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Optimizing resource utilization: palliative care consultations in critically ill pediatric trauma patients

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ABSTRACT

Objectives The American College of Surgeons Trauma Quality Improvement Program (TQIP) and Committee on Trauma released a best practice guideline for palliative care in trauma patients in 2017. Utilization of pediatric palliative care services for pediatric trauma patients has not been studied. We sought to identify patients who received the consultation and develop criteria for patients who would benefit from these resources at our institution.

Methods The institutional pediatric trauma registry was queried to identify all admissions age 0–17 years old to the pediatric intensive care unit (PICU) or trauma ICU (TICU) from 2014 to 2021. Demographic and clinical features were obtained from the registry. Electronic medical records were reviewed to identify and review consultations to the ComPASS team. A clinical practice guideline (CPG) for palliative care consultations was developed based on the TQIP guideline and applied retrospectively to patients admitted 2014–2021. The CPG was then prospectively applied to patients admitted from March through November 2022.

Results A total of 399 patients were admitted to the PICU/TICU. There were 30 (7.5%) deaths, 20 (66.7%) within 24 hours of admission. Palliative care consultations were obtained in 21 (5.3%). Of these, 10 (47.6%) patients were infants/toddlers <age 2 years, all had traumatic brain injury, 3 (14.3%) were for suspected child abuse, and many were for "goals of care" or family meetings. When the CPG was applied retrospectively, 109 (27.3%) patients met criteria for consultation. After 8 months of prospective implementation of this CPG, palliative care consultation was obtained in 25% (7 of 28) of pediatric trauma patients admitted to the ICU.

Conclusion Our results demonstrate underused potential of the palliative care team to impact the hospital course of critically ill pediatric trauma patients. Ongoing studies will analyze the utility of CPG implementation for early involvement of palliative services in critically ill pediatric trauma patients.

Level of Evidence Level III (retrospective cohort)

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In 2017, the American College of Surgeons Trauma Quality Improvement Program (TQIP) published a best practice guideline for the utilization of palliative care services in trauma patients.
⇒ Level 1 trauma centers have subsequently implemented and validated these guidelines in adult and geriatric trauma patients.

WHAT THIS STUDY ADDS

⇒ This study identifies the current practices in obtaining palliative care consultation for critically ill pediatric trauma patients.
⇒ We additionally describe the successful design and implementation of a clinical practice guideline for the utilization of palliative care services in these patients.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study encourages the early involvement of palliative care in the appropriate subset of critically ill pediatric trauma patients.
⇒ Further research is needed to analyze the impact of these services on patient outcomes, family satisfaction and hospital resource utilization.

INTRODUCTION

In October 2017, the American College of Surgeons Trauma Quality Improvement Program (ACS-TQIP) published guidelines for the early incorporation of palliative care services in the care of trauma patients, particularly those who are critically ill.[1] This guideline was published based on accumulating evidence that incorporation of palliative care into the multidisciplinary approach improves quality of care for critically ill patients and their families, particularly regarding symptom management.[2–5] Specifically in trauma patients, key components of palliative care include effective communication and support around prognosis and treatment plans, shared decision making with the patient and family, development of a psychosocial care plan, and providing a framework for sudden delivery of bad news.[4–6] It is well known that communication remains a major source of medical errors and patient dissatisfaction with care; in fact, involvement of supportive services in the care of critically ill injured patients has demonstrated improved communication with patients and family, earlier goals of care discussions, and decreased length of stay, with no increase in mortality.[4 5]

Shortly after the ACS-TQIP best practice guideline was released, a number of Level 1 trauma centers began implementing and validating practice management guidelines (PMGs) for the role of palliative care in trauma patients, and quickly found that these guidelines increased patient satisfaction, particularly for the care of geriatric trauma patients.[7 8] Furthermore, recent work has shown that early palliative care consultation (within 72

hours) for trauma patients may lead to shorter length of stay, reduced ventilator days, decreased invasive procedures and lower overall costs.[9] There are, however, limited studies on the current practices and outcomes for palliative care in pediatric trauma patients, particularly those who are critically ill. Trauma remains the leading cause of morbidity and mortality in those aged 1–21 years, with traumatic brain injury (TBI) being the most common lethal injury.[10 11] Special issues pertaining to supportive care in children and adolescents include incorporation of healthcare surrogates, state rules regarding consent of minors, need for child life services, and unique challenges for bereaving families facing the loss of a child.[12] It is unknown how often palliative care services are used in pediatric trauma centers and there are no current PMGs for the utilization of palliative care services in the pediatric trauma population.

