CAPE in Context:
Policy and Practice to Improve Pediatric Resuscitations

By
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Date

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Abstract

**Objective:** Rural emergency departments face unique challenges in maintaining staff preparation for pediatric cardiopulmonary arrests, or “codes,” yet federal law creates the expectation that all EDs be prepared to manage any and all critically ill patients. Project CAPE is based on the hypothesis that it takes as little as one intervention and the provision of self-guided learning tools to establish a self-perpetuating educational policy in rural NC emergency departments. The purpose of this study is to determine whether such an intervention demonstrably improves the ability to manage pediatric codes in rural EDs; this analysis concerns the initial step of assessing pre-intervention provider knowledge, experience, and comfort. **Methods:** We gathered data on baseline provider skill, comfort, and knowledge at five NC hospitals by online survey. **Results:** Provider knowledge of PALS guidelines is low, regardless of PALS certification. Providers are more comfortable with older pediatric patients than younger patients and have limited exposure to pediatric patients and limited experience performing pediatric procedures. Providers receive little ongoing pediatric education but believe they would benefit from pediatric mock code training. **Significance:** The initial results suggest that providers at rural NC EDs will benefit from and are receptive to further pediatric emergency training with mock codes. This finding is supportive of Project CAPE and may have broad public policy implications.
Acknowledgements

Thank you to Drs. Jessica Katznelson and William Mills of the UNC Pediatric Emergency Department for letting me tag along with them on Project CAPE, and to Dr. Katznelson for graciously agreeing to be my second reader. Thank you to my advisor, Dr. Sue Tolleson-Rinehart, whose patient guidance made this master’s project possible.
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Introduction

Cardiopulmonary arrests (CPA) are relatively rare in children. The expectation that medical interventions to reverse a CPA—or any pediatric code—should run perfectly, rarity notwithstanding, is often met with disappointment. Despite advances in medicine and team work dynamics aimed at improving pediatric codes, a review of their outcomes is disheartening: overall, the immediate survival rate for pediatric CPA may be as low as 13% (Young and Seidel 1999).

If providing ideal care in a pediatric code is hampered by rarity, this challenge should be all the more evident in small, rural emergency departments (EDs). A 2006 national telephone survey of emergency departments in hospitals with fewer than 100 beds revealed that over half of such hospitals have no emergency medicine physicians on staff and only 8.6% have pediatricians on call to back up the ED. However, most of those hospitals reported that at least 75% of their ED staff maintained current PALS certification (Casey, Wholey, and Moscovice 2008). The bulk of small EDs are relying on PALS certification to ensure that their staffs are prepared to provide care in the rare event of a pediatric code.

First published in 1986, the American Heart Association’s Pediatric Advanced Life Support (PALS) guidelines have become the de facto standard of care for pediatric CPA and other code situations in the United States (Bardella 1999). By 2001, fully 99% of American medical schools required certification in PALS for their pediatric residents. ED staff, however, are not uniformly required to maintain certification (Quan et al. 2001).

Even with a PALS-certified staff, small EDs must guard against complacency in the face of rarity. Project CAPE (Critical Access for Pediatric Emergencies) was designed by Drs. Jessica Katznelson and William Mills of the UNC Pediatric Emergency Department at the University of North Carolina at Chapel Hill with the hypothesis that it takes as little as one
outside training intervention to improve the comfort and skill of a small hospital’s ED staff in conducting pediatric resuscitations. Emergency departments at five rural North Carolina hospitals with fewer than 25 beds participated. Each ED completed a brief pediatric mock code scenario administered on site by one of Project CAPE’s principal investigators. Prior to this mock code, providers at each ED completed a survey their experience with pediatric codes, their training for such events, and their comfort and experience performing common pediatric procedures (see appendix 1, “Project CAPE Survey”). Each hospital was then given a pediatric patient simulator and agreed to hold mock codes at regular intervals. Project CAPE seeks to improve pediatric emergency skills while tracking this improvement through follow-up repetitions of the same survey.

Existing federal law creates the expectation that all EDs provide care to any critically ill patient. The present research includes an analysis of national policies that dictate the expectations of the American emergency department to better understand the policy context of interventions like Project CAPE. The policy analysis is one of national focus, but it provides critical context: it is national policy that has created the expectations that Project CAPE is attempting to meet. For a complete discussion federal policy relating to American EDs, see appendix 4, “Reforming Emergency.”

This analysis considers the initial survey data from Project CAPE and the public policy implications they suggest. The data presented here are limited by time; only the initial survey was available for analysis. An evaluation of the efficacy of Project CAPE in toto would be premature. Rather, it is the goal of this analysis to understand project CAPE, its results to date, and the political context in which it was created.
Survey Methods: Design, Distribution and Analysis

Project CAPE consists of three main components: mock codes, a team dynamics and mock code training seminar at UNC Hospital, and an iterative survey to measure baseline provider characteristics and track improvements over time. The survey assessed four facets of the ED staff at five rural NC hospitals: background provider information, existing training and certifications, experience and comfort with pediatric patients and pediatric emergency procedures, and knowledge of the American Heart Association’s Pediatric Advanced Life Support (PALS) guidelines. This analysis is concerned primarily with the design, analysis, and results of the initial survey.

Project CAPE is funded by the North Carolina Office of Rural Health and Community Care and the Cannon Foundation. The study received a waiver from the University of North Carolina’s Institutional Review Board (Biomedical IRB, study number 09-2327).

Survey Content and Design

A complete copy of the Project CAPE survey as distributed is provided in appendix 1. Respondents at participating hospitals completed the survey online, before the initial site visit, using Qualtrics survey software (Qualtrics Labs Inc., Provo, UT). All questions were generated by expert consensus among pediatric ED physicians in consultation with an expert in survey research design. The survey was administered and maintained by the first author.

No individual identifying information was collected, but we did ask each respondent to answer three open-ended questions such as, “What city were you born in?” in order to anonymously track changes in individual providers’ responses at each iteration of the survey.
Initial questions also identified the respondent’s provider type, primary specialty, and years of ED experience.

We asked respondents what, if any, training programs or certifications they had completed, such as PALS or Advanced Cardiac Life Support (ACLS) training. We assessed ongoing educational efforts by asking about existing mock codes at the respondent’s hospital, availability of continuing education programs, and the degree to which pediatric topics were included in such programs. Providers also rated the overall helpfulness of mock codes and were asked if they thought mock codes would improve their skill and comfort with pediatric patients.

To assess provider experience and comfort with pediatric patients, we asked respondents to estimate the number of pediatric patients they treat during a typical ED shift. They also reported the number of times over the past year they had performed several common procedures identified by prior work as targets for future improvement in pediatric code performance (see Hunt et al. 2006). Respondents rated their comfort with each procedure in each age group, ranging from “not at all comfortable” (0) to “completely comfortable” (100). Physicians and mid-level providers (MLPs)—including physician assistants (PA) and nurse practitioners (NP)—were asked to rate experience and comfort on the same scale for an additional list of tasks specific to these providers.

We assessed provider knowledge with six multiple choice questions. All questions were consistent with PALS guidelines, and several addressed topics previously identified as targets for future pediatric code performance improvement (see Hunt et al. 2006). We tested the knowledge questions for clarity and content in a convenience sample of UNC pediatric emergency specialists.
Each of the five participating hospitals designated a point person to distribute the survey to the ED staff at his or her hospital. Surveys remained identifiable at the hospital level, but not among individual respondents. The first round of surveys was distributed to each hospital’s point person prior to the initial Project CAPE site visit, and only those surveys completed before the first site visit are included in the analysis.

Analysis

One hundred and twenty-five completed surveys were available for this initial analysis. Nineteen surveys were completed after the time of the initial site visit and were dropped from further analysis. Data were analyzed using Stata version 10 (StataCorp 2007).

We calculated summary descriptive statistics for each question in total and stratified by provider type. Ten respondents gave no provider type; these responses were included in the general analysis, but dropped from any provider type-specific analyses. The roles and expected knowledge of PAs and NPs in this context are similar to those of physicians, so we grouped physicians and these mid-level providers for this analysis.

We created composite variables to measure provider experience and knowledge (see appendix 2, “Construction of Composite Variables”). We assigned each provider an experience score for each patient age group based on the number of procedures performed in that age group over the past year. A primary knowledge score comprises only the respondent’s performance on the six multiple choice knowledge questions. We also created a composite knowledge indicator that includes knowledge question performance as well as existing certifications, past training experiences, and use of continuing education programs with pediatric patients.
We created an indicator variable for physician comfort to control for inter-respondent variation in comfort reporting. MLP or physician comfort scores represent the deviation in providers’ comfort for a given age group from their overall average comfort score (see appendix 2). Other respondents rated comfort for infants and children only; these score are reported as averages by age group.
Initial Results

Experience & Comfort

Table 1 provides a summary of baseline characteristics. Sixty-two nurses, 25 physicians, and seven MLPs completed the survey. Most nurses had completed both PALS and ACLS within the past two years (87 and 98%, respectively), but far fewer physicians and MLPs completed these courses (47 and 60%, respectively). Less than a quarter of providers report regularly scheduled mock codes or a continuing education program with pediatric focus at their hospitals.

Table 2 lists the proportion of providers who reported performing each procedure 0-5 times over the past year in each patient age group. Most respondents had little experience with starting IVs, placing NG tubes, or placing urinary catheters in pediatric patients over the past year.

Table 3 shows that experience with intraosseous lines, central lines, bag mask ventilation, and intubation is similarly limited among physicians and MLPs; most providers indicated performing the listed procedures 0-5 times over the past year.

Nevertheless, experience performing pediatric procedures is associated with comfort in treating pediatric patients. Mean reported comfort for all procedures in all age groups was 55.3 for providers with experience scores below the 50th percentile and 72.2 for providers at or above the median (P < 0.001).

Knowledge

Figure 1 displays the percent of correct responses to each of the six knowledge questions among all providers. Performance was highest for questions two and three, about Brosetlow tape
use (91% correct) and IO medications (94% correct.) Performance on the remaining four questions was generally poor, ranging from 17% correct (appropriate use of fluid resuscitation for a child with suspected sepsis) to 32% correct (first step in care for a patient showing ventricular fibrillation). There was no significant difference in overall performance between nurses and physicians/MLPs (45% and 49% correct, respectively; P=0.28), suggesting that all members of ED teams can profit from educational interventions.

