

Use of a New Instrument to Assess Health-Related Quality of Life in Children 0-3 Years of Age During a Hospitalization Due to Rotavirus Gastroenteritis in the US

Cristina Carias¹; Doug Altenweg²; Jaime G. Deville³; Janine Verstraete⁴; Jae S. Min¹; Krow Ampofo⁵; Lisa Saiman⁶; Marian G. Michaels⁷; Mary Staat⁸; Mike Herdman MSc⁹; Morgan Eaton²

¹Merck & Co, Inc.; ²Oracle Life Sciences; ³David Geffen School of Medicine at UCLA; ⁴University of Cape Town; ⁵University of Utah Health; ⁶New York-Presbyterian Morgan Stanley Children's Hospital, Columbia University; ⁷University of Pittsburgh School of Medicine; ⁸Department of Pediatrics University of Cincinnati; ⁹Insight Consulting & Research

Background

- Rotavirus gastroenteritis (RVGE) is characterized by mild to profuse vomiting, watery diarrhea, and dehydration; in severe cases, it can lead to dehydration and death.¹
- Rotavirus burden falls especially on children ≤ 5 years of age, with the median age of rotavirus infection being < 2 years of age across both high and low child-mortality settings.² However, economic evaluations of vaccination have previously estimated quality-adjusted life-year (QALY) losses associated with RVGE in children using utility weights derived from non-age-specific instruments.³⁻⁶
- Recently, a new instrument was developed and validated to assess HRQoL in children ≤3 years old. This prospective, observational study assessed the responsiveness and acceptability of the experimental EuroQol Toddler and Infant Populations Quality of Life instrument version 2.0 (EQ-TIPS) in children ≤3 years old hospitalized with RVGE.

Methods

Study design:

This was a prospective, observational study conducted between February 2023 and June 2025 at five hospitals in the United States. The study enrolled caregivers of children 0-7 years of age hospitalized with community RVGE.

Study procedures:

Caregivers of hospitalized children aged 0-3 years of age were interviewed to complete the EQ-TIPS within 48 hours of hospitalization and again 10-13 days following hospital discharge. Post-discharge, caregivers also completed a survey to characterize demographic characteristics and patient symptoms. A subset of caregivers additionally provided feedback on the acceptability and usefulness of EQ-TIPS in semi-structured interviews conducted 14-18 days after discharge. The interviews were recorded, transcribed, and coded by two coders.

The EQ-TIPS (experimental version 2.0) is a caregiver-reported questionnaire designed for children aged 0-3 years that assesses six health dimensions along with a Visual Analog Scale. Caregivers were asked to select the statement that best described their child's health at each assessment timepoint.

Statistical analyses:

We used descriptive statistics to calculate the EQ-TIPS VAS scores and dimension-level responses. We analyzed response codes to the semi-structured interviews.

Continuous and ordinal variables from cross-sectional analyses within a single visit were assessed using Mann-Whitney tests, while categorical variables were analyzed using chi-square tests. Longitudinal within-patient and within-caregiver comparisons across study visits were evaluated using the Wilcoxon signed-rank test for paired comparisons. *P*-values were reported, and values <0.05 were considered statistically significant.

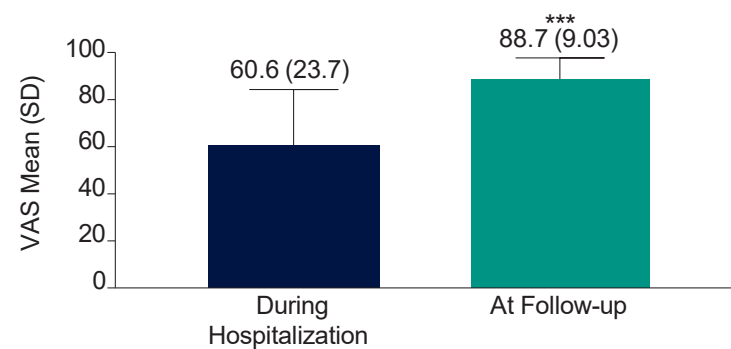
Conflicts of Interest

CC and JSM are employees of Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, USA and shareholders of Merck & Co., Inc., Rahway, NJ, USA, which funded the study. Merck & Co., Inc., Rahway, NJ, USA is the manufacturer of a rotavirus vaccine (RotaTeq[®]). JGD, JV, KA, LS, MM, and MS received consulting fees from Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, USA. DA and ME are employees of Oracle Life Sciences, Austin, Texas and MH is an employee of Insight Consulting & Research, Barcelona, Spain. Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, USA sponsored the study and contracted Oracle Life Sciences, Austin, Texas and Insight Consulting & Research, Barcelona, Spain to conduct the study. JV and MH are also members of the EuroQol Research Group.

