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An Educational Program to Train Emergency Medicine Residents in Pre-hospital Direct Medical Direction

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Global Health

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An abstract of

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Abstract

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By Lekshmi Vaidyanathan

Emergency Medical Services (EMS) plays a vital role in the country's emergency and trauma care system providing response and transport to over 18 million Americans annually. Since field care is provided largely by paramedics, the clinical practice of emergency medicine extends into the pre-hospital environment through the radio communication between the paramedics and physician for real time medical advice. Direct Medical Direction is care rendered under direct orders over the radio or telephone. Training in base station communication and medical direction has been highlighted as a requirement for physicians training in Emergency Medicine (EM). Given the growing emphasis on the benefits of experiential learning the aim of this project was to design an educational program to provide practical education to the physicians training in Emergency Medicine as well as provide a recorded line for continuous ongoing call quality improvement.

The educational program incorporates longitudinal and practical training in direct medical direction to improve pre-hospital care delivery and enabling physicians to be better equipped to manage these calls following their training period. The project also consists of a monitoring and evaluation component to assess the effectiveness of this program over a 4 year time period from implementation and continued ongoing evaluation thereafter to assess the efficacy of the program. Monitoring of the program will be performed through recorded paramedic calls, documentation on triage nurse call logs, Direct Medical Direction feedback forms and paramedic satisfaction surveys. The evaluation component is geared toward evaluating the benefits rendered to the physicians (resident and attending) and paramedics.

The direct medical direction operational program hopes to standardize patient care while providing the vital hands-on education to 3rd year residents training in Emergency Medicine. It allows future evaluation of these recorded calls and measures the quality and consistency of the physician's advice. These reports allow the ED to develop training courses and materials for physicians to help streamline their responses. It also provides an opportunity to expand the pre-hospital curriculum for resident physicians training in Emergency Medicine.

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Contents

Background

Emergency Medical Services (EMS) play a vital role in the country's emergency and trauma care system providing response and transport to health care facilities for millions of Americans annually. Recent estimates indicate that there are more than 15,000 EMS systems and 800,000 personnel that respond to more than 16 million emergency calls annually.[1] Of the 113 million Emergency Department (ED) visits that occurred in 2003, an estimated 14% arrived to the ED by ambulance. Though this seems like a small proportion, EMS-transported patients accounted for 40% of hospital admissions. This suggests that transported patients tend to have more complex medical conditions and require greater care than walk-in patients. In 2003, an average of 6.5 diagnostic tests were performed for transport cases which was approximately 40% higher than the average for non-transport cases.[2] EMS providers more frequently handle pre-hospital cardiac arrests which occur at a rate of 250,000 per year or more than 650 a day across the country.[3] The majority of patients transported by EMS are older. For example, of the ED visits by patients over 75 years, 40.9% were transported by an ambulance. This is in contrast to 3.8% of patients under the age of 15 presenting to the ED that were transported.[1]

EMS offers effective, coordinated, and timely delivery of health and safety services to victims of sudden illness or injury. EMS is dedicated to providing timely care to victims of sudden and life-threatening injuries or emergencies in order to prevent needless mortality or long-term morbidity, and transport the affected individuals to definitive care, which is most likely an ED. EMS is more than an ambulance service.

It includes:

- the call center that receives the call for and dispatches help
- first responders (police officers and firefighters)
- an ambulance transportation team of EMTs and/or paramedics
- physicians and nurses who provide advice via radio or phone
- air medical services
- hospital receiving facilities
- governmental and medical oversight

EMS functions can be divided into four main categories; accessing emergency care, care in the community, care en route, and care upon arrival to receiving health care facility.[4] EMS has grown considerably since its inception in the 1800s. In addition, with technological advances in medical care, there have been significant reductions in mortality that is related to acute medical conditions and emergencies.

The components and roles of EMS systems have been graphically described in the National highway Traffic Safety Administration (NHTSA) EMS website.[5] Figure 1 illustrates the basic structure of an EMS system. The large circle represents each system element as it is activated in response to an incident. The brown arrows within the circle represent the specialty care areas within EMS. The items listed within the circle represent the resource elements supporting the system.

Since the 1970s, there have been two main models of EMS. These are the Anglo-American (AA) and the Franco-German (FG) models. The Franco-German model of EMS delivery is based on the "stay and stabilize" philosophy. This model is designed to bring the physician to patients. The emergency physician in the field has the authority to

make complex clinical judgments and treat patients in their homes or at the scene of the emergency or illness. Countries such as Germany, France, Greece, Malta, and Austria all have well-developed Franco-German EMS systems.[6]

In contrast, the Anglo-American model is based around the "scoop and run" philosophy. The aim of this model is to rapidly bring patients to a hospital or healthcare facility that is equipped to manage the condition. Trained paramedics and Emergency Medical Technicians (EMTs) run the system with clinical oversight by physicians. Countries which use this model of EMS delivery include the United States, Canada, New Zealand, and Australia. EMTs answer emergency calls, drive ambulances, and give basic medical care at the scene or en route to a health care facility. Paramedics, in addition to the above-mentioned roles, have training to perform certain advanced medical procedures in the field compared to EMTs. The patient is usually transported to an ED for definitive care.

Multiple studies have attempted to compare the two systems in terms of outcomes achieved and cost-effectiveness. However, since these models are implemented in different contexts with different types of demands to meet, it is challenging to make meaningful comparisons. There is currently no evidence that one model is better than the other,[6] though some studies report that total pre-hospital times and scene times are minimally longer in the European system compared to the US system, and the data regarding patient survival are comparable.[7] The model selected by individual countries is largely based on the available resources and structure of the healthcare system. Most EMS systems today are a combination of both of the above models.

The EMS system is an important component of the health care system in the United States (US). Since field care is provided largely by EMTs and paramedics in the US system, the clinical practice of emergency medicine extends into the pre-hospital environment as ED physicians are involved in providing real-time medical advice to paramedics through radio. This added role creates an increased need for prudent medical supervision of EMS personnel, both directly (in real-time) in terms of medical advice in challenging situations, and indirectly through quality assurance and continued educational opportunities. It is therefore increasingly important to train emergency physicians to assume a leadership role in the implementation and management of this subspecialty.

Medical direction for EMS is most often provided by Emergency Medicine (EM) physicians. There are two different types of medical direction. Direct Medical Direction, often called On-Line Medical Direction, involves care delivery under direct orders of the Base Station Physician, usually over the radio or telephone. The other is Indirect Medical Direction, or Off-Line Medical Direction, which includes the development of a set of written instructions or protocols that are followed by paramedics in the field. Thus, the EM physician plays an important role, and knowledge of paramedic base station communications or direct medical direction may be a vital aspect of the physician's repertoire of skills and knowledge.