Table 4 lists the mean reported comfort level among all respondents for each procedure by age group and by provider type. In all cases, providers are more comfortable performing procedures in children than in infants (P < 0.001). There is no significant difference, however, in comfort scores either for children or infants compared by provider type: P= 0.52, comparing nurse and physician comfort with children, and P= 0.84, comparing nurse and physician comfort with infants.

Table 5 displays mean comfort deviation scores among physicians and MLPs by age group. Mean comfort for all procedures in all age groups—including adults—is 66.9 (out of 100). Physicians and MLPs are slightly more comfortable than their baseline performing procedures in children, but less comfortable in pediatric patients overall (-5.2), and report decreasing comfort with decreasing patient age.

Figure 2 displays mean comfort ratings reported on a 100 point scale for all procedures in both children and infants, stratified by years of ED experience. While there is an apparent trend of increasing comfort with increasing years of experience, these differences were not statistically significant (P = 0.089). In contrast, Figure 3 displays mean comfort for all procedures in children only, stratified by years of ED experience. Considering only children, there is
significantly greater comfort with increasing years of experience.

**Mock Codes**

We asked several questions tapping providers’ attitudes about the usefulness of mock code training and the current amount of pediatric training at their hospital. These responses are summarized in table 6. Providers overwhelmingly endorse the utility of mock codes in general and for improving comfort and skill with pediatric patients. However, only a minority of providers are currently receiving mock code training, and among those who are, few are experiencing mock codes with substantial pediatric content.
Discussion: Survey, Results, and Policy Implications

Our data suggest that providers at rural North Carolina hospitals have limited exposure to pediatric patients, pediatric procedures, and continuing training in pediatrics. Physicians are substantially less comfortable caring for pediatric patients than they are treating adults, and all providers demonstrate a monotonic, declining association of comfort with patient age. While most have completed a PALS training course, provider knowledge of PALS guidelines remains limited. Yet by virtue of having an emergency department, public policy demands that these providers be prepared to handle critically ill pediatric patients.

That limited pediatric experience is associated with limited comfort in treating pediatric patients argues for the potential of Project CAPE. Mock codes have become the standard training modality for improving code team performance precisely because they can provide regular experience with otherwise rare events (Birkhoff and Donner 2009).

Knowledge of PALS guidelines among our providers is generally low, regardless of years of experience or provider type, and despite completing a PALS course. This is certainly not surprising, as existing literature shows that PALS training is effective in making short-term improvements in provider knowledge, but long-term knowledge retention is poor (Grant, Marczinski, and Menon 2007). Thus, to be effective, a training intervention must be repeated at intervals. To be practical, it should also be self-perpetuating. Such is the promise of Project CAPE.

The current study faces several limitations. Chiefly, this analysis considers only the first round of results from a survey instrument that is meant to generate an iterative, longitudinal panel study. Given this intent, the survey was not explicitly designed to detect relationships between provider comfort, knowledge, and experience after a single sampling, but rather to
assess improvement over time. Some informative relationships were apparent in this initial dataset, but the true utility of this survey rests on coming results.

The survey itself could be refined. Providers chose from four categories to rate procedure experience in the past year. Because the bulk of respondents reported “0-5” procedures, and almost none selected the “more than 20 times” option, these questions could be improved by offering more narrowly defined categories focusing on lower ranges. Non-physician respondents were asked to rate comfort in only two age groups in an effort to reduce the burden of administration for the bulk of respondents. The reliability of our comfort measure could be improved, however, by asking all respondents to rate comfort in all four age groups, as was asked of physicians and MLPs.

Despite these limitations, our results show substantial promise for the future of Project CAPE. Consider again Table 6, “Providers’ Views on Mock Code Training.” Taken together, these responses suggest that although most providers find mock codes helpful and believe participating in pediatric mock codes would improve their comfort and skill, the majority are getting little or no exposure to pediatric mock codes. Rural ED providers believe in the value of mock code training for pediatric patients, but currently, such training is limited. The goal of Project CAPE is to effect a self-perpetuating pediatric code training program. For such a program to work, providers must “buy in,” as ultimately success depends upon their continuing participation. As Table 6 demonstrates, rural ED providers are eager to participate in further pediatric training. Project CAPE is prepared to provide it.

Project CAPE is intended to improve practice at North Carolina hospitals, but it is addressing a need for excellent pediatric care created by national policy. The Emergency Medical Treatment and Active Labor Act (EMTALA) of 1986 was designed to ensure treatment
for critically ill patients regardless of their capacity to pay (Lee 2002). However, it has also created the expectation that EDs will be ready to provide critical care for any and all patients who come through the door, regardless of age or the rarity with which the ED sees such patients. Despite this expectation, formal completion of a PALS course is generally not required of physicians outside of pediatric specialties (Bardella 1999). Further, as our results suggest, PALS certification alone is insufficient to guarantee high quality pediatric code care in EDs that rarely treat critically ill children.

The result, unsurprisingly, is significant variation in pediatrics survival after a code depending on hospital characteristics. A 2006 report generated from the National Registry of Cardiopulmonary Resuscitation found significant positive correlations between improved 24 hour survival and receiving care at a hospital staffed by pediatric residents and pediatrics surgeons (Donoghue et al. 2006). That outcomes are best among those providers most likely to have hands-on experience managing pediatric CPA argues favorably for the wider dissemination of pediatric code simulation training.

Complicating matters further, the expectations for EDs created by policy at the national level come without financial support to help realize them. The result is tension between small hospitals’ legal—and perhaps moral—obligation to prepare for pediatric codes despite their rarity, and those hospitals’ very real concern for their own bottom lines. Thus, while most hospitals with fewer than 100 beds in America require at least a portion of their ED staffs to maintain PALS certification, fewer than half of these hospitals provide the necessary training on site (Casey, Wholey, and Moscovice 2008).

Project CAPE is surely not a replacement for PALS certification. Rather, it is meant to augment formal training by allowing providers to routinely practice what they have learned.
PALS training has been shown to be effective for improving provider performance in pediatric mock codes, but knowledge and skill decay quickly after training (Grant, Marczinski, and Menon 2007). Hunt et al. have demonstrated that a single pediatric mock code followed by an educational intervention leads to improved mock code performance in ED staff after six months (2007). Project CAPE includes a similar intervention, with an additional focus on establishing a policy of regularly scheduled mock codes within each participating ED.
Conclusion

Project CAPE has the potential to be not only a training tool for small EDs, but also a realistic policy tool to help relieve the tension between financial realities and federal expectations. It is a relatively inexpensive intervention, requiring a one-time investment in a pediatric patient simulator. Thereafter, it becomes a matter of EDs’ systematically choosing to hold pediatric mock codes in accordance with Project CAPE’s schedule. Implementing Project CAPE, then, represents more of a shift in department or hospital policy than a significant financial investment in training hospital staff.

Our intention is to demonstrate that such a policy shift effectively improves providers’ pediatric code comfort and knowledge at a department level. The initial results are promising in that they indicate a desire among providers to participate with a new training policy. Should this policy shift prove to effectively improve PALS knowledge and comfort with pediatric code procedures, we will consider Project CAPE a success. But we may have also found an appropriate model for future public policy initiatives aimed at redressing the discordance between the expectations for EDs set at the federal level and the practical realities that hamper their achievement.
References


StataCorp. 2007. *Stata Statistical Software: Release 10*. College Station, TX: StataCorp LP.

### Table 1
Summary Characteristics in Total Sample and by Provider Type

<table>
<thead>
<tr>
<th>Provider Type</th>
<th>% or mean (n)</th>
<th>RN</th>
<th>MD/MLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Respondents</td>
<td>61% (62)</td>
<td>34% (32)</td>
<td></td>
</tr>
<tr>
<td>EM is primary specialty</td>
<td>63% (64)</td>
<td>24% (39)</td>
<td>75% (24)</td>
</tr>
<tr>
<td>≥ 5 years of ED experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10 Years of ED experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed PALS course in last 2 years</td>
<td>72% (73)</td>
<td>87% (54)</td>
<td>47% (15)</td>
</tr>
<tr>
<td>Completed ACLS course in last 2 years</td>
<td>84% (85)</td>
<td>98% (61)</td>
<td>60% (15)</td>
</tr>
<tr>
<td>Hospital has scheduled mock codes</td>
<td>19% (19)</td>
<td>44% (14)</td>
<td>9% (3)</td>
</tr>
<tr>
<td>Hospital offers continuing education program with ≥ 25% pediatric focus</td>
<td>19% (18)</td>
<td>18% (11)</td>
<td>16% (5)</td>
</tr>
<tr>
<td>Pediatric patients seen per shift</td>
<td>8.4 (93)</td>
<td>8.6 (58)</td>
<td>7.8 (31)</td>
</tr>
<tr>
<td>Toddlers seen per shift</td>
<td>4.6 (92)</td>
<td>4.8 (57)</td>
<td>4.5 (31)</td>
</tr>
<tr>
<td>Infants seen per shift</td>
<td>2.2 (92)</td>
<td>2.5 (57)</td>
<td>1.8 (31)</td>
</tr>
</tbody>
</table>

**SOURCE:** Project CAPE on-line survey, conducted by the investigators.

Note: “MD/MLP” (mid-level provider) includes physicians, physician assistants, and nurse practitioners. Ten respondents listed no provider type; these responses are counted among “all respondents” but were not included in calculations by provider type.

