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Knowledge translation in emergency medical services: A qualitative survey of barriers to guideline implementation

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Abstract

Background—The American Heart Association (AHA) released guidelines to improve survival rates from out-of-hospital cardiac arrest in 2005. We sought to identify what barriers delayed the implementation of these guidelines in EMS agencies.

Methods—We surveyed 178 EMS agencies as part of a larger quantitative survey regarding guideline implementation and conducted a single-question semi-structured interview using the Grounded Theory method. We asked “What barriers if any, delayed implementation of the (2005 AHA) guidelines in your EMS agency?” Data were coded and member validation was employed to verify our findings.

Results—176/178 agencies completed the quantitative survey. Qualitative data collection ceased after reaching theoretical saturation with 34 interviews. Ten unique barriers were identified. We categorized these ten barriers into three themes. The theme Instruction Delays (reported by 41% of respondents) included three barriers: booking/training instructors (9%), receiving training materials (15%), and scheduling staff for training (18%). The second theme, Defibrillator Delays (38%), included two barriers; reprogramming defibrillators (24%) and receiving new defibrillators to replace non-upgradeable units (15%). The third theme was Decision-Making (38%) and included five barriers; coordinating with allied agencies (9%), government regulators such as state

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and provincial health authorities (9%), medical direction and base hospitals (9%), ROC participation (9%), and internal crises (3%).

Conclusion—Many barriers contributed to delays in the implementation of the 2005 AHA guidelines in EMS agencies. These identified barriers should be proactively addressed prior to the 2010 Guidelines to facilitate rapid translation of science into clinical practice.

Keywords

heart arrest; emergency medical services

Introduction

Out-of-hospital cardiac arrest (OHCA) affects over 300 000 people each year in the United States with a case fatality rate of 92%¹. In December 2005, the AHA published “Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care²”. Implementation of components of similar guidelines in an emergency medical services (EMS) system has demonstrated improved survival to hospital discharge, providing evidence that implementing such guidelines improves patient outcomes^{3,4,5}.

Prehospital providers including fire fighters, emergency medical technicians and paramedics are often the first to provide care for OHCA patients. Our previous research has determined that while 99% of EMS agencies participating in the Resuscitation Outcomes Consortium (ROC) implemented the 2005 AHA guidelines, delay to implementation was significant and highly variable (median 415 days, range: 49 to 750 days).⁶

Little is known about the implementation of scientific evidence into EMS practice⁷. Cone (2007) found a paucity of literature relating to knowledge translation in the prehospital setting, recommending that “research is needed regarding how the EMS community analyzes and implements scientific evidence”. However, we know from published literature in other patient care settings that the adoption of best practices can be delayed^{8,9,10,11,12}. The use of therapeutic hypothermia for post cardiac arrest patients is still not widely used, despite recommendations from several scientific bodies¹⁰. Across the United States, McGlynn et al has estimated that only 55% of patients are treated in accordance with evidence-based medicine⁸. A systematic review by Cabana has uncovered several causes of failed knowledge transfer¹³ that may be applicable to the prehospital setting. However, there are no published reports describing the challenges of knowledge transfer in prehospital systems. We sought to determine what barriers emergency medical services experienced when attempting to implement the 2005 AHA CPR and ECC guidelines into field practice.

Methods

To understand barriers that contributed to delayed prehospital implementation of the 2005 AHA guidelines we conducted a telephone survey with EMS agencies participating in the Resuscitation Outcomes Consortium. We used a qualitative approach to determine the barriers to guideline implementation.

Participants

The Resuscitation Outcomes Consortium consists of 11 regional centers across North America and was created to study out-of-hospital cardiac arrest and life threatening trauma¹⁴. Three of the centers are Canadian while 8 are American. These 11 centers have 264 separate EMS agencies participating in a population based registry and clinical trials¹⁴. We excluded 2 centers because they were employing cardiac arrest protocols similar to the

2005 guidelines prior to their release. We also excluded air transport agencies that did not primarily respond to 911 calls. The principal investigator from each site had previously identified the key informant at each agency as part of our prior survey on implementation times. From a pool of 178 agencies, we randomly contacted agencies until theoretical saturation for responses was reached¹⁵. Data from the ROC Epistry database was used with Research Ethics Board (REB) approval (approval number 435-2005). Additional descriptive/infrastructure data were obtained using a telephone survey methodology not considered part of human subject research and not requiring REB approval under the directing REB. Verbal consent was obtained and no compensation or incentives were offered.

