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Emergency Medical Services (EMS) Clinician Perspectives on the Pediatric Observation Priority Score (POPS)

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ABSTRACT

OBJECTIVES: Approximately 50% of children assessed by emergency medical services (EMS) in the United States (U.S.) have no emergent needs. The lack of validated triage tools to identify children at low risk of deterioration without transport is one reason that children have not been included in most alternative disposition programs. The Pediatric Observation Priority Score (POPS) is a triage tool incorporating vital signs and clinical observations. British prehospital studies show the POPS accurately identifies low-acuity children. The POPS has not been assessed in the U.S. Our objective was to determine whether U.S. EMS clinicians find the POPS acceptable, appropriate, and feasible.
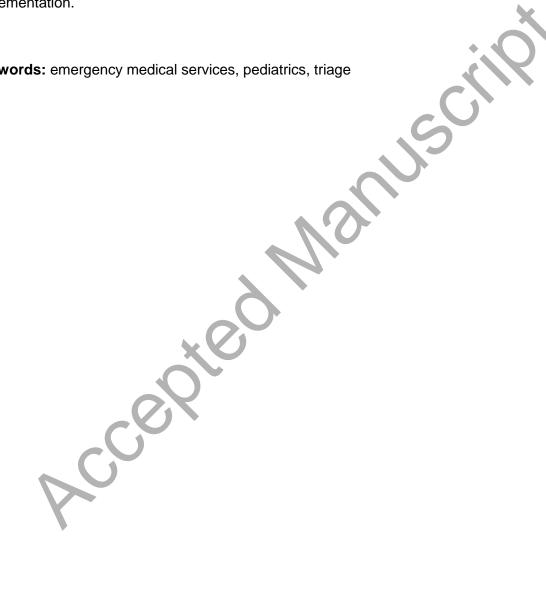
METHODS: We conducted a mixed methods study with EMS clinicians. Participants were provided with an overview of the POPS then completed a survey using the validated Acceptability, Appropriateness, and Feasibility of Implementation Measures (12 Likert-scale questions [1=strongly disagree to 5=strongly agree]). We calculated mean question scores. A PhD-trained facilitator conducted cognitive interviews with a subset of participants to explore their perception of the POPS. Multiple investigators coded transcripts until we reached thematic saturation.

RESULTS: We recruited 100 participants (51% paramedics, 48% emergency medical technician (EMTs)) with a median (IQR) of 5 years (3, 9) clinical experience. Individual question mean scores across all domains ranged from 4.4 - 4.6. Paramedic and EMT responses were similar. 10 participants completed interviews and agreed the POPS was acceptable, appropriate, and feasible. Positive themes from analysis included: 1) ease of use and 2) helpful additional tool. Facilitators to implementation included 1) embedding the POPS in documentation systems 2) with a force function, 3) positive messaging, and 4) incorporating the POPS in protocols. Implementation barriers included 1) resistance to mandatory documentation, 2) undermining professional standing, 3) impaired rapport with patients, 4) uncertainty about

integration with protocols, 5) and concern about legal liability. Participants suggested changes in wording and question order to improve usability.

CONCLUSIONS: Prehospital clinicians in the U.S. find the POPS acceptable, appropriate, and feasible for implementation with minor modifications. Further research is needed to determine whether EMS clinicians can accurately apply the POPS in controlled and field settings before implementation.

INTRODUCTION

Each year, approximately 1.6 million children are assessed by emergency medical services (EMS) in the United States (U.S.) (1). Almost half of these children have no emergent medical needs (2, 3). Notwithstanding the absence of validated pediatric EMS triage tools (4) and EMS deficiencies in pediatric skills (5, 6), one third of all children are left on scene and at risk for under-triage (7). Conversely, many children with low-acuity complaints are transported to the emergency department (ED) (2, 3). This contributes to ED crowding and prolongs EMS response times for other more critical patients (8). Patients, payers, hospitals and federal and state governments (9) have all shown a strong interest in developing alternatives for low acuity EMS patients, including leaving patients at scene (with or without telemedicine), transporting them to clinics, and substituting taxis for ambulances.

