Health Care Provider and Caregiver Preferences Regarding Nasogastric and Intravenous Rehydration

WHAT’S KNOWN ON THIS SUBJECT: Some children with gastroenteritis fail to respond to oral rehydration. Subsequent interventions are dictated by regional preference. In North America, nasogastric rehydration is rarely administered. Caregiver and health care providers’ perspectives regarding its use have not been described previously.

WHAT THIS STUDY ADDS: Both caregivers and health care providers would select intravenous rehydration instead of nasogastric rehydration when oral rehydration fails. Greater knowledge mobilization efforts will be required for nasogastric rehydration to be adopted into clinical practice.

abstract

OBJECTIVE: Despite evidence supporting its use, nasogastric rehydration is rarely used in North America. We conducted a prospective, cross-sectional, 3-phase study to evaluate current perspectives.

METHODS: We compared the proportions of respondents in favor of nasogastric (as opposed to intravenous) rehydration, should oral rehydration fail, between clinicians and caregivers. Phase 1: caregivers of children aged 3 to 48 months, who presented to a Canadian pediatric emergency department with symptoms of gastroenteritis, were invited to complete a survey. Phase 2: phase 1 participants administered intravenous or nasogastric rehydration had the procedure observed and outcome data recorded. Phase 3: pediatric emergency medicine physicians, fellows, and nurses completed a survey.

RESULTS: Four hundred thirty-five children-parent dyads and 113 health care providers participated. If oral rehydration were to fail, 10% (47 of 435) of caregivers and 14% (16 of 113) of clinicians would choose nasogastric rehydration (difference = 3.4%; 95% confidence interval: 2.2 to 11.4). Caregivers were more familiar with the term intravenous than nasogastric rehydration (80% vs 20%; P < .001). Sixty-four children (15%) received intravenous rehydration; none received nasogastric rehydration. Participating nurses have inserted 90 (interquartile range: 25–150) intravenous cannulas compared with 4 (interquartile range: 2–10) nasogastric tubes during the preceding 6 months (P < .001). After a brief educational intervention, the proportion recommending nasogastric rehydration increased to 27% (117 of 435) among caregivers (P < .001) and 43% (49 of 113) among health care providers (P < .001).

CONCLUSIONS: In keeping with caregiver desires, health care providers in a Canadian emergency department employ intravenous rehydration when oral rehydration fails. Enhanced change management strategies will be required for nasogastric rehydration to become adopted in this environment. Pediatrics 2012;130:e1504–e1511

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Abbreviations

ORT—oral rehydration therapy
ED—emergency department
IQR—interquartile range
CI—confidence interval

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Despite evidence in favor of oral rehydration therapy (ORT), some children with gastroenteritis fail to respond to therapy because of persistent vomiting, inadequate oral intake, or excessive diarrhea. The choice of subsequent interventions is dictated by regional preference. In Europe and Oceania, nasogastric rehydration predominates; in North America, intravenous rehydration is administered routinely. Despite endorsement by the American Academy of Pediatrics, nasogastric rehydration is administered to <1% of North American children with gastroenteritis.

Although authors of numerous studies have evaluated the role of ORT, few have examined nasogastric rehydration as the sole rehydration intervention or in combination with ORT. A study of children with moderate to severe dehydration found that those administered nasogastric rehydration had a greater intake of fluids and electrolytes, fewer electrolyte disturbances, less vomiting, shorter duration of diarrhea, and lower mortality compared with those administered intravenous rehydration. Similar findings have been reported in children with lesser degrees of dehydration.

Because adoption into clinical practice is highly variable, the identification of barriers to nasogastric rehydration use in North America merits evaluation. We conducted a multiphase study to evaluate caregiver and health care practitioner perspectives on the use of nasogastric and intravenous rehydration.

We sought to determine, in a hypothetical model that includes the failure of ORT, whether the proportion of respondents in favor of nasogastric rehydration (as opposed to intravenous rehydration) would differ between health care providers and caregivers and whether an educational intervention could alter this outcome.