The Accreditation Council for Graduate Medical Education (ACGME) is a private, nonprofit council that evaluates and accredits residency programs in the US. The ACGME was established in 1981 following consensus among the academic medical community that there was a need for an independent accrediting organization. The

mission of the ACGME is to improve health care delivery by setting the standards for residency training, and assessing and advancing the quality of education for resident physicians in training.[8] Training in base station communication and medical direction, both online and offline, has been highlighted in the ACGME requirements for EM residents.[9] The ACGME requirements also state that EM residents "must have experience in out-of hospital care. This should include: participation in paramedic base station communications; emergency transportation and care in the field, including ground units and if possible, air ambulance units; teaching and oversight of out-of-hospital personnel; and disaster planning and drills."[8]

The emphasis on the importance of physician support for EMS was a key driver for improving the education of EM residents at the Emory Emergency Medicine residency program. A modified curriculum for direct medical direction was proposed to improve practical experience and longitudinal exposure in this unique area of practice.

Education Modalities

There is an increasing focus on evidence-based practice and medical education as the amount of research and data regarding cutting edge medical management emerges. There is also a greater focus on patient safety and quality of care delivery in clinical medicine, both of which make practical education and bedside teaching for students and trainees more challenging. In addition, it also becomes more and more challenging for individuals in training to keep abreast of all the new developments.

Numerous theories and models have sought to describe how adults learn. Malcolm S. Knowles' theory of andragogy describes the specific needs of adult learners and the principles of enabling learning for adults. In contrast to pedagogy, or learning in childhood and youth, Knowles emphasizes that adults are self-directed and expect to take responsibility for decisions; and that adult learning programs must accommodate this fundamental aspect. Knowles published an article on applications in continuing education for health professionals in 1985 where he said that the half-life of knowledge, skills, attitudes, and values required by physicians, nurses, allied health professionals, and pharmacists is shrinking with increasing speed.[10] In his article, he describes a three year pilot project conducted at the University of Southern California (USC) Health Sciences Campus and organized by the USC Development and Demonstration Center in Continuing Education for Health Professionals. The pilot project was an innovative program for continuing education for health professionals based on the andragogical model which received highly positive feedback. According to Knowles, there is evidence that adults learn more deeply and permanently when motivated by their own initiative than with traditional teacher-oriented, didactic classroom approaches.[10]

Although different models of adult learning have different foci of emphasis, the central principles are largely similar. Recurring themes have been identified in this area and synthesized into five key principles based on andragogy and self-directed learning.[11] These principles are summarized in Table 1 from the article by Okuda et al.[12] These principles can be applied in the training process, from (a) assessing trainee needs, (b) planning and delivering training, to (c) evaluating the process and impact of training activities. Strategies for adult learning emphasize the role of experience and self-direction as well as the need to know the benefits of knowledge and its potential applications.[13] However, as Misch points out, the motivators may be different for different learners,[13] making it important to offer a diverse program that adopts and incorporates different methods of learning that may be important towards achieving maximal benefit for a wide variety of students.

"I see and I forget, I hear and I remember, I do and I understand." – Confucius. Edgar Dale illustrated this principle through developing the 'Cone of Experience' (Figure 2) which was published in his book in 1946. It explains some of the important ideas of communication, learning, and concept development. Dale's work was designed as a visual aid to help explain the interrelationships of various types of audio-visual materials, as well as their individual 'positions' in the learning process.[14]

Dale's original work has since been modified and the cone of experience has been published as the cone of learning with percentage values attached to each stage. These modified images were developed and used by the National Training Laboratories (NTL) Institute at their Bethel, Maine campus in the early 1960s when they were still part of the National Education Association's Adult Education Division. The research behind these

percentages is challenging to find as they are not published, but the versions of the images along with the percentages have been published extensively on the web. An example is attached below (Figure 3).[15] Croley et al published a similar version of this image in his article and stated that students tend to remember 90% of what they do, yet only 10% of what they read.[16]

However, clinical medical practice is a unique profession. Clinical skills require the integration of problem-solving, communication, and technical skills in the setting of a complex medical context, along with a base of experiences on which to arrive at current plans of action. Education and on-the-job practice are essential educational techniques and are contingent upon four conditions: intense repetition of a skill, rigorous assessment of that performance, specific informative feedback, and improved performance in a controlled setting.[17] Given the higher rate of retention and mastery of expertise in practical training compared to classroom education, the experiential nature of this project serves well to train future leaders in the Emergency Medicine specialty in an important aspect of EMS in a safe environment.

Emergency Medical Services (EMS) Education

Education for EM residents in direct medical direction has been performed in different ways across residency programs in the country. Multiple curricula have been proposed and various approaches have been tried. Training modalities have included:

- didactic training
- training under a simulation setting
- practical training with taking regular medical direction calls
- retrospectively reviewing recorded calls to understand the processes and responses

One or a combination of the above types is commonly utilized. A survey in 2005 regarding EMS training modalities across all 135 ACGME-accredited and 34 American Osteopathic Association-accredited EM residencies showed that 11.2% provided no direct medical direction education, 34.8% completed a base station medical command course, 78.5% provided on-line medical command during ED shifts, and 15.1% provided direct field supervision and medical commands as part of their field experience.[18] Programs were allowed to pick all options that applied to them in the survey if they were providing their trainees more than one modality of education. The survey had a 66% response rate, implying that the results are fairly but not completely representative of the all EM residency programs. The non-responders may have different characteristics than the programs that responded. It is possible, for example, that the residencies that chose not to respond may not have had a robust EMS curriculum for their residents. This is corroborated by the fact that most of the institutions with an EMS fellowship or advanced EMS training curricula did respond to the survey.

A model curriculum shown below, proposed by Verdile et al. for the Society of Academic Emergency Medicine (SAEM) Emergency Medical Services Committee, suggested a model of didactic training combined with practical training (Table 2).[9]

Emory Emergency Medicine Resident Direct Medical Direction Education

The Emory University Department of Emergency Medicine has a large residency program where 19 residents are trained per year. In 2010, this number was increased to 21. The residency training period is over three years following which residents graduate to move on to community or academic EM practice or apply for further fellowship training. Over the course of the residency training curriculum, there is a one-month period in the second year of training that is dedicated to EMS education. Education and training in direct medical direction is mainly provided through didactic lectures over a month of rotation in EMS and discussion regarding calls that have been received. This is often done over a 2-3 hour lecture period with post lecture discussion. To date, there has been no requirement for residents to answer direct medical direction calls that are received by the ED as part of their training. The attending or supervising physicians are currently responsible for these calls. There are no additional simulation sessions or review of calls already taken for practical education of direct direction.

