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Expanding pediatric services to include adults during the COVID-19 pandemic

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ABSTRACT

Background: During COVID-19, pediatric hospital admissions decreased, leaving many inpatient pediatric units at reduced capacity. Pediatric units could be adapted for use as inpatient beds for adult patients.
Aims: The specific aims were to describe the rapid expansion of pediatric services to include adult patients and examine the characteristics of adult patients treated and managed by pediatric providers and nurses.
Methods: This quality improvement project used a plan-do-study-act cycle to evaluate project implementation and effectiveness with cycle changes. Adults age 19 to 30 were admitted to the pediatric unit. Process, outcome, and balancing measures were used as measurements.
Results: A total of 88 adult patients were admitted. No rapid responses were called during the intervention period. The number of adverse safety events were compared ten months prior to the ten months post intervention and was not statistically significant ($p = 0.194$).
Conclusion: This project serves as a model for other pediatric medical-surgical units and PICUs to rapidly develop a plan to serve adult patients, whether amid the COVID-19 pandemic or adult patients with chronic childhood disorders. These results suggest that pediatric staff can safely care for adults when a pediatric team structure and familiar environment are maintained.

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) caused a global pandemic that primarily caused adults to be hospitalized. The needs of pediatric hospitalizations changed as different SARS-CoV-2 variants were encountered. While children and adolescents can be infected with SARS-CoV-2, historical experiences have been that they are often more asymptomatic or have a mild response (Wu & McGoogan, 2020). Pediatric hospital admissions decreased across the nation (Pelletier et al., 2021), leaving many inpatient pediatric units at reduced capacity. This is potentially due to the implementation of remote learning, daycare closures, physical distancing, hand hygiene, and mask coverings. To prepare for a surge of hospitalized adult patients with coronavirus disease 2019 (COVID-19), the Center for Disease Control and Prevention (CDC) asked hospitals to rapidly develop and implement a surge plan, including identifying physical space that could be adapted for use as inpatient beds (CDC, 2020).

Problem description

The pediatric medical-surgical unit and pediatric intensive care unit (PICU) at a hospital in the southwestern United States had a decreased inpatient pediatric census, leaving many pediatric patient rooms unoccupied. Simultaneously, the adult inpatient census increased as the transmission of COVID-19 became more prevalent. This hospital's COVID-19 incident command center was interested in expanding adult inpatient services to other parts of the hospital. The pediatric leadership team, which included the pediatric medical director, pediatric critical care medical director, nurse manager, and clinical nurse educator, recognized there was a need for unoccupied pediatric inpatient rooms to be repurposed for adult patients. Therefore, the pediatric leadership team collaborated with stakeholders from the adult hospitalists and intensivists to create a proposal for inpatient medical-surgical and critical care adults, including COVID-19 positive patients, to be admitted to the pediatric units for hospitalized care.

Available knowledge

Even though caring for adults on a pediatric unit is not a new concept, the available literature on COVID-19 preparedness is limited. Much of the literature is related to the increased number of people

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living with childhood-onset chronic illnesses (Goodman et al., 2011). Edwards et al. (2013) published an extensive description of adults admitted to PICU. The authors found that patients age 21 to 29 years had twice the risk of mortality compared to pediatric and adolescent patients. Even though adults 19 years and older accounted for less than 3 % of PICU admissions, there was enough safety concern to warrant age-appropriate protocols. Ibsen et al. (2013) reported that barriers to providing high-quality care for adults in pediatric units included lack of knowledge, psychosocial challenges, and logistical challenges in the context of caring for adults with the age-related illness. The authors suggested that pediatric providers and staff consult with adult specialists to enhance the quality of care delivered when adult patients overflow into a pediatric unit due to the availability of beds.

With COVID-19 exhausting available space in adult units, many organizations recently began publishing how they rapidly addressed the demand for physical inpatient space to accommodate adults requiring hospitalizations. Wolfe et al. (2020) identified two ways that pediatric staff could share resources: expand their patient populations to include caring for adults or temporarily transfer medical equipment to adult care areas. Philips et al. (2020) found that the best approach was for pediatricians and pediatric nursing staff to expand their patient populations to include adult patients on pediatric units. The success of this approach was due to maintaining a familiar environment, structure, and culture of the pediatric team (Philips et al., 2020). Pediatric nurses expressed concerns about safety and preparedness to care for patients outside of their usual practice while acknowledging their emotional responses and the need for teamwork to help them persevere (Lulgjuraj et al., 2021). Similarly, Jenkins et al. (2020) suggested that institutions develop a multidisciplinary team and consider system readiness, institutional awareness, scope of practice, staffing considerations, patient safety, and adult care considerations.