**METHODS**

**Study Population**

Two sample populations were evaluated: (1) caregivers of eligible children were enrolled in the emergency department (ED) of The Hospital for Sick Children, Toronto, between August 2010 and May 2011. Eligible children were aged 3 to 48 months and presented with gastroenteritis, defined by \( \geq 3 \) episodes of vomiting or watery stools within the preceding 24 hours. Children were excluded if they had symptoms for \( \geq 7 \) days, had previously been enrolled, or if caregivers were non–English-speaking. (2) Health care providers were eligible if they were pediatric emergency medicine physicians, fellows, or nurses. Research assistants were present 15 hours per day, 7 days per week to enroll participants. The study was approved by The Hospital for Sick Children’s research ethics board.

**Survey Content and Administration**

The surveys were developed in accordance with guidelines and included a literature review, expert panel item generation, reduction, and pretesting. Both surveys employed dichotomous and frequency-of-endorsement-question formats and required 10 minutes to complete. The caregiver survey (Supplemental Information 1) was administered by the research assistants and was used to collect data on demographics, symptoms, experiences, beliefs, knowledge, and desires regarding rehydration methods. The self-administered health care provider survey (Supplemental Information 2) was used to collect demographic and experiential data along with perceptions, knowledge, beliefs, and treatment patterns in children with gastroenteritis. It employed advance mailings and reminder e-mails and was distributed in electronic and paper formats. Reminders were sent to nonresponders at predetermined 1- to 2-week intervals, up to a maximum of 4 additional e-mails. To preserve anonymity while preventing multiple responses, each participant was assigned a study identification number.

**Study Design**

This prospective, cross-sectional, 3-phase study was conducted as follows:

**Phase 1: Caregiver Survey**

After triage, the caregivers of consecutive, potentially eligible children presenting between 8:00 AM and 11:00 PM were assessed for eligibility. Those meeting eligibility criteria and providing informed consent were invited to complete the survey. The final survey question was, “If you were given the choice, would you prefer that your child receive nasogastric or intravenous rehydration?” Subsequently, the caregiver was provided with a 1-page document outlining the advantages and disadvantages of nasogastric and intravenous rehydration (Supplemental Information 3), and then provided the opportunity to modify his or her answer to the final question.

**Phase 2: Rehydration Data Collection**

All treatment decisions (ie, oral, nasogastric, or intravenous rehydration) and the application of topical analgesics and other pain reduction modalities were unrelated to the study and at the discretion of the supervising physician. Participants administered intravenous or nasogastric rehydration had the procedure observed by a research assistant who documented the number of insertion attempts. Caregivers were asked to indicate their satisfaction with the insertion process on a 5-point Likert scale. Although agreement in pain scores assigned by children, parents, and practitioners is not perfect, given the importance...
of the topic, we asked parents to provide an assessment of their child’s pain during the procedure on a 100-mm Visual Analog Scale. The Visual Analog Scale allowed parents to indicate, along a 100-mm line, the intensity of their child’s pain with 0 mm representing “no pain” and 100 mm representing the “worst possible pain.”

**Phase 3: Health Care Provider Survey**

All full-time and part-time physicians, nurses, and pediatric emergency medicine fellows working in the ED that provided informed consent were eligible. As with the caregiver survey, the last question recorded the preferred method of treatment of children who fail to respond to ORT. Again, respondents were provided with a document outlining the pros and cons of nasogastric and intravenous rehydration, and the final question was repeated.

**Sample Size and Data Analysis**

Based on local expert opinion, health care providers were expected to be more aware of the reasons to use nasogastric rehydration, so we a priori estimated that in our hypothetical model, the proportions of responses in favor of nasogastric rehydration would be 15% for caregivers and 30% for health care providers. Assuming a 1:4 recruitment ratio for health care providers to caregivers, we estimated that responses from 96 health care providers and 384 caregivers would provide 90% power, with a type 1 error probability of .05 to reject the null hypothesis (PASS 2008, Version 08.0.2; NCSS Statistical Software, Kaysville, UT).