At our institution, the Comprehensive Pediatric Adolescent Support Services (ComPASS) Care Team has been active in the care of critically ill pediatric patients since 2014 and is available 24/7 for referrals. The missions of ComPASS are to provide "interdisciplinary supportive care with representation from pain, palliative, hospice, bereavement, and complimentary medicine backgrounds." As part of the multidisciplinary approach, ComPASS includes a team physician, nurse practitioner, pain specialist, social worker, child life specialist, child psychologist, and chaplain, all of whom may be involved in a patient's care. Pediatric palliative care is a growing subspecialty at academic hospitals in the twenty-first century and is based on the integration of these clinical resources as well as patient family involvement.[13] In this retrospective, single-institution, single-arm cohort study, we aimed to identify critically ill pediatric (age 0–14 years) and adolescent (15–17 years) trauma patients with palliative care consultations from 2014 to 2021 and implement a clinical protocol for the consultation of palliative care services in pediatric trauma patients. We hypothesized that palliative care consultations would be underused in this patient population and that the implementation of our decision support tool would lead to increased involvement of ComPASS services in critically ill pediatric and adolescent trauma patients.

METHODS

Trauma registry report review of critically ill pediatric and adolescent trauma patients

Queries were made to the institutional pediatric trauma registry for patients 0–14 years of age (pediatric) and the institutional adult trauma registry for patients aged 15–17 years (adolescent). Data obtained for all patients requiring intensive care unit (ICU) admission from 2014 to 2021 included: patient details (not sure what are patient data), demographic information, event related details, prehospital/transport data, referring information if applicable, hospital data including the type of inpatient units, vitals, diagnoses, procedures, complications, discharge data, and death data if applicable. No further continuing review was required.

Medical chart review of critically ill pediatric and adolescent trauma patients

Electronic medical records were reviewed for all patients in the trauma registry report age 17 years and under admitted to the ICU between 2014 and 2021. Each individual record was queried for palliative care consultation and documentation from palliative care provider. Data were obtained for date/time of consultation as well as reasons for consultation. These records were compared with the consultation records from our ComPASS team. All data were de-identified and housed in a secure encrypted database that can only be accessed through institutional login.

Development of CPG for palliative care consultation in critically ill pediatric and adolescent trauma patients

Based on the 2017 ACS-TQIP and Committee on Trauma best practice guideline for palliative care in trauma patients[1] and the chart review of critically ill pediatric and adolescent patients at our institution, we created an institutional CPG. The panel creating this CPG consisted of experienced faculty members in the divisions of pediatric surgery, pediatric critical care, pediatric palliative care, and the institution's pediatric trauma program manager (TE). We aimed to analyze (1) The clinical conditions warranting a palliative care (ComPASS) involvement and (2) The appropriate timing for consultation. The CPG was reviewed by trauma surgery, pediatric surgery, and pediatric palliative care prior to implementation.

Retrospective review of CPG criteria for palliative consultation in critically ill pediatric and adolescent trauma patients

The trauma registry reports and electronic medical records were reviewed by two independent providers (JG and JB). A CPG was developed and retrospectively applied to identified critically ill pediatric and adolescent trauma patients from 2014 to 2021 who would have met criteria for palliative care consultation based on clinical status, diagnoses, and time frame. Reasons for meeting the CPG criteria were reviewed.