Rationale

Despite recommendations on best practices in adult patients with childhood-onset chronic illnesses, there was no standard recommendation on how to increase inpatient capacity for adults during the COVID-19 pandemic. Drawing on successful experiences of pediatricians and pediatric nursing staff expanding their patient populations to include adult patients on pediatric units (Jenkins et al., 2020; Philips et al., 2020), the pediatric leadership team expanded the pediatric service to include adults age 19 to 30 with similar diagnoses as pediatric patients. This plan was of particular interest to executive nursing leadership to optimize bed capacity for adult patients when the pediatric medical-surgical unit and the PICU had an uncharacteristically low census. Normally, the pediatric medical-surgical and PICU at this institution has a seasonal census. In the winter months, typically November through April, the census increases due to respiratory-related diseases; in contrast, in May through October, the census decreases, and staff and patient rooms are not used at their fullest capacity.

The pediatric leadership team used Roy's (1970) Adaptation Model of Nursing to help guide this project. Roy (1970) proposed that adaptation occurs when individuals balance various stimuli. In this landmark model, which still informs health care today, Roy addressed four main components: person, health, environment, and nursing. According to Meleis (2017), adaptation occurs when people respond positively to process and environmental changes, influencing outcomes. The pediatric leadership team used Roy's model to guide interdisciplinary education, knowledge development, and clinical practice to support nurses during implementation (Lulgjuraj et al., 2021).

Specific aims

The specific aims of this quality improvement (QI) project were to describe the rapid expansion of pediatric services to include adult patients and examine the characteristics of adult patients treated and managed by pediatric providers and nurses. The multidisciplinary team defined the goals of the project in conjunction with the incident command center to determine a timeline for implementing the expansion of pediatric services. The intervention period ran from from November 1, 2020, to August 2021.

Methods

Context

This project was conducted on a pediatric unit at a 555 bed urban, safety-net, teaching hospital. The pediatric unit is a shared unit that includes 20 medical-surgical beds and eight Level 2 PICU beds with the opportunity to convert two medical-surgical beds into PICU beds, for a potential total of 10 PICU beds. The pediatric unit has 39 nursing staff, including 37 registered nurses (RNs) and two unit clerks who serve as certified nursing assistants (CNAs). RNs are cross-trained between medical-surgical and PICU and include 50% of RNs trained to float between the two levels of care. In addition to the nursing staff, the pediatric unit incorporates a multidisciplinary care approach and includes representation from pediatric pharmacists, child life specialists, pediatricians, and pediatric intensivists.

A core multidisciplinary team was established and included stakeholders from pediatricians, pediatric intensivists, nursing management, and clinical nurse educators from the pediatric unit; a senior quality professional from the hospital's patient safety and quality department; a senior clinical risk manager from legal services; a pharmacist from the inpatient pharmacy; a child life specialist from the child life services program; and the respiratory care services director from respiratory therapy. The multidisciplinary team was responsible for planning, implementing, and evaluating the proposed expansion of the pediatric unit.

Interventions

The multidisciplinary team used three sequential plan-do-study-act (PDSA) cycles to implement the new pediatric service line process (Fig. 1). During the *planning* phase in the first PDSA cycle, provider and nursing staff education occurred. Four pediatric attending physicians, including pediatricians and intensivists, one pediatric infectious disease hospitalist, and community pediatrician volunteers, were

