Cadieux G, Beckeridge DL, Jacques A, Libman M, Endukenu N, Tamlyn R. Accuracy of syndrome definitions based on diagnoses in physician claims. BMC Public Health 2011; 11: 17.
27. Todkill D, Elliot AJ, Morbey R, Harris J, Hawker J, Edeghere O, et al. What is the utility of using syndromic surveillance systems during large subnational infectious gastrointestinal disease outbreaks? An observational study using case studies from the past 5 years in England. *Epidemiol Infect* 2016;144: 2241–50.

28. Colston JM, Ahmed AMS, Soofi SB et al.; Mal-Ed network. Seasonality and within-subject clustering of rotavirus infections in an eight-site birth cohort study. *Epidemiol Infect* 2018; 146: 688–97.

29. Green KY. Norovirus surveillance comes of age: the impact of NoroNet. *Lancet Infect Dis* 2018; 18: 482–3.

30. van Beek J, de Graaf M, Al-Hello H et al.; NoroNet. Molecular surveillance of norovirus, 2005-16: an epidemiological analysis of data collected from the NoroNet network. *Lancet Infect Dis* 2018; 18: 545–53.

31. O’Brien SJ, Donaldson AL, Iturriza-Gomara M, Tam CC. Age-Specific Incidence Rates for Norovirus in the Community and Presenting to Primary Healthcare Facilities in the United Kingdom. *J Infect Dis* 2016; 213(Suppl 1): S15–8.

32. Rebnord IK, Hunskaar S, Gjesdal S, Hellevik Ø. Point-of-care testing with CRP in primary care: a registry-based observational study from Norway. *BMC Fam Pract* 2015; 16: 170.