Prospective validation of CPG for palliative consultation in critically ill pediatric and adolescent trauma patients

Starting from March 2022, the developed CPG was implemented at our institution. Information about this CPG was disseminated to all providers in both the pediatric ICU (PICU) and trauma ICU (TICU). Consults to ComPASS were tracked in the postimplementation period ending in November 2022. Trauma registry and electronic medical records were reviewed to identify critically ill pediatric and adolescent trauma patients who met criteria for palliative care consultation using the CPG. The list of palliative care consults before and after CPG implementation were compared.

Statistical analysis

De-identified data were compiled using Microsoft Excel. All data are expressed as medians and quartiles (Q1, Q3) or as counts and percentages of whole.

RESULTS

Demographics and clinical features of pediatric and adolescent trauma patients requiring ICU care

From 2014 through 2021, a total of 399 trauma patients aged 0–17 years were admitted to the ICU at our institution (table 1). Of these, 299 (75%) were patients 14 years old and younger who were admitted to the PICU and the remaining 100 (25%) were patients aged 15–17 years admitted to the adult TICU. Male patients comprised 58% of pediatric and 78% of adolescent trauma patients. The majority suffered blunt trauma. Air transport was used for 52% of pediatric and 55% of adolescent patients in this cohort. Clinical features of pediatric and adolescent patients are shown in table 2. Median Injury Severity Scores for pediatric and adolescent patients were 14 and 19, respectively. TBI was present in 72% of pediatric and 54% of adolescent patients. Median ICU stay was 1 day for pediatric and 3 days

Table 1 Demographic features for pediatric and adolescent trauma patients requiring ICU admission (2014–2021)

	Pediatric Age 0–14 years (n=299)	Adolescent Age 15–17 years (n=100)
Age (years)	6 (2, 11)	16 (15, 17)
Sex (% male)	172 (58%)	78 (78%)
Mechanism		
Blunt	266 (89%)	91 (91%)
Penetrating	11 (3.7%)	6 (6%)
Unknown*	19 (6.3%)	3 (3%)
Thermal injury	3 (1.0%)	0 (0%)
Ingestions	0 (0%)	0 (0%)
Transport		
Ground	118 (39.5%)	37 (37.0%)
Air	156 (52.1%)	55 (55%)
Private	25 (8.4%)	8 (8%)
Trauma level		
Not coded	19 (6%)	5 (5%)
Green (III)	52 (17%)	15 (15%)
Yellow (II)	50 (17%)	23 (23%)
Red (I)	178 (60%)	57 (57%)

*Unknown mechanisms include patients who were found down, drownings, and hangings.
ICU, intensive care unit.

for adolescent patients. Discharge disposition was home for 81% of pediatric and 78% of adolescent patients.

Palliative care consultations obtained in critically ill pediatric and adolescent trauma patients

During the time period reviewed (2014–2021), only 21 palliative care consultations were obtained out of the 399 pediatric and adolescent trauma patients requiring ICU care (table 3). Of these, 19 were in patients 14 years and under. The greatest number of consultations in any calendar year was six in 2018.

Table 2 Clinical features of pediatric and adolescent trauma patients requiring ICU admission (2014–2021)

	Pediatric Age 0–14 years (n=299)	Adolescent Age 15–17 years (n=100)
Injury Severity Score (ISS)	14 (9, 24)	19 (9, 29)
Traumatic brain injury (%)	214 (72%)	54 (54%)
Disposition from ER		
ICU (%)	244 (82%)	75 (75%)
Operating room (%)	54 (18%)	25 (25%)
Total LOS (days)	3 (1, 7)	6 (2, 8)
ICU LOS (days)	1 (1, 3)	3 (1, 3)
Dispo		
Home (%)	243 (81%)	78 (78%)
Rehabilitation (%)	24 (8%)	14 (14%)
Other (%)*	8 (3%)	2 (2%)
Death (%)	24 (8%)	6 (6%)

*Other discharge dispositions include ongoing inpatient care, inpatient psychiatric care, foster care, or patients coded in trauma registry as 'other'.
ER, emergency room; ICU, intensive care unit; LOS, length of stay.