Survey data were entered into Microsoft Excel (Microsoft Corp, Redmond, WA), and then into SPSS, version 16.0 (SPSS, Inc, Chicago, IL). Responses were analyzed by using descriptive statistics to describe demographic variables and percentages to summarize categorical data. For the primary outcome, preference of rehydration method, the χ² test was used. Other categorical response variables were tested by using the χ² test or Fisher's exact test, as appropriate. Continuous variables were compared by using the 2-sample t test. When paired responses were evaluated, McNemar’s test was used for categorical variables, the paired t test was used for continuous parametric variables, and the Wilcoxon signed rank test was used for nonparametric continuous variables. Subanalyses were used to explore the preferences based on previous intravenous rehydration episode, time of presentation (8:00 AM–8:00 PM vs 8:00 PM–8:00 AM), intravenous rehydration status at the current visit, and distance to hospital (>25 km = rural). Results were calculated based on the number of respondents to a particular question. A Bonferroni correction for multiple comparisons was applied to the analyses presented in each table. The Bonferroni correction divides the type I (α) error (.05) by the number of comparisons to yield a more conservative P value that is then used to assign statistical significance.

**RESULTS**

A total of 1103 children were screened; 435 were enrolled, 193 caregivers did not consent, and 475 were ineligible (317 had symptoms for ≥7 days, 141 did not meet vomiting or diarrhea frequency criteria, 12 had a language barrier, and 5 were too old or too young). Sixty-six percent (260 of 435) of participants were male, the mean age was 1.8 ± 1.0 years, 65% (283 of 435) had diarrhea, 90% (393 of 435) had vomiting, and 60% (263 of 435) had a history of fever. Forty-nine percent (211 of 435) had seen a physician during the current illness, and 26% (115 of 435) had caregivers who were instructed to bring their child for ED care.

**Primary Outcome (Before Information Leaflet)**

Given the choice, 10% (47 of 435) of the caregivers would choose nasogastric rehydration compared with 14% (16 of 113) of health care providers (difference = 3.4%; 95% confidence interval [CI]: −2.8% to 11.4%; P = .41). This finding was similar for those presenting during daytime (36 of 356; 10%) and evening (11 of 79; 14%) hours (P = .37); by intravenous fluid administration at the index visit (10 of 64; 16%; yes; 38 of 371; 10%, no; P = .20); and by distance to the hospital (19 of 135; 14% rural; 45 of 300; 15% urban; P = .80).

**Caregiver Survey: Phase 1**

Caregivers report being more familiar with the concept of intravenous rehydration, and they believe this route to be easier, less painful, and more effective than nasogastric rehydration (Table 1). Similar proportions of caregivers of children who have (61 of 174; 35%) and have not (80 of 261; 31%) previously received intravenous rehydration reported that intravenous insertion is easy (difference = 4.4%; 95% CI: −4.5% to 13.5%; P = .08). Forty-five percent (18 of 40) of the caregivers of children who previously experienced nasogastric tube insertion indicated that tube insertion is easy. This proportion was greater than the proportion among those who had never experienced nasogastric tube insertion, in which only 51 of 395 (12%) believed this task to be easy (difference = 32%; 95% CI: 17% to 48%; P = .001). Only 13 of 40 (33%) of the caregivers of children who previously had a nasogastric tube believe it is as effective as intravenous rehydration; by comparison, 50% (197 of 395) of those who never experienced nasogastric tube insertion believe it is as effective.
TABLE 1 Caregiver Responses to Questions Regarding Their Knowledge of Nasogastric (NG) and Intravenous (IV) Rehydration (N = 435)