The lack of validated triage tools to identify children at low risk of deterioration without transport is one reason that children have not been included in most alternative disposition programs. An Agency for Healthcare Research and Quality (AHRQ) review found that existing EMS triage measures focus on identifying severely ill and injured patients, have low sensitivities, and perform poorly in children (10). Many existing scoring systems focus on identifying children at risk for deterioration in the inpatient setting (11), and do not accurately identify children without emergent needs in the prehospital setting (12). The Emergency Severity Index (ESI), for example, stratifies patients based on acuity and anticipated ED resource needs. Blinded assessments show only moderate concordance between nurse and paramedic ESI scores, and poor sensitivity in identifying low acuity EMS patients (13). Prehospital clinicians have noted there is a need for validated pediatric triage tools to support non-transport protocols (14).

The Pediatric Observation Priority Score (POPS) was developed in England to identify children at low risk of deterioration in emergency settings (Figure 1) (15). The POPS

incorporates vital signs and clinical observations (work of breathing, mental status, medical history, and clinician concern). Each of these components is scored from 0 to 2 resulting in a total score from 0 (low risk of serious illness) to 16 (high risk). POPS has primarily been used in ED settings where a child with a score of > 8 should have immediate assessment by a senior clinician. Specific score thresholds for guiding EMS triage decisions have not been established. The tool was developed to support clinical decision-making, especially for staff with less pediatric experience. The POPS accurately identifies children at low risk of deterioration in both single center (15, 16) and multicenter validation studies (17) and outperforms other screening tools (18, 19). The POPS has moderate to excellent inter-rater reliability when used by staff of varying experience levels (including physicians and health care assistants) (20). Preliminary British data suggests that the POPS is feasible in EMS (21). There is, however, no data assessing the POPS tool in EMS agencies in the U.S. The objective of this study was to determine the acceptability, appropriateness, and feasibility of implementing the POPS in the U.S. prehospital setting. Our secondary objective was to identify modifications to the POPS that would increase the likelihood of successful implementation in U.S. EMS agencies.

METHODS

Study design

We conducted an explanatory sequential mixed methods study. We first conducted a quantitative survey with EMS clinicians, followed by a qualitative study where a subset of survey respondents completed cognitive interviews to further understand the survey responses. The study was determined to be exempt from review by the Children's National Hospital Institutional Review Board (protocol number 00000649).

Participants

Study participants for both the quantitative and qualitative study arms were paramedics and emergency medical technicians (EMTs). Participants were recruited through emails to agency representatives and EMS for Children (EMSC) State Partnership Grant program managers, and social media postings to EMS list-serves. We also used snowball sampling with research participants disseminating recruitment postings to other eligible participants. We used purposive sampling to recruit diverse participants with respect to demographics (age, sex, race, ethnicity and years of clinical experience). Participants were recruited from EMS agencies from Washington DC, Virginia, and Maryland. All survey respondents were asked if they would be willing to participate in the cognitive interviews. Interviews were scheduled sequentially based on timing of participant response.

Researcher characteristics

All interviews were conducted by the same study team member (JS), who has relevant PhD-level training, experience, and expertise in conducting qualitative research. The interviewer (JS) had no previous relationship with the study participants, nor does she have any EMS clinical experience. Additional team members involved in analyzing the interview transcripts included a board-certified pediatric emergency medicine physician (CW) and an EMT (DZ).

Survey administration

Participants were provided with a brief overview of the POPS (including reviewing a video of data entry using the electronic POPS app). Prior to the study session, participants were asked to download the POPS app and practice entering data. We did not provide standard scenarios for this practice. Participants then completed a survey based on the combined Acceptability of Implementation Measure (AIM), Implementation Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) (22). This open access survey consists of 12 items (four per

construct), each scored on a 5-point Likert scale (1=strongly disagree; 5=strongly agree). This pragmatic measure has broad applicability in implementation science and shown to have substantive and discriminant content validity (22). Study data were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools hosted at Children's National (23). REDCap is a secure, web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

Survey analytical approach

We calculated the mean and 95% confidence interval (CI) for each question on the AIM, IAM, and FIM components of the quantitative survey. There are no standardized cut-off scores for interpreting these measures. Consistent with other studies using this tool, we set a threshold of 80% of participants with an average score of ≥ 4 (= agree) for the combined measure. We decided a priori to recruit 100 participants to complete the survey to enable us to calculate a 95% confidence interval with a lower limit of 80% for a point estimate of 88%.