Table 3 Palliative care consults placed for pediatric and adolescent (ages 0–17) trauma patients requiring ICU admission

Year	All ICU admissions	Palliative care consults
2014	63	1
2015	52	5
2016	57	1
2017	39	1
2018	56	6*
2019	47	3*
2020	51	3*
2021	34	1
Total	**399**	**21**

*One each canceled due to patient death prior to palliative evaluation.

Of the patients who were seen by palliative care services, all did have TBI, 10 were infants or toddlers (age 2 years and under), and 3 were for suspected child abuse. Eight consultations were in children and adolescents who had suffered cardiac arrest. In five of these patients, palliative care had discussions with family including "goals of care". Three patients for whom consultations were placed were canceled due to patient death prior to palliative care evaluation. In each of these three patients, death occurred within 24 hours of admission.

Design and implementation of CPG for consultation of palliative care services for critically ill pediatric and adolescent trauma patients

In March 2022, a CPG was developed for the consultation of ComPASS, our institutional group for palliative care services in patients younger than age 18 years (figure 1). This guideline was created based on the ACS-TQIP 2017 best practice guideline for palliative care and intended for pediatric and adolescent Levels 1 and 2 trauma patients requiring ICU admission. We used our existing retrospective data to identify clinical features of patients who had received palliative consultation. The CPG recommended that all critically ill pediatric and adolescent trauma patients with threat to life or severe alteration to quality of life be provided with ComPASS consultation. Specific clinical scenarios for which we recommended palliative care consultation included: TBI with admission Glasgow Coma Scale (GCS) Score <8, spinal cord injury, limb amputation (excluding digits), and violent mechanism (including penetrating traumas and child abuse). Timing of consultation was suggested at 72 hours from admission. There is no perceived benefit on earlier consultations until patient's injuries are fully defined.[1] Additionally, our ComPASS team would perform chart-based assessments on any consultations prior to inperson visit. Once this CPG was designed, it was reviewed and revised at both adult and pediatric trauma quality improvement meetings prior to implementation. All providers in the PICU and TICU were provided education about the new CPG.

Retrospective validation and prospective implementation of palliative care CPG in critically ill pediatric and adolescent trauma patients

Trauma registry reports and electronic medical reports were reviewed to analyze which of the 399 pediatric and adolescent trauma patients requiring ICU admission from 2014 to 2021 would have met our CPG's criteria for ComPASS consultation (table 4). A total of 109 patients met criteria to be evaluated by palliative care, comprising 27.3% of the ICU admissions. Of these 109, only 21 (19.3%) had received palliative care

Criteria For Palliative Care Consults in Pediatric Trauma Patients Guideline - Rochester

Guidelines are recommendations, rather than rigid rules. Guidelines can be modified using professional judgment and may be adapted to many different situations.

Scope

Applies to all clinicians who care for injured patients from ages 0-17 years of age.

Purpose

To define clinical situations where a pediatric palliative care consult should be obtained.

Guideline

- The pediatric palliative care team (COMPASS) provides multidisciplinary care for children and their families under a variety of circumstances. The team collaborates with the primary team to address complex pain and symptom management, difficult communication and decision-making around end of life, and complicated grief and bereavement.
- It is difficult to make assessments about prognosis early after trauma; thus, optimal time for palliative consult is 72 hours after admission when the prognosis of the injury may become clearer. The team may review the chart prior to that time.
- For injured children less than 18 years old, the pediatric palliative care should be considered in all cases when there is a threat to life or severe alteration to quality of life as a direct result or sequalae of injury. Pediatric palliative care consultation should also be considered in the following clinical conditions:
  - Traumatic brain injury with admission GCS < 8 and persistent deficits
  - Spinal cord injury
  - Limb amputation, excluding isolated digits
  - Inflicted violence resulting in traumatic injury to include suspected child physical abuse and penetrating trauma
  - Post-cardiac arrest
  - Prolonged hospitalization anticipated
  - 7. Death at site of trauma (e.g. MVC with death)

