An Algorithm for Transition of Care in the Emergency Department

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Abstract

Objectives: The objective of this study is to present an algorithm for improving the safety and effectiveness of transitions of care (ToC) in the emergency department (ED).

Methods: This project was undertaken by the Council of Emergency Medicine Residency Directors (CORD) Transitions of Care Task Force and guided by the six-step Kern model for curriculum development. A targeted needs assessment in survey form was designed using a modified Delphi method among the CORD ToC Task Force. The survey was designed for four subgroups within the ED: emergency medicine (EM) residency program directors, EM academic chairpersons, EM residents, and EM nurses. Members from nationally recognized EM organizations assisted in the development of each respective survey, including the Academic Affairs Committee of the American College of Emergency Physicians, the leadership of the Emergency Medicine Residents’ Association (EMRA), and the leadership of Emergency Nurses Association (ENA). The surveys contained questions about current handoff practices and asked participants to rate the importance of key logistical and informational parameters within a ToC. Survey validity was achieved through content validity, item analysis, format familiarity, and electronic scoring. The surveys of program directors and academic chairpersons were distributed through the CORD listserv, the resident survey was distributed via EMRA correspondents, and the nurse survey was distributed through the ENA listserv. Following survey collection, the ToC Task Force convened and used the data to assess handoff practices and deficiencies. The Task Force developed recommendations for a ToC algorithm that was then piloted by medical educators in their institutions. These educators shared their experiences with senior department members in a phone interview. This informant feedback was used to address deficiencies in the algorithm and finalize the recommendations from the CORD Task Force.

Results: The surveys for program directors (n = 147), academic chairpersons (n = 99), residents (n = 194), and nurses (n = 902) were electronically scored. Handoff education in the form of structured workshops or classes was typically not offered, with only 10.9% of residents and 9.0% of nurses reporting that they received such training. The majority (93.9%) of EM academic chairpersons stated that assessments of handoff proficiency were not conducted within their programs. Computerized handoff was the most popular assistive tool among all surveyed groups. Handoff parameters that were rated as “important” and “extremely important” included uninterrupted time and space to perform the handoff, identification...
of “high-risk” handoffs, and the opportunity for questions and clarification from the handoff recipient. The developed handoff algorithm consisted of five steps: 1) setting the stage, 2) assembling the team, 3) identification of high-risk patients, 4) shift sign-out, and 5) closing the loop.

Conclusions: The authors present specific guidelines for an algorithm-based approach to transitioning care within the ED. This algorithm is based on surveys of perceived deficiencies and emphasizes informational and logistical parameters within a ToC. Standardizing the process of the ToC may allow for future research on the link between effective ToC and patient outcomes.

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METHODS

Study Design and Population

This was a survey study. In addition to the CORD Task Force, other groups that supported the study included: the American College of Emergency Physicians (ACEP) Transitions of Care Task Force, the ACEP Academic Affairs Committee, and the Society for Academic Medicine’s Graduate Medical Education Committee. The Kern curricular model was used to guide study procedures. The model is a tool for the development of medical curricula consisting of six steps: 1) problem identification, 2) general needs assessment, 3) targeted needs assessment, 4) development of goals and objectives, 5) implementation, and 6) evaluation. The identified problem was the lack of ToC education, standardization, and evaluation in the ED. A general needs assessment was conducted in the form of a literature review. Targeted needs assessments, or surveys, were developed and distributed to different EM personnel as mentioned above. This study focused on step four of the Kern model, with goals and objectives being derived from data collected by the targeted needs assessments, and being presented in the form of a ToC algorithm. The intention of the CORD Task Force was to create a ToC curriculum that could be implemented and evaluated in the future.

Survey Content and Administration

We created a targeted needs assessment through a modified Delphi method among the CORD Task Force. Using this method, all members of the group submitted questions that were then compiled and piloted in a survey. Additionally, governing bodies of the representative EM educators were sought out for their expertise. The ACEP Academic Affairs Committee reviewed and improved upon the survey for EM program directors, the leadership of the Emergency Medicine Residents’ Association (EMRA) reviewed the survey for residents, and the leadership of the Emergency Nurses Association (ENA) reviewed the survey for emergency nurses. We reviewed and modified each survey based on data and feedback from the pilot groups. Survey questions consisted of a combination of multiple choice, four-point Likert-type rating, and free-text response questions (Data Supplements S1–S4, available as supporting information in the online version of this paper). Initial questions served to gain
insight on current ToC practices at each institution, including ToC location, time commitment, and the use of tools to assist in the ToC process. Subsequent questions determined satisfaction with their ToC system, their self-perceived competency, and the relative importance of specific parameters involving the ToC. These parameters were divided into two types; logistical parameters included the environment, participants, and documentation of the ToC, whereas informational parameters included the clinical information typically conveyed in a ToC. Additionally, the survey asked residents questions about characteristics of a “bad” ToC, as well as what type of additional training would be most beneficial to them. The survey for program directors was distributed through the CORD listserv, which contains residency program directors, assistant and associate program directors, and clerkship directors from all ACGME-accredited EM programs. Each director was then responsible for distributing the survey to his or her ED’s academic chairperson, vice-chairperson, and director of operations. The survey for EM residents was distributed through specific EMRA correspondents in each region and also through the use of their national website and newsletter. The survey for EM nurses was distributed through the national ENA listserv. Each survey was administered through an online survey tool (SurveyMonkey.com), which collected and presented data in electronic format.

