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Management of Uncomplicated Acute Gastroenteritis in Pediatric Patients Attending Out-of-Hours Primary Care

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Abstract

Background: This study aims to elucidate the trajectory of vomiting, diarrhea, fever, and clinical progression in pediatric patients presenting with uncomplicated acute gastroenteritis in out-of-hours primary care settings. Conducted as a 7-day prospective follow-up study, the course of vomiting, diarrhea, and fever was analyzed using generalized linear mixed modeling. Given the heightened risk of dehydration in infants (≤12 months) and those with severe vomiting, we delineate the potentially more complex courses of these subgroups separately. Additionally, we identify the most common day(s) associated with deterioration and outline the symptoms prevalent in children experiencing such deterioration during follow-up.

Results: Among the 359 children presenting with uncomplicated acute gastroenteritis, 31 (8.6%) experienced complications necessitating referral or hospitalization. The majority of symptoms showed resolution within 5 days in over 90% of cases. Vomiting and fever exhibited rapid decline, while diarrhea demonstrated a slower reduction, particularly among children aged 6–12 months. Notably, children who deteriorated during follow-up exhibited higher rates of vomiting at presentation and elevated frequencies of both vomiting and fever throughout the follow-up period.

Conclusions: Our findings suggest that the frequency of vomiting, rather than its duration, serves as a more significant predictor of deterioration. When counseling parents, it is crucial to provide guidance on typical symptom duration and emphasize recognition of alarm symptoms. Clinicians should maintain vigilance for children with heightened vomiting frequencies upon presentation and during follow-up, as these individuals are at increased risk of deterioration.

Keywords: Safety netting, Symptomatology, Vomiting, Diarrhea, Fever

Introduction

Acute gastroenteritis poses a significant burden on primary care services due to its prevalence among children. Typically characterized by vomiting and/or diarrhea, often accompanied by fever, it generally manifests as a minor, uncomplicated illness manageable at home. However, the condition can escalate to severe dehydration, especially in young children and those with intense vomiting episodes. Consequently, safety netting strategies are advocated for children with acute gastroenteritis who do not necessitate immediate referral. (Bonvanie et al., 2021)

Safety netting advice should encompass comprehensive parental education regarding the anticipated disease progression, identification of potential alarm symptoms, and guidance on when and where to seek further medical assistance. The overarching aim of safety netting is to empower

parents to confidently care for their unwell child while ensuring prompt re-evaluation for those exhibiting signs of deterioration. Ideally, such advice should be tailored to individual children, considering risk factors such as young age (≤ 12 months) and severe vomiting, which may predispose to a more complicated illness trajectory. Evidence indicates that effective safety netting reduces re-attendance rates of febrile children in primary care settings. However, current guidance may be limited due to a lack of precise understanding regarding the expected duration of symptoms in an uncomplicated disease course. Furthermore, the timing and specific symptoms indicative of deterioration remain unclear. Enhancing our understanding of the natural course of acute gastroenteritis could aid both general practitioners (GPs) and parents in distinguishing children necessitating re-evaluation or referral from the majority who will experience an uncomplicated recovery. (Weghorst et al., 2021a)

In this study, our objective is to delineate the trajectories of vomiting, diarrhea, fever, and clinical deterioration over a 7-day period following initial presentation to primary care with uncomplicated gastroenteritis. (Freedman et al., 2013)

Methods

Design and Setting

This study is a cohort study ,a Detailed information on the study design is available elsewhere. All parents of the included children provided written informed consent. The Medical Ethics Review Committee approved this study.

Participants

Children included in the RCT were aged 6 months to 6 years, diagnosed with acute gastroenteritis, and considered at risk of dehydration based on specific criteria. Antiemetic use or prescription within 6 hours before presentation was the main exclusion criterion for the RCT. Children in the parallel cohort study were aged 6 months to 6 years and diagnosed with acute gastroenteritis. All parents of children from both studies completed a diary for 7 days.

Data from children with uncomplicated acute gastroenteritis at presentation were included in the current study. Children requiring immediate referral to or hospitalization in a pediatric emergency department were excluded.

Patient Recruitment and Baseline Assessment

Parents of consecutive children presenting to the primary health care with vomiting and/or diarrhea were informed about the studies by a research assistant before the general practitioner (GP) consultation. Baseline assessment, including demographic and medical data collection, was conducted by the research assistant. The GP confirmed or refuted the diagnosis of acute gastroenteritis and assessed dehydration status. Children were included based on the GP's diagnosis, baseline data, and parental consent.

