Utilization of Text Messages to Supplement Rounding Communication: a Randomized Feasibility Study

Austin Wesevich, MD, MPH[1,2,3], Mikelle Key-Solle, MD[2], Apoorva Kandakatla, BS[4], Colby Feeney, MD[1,2], Kathryn I. Pollak, PhD[5], and Thomas W. LeBlanc, MD, MA, MHS[6]

[1]Department of Medicine, Duke University School of Medicine, Durham, NC, USA; [2]Department of Pediatrics, Duke University School of Medicine, Durham, NC, USA; [3]Section of Hematology/Oncology, University of Chicago, Chicago, IL, USA; [4]Duke University School of Medicine, Durham, NC, USA; [5]Cancer Prevention and Control, Duke Cancer Institute, Durham, NC, USA; [6]Division of Hematologic Malignancies and Cellular Therapy, Department of Medicine, Duke University School of Medicine, Durham, NC, USA.

BACKGROUND: Fragmented communication with patients and families during hospitalizations often leaves patients confused about the daily plan.
OBJECTIVE: To pilot a supplemental text message–based platform for improving bidirectional communication about the clinical plan and patients' goals.
DESIGN: Randomized controlled trial
PARTICIPANTS: Thirty adult patients, thirty caregivers of pediatric patients, and the interns caring for them on inpatient general medicine and pediatric services.
INTERVENTIONS: Patients and caregivers were texted or emailed daily to report their personal goal and assess their understanding of the team's clinical plan. Interns were texted daily to report the team's clinical plan and to assess their understanding of the patient's personal goal.
MAIN MEASURES: Primary outcomes were feasibility, defined as survey response rates, and acceptability. Secondary outcomes were patient comprehension of the clinical plan, trainee comprehension of the patient's goal, patient-centered communication scores, and educational satisfaction scores.
KEY RESULTS: Thirty adult patients, thirty caregivers of pediatric patients, fourteen general medicine interns, and six general pediatric interns enrolled. Intervention feasibility was met, with survey response rates of 80% for general medicine trainees, 67% for general pediatric trainees, 58% for adult patients, and 70% for caregivers. Patients and caregivers in the intervention arm had higher understanding of medication changes (76% vs 50%, $p = 0.02$) and new consultations (90% vs 61%, $p = 0.002$). Interns had higher understanding of patients' goals in the intervention arm (93% vs 40%, $p < 0.001$), particularly for adult patients (97% vs 17%, $p < 0.001$). Caregivers rated communication higher regarding information to help make decisions ($p = 0.04$). Interviews demonstrated high acceptability.
CONCLUSIONS: Our text message–based communication intervention was feasible and acceptable to all involved participants, with preliminary signals of efficacy. The intervention may contribute to improved understanding of medication changes and new consultations, as well as help in making decisions. A large, randomized efficacy trial of this intervention is warranted.

Received May 26, 2021
Accepted November 17, 2021
Published online February 25, 2022

KEY WORDS: patient communication; rounding; hospital medicine; technology; graduate medical education.

J Gen Intern Med 37(12):2991–7
DOI: 10.1007/s11606-021-07285-4

INTRODUCTION

The patient and family experiences of hospitalization need improvement. Patient confusion persists around diagnoses and treatment plans.[1,2] Clinicians often discuss treatment plans privately then reveal these plans to patients in bite-size pieces during bedside rounds. This impedes shared decision-making, as patients are not included, and poorly transfers information from clinicians to patients. Thus, patient comprehension of the daily plan and clinician understanding of the patient's goals are generally low.[3]

Many pediatric wards have implemented patient/family-centered rounds (PFCR),[4,5] which involve patients and families in discussions. While families appreciate PFCR, they have not been directly compared to standard rounding schemas.[6] Smaller studies suggest PFCR improve communication, discharge timing, and parental and nursing satisfaction.[7] Adult medicine wards have implemented multidisciplinary bedside rounds to reduce length of stay and detect impending clinical deterioration earlier,[8] but bedside rounds may increase patient confusion.[9] Both adult and pediatric inpatient services could augment the rounding experience to ensure adequate, bidirectional communication.