### Table 2
Experience Among All Providers With Three Procedures, by Age Group of Patient

<table>
<thead>
<tr>
<th>% of all providers reporting 0-5 procedures over last year (n=97)</th>
<th>In Infants</th>
<th>In Toddlers</th>
<th>In Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start IV</td>
<td>79%</td>
<td>66%</td>
<td>55%</td>
</tr>
<tr>
<td>Place NG</td>
<td>100%</td>
<td>99%</td>
<td>97%</td>
</tr>
<tr>
<td>Place urinary catheter</td>
<td>86%</td>
<td>82%</td>
<td>85%</td>
</tr>
</tbody>
</table>

**SOURCE:** Project CAPE on-line survey, conducted by the investigators.
Table 3
Experience Among MDs & MLPs with Four Procedures, by Age Group of Patient

<table>
<thead>
<tr>
<th>% of MD/MLPs reporting 0-5 procedures</th>
<th>In Infants</th>
<th>In Toddlers</th>
<th>In Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start IO</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Place Central Line</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Bag Mask Ventilate</td>
<td>97%</td>
<td>97%</td>
<td>97%</td>
</tr>
<tr>
<td>Intubate</td>
<td>93%</td>
<td>97%</td>
<td>97%</td>
</tr>
</tbody>
</table>

SOURCE: Project CAPE on-line survey, conducted by the investigators.

Table 4
Comfort Among All Providers with Six Procedures, by Age Group of Patient

<table>
<thead>
<tr>
<th>Mean (sd) comfort score on a 0-100 point scale</th>
<th>All Providers (n=97)</th>
<th>RN (n=61)</th>
<th>MD/MLP (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Children</td>
<td>Infants</td>
<td>Children</td>
</tr>
<tr>
<td>Assessing Patient</td>
<td>80 (22.7)</td>
<td>72 (27.9)</td>
<td>77 (23.7)</td>
</tr>
<tr>
<td>Drawing Blood</td>
<td>62 (32.0)</td>
<td>50 (34.8)</td>
<td>71 (29.7)</td>
</tr>
<tr>
<td>Placing an IV</td>
<td>62 (33.0)</td>
<td>49 (43.9)</td>
<td>73 (28.7)</td>
</tr>
<tr>
<td>Placing an NG</td>
<td>52 (33.1)</td>
<td>46 (35.4)</td>
<td>51 (32.5)</td>
</tr>
<tr>
<td>Placing a Urinary Catheter</td>
<td>66 (29.6)</td>
<td>56 (32.0)</td>
<td>68 (30.3)</td>
</tr>
<tr>
<td>Recognizing Abnormal Vitals</td>
<td>82 (22.0)</td>
<td>78 (26.4)</td>
<td>81 (21.5)</td>
</tr>
<tr>
<td>Column Mean</td>
<td>67 (24.4)</td>
<td>59 (26.0)</td>
<td>70 (25.0)</td>
</tr>
</tbody>
</table>

SOURCE: Project CAPE on-line survey, conducted by the investigators.

Note: Comfort was reported on a 100 point scale using adjustable sliders. Zero was defined as “not at all comfortable;” 100 was defined as “completely comfortable.” Column means compared with two-sample tests.
Table 5
Comfort and Comfort Deviation by Age Group Among MD/MLPs

<table>
<thead>
<tr>
<th></th>
<th>Mean Comfort (sd) or Deviation from Baseline (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Comfort</td>
<td>66.9 (21.0)</td>
</tr>
<tr>
<td>Comfort Deviation, Children</td>
<td>0.44 (4.6)</td>
</tr>
<tr>
<td>Comfort Deviation, Toddlers</td>
<td>-5.9 (3.5)</td>
</tr>
<tr>
<td>Comfort Deviation, Infants</td>
<td>-10.2 (5.8)</td>
</tr>
<tr>
<td>Comfort Deviation, All Peds</td>
<td>-5.2 (3.2)</td>
</tr>
</tbody>
</table>

SOURCE: Project CAPE on-line survey, conducted by the investigators.

Note: P < 0.001 for two sample t tests comparing each pair of comfort deviation scores.

Table 6
Providers’ Views on Mock Code Training

<table>
<thead>
<tr>
<th>% Agreeing or Mean*</th>
</tr>
</thead>
<tbody>
<tr>
<td>How helpful are mock codes?</td>
</tr>
<tr>
<td>Very Useful</td>
</tr>
<tr>
<td>At least somewhat useful</td>
</tr>
<tr>
<td>Somewhat useless or less</td>
</tr>
<tr>
<td>Pediatric mock codes would improve skill</td>
</tr>
<tr>
<td>Pediatric mock codes would improve comfort</td>
</tr>
<tr>
<td>Pediatric focus hospital's CE program is inadequate</td>
</tr>
<tr>
<td>Hospital has no regularly scheduled mock codes</td>
</tr>
</tbody>
</table>

Expected benefit from further pediatric training (0-100) *87

SOURCE: Project CAPE on-line survey, conducted by the investigators.
Figure 1
Percent of Correct Responses to Six Knowledge Questions Among All Providers

SOURCE: Project CAPE on-line survey, conducted by the investigators.
Note: Response rate varied by question; n = 94, 95, 95, 90, and 92 respectively. Bar labels refer to question topic. See Appendix 1, “CAPE Survey,” for a complete list of questions and answer choices.

Figure 2
Mean Comfort Among All Providers with All Procedures in Infants and Children

SOURCE: Project CAPE on-line survey, conducted by the investigators.
Note: Providers rated comfort with six tasks in two age groups from 0-100. Bar height represents mean comfort for all procedures in both age groups. Comparison of means based on one-way analysis of variance; P=0.089.
Figure 3
Mean Comfort Among All Providers with All Procedures in Children Only

SOURCE: Project CAPE on-line survey, conducted by the investigators.
Note: Providers rated comfort with six tasks in two age groups from 0-100. Bar height represents mean comfort for all procedures in children only. Comparison of means based on one-way analysis of variance; P=0.05.
Appendix 1: CAPE Survey

Unique Survey ID questions

Thank you for your willingness to take the survey. Your answers are completely anonymous. We will not collect any personally identifying information about you, and your responses will never be linked to you individually.

We have included the questions below ONLY to connect your own survey responses to your responses in a follow up survey in the future. With these questions, we can link your responses to different surveys without ever knowing who you are individually. We are doing this only for the purpose of measuring change and stability over time.

Please answer the following questions to help us anonymously link your surveys.

- What city or town were you born in?
- What was the make and model of your first car? (e.g. "Honda Civic")
- What is your mother’s middle name?

Which type of provider are you?
- RN
- PA
- NP
- MD
- none of these

What is your primary specialty?

Are you board certified in that specialty?
- Yes
- No

How many years have you worked in an emergency department?
- <1
- 1-5
- 5-10
- >11

How many years have you worked in a Critical Access Hospital emergency department?
- <1
- 1-5
- 5-10
- >11

Which of the following courses have you successfully completed in the past two years? (choose all
that apply)
- PALS
- ACLS
- ATLS
- ENA-ENPC
- TNCC
- none of the above

Are you certified to be an instructor for any of the following courses? (choose all that apply)
- PALS
- ACLS
- ATLS
- ENA-ENPC
- TNCC
- none of the above

Does your hospital require you to maintain certification in any of the following? (choose all that apply)
- PALS
- ACLS
- ATLS
- ENA-ENPC
- TNCC
- none of the above

Does your hospital offer you any continuing education programs?
- Yes
- No

About how many of the continuing education programs offered by your hospital focus on pediatric patients?
- <25%
- 25-50%
- 51-75%
- >75%

Do you think that the percent of continuing education programs focusing on pediatric patients offered by your hospital is adequate?
- Yes
- No

Does your institution offer continuing education funds to allow you to attend outside courses, conferences or workshops?
- Yes
- No

Have you attended any such outside courses, conferences, or workshops in the past two years?
- Yes
- No
Did any of the outside programs you have attended in the past two years include pediatric patients?
- Yes
- No

Does your hospital run regularly scheduled “mock codes”?
- Yes
- No

How often does your hospital run regularly scheduled “mock codes”?
- once a week
- once a month
- twice a year
- once a year or less

Is participation in mock codes mandatory for all ED staff?
- Yes
- No

How many of these mock codes include pediatric scenarios?

<table>
<thead>
<tr>
<th>None</th>
<th>&lt;25%</th>
<th>25-50%</th>
<th>51-75%</th>
<th>&gt;75%</th>
</tr>
</thead>
</table>

Do you find participating in mock code scenarios helpful?
- Very Useless
- Useless
- Somewhat Useless
- Neutral
- Somewhat Useful
- Useful
- Very Useful

Considering the number of pediatric patients you see on an average shift,

- how many do you see total (all patients less than 18 years old)?
- how many are younger than 5 years old?
- how many are infants?

Many people feel very comfortable with some elements of patient care and less comfortable with others.

Please use the slider bars below to rate how comfortable you are with the following tasks, ranging from not at all comfortable (0) to completely comfortable (100).

<table>
<thead>
<tr>
<th>Not at all comfortable</th>
<th>Completely Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
<tr>
<td>Not at all comfortable</td>
<td>Completely Comfortable</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>assessing a child?</td>
<td></td>
</tr>
<tr>
<td>assessing an infant?</td>
<td></td>
</tr>
<tr>
<td>drawing blood from a child?</td>
<td></td>
</tr>
<tr>
<td>drawing blood from an infant?</td>
<td></td>
</tr>
<tr>
<td>placing an IV in a child?</td>
<td></td>
</tr>
<tr>
<td>placing an IV in an infant?</td>
<td></td>
</tr>
<tr>
<td>placing an NG tube in a child?</td>
<td></td>
</tr>
<tr>
<td>placing an NG tube in an infant?</td>
<td></td>
</tr>
<tr>
<td>placing a bladder catheter in a child?</td>
<td></td>
</tr>
<tr>
<td>placing a bladder catheter in an infant?</td>
<td></td>
</tr>
<tr>
<td>recognizing abnormal vital signs in a child?</td>
<td></td>
</tr>
<tr>
<td>recognizing abnormal vital signs in an infant?</td>
<td></td>
</tr>
</tbody>
</table>

Now consider how often you perform some of these tasks in various age groups. Please consider each of the clinical tasks below, and tell us about how many times you have done them for each age group over the last year.

In the past year, about how many IVs have you started in:

<table>
<thead>
<tr>
<th>Infants less than one year</th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### In the past year, about how many NG tubes have you placed in:

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 18+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### In the past year, about how many bladder catheters ("in and out" or Foley placement) have you successfully placed in:

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 18+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now we would like to ask you a few more specific questions for mid-level providers and MDs.