Cognitive interview format

Cognitive interviews were conducted with a subset of survey respondents. We used the Cognitive Interview Reporting Framework to plan our approach (24). The goal of the interviews was to understand why participants assigned particular scores for questions on the AIM, IAM, and FIM. We sought to identify modifications to the POPS that would enhance the acceptability, appropriateness, and feasibility (e.g., changes in wording, format, or instructions). Finally, we asked participants about facilitators and barriers to successfully implementing the POPS. All interviews were conducted virtually using a standardized moderator guide (Supplemental File

Figure 1). Audiovisual recordings of interviews were crosschecked with contemporaneous notes to ensure accuracy.

Cognitive interview analytical approach

Analysis of the interview transcripts was done sequentially after 10 interviews were completed. We used a hybrid inductive and deductive approach for analysis. The inductive portion of analysis involved the lead analyst (JS) reviewing the survey results and completing 10 cognitive interviews to develop an initial codebook. Three study team members (JS, CW, DZ) refined the codebook by consensus (Supplemental File Table 1). For the deductive portion of the analysis, the same three team members independently coded a sample transcript using *Dedoose*^{TM} to promote data-coding consistency and minimize bias (25). Team members agreed that codes were being applied consistently; therefore, a single team member (JS) completed the deductive axial coding of the additional transcripts. This was done to increase feasibility of the study. To minimize bias, JS had no role in developing the POPS or EMS background. Memoing was used to identify representative quotations. Analysis of the tenth interview transcript did not reveal any additional themes or subthemes and therefore no further interviews were scheduled (26). Codes were then grouped into categories (pattern coding) anchored around the study objectives of assessing appropriateness, acceptability and feasibility of the POPS. For example aesthetical appeal of the POPS was assigned as a sub-theme for 'Ease of use' (Theme 1), which directly related to acceptability of the tool. Implementation facilitators (Theme 4) and barriers (Theme 5) related directly to feasibility of the POPS.

RESULTS

We recruited 100 participants (51% Paramedics, 48% EMTs) from diverse settings (56% urban, 35% suburban, 9% rural) with a median (IQR) of 5 years (3, 9) clinical experience. A majority of the participants held a leadership role within their agency, including working as an educator

(35%), shift supervisor (28%), quality improvement officer (10%) or other leadership role (22%) (Table 1). For the AIM, IAM, and FIM quantitative survey, the mean individual question scores ranged from 4.4 - 4.6 (with 4 = agree; 5 = strongly agree). For participants, the aggregate survey mean score was 4.5 (95% CI 4.3 – 4.6) (Table 2). Paramedic and EMT responses did not differ significantly (Supplemental File Table 2).

We completed cognitive interviews with 10 survey respondents. Participant characteristics are summarized in Table 1. Interviews ranged from 30– 45 minutes. Most participants agreed that the POPS was easy to use (Theme 1) and a helpful additional clinical tool (Theme 2). Participants identified several minor modifications of the POPS that could increase usability (Theme 3). Participants also identified several facilitators and barriers to implementing the POPS (Themes 4 and 5). Details of the themes and supporting quotes are provided below and in Table 3.

Theme 1: Ease of use

Participants generally agreed that the POPS was easy to use. Subthemes were that the POPS was short, aesthetically appealing, and could be navigated intuitively by clinicians with very little training.

Theme 2: Helpful additional tool

Most participants agreed that the POPS would be a useful additional clinical tool when making treatment and disposition decisions for pediatric patients, and for helping to educate caregivers.

Theme 3: Modifications

Participants identified several minor modifications to the POPS that could increase usability. Subthemes included: modifications to reflect geographic differences in medical terminology;

clarity about how to use the POPS with incomplete vital signs; re-labeling "Other Factors" and "Gut Instinct" to improve clarity; refining response options for "Consciousness Level" and "Other Factors"; and having the POPS available in multiple languages.