Data Collection

We applied the Glaser and Strauss Grounded Theory to determine barriers to 2005 AHA guideline implementation¹⁶. A qualitative survey consisting of a single question was conducted in a semi-structured interview. The interviewer ensured the question was asked and answered while following trajectories in the conversation¹⁷. In this interview, the single question asked was “What issues, if any, delayed implementation of the guidelines into field practice?” Within this framework, the interviewer would allow the key informant to discuss issues that hampered timely implementation of the guidelines. The interviewer would record the responses as they were presented and encourage elaboration to collect more in-depth data. At the end of the conversation, the interviewer would repeat captured information and request confirmation from the key informant to ensure data accuracy. Interviews rarely exceeded 5 minutes in length. The same person (BB) performed all interviews.

Data Analysis

All data was coded into thematic coding trees. The lead investigator (BB) categorized the coded data first into broad “themes” and then into specific “barriers” using a constant comparative method¹⁶. This iterative analysis is also supported by Endacott, who describes data analysis while data collection continues as “a tenet of qualitative research”¹⁸.

Initial themes included descriptive categories of barriers. Further examination of the data led to higher order coding that resulted in 10 barriers. These categories were monitored by the interviewer until no further information was emerging from the interviews, indicating that saturation had been reached.

To add rigor to our findings, we used a technique known as “member validation”¹⁹. This consisted of presenting and discussing our data at semiannual meetings of the operators and investigators involved in the Resuscitation Outcomes Consortium. The group attending these meetings, while not necessarily the key informants interviewed, had similar EMS experience. Feedback gathered at these meetings verified our findings.

Results

Saturation was reached after interviews with 34 EMS agencies. No agencies refused to provide data. The mean number of days to crossover in the agencies that participated in the qualitative survey was 454.8 ± 149 days. There were 40 individual causes of delay reported by the 34 agencies during the telephone interviews. No agency reported a barrier-free process. These responses were categorized into 3 themes: training, defibrillators, and decision-making. These themes were further broken down into 10 specific barriers. Some barriers were more prevalent than others (Table 1).

A delay attributed to training was the most common reported theme identified by 14 (41%) of participating services. These delays were further broken down into three major issues. A

delay in finding certified instructors to lead the training was reported by 3 (9%) agencies. Delays in receiving printed training materials required for instruction were reported by 5 (15%) agencies and 6 (18%) agencies reported that they had to wait for their next scheduled continuing medical education sessions in order to train their providers.

A second reported theme for delays was associated with reprogramming defibrillators so they were compatible with the 2005 AHA guidelines (n=13, 38%). Several agencies (n=8, 24%) reported that there was a delay in reprogramming defibrillators. Reasons for this delay were that the software was not available or that the defibrillator was not reprogrammable and needed to be replaced. Agencies that could not reprogram their defibrillators were often unable to afford to purchase new defibrillators. Agencies capable of ordering new defibrillators reported that there was a delay in obtaining these new defibrillators from the distributor or the manufacturer (n=5, 15%).

The final theme, decision-making delays, was equal in reporting frequency to the delays associated with defibrillators (n=13, 38%). Delays attributed to rolling out the new guidelines in sequence with other local agencies were reported by 3 (9%) agencies. Three agencies (9%) reported that government regulators were slow to approve the new guidelines, prohibiting timelier implementation. Three agencies (9%) reported that local medical direction (medical director or base hospital) was slow to act on implementing the new guidelines. Three agencies (9%) reported that they delayed training their staff in the 2005 AHA guidelines while waiting for decisions to be made relating to Resuscitation Outcomes Consortium clinical trials. These agencies had the intention of providing all training relating to guidelines and ROC research at a single training session. One agency reported distraction caused by an internal agency crisis as the reason for delay (3%). A serious vehicle collision had gravely injured an EMS provider, and the small agency was focused on the well-being of their staff.