Many providers feel very comfortable with some elements of patient care and less comfortable with others in certain age groups.

**How comfortable are you with OBTAINING IV ACCESS in patients of the following age groups, ranging from not at all comfortable (0) to completely comfortable (100)?**

**Not at all** | **Completely Comfortable**
---|---
<table>
<thead>
<tr>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 18+</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**How comfortable are you with OBTAINING IO ACCESS in patients of the following age groups, ranging from not at all comfortable (0) to completely comfortable (100)?**

**Not at all** | **Completely Comfortable**
---|---
<table>
<thead>
<tr>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td>Not at all</td>
<td>Completely Comfortable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How comfortable are you with placing a CENTRAL LINE in patients of the following age groups, ranging from not at all comfortable (0) to completely comfortable (100)?

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Not at all</th>
<th>Completely Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
<tr>
<td>Infants less than one year</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

How comfortable are you with BAG MASK VENTILATION in patients of the following age groups, ranging from not at all comfortable (0) to completely comfortable (100)?

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Not at all</th>
<th>Completely Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
<tr>
<td>Infants less than one year</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

How comfortable are you with INTUBATING patients of the following age groups, ranging from not at all comfortable (0) to completely comfortable (100)?

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Not at all</th>
<th>Completely Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
<tr>
<td>Infants less than one year</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Completely Comfortable</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
<tr>
<td>one year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

In the past year, about how many IOs have you started in:

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the past year, about how many central lines have you placed in:

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the past year, about how many of the following patients have you bag mask ventilated?

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the past year, about how many of the following patients have you intubated?

<table>
<thead>
<tr>
<th></th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults, 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How much do you feel you would benefit, if at all, from increased training in caring for pediatric patients? Place the slider bar anywhere from “not at all” to “benefit a great deal.”

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Benefit a great deal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
<td></td>
</tr>
</tbody>
</table>
Now think about what you might get out of participating in a pediatric code simulation.

First, would it improve your **comfort level** in caring for pediatric patients?
- Yes
- No

Second, would it improve your **skill level** in caring for pediatric patients?
- Yes
- No

Finally, we have prepared six brief clinical scenarios. Please consider each question, and select the most appropriate answer.

**Correct answer, provided for this appendix.**

A 7 year old patient is on a monitor in the ED. She becomes unresponsive, and the monitor now shows ventricular fibrillation (V-fib). The first thing you should do is:
- defibrillate at 2J/Kg
- start CPR
- administer epinephrine
- give a precordial thump

A 5 year old female girl who was struck by a car arrives to your emergency department (ED) with full spinal immobilization. The best estimate of her weight can be obtained by:
- educated guess based on patient length and body shape
- last known measured weight, reported by a family member
- a measuring tape with critical medication doses printed for various lengths (such as a Braselow™ tape)
- age-based estimate based on a validated clinical calculator

Which of the following may be administered via an intraosseous (IO) needle?
- epinephrine
- atropine
- adenosine
- normal saline
- all of the above
- none of the above

You are caring for a pediatric patient with suspected sepsis. You have maintained the airway and established access according to PALS guidelines. Within the next 15 minutes of resuscitation, you should:
- Push 20mL/kg isotonic fluid boluses repeatedly, providing a total of at least 60 mL/kg
- start a continuous dopamine infusion at 1-20 mcg/kg/min and titrate rate to desired effect
- start a continuous epinephrine infusion at 0.1-1 mcg/kg/min and titrate rate to desired effect
-
A 8 year old girl presents to your ED with acute onset of urticarial rash and emesis. Your first intervention should be:
- administer a 20 mL/kg bolus of isotonic fluid
- administer diphenhydramine 1-2 mg/kg up to 50 mg PO/IV
- administer 0.01 mg/kg of epinephrine 1:1000 up to 0.5 mg IM
- administer methylprednisolone 2 mg/kg IV

A 22 month old male boy presents to your ED with tachypnea, increased work of breathing (nasal flaring and retractions), and wheezing. His condition does not respond to treatment with albuterol. You should consider which of the following in your differential? (select all that apply)
- foreign body
- bronchiolitis
- extrinsic compression of the airway
- myocarditis

Thank you very much! This completes the survey! We would be glad to have any comments -- please enter them in the space below.
Appendix 2
Construction of Composite Variables

Knowledge Scores: Two Indicators

Each respondent received two knowledge scores.

A primary knowledge score comprised simply of the proportion of multiple choice knowledge questions answered correctly, expressed on a continuous scale from 0-1.

The composite knowledge indicator was constructed by awarding points to respondents for relevant background educational experiences as well as their performance on the knowledge questions, creating a final composite score ranging from 0-10.

We assigned one point for each of the following to construct the composite knowledge score:

- Current PALS certification
- Current ACLS certification
- Certified as PALS instructor
- Certified as ACLS instructor
- Hospital has a continuing education program with at least 51% focus on pediatric patients
- Attended an outside educational program that included pediatric patients in the past two years
- Hospital has scheduled mock codes at least twice a year using at least 25% pediatric scenarios

Additionally, 0-3 points were awarded for knowledge question performance:

- At least one correct question, primary score < 50% correct one point
- Primary score between 50-75% correct two points
- Primary score >75% correct three points

Experience Scores

Example experience question:

<table>
<thead>
<tr>
<th>In the past year, about how many IVs have you started in:</th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children 1-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &gt;5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults 18 and older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We assessed experience in all providers with each of the following procedures:

- Starting an IV
- Placing an NG tube
- Placing a bladder catheter
Physicians and mid-level providers were also asked about the following additional procedures:

- Starting an IO line
- Placing a central line
- Bag mask ventilation
- Intubation

Experience scores were calculated based on the number of times a procedure was performed in the past year:

- 0-5 times in past year: **zero points**
- 6-10 times in the past year: **one point**
- 11-20 times in the past year: **two points**
- >20 times in the past year: **three points**

Respondents were asked to estimate experience in each of the following age groups:

- “Infants less than one year” (infants)
- “Children 1-5” (toddlers)
- “Children >5” (children)
- “Adults 18 and older” (adults)

The final experience score in each age group ranged from 0-9 points among all providers, and 0-21 for physicians and mid-level providers.

For analyses considering experience in all pediatric patients, we used the mean of each respondent’s infant, toddler, and child scores.

### Comfort Scores

**Example comfort question:***

We constructed separate comfort scores based on provider type. All respondents rated their comfort with the following list of procedures for both children and infants. The scale was set from 0-100, with a score of zero defined as “Not at all comfortable,” and a score of 100 defined as “Completely comfortable.”

Tasks rated for comfort by all respondents:

- Assessing a patient (child or infant)
- Drawing blood
- Placing an IV
- Placing an NG tube
- Placing a bladder catheter
- Recognizing abnormal vital signs
These responses were used to calculate a mean comfort score for each provider in both children and infants.

**Physicians and mid-level providers** were additionally asked to rate their comfort with the following procedures in four age groups, infant, children, toddlers, and adults:

- Obtaining IV access
- Obtaining IO access
- Placing a central line
- Bag mask ventilation
- Intubation

Because these comfort questions included not only pediatric patients but also comfort ratings for performing the procedures in adults, we were able to calculate an overall average comfort score, from 0-100, for each physician or MLP.

We created comfort deviation scores for physicians and MLPs to assess the degree to which provider comfort in performing pediatric tasks differed from baseline comfort. Using the overall comfort score as a baseline, physician and MLP comfort deviation for each age group was calculated by subtracting each provider’s mean comfort score for a given age group from that provider’s baseline comfort score. Thus, negative comfort scores indicate relatively less comfort in the given age group than the baseline, while positive scores indicate relatively greater comfort than the respondent’s baseline.
Appendix 3

Prior to CAPE: A Systematic Review of the Literature

The Pediatric Advanced Life Support (PALS) guidelines published by the American Heart Association (AHA) have become the de facto standard of care for pediatric resuscitations (Bardella 1999). Improving performance within that guideline is the standard of achievement used in Project CAPE.

“Codes” are among the most complicated and fast-passed types of health care. The mounting complexity of emergency medical intervention is further complicated by its demand for multidisciplinary team action (Birkhoff and Donner 2010). Simulated “mock” codes have, therefore, been widely accepted as the ideal training modality to prepare health care providers for these critical, high-stress encounters in a low risk environment conducive to practice and learning (Hunt et al. 2006). The studies reviewed here consider mock codes as training tools for real-life pediatric codes.

Systematic Review

This review begins with a question: what have programs attempting to use mock codes for training within the PALS guidelines accomplished to date? I searched PubMed on April 1, 2011 using the terms “Pediatric Advanced Life Support” AND “education OR Training” to capture published studies using the PALS guidelines for training or educational purposes. PALS was last updated in 2005; therefore, I limited the search to studies published in the last five years. I also limited the search to studies published in English, using human subjects, and those with available abstracts. This initial search yielded 20 results. I printed and reviewed abstracts for all
20 findings to assess their relevance to understanding the proposed training interventions in Project CAPE.

I dropped several studies from further review after assessing their abstracts. Five of the initial 20 abstracts concerned neither existing nor novel training interventions related to PALS guidelines. Two abstracts considered the effects of using cognitive aids during a code scenario, but not the effects of training. One abstract limited its assessment to the performance of single pediatric emergency procedure (tracheal intubation). Two studies considered electronic training programs which, though promising, are outside of the scope of this review. Three studies characterized the state of current PALS training requirements in various settings; these studies are referenced in this paper’s introduction but are outside of the scope of the systematic review. Finally, one abstract considered the effects of PALS training in EMS workers in a pre-hospital setting. In total, 14 of the initial 20 studies were dropped from further review.

I reviewed the remaining six studies in full. After review, the studies were grouped into one of three categories. Three studies assessed the value of high-fidelity simulators capable of mechanically reproducing physical findings in a PALS training context. One study considered a standardized measurement tool for assessing provider performance in code scenarios. Finally, two studies evaluated a novel training intervention to improve pediatric code team performance. The findings from each of these studies are presented below, organized by category. Each category ends with an overall assessment of the contribution of that category and its relevance to Project CAPE. Table 1 summarizes each study’s main findings, overall internal validity and generalizability, and potential contribution to Project CAPE.
High-Fidelity Simulators for Pediatric Mock Codes.