Theme 4: Implementation facilitators

Participants identified several factors that could facilitate successful implementation of the POPS, including: incorporating the POPS into the electronic patient care report; adding a force function requiring POPS completion to complete a patient care report; framing of the tool as a useful additional resource from colleagues; and incorporating the POPS into EMS protocols.

Theme 5: Implementation barriers

Participants identified several potential barriers to implementing the POPS. These included: resistance to additional mandatory documentation; concern that triage tools undermine the professional standing of EMS clinicians; concern that completing the POPS could impair establishing a rapport from patients and caregivers; uncertainty about how POPS could be incorporated into existing treatment protocols; and a general fear of liability with pediatric non-transport cases.

DISCUSSION

In this mixed methods study involving 100 EMS clinicians, a majority of EMS clinicians had a positive impression of the POPS. The vast majority of survey respondents found the POPS acceptable, appropriate, and feasible for implementation in U.S. EMS agencies. Support for the POPS did not differ significantly between paramedics and EMTs. Qualitative analysis identified themes that explained why EMS clinicians scored the POPS highly. Participants found the POPS could be navigated intuitively and completed quickly. Participants felt the POPS would be a helpful tool for making disposition decisions for children, and also for educating caregivers.

Participants identified several minor modifications that would improve usability of the POPS. Participants suggested some changes to medical terminology to reflect U.S. clinical terminology (e.g. replacing the term "recession" with "retraction"). Other headings, such as "Other Factors" and "Gut Instinct" were felt to be ambiguous by some participants. Finally, several participants wondered what would happen if EMS clinicians did not obtain all of the vital signs included in the POPS. Previous studies have shown that children are less likely than adults to have vital signs documented (27, 28). It was noted that there was a lack of guidance on whether the POPS could still be used in such cases, and if so, how that domain should be scored.

Participants identified several factors that would facilitate successful implementation of the POPS. Most participants felt that incorporating the POPS into the ePCR, rather than using a paper-based form or standalone electronic app (potentially with a force-function design), would increase the likelihood that clinicians would complete the form. Participants also noted that positive word-of-mouth referrals from other EMS clinicians and ED staff would increase the likelihood of use. Conversely, participants identified several barriers to implementation. Participants noted that many EMS clinicians are resistant to mandatory documentation, and feel that triage tools such as POPS undermine their professional judgment. Some participants were concerned that entering data on their phone or other electronic device could impair their ability to establish rapport with patients and caregivers. Participants also expressed hesitancy about how the POPS would be incorporated into local agency protocols. Several participants who worked as front-line clinicians were concerned about legal liability should the POPS be incorporated into EMS-initiated non-transport protocols. Clinicians were concerned that they would be legally liable if a child who had a bad outcome after non-transport, regardless of the POPS assessment.

To our knowledge, this is the first study to examine the perspectives of EMS clinicians about the POPS. Our finding that EMS clinicians liked the intuitive nature of the POPS and speed at which it could be completed, is consistent with several other studies that show EMS clinicians value succinct, unambiguous protocols for a range of conditions (14, 29, 30). The facilitators and barriers for successful implementation of POPS are also consistent with previous studies. First, participants in our study noted that embedding the POPS into ePCRs could facilitate implementation. Embedding clinical decision support is associated with increased utilization of screening tools and care pathways in other clinical settings (31-33). Finally, EMS clinician concerns about potential legal liability associated with non-transport of patients are well documented (14, 34, 35). It remains to be seen whether incorporating evidence-based triage tools such as POPS into agency protocols can mitigate both the actual risk, and perceived threat, of litigation. It will be important to validate POPS in prospective studies to address these concerns.

Previous studies have shown that EMS clinicians believe there is a need for better pediatric triage tools, especially if children are to be included in alternative EMS disposition programs. This study suggests that EMS clinicians believe that subject to minor modifications, the POPS may be suitable for implementation in the U.S. Studies are needed to assess the accuracy of EMS clinicians when using the POPS in both controlled and field patient settings. It will also be necessary to conduct studies to determine appropriate POPS score thresholds to guide patient disposition prior to broader implementation in U.S. EMS agencies.