Discussion

The large variability in the length of time required to implement the 2005 AHA guidelines, 49 to 750 days⁶, can be partially explained by several barriers self-identified by EMS agencies. Training, defibrillators and decision making barriers were all reported by at least one third of respondents and are substantial, warranting consideration. Our grounded theory approach allowed us to identify ten specific barriers that hampered EMS agencies as they attempted to implement the 2005 guidelines into field practice.

Little evidence is available to guide prehospital translation. Cone (2007) found that there is little evidence related to knowledge translation in emergency medical services⁷ and Haskell has described that only 30% of EMS providers were aware of AHA recommendations for paediatric defibrillation²⁰. We used the framework of published works from physician practice and intensive care experience to assess implications for prehospital translation.

McGlynn and colleagues estimate that only about half of all patients in the United States are treated in accordance with best practice⁸. In intensive care units, nearly half⁹ of physicians reported in 2008 that they have never employed therapeutic hypothermia in the treatment of resuscitated patients despite strong recommendations supporting its use published in 2003^{10,21}. Further, although several randomized controlled trials have shown that statin therapy can decrease morbidity and mortality in post-stroke patients, they are underprescribed^{11,12}. It has been estimated that cancer mortality could be reduced by 10% if current research knowledge was fully implemented²². Cabana et al have identified several delays to knowledge transfer in physician practice through a rigorous systematic review process¹³. In the context of the intensive care unit (ICU), several barriers have been

identified that slowed implementation of evidence based guidelines for therapeutic hypothermia in post-cardiac arrest patients^{9,23,24}.

Theme 1: Decision Making

Making the decision to accept a new guideline is a critical step in the pathway to translating knowledge into action^{13,25–27}. Decision making delays were prevalent amongst 38% of respondents. Two external barriers beyond the control of EMS agencies, and three internal barriers were identified. Approval from regulatory bodies such as state health boards and provincial ministries is required in advance of training and implementation of any change in treatment practice. Abella et al (2005) found that a lack of leadership from senior administrators was reported to be a cause of delay in the implementation of therapeutic hypothermia for post-cardiac arrest patients in emergency departments and intensive care units⁹ and Sasson et al found that legislative and government barriers impeded the implementation of evidence-based Termination of Resuscitation guidelines (39). Regulatory bodies are in a position to help knowledge translation processes and are in a unique position to overcome decision-making delays.

A second barrier that was outside the control of the agency was attributed to a delay in approval of the new guidelines at the level of the physician oversight group. This delay could be related to a lack of awareness or disagreement with the guidelines due to unclear recommendations or initial clinical equipoise surrounding the guidelines¹³. Pathman's model of adoption explains that agreement is a crucial step to reach adherence to practice guidelines²⁸. A lack of agreement associated with guideline uncertainty was also reported as a barrier to implementing guidelines in the ICU by Abella (2005) and Kennedy (2008) who found that a lack of direction from cardiology and critical care consultants was perceived to be a reason therapeutic hypothermia was rarely used^{9,23}. Ideally, agencies have an established, collaborative relationship with a medical director with a collective emphasis on ensuring medical directives or protocols are in line with significant advances and changes to guidelines.

Factors under the control of the agency were also reported as barriers to guideline implementation. Some EMS agencies opted to delay adoption of the guidelines until allied services were prepared to implement the guidelines. This observation is not unique to cardiac arrest and an a priori working arrangement to unify changes to care practice in a timely and coordinated way should be in place in EMS systems and should involve all affected organizations. Delays at the agency level can be equated to 'slow administrative processes' as described by Jones et al who completed semi-structured interviews in ICUs across Canada and reported several barriers to implementing guidelines for nutrition support²⁹. These barriers include resistance to change, lack of awareness and slow administrative processes. Local champions and opinion leaders, as praised by Rogers and others, in addition to an established coordinated approach across agencies may be able to facilitate and encourage faster implementation of guidelines in regional systems^{25,30}.