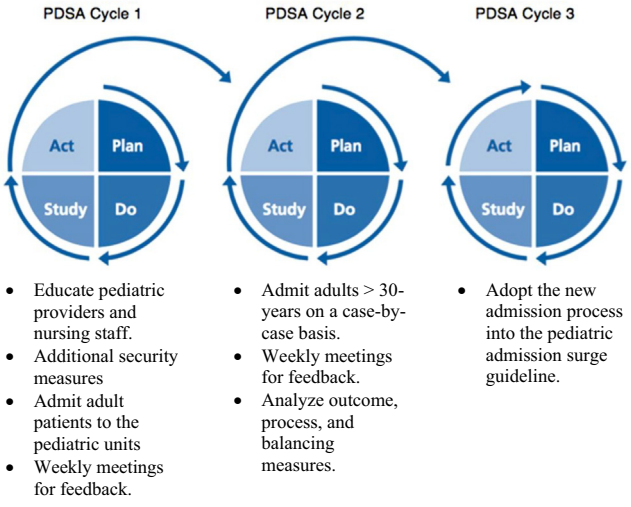

Fig. 1. PDSA Cycles.
Note. The intervention was implemented using three sequential PSDA cycles. PDSA = plan-do-study-act.

selected to treat and manage adults admitted to the pediatric unit and PICU. Two pediatric intensivists were selected to train in the medical intensive care unit for one week. The additional pediatric attendings received education on adult care guidelines from the adult intensivists and hospitalists. An ongoing mentorship was established between the adult intensivist and hospitalist and the pediatricians, and pediatric intensivists for when questions or concerns about adult care guidelines arose. Pediatric medical students, interns, and residents were excluded from providing adult care due to licensure restrictions.

Initially, mandatory education was offered to the nursing staff during the same timeframe using a virtual meeting platform. Education included adult admissions criteria, vital signs, advanced life support, additional security measures, hourly rounding, order by protocols (e.g., electrolyte replacement and heparin), and rapid response. An educational reference document was created, and follow-up education was provided to nursing staff in a weekly email. All nursing staff had access to email during this time. The educational material was also placed on the pediatric unit's internal intranet for easy access by any pediatric staff member.

After staff completed the mandatory education, adults were officially admitted to the pediatric unit and PICU. In the *do* phase of the first PDSA cycle, priority admission was given to adults age 19 to 30 with similar diagnoses and equipment as pediatric patients. Diagnosis inclusion criteria included surgical/trauma (e.g., appendectomies, orthopedics, trauma, and traumatic brain injury), infectious diseases (e.g., cellulitis, COVID positive, pneumonia, pyelonephritis, and sepsis), medical (e.g., diabetic ketoacidosis, epilepsy, rehabilitation, respiratory disorder, and rheumatologic disease), and behavioral (e.g., suicidal ideation, suicidal attempt). Equipment inclusion criteria included central lines, chest tubes, indwelling urinary catheters, and infusion ports. Exclusion criteria included comfort care for a terminal disease, dialysis, gastrointestinal bleed, history of inappropriate behavior, myocardial infarction, substance use withdrawal, and violent history. The charge RN and the pediatrician reviewed all adult patient admission requests and collaborated with the administrative clinical coordinator to ensure the patient was appropriate for the pediatric unit before admission. Patients were admitted to the pediatric service and cared for by pediatric nurses and staff. Adult patients were transferred to the appropriate level of care if at any point during the admission they met any of the exclusion criteria.

On admission to the pediatric unit, all adult patients and visitors were informed that they needed to have a staff escort when leaving their room to maintain the security of pediatric patients. The pediatric unit already had security measures such as badge access entry points, 24/7 closed-circuit television (CCTV) entry point monitoring, and pink badges to identify pediatric staff. In addition to staff escorts, other security risk measures were put into place. Adult patients were placed in view of already existing hallway cameras to visualize and monitor traffic in and out of rooms. The CCTV was configured to accommodate additional monitoring. An hourly rounding cadence was implemented to follow adult patient processes, similar to an hourly rounding process in medical-surgical areas.

In the *study* phase of the first PDSA cycle, the team evaluated project implementation and effectiveness. Multiple methods of communication were established to elicit feedback from staff, including weekly meetings and a communication board for staff to write questions, comments, and concerns using sticky notes. Overwhelming, adults older than the 30-years age limit still needed bed placement throughout the organization. During the *act* phase of the first PDSA cycle, the team adapted the admission criteria to allow patients greater than 30-years, who met the previous admission criteria on a case-by-case basis.

The *plan* portion of the second PDSA (Fig. 1) cycle focused on developing criteria to admit patients older than 30-years. The charge RNs, pedatrician, and the administrative clinical coordinator came to a consensus that inclusion criteria would remain the same with the exeception of removing the age limit. In the *do* portion of the second PDSA cycle, began to admit adults older than 30-years on a case-by-base basis. During the *study* phase, weekly meetings to elicit feedback from staff occurred, and measures continued to be measured. During the *act* phase, the team adopted the current process to admit adults to the pediatric unit as a standard workflow.