LIMITATIONS

This study has several limitations. First, study participants came from states in the mid-Atlantic and may have views that differ from EMS clinicians in other parts of the U.S. We attempted to recruit a diverse group of clinicians with respect to personal demographics and clinical

experience to mitigate this potential bias. A majority of participants, however, held some form of leadership role within their EMS agency. While this may skew our results, all participants had relevant clinical experience working as an EMS clinician. Furthermore, while many participants had a leadership role within their agency, they may still have been providing clinical care. It is also notable that 25% of participants had less than 5 years clinical experience and almost half of survey respondents and interview participants were EMTs. Second, study participants based their responses on the POPS information session and data entry practice using hypothetical patient scenarios. We did not provide standard scenarios for data entry practice or directly observe participants practicing with the app. This may have impacted how participants perceived the POPS. It is also possible that their impression of the POPS would differ when applied to actual patients.

CONCLUSIONS

In this mixed methods study EMS clinicians indicated the POPS was acceptable, appropriate, and feasible for implementation in the U.S. Minor modifications were suggested to optimize usability. The POPS may be an appropriate triage tool to facilitate alternative dispositions for low acuity pediatric EMS calls. Further research is needed to assess usability in field settings and to determine whether EMS clinicians can accurately apply the POPS in controlled and field settings prior to implementation.

DECLARATION OF INTEREST STATEMENT: The authors report there are no competing interests to declare.

DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING: The authors did not use a generative artificial intelligence (AI) tool or service to assist with preparation or editing of this work. The authors take full responsibility for the content of this publication.

DATA SHARING STATEMENT: De-identified individual data that support the results will be shared after publication provided the investigator who proposes to use the data has approval from an Institutional Review Board and executes a data use or sharing agreement with Children's National Hospital.

AUTHORSHIP STATEMENT: The authors confirm contribution to the manuscript as follows: overall study conception and design (CW, DR, JC), acquisition of funding (CW), qualitative analysis and interpretation of results (JS, CW, DZ), draft manuscript preparation (CW). All authors contributed to the analysis of results, reviewed this manuscript and revised it critically for important intellectual content, approve of version as submitted, and agree to be accountable for all aspects of the work.

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Figure 1: *Pediatric Observation Priority Score (POPS) app user interface*

Table 1: *Survey and cognitive interview participant characteristics*

Variable	Survey respondents		Interview participants	
	N (IQR)	%	N	%
Age				
Median (in years)	29 (25, 34)		32 (23, 44)	
Gender				
Female	53	53%	4	40%
Male	47	47%	6	60%
Race				
Black/African-American	46	46%	1	10%
White	40	40%	7	70%
Asian	8	8%	2	20%
American Indian/Alaskan Native	1	1%	0	0%
Other or not reported	5	5%	0	0%
Ethnicity				
Non-Hispanic	81	81%	9	90%
Hispanic	14	14%	1	10%
Not reported	5	5%	0	0%
Clinician Type				
Paramedic	51	51%	5	50%
EMT	48	48%	5	50%
Other	1	1%	0	0%
Years EMS Experience				
Median	5 (3, 9)		13 (3, 20)	
Professional Roles[1]				
Educator	35	35%	2	20%
Shift supervisor	28	28%	2	20%
Other leadership role	22	22%	3	30%
QI Officer	10	10%	1	10%
No leadership role	13	13%	4	40%
Urbanicity				
Urban	56	56%	4	40%
Suburban	35	35%	6	60%
Rural	9	9%	0	0%

[1]*Total > 100% as participants marked all applicable answers in this category*

Table 2: *EMS clinician assessment of the Pediatric Observation Priority Score (POPS) using the combined Implementation Appropriateness Measure (IAM), Acceptability of Implementation Measure (AIM), and Feasibility of Intervention Measure (FIM)*