Trainees could foster improved patient understanding through frequent bedside interactions, but they spend more time documenting and indirectly coordinating care than bedside,[10–12] despite wanting more time directly communicating with patients.[13] This discrepancy between desired and actual time at the bedside can contribute to trainee job dissatisfaction and decreased empathy. While medical knowledge increases through training, empathy appears to decrease.[14] Leveraging existing technology to establish more direct communication between clinicians and patients could address gaps without increasing indirect care burden. Enhanced bidirectional communication could improve workflow, allow more time at the bedside, and help maintain trainee empathy.[15]

We therefore piloted a relatively low-technology and collaborative intervention, the "Patient-Centered Daily Plan," to supplement bedside communication. The intervention provided patients and families an avenue to explicitly review the plan discussed on rounds, talk with their caregivers about that plan, and communicate their goals to the clinician. We hypothesized that brief text messages or emails summarizing daily plans and patient goals would be a feasible way to supplement bidirectional communication on daily rounds.

METHODS

Study Overview

We conducted a randomized controlled pilot study that randomized two groups: (1) adult patients and (2) caregivers of pediatric patients. The primary outcome measures were feasibility, defined as response rates to intervention surveys, and acceptability, assessed through qualitative interviews. Secondary outcomes were (1) patient comprehension of the primary team's clinical daily plan, (2) trainee comprehension of the patient's personal daily goal, (3) patient satisfaction with physician communication, and (4) trainee educational experience satisfaction.

Study Sample

For the first group, we consented and enrolled thirty general medicine teaching service adult patients at Duke University Hospital. Patients were eligible if they were assigned to a consented trainee, were able to read English, had access to a phone or computer while hospitalized, and were able to see the phone or computer screen. For the second group, we consented and enrolled thirty caregivers of patients on the general pediatric service at Duke Children's Hospital. Caregivers had identical eligibility criteria plus being the patient's legal guardian and planning to be bedside daily. All interns on general medicine and pediatric teams during the months of enrollment were eligible to participate in the study.

Study Procedures

The resident study member (AW) emailed consent forms to interns on general medicine and pediatric services prior to the start of their rotations. Interested trainees enrolled via email after all concerns were addressed. The clinical research coordinator called potential patient or caregiver participants for screening and enrollment. The groups of thirty enrolled adult patients and thirty enrolled caregivers of pediatric patients were each randomized through fixed block randomization, without stratification, to the intervention or control arm, with fifteen patients or caregivers per arm. The research coordinator was blinded to randomization. Patient and caregiver preference guided text message versus email communication during the study, while all enrolled interns only received text messages. The Research Electronic Data Capture (REDCap, version 10) system automated survey invitations per the schedule below.[16] Twilio, a cloud communication platform enabling survey administration through SMS, sent text-messaged surveys and directly imported responses into Duke REDCap. Text message questions and responses were a text thread; email required clicking the REDCap survey link.

Study Intervention

We asked all patients and caregivers each morning for their personal daily goal ("What is your goal for today?" or "What

is your goal for your child today?"). In the intervention arm only, we sent the response verbatim to the intern caring for the patient. Midday, we asked the interns for the team's clinical daily plan for intervention for patients in layman terms ("What is the plan for the patient in room X today?"), and we sent responses verbatim to the patient or caregiver as a summary of the discussion from rounds.

Study Outcomes

Each afternoon, we asked patients and caregivers about six aspects of the clinical care plan: diagnosis, planned tests, planned procedures, medication changes, consulted services, and expected discharge date (Appendix A).[3] In the late afternoon, we asked all interns their patient's daily goal ("For the patient in room X, what did the patient express as his/her goal for today?").

After discharge or five days on the study, whichever came first, we asked patients and caregivers questions from an adapted version of the Patient-Centered Communication scale (Appendix B).[17] Validated for cancer patients, this six-item, five-point Likert scale asks respondents to rate different aspects of communication from clinicians. At the end of the interns' rotations, we assessed trainee satisfaction through a modified version of the iCOMPARE survey (Appendix C).[18] The study coordinator called all adult patients, pediatric caregivers, and interns after study completion and offered brief, audio-recorded, deidentified interviews.

Responses to the six-question daily plan were assessed by two physicians (AW and either MKS, CF, or TWL) for alignment with the daily progress note and rated as "no agreement," "partial agreement," or "complete agreement."[3] Raters were blinded to the randomization assignment. Any rater discrepancies were reconciled through further review of the electronic medical record and discussion until complete concordance was reached. Similarly, responses to the question about the patient's daily goal were compared by two team members (AW and AK) for alignment and then reconciled through discussion if discrepant.