In the third PDSA cycle (Fig. 1), the team wrote the new workflow into a unit clinical guideline. The guideline was approved by the organization's incident command center, and it went into effect as a COVID-19 surge guideline for the pediatric units.

Study of the interventions

The team used three sequential PDSA cycles (Fig. 1) to evaluate project implementation and effectiveness with each cycle change. Meetings were held weekly for project planning and feedback from staff. Outcome, process, and balancing measures were tracked with each cycle change.

Measures

Three measures were used to evaluate the project: process, outcome, and balancing measures. The process was measured using the number of adults admitted to the pediatric unit and their associated length of stay. Admission data were collected daily and aggregated by month using the electronic health record. Adult patients were tracked from their admission until discharge. Patient encounter data for the length of stay was captured through a medical record chart review.

The outcome was measured using the hospital's clinical deterioration index for patient decompensation and rapid response events and was also obtained from a medical record review. The clinical deterioration index used at this hospital is a proprietary prediction model used to determine patient decompensation. It uses clinical data to calculate risk scores from 0 to 100 at regular 15-min intervals throughout a patient's stay, starting from the time of hospital admission. Thresholds are set by the hospital and include low (0–39), medium (40–59), and high (60–100) risk of clinical deterioration. Patients at high risk of clinical deterioration should have a rapid response called for evaluation and possible transfer to a higher level of care.

The number of adverse safety events was specifically examined as a balancing measure. Balancing measures are new problems that develop because of a change meant to improve a different problem (IHI, 2020). All adverse safety events are reported by location and event type, and were collected from the hospital's adverse event reporting system for the pediatric medical-surgical unit and PICU. Any hospital staff member could use the adverse event reporting system to report quality or safety events anonymously.

Analysis

Data collected for this project were analyzed using Intellectus Statistics (2019). Frequencies and percentages were reported for process, outcome, and balancing measures for adult patients admitted to the pediatric unit from November 1, 2020, to August 31, 2021. A two-tailed Mann-Whitney rank sum test was conducted to examine whether there were significant differences between the reported adverse safety events between the pre- and post- intervention groups.

Ethical considerations

This project was reviewed by the Quality Improvement Committee, which is authorized by the Colorado Multiple Institutional Review Board, and was determined not to be human subjects research. As such, this project did not require IRB review. This project had the executive support of the medical director of pediatrics and PICU and the nursing director of Women and Children's Services.

Results

The process measure using the number of adults admitted to the pediatric unit were collected daily and aggregated by month. A total of 88 adult patients were admitted between November 2020 and August 2021. The number of admissions for adults and pediatrics are provided by month in Fig. 2. Adult patients accounted for 10% (monthly range 3% - 20%) of admissions to the pediatric units. The average adult length of stay was 4.17 days (range 0.54–41.44). A summary of adult patient demographic characteristics is provided in Table 1. Adult patients who were admitted to the pediatric unit were predominantly female ($n = 61$, 69.32%), white or Caucasian ($n = 59$, 67.05%), preferred English as a first language ($n = 71$, 80.68%), had Medicaid insurance coverage ($n = 59$, 67.05%), were admitted with a medical diagnosis ($n = 49$, 55.68%), and were successfully discharged home ($n = 86$, 97.73). The average age was 21.24 years (range 19–33).

The outcome was measured using the hospital's clinical deterioration index for patient decompensation and rapid response events. On review, it was discovered that all adults admitted to the pediatric unit and PICU had a low category of clinical deterioration throughout their hospital stay, and no rapid responses were called as a result.

The number of adverse safety events was specifically examined as a balancing measure. The number of safety events were aggregated by month. Safety events for the ten months prior were compared to the ten months post intervention. The pre-intervention group had an average number of safety events reported in the pre-intervention group was 11.6 ($SD = 4.7$). The post-intervention group had an average of 13.5 ($SD = 3.5$) safety events reported each month. The result of the two-tailed Mann-Whitney U test was not significant based on an alpha value of 0.05, $U = 33$, $z = -1.30$, $p = 0.194$. The mean rank fore pre-intervention group was 8.80 and the mean rank for the post-intervention group was 12.20. This suggests that the distribution for adverse safety events for the pre-intervention group ($Median = 11.50$) was not significantly different from the distribution of safety events post-intervention ($Median = 14.50$).