Birkhoff and Donner (2010) combine a review of the published literature and a qualitative analysis of a PALS curriculum with an integrated high-fidelity simulation component at one pediatric academic medical center in Pennsylvania. Participants comprised potential PALS providers with varying professional backgrounds who participated in a PALS course with high-fidelity simulators. Twenty-three participants responded to eight short answer questions about personal demographic information, perceptions of the simulation, and thoughts on comparing the enhanced simulators to previous, traditional PALS courses. The authors evaluated these open-ended responses and summarize recurring themes.

From their literature review, Birkhoff and Donner conclude that high-fidelity simulators are more beneficial than traditional simulators for pediatric mock codes. However, they note that the magnitude of this difference is difficult to assess in the current literature due to inconsistent study designs and outcomes measures. From their own survey, the authors conclude that most participants found simulator realism and rotating through multiple rolls during the simulation to be the most helpful parts of the course.

The qualitative nature of this study allows the conclusion that participants may like high-fidelity simulators more than traditional PALS courses, but does not allow any quantification of this preference. The participants were drawn from two institutions in an effort to maximize opportunities to improve communication and team work dynamics. Participants reported a perceived benefit in this arrangement, but again there is little presented here that would allow an analysis of the magnitude of this effect. This study was conducted with a variety of medical professionals, drawn from large academic medical institutions, and so the results are generalizable to PALS training in most contexts. The main finding—that participants prefer
high-fidelity simulators and team work in PALS courses—is consistent with extant literature, and I can find no reason to argue against generalizing this conclusion to most PALS training situations. However, the magnitude and importance of these preferences remains unclear.

In a non-blinded, controlled trial, Donoghue, Durbin, Nadel, Stryjewski, Kost, and Nadkarni (2010) sought to determine how the use of high-fidelity simulators would affect mock code participants’ perception of realism. All first or second year pediatric residents from three academic medical centers were invited to participate; 51 residents responded and completed the study. All subjects participated in four mock code scenarios, followed by a one-on-one teaching session with one of the study’s principal investigators, followed by two additional mock code scenarios. Half of the participants were randomly assigned to mock codes using high-fidelity simulators; the remaining participants had the high-fidelity features of their mannequins disabled. Participants were then asked to rate the realism of the code experience on a five point Likert scale. Those who had used the high fidelity mannequins were further asked to rate the realism of the eight physical findings that the mannequins were designed to simulate.

Among the high-fidelity group, the ability to palpate a pulse in the mannequin was rated as the most important simulated physical findings. Only the mock code scenarios involving asystole and pulseless ventricular tachycardia were statistically different in realism scores between groups. While the high-fidelity group did rate the experience as more realistic when averaged across all scenarios, the difference was small; mean realism on a scale of 1-5 was 3.7 for the traditional group and 4.0 for the high-fidelity group (P = 0.04). The authors conclude that high-fidelity simulation is potentially beneficial when integrated into PALS courses, especially in terms of certain physical features such as the ability to palpate a pulse.
However, the magnitude of this effect was small; both groups of residents rated the realism of their mock code experience highly, with the high-fidelity group rating realism only slightly higher. Most scenarios, taken individually, revealed no difference in realism scores between groups. The two scenarios that did reveal a difference in perceived realism between groups found only a small difference. In both scenarios showing a difference in realism, the mean scores were 3.75 for the traditional group and 4.0 for the high-fidelity group (P = 0.04) on a five point scale.

This study presents several concerns, both in terms of its internal validity and its generalizability. The participants were not blinded to their group allocations. Those who experienced high-fidelity simulation were aware they were using enhanced simulators. Because the magnitude of the difference in realism scores between groups was small to begin with, this lack of blinding could account for the difference between groups. Further, realism was rated here by junior residents who are likely to have limited clinical exposure to code scenarios. With more experience with real-world code scenarios, participants may rate the realism of simulators differently. Participants rated only their perceived realism, with no attempt to quantify how that realism may have translated into improved performance in executing the PALS algorithms. With these limitations in mind, it is difficult to generalize the findings presented here to PALS training in general.

The authors of the above study also published an analysis of the same data, considering the effect of high-fidelity simulation on trainee cognitive performance in adhering to PALS algorithms (Donoghue et al. 2009). Again, 51 residents participated, each completing four mock code scenarios, a one-on-one didactic session, and finally two additional mock code scenarios in
which the participant’s performance was scored. Cognitive assessment consisted of awarding zero to two points for each “critical task” in the assessment mock codes. Scoring was completed by expert consensus after pediatric emergency department faculty reviewed video recordings of the trainees’ performance. Participants were randomly assigned without blinding to high-fidelity and traditional simulator groups. The high-fidelity group had the relevant simulated physical findings demonstrated to them during the didactic session, before the cognitive assessment.

Among both groups, mean cognitive assessment scores improved after the didactic session; the high-fidelity group’s mean score improved slightly more than the traditional group, but the difference was not statistically significant. However, mixed modeling analysis revealed a statistically significant difference in the amount of change between groups. Using this model of amount of change, the authors report that the traditional and high-fidelity groups improved their scores by 4.8 points and 11.1 points, respectively (P < 0.001) on a 100 point scale.

The present study faces several limitations. Most importantly, the difference in mean cognitive scores between groups was not statistically significant. A significant effect was revealed only with the use of mixed modeling to account for within-subject covariance. This difference, though statistically significant, is quite small and unlikely to represent a meaningful difference in terms of selecting training modalities for future PALS courses. Notably, the high-fidelity group was explicitly shown the relevant physical findings during their didactic sessions, prompting one to wonder if that group actually learned more as a result of a better simulation or if they were simply better prepared to interpret physical finding cues within the context of a mock code. Even setting concerns for validity aside, the effect of high-fidelity simulators demonstrated here seems too small to warrant much argument in favor of their use in general.
Taken together, the above studies of high-fidelity simulation in PALS training suggest promise in this modality, though that promise may not yet be fully realized or adequately proven. Birkhoff and Donner (2010) convincingly demonstrate that participants from a wide range of professional backgrounds prefer high-fidelity simulation to traditional mock codes. The two studies by Donoghue et al. (2009, 2010) demonstrate small improvements in participant-rated realism and acquisition of cognitive PALS objectives using high-fidelity simulators compared to traditional mock codes. These findings may be generalizable to most PALS training contexts, but even so, the magnitude of the effects reported here are too small to make convincing arguments to change current practice. Nevertheless, these studies provide valuable insight into avenues for future research regarding the use of high-fidelity simulation to improve the utility of pediatric mock codes.

Project CAPE relies on standard, “low-fidelity” mannequins. For now, the evidence seems to suggest that the benefit, if any, of high-fidelity simulators is small. Given that its ultimate objective is to improve pediatric code team performance in small hospitals state-wide, Project CAPE must be easily implemented in many small hospitals. The potential benefit of high-fidelity simulation must be balanced against the additional costs associated with purchasing, maintaining, and using high-fidelity simulators. In light of the evidence presented here, the added utility of high-fidelity simulators seems unlikely to outweigh the additional costs they present to interventions like Project CAPE.


Measurement implies definition; the definition of quality health care hinges on both outcome and process. In the case of pediatric resuscitation, when patient outcomes differ so
fundamentally as “alive” or “dead,” it is tempting to assume a shared definition of quality; but some patients survive poorly run codes just as surely as others die in the midst of medical excellence. Thus, measuring quality must also include some comparison of the care delivered to the care our best evidence suggests is ideal. The following study attempted to validate standardized scoring algorithms to assess student or trainee code performance in simulated pediatric codes.

Donoghue, Nishisaki, Sutton, Hales, and Boulet (2010) developed scoring rubrics for four simulated pediatric code scenarios based on the PALS guidelines. The team created the rubrics by expert consensus. The authors generated a list of essential tasks for each code scenario. Each task could earn the trainee from zero to two points. Generally, two points were awarded for performing the correct task at the correct time, one point was awarded for performing the correct task but at the wrong time, and no points were awarded for performing the task at a point in the simulation where it was no longer relevant or failing to perform the task at all.

Twenty-one first and second year pediatric residents from three academic medical centers were selected from a larger ongoing study; this was a convenience sample, based on selecting participants from the larger study for whom complete audio and visual recordings of their simulated code performances were available. Participants’ tapes were independently reviewed by four raters and scored according to an explicit rubric. Each rater was a certified PALS instructor and certified simulation facilitator. The authors then analyzed the scores by trainee year; a fully-crossed G study (crossing trainee, scenario, and rater) was performed to determine the degree to which each of these factors contributed to the overall variance.
The authors report a statistically significant difference in mean scores by trainee year, with second year residents out-performing junior residents (P < 0.05). This finding suggests that the scoring instrument detected the anticipated difference in performance between first and second year trainees, which argues for the validity of the instrument. The G study revealed that of the total variation among scores, 16.9% stemmed from differences in individual trainees, 1.5% from the person scoring their performance, and 12.8% from the scenario itself. Thus, most of the variation in scores came from the individual trainee, as would be expected if the scoring rubric was truly measuring individual performance. Taken together, these results suggest that the authors’ scoring rubric is a valid and reliable measure of trainee performance in the selected code simulations.

The internal validity of the study is sufficient to accept the results reported here at face value. It is worth considering, however, that the residents used to test the rubric in this study were drawn as a convenience sample from a larger study population; the authors do not assess how this convenience sample may have influenced the results or any efforts that they may have made to control for this effect. That the scoring rubric was developed by expert consensus alone may also present some concerns, but in light of the analysis presented here, it is likely that expert consensus was sufficient. Despite these limitations, the authors present an overall valid assessment of their scoring rubric.

However, any such metric must also perform outside of the controlled environment of the present study in order to be valuable to pediatric code training efforts in general. It remains unclear how well the metric would perform in other hospitals, where the raters are unlikely to be PALS certified instructors with extensive simulation experience. The low degree of inter-observer variability reported here (r = 0.82) may be due to the scoring rubric itself; however, the
extensive expertise of the raters may contribute as well. Without knowing if the validity of the scoring rubric was due to expert raters and not the rubric itself, it is difficult to generalize its validity to settings without expert raters.