Analysis

Baseline demographic data (age, sex, race, ethnicity, education level, insurance status, and prior hospitalizations) for adult patients, pediatric patients, and caregivers were described and compared using Fisher's exact and Wilcoxon rank sum tests. Similarly, general medicine and pediatric intern demographic data (age, sex, race, ethnicity, and residency program) were described and compared. Statistical significance was prespecified as $p < 0.05$.

Feasibility was based on the response rate to the intervention surveys of the patient's personal daily goal and the team's clinical daily plan. Response rates were calculated at the patient level, as the number of surveys completed divided by the number sent to them, then averaged across the study arm. Given lack of prior studies, we did not establish an *a priori* feasibility threshold but instead reported feasibility metrics to describe adherence to the intervention. Response rates were compared using Wilcoxon-Mann Whitney tests.

Patient understanding of the team's daily plan ratings was dichotomized into agreement ("complete agreement") or not ("partial agreement" or "no agreement"). Fisher's exact tests compared the intervention and control arms for adult and pediatric populations individually and cumulatively. Similarly, Fisher's exact tests assessed trainee understanding of the patient's daily goal.

Wilcoxon rank sum tests compared patient-centered communication item scores (1–5) and total scores (6–30) between intervention and control arms for patients and caregivers individually and cumulatively. Trainee satisfaction responses were dichotomized into satisfied ("very satisfied" or "satisfied") or not ("neutral," "unsatisfied," or "very unsatisfied") then compared between medicine and pediatric interns using Fisher's exact tests.

All quantitative analyses were done using Stata 16.1 (College Station, TX). Given the preliminary exploratory nature of this pilot study, we did not correct for multiple hypothesis testing. Interviews were transcribed and reviewed by team members to identify representative themes and quotes, but no formal qualitative analysis was conducted.

Ethical Approval

This study was reviewed and approved by the Duke University Health System Institutional Review Board.

RESULTS

Study Sample

We screened 82 adult patients in June and September 2020 and 51 pediatric caregivers in September and October 2020. Most (68%) screened adult patients were eligible, and 54% of those eligible were interested in enrolling. Almost all (88%) caregivers of pediatric patients were eligible, and 67% of those were interested in enrolling (Fig. 1). We invited 27 general medicine interns and 12 general pediatric interns, and 14 (52%) and 6 (50%) enrolled, respectively.

Adult patients and pediatric caregivers highly preferred texting over email (90% adult, 100% pediatric) and were mostly female and white but varied in education level and insurance type with adequate randomization (Table 1). Trainees were on average 29 years old, white, and in categorical programs (Appendix D). Pediatric interns were predominantly female.

Primary Outcome: Feasibility

Feasibility was evaluated on the basis of survey response rates of the patient's personal daily goal and the team's clinical daily plan. Response rates were generally about 60% or higher (Table 2). We also met both enrollment targets, suggesting