Outcomes

The primary outcome was to describe the trajectories of vomiting, diarrhea, and fever over the 7-day follow-up period among children with uncomplicated acute gastroenteritis. Secondary outcomes included the day of deterioration and the prevalence of each symptom on the day of deterioration.

Measurements

Parents completed a diary for 7 days, reporting their child's progress and healthcare utilization hourly for the first 4 hours and daily thereafter. Data from the first day of the diary were excluded from analysis. Symptoms were recorded as present or absent in the past 24 hours. Vomiting,

diarrhea, and fever were defined according to standard criteria. Separate descriptions were provided for children aged ≤12 months and those with severe vomiting.

Statistical Analysis

Descriptive statistics summarized baseline characteristics. The courses of vomiting, diarrhea, and fever were analyzed using generalized linear mixed models (GLMMs). Frequency of deterioration was depicted by day of follow-up, and differences in baseline characteristics between children who did and did not deteriorate were assessed. Data analysis was conducted using IBM SPSS version 25.0.

Results

Participant Flow and Baseline Characteristics

A total of 1061 children were screened for eligibility across the three participating OOH-PC centers. Eventually, data from 359 children were included in the analyses. Their median age was 1.5 years (IQR, 0.9–2.2 years), with 184 (51.3%) being female.

The median duration of vomiting before presentation was 2 days (IQR, 1.0–3.0 days), while diarrhea was present in 181 (50.7%) children, with a median duration before presentation of 3 days (IQR, 2.0–4.0 days). Severe vomiting and age 6–12 months were the most prevalent risk factors for dehydration, observed in 244 (68.0%) and 103 (28.7%) children, respectively. The most frequent alarm symptom for dehydration was no urine output for 24 hours, present in 45 (13.3%) children.

Presence of Symptoms

Children were grouped by age and vomiting severity into four categories: age 6–12 months without severe vomiting (n=32), age 6–12 months with severe vomiting (n=71), age > 12 months without severe vomiting (n=83), and age > 12 months with severe vomiting (n=173). Estimated percentages and 95% confidence intervals for vomiting, diarrhea, and fever .

Vomiting was the predominant symptom at presentation, with 20%–50% of children still experiencing it by day 2 post-presentation, particularly among those with severe vomiting initially. By day 5, these percentages had decreased to around 10% across all risk groups.

The percentage of children presenting with diarrhea varied by age and severity of initial vomiting, ranging from 38.9% to 84.7%. Notably, 10% of children aged > 12 months had persistent diarrhea by day 5, while this threshold was reached by day 7 for children aged 6–12 months.

Fever was present in 20%–40% of children at presentation, with fewer than 10% experiencing persistent fever by day 4. The course of fever was similar across all groups.

Deterioration: Referral or Hospitalization

During follow-up, 31 children (8.6%) were referred to the emergency department, with 18 (5.0%) of these subsequently hospitalized. Most deteriorations occurred on days 2 and 3 post-presentation. Children hospitalized had a median of 1 day of vomiting before presentation compared to 2 days in non-hospitalized children, along with higher median frequencies of vomiting at presentation. Throughout follow-up, children who deteriorated exhibited higher frequencies of vomiting and fever, while the frequencies of diarrhea remained similar to those who did not deteriorate.

Table 1 Baseline characteristics

Baseline characteristics	N Included	N Deterioration follow-up	N Hospitalized follow-up
Gender (female)	359	184 (51.3%)	31
Age in years	359	1.5 (0.9–2.2)	31
Weight in kg	296	11.1 (9.5–14.0)	29

Vomiting present	357	328 (91.9%)	31
Duration of vomiting prior to presentation OOH-PC in days	326	2.0 (1.0–3.0)	29
Frequency of vomiting past 24 h	311	5.0 (3.0–8.0)	29
Diarrhea present	357	181 (50.7%)	31
Duration of diarrhea prior to presentation OOH-PC in days	180	3.0 (2.0–4.0)	13
Frequency of diarrhea in past 24 hours	167	5.0 (4.0–7.0)	14
Dehydration assessed by GP (0–100%)	339	20.0 (9.0–35.0)	31
Additional risk factors for dehydration	357	31	18
- 1	131 (36.7%)	13 (41.9%)	7 (38.9%)
- ≥2	30 (8.4%)	3 (9.6%)	2 (11.1%)
Alarm symptoms of dehydration	357	31	18
- 1	50 (14.0%)	8 (25.8%)	6 (33.3%)
- ≥2	8 (2.2%)	1 (3.2%)	1 (5.6%)