Implementation Appropriateness Measure (IAM)	Mean survey score
The POPS screening tool seems fitting	4.5
The POPS screening tool seems suitable	4.4
The POPS screening tool seems applicable	4.5
The POPS screening tool seems like a good match	4.4
Acceptability of Implementation Measure (AIM)	
The POPS screening tool meets my approval	4.4
The POPS screening tool is appealing to me	4.5
I like the POPS screening tool	4.5
I welcome the POPS screening tool	4.5
Feasibility of Intervention Measure (FIM)	
The POPS screening tool seems implementable	4.5
The POPS screening tool seems possible	4.6
The POPS screening tool seems doable	4.6
The POPS screening tool seems easy to use	4.5

Table 3: *Themes, subthemes, and supporting quotes form interviews with EMS clinicians about the Pediatric Observation Priority Score (POPS)*

Theme 1: Ease of use	
(1) Short tool that could be quickly completed	*"I felt like the interface was pretty quick and easy. I could hit a couple buttons while still focusing on the patient, get a score, and then move on with what my next step was."* **(P6)** *"Keeping it simple and keeping it basic - only covering like the major bases of what's happening - it eliminates all of the extraneous information. It makes the question to the point and very simple. It takes out everything else out of it."* **(P10)** *"It's succinct. …The refusal form we have for adults… is ridiculous. Like it's so long."* **(P7)**
(2) Aesthetically appealing	*"One thing that I think makes this tool really cool is that it's big. It's very user-friendly... I think - I haven't gotten the situation - but I think if I had like heavy-duty gloves, like if I was at a car accident, I think it would still be usable. Right? Because I'm just clicking on something, versus like scrolling down this menu of items…"* **(P2)** *"As far as easy to use, like I said, the colors are pretty, it's pretty slidable…. I think there's a younger group that is more—relies on technology…"* **(P7)** *"So, me personally, one of the chief things I like about that tool… is the presentation of the tool. The bright colors, the big buttons, the big functionality, like this is just dumbed down, watered down, but I love it."* **(P2)**
(3) Navigated intuitively	*"It's pretty self-explanatory, which is actually one of the best features of it."* **(P2)** *"So, I definitely thought that it's super easy to use. It's you're clicking like five buttons and then you get to like a decision. Which is also why I thought it's super doable, just because of how easy it is."* **(P5)** *"I mean, it went kind of how we assess our patients. I mean, you know, it started with like level of consciousness, then what is my gut feeling, and then breathing. You know, I mean, it—you guys nailed it when you—when you made the list. Or whoever over in England did. Yeah. I liked how some were fill-in-the-blanks, some were even just dropdowns too."* **(P8)**
Theme 2: Helpful additional tool	
(1) Making disposition decisions	*"I think [with] kids, everybody is so scared that it's always just like, "go to the hospital, go to the hospital." So, I think this is a good resource."* **(P7)** *"I think it would be great, especially for those jurisdictions that do allow transport to the like smaller doctors' offices and like urgent cares…and trying to keep the emergency rooms for emergencies, and kind of keeping, you know, the sniffles and the broken fingers kind of out of the emergency room and not clogging up those spaces."* **(P4)** *"Overall, I think like being able to use this tool, would effectively kind of address like the need to have some sort of validated scoring tool for identification of low-acuity patients."* **(P1)**

(2) Educating caregivers	*"It's just another tool to put in our toolbox and especially for kids – we definitely could use any additional help…you could straight-up show parents or families and say, 'Look, like your child's showing up in the green, everything looks okay.' "* **(P7)** *"I think it just gives the provider another resource on scene of helping educate parents and keep the parents in the loop of what's happening… There's a lot of trust issues when it comes to just the general public and interacting with anybody that wears a uniform. I think it helps by saying 'This is why we're not running out the door' or 'This is why we're doing something'. "* **(P10)**