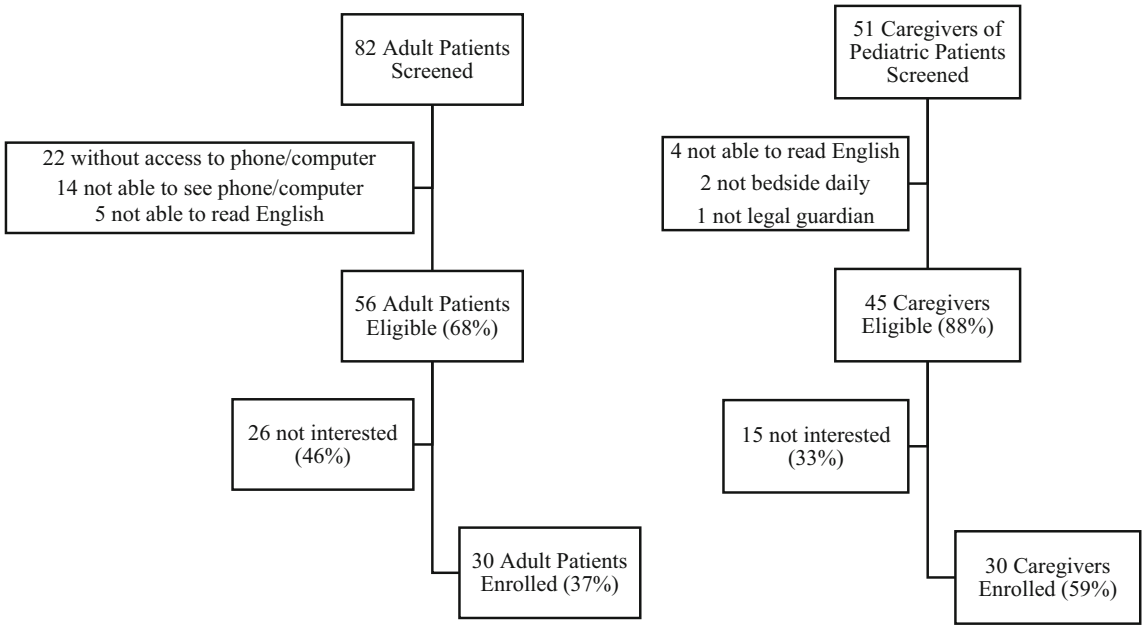

Figure 1 Screening and enrollment.

feasibility regarding openness to the intervention. Secondary analyses of demographic variables, including age, showed no association with response rate.

Adult patients responded to the personal daily goal survey more in the intervention arm (58% vs 41%, $p = 0.2$) while pediatric caregivers responded more than adults (69% vs 50%, $p = 0.09$) but did not differ between intervention and control arms (70% vs 68%, $p > 0.99$). General medicine interns responded to the team's clinical daily plan text more than pediatric interns (80% vs 67%, $p = 0.2$).

Secondary Outcome: Understanding the Team's Clinical Daily Plan

Overall, the intervention arm had higher understanding of medication changes ($p = 0.02$) and new consultations ($p = 0.002$, Table 3). Adult patients knew their diagnoses overall, but the adult intervention arm had higher understanding of all other categories of the daily plan, particularly which new consultations were placed that day (93% vs 65%, $p = 0.04$). Pediatric caregivers knew the procedures being done and discharge timing, but the pediatric intervention arm had higher

Table 1 Participant Demographics

	Adult intervention ($n = 15$)	Adult control ($n = 15$)	Peds intervention ($n = 15$)	Peds control ($n = 15$)
Electronic preference				
Phone	13 (87%)	14 (93%)	15 (100%)	15 (100%)
Email	2 (13%)	1 (7%)	0 (0%)	0 (0%)
Age, years (SD)	51.4 (16.9)	52.3 (12.9)	37.9 (8.8)	35.8 (6.8)
Female sex	10 (67%)	8 (53%)	12 (80%)	13 (87%)
Child's age, years (SD)			10.4 (5.9)	8.1 (6.5)
Female child sex			8 (53%)	7 (47%)
Race				
White	10 (67%)	8 (53%)	9 (60%)	10 (67%)
Black	4 (27%)	7 (47%)	6 (40%)	5 (33%)
Other	1 (7%)	0 (0%)	0 (0%)	0 (0%)
Hispanic ethnicity	2 (13%)	0 (0%)	2 (13%)	0 (0%)
Education				
No high school diploma	1 (7%)	1 (7%)	1 (7%)	2 (13%)
High school diploma or GED	4 (27%)	5 (33%)	2 (13%)	2 (13%)
Some college	2 (13%)	5 (33%)	4 (27%)	4 (27%)
College degree	6 (40%)	3 (20%)	7 (47%)	2 (13%)
Advanced degree	2 (13%)	1 (7%)	1 (7%)	5 (33%)
Insurance type				
Uninsured	1 (7%)	2 (13%)	1 (7%)	0 (0%)
Medicaid	3 (20%)	5 (33%)	8 (53%)	8 (53%)
Medicare	6 (40%)	5 (33%)	-	-
Private	5 (33%)	5 (33%)	6 (40%)	7 (47%)
Prior hospitalization	15 (100%)	14 (93%)	10 (67%)	11 (73%)
Hospitalizations in past year (SD)	2.3 (2.8)	0.7 (1.3)	0.7 (1.2)	0.9 (1.4)

SD standard deviation

Table 2 Survey Response Rates

	Adult		Pediatrics		Intern	
	Intervention	Control	Intervention	Control	Gen Med	Gen Peds
9:00 a.m. daily goal	58%	41%	70%	68%		
11:45 a.m. daily plan					80%	67%

understanding of all other categories, particularly medication changes (77% vs 43%, $p = 0.03$).