Given the growing emphasis on the benefits of experiential and practical learning, in 2010, the Emergency Medical Services (EMS) section (EM physicians specializing in EMS) at Emory University's Emergency Medicine department initiated the Direct Medical Direction (DMD) project to provide practical 'medical direction' education for EM residents. Besides providing practical education to EM residents in the Emory program, the goal of this project is to provide a recorded line for continuous ongoing call quality improvement. Through providing longitudinal and practical training in direct medical direction, it is hoped that pre-hospital care delivery will improve and residents will be better equipped to manage these calls following their training period. This project

also consists of a monitoring and evaluation component to evaluate the effectiveness of this program. This report describes the components of the program in greater detail as well as the anticipated evaluation plan and implications for medical training, the EMS system at Emory, and public health.

Grady EMS overview

Each year, approximately 100,000 people call the Grady Emergency Medical Services (EMS) system, one of the largest hospital-based EMS systems in the United States. Of these emergency calls, seventy-five percent of people are transported to emergency medical facilities in the Metro Atlanta area.[19] The paramedics running these calls operate under physician-direction. The Grady EMS system obtains all medical direction from EM physicians (i.e., Emory HealthCare Staff) working in Grady Hospital's ED at the time of the call.

The Grady Hospital ED, along with the Grady EMS system, is primarily where Emory University's EM residents receive their pre-hospital training. Physicians, specializing in pre-hospital emergency services or EMS, have outlined standard protocols for paramedics to implement in the field. If paramedics require further medical direction while responding to an emergency call, they can contact the ED on a recorded radio line to discuss the case with a physician working in the ED. The physician gives advice regarding response management.

Program Description

To create this educational program for resident EM physician training, the various components affecting pre-hospital transport and medical direction were initially outlined in a conceptual framework. The current educational and practice guidelines were evaluated and modified to enable the new program to provide well-rounded longitudinal and practical experience in direct medical direction. The hardware (e.g., radio set up, etc.) required was installed and education sessions for the stakeholders organized. A monitoring and evaluation tool was created. The program was initiated in November 2011 and once it has been running for a year, the monitoring and evaluation will be initiated. The entire project is scheduled to be conducted over four years following which continuous monitoring and intermittent evaluation will be performed to ensure the effective functioning of the program. The program is designed such that all third-year resident physicians will go through - this is a complete coverage program with no randomization. Schedules and time frames for monitoring and evaluation are described below. We were not required to submit to IRB as the program did not directly involve human subjects.

Conceptual Framework and Log Frame

A conceptual framework (Figure 4) was created to identify the determinants that would play a role in the logistics of this project. Currently there is a single radio frequency line utilized for calls to the Emergency Physician for medical direction. Given the single frequency, the number of calls taken and the amount of time that may be spent

waiting for the radio frequency to clear were important factors to consider as this would be a rate-limiting step as to the number of possible calls that can be taken. If this model is utilized by other services in addition to Grady EMS, additional radio frequencies may need to be added. The volume of patients in the ED at any given time would also impact how easily the physician or senior resident was available to take the call. Outcome measures are outlined in the conceptual framework and include improved education, consistency of patient management practices, and paramedic satisfaction. A log frame was also constructed to outline the performance indicators and means of verification (Figure 5).

The main goal is to improve patient flow and care through a streamlined approach. The purpose of the project is mainly to provide a practical educational opportunity in direct medical direction and to incorporate this in their curriculum in a longitudinal fashion to obtain more call volume. Considering that it would be challenging to measure outcome benefits like mortality, provider satisfaction surveys to evaluate the process was used as an indicator to verify the goal. The recording and review of calls would also help achieve consistent medical direction by a large group of physicians and allow monitoring for call quality. Output measures were quality and consistency of medical direction provided by both attending physicians as well as resident physicians in training. We will also evaluate the ease of operations for paramedics. At the beginning of the program, resident physicians are trained in radio operation and documentation. The ED physicians and paramedics are also trained in radio use and the nurses are trained in triaging the calls and routing these to the appropriate provider. The calls are recorded and reviewed for uniformity in medical direction, radio etiquette, and appropriate triage.

EMS Clinical Care Guidelines Access

Current EMS clinical care guidelines for Fulton County have been made available to Grady's ED. A locked copy (PDF) of the guidelines has been uploaded onto the departmental website and can be securely accessed. This document will give physicians, ED residents, and triage nurses an overview of Grady Hospital's EMS provider's capabilities and can be accessed both within the facility as well as remotely. The documents are revised every 5 years, and once available, the previous EMS clinical care guidelines are replaced with the approved updated guidelines. A hardcopy has also been placed at the nurses' station adjacent to each radio in the department for clarification purposes.

The ED in Grady is divided into three zones and patients are assigned to zones by triage depending on their clinical presentation. Each zone has a radio and calls are directed by the triage nurse depending on the chief complaint of the patient as it is described by the paramedic. This would ensure that the patient would likely be triaged to the same zone physicians that provided medical control thus offering continuity of care.

Communication Protocol

DMD utilizes two-way radios, which are conveniently installed in the three ED zones. Paramedics have a direct line to contact ED personnel via the radio. There are two call tag codes to facilitate accuracy in directing paramedics' calls. Calls concerning patient reports and clinical updates fall under the code "Nurse Report." Triage nurses will be able to answer these types of calls. If the call is a direct medical control call

requesting a physician, the paramedic will use the code "MD to radio." Using the public announcement system (PAS), the triage nurse answering the call will immediately give the code "MD to radio" and state the ED zone where he or she is located.

If a call coded "MD to radio'" is placed and depending on the patient's clinical presentation, the call will be triaged by the triage nurse to the appropriate zone of the ED. The attending or senior resident in that zone takes the call. If he or she is unable to respond due to other emergency clinical issues, then they will inform the triage nurse through the PAS that the physician is occupied. The triage nurse will then try to contact the attending or senior resident in one of the other zones to take the call. The protocol is outlined in the communications pathway (Figure 6). The nurses will also log the triage calls to monitor call volume and type using the call log form (Figure 7).