Palliative Care Screening in Trauma - to be completed at 72 hours from admission			
	Negative Screen	**Category 1: Positive Screen**	**Category 2: Positive Screen**
Traumatic Injury Severity	Non-life-threatening injuries	Potentially life-threatening injuries	Anticipated high risk of hospital mortality
Disability	Non-disabling trauma injuries	Potentially disabling injuries	Permanent disability or functional outcome incompatible with patient's wishes
Previous Functional Status	Healthy, no serious chronic illness	One or more serious illness, frailty, older age	Chronic serious illness, frailty, older age
Surprise Question	Surprise question: YES	Surprise question: MAYBE or NO	Surprise question: NO
Example: Young Patient	Multiple fractures Mild TBI Abdominal GSW Pneumothorax	Spinal cord injury Moderate TBI Amputation Any trauma plus shock	Severe TBI High spinal cord injury Major hemorrhage Multiple amputation

Figure 1 Practice management guideline for palliative care consults in pediatric trauma patients, implemented March 15, 2022. ComPASS, Comprehensive Pediatric Adolescent Support Services; GCS, Glasgow Coma Scale; GSW, gunshot wound; MVC, motor vehicle collision; TBI, traumatic brain injury; 'Surprise question', "Would you be surprised if this patient were dead in 12 months?."

consultation. Additionally, 81 of these patients were in the pediatric age category where only 19 (23.5%) had undergone ComPASS evaluation, whereas 28 were in the adolescent category of whom 2 (7.1%) had received consultation by palliative care services. The most common criteria for consultation were TBI, violent injury (primarily child abuse), and injuries deemed to be life-threatening (table 5).

After 8 months of formal implementation of the CPG (March–November 2022), there were 28 pediatric trauma patients requiring admission to the PICU or TICU. Palliative care was consulted for 7 (25%) of these patients demonstrating a higher rate of consultation. On retroactive chart review, 9 of these 28 patients were deemed to meet CPG criteria for ComPASS consultation, meaning a 78% compliance with CPG recommendations. Of the two patients not evaluated by ComPASS, one was at the provider's discretion and one had severe TBI and died within 24 hours of admission.

DISCUSSION

Our findings revealed underutilization of palliative care services for patients who would have met the clinical protocol criteria for pediatric consultations. Implementation of a CPG demonstrated an increase in the usage of palliative care services for critically ill pediatric trauma patients. To our knowledge, this is the first study to document effectiveness of palliative care guideline utilization in the pediatric trauma population. Pediatric trauma patients were identified as a population needing special consideration in the 2017 ACS-TQIP Palliative Care Best Practice Guidelines in 2017.[1] These guidelines have previously only been studied in adult and geriatric populations.[1 7 8] Unique challenges with

Table 4 Pediatric and adolescent (age 0–17 years) trauma patients requiring ICU admission who met criteria for palliative care consultation

Year	All ICU admissions	Retrospectively met criteria for palliative care consultation
2014	63	8
2015	52	9
2016	57	19
2017	39	8
2018	56	20
2019	47	15
2020	51	20
2021	34	10
Total	**399**	**109**

ICU, intensive care unit.

Table 5 Criteria met for palliative care consultation in a retrospective cohort of critically ill pediatric and adolescent trauma patients

Guideline criteria	Retrospectively met criteria
TBI with admission GCS Score <8 and persistent deficit	28
Spinal cord injury	3
Limb amputation	5
Violent injury	28
Penetrating trauma	6
Non-accidental trauma	22
Postcardiac arrest	12
Prolonged hospitalization anticipated	6
Death at site	5
Other reason for threat to life or alteration in quality of life	22
Total	**109**

GCS, Glasgow Coma Scale; TBI, traumatic brain injury.