<table>
<thead>
<tr>
<th>IV Rehydration</th>
<th>NG Rehydration</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heard of the term “IV/NG rehydration”; yes, n (%)</td>
<td>348 (80)</td>
<td>85 (20)</td>
</tr>
<tr>
<td>A child in the family has previously received IV/NG rehydration; yes, n (%)</td>
<td>174 (40)</td>
<td>40 (9)</td>
</tr>
<tr>
<td>Believe IV/NG insertion is easy, n (%)</td>
<td>141 (32)</td>
<td>69 (16)</td>
</tr>
<tr>
<td>No</td>
<td>256 (58)</td>
<td>335 (77)</td>
</tr>
<tr>
<td>Do not know</td>
<td>38 (9)</td>
<td>31 (7)</td>
</tr>
<tr>
<td>Believe IV/NG rehydration will replenish fluids; n (%)</td>
<td>417 (96)</td>
<td>372 (85)</td>
</tr>
<tr>
<td>Yes</td>
<td>12 (3)</td>
<td>47 (11)</td>
</tr>
<tr>
<td>No</td>
<td>6 (1)</td>
<td>17 (4)</td>
</tr>
<tr>
<td>Estimated pain with IV/NG insertion; median (IQR) on scale of 0 (no pain) to 100 (worst possible pain)</td>
<td>70 (50–90)</td>
<td>80 (60–100)</td>
</tr>
</tbody>
</table>

Significance was set at P < .005.
* Compared by using Wilcoxon signed rank test.
† N = 33 in total for these items.

(difference = 17.4%; 95% CI: −0.1% to 31.7%; P = .06).

At baseline, 10% of caregivers favored nasogastric rather than intravenous rehydration. After reading the information leaflet (Supplemental Information Appendix 3), the proportion in favor increased to 27% (117 of 435; difference = 17%; 95% CI: 11% to 21%; P < .001). Caregivers of children with previous intravenous experience indicated they would opt for intravenous rehydration as often as caregivers without previous intravenous experience (155 of 174 [89%] vs 233 of 261 [89%]; difference = 0.2%; 95% CI: −5.6% to 6.6%; P = .95). After reviewing the information leaflet, fewer caregivers of children without previous intravenous experience chose intravenous rehydration: 79% (137 of 174) vs 69% (181 of 261) (difference = 9.4%; 95% CI: 0.9% to 17.4%; P = .03). Lastly, if ORT were to fail, the caregivers of children who previously experienced the insertion of a nasogastric tube were more likely to opt for nasogastric rehydration than those without a previous experience (9 of 40 [23%] vs 38 of 385 [10%]; difference = 12.9%; 95% CI: 2.2% to 28.1%; P = .01). After reading the information leaflet (Supplemental Information 3), the difference was no longer significant: 13 of 40 (33%) vs 104 of 395 (26%) (difference = 6.2%; 95% CI: −7.1% to 22.2%; P = .40).

**Nasogastric/Intravenous Rehydration Data: Phase 2**

Three hundred seventy-one children (85%) were successfully treated with ORT before discharge; 64 (15%) failed to improve and were administered intravenous rehydration. No child received nasogastric rehydration. The distance from home to the ED was similar between those administered intravenous fluids (24 ± 27 km) and those successfully treated with ORT (23 ± 21 km; P = .56). The number of intravenous insertion attempts was available for 52 children. The median number of attempts was 1 (interquartile range [IQR]: 1–2). Nine children required 2 attempts, 4 required 3 attempts, 2 required 4 attempts, and 1 required 8 attempts. The median caregiver-reported (N = 33) perception of pain during intravenous insertion was 70 out of 100 (IQR: 50–90), and median parental satisfaction with the insertion process was 1 (“very satisfied”; IQR: 1–1) on a 5-point Likert scale. Scores of 3 (neither satisfied nor dissatisfied) to 5 (very dissatisfied) were reported by 3 parents: those whose children required 2, 3, and 8 attempts.

**Health Care Provider Survey: Phase 3**

Survey responses were received from 57 physicians (response rate = 67%; 19 full-time, 22 part-time, 16 fellows); 2 declined, and 26 (25 part-time, 1 fellow) did not respond to the invitation (Tables 2 and 3). Fifty-six nurses (71%) completed the survey, and 23 did not respond. The reported rehydration methods used (oral, nasogastric, and intravenous) in children with moderate dehydration differed significantly among groups (Fig 1; P = .001). At baseline, 14% of health care providers favored nasogastric over intravenous rehydration. After reading the information leaflet (Supplemental Information 3), the number in favor of nasogastric rehydration increased to 43% (49 of 113) (difference = 29%; 95% CI: 18% to 40%; P < .001).