Physician and Resident Involvement

All triage nurses and ED physicians are given an overview of the DMD project and trained in the related operational protocols. A pre- and post-assessment survey will be conducted to evaluate the efficacy of the training process and provide future direction if the educational module needs to be changed. Biannually, during the ED staff monthly meeting, triage nurses and ED physicians will be reminded of the location and operation of radios and DMD protocols. During the meeting, if there are updates in the Direct Medical Direction and/or protocols, the ED staff will be notified. In June of each year, the ED physicians will review the DMD project requirements for the 3rd year residents rotating in the ED. Physicians will also determine the minimum number of Direct Medical Direction calls that residents will be required to experience.

The formalized process of integrating this into training involves the following. In July or August between their second and third year, EM residents at Grady Hospital will receive an in-depth orientation to the DMD project. The residents will learn about Direct Medical Direction procedures, the Fulton County Clinical Care Guidelines, and the operation of the two-way radio. Each 3rd year resident must document all of their direct medical direction experiences, using a form provided to obtain feedback for the program. (Figure 8)

Forms are conveniently placed beside each ED zone radio to facilitate residents entering call information in real-time. The form helps EMS physicians provide feedback to the residents regarding the medical direction provided to the paramedics. Medical direction by residents should be provided with direct supervision from the attending ED scheduled to supervise them in that zone.

A timeframe for implementation of this educational program was outlined and a Gantt chart has been prepared to assist implementation (Figure 9). As an educational program, the benefits of this project are mainly associated with resident education. This program not only provides the practical experience in direct medical direction in a safe environment under supervision, but also conducts this education in a longitudinal fashion in applied format where third-year EM residents receive the education during shifts for the duration of the year. This would aid in repetition with continuous, rigorous assessment of performance and feedback which would likely improve performance. This would conform to the outlined recommendations by Ericsson et al. (referenced above) for successful practical medical education.[17] The longitudinal nature of this education

helps both extensive experience and retention of material compared to exposure over a short period.

The recording of these calls and continuous quality assessment will aid in a streamlining patient care processes as well as helping monitor deviations from the outlined protocols. This not only provides a safe environment for learning but also ensures continued high-quality patient care.

Monitoring and Evaluation

Unfortunately, no published records exist for a project like DMD, since DMD education for residents is implemented in different ways in various residency programs ranging from power point presentations incorporated into the educational curriculum to practical experience taking calls. Also, there are no "gold standards" to benchmark against. However, educational modalities of this nature have been discussed informally with other programs prior to designing ours.

Given the distinct nature of the program, a monitoring and evaluation plan was outlined to evaluate the efficacy of the program and evaluate the benefits rendered to the physicians (resident and attending), paramedics, patients, and its effects on work and patient flow through the ED.

Monitoring

Performance Indicators

After determining the outputs and activities needed to support the goals of the project, performance indicators were defined to assist in monitoring whether these outputs and activities are achieved. Indicators have been specifically tailored to the corresponding activity or output that they are measuring. These indicators are measurable within our pre-determined timeline of four years and are realistically achievable. All DMD performance indicators are listed in the log frame. (Figure 5)

Verifying Performance Indicators

Four main means of verification (i.e. recorded paramedic calls, documentation on

triage nurses' call logs (Figure 7), Direct Medical Direction forms (Figure 8), and paramedic satisfaction surveys are outlined for our given performance indicators. Means of verification for the activities and outputs have been highlighted in the log frame (Figure 5).

Records will be maintained and used for ongoing monitoring processes and scheduled project evaluations. The time line for documenting the achievement of individual indicators over the four year period is described both in the Gantt chart and below. Ongoing monitoring (data are being tabulated and analyzed alongside implementation so results will be readily accessible and current) will provide real-time assessment and also help make timely changes to the project design to fulfill the needs of the ED and better serve patients.

Means of verification

Recorded calls

Firstly, recorded direct medical direction calls will be reviewed to check for accuracy of in call-transfer by the triage nurses. The EMS section members of Grady's ED are responsible for monitoring individual calls and crosschecking them with the triage nurses' call logs. This process is scheduled to occur at monthly intervals for the first 18 months of the DMD, with the results reported during the staff monthly meetings. Since there is minimal turnover of triage nurses in the ED, following the initial training, if approximately 90% of the calls are appropriately transferred during months 7 thru 18, then the review schedule will be revised to a quarterly interval. If there does appear to be a high turnover with greater than 10% of the nurses being new hires, then the frequency

of review will be increased to monthly to ensure that the patients are being appropriately triaged. If greater than 90% are triaged to the proper zone over a period of 6 months, the frequency of review can be dropped to quarterly again. The nursing supervisor will keep track of new hires and perform the training as part of their orientation process.

Secondly, all resident calls and a sample of the attending calls will be reviewed for consistency and quality of information conveyed. The EMS section members are responsible for evaluating and randomly selecting calls to audit, based on the Lot Quality Assurance Sampling (LQAS) model [20, 21] every month. LQAS is a one-sided test to determine, at a given level of confidence, whether the true population value is lower than a threshold value in a randomly-selected sample that is representative of the population being studied. For the threshold value in this program, a 100% consistency in medical direction provided by the resident physicians would be ideal, but a target of 80% is more realistic, with 60% being the lowest acceptable rate. We have assumed a 5% error rate and 90% power. Based on these assumptions; we estimate that physician call sample size and minimum threshold for consistency and quality assessments will be 44 calls. The ED is anticipated to receive 10-15 DMD calls per day, with roughly 60% of the calls being addressed solely by attending physicians. If more than 12 calls are deemed inconsistent and/or of poor information quality, then further targeted training on information consistency will be provided. All deviations found in the selected call will be evaluated and the EMS section evaluator for that month will provide feedback to the physician.

Direct Medical Direction forms

Thirdly, recorded calls and the information documented on the Direct Medical Direction form will be combined to provide residents with feedback on the quality of

information they provided. The EMS section, in addition to the real-time feedback from the attending physicians, will provide the residents with individualized quarterly feedback during their resident evaluations. A synthesis of feedback will be electronically mailed to residents individually at the end of each month. This feedback will focus on the deviation from medical direction protocols.

Triage nurse call log

There are two call types: nurse report (triage nurses can answer these questions regarding patient's status) and medical direction requests (triage nurses assign the call to an ED zone for an EM physician). Triage nurses answering the paramedic's initial call will record if the call was made using the standard equipment (i.e. two-way radio) or the non-standard equipment (i.e. cellular phone) – this has implications for whether calls can be recorded. Information on a call's transfer will also be recorded on the triage nurses' call log. Both will be used to monitor if the calls came in through the right channels and were transferred to the appropriate destination. Members of the EMS section will evaluate the triage nurse call log monthly on a rotating basis.