This study suggests that a scoring guideline can be developed that accurately and reliably measures trainee performance in mock codes. It is not the aim of Project CAPE to measure mock code performance; rather, it seeks to increase the exposure of hospital staff to this training modality. However, future assessments of the success or failure of Project CAPE and other training interventions may well depend on standardized measurements of mock code performance. Future iterations of Project CAPE or similar programs may have much to gain from the insights generated here.

**Novel Training Interventions for PALS Guidelines.**

Two studies investigated the effects of a novel training intervention designed to improve provider performance in pediatric emergency care using mock code simulations. The first considered mock code training in a pediatric outpatient office setting. While this study initially seems out of place in this review due to its setting, it is included here because of its overall similarities to Project CAPE. The second study is even more similar to project CAPE, as it is set in a random sample of North Carolina emergency departments.

Toback, Fiedor, Kilpela, and Reis (2006) published the results of an office-based pediatric mock code training program. Eleven pediatric offices in southwestern Pennsylvania
were invited to participate. The authors conducted a two step intervention, consisting of a didactic session followed by a mock code training scenario. Each office was given a pediatric mannequin and a manual of mock code scenarios to encourage further self-directed training. Participants were surveyed before and after the intervention to ascertain pre- and post-training confidence and comfort with specific pediatric code skills. The offices were also contacted one year after the intervention by telephone to ascertain what improvements in office procedure and protocol related to pediatric emergencies had been made as a result of the intervention.

The authors analyzed their data by dividing the participants into two groups. Group one comprised doctors, nurse practitioners, and physician assistants. Group two included registered nurses, licensed practical nurses, and medical assistants. Reported confidence in performing emergency tasks covered in the mock code intervention improved significantly in both groups. Further, group one reported increased confidence in placing IO lines (24% vs. 39%, P = 0.003), and group two reported increased confidence in administering oxygen (65% vs. 84%, P < 0.001). At one year follow up, 18% of practices reported conducting at least one additional mock code.

While these results are applicable only to the outpatient setting, they do suggest that provider comfort and confidence can be improved by a single training intervention. That the majority of offices opted not to perform additional mock codes may suggest that leaving material for further self-practice after a single training intervention is not helpful. However, this finding is only relevant for the outpatient setting, as it is likely that pediatric offices feel much less pressure to maintain preparedness for emergency care than emergency departments in general.

Hunt, Heine, Hohenhaus, Luo, and Frush (2007) assessed a similar single-intervention pediatric code training program conducted in a sample of North Carolina emergency
departments. In this prospective, pre- and post-intervention analysis, 18 randomly selected emergency departments participated in an unannounced pediatric mock code, an educational intervention, and an additional unannounced follow up mock code six months later. All mock codes were evaluated using a previously presented, 44 item task list. Task performance was rated on a scale of 1-5; these scores were dichotomized in the final analysis to “passing” (score 4 or 5) and “failing” (score < 4) scores. Over half of the mock codes were rated independently by two observers to ensure interrater reliability.

All provider types, regardless of previous training or specialty, were invited to participate; any staff member who would have been involved had the code scenario happened in reality was eligible to participate. The intervention consisted of three components: the simulation exercise, the clinical assessment tool for scoring code team performance, and the educational intervention. The educational intervention was based on both Advanced Trauma Life Support (ATLS) and PALS guidelines, focusing on certain pediatric emergency skills that had proven particularly troublesome in previous related studies (see Hunt et al. 2006). Following the intervention, each team was given a Broselow tape, a manual for the use and organization of color-coded pediatrics emergency equipment and drugs, and an inventory list of items that should be kept on hand by any ED in preparation for providing pediatric emergency care.

The mean number of tasks rated at a passing level increased from 17.7% before the intervention to 26.6% after the intervention (P < 0.001). The authors also considered the results at the individual task level and report significant improvement in 11 out of 44 tasks tested. Finally, the authors note that certain tasks did not improve after the intervention. Tasks for which fewer than half of emergency departments earned passing marks both before and after the intervention came from several categories, including neurologic assessment, proper patient
exposure and warming measures, the secondary survey exam, and appropriate fluid and dextrose administration based on weight.

The study had several limitations, some of which the authors addressed. The study was not controlled, so it is impossible to know which of the intervention components contributed to the overall improvement. Scorers were not blinded, and may have been biased to show greater scores at the six-month follow up code. A portion of the mock codes were rated independently, allowing the authors to calculate a kappa statistic for interrater reliability (k=0.80, 95% CI 0.76, 0.84), which they argue can be taken as evidence that there was no rater bias at the six month follow up. However, while high interrater reliability may represent a lack of experimenter’s bias, it may also simply represent similar levels of bias in the two raters. The authors do no explain why they opted to dichotomize their task scores. Had they left the original 1-5 scale intact and analyzed the results using a multiple linear regression model instead of two sample t-tests, they may have uncovered other significant effects from the intervention. But the choice to dichotomize the scores is unlikely to create a significant effect where none existed otherwise, and so while it may have limited the results, it does not cast doubt on the findings presented here.

Overall, these findings suggest that a single training intervention can improve provider skill in pediatric mock code scenarios. Because the study comprised a random sample of hospitals, including both community hospitals and trauma centers, the results are highly generalizable. However, that only 11 out of 44 measured skills improved significantly suggests room for improvement in the training intervention. Nevertheless, this prospective study of a novel training intervention suggests promise for similar single-intervention training programs in the future, such as Project CAPE.
Together, these two studies of single-intervention educational programs provide valuable insight into the challenge and promise of mock code training programs that seek to improve provider performance and comfort in conducting pediatric codes, such as Project CAPE. Toback et al. (2006) show the potential of a single intervention to create a self-perpetuating educational program, which is the central goal of Project CAPE. Hunt et al. (2007) demonstrate that such single-intervention programs can be effective in a variety of emergency department settings, a similarly critical goal of Project CAPE.
Table 1
Summary of Literature Reviewed

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Appendix 4

Reforming Emergency:
How EMTALA Shaped the American Emergency Department

Project CAPE is at its core an educational intervention. But it is also an intervention in policy at the hospital level to create a self-perpetuating educational program. The Emergency Medical Treatment and Active Labor Act represents public policy at the national level that has deeply affected American emergency departments. Project CAPE, seen not just as an educational tool but also as a potential public policy tool, exists in some part as a reaction to this national policy. The following analysis of the policies surround emergency department care provides critical context for understanding the need for—and potential future of—interventions like Project CAPE.

The Patient Protection and Affordable Care Act (PPACA) is America’s latest move towards universal health care. The social and economic motives driving reform are powerful, but they are not new. The most basic universal care was meant to be guaranteed by laws governing our emergency departments dating back over sixty years ago. The Hill-Burton Act proved fraught with loop holes and logistic challenges, but it laid the groundwork for the Emergency Medical Treatment and Active Labor Act (EMTALA). EMTALA established a de facto right to emergency health care, codifying in law what one can only assume to be a plain moral imperative: no one, regardless of ability to pay, should be left for dead at the doorstep of an American hospital. But establishing a legal right to emergency care is wholly distinct from creating the institutional structures to provide it. The ensuing collision between the right to care implied by EMTALA and the fiscal realities governing that care in the American emergency department left both providers and patients in a fog of financial, legal, and moral ambiguity.

The history of EMTALA is rooted in policy first imagined over half a century ago. The law itself has been defined and redefined by regulatory agencies and an ever-growing body of
case law since its passage in the mid 1980s. Now, with the passage of PPACA, our understanding of emergency care and the laws surrounding its delivery will be challenged again. How President Obama’s reform will reshape the role of emergency departments remains to be seen. Understanding this change begins with an understanding of how EMTALA created the emergency department as a safety net—albeit rife with holes—for critical health care in the U.S. This analysis does not attempt to advocate for a particular policy or approach to American health care. Rather, it seeks to understand the emergency department as we have created it by understanding the political process from which it is came. Seen through the lens of political theory, the history of emergency health care policy provides a framework for understanding the potential and peril that PPACA presents to the American emergency department.

**Backdrop**

The first half of the twentieth century bore witness to the beginnings of an ongoing trend in health care: new treatments created the promise of modern medicine, and along with that promise came growing costs. As hospitals faced the reality of increasing costs, the unsavory practice of “patient dumping” was born. Patients who could not pay began to be shuffled from hospital to hospital, each institution hoping that care would be provided on someone else’s dime (Kamoie 2004). Some states tried to address the problem by holding hospitals to a common law standard, an “…affirmative duty on the part of public hospitals to provide emergency treatment to patients without regard to ability to pay” (Lee 2002). But with no common definition of “emergency” and an unwillingness on the part of the states to hold hospitals to the lose standards implied by common law, the poorest patients saw little relief from rampant dumping (Lee 2002).
The Process of Reform

A First Pass: The Hill-Burton Act

As patient dumping grew more frequent despite the common law standard, notions of a federal law to end the patient shuffle gained traction in Washington. In 1946, Congress passed the Hill-Burton Act, which provided federal funds for the construction of public hospitals (Rosenbaum and Kamoie 2003). The act required any hospital that received federal funds for its construction or renovation to provide basic emergency treatment and ensure a patient was medically stable before discharge, regardless of that patient’s ability to pay (Rose 1975). The Department of Health, Education, and Welfare (HEW) would eventually interpret the law as a requirement for all hospitals receiving federal funds to maintain an emergency room and participate in Medicare and Medicaid, as well as to provide emergency care and stabilization to all comers (Gordon et al. 2001).

Though promising in concept, the Hill-Burton Act proved impotent by design. The term “emergency” remained undefined, the Department of Health and Human Services was unwilling or unable to enforce the act’s mandate, and indigent patients remained largely unaware of their right to treatment extended by the law (Lee 2002). A series of law suits in the 1970s prompted HEW to issue new regulations to clarify and strengthen the law, but ultimately failed to make substantive changes in hospital practice (Rose 1975). Finally, congress reacted to an apparent glut of hospital beds nationwide in the mid seventies by stopping appropriations for federal hospital funding under the act (Rosenbaum and Kamoie 2003). In light of its policy goal to ensure care regardless of ability to pay stated over thirty years prior, by the 1970s the Hill-Burton Act was a policy failure (Rose 1975).
It was not the text or intent of the law that ultimately thwarted its policy goals, but rather the regulatory and enforcement processes to which it was subjected. The Hill-Burton Act has long since been replaced in the ongoing effort to provide care to those who cannot pay. Yet the Hill-Burton act, understood from a policy process perspective, provides context for the laws that followed it and a cautionary tale for those who still seek reform.

Like more recent examples of reform, the Hill-Burton act was passed not as any one stakeholder’s ideal solution, but rather as an amalgam of theoretical compromise and political expediency. The central function of Hill-Burton was to provide funding for the creation of private hospitals (Kamoie 2004). Two conditions were added to the bill in the Senate in 1945, one requiring hospitals to provide access to all patients and the other requiring hospitals to provide some volume of services to those unable to pay, which made Hill-Burton America’s first attempt at providing some degree of universal care (Dowell 1987). These provisions, referred to as the “free service” and “community service” obligations, were added as concessions to Senate liberals, whose true ambition was the creation of a national health insurance plan. As such, they represent a compromise designed to provide some degree of coverage for the indigent without losing majority support for the bill. The compromise came with its own limits; there were no specific provisions in the law elucidating how the free service and community service obligations were to be met (Dowell 1987). This concern was addressed during Senate hearings as specifically as it ever was before the bill’s passage by conservative senator Robert Taft, who suggested somewhat abstractly that hospitals be required to provide “some percentage” of services to the indigent (Rose 1975).

The scope of actual reform resulting from Hill-Burton would be defined by regulatory process and judicial rulings. HEW was empowered at the federal level to oversee the execution
of the program by individual states, which in turn would be responsible for defining what obligations the law imposed and how to meet them. The Hill-Burton act as passed did not include enforcement measures or specific benchmarks for state oversight. As such, the two concessions secured by Senate liberals in an attempt to provide care to the indigent had little effect in practical terms (Dowell 1987). It would be another 25 years before private litigation attempted to resuscitate the ineffectual “free service” and “community service” obligations seemingly hidden in Hill-Burton (Rose 1975).

A series of lawsuits refocused national attention on Hill-Burton and the as yet unresolved issue of patient dumping in the early 1970s (Dowell 1987). Their ultimate effect was to finally prompt HEW to issue regulations clarifying the extent of the “free service” and “community service” obligations under the law. The Federal Hospital Council (FHC), which operated within HEW to represent the interests of American hospitals, had been given broad authority by Hill-Burton to approve regulations under the law. The FHC successfully added two critical restrictions to the proposed HEW regulations, including allowing hospitals to simply certify that no patient would be turned away from care rather than submit lengthy budget documents certifying that a minimum percent of hospital expenditures were going to uncompensated care (Rose 1975). Under this provision, a hospital was under no obligation to provide any set amount of uncompensated care. Though they would not be permitted to turn away an indigent patient, hospitals would nevertheless be able to require a cash deposit for services before admitting the patient, effectively nullifying the intent of the open door option while still escaping their obligation to provide a certain percent of uncompensated care (Dowell 1987).

Taken at face value, the text of Hill-Burton and its subsequent regulation by HEW seem to meet the policy goals of providing some universal care to the indigent. Senate liberals had
secured some degree of expanded health care for the poor in exchange for dropping pursuit of a national health insurance policy. Hospitals eventually secured regulations that limited their exposure to uncompensated care while still facing a mandate to provide for the poor. But political interest in Congress was always more aligned with the primary policy goal of funding new hospitals than ensuring care for the needy, and this influence persisted through years of regulatory reform under the law. The dissonance between stated policy goals, legal text, and actual outcomes seen in the history of the Hill-Burton act are not unique in our political process. Nor, as demonstrated by ensuing reforms, is such dissonance immune to repetition.

Round Two: EMTALA

In 1986, Congress passed the Emergency Medical Treatment and Active Labor Act. Born from the policy heritage of the failed Hill-Burton Act amidst growing public concern for a seemingly endless stream of patient dumping horror stories, Congress once again attempted incremental reform to ensure universal access to emergency care (Kamoie 2004). Still tying regulation to federal dollars, the proposed EMTALA bill placed two requirements on any hospital that participated in Medicare and had an emergency department. First, any person who comes to the emergency department and asks for “…examination or treatment for a medical condition…” must be given “an appropriate medical screening examination within the capability of the hospital’s emergency department…to determine whether or not an emergency medical condition…exists” (42 USC 1395dd). Then, if such a condition is determined to exist, the hospital is obliged to provide “further medical examination and…treatment as may be required to stabilize the medical condition” or transfer the patient to another facility, but only if the transfer meets strict criteria defined by the law (42 U.S.C 1395dd). Though tied to Medicare for
its regulatory weight, EMTALA in no way allowed hospitals to bill the federal government for the care provided under the new regulations.

The results of EMTALA, then, would be twofold. It would create a safety net by putting into law the basic moral premise that the poor ought not be left to suffer or die from treatable emergent disease in the interest of a hospital’s bottom line. But it would also create an unfunded mandate forcing most hospitals to provide care—often with little hope of compensation—to any and all who show up. Unsurprisingly, hospital administrators greeted the bill with little enthusiasm as it worked its way through Congress. Hospitals railed against the bill, claiming to already provide sufficient access without further government regulation (Lee 2002). A burgeoning body of literature, however, suggested otherwise. Building upon several studies with similar findings, Himmelstein, Woolhandler, and Harnly et al. published “Patient Transfers: medical practice as social triage” in 1984. Alluding to the problem of patient dumping, they concluded that “…transfer is a common and potentially dangerous medical intervention which appears to reinforce racial and class inequalities of access to medical care” (Himmelstein et al. 1984, 494). Congress was sold. The EMTALA safety net, and the unfunded mandate to provide it, passed as part of the Consolidated Omnibus Reconciliation Act of 1985 (Kamoie 2004).

It is difficult to find the beginning of any one policy process, but if one is to be found in the case of EMTALA, it is in the definition of patient dumping as formal, persistent problem ripe for policy change. In some sense, the history of Hill-Burton provided a prefabricated problem definition: Congress already acknowledged patient dumping as a credible problem seeking a policy solution as evidenced by their attempt to solve it in 1946. Hospital administrators fought this assumption as EMTALA was crafted, hoping to redefine patient dumping not as a policy
problem, but rather as an inherent condition of the American health care system that was already sufficiently addressed by individual action.

Borrowing a metaphor from political theorist John Kingdon, the window of opportunity for the passage of EMTALA opened despite the objections of private hospitals. The problem of patient dumping was nothing new; the health care system had been dealing with it in some form or another since well before the passage of Hill-Burton. So why, after years of marginal regulatory tweaking to the Hill-Burton Act, did Congress pass new legislation in 1986? Kingdon suggests we look for “focusing events,” some turn of affairs that brought patient dumping again to the national stage and lead to the passage of EMTALA (Kingdon 1984).

Horror stories of patient dumping had begun to circulate in public media. Seizing the moment of interest, Representative Fortney Stark cited a litany of examples on the House floor in December, 1985; Senator David Durenberg, among others, weighed in with similar outrage in the Senate (Lee 2002). Personal stories of tragedy capture interest, but are rarely sufficient to yield policy change alone; the same can be said for a scientific study or a politician’s impassioned plea (Kingdon 1984). But whispers of tragedy began to color the national mood. Declarations of urgency from astute politicians who were ready and able to drive change galvanized large segments of the political stream. Commissioned studies explicitly quantifying the magnitude of patient dumping lent seemingly incontrovertible credibility to the problem.

The confluence of these events created a unifying symbol of a clear and palpable problem: patient dumping. What for years before had been vague notions of a persistently nagging problem became a “crisis.” Opponents of reform, however genuine or self-serving they may have been, were no match for the power of this shared symbol precisely because it made clear what most people had already come to believe: patients were being shuffled around to save
money, and real people were getting hurt. The value of a sudden and urgent crisis on the National stage is its ability to momentarily align an endless list of partially concordant political actors and effect change. But crisis also begets haste; policy windows are apt to close as quickly and unexpectedly as they open, and compromises must be made quickly if change is to happen at all. EMTALA was no exception, and the speed with which the law was assembled is evident in its text.

EMTALA’s seemingly simple language is belied by ambiguity. What constitutes “appropriate medical screening” is never elucidated in the law itself. “Emergency condition” is defined broadly in the text, leaving little room for doubt regarding the law’s spirit but plenty of space to equivocate on its legal implications. “Stabilization” seems a reasonable goal, but the language also requires hospitals to provide the care required to maintain that stability; for how long should this requirement be understood to extend?

The law’s text, to some extent, was purposefully vague in an attempt to prevent savvy hospitals from circumventing its intent (Lee 2002). This built-in defense mechanism was reasonable at the time given the failure of EMTALA’s policy predecessors. But ambiguity yielded unanticipated expansion. Determinations of these and other uncertainties have come in hybrid from published CMS rules and case law precedents over the past 25 years (Bitterman 2002). The unintended—though perhaps foreseeable—consequences of EMTALA have reshaped the emergency department and health care in the U.S. as whole, in ways well beyond achieving the policy goals that created it.
Expansion of EMTALA: Regulation and Enforcement

Like Hill-Burton, the ultimate effect of EMTALA is a story of post-legislative regulation. Though enacted in 1986, implementation guidelines for EMTALA were not issued by the Department of Health and Human Services until 1994; they were clarified further in 1998 and again in 2003 (Kamoie 2004). Because in the intervening years hospitals had found ways of operating around the intent of the law, it is not surprising nor inappropriate that the DHHS guidelines seemed to expand the expectations of an emergency department by explicitly defining many of the previously vague terms of EMTALA.

Though still subject to political and public review, a bureaucratic agency is able to make regulatory changes without the exacting oversight and debate experienced by new legislation as it wends its way through Congress. Freeing the hand of EMTALA to achieve its policy objectives in this way may have been as necessary for its function as it was for its passage. However, with no obligation to directly appease a constituency, bureaucratic offices run the risk of creating unsustainable legal obligations and unrealistic financial burdens—burdens that may have been checked by the political process had they been made plain in Congress.

Regulations from the Centers for Medicare & Medicaid Services (CMS) slowly expanded the expectations of emergency departments under EMTALA. CMS’s clarifications on the requirements of EMTALA compliance have distinguished the definitions of “stable for transfer” from “stable for discharge.” Patients may be transferred if doing so cannot reasonably be expected to cause harm. Discharge, however, requires the physician to certify that she “…reasonably believes that the patient has reached the point where any needed diagnostic test or treatment can be performed safely on an outpatient basis…” (Wanerman 2002, 466). Because the uninsured have little hope of securing such an outpatient visit, EMTALA has come to
guarantee not only stabilization, but often definitive management as well. The law also requires
the ED to employ the full scope of ancillary services at its disposal to effect that care. The ED is
expected to provide this care, regardless of cost, or face steep penalties under EMTALA (Lee
2002).

How EMTALA functions in the real world is a product of these DHHS regulatory
statements, but it is just as much a product of its enforcement. Enforcement is the joint
responsibility of CMS and the Office of the Inspector General (OIG). CMS is charged with
investigating complaints, and has the authority to prevent a hospital or physician from further
participating with Medicare—a considerable threat given that most hospitals would be unable to
sustain themselves without Medicare patients (Wanerman 2002). The OIG is empowered to levy
hefty fines for violations; hospitals may be charged up $50,000 per incident. Individual
physicians found to be complicit in an EMTALA violation may be fined as much as $50,000 as
well, and these fines are typically not covered by malpractice insurance (Wanerman 2002).

Political theorists have long recognized that “either by design or not, implementers
sometimes interpret legislative…mandates in a way that authors subsequently argue was not their
intent” (Kingdon 1984, 102). That EMTALA has outgrown its policy goal is not a new
phenomenon; political theorists expect this sort of evolution. And, despite regulatory
clarifications, “Some hospitals and physicians express uncertainty about the extent of their
responsibilities under EMTALA” (US GAO 2001, 3). Combined with a reasonable fear of
EMTALA’s steep institutional and personal penalties, this uncertainty has translated into a
significant expansion of the care provided under the EMTALA mandate.
The ED, Re-Formed

The Post-EMTALA Emergency Department

Emergency departments have seen a dramatic increase in the number of patient visits, from 85 million per year prior to EMTALA to nearly 110 million in 2002—outpacing population growth by several percentage points (Bitterman 2002). Increases in demand without reciprocal growth in supply proved financially unsustainable for some. By 1998, emergency departments were closing 27% faster than hospitals in general (Fields et al. 2001). EMTALA cannot be held accountable for escalating demand alone; the growing ranks of the uninsured, cost-evading strategies of managed care organizations and Medicaid’s paltry reimbursement rates bear some fault. But as their resources dwindled in the face of mounting demand, the responsibilities of emergency departments to their growing patient population expanded under EMTALA (Gordon et al. 2001).

Financial woes aside, EMTALA—and CMS’s interpretation of it—changed the nature of care emergency departments are prepared to deliver. Gone are the days of the emergency room; they have been replaced by full-fledged departments, and the moniker “emergency” has become something of a misnomer. An ED visit is now the sole contact point with the health care system for many of America’s uninsured (Fields et al. 2001). Necessity bred invention, and the post-EMTALA emergency department now provides not only disease treatment, but also primary and secondary prevention. It vaccinates our uninsured children. It detects and manages chronic conditions. It generates practice guidelines for “screening, brief intervention, and referral for treatment (SBIRT)” that address the urgent and emergent alike (Bernstein and Haukoos 2008, 191).
The ED has grown well beyond the law’s mandate; EMTALA has re-formed the ED. Once a last resort for the most critically ill, the ED is now the only guaranteed source of universal access to care. First imagined as creating a safety net for emergencies, EMTALA ultimately created an ED that functions as a federal safety net for all health care (Fields et al. 2001).

Blowback: EMTALA’s Fiscal Fallout

Care costs money, and the tension between budgets and EMTALA’s unfunded mandate has created its own set of policy problems. At the behest of Congress, the U.S. Government Accountability Office issued a report on the effects of EMTALA in 2001. Their findings were encouraging in terms of the law’s initial policy goals; interviews with physician and hospital representatives revealed a prevailing belief that EMTALA has successfully ensured access to emergency care and stemmed the practice of patient dumping (US GAO 2001). But the report also revealed widespread concerns over increased use of the ED for non-emergent conditions leading to waste and increased wait times, confusion among providers about the requirements of the law, and a trend among physicians to limit their exposure to EMTALA requirements by refusing to take call or dropping hospital privileges altogether (US GAO 2001).

Champions of EMTALA policy point to several specific limitations on the care emergency departments are expected to provide, ostensibly limiting costs (Lee 2002). However, the practical reality of the complex and fluid policy surrounding EMTALA enforcement has left physicians and hospitals fearful of an EMTALA violation, shifting the norm from patient dumping to routinely erring on the side of definitive management for all ills (Bitterman 2002). Stabilization is always the first step in care, and it is often the only step expressly required by
EMTALA provided a plan for securing definitive treatment is in place (Kamoie 2004, 41-60). The costs of that definitive management could be left to the patient, in theory. In practical terms, though, leaving the cost of follow-up to an uninsured patient may be tantamount to securing no real follow-up at all. In light of physicians’ requirement to discharge patients only when they can be “reasonably expected” to obtain any remaining needed care, physicians are hesitant to risk an EMTALA violation by letting the merely stabilized patient go (US GAO 2001).

Critics of the state of emergency care balk not at the new roll of the ED as primary care provider and access point for the indigent, but rather at the results of creating that roll from an unfunded mandate. Americans without health insurance now turn to emergency departments as a primary source of care. Though not prevented from billing for these services, hospitals rarely recoup their costs (Wanerman 2002). A 1998 National Center for Health Statistics (NCHS) survey of hospitals suggested that services provided under EMTALA regulations comprised about half of uncompensated costs in 1998, generating an $8.35 billion dollar bill for hospitals that year alone (Fields et al. 2001).

The pecuniary quagmire is compounded by unrealistically low reimbursement rates from most state Medicaid programs, as well as managed care organizational rules that allow payments to be reduced or denied for care provided without prior authorization—a care-delaying chore forbidden by EMTALA (US GAO 2001). In essence, EMTALA has created a federal health care safety net, but done nothing to fund it. The number of uninsured grew from 29 million in 1979 (shortly before EMTALA was enacted) to 46.3 million in 2008; federal support for the safety net created by EMTALA remains at a stagnant zero dollars (Connors and Gostin 2010).
PPACA: Hope for the ED?

The greatest source of relief for emergency departments laboring to provide care to the uninsured will come from reducing their numbers. The Patient Protection and Affordable Care Act is poised to do so. The law mandates insurance coverage for most people by 2014; out-of-pocket caps and sliding scale subsidies are included in the reform to make this goal possible. PPACA removes traditional barriers to private insurance by barring insurers from denying coverage for pre-existing conditions. The law allows children to stay on their parents’ insurance up to age 26. And for those Americans who are still unable to purchase insurance, PPACA expands Medicaid eligibility to 133% of the federal poverty level (Connors and Gostin 2010).

The requirements of EMTALA have not changed, but for the first time since its passage, the number of people dependent on it for uncompensated care will start to shrink.

Private insurers and Medicaid have created their own problems for emergency departments since the passage of EMTALA, and PPACA addresses some of them. Medicaid payments for ED services have generally been too low to meaningfully remunerate hospitals for services rendered under EMTALA requirements (Fields et al. 2001). PPACA standardizes Medicaid programs, requiring each state to meet a minimum standard of “essential services,” including emergency care. Private insurers will no longer be able to require prior authorization for ED care, closing the loop hole that has allowed them to avoid reimbursement (Connors and Gostin 2010). Emergency departments after health reform will see more insured patients and be more able to consistently extract payment for those visits.

PPACA includes multiple provisions to encourage preventive care and the use of a primary care provider. States will now have the option of creating “health homes” for patients with chronic conditions, and the law requires such plans to “establish procedures for referring any
eligible individuals with chronic conditions who seek…treatment in a hospital emergency department to designated providers” (PPACA Sec 2703). With greater access to primary care reducing the flow of patients into the ED and new requirements for outpatient follow up, PPACA could fundamentally change the nature of the emergency department born out of EMTALA.

Still, it is perhaps best to beware the apparent silver bullet. Forgetting for the moment the political landscape that threatens PPACA’s implementation, CMS’s own actuarial report estimates that 23 million people will remain uninsured under the reform (Foster 2010). Of these, the majority will be undocumented workers or people who are eligible for coverage but fail to sign up (Katz 2010). In short, they represent a population with little political sway in a system with little inclination to protect them.

Opposing the policy goals of EMTALA has historically been political, if not moral, folly. EMTALA will continue to protect the uninsured, but if they are redefined in the political realm as freeloaders rather than every day Americans, they may face an erosion of political support for that protection. Regardless, there will still be 23 million people demanding care under EMTALA’s unfunded mandate. PPACA may drastically change the emergency department, but it will not relieve the burden of EMTALA entirely.
Conclusion

The ED has been remolded by EMTALA into a federal safety net, and the laws of EMTALA have not changed. How the ED will reform itself again under the auspices of PPACA remains to be seen. Medicaid will now have to cover emergency services, but will their reimbursement rates for those services could remain untenably low? Will hospitals continue to lose money in the ED to Medicaid patients for providing the care required by EMTALA? Will increasing the numbers of insured patients ease ED crowding or simply fund the primary care provided there? Is care provided to illegal immigrants destined to remain an unrecoverable expense for the ED? The effects of past reforms have been defined as much by their implementation as the policy goals inherent in their text. PPACA will likely prove no different in this respect, and it may be years before its full effect on the American emergency department is realized.
References