obtaining and using palliative care services in critically ill pediatric trauma patients include delineating the differences between "assent" from older children and adolescents, keeping in mind the need for "consent" (laws vary by state) from guardians and being sure to incorporate age-specific child life services.[1] Additionally, special bereavement services and sometimes hospice services are needed for families, particularly as social and cultural expectations are that pediatric patients will not die.[1]

As early as 2000, the American Academy of Pediatrics began emphasizing the important role of pediatric specific palliative care.[14] Studies have shown that pediatric palliative care services can improve quality of life for both patients and family members (especially parents), increase access to resources, boost mood, support symptom management, and decrease hospital admission and length of stay for children with potentially life-limiting illnesses.[15–17] The literature on quality improvement and resource utilization of pediatric palliative care initiatives focuses on chronic illnesses, particularly the pediatric oncology population.[18–20] One single-center study of 167 patients aged 0–25 years with acute life-threatening illness or injury in the absence of complex chronic conditions showed that palliative care was involved in 20% of these patients' care and were able to provide earlier goals of care discussions and documentation of end-of-life preferences.[21] Our pilot study is the first quality improvement project specifically focused on a population of pediatric and adolescent trauma patients.

In addition to the age category, injury patterns are an important determinant for the role of palliative care services after traumatic injury. The 2017 ACS-TQIP Best Practice Guidelines highlight the role of palliative care in TBI, with a GCS Score ≤12 as a trigger for a more thorough evaluation to analyze the need for palliative care services.[1] Retrospective studies have shown that the incorporation of palliative care services into the management of severe TBI has greatly increased during the last two decades and improves overall hospital resource utilization with decreased total costs and reduction in percutaneous endoscopic gastrostomy tube placement for these patients.[22] Due to the differences in GCS scoring by age and the difficulty in prognosticating long-term outcomes after TBI in pediatric patients, our center's CPG has used GCS<8 as a trigger for involving palliative care services in this patient population, thus focusing on severe TBI. Well over half of the critically ill pediatric and adolescent trauma patients in our study were found to have TBI, and ongoing studies and follow-up are essential to analyze the impact of early palliative care consultation in this population.

Our study has several limitations. This is a single-center observational study intended for quality improvement purposes, and we present only quantitative data to describe our findings. We have a relatively small number of patients, and our cohort is almost exclusively patients suffering from blunt trauma. Distressingly, there has been a nationwide increase in interpersonal violence, even affecting children and adults. Further studies are needed to analyze the role of palliative care services and how they affect long-term outcomes in this vulnerable population. It is also important to note that among the critically ill patients included in this study, 17% of pediatric and 15% of adolescent subjects presented as a level green trauma. This is a significant undertriage rate, and it is possible that the admission triage level affected clinician judgment in getting palliative care services involved prior to implementation of the CPG. Finally, though our short-term follow-up shows a promising increase in early involvement of palliative care, we cannot make any definitive conclusions about the CPGs long-term effect on usage of palliative care services, impact on overall hospital resource utilization (eg, length of stay, ICU or mechanical ventilation days), or impact on patient and family quality of life.

We plan to use this pilot study as a stepping stone for further studies to assess the long-term effects of implementing a clinical protocol to better incorporate pediatric palliative care services into the management of critically ill pediatric and adolescent trauma patients. Ongoing work is needed to collect qualitative data on patient and family perceptions and quality of life after the utilization of palliative care services. Additionally, it is essential to explore the understudied importance of palliative care as a support mechanism for patient families and medical care teams.[23]

CONCLUSION

The results of our quality improvement project demonstrate the potential for improved utilization of the palliative care team in critically ill pediatric and adolescent trauma patients at our institution. Ongoing studies will analyze the effects of implementing a CPG for early palliative care consultation in these vulnerable patients on outcomes and hospital resource utilization.

Contributors JG and JB performed literature search, data collection, data analysis, data interpretation, writing, and critical revision. BS performed study design, data interpretation, writing, and critical revision. TE performed study design, data collection, data interpretation, writing, and critical revision. GA and DK performed literature review, study design, data interpretation, writing, and critical revision. DK serves as the guarantor of this study.

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