EMS satisfaction survey

Finally, an EMS satisfaction survey will be sent to the paramedics to evaluate the quality of information they received and ascertain issues faced by the paramedics during the contact process. This is done to monitor processes and re-design aspects of the program to make implementation logistically easier and more consistent for all stakeholders. Surveys will be conducted at the end of the academic year. The paramedics

will always be able to contact the EMS section if they have any urgent concerns of questions that need to be evaluated further.

Resources

The EMS section, including the EMS fellow-in training, will be responsible for monitoring call content, information quality, and triage nurse call logs. Comparing the materials needed for the DMD project and the ones available, we determined that the project will add minimum cost to the Grady ED's budget. The required office supplies and resources needed for the creation and completion of forms and surveys will comprise the largest resource cost. These were proposed and approved by the Grady ED. Forms were printed and have been placed beside the radio in the department. Hospital radios, frequency channels, and individual radios located in all ambulances have been installed, tested, and are operational. Installation of the radios was performed using the Grady EMS operational budget. The recorded radio line was installed as part of state mandated EMS communication.

Training will be performed as a part of the monthly all-staff meeting. Attendance at this meeting is mandatory. As a result, there is no need to account for or factor in payment for overtime.

Data Summary

The monitoring data will be summarized and presented to residents, physicians, and paramedics during the annual ED conference to outline the progress and success of the DMD project's implementation. Attached are examples of graphical summaries that

will be collected and presented (Figure 10). These types of graphical illustrations, as well as methods for improving the project and delivery of direct medical direction services will be distributed to all pertinent EMS personnel.

Data-Driven Action

The monitoring data will be used to evaluate the progress of the DMD project. The information gathered from the data will target areas and individual medical advice providers needing extra educational opportunities for improvement. The goal is to provide consistency in care delivery throughout the ED in direct medical direction, as well as providing invaluable education of third-year residents for the proper and consistent advisement of paramedics. Once the 4-year DMD project is complete, monitoring for resident evaluations will become an ongoing, embedded process for resident education improvement.

Evaluation

In the monitoring aspect of the program, the functioning of the individual components was assessed. Evaluation is focused on assessing the impact of the DMD program i.e. resident educational benefit, call consistency and paramedic satisfaction. Assessing consistency and uniformity of medical direction provided to paramedics is challenging to evaluate because this is extremely subjective. The main motive is to ensure that no provider (i.e. ED attending physician or EMS resident) deviates from the published paramedic protocols. The published protocols are unique to the paramedic systems that operate under the medical direction of the Emory EMS faculty and are published with updates and copies provided to all providers as direction on operational guidelines. The EMS faculty evaluates the recorded medical calls for medical direction that deviates from the published paramedic protocols. Deviations from protocol are considered inconsistent medical direction.

All physicians and residents working in the Emergency Medicine Department are participants of the DMD program making it a full coverage program. A before and after evaluation program would be challenging as the infrastructure for recording medical direction was not established until the implementation of this program. Hence it is challenging to retrospectively assess, with accuracy, what was being done before implementation of the program.

Looking at other EMS residency programs in the U.S., would not be a viable comparison option, as EMS systems, as well as, EDs nationwide vary in patient flow, clinical management protocols, and patient populations. Each residency program fulfills the requirement of pre-hospital direct medical direction education with a different

methodology. If the DMD project is successful, this practical approach with minor changes to adapt to individual setting may be used as a model for other residency education programs.

Based on Victora et. al, plausibility is the best evaluation design suited for this project.[22] Since there is no threshold and this is truly a full coverage program, regression discontinuity is not an option. Our elected method for determining counterfactuals will be reflexive controls, where we perform a pre- and post- comparison on the residents who act as their own reflexive controls.

Evaluation of the program is based on the effects of the program on

- Resident Education
- Call consistency
- EMS satisfaction

The individual evaluation plans are described below.

Evaluating Resident Education

The residents will be surveyed entering their third year to evaluate their comfort in providing medical direction. Residents will have some previous didactic exposure to medical direction from their second-year EMS rotation; thus, baseline knowledge of direct medical direction along with radio operations will also be evaluated. The survey will be repeated towards the end of the residents' third year, prior to graduation from residency. Sample post residency survey created and attached. (Figure 11) The initial baseline survey will be distributed this academic year in June when the second year residents graduate to their third year.

The initial survey distributed at the start of third year evaluates baseline

knowledge of direct medical direction and radio operation etiquette. The post residency survey evaluates the number of medical direction calls the resident has been exposed to and resident comfort level of taking these calls after the practical experience. Information is also obtained on if they will be using this skill in their future job to assess relevance of the education provided.

Questions concerning comfort level about direct medical direction will be assessed using a Likert scale, ranging from extremely uncomfortable to extremely comfortable. Questions concerning the ease of DMD use will also be assessed using a Likert scale, ranging from strongly disagrees to strongly agree. Surveys will be distributed to residents via a survey tool like Survey Monkey or Google Form, which would facilitate the ease of aggregating answers for analysis and reporting. Besides the surveys, residents will also take a content pre-test on prior knowledge of the direct medical direction process, using a multiple-choice format. A post-test will be given after residents are educated on the process, prior to actually taking calls to evaluate efficacy of didactic training. There will also be an option of free text comments that can be provided. Thus the survey will provide us quantitative and some qualitative impressions of the program.

The pre- and post- third-year resident surveys will be a mandatory component for their residency requirement for graduation. This would ensure a survey response rate of near 100%. The resident responses will be anonymous, thus blinding the evaluation team. It is believed that anonymity will increase truthfulness in responses. Since the reviewing faculty will be blinded to the identity of survey respondents, this will also ensure honest feedback from residents. A survey will also be sent out to the same group

of residents six months following graduation to assess if the experience during their residency training is assisting them in their current job and to what extent they are being exposed to medical direction in their new capacity. The 6-month survey will likely not yield a 100% response rate, but any feedback on the long-term ramifications of the project would be helpful in improving and modifying the processes and implementation. The average responses for each question in the survey will be determined and compared to the average end-of-year and post residency surveys. Sample graphical illustrations of summarized results are outlined (Figure 12).

Evaluating Call Consistency

Medical direction consistency and call quality are more subjective, since there are many correct techniques for managing calls. Essentially, the aim is to see that medical direction provided by the physicians and residents coincide with the published paramedic protocols. As part of his/her responsibilities, the EMS fellow (more senior) will conduct the analysis of continuous quality improvement (CQI) of calls. Evaluating the calls will consist of identifying whether appropriate radio etiquette with clear introduction using name and title was used, and whether delivery used brief and simple commands. For example, physicians should routinely obtain relevant clinical data, patient clinical condition, vital signs, and mental status from the caller. They should be specific about drug, dosage, route and further clinical monitoring following medication administration. After any medication instructions, the physician is required to request the paramedic to repeat it and verbalize understanding. Clinical instructions given should conform with published EMS county protocols outlined by the EMS section and provided for reference

while the calls are taken. The number of calls that will be evaluated is discussed in our monitoring plan. The time frame for the data collection is scheduled in monthly intervals for all residents and for the first 18 months of the DMD project for ED physicians.