Furthermore, there may be a culture of apathy surrounding cardiac arrest care. Cabana suggests that in order for adoption to occur, there must be an expectation of improvement¹³. With prior survival rates of less than 2 % in some regions, it is predictable that there may be an attitude of hopelessness surrounding cardiac arrest patients given the low survival rates observed by EMS agencies and providers. Brooks suggests this may be partly responsible for delayed implementation of therapeutic hypothermia in the emergency department and ICU setting²⁵. Opinion leaders should share stories of success and outcomes should be made available to all providers and decision-makers highlighting improvements in survival following implementation³¹.

The final barrier reported under the theme of “decision making” related to prehospital research where guideline training was paired with clinical trial training as a cost and time saving measure. One agency stated that they waited for several months before going ahead with AHA guideline training while continuing to wait for ROC information. Another agency reported that “uncertainty” surrounding ROC participation contributed to the delay as training sessions were postponed until confirmation of ROC participation was made. Research should layer onto existing practice rather than act as a barrier itself. Ideally, a research protocol would be delivered only once current care is optimized through training, practice and adherence to guidelines. All investigators need to consider this in the design of the trial and implementation strategy.

Many of these barriers related to decision making can be overcome by fostering collaborative working relationships, engaging leaders, making sure the existing infrastructure is tuned to respond to the science, and measuring and reporting patient outcomes.

Theme 2: Defibrillators

Changes in electrical therapy were a significant part of the 2005 AHA guidelines. However, it proved challenging to update defibrillator software to reflect the new guidelines. Agencies reported delays in reprogramming their defibrillators from delivering three consecutive – or stacked – shocks to single shocks. Many agencies delayed training staff in part of the new guidelines (such as changes to chest compressions) until the defibrillator upgrades were addressed. It is likely that this was done with good intentions; frequent changes to practice guidelines can be confusing and frustrating for clinical staff. These defibrillators required software upgrades that were not immediately available or were not easy to access and upload. The delays attributed to device upgrades spanned across the three different manufacturers who supply ROC agencies with defibrillators. This prevalent cause of delay highlights the important role industry plays in guideline implementation. Medical device companies must work along side organizations that release guidelines and EMS agencies to ensure the timely upgrade of devices used to treat out of hospital cardiac arrest.

Cabana has described that environmental factors can delay implementation even after a decision has been made to put knowledge into action¹³. In 2005, the medical equipment industry was blocked from the guideline process in an effort to address potential conflicts of interest. ILCOR restricted industry access from the guideline processes in an effort to mitigate potential conflict of interest. Although COI is a very important consideration, future guideline processes may consider early on the implications for industry. The challenge then is to provide timely, accurate, and equitable information to industry that is useful but does not short-circuit the guideline process.

Theme 3: Training

The third theme identified was training barriers. Over 36 000 firefighters, emergency medical technicians, and paramedics are employed in the agencies that make up the Resuscitation Outcomes Consortium¹⁴. To train each in new guidelines and improvements in patient care including new drugs, devices and processes of care is an expensive and logistical challenge.

Agencies reported two difficulties: booking an instructor to facilitate the education session highlighting guideline changes, and receiving training materials. BLS training materials were first available from the AHA on February 15, 2006, a two month delay, followed by ALS materials on August 31, 2006³², a 9.5 month delay. These delays are less than the median time required to implement the guidelines, but seems to have contributed to

implementation delays. Cabana identified that factors beyond the control of the decision maker, such as training, can hamper implementation even after the decision to accept a guideline has been made¹³. Smaller services should partner with other services to share expensive and essential services including instructors. The AHA and other organizations that publish training material should develop these products concurrent with the guideline derivation process such that updated instruction materials are available shortly after the launch of guidelines. This cycle of training is included in a model for guideline implementation by Haines and Jones and should be considered in implementation plans by organizations that release evidence based guidelines³³.

Respondents reported an internal delay to implementation of the 2005 guidelines related to the training cycle of the agency. Many agencies train only once or twice a year and do not have the resources nor the manpower to maintain operations and run extra training sessions. Some agencies waited until staff required a recertification or update of other skills as well. In small services where ambulance coverage is thin, this efficiency addresses an important patient care perspective. In a large service it may be cost prohibitive to train twice when there is limited individual benefit. Other training forums may address this delay. The use of web-based programs while off duty or on duty between calls may allow the paramedic to accumulate continuing education credits to maintain certification, although this avenue requires further research to see if practice changes can effectively be taught through this medium. Other options include field trainers who train individuals while on duty addressing new changes or updates in practice.