Nurses reported performing a significantly greater number of intravenous and nasogastric insertions than physicians; however, the former group performs a ratio of 22:1 intravenous-to-nasogastric insertion. Although both physicians and nurses estimated high success rates with nasogastric tube insertion (80%–90%), nurses estimate greater success with nurse-executed intravenous insertion (85%) compared with the physician group (60%–70%; P < .001). Compared with physicians, nurses are also more likely to estimate that intravenous insertion is “easy” (79% vs 32% ED staff vs 31% ED fellows; difference = 47%; 95% CI: 29% to 61%; P < .001), whereas estimates for ease of nasogastric insertion were similar (P = .12; Table 3). Although most physicians believe that nasogastric rehydration results in shorter ED length of stay and is less painful to insert, nurses do not share those beliefs.
Estimated percent successful IV insertion, No. of IV insertions in child, past 6 mo; median (IQR)

Estimated percent successful IV insertion, first attempt, adult; median (IQR)

Previous IV insertion in child; yes, n (%) 56 (100)

No. of IV insertions in child, past 6 mo; median (IQR)

Estimated percent successful IV insertion, first attempt, child; median (IQR)

Consider IV insertion in a child to be “easy”; yes, n (%) 44 (78)

Estimated percent “average medical practitioner” inserts IV on first attempt in child <3 y with dehydration; mean ± SD 65 ± 20

Estimated pain associated with IV insertion in a young child (0–100 mm scale); mean ± SD

Maximum no. of IV insertion attempts; median (IQR)

IV rehydration, yes, n (%) Reduces the frequency of vomiting and diarrhea

Reduces the vol of vomiting and diarrhea episodes

Replenishes fluids lost through vomiting and diarrhea

Alleviates abdominal pain in children with gastroenteritis

Estimated percentage in whom, mean ± SD

IV access not achieved

Incorrect IV fluid is administered

IV rate is incorrect

Cellulitis/phlebitis develops

Electrolyte disturbance develops

Significance was set at P < .002. IQR, 25–75th IQR.
from the United States, however, in which the authors provided the options of oral or intravenous rehydration to parents,22 62% of whom, even after education, preferred intravenous rehydration. In our study, even the caregivers of children with previous intravenous experience predominantly opted for intravenous rehydration; they were also less influenced by our information leaflet. Their preference for intravenous rehydration likely reflects a high satisfaction rate with the intravenous rehydration process and a lack of familiarity with the use of nasogastric rehydration. Most dissatisfied caregivers witnessed their children undergo multiple intravenous insertion attempts. Perhaps such children could be targeted for an alternative rehydration method (eg, nasogastric) through the use of intravenous access scores such as the Difficult Intravenous Access (DIVA) score.23 On the other hand, the lack of adoption of nasogastric rehydration by health care providers is likely related to the multitude of challenges involved in implementing knowledge translation.24 Moreover, although health care providers seem to underestimate the discomfort of nasogastric tube insertion,25 26 they overestimate its complication rate (eg, 3%–6% rate of intrapulmonary infusion). The reasons for clinicians’ choice of intravenous rehydration are likely multifactorial, which is most clearly evidenced by the failure to integrate nasogastric rehydration into our department despite our having a gastroenteritis pathway that includes the use of nasogastric rehydration in children in whom intravenous insertion is unsuccessful after 2 attempts.

Translating evidence to practice is not easy, and a variety of strategies targeting barriers to change at different levels is required.27 Although we were able to document changes in perception, changes in clinical practice are more challenging and only partly within doctors’ control, with prevailing professional and organizational cultures playing significant roles.28 Professional development needs to be incorporated into patient care, employing both clinical decision support tools and real-time, patient-specific reminders to help physicians make the best decisions. Additional barriers include the patient, the care process, available resources, and physician and nursing leadership.29 Intervention at the team level is required to develop and implement a transition from intravenous to nasogastric rehydration. Our study has several limitations, the most significant of which is that the opinions expressed by clinicians are reflective of our local context and are not generalizable beyond North America. Our findings must be interpreted in the context of the study milieu, which lacks equipoise in the usage and experience with nasogastric and intravenous rehydration. In addition, our