Table 2 Risk factors and alarm symptoms of dehydration

Risk factors and alarm symptoms of dehydration	**N Included**	**N Deterioration follow-up**	**N Hospitalized follow-up**
Age 6–12 months	359	103 (28.7%)	31
Severe vomiting	359	244 (68.0%)	31
≥6 watery stools	355	81 (22.8%)	31
Fever (≥38 °C)	346	84 (24.3%)	31
Reduced intake in the last 12 h	353	28 (7.9%)	31
Alarm symptoms of dehydration	357	31	18
- Confused or decreased consciousness	10 (2.8%)	2 (6.5%)	2 (11.1%)
- Bradycardia	1 (0.3%)	0 (0.0%)	0 (0.0%)
- Weak peripheral pulse	0 (0.0%)	0 (0.0%)	0 (0.0%)
- Capillary refill >4 s	1 (0.3%)	1 (3.2%)	1 (5.6%)
- Skin pitch >4 s	1 (0.3%)	1 (3.2%)	1 (5.6%)
- Extremities cold/marbled	7 (2.0%)	0 (0.0%)	0 (0.0%)
- No urine output for 24 h	45 (13.3%)	6 (20.7%)	4 (25.0%)

Discussion

This study delineated the progression of vomiting, diarrhea, and fever over a span of 7 days, alongside the clinical deterioration pattern, among children seeking care at Out-of-Hours Primary Care (OOH-PC) centers due to uncomplicated acute gastroenteritis. Among the cohort, 8.6% experienced a complex illness necessitating referral, with 5.0% requiring hospitalization. Symptoms notably abated by day 5 in over 90% of cases, except for diarrhea persisting among

children aged 6–12 months. Vomiting and fever exhibited rapid decline, while diarrhea resolution was slower, particularly in younger children. Notably, children who deteriorated showed higher initial vomiting rates, with vomiting and fever persisting longer. (Van Damme et al., 2007)

A drawback of this study lies in its focus on children presenting with excessive vomiting, potentially skewing the representation towards severe cases. Nonetheless, the analysis was stratified to differentiate between children with and without severe vomiting, facilitating tailored advice provision. Despite this limitation, the study benefitted from prospectively collected data on 359 children with uncomplicated gastroenteritis at OOH-PC, utilizing parental diaries over 7 days for insights into symptom progression. (Maguire et al., 2011)

Regarding existing literature, this study aimed to provide robust safety netting advice for pediatric gastroenteritis cases in primary care. Consistent with previous findings, over 90% of children ceased vomiting within 5 days post-presentation. Discrepancies with other studies, such as Chow et al., possibly stem from differences in etiology, with rotavirus infections known for prolonged symptoms. Notably, our study's inclusion criterion of severe vomiting may have led to a higher proportion of rotavirus cases. Additionally, the duration of vomiting may have been prolonged due to exclusive inclusion of GP-consulting children. Comparable to secondary care data, our findings align with studies by Roslund et al. and Reeves et al., depicting diarrhea persistence post-discharge. (Roslund et al., 2008) (Reeves et al., 2002)

At presentation, less than 40% of children exhibited fever, in line with expectations for rotavirus gastroenteritis. Similarly, fever resolution within 4 days for 90% of children aligns with existing primary care literature on childhood fever. Noteworthy is the observation that most deteriorations occurred on days 2 and 3 post-presentation, echoing findings by Friesema et al., underscoring the predictive value of vomiting frequency for referral. GPs should thus vigilantly assess vomiting frequency during gastroenteritis management. (Friesema et al., 2012)

Conclusions and Implications for Clinicians and Policymakers

To provide effective safety netting advice, it is imperative to offer a comprehensive description of the expected duration of symptoms in an average uncomplicated course of acute gastroenteritis, along with predictors of deterioration whenever feasible. Based on the findings of this study, we suggest that GPs in OOH-PC settings educate parents about the typical duration of symptoms and the alarm symptoms to monitor as part of this safety netting advice. It is reasonable to advise parents that vomiting should typically resolve within 5 days, while fever should subside within 4 days of presentation in 90% of children. However, regarding diarrhea, it is crucial to tailor advice based on the age of the child: children aged ≤12 months may experience diarrhea for up to 7 days, whereas children aged >12 months should recover within 5 days. GPs should pay close attention to children presenting with higher frequencies of vomiting, as these children demonstrated a higher likelihood of deterioration in our study. Although further research is warranted to validate these findings, the advice aligns with best practices and the results of another research in this domain.

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