Table 1
Demographics of Adult Patients (N = 88).

Variable	*n*	%
Age in years, *M (SD)*	21.24 (3.39)	
Length of stay, *M (SD)*	4.17 (5.88)	
Gender		
Female	61	69.32
Male	27	30.68
Race		
White or Caucasian	59	67.05
Other	23	26.14
Black or African American	5	5.68
Decline to Answer	1	1.14
Ethnicity		
Hispanic, Latinx, or Spanish Origin	58	65.91
Not Hispanic, Latinx, or Spanish Origin	29	32.95
Decline to Answer	1	1.14
Preferred Language		
English	71	80.68
Spanish	17	19.32
Financial Class		
Medicaid	59	67.05
Commercial	18	20.45
Self-pay	7	7.95
Financial Assistance	3	3.41
Worker's Compensation	1	1.14
Primary Diagnosis		
Medical	49	55.68
Surgical/Trauma	21	23.86
Infectious Disease	12	13.64
Behavioral	6	6.82
Discharge Disposition		
Home/Self Care	86	97.73
Transfer to Home Health Care	1	1.14
Transfer to Acute Rehabilitation	1	1.14

Discussion

Summary

There is a growing need to find innovative and safe ways to deliver care to adults in the presence of the COVID-19 pandemic. This QI project

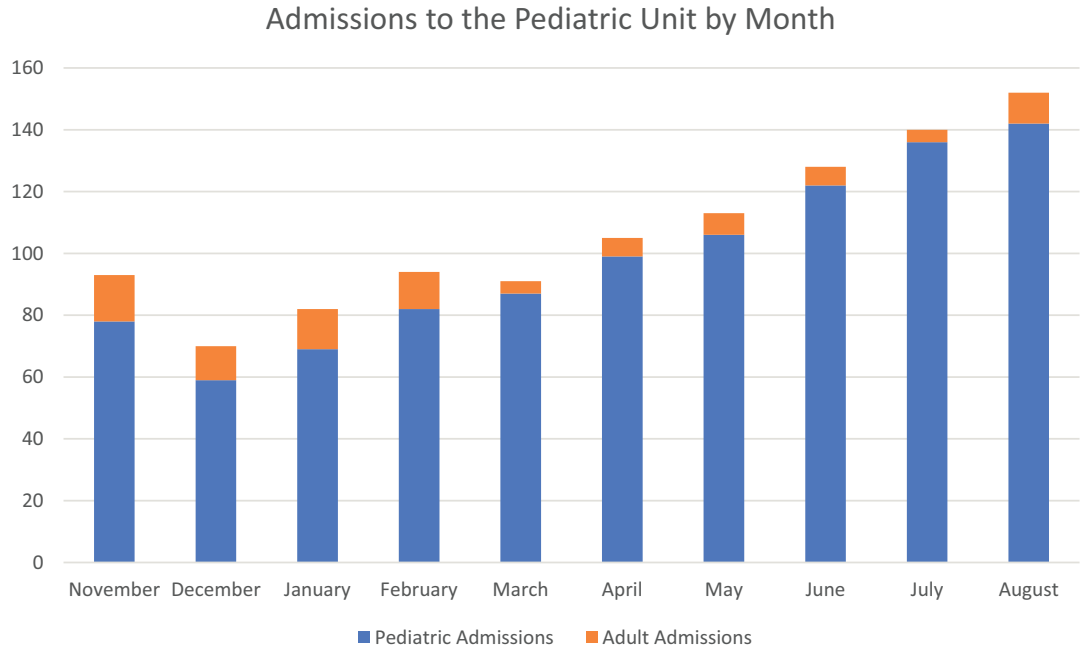

Fig. 2. Admissions by Month (November 2020 – August 2021).
Note. The number of associated adult admissions are aggregated by month using the orange bar. The number of associated pediatric admissions are aggregated by month using the blue bar.

highlights how a pediatric team can develop a rapid process to accommodate adults requiring inpatient beds. While there is a current gap in the available research that addresses the rapid implementation of a dedicated pediatric unit and PICU to include adults, the results of this QI project support recent studies by Jenkins et al. (2020) and Philips et al. (2020) that demonstrated pediatricians and pediatric nursing staff could successfully care for adult patients on pediatric units when they maintain a familiar environment, structure, and culture of the pediatric team. While the scope of this project did not assess pediatric nurses concerns of safety and preparedness to care for adult patients, the authors believe that the success can be attributed to staff buy-in, the familiarity of the environment, and teamwork that helped them persevere during a critical time (Lulgjuraj et al., 2021). This may be the result of the individuals ability to balance various stimuli and changes presented in Roy's Adaptation Model of nursing (1970).