**TABLE 3** Health Care Provider Background, Experience, and Success With Nasogastric (NG) Insertion

<table>
<thead>
<tr>
<th></th>
<th>Nurses, N = 56</th>
<th>Staff Physicians, N = 41</th>
<th>Fellows, N = 16</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous NG insertion in adult; yes, n (%)</td>
<td>47 (84)</td>
<td>34 (83)</td>
<td>12 (75)</td>
<td>.59</td>
</tr>
<tr>
<td>No. of NG insertions in adult, past 6 mo; median (IQR)</td>
<td>0 (0–2)</td>
<td>0 (0–0)</td>
<td>0 (0–0)</td>
<td>.01</td>
</tr>
<tr>
<td>Estimated percent successful (&lt;2 min) NG insertion, first attempt, adult; median (IQR)</td>
<td>0 (0–5)</td>
<td>0 (0–0)</td>
<td>0 (0–0)</td>
<td>.94</td>
</tr>
<tr>
<td>Previous NG insertion in child; yes, n (%)</td>
<td>56 (100)</td>
<td>34 (83)</td>
<td>13 (81)</td>
<td>.007</td>
</tr>
<tr>
<td>No. of NG insertions in child, past 6 mo; median (IQR)</td>
<td>4 (2–10)</td>
<td>0 (0–0)</td>
<td>0 (0–0)</td>
<td>.001</td>
</tr>
<tr>
<td>Estimated percent successful NG insertion, first attempt, child; median (IQR)</td>
<td>90 (75–89)</td>
<td>80 (50–90)</td>
<td>90 (80–80)</td>
<td>.27</td>
</tr>
<tr>
<td>Consider NG insertion in a child to be “easy”; yes, n (%)</td>
<td>43 (77)</td>
<td>25 (61)</td>
<td>11 (69)</td>
<td>.12</td>
</tr>
<tr>
<td>Estimated percent “average medical practitioner” inserts NG on first attempt in child &lt;3 y with dehydration; mean ± SD</td>
<td>73 ± 23</td>
<td>96 ± 27</td>
<td>77 ± 12</td>
<td>.54</td>
</tr>
<tr>
<td>Estimated pain associated with NG insertion in a young child (0–100 mm scale); mean ± SD</td>
<td>64 ± 18</td>
<td>52 ± 25</td>
<td>50 ± 16</td>
<td>.007</td>
</tr>
<tr>
<td>Maximum no. of NG insertion attempts; median (IQR)</td>
<td>3 (2–3)</td>
<td>3 (2–3)</td>
<td>3 (2–5)</td>
<td>.19</td>
</tr>
<tr>
<td>NG rehydration; yes, n (%)</td>
<td>11 (20)</td>
<td>9 (22)</td>
<td>3 (19)</td>
<td>.58</td>
</tr>
<tr>
<td>Reduces the frequency of vomiting and diarrhea</td>
<td>10 (18)</td>
<td>5 (12)</td>
<td>1 (6)</td>
<td>.53</td>
</tr>
<tr>
<td>Replenishes fluids lost through vomiting and diarrhea</td>
<td>47 (84)</td>
<td>36 (88)</td>
<td>16 (100)</td>
<td>.51</td>
</tr>
<tr>
<td>Alleviates abdominal pain in children with gastroenteritis</td>
<td>15 (27)</td>
<td>7 (17)</td>
<td>5 (31)</td>
<td>.10</td>
</tr>
<tr>
<td>Estimated percentage in whom; mean ± SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epistaxis occurs</td>
<td>29 ± 27</td>
<td>7 ± 5</td>
<td>26 ± 26</td>
<td>.001</td>
</tr>
<tr>
<td>The child vomits out the NG tube</td>
<td>24 ± 19</td>
<td>11 ± 11</td>
<td>22 ± 20</td>
<td>.001</td>
</tr>
<tr>
<td>Fluids are administered into the lungs</td>
<td>5 ± 5</td>
<td>3 ± 6</td>
<td>6 ± 8</td>
<td>.33</td>
</tr>
<tr>
<td>Electrolyte disturbance develops</td>
<td>5 ± 5</td>
<td>3 ± 6</td>
<td>6 ± 8</td>
<td>.03</td>
</tr>
</tbody>
</table>