Results will be reported during the all-staff monthly meetings. The fellow considers which calls will be discussed in the monthly EMS faculty meeting, fellow education sessions, and utilizes equivocal or challenging cases as case studies for further discussion and resident education. If there are inconsistencies with the protocols, the call is considered inadequate and not consistent with the guidelines for how care should be delivered.

Evaluating EMS satisfaction

Paramedics will evaluate the quality of the direct medical direction they receive through an EMS satisfaction survey sent via email. Surveys will be conducted at the end of the third-year residents' academic year. Based on previous surveys sent to paramedics, we anticipate the response rate to be between 60 - 85%. This will help modify systems and processes to ensure smooth running of the DMD project. Paramedics will always be able to contact the EMS staff directly, if they have any urgent concerns that need to be addressed.

Validity and Reliability

The majority of data will be qualitative in nature, and the evaluation will be an uncontrolled pre- and post-test assessment. The pretest measures will be utilized as an estimate of what a counterfactual situation might be. With the reflexive control evaluation design, it is assumed that without the project, no change would have taken

place on the measure of direct medical direction consistency and uniformity among residents between the pre-test and post-test. Since this assumption is made, the changes occurring between the baseline and annual evaluations may be reasonably attributed to the DMD project. Realistically, a measure of the gross rather than net program impact is measured in this case.

Internal validity

When evaluating the internal validity of the data, concern emerges regarding how other events affect the changes observed. This is unlikely as the pre-hospital education for residents has not changed over the years and there is no new EMS services transporting to the hospital. Even though the method for responding to direct medical direction calls has changed, this will unlikely have a large effect. The only factor that may affect medical direction provided is the provider's knowledge that the conversation over the radio line is recorded, making them more cognizant of the medical direction provided. This "unblinding" of the person helps in ensuring consistent and higher quality delivery of information, so the intervention does add a bias, though this bias would likely affect the entire group given that this is a full coverage program.

Since this is a full coverage program, it will most likely affect all the providers in a similar fashion. Though the faculty pool has greater stability, the resident pool does change yearly. Across the 19 residents per academic year, there will be lower and higher performers within the resident class. However, we expect to see a normal distribution within each class since the program is one of the larger residency classes nationally. There may be an element of selection bias given the fact that Emory selects its residents

each year through a matching process and the medical students selected for residency within our program likely have high credentials.

It is highly unlikely that third-year residents won't graduate, minimizing our dropout rate. Using the average of answers on surveys would less likely bias the evaluation results, since all residents take the same anonymous pre- and post-surveys with evaluators blinded to the person responding. The measurement method and protocols will therefore not be changed during the program. However, paramedic protocols are reviewed and updated every 5 years, and have been recently completed (December 2011), so changes will not be made until 2016, by which time the four-year program will have completed a full cycle.

Reliability

Though there are state wide EMS protocols, each service follows a modified version of the protocol depending on the available resources, common clinical presentations/ calls in the area, transport times and medical director comfort regarding clinical management. Each service also has different levels of providers from EMTs to Paramedic. Given the diverse clinical scope of practice of the different tiers of pre-hospital providers, the protocols are adjusted. The medical directors along with the service modify state protocols to suit their day to day clinical practice. The uniqueness of each EMS' protocol makes it more difficult for other hospitals to duplicate the DMD project verbatim. There are, however, strategies in place to enhance the reliability of the data so that, when the DMD project is conducted using identical implementation procedures and data collection methods, the same observations may be seen as

standardized and documented as such. Standardization is maintained in the forms and training, of the data collection techniques, and protocols used in this program and its evaluation. Consistent documentation including date, time, and place, call quality and evaluation will be recorded.

External validity

Implementation of the same project may be challenging as every residency program and EMS system is unique, though individual features of this program could be duplicated with changes to suit the EMS system. Ideally, we hypothesize that the program would work best for an academic residency program set in a high volume urban setting similar to Atlanta. If the practical nature of the educational program does appear to improve comfort level among the residents, this form of education may be a more valuable modality of instruction. Practical direct medical direction is currently practiced in many academic centers though there is no structured curriculum formally published, nor broadly publicized plans to evaluate these programs.

The monitoring and evaluation of the project would provide good methodology for evaluating the effectiveness. The monitoring helps provide real time feedback which would help modify the program as it progresses to suit the system's and stakeholders' needs. The evaluation helps determine if, in addition to providing quality medical direction, the project provides improved practical education on direct medical direction compared to only classroom didactics. Results from the evaluation can be utilized to formally report on the effectiveness of the program and also provide feedback to the residency and hospital leadership on how this program provides better education.

Limitations

One of the main limitations of this study includes the subjective nature of the evaluation of recorded calls. Though subjective, an attempt has been made to make it as objective as possible by dividing the calls into those that conform to the published protocols and those that do not. Despite this, the type of calls that come in are so varied it may be challenging to avoid the subjectivity altogether. Given the diverse nature of the calls taken and subjectivity, knowledge in handling medical direction calls was not tested.

Real time attending supervision with feedback and call recording may influence the medical direction given by the resident but this is extremely important for good quality patient care while providing a safe learning environment, so there are benefits beyond the bias to the study.

Currently we do have up to three radio lines for the calls but depending on the call volume additional lines may have to be added on in the future to decompress the call traffic. Calls made on the radio are recorded, so conversations can be evaluated in the future. If the paramedic uses a phone line to contact the physician in the Grady ED, the line is not recorded and the call cannot be evaluated. Paramedics are encouraged to use the radio for communication but if they do not, it is a potential limitation of the study. Reflexive controls are used for comparison as there is no data from previous years. Success of the DMD project is also contingent on log maintenance, feedback form completion, legibility and survey response. Incomplete or illegible data and noncompliance is a potential limitation of the program.