Secondary Outcome: Understanding the Patient's Personal Daily Goal

Cumulatively, general medicine and pediatric interns correctly identified personal daily goals more for intervention patients and participants than controls (93% vs 40%, $p < 0.001$). This was more pronounced for general medicine interns (97% vs 17%, $p < 0.001$) than general pediatric interns (87% vs 59%, $p = 0.047$).

Secondary Outcome: Patient Satisfaction

The modified patient-centered communication scale did not significantly differ between arms for any individual item except for intervention arm pediatric caregivers rating one item higher (item 3, $p = 0.04$), which referred to doctors giving information and resources to help make decisions (Appendix B). All scores for both adult and pediatric groups were higher for the intervention arm than the control arm except for caregivers with the fourth item, which referred to doctors discussing how to cope with fears, stress, and other feelings (Table 4, Appendix B). Adult patients rated patient-centered communication higher than pediatric caregivers (26.9 vs 24.4, $p = 0.2$).

Secondary Outcome: Trainee Satisfaction

Trainee participants were overall satisfied with their educational experiences. Medicine interns rated continuity of care, patient safety, attending supervision, overall resident education, and following clinical care of admitted patients as either "satisfied" or "very satisfied" (Appendix C). Pediatric interns rated satisfaction lower for patient safety (83%, $p = 0.3$) and resident education (67%, $p = 0.08$). The lowest rated category was overall well-being (medicine 71% satisfied; pediatrics 83% satisfied).

Qualitative Pilot Feedback

Interns had overall positive feedback and recommended program expansion to other patients, particularly if found to be beneficial. One trainee highlighted how the intervention gives patients a voice: "Patients aren't always able to bring up what's important to them necessarily. So it's nice to have the opportunity for them to text us with what they think is important." Interns found the program less engaging with control arm patients or no responses; they desired "getting some sort of feedback" from patients. They wanted "to integrate it into the [electronic medical record]" as it was sometimes "hard to respond to the text messages if [they were] busy."

Both patients and caregivers felt "empowered." One patient noted the program's focus on her "responsibility" in her health: "so if [she] was able to follow through, it just felt like [she] was on the right path to healing." Another called the study "an essential tool, if people actually listen to and tell the truth about their experience of being…in the hospital." A third suggested that "doctors just need to be more aware of what they say and do around patients" and that the study could "encourage the patients in the hospital to speak for themselves, to question what they are being told more than they do."

Caregivers found the texts "easy," "super quick," and "convenient." One appreciated the convenience of a texted plan if caregivers "had to leave to…get something to eat or…to go to work." Another emphasized that the daily plan text not be "too vague" and to consider how "knowledgeable with how the system works" a caregiver is in its phrasing.

DISCUSSION

The Patient-Centered Daily Plan simple texting-based intervention is feasible and can be implemented on general medicine and general pediatric inpatient teams. All participant types generally accepted the intervention. Although not

Table 3 Daily Plan Understanding

	Adult			Pediatrics			Overall		
	Intervention	Control	*p*-value	Intervention	Control	*p*-value	Intervention	Control	*p*-value
Diagnosis	85%	89%	>0.99	82%	65%	0.3	84%	76%	0.4
Tests	70%	50%	0.2	59%	48%	0.6	65%	49%	0.1
Procedures	93%	76%	0.2	95%	91%	>0.99	94%	85%	0.3
Med changes	74%	59%	0.3	77%	43%	0.03	76%	50%	0.02
Consults	93%	65%	0.04	86%	57%	0.08	90%	61%	0.002
Discharge	78%	65%	0.5	90%	95%	>0.99	83%	82%	>0.99

Table 4 Patient-Centered Communication Scores

	Adult			Pediatrics			Overall		
	Intervention	Control	*p*-value	Intervention	Control	*p*-value	Intervention	Control	*p*-value
Comfort asking questions	4.58	4.45	0.8	4.83	4.33	0.1	4.71	4.39	0.2
Open/honest communication	4.83	4.45	0.2	4.33	4.08	>0.99	4.58	4.26	0.4
Help making decisions	4.50	4.45	0.9	4.64	3.82	0.04	4.57	4.14	0.1
Coping	4.36	4.00	0.4	3.38	4.00	0.3	3.95	4.00	>0.99
Understanding care	4.92	4.73	0.2	4.36	4.18	>0.99	4.65	4.45	0.6
Dealing with uncertainty	4.50	4.09	0.5	3.91	3.73	0.7	4.22	3.91	0.4
Total score	27.64	26.18	0.5	24.38	24.33	0.7	26.26	25.35	0.9

powered for specific secondary outcomes, we observed differences between intervention and control groups that suggest the intervention may be beneficial to patient understanding of the clinical plan, physician understanding of the patient's goal, and satisfaction with patient-centered communication.