Theme 3: Modifications to POPS to increase usability	
(1) Modifications to reflect geographic differences in medical terminology	*"The only thing was that when I was using it, I had like the first initial screen where it was asking me about who I am…I was kind of questioning what I should put, because I think EMT wasn't listed as one of the possible roles."* **(P3)** *"I think like 'recession'? I asked, and you clarified it then, or put 'retractions' instead of 'recession' because I think all of us were kind of like, huh?"* **(P7)**
(2) Clarity about how to use POPS with incomplete vital signs	*"Going back to the two pediatric calls I had, one of the kids was very antsy and we almost had an impossible time taking a temperature…. But if there were to be a way that maybe if I couldn't get one, and then maybe still have that calculated, I think would be a little more realistic…. Rather than me just trying to figure out like, 'Okay, I can't get a temperature, what am I going to do now?' "* **(P2)** *"If you can't fill out a field, can you wipe that out and it knocks it out of your data?"* **(P7)**
(3) Re-label "Other Factors"	*"I guess 'other factor'. I would say like 'underlying conditions' could work as well. Because all of these other factors are underlying conditions right? …I think, maybe people would be inclined to skip over it if it's just like 'other.' Yeah, I think specifying it would be would be good."* **(P4)** *"I feel like if we change ["other factor"] to something else because 'other factor' makes it seem like it's not as important… "Contributing factors" maybe? Or something like that might make it sound more pertinent."* **(P5)**
(4) Re-label "Gut Instinct"	*"So, for 'gut instinct,' I know a lot of times for National Registry, it's called 'general impression'? … I mean, 'gut instinct' is like plain English and it's very direct, and I think we all know what that means. But if you're trying to get it nationally accredited in America, going along with what National Registry says might help you."* **(P8)** *"I think one of the buttons that kind of gave me pause was the 'gut instinct' one. And I know that, you know, gut feeling and provider judgment does, almost always play a role in any kind of medical treatment, whether that's EMS or not. But I kind of—what I liked about the rest of it was that it was something more concrete that I could assess."* **(P3)**
(5) Modify response options for "Other Factors"	*"I think the choices that they made to put into the dropdowns were very—very well thought out. A lot of the patients I ran have seizure disorders and I noticed that, like history of epileptic or anything like that wasn't really on there. And I was like, 'Oh, that's kind of odd.' "* **(P10)** *"The 'other factors,' I think I—initially I was curious if there would have been more*

	- you know, why was it limited to just those six? Did it seem that those six covered the aspects that we're looking for... And then as far as the ex-premature, I mean, how far back are we looking to include that?" (P9)
(6) Clarification of conscious level response options	*"The first thing I was going to add is for the 'conscious' level, I don't see an unconscious tab. But thinking about it, I wouldn't be using this tool if the patient was unconscious anyway. I would be transporting. So, I guess that's not even applicable." (P4)* *"Let's see, conscious level—I guess for the alert, voice, and pain, if there's an unconscious button?" (P2)*
(7) Have POPS tool available in multiple languages	*"In my particular area where I respond and work, we have a large community of different ethnic backgrounds. So, we have different ways of translating, you know? So, for instance, if I'm having difficulty communicating with the child or even the parents — perhaps I could show them some of these key things, and I might be able to communicate better and quickly with them." (P6)*

Theme 4: Implementation facilitators

(1) Incorporating POPS into the electronic patient care report	*"And then the last thing was putting it as like an app or into a, you know, electronic medical record. That's perfect, because that's all we use now. If it was me, I wouldn't even offer paper." (P8)* *"What would be pretty cool would be to have some type of integration with this tool that maybe I can just click on those things, get that score, and then when I'm writing my report, it can actually transmit to the report…. it will take out a lot of the writing-out part of it, and then I can just use it as a justification in my report." (P2)* *"But if you actually had, you know, something that would take these items and automatically give it that score within our documentation software that we use, I would guarantee it that folks would have to use it." (P4)*
(2) Force function requiring POPS completion to close patient care report	*"So maybe adding like conditional formatting so that if you have a patient under the age of 18… making a POPS survey a required form would be probably the only way to make providers do it. Because if they don't have to do it, they're not going to do it." (P4)* *"We use the electronic ImageTrend documentation tool… And if you make it red, it forces them to do it. It's like adding the patient's name and date of birth. If you don't do it, it's going to say, 'Hey, you need to do that.' So, if you say, 'Hey, you need a POPS score and make it red,' it forces them to do it." (P10)*
(3) Framing of the POPS as a useful additional resource from colleagues	*"It's kind of one of those things like, you can introduce something, and you maybe get like 5-10% of the department that bites. And then throughout time, it slowly grows from there. Once you get people that are like, 'Oh, this is really super, super simple to use.' And then they show their friend, and they show their friend. And I think it spirals like that." (P8)* *"If you have enough nurses and doctors that doing the online or over-the-radio consult receiving and they ask for it and it's been pushed out to the providers as 'Hey, this is the tool that we're going to start using,' people are going to start naturally using it." (P10)*