Limitations

It was not our aim to quantify the incidence of specific barriers to guideline implementation. An investigation of that nature is beyond the scope of the present study. Further, as a qualitative study, the results may not be generalizable outside of ROC agencies, as these agencies are all participating in a research network. We did not have the foresight to plan analyses of differences in respondent characteristics between themes and therefore did not collect enough data to conduct subgroup analyses. The study does however, provide a current picture of barriers to implementation of the 2005 AHA guidelines that occurred within the ROC, that are uppermost in the minds of highly experienced EMS professionals. Based on this study, there is ample scope for future research to understand better how education, organizational structure and research interact to facilitate change.

Improving Knowledge Translation in EMS

Clinical practice guidelines are not easy to implement in the EMS setting. However, the resuscitation guidelines released by regional Resuscitation Councils are based on an international consensus of science and should not need to be evaluated or endorsed locally. EMS systems should be prepared to implement these guidelines quickly after release. The release dates of upcoming guidelines should be advertised well in advance to allow EMS agencies, regulators, manufacturers and medical directors to plan for their implementation. Further, implementation tools and time targets should be made available in addition to published guidelines to guide EMS agencies in their implementation efforts.

To improve knowledge translation for all EMS agencies, organizations that release evidence-based practice guidelines should consider developing implementation programs to help overcome the many barriers facing change. In 2000, the American Heart Association launched “Get With The Guidelines” (GWTG), an in-hospital quality improvement program for three diseases; coronary artery disease, heart failure and stroke. The GWTG program helps to ensure that hospitals are treating patients in alignment with the most current scientific guidelines and evidence-based practices using various media to encourage and

assist hospitals to improve patient care quality and adhere to evidence based guidelines. Online resource guides, protocol templates and evidence-based literature are all made available to these institutions in order to assist them achieve adherence to the guidelines. Since its inception, more than 1300 hospitals have taken part and the program was awarded the Innovation in Prevention award from the US Department of Health and Human Services³⁴.

Several studies have demonstrated that participation in GWTG increases adherence to evidence based guidelines and improves patient outcomes. With regards to stroke, adherence to diagnostic guidelines was improved³⁵ and rates of thrombolytic therapy for stroke patients was “drastically improved”³⁶, among hospitals participating in the GWTG Stroke program. Patients with coronary artery disease received recommended therapy more often after the implementation of the GWTG program^{37,38}. These improvements have been shown to be sustained over a time period of at least two years³⁹. We can speculate that a similar program of knowledge translation support would improve the outcomes in other settings, such as the prehospital environment.

Conclusion

Many barriers contributed to delays in the implementation of the 2005 AHA guidelines in EMS agencies, including instructional delays, defibrillator delays and decision-making delays. These identified barriers should be proactively addressed prior to the 2010 Guidelines are released to facilitate quick translation of science into clinical practice. Research is required to understand if knowledge translation tools that have been shown to work in other health care settings can help overcome barriers to guideline implementation in emergency medical services.

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Table 1

Guideline implementation was reportedly delayed by 10 barriers grouped into 3 themes. Barriers to Implementation of the 2005 AHA CPR and ECC Guidelines

Barriers to Implementation	
Theme n (%)	Barrier n (%)
Instruction Delays 14 (41)	Lack of instructors 3 (9)
	Lack of materials 5 (15)
	Delay to next scheduled training 6 (18)
Defibrillator Delays 13 (38)	Delay to reprogram defibrillators 8 (24)
	Delay to receive new defibrillators 5 (15)
Decision-Making Delays 13 (38)	Delay due to coordinating with other agencies 3 (9)
	Delay due to government regulators 3 (9)
	Delay due to medical direction 3 (9)
	Delay due to ROC participation 3 (9)
	Delay due to internal crisis 1 (3)