Based on generally high survey response rates compared to other web-based survey studies and suggested trial standards,[19–21] we believe a larger study of this intervention would be feasible. Pediatric trainees may have responded less frequently than medicine trainees due to timing earlier in the academic year (September and October 2020), when most focused on learning inpatient workflow logistics. Interviews demonstrate patients may prefer different timing or frequencies of texts. Pairing the preference for texting over email with the fact that no demographics, including age, were predictive of a higher response rate, a texting-based intervention appears feasible for a diverse group of patients and caregivers. Also, text message prompts asking for patient goals may address patient reservations that clinicians are not interested in their goals.[22]

Interviewed participants overwhelmingly recommended expansion of the pilot intervention. Patients felt empowered to share their voices through the personal daily goal survey and confident their voices would be heard through forwarding their response to the doctor taking care of them. Trainees found the extra text messages manageable within their workflow. Some suggested this duplicates whiteboard use during rounds. Despite whiteboards in each patient's room and data demonstrating improved team shared understanding of patient care plans with white board use,[23] our anecdotal experience is that they are inconsistently used. Texting provides a more accessible, reliable, and consistently utilized method of communication that can be HIPAA-compliant by avoiding personal health information and using room numbers for identification.

Despite not being powered for secondary outcomes, several secondary outcomes showed promise. Patients and caregivers better understood medication changes and new consulting teams, suggesting a text message may reinforce the plan discussed during team rounds and might help address deficits in patient understanding of the post-discharge treatment and follow-up plan.[24] Additionally, trainees better understood patients' personal daily goals. Daily text messages of patients' goals could supplement rounds with helpful patient-centered information, and collaborative approaches to patient goals could improve clinical outcomes.[25] Finally, while most of the patient-centered communication scale did not signal differences between groups, whether related to sample size, measurement technique, or scale adaptation, the intervention may help caregivers with making decisions, either through the texted plan itself or the subsequent communication it fostered. These findings are grounded in prior studies demonstrating the role of text messages in improving medication adherence,[26] supplementing patient experience and communication,[27] and reducing emergency department visits.[28,29] Primary limitations are implementation at a single institution with a limited sample size, leading to low study power for secondary outcomes. Determination of alignment between patient responses to the daily plan assessment questions and what was communicated with the patient was limited by the proxy of daily progress notes and chart review as communications were not recorded, so non-documented conversations about discharge timing and upcoming procedures were not accounted for. Since documenting patient goals is not standard, we asked patients directly, so responses could have repeated what was texted prior for intervention patients. Further research could assess whether this method translates to true "understanding." Randomization was at the patient level, which could have affected how interns interacted with their control and intervention patients. Future trials could randomize interns or inpatient teams. Finally, results are generalizable to patients who can read a text message or operate a mobile device, though mobile phones are widely used by adults of all age groups.[30] In future studies, the Patient-Centered Daily Plan texting intervention could be expanded to more teams across the hospital and could include the bedside nurse and attending to ensure shared understanding across the care team.

Overall, our trial demonstrates the feasibility and promising preliminary evidence for a novel intervention to enhance bidirectional communication between patients and trainees, with apparent positive effects on understanding. This communication model should be evaluated through a large, randomized efficacy trial.

Supplementary Information *The online version contains supplementary material available at https://doi.org/10.1007/s11606-021-07285-4.*

Acknowledgements: *The study team would like to acknowledge the contributions of Shannon Haney, who represented the patient and family voice through the study planning process, as well as all patients, caregivers, and trainees who participated in the study. This study was funded through four grants: The Beryl Institute Patient Experience Grant, a National Med-Peds Residents' Association Resident Research Grant, a Duke Internal Medicine Faculty Resident Research Grant, and a Duke Pediatric Resident Research Grant. Preliminary results were presented at the National Med-Peds Residents' Association National Meeting virtually on October 9, 2020.*

Corresponding Author: *Austin Wesevich, MD, MPH; Department of Medicine, Duke University School of Medicine, Durham, NC, USA (e-mail: austin.wesevich@uchospitals.edu).*

Declarations:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

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