Several steps were taken to create surveys with appropriate validity. The expertise of the clinicians who wrote questions for each of the four surveys contributed to the strength of their content validity and the applicability of the survey to each type of clinician. Content validity was further augmented by having a second group, consisting of clinicians representative of each surveys target population, review each survey and provide feedback to improve content. By allowing different groups to suggest revisions to each survey, an item analysis was conducted in which questions deemed to be confusing, irrelevant, or containing an inadequate pool of answer choices were changed. Successive rounds of revision using a modified Delphi method addressed concerns raised by those involved in the development of each survey. Prior to distribution, each survey was unanimously approved by its development group and principal investigator. The familiar format of the four surveys permitted a standardized response process, whereas the use of an online tool to administer the surveys provided a reliable electronic method for collecting and compiling data; both of these items contributed to the validity of the response process.

Once data were collected and analyzed, the Task Force convened to develop a safe and effective ToC procedure. In addition to extrapolation from collected data, a focus group and consensus panel formed to finalize recommendations. The group took caution to ensure that the developed procedure would not compromise patient flow in the ED. This ToC procedure was then piloted by medical educators in their institutions. This group of educators implemented the algorithm in actual practice and noted areas for possible improvement. They then shared their experiences with their senior department members in an interview. This method of informant feedback addressed possible issues that could arise when implementing the algorithm. In response to this feedback, the procedure was adjusted as needed and these changes were reviewed and affirmed by the consensus panel.

RESULTS

Surveys were distributed electronically and sampled a diverse array of institutions. The sizes of participating institutions varied from two to 68 residents and contained as many as 90 EM faculty. Participant subgroups were identified in each survey (Table 1). Key findings from the surveys administered to EM program directors (n = 147), academic chairs (n = 99), residents (n = 194), and nurses (n = 902) are shown in Table 2.

All survey groups were also asked to rate the importance of logistical and informational ToC parameters. The ToC algorithm developed based on these findings is shown in Figure 1. Having a designated, uninterrupted time to perform the ToC and the ability to identify a “high-risk” ToC were noted to be important logistical parameters by all groups. Informational parameters considered important were the patient’s current clinical condition, ED clinical course, completed and pending laboratory tests and examinations, an assessment with differential diagnosis, a management plan, treatment goals, patient disposition, and having the opportunity for questions and clarification (Figure 2).

Transitions of care lasting between 1 and 2 minutes were the most common in all surveyed groups. Program directors (43.9%), academic chairs (50.5%), and emergency nurses (43.5%) believed that the ToC should occur at the patient’s bedside, although in actual practice individual computer stations were found to be the most common location among all groups. Electronic

Table 1

<table>
<thead>
<tr>
<th>Participant Subgroups Identified Among Each of the Administered Surveys</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program directors (n = 147)</strong></td>
<td></td>
</tr>
<tr>
<td>Residency program directors</td>
<td>54.5</td>
</tr>
<tr>
<td>Associate or assistant program director</td>
<td>32.4</td>
</tr>
<tr>
<td>Clerkship director</td>
<td>4.8</td>
</tr>
<tr>
<td>EM department chair</td>
<td>0.7</td>
</tr>
<tr>
<td>Faculty or attending</td>
<td>7.6</td>
</tr>
<tr>
<td><strong>Academic chairpersons (n = 99)</strong></td>
<td></td>
</tr>
<tr>
<td>Chair</td>
<td>50.5</td>
</tr>
<tr>
<td>Vice-chair</td>
<td>13.1</td>
</tr>
<tr>
<td>Medical director or director of operations</td>
<td>36.4</td>
</tr>
<tr>
<td><strong>EM residents (n = 194)</strong></td>
<td></td>
</tr>
<tr>
<td>PGY-1</td>
<td>26.8</td>
</tr>
<tr>
<td>PGY-2</td>
<td>34.0</td>
</tr>
<tr>
<td>PGY-3</td>
<td>32.0</td>
</tr>
<tr>
<td>PGY-4</td>
<td>6.7</td>
</tr>
<tr>
<td>PGY-5</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>EM nurses (n = 902)</strong></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>6.5</td>
</tr>
<tr>
<td>Associate degree</td>
<td>23.4</td>
</tr>
<tr>
<td>Bachelor of science</td>
<td>45.8</td>
</tr>
<tr>
<td>Master of science</td>
<td>19.4</td>
</tr>
<tr>
<td>Doctorate</td>
<td>1.3</td>
</tr>
<tr>
<td>Other</td>
<td>3.5</td>
</tr>
</tbody>
</table>
tools were the most widely used type for ToC (Table 2). Written templates and mnemonics (e.g., SBAR) were also prominent tools among all groups. Residents identified the most likely characteristics of a “bad” ToC as incomplete or incorrect information, a lack of a clear plan for work-up or disposition, and not having the opportunity to ask questions or provide feedback. Residents also stated that receiving training to standardize ToC information, minimize interruption, and identify a “high-risk” ToC would be most beneficial to them.