	"I really think it should be more of a, 'Hey, this is a really neat tool. It's easy to use. It's there at your convenience.' " **(P2)**
(4) Incorporating POPS into EMS Protocols	*"I mean, as far as the agency goes, you write it into your protocols and procedures, and that just takes implementation and just buy-in, really, when it comes to stuff like that."* **(P6)** *"I think going to the states and whoever writes the protocols, I think including them in the protocol for like initiation of refusal of care."* **(P7)**
Theme 5: Implementation barriers	
(1) Resistance to additional (mandatory) documentation	*"I think with any job… you have individuals that tend to be a little stubborn and not open for new ideas and new advancements."* **(P6)** *"The thing is, making something mandatory is just going to make people resent the tool. It's just going to make them see like another chore to do."* **(P2)**
(2) POPS could undermine the professional standing of EMS clinicians	*"I feel like a lot of providers might feel like it's undermining what they feel like might be their authority in the field to make decisions. And a lot of people that join EMS, they do it as 'Oh, you know, we need to be making split-second decisions. So why do we have to pull out our phones and use this tool?' "* **(P5)** *"In emergency situations, it's hard to be like, 'Hold on, let me pull up my little handy dandy booklet.' It's sort of assumed that you would know what you're doing, which also brings me to my second point, which is that I feel like it might make the provider look like they don't know they're doing well enough…. from my experience, I have seen that people will be very hesitant to use it, so that they don't appear incompetent."* **(P5)**
(3) POPS could impair rapport with patients and caregivers	*"You know, when you've got that rapport going with the patient, sometimes moving your eyes away or drawing your attention away from them could change the way the evaluation goes. So perhaps drawing someone's attention to a phone, some providers may have trouble doing that."* **(P6)** *"I feel like if we were to pull this out in front of a parent, first of all, we'd have to explain to them what it is, because you can't just pull out your phone in front of the parents."* **(P5)**
(4) Uncertainty about how POPS could be incorporated into existing treatment protocols	*"In terms of actually using it for alternative dispositions, I think there's a lot more barriers, just because it's sort of tricky scenario for when to implement alternative dispositions… I think there's a lot of disagreement sometimes between providers and caregivers, where - even if providers use this tool and see that based on the tool and based on other clinical findings the patient seems to be low acuity - caregivers might disagree and might still want to go to the hospital anyway. So, I think that's another barrier for implementation in terms of actually effecting an alternative dispositions program."* **(P1)** *"I think I was looking for somewhere on the app where it would show where the patient would fall within each level… Because I mean, when I put in the last patient I had, it was a medical patient, and I knew it was definitely going to continue to be an ALS patient, which placed the patient in an orange section. But I just wanted to figure out — what does that really mean in the whole realm of things."* **(P9)**
(5) Fear of liability	*"I think I've heard of like a line of thinking where certain people or certain providers*

with pediatric non-transport generally	*are hesitant or unwilling to obtain, like refuse—transport refusals in general, because of either like concern that, you know, something's going to happen and that they might be held liable, or that it might just result in them being called back again."* **(P3)**
	"The big thing with refusals is if you let someone refuse and they really needed treatment, but they really wanted to refuse, that's your license that could be on the line there. And I think filling out the tool would be like another barrier of protection for providers, because it would show like, 'Well, they had all of these, like this is all their vitals and all their chief complaints, and they had a low score of acuity. So, I couldn't really tell that there was going to be something like terribly wrong.' " **(P4)**

*¹ Participant identifier for associated quotes is denoted with **P1 – P10***