Results

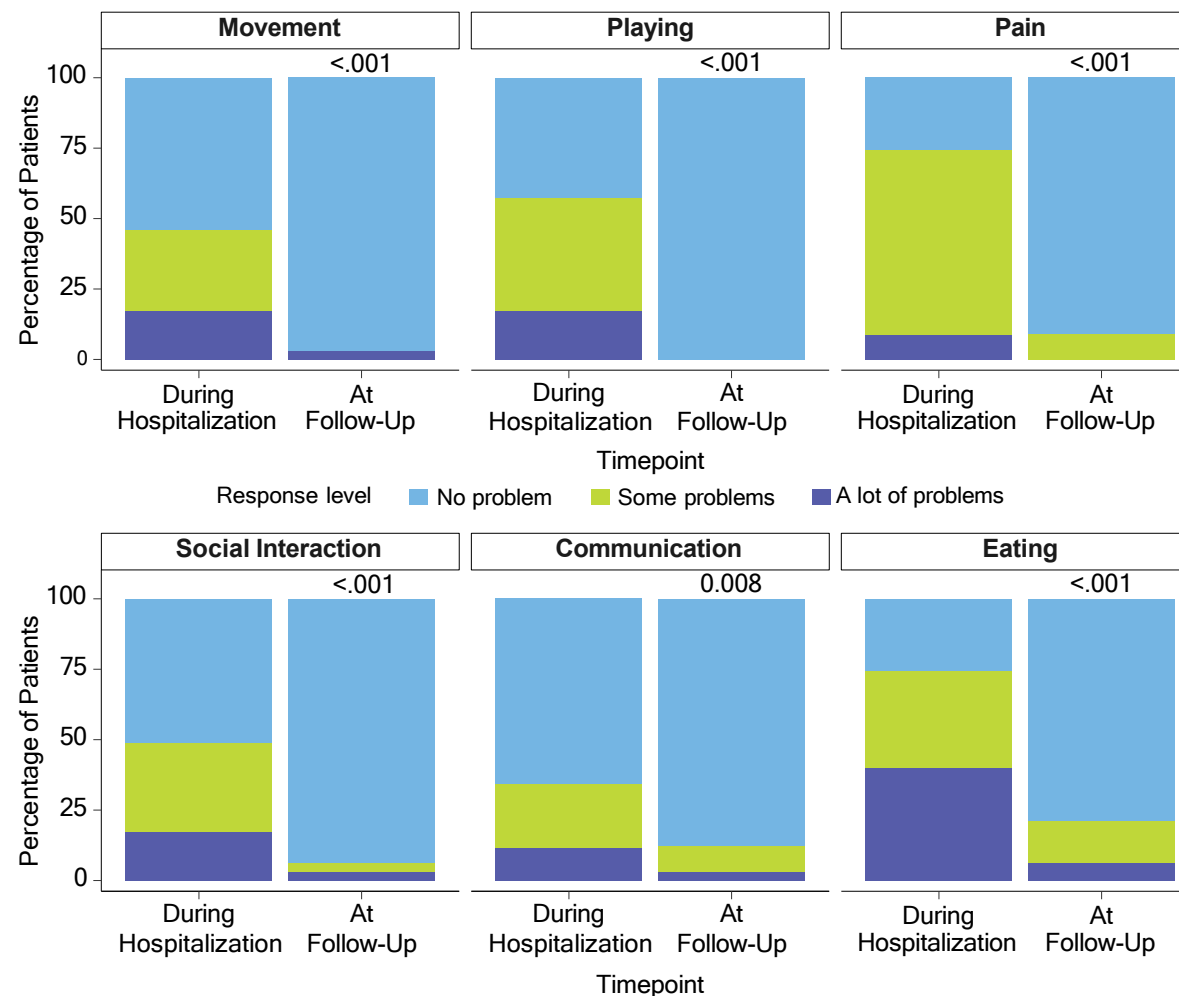
- A total of 35 caregivers of children 0-3 (one per patient) completed the EQ-TIPS questionnaire within 48 hours of hospital admission; 2 were lost-to-follow-up. 15 caregivers participated in qualitative interviews and 12 evaluated the acceptability and usefulness of EQ-TIPS.
- Most caregivers were female (88.6%), patients' mean (SD) age was 1.4 (0.8); the most common symptoms were diarrhea and vomiting (Tables 1-3).
- The mean EQ-TIPS VAS score within 48 hours of hospitalization was 60.6 (SD 23.7), which significantly improved to 88.7 (SD 9.0) at follow-up (*P*≤0.001). Improvements were observed across all EQ-TIPS dimensions, especially playing, pain, and eating (Figures 1-2).
- Among caregivers who participated in qualitative interviews, most reported that the EQ-TIPS content was easy to understand and relevant for assessing the child's RVGE experience. Some caregivers reported that it was not sufficiently specific and did not assess the impact of illness on siblings (Table 3).

Figure 1. EQ-TIPS VAS responses



VAS response to how good the patient's health is today. The overall VAS score for EQ-TIPS was provided by caregivers of children ≤3 years of age during hospitalization (RVGE episode) and 10 to 13 days after discharge (base state). The mean EQ-TIPS was significantly improved after discharge. ****P*≤0.001.

Figure 2. Health-related quality of life in patients aged 0-3 (EQ-TIPS)



Significant within-patient improvements were observed across all six EQ-TIPS dimensions between hospitalization and follow-up (Wilcoxon signed-rank test, *P*≤0.01 for all). At hospitalization, playing, pain, and eating showed the greatest impairment, while at follow-up, the majority of caregivers reported "no problems" across all dimensions.

Table 1. Caregiver reported sociodemographic characteristics

Characteristics	
Age (Mean, SD) [N]	32.36 (5.16) [30]
Missing	5
Female [N]	88.6% [31]
Missing	2
Ethnicity	
Hispanic	2 (5.7%)
Not Hispanic	18 (51.4%)
Missing	15 (42.9%)
Race	
White	13 (37.1%)
Black or African-American	6 (17.1%)
Native Hawaiian or Other Pacific Islander	1 (2.9%)
Missing	15 (42.9%)
Employment^{b,c}	
Full-Time Employment	15 (42.9%)
Part-Time Employment	4 (11.4%)
Stay at Home	7 (20.0%)
Student	1 (2.9%)
Unemployed	4 (11.4%)
Parental Leave	1 (2.9%)
Other	1 (2.9%)
Missing	5 (14.3%)
Patient healthcare insurance^a	
Public (Medicaid, CHIP, or Medicare)	15 (42.9%)
Private	14 (40.0%)
No insurance	0
Other	1 (2.9%)
Missing	5 (14.3%)
Highest Level of Education Completed^a	
No Formal Schooling	0
Elementary or Primary	1 (2.9%)
Secondary or High School	12 (34.3%)
College or University Degree	11 (31.4%)
Advanced or Graduate or Post-Graduate Degree	6 (17.1%)
Missing	5 (14.3%)

Results abstracted from the post-discharge survey. 2 caregivers were lost-to-follow up, and 3 completed the post-discharge survey partially. ^a Multiple responses may be selected.

Table 2. Patient sociodemographic characteristics

Patient caregiver-reported characteristics	
Age (Mean, SD) [N]	1.4 (0.8) [N=35]
Female	17 (48.6%) ^a
Male	13 (37.1%) ^a

^a Five patients were missing from caregiver-report.

Table 3. Patient caregiver-reported RVGE symptoms

No. of Days of Acute Gastroenteritis Symptoms	6.67 (2.88) [N=30]
Symptoms^a	
Vomiting	29 (82.9%)
Diarrhea	30 (85.7%)
High fever (>38.5 °C)	17 (48.6%)
Dehydration	29 (82.9%)
Lost weight	25 (71.4%)
Inflamed bottom	16 (45.7%)
Seizure	2 (5.7%)
Other conditions	5 (14.3%)
Missing	5 (14.3%)

^a Multiple responses may be selected. 2 caregivers were lost-to-follow up, and 3 completed the survey partially.