Conclusion

The direct medical direction operational project hopes to standardize patient care while providing the vital hands-on education to third year residents training in Emergency Medicine. DMD allows future evaluation of these recorded calls and measures the quality and consistency of the physician's advice. These reports allow the ED to develop training courses and materials for physicians to help streamline their responses. DMD also provides an opportunity to expand the pre-hospital curriculum for resident physicians under training in Emergency Medicine in the Emory Emergency Medicine residency program. The Institute of Medicine EMS report stated, "substantial variation exists nationwide in how medical oversight and review are conducted; in many localities, physicians with little or no training and experience in out-of hospital medical care provide this service. The committee believes that physicians who provide medical direction for EMS systems should meet standardized minimum requirements for training and certification that are reflective of their responsibilities…"[23] In 2010 the American Board of Emergency Medicine recognized EMS as a subspecialty and created a certification. Given the increased impetus to standardize training and provide the maximum amount of experience, Emory initiated the DMD project and many institutions are attempting to standardize training. If the modality of education used in the program appears to be beneficial to resident training, we hope to continue this program for future trainees.

References

1. Burt, C.W., L.F. McCaig, and E.A. Rechtsteiner, *Ambulatory medical care utilization estimates for 2005.* Adv Data, 2007. **29**(388): p. 1-15.
2. Medicine, I.o., *Emergency Medical Services at the Crossroads*2007.
3. Zheng, Z.J., et al., *Sudden cardiac death in the United States, 1989 to 1998.* Circulation, 2001. **104**(18): p. 2158-63.
4. Razzak, J.A. and A.L. Kellermann, *Emergency medical care in developing countries: is it worthwhile?* Bull World Health Organ, 2002. **80**(11): p. 900-5.
5. EMS, N. *Emergency Medical Services System*. Available from: http://www.ems.gov/emssystem/diagram.html.
6. Al-Shaqsi, S., *Models of International Emergency Medical Service (EMS) Systems.* Oman Med J, 2010. **25**(4): p. 320-3.
7. Dick, W.F., *Anglo-American vs. Franco-German emergency medical services system.* Prehosp Disaster Med, 2003. **18**(1): p. 29-35.
8. *Accreditation Council for Graduate Medical Education. Emergency medicine program requirements.* . April 30, 2006 [cited 2011 December 31]; Available from: http://www.EMResidentEMSInvolvement393acgme.org/acWebsite/downloads/RRC_progReq/110pr905.pdf.
9. Verdile, V.P., et al., *Model curriculum in emergency medical services for emergency medicine residency programs. SAEM Emergency Medical Services Committee.* Acad Emerg Med, 1996. **3**(7): p. 716-22.

10. Knowles, M.S., *Application in continuing education for the health professions: chapter five of "Andragogy in Action".* Mobius, 1985. **5**(2): p. 80-100.

11. Bryan, R.L., M.W. Kreuter, and R.C. Brownson, *Integrating adult learning principles into training for public health practice.* Health Promot Pract, 2009. **10**(4): p. 557-63.

12. Okuda, Y., et al., *The utility of simulation in medical education: what is the evidence?* Mt Sinai J Med, 2009. **76**(4): p. 330-43.

13. Misch, D.A., *Andragogy and medical education: are medical students internally motivated to learn?* Adv Health Sci Educ Theory Pract, 2002. **7**(2): p. 153-60.

14. Dale, E., *Audiovisual Methods in Teaching*. 3rd edition ed1969: Holt, Rinehart and Winston, Inc., 383 Madison Avenue, New York, NY 10017.

15. Jeffrey Anderson. *Cone of Experience*. 2007; Available from: http://www.edutechie.ws/2007/10/09/cone-of-experience-media/.

16. Croley, W.C. and D.M. Rothenberg, *Education of trainees in the intensive care unit.* Crit Care Med, 2007. **35**(2 Suppl): p. S117-21.

17. Ericsson, K.A., *Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains.* Acad Med, 2004. **79**(10 Suppl): p. S70-81.

18. Ray, A.M. and D.P. Sole, *Emergency medicine resident involvement in EMS.* J Emerg Med, 2007. **33**(4): p. 385-94.

19. *Grady Emergency Medical Services (EMS) metrics*, 2010.

20. Bilukha, O.O. and C. Blanton, *Interpreting results of cluster surveys in emergency settings: is the LQAS test the best option?* Emerg Themes Epidemiol, 2008. **5**: p. 25.

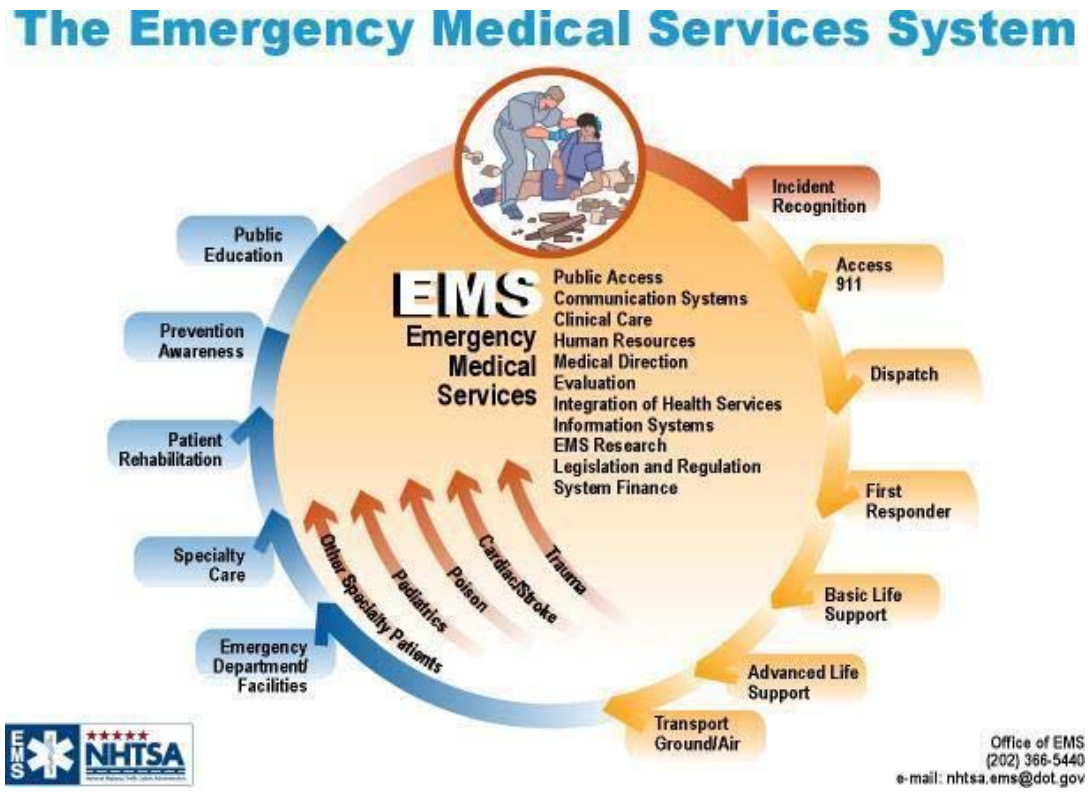
21. Robertson, S.E. and J.J. Valadez, *Global review of health care surveys using lot quality assurance sampling (LQAS), 1984-2004.* Soc Sci Med, 2006. **63**(6): p. 1648-60.

22. Habicht, J.P., C.G. Victora, and J.P. Vaughan, *Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact.* Int J Epidemiol, 1999. **28**(1): p. 10-8.

23. Institute of Medicine, *Future of Emergency Care: Emergency Medical Services at the Crossroads*2007: The National Academies Press, Washington DC.

Figures & Tables

Figure 1: Components of the Emergency Medical Services (EMS) System in the United States



Source: EMS, N. *Emergency Medical Services System*. Available from: http://www.ems.gov/emssystem/diagram.html.

Table 1: Adult Learning Principles that apply to the Medical Learner

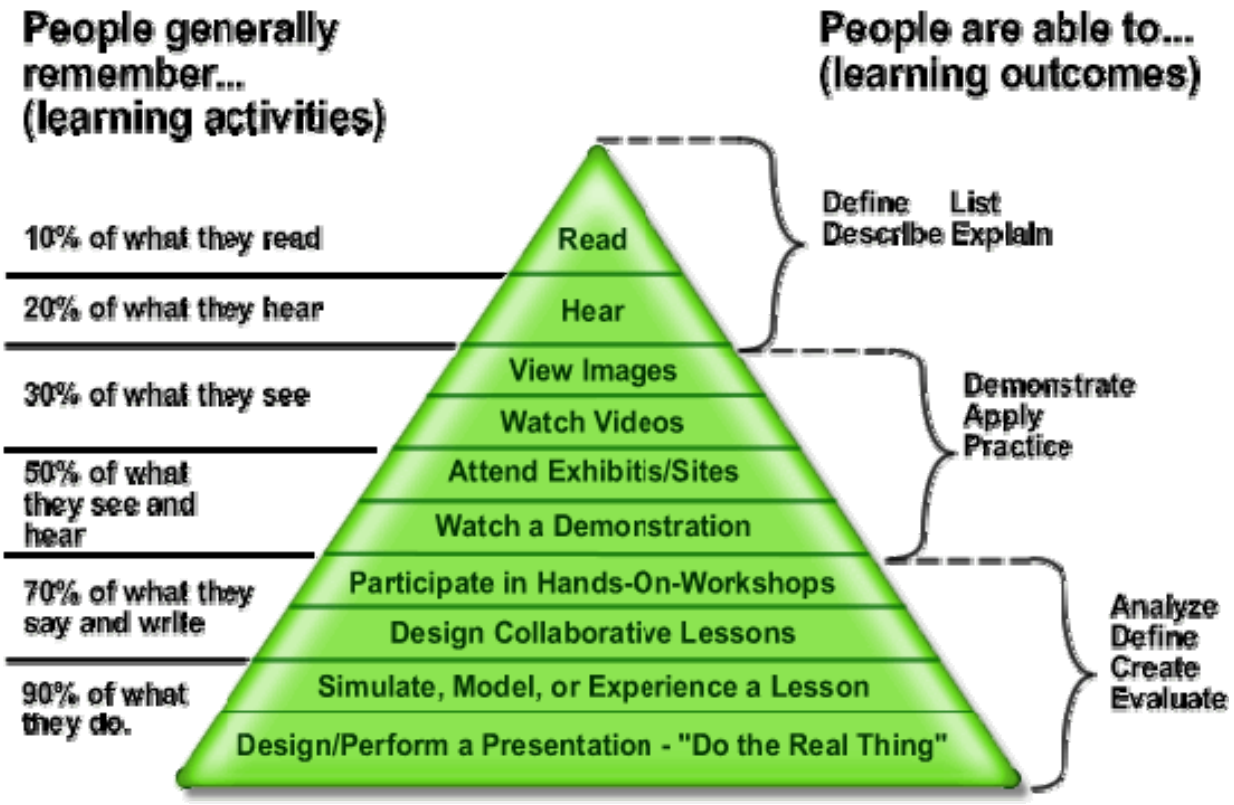
Five Adult Learning Principles That Apply to the Medical Learner
1. Adult learners need to know why they are learning.
2. Adult learners are motivated by the need to solve problems.
3. The previous experiences of adult learners must be respected and built upon.
4. The educational approach should match the diversity and background of adult learners.
5. Adults need to be involved actively in the process.

Source: *Okuda, Y., et al., The utility of simulation in medical education: what is the evidence? Mt Sinai J Med, 2009. 76(4): p. 330-43.*

Figure 2: Dale's Cone of Experience: an intuitive model of the concreteness of various audiovisual media

Source: *EMS, N. Emergency Medical Services System. Available from:* **http://www.ems.gov/emssystem/diagram.html**.

Figure 3: Cone of experience displaying percentage of information people remember under different learning conditions adapted from the original Dale's cone of experience



Source: *Jeffrey Anderson. Cone of Experience. 2007; Available from:* http://www.edutechie.ws/2007/10/09/cone-of-experience-media/.

Table 2: Proposed model Direct Medical Direction training curriculum for the Society of Academic Emergency Medicine (SAEM) Emergency Medical Services Committee

On-line medical radio operator training
4.1.1. Equipment - Explain how to use telemetry equipment.
4.1.2. Etiquette - Recite common appropriate radio jargon and explain meanings.
4.1.3. Protocols - Given a clinical scenario, recite the local EMT protocol.
4.1.4. Other training aids
4.1.4.1. Case reviews - Review tapes of common radio and problem radio calls.
4.1.4.2. Simulations - Demonstrate competence in management of simulated radio calls.
Time spent - 6 hours; Selected readings - Crowell
Direct Medical Direction
3.1.1. Medical radio operation – Precepted calls
3.1.2. Medical radio operation - At PGYII/III* level. Participate in regular direction of pre-hospital care as medical control physician.

*PGYII/III represents year 2 and year 3 of a three year residency program

Source: Verdile, V.P., et al., *Model curriculum in emergency medical services for emergency medicine residency programs. SAEM EMS Committee.* Acad Emerg Med, 1996. **3**(7): p. 716-22.

Figure 4: Conceptual Framework outlining the key determinants, outcome measures and benefits of the DMD program