Interpretation

The results of this QI project suggest that it is safe for adults to be admitted, managed, and treated in a pediatric medical-surgical unit and PICU. As suggested by Ibsen et al. (2013), providing high-quality care for adults in pediatric units is enhanced when they consult with adult specialists. This is evident between the relationship and mentorship created between the pediatricians and the adult intensivists.

The patients admitted aligned with the goals and criteria established by the multidisciplinary team. Although patients over 30 were admitted on a case-by-case basis to help accommodate adult patients that needed inpatient care, most patients were relatively younger and likely had fewer comorbidities. While it was not intended to prioritize adult patients with fewer comorbidities, clinically complex patients were likely excluded when the charge RN and pediatrician screened them. This is supported by the number of adverse safety events that did not change after the project implementation.

A strength of this QI project was the early formation of a multidisciplinary team to guide the new process. QI for any project involves multiple systems and multiple disciplines within an organization (Agency for Healthcare Research and Quality, 2013). The multidisciplinary team members were crucial in addressing the new process, analyzing the process measures, and adapting the process to address the hospital's needs.

Another strength of this project was the enhanced communication that allowed the multidisciplinary team to address pediatricians and nursing staff questions, comments, and concerns. Because of the enhanced communication, the multidisciplinary team could identify issues and solutions. One example of this is the increased request to accommodate adults older than the original age limit of 30-years-old.

Practice implications

When hospitals are faced with a healthcare crisis, regardless of the underlying issue, they must be able to implement a surge plan to care for patients beyond normal operations. The COVID-19 pandemic challenged healthcare systems' infrastructures and staff adaptability across all settings. Pediatric nurses should be adaptable and flexible to practice outside of their comfort zone during the state of an emergency. Pediatric nurses have a commitment to care for children, but during the COVID-19 pandemic they were called to meet the needs of the community to provide age-appropriate adult care while building relationships with adult nurses and healthcare providers. Establishing these relationships can strengthen the healthcare community beyond the COVID-19 pandemic into the setting of chronic childhood disorders.

Limitations

This QI project had several limitations. This project is likely context-driven based on the individual institution's capacity surge needs during the COVID-19 pandemic. This may limit generalizability to other units and institutions. There is biased sampling because a convenience sample of patients was used, and there was no random admission to the pediatric unit. The pediatric team did not have access to the adult acute care division's data, so there was no comparison group, and no causal claims could be made. This results in a limited understanding of the results. The team attempted to mitigate these limitations by inviting pediatricians and nursing staff to ask questions and share comments and concerns. While the team attempted to enhance communication, it is possible there was a variation in the communication shared since it was in a public format. This could be evident in the lack of comments that were reported. The team attempted to mitigate the hesitancy to share feedback by providing an anonymous board to write questions without staff having to identify themselves.

Conclusion

This project serves as a model for other pediatric medical-surgical units and PICUs to rapidly develop a plan to serve adult patients, whether amid the COVID-19 pandemic or adult patients with chronic childhood disorders. Hospital leadership can choose to deploy pediatricians and pediatric nursing staff to other units managed by adult care providers, but the results of this project suggest that pediatric staff can safely care for adult patients when a pediatric team structure and familiar environment are maintained. There is a great need for continued publishing and research in admitting adults to pediatric units. There is little knowledge about mixed units that serve adults and pediatric patients. The authors hope this project can help inform future work and lead to further investigations in this setting.

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Previous presentations

None.

Credit authorship contribution statement

Sara Gandora: Conceptualization, Methodology, Project administration, Supervision, Writing – original draft. **Nicole Robbins:** Conceptualization, Project administration, Supervision, Writing – original draft. **David Mulkey:** Methodology, Validation, Formal analysis, Data curation, Writing – review & editing, Visualization.

Declaration of Competing Interest

None.

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