Table 3: Select caregiver feedback on EQ-TIPS

Code	Mentions	Quotes
EQ-TIPS Questionnaire Experience		
Easy to complete	2	His quality of life and all of that was... right now, I wouldn't even be able to tell you, but because it was so fresh in my mind that it was so easy in the wording with everything and just the scale itself; it was easy CG_001005 I think it was both easy to understand and answer. It was nice because it didn't take too much time to complete. CG_0040087
Straightforward	1	I liked the scale and that was the one that was - was it only four or five questions? It wasn't a ton - it wasn't a lot of questions, and they were straightforward. CG_0020114
Would have preferred in digital format	1	I will say I feel like it would have been nice if it was digital and could have been done whenever, because when we did it in the hospital, my daughter had to use the bathroom in the middle of it and wanted to walk around, so it was just kind of difficult, I guess, to answer in that moment. CG_0040087
Not particularly useful	1	I did not necessarily find them useful. [...] At least the question related to the score was broad and a little vague as far as what you're using to measure and determine whatever score. I mean, it didn't necessarily tell me anything useful about my experience. CG_0020088
Not specific enough	1	It wasn't difficult. It was just one of the things that was like, "Well" - I mean she just slept (Laughs) so - I mean she was able to do stuff. She chose not to because she wanted to sleep because she was miserable so it's kind of those - I mean, "Ehh." (Laughs) [...] I would have liked something more specific: like a space to actually give a real answer and not just the number, if that makes sense. CG_0040091
Was distracted	1	I think I was pretty distracted because I think I was driving to go and take my son to Indianapolis at that time. CG_0020099
EQ-TIPS Understandability		
Easy to understand	10	Yes, I think it was both easy to understand and answer. It was nice because it didn't take too much time up to complete. CG_0040087
One question asked backward	1	There's one question that was a little odd because it was backward. CG_0010007
EQ-TIPS Purposefulness		
Most important topics covered	10	I felt like every field was covered with the questionnaire and the thermometer on how it was gauged. CG_0040035
Missing a question about impact on siblings	1	I don't remember the question about impact on like siblings. I don't remember one specifically for that. That's a big deal because she has several siblings. That would probably capture better our experience if that was there. CG_0010007

Discussion and conclusions

- RVGE hospitalization was associated with substantial short-term HRQoL decrease in children ≤3 years old, as captured by EQ-TIPS.
- EQ-TIPS demonstrated responsiveness assessing HRQoL changes during and after RVGE hospitalization. Most caregivers thought it was easy to understand and comprehensive.
- The magnitude of the EQ-TIPS VAS during the RVGE hospitalization was similar to the VAS for patients ≤3 years of age hospitalized with severe COVID-19 (58.4).⁷
- Results are limited by small sample size and generalizable to hospitalized children only.
- The validation of a utility value set for the EQ-TIPS set will further allow for the use of the EQ-TIPS in economic evaluations.

References

- Troeger et al. (2018) *JAMA Pediatr.* 172(10):958-965. doi: 10.1001/jamapediatrics.2018.1960.
- Hasso-Agopowicz et al. (2019) *Clin Infect Dis.* 69(6):1071-1078. doi: 10.1093/cid/ciz060
- Herdman et al. (2016) *Value Health.* 19(2):255-66. doi: 10.1016/j.jval.2015.11.003
- Hoffman et al. (2011) *Eur J Pediatr.* 170(12):1535-9. doi: 10.1007/s00431-011-1465-y.
- Brisson et al. (2010) *Pediatr Infect Dis J.* 29(1):73-75. doi:10.1097/INF.0b013e3181b41506
- Martin et al. (2008) *J Med Econ.* 11(3):471-484. doi:10.3111/13696990802321047
- Zhou et al. (2025) *Eur J Health Econ.* 26(3):337-351. doi:10.1007/s10198-024-01710-1

RotaCARE
Because Rotavirus Impacts Families, Not Just Children