Significance was set at *P < .003; IQR, 25–75th IQR.*

**FIGURE 1** Reported usage of therapeutic options in infants with moderate dehydration. Responses were statistically different among groups (*P = .001*). PEM, pediatric emergency medicine.
with the use of nasogastric rehydration, so many prefer intravenous rehydration when ORT fails. This treatment choice is in keeping with caregiver desires. Future research should include a detailed study to better clarify barriers to nasogastric rehydration use in North America. Additionally, high-quality research, in a region where nasogastric tube insertion is commonplace, should assess the discomforts associated with this procedure. Given current knowledge and perceptions, extensive knowledge translation efforts are required for the nasogastric route to become a routine treatment option in North America.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the assistance of the Paediatric Research Academic Initiative in SickKids Emergency (PRAISE) volunteers with the conduct of the study. We also thank Johanna Crudden, Clinical Research Manager, for supervising the work of the PRAISE volunteers, Catherine Wong for her administrative assistance, Tuula Kalliomaki for preparing the required study materials, and Monica Monchis for assisting with data entry.

REFERENCES


TABLE 4 Health Care Provider Perceptions Regarding Nasogastric (NG) and Intravenous Rehydration

<table>
<thead>
<tr>
<th>Method recommended to families when ORT fails</th>
<th>Nurses, N = 56</th>
<th>Staff Physicians, N = 41</th>
<th>Fellows, N = 16</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most effective method to administer rehydration fluids, NG (%)</td>
<td>9 (16)</td>
<td>7 (17)</td>
<td>2 (13)</td>
<td>.59</td>
</tr>
<tr>
<td>Most often successfully inserted on first attempt, NG (%)</td>
<td>45 (80)</td>
<td>36 (88)</td>
<td>15 (94)</td>
<td>.44</td>
</tr>
<tr>
<td>Vomiting more likely to continue, NG (%)</td>
<td>40 (71)</td>
<td>33 (81)</td>
<td>13 (81)</td>
<td>.23</td>
</tr>
<tr>
<td>Higher risk of medical error resulting in complication, NG (%)</td>
<td>15 (23)</td>
<td>7 (17)</td>
<td>2 (13)</td>
<td>.57</td>
</tr>
<tr>
<td>Shorter ED stay, NG (%)</td>
<td>21 (38)</td>
<td>23 (56)</td>
<td>12 (75)</td>
<td>.04</td>
</tr>
<tr>
<td>Lower admission rate, NG (%)</td>
<td>32 (57)</td>
<td>23 (56)</td>
<td>10 (63)</td>
<td>.90</td>
</tr>
<tr>
<td>Insertion more painful/distressing or the child, NG (%)</td>
<td>34 (61)</td>
<td>20 (49)</td>
<td>5 (31)</td>
<td>.04</td>
</tr>
<tr>
<td>Associated with significantly fewer major adverse events, NG (%)</td>
<td>38 (68)</td>
<td>29 (71)</td>
<td>12 (75)</td>
<td>.63</td>
</tr>
<tr>
<td>Method recommended to families when ORT fails; before handout, NG (%)</td>
<td>9 (16)</td>
<td>3 (7)</td>
<td>4 (25)</td>
<td>.17</td>
</tr>
<tr>
<td>Method recommended to families when ORT fails; after handout, NG (%)</td>
<td>19 (34)</td>
<td>18 (44)</td>
<td>12 (75)</td>
<td>.04</td>
</tr>
</tbody>
</table>

**REFERENCES**


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<table>
<thead>
<tr>
<th>Updated Information &amp; Services</th>
<th>including high resolution figures, can be found at: /content/130/6/e1504.full.html</th>
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<tbody>
<tr>
<td>Supplementary Material</td>
<td>Supplementary material can be found at: /content/suppl/2012/11/14/peds.2012-1012.DCSupplemental.html</td>
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<tr>
<td>References</td>
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Health Care Provider and Caregiver Preferences Regarding Nasogastric and Intravenous Rehydration

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