**DISCUSSION**

The findings from these four surveys demonstrate that, despite recommendations from governing bodies such as the JC and the ACGME, standardized ToC is not the norm. The dearth of ToC education was also concerning, as formal training opportunities were limited. Informal training by senior physicians within the clinical environment was the most popular training method. All groups lacked routine ToC proficiency assessments. Another relevant finding was the rise in prevalence of electronic methods as assistive tools. Other tools, such as mnemonics (e.g., SBAR) and written templates, remain in use today, and overall EM residents reported being satisfied with the tool(s) they use. Although the bedside was selected by all groups except EM residents as the location where ToC “should” occur, individual computer stations were the most popular location in actual practice. There is evidence that bedside ToC improves patient safety, specifically in nurse-to-nurse ToC. Possible barriers to bedside handover include a lack of overlapping shifts, the belief among health care professionals that bedside handover will take extra time, and the concern of breaking patient confidentiality. However, there is evidence that bedside handover actually decreases the amount of overtime among nurses and that patient confidentiality can be maintained.

Unlike other studies, which demonstrated the use of tools to create consistent information delivery during a ToC, this study resulted in the development of a procedural approach to ED ToC. In doing so, this approach further standardizes and improves on the ToC process through minimizing interruption, ensuring that patient information is readily available for review, and providing the incoming team with an opportunity to ask questions, clarify information, or both. This algorithm does not require or suggest which ToC tool (e.g., checklist or mnemonic) to use. Rather, and perhaps more importantly, it establishes a framework to ensure the steps that we have identified occur with each ToC.

**Figure 1.** A five-step algorithm for performing ToC in the ED setting. ToC = transition of care.
Commonly emphasized logistical and informational parameters were used to develop a ToC algorithm (Figure 1). The initial step, “setting the stage,” was based on the need for a designated and uninterrupted time and space to conduct the ToC. Based on the responses received and existing evidence, the ideal location for the ToC is the patient’s bedside. The second step, “assembling the team,” was based on the acknowledgement that a ToC was occurring and that assembling as much of the care team as possible (including nurses and other care providers) will both provide more comprehensive information regarding the current status of the patient and ensure that all care providers have a shared plan for the patient. The third step, identification of high-risk ToC, addressed a major concern of all surveyed groups and was also pertinent to patient safety. The fourth step, “shift sign-out,” required the use of a standardized method, such as an electronic tool or a mnemonic. ToC standardization has been proven to be a means of reducing error and improving communication. The fifth and final step, “closing the loop,” permitted time for questions and clarification, identified which patients should be immediately seen, and also addressed any operational issues within the ED.

Future work will involve a continuation of the Kern model. A formal curriculum for teaching the ToC algorithm will need to be developed to educate users. An accurate means of evaluating the feasibility of using the algorithm in actual practice, as well as determining its effectiveness, will also be necessary. And although it is thought that poor ToC can lead to a negative outcome for patients, the measurement of these outcomes has not yet been accomplished. Quantifying the link between ToC effectiveness and patient outcomes should be a primary focus of research across all disciplines.

LIMITATIONS

The primary limitations of this study involved the distribution methods for the four surveys. Because each of the surveys was distributed through e-mail listservs, it is possible that certain institutions/hospitals had more than one participant. The option of anonymity prevented the estimation of the number of ACGME emergency programs represented by these data. The survey methodology also prevented the calculation of return rate, making it impossible to assess response bias. The developed algorithm for ToC has yet to undergo a formal evaluation of its effectiveness in improving ToC and patient outcomes. Further, each respondent made comments based on his or her perception of ToC—there was no exact measurement of the prevalence of ToC nor was there a measure of the actual safety or effectiveness of existing ToC practices. Construct underrepresentation presented a threat to validity of the clinical performance ratings in this survey, and construct-irrelevant variance poses a validity threat in the form of inappropriate rating items. As with all survey studies, rater and recall bias could have had an effect on the results.

CONCLUSIONS

Based on surveys from program directors, academic chairs, residents, and nurses, we present an approach to transitioning care in the ED. These recommendations were based on perceived deficiencies and emphasized parameters from different disciplines, levels of training, and experience. ED transitions of care involve both logistical and informational aspects. Just as any procedure in the ED is approached with specific guidelines, a transition of care is a process that requires multiple steps. Although the fourth step, the “shift sign-out,” is almost always performed with the aid of various tools, other steps such as “setting the stage” and “identifying high-risk patients,” may not be routinely incorporated into the transition of care. Only by achieving the standardization of transitions of care procedures and content can the link between transitions of care effectiveness and patient outcomes be quantified.

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REFERENCES


Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. Needs assessment for emergency medicine handoff curriculum.

Data Supplement S2. Academic chairs/medical directors needs assessment for emergency.

Data Supplement S3. Resident needs assessment for emergency medicine handoff curriculum.

Data Supplement S4. Emergency nurse to emergency nurse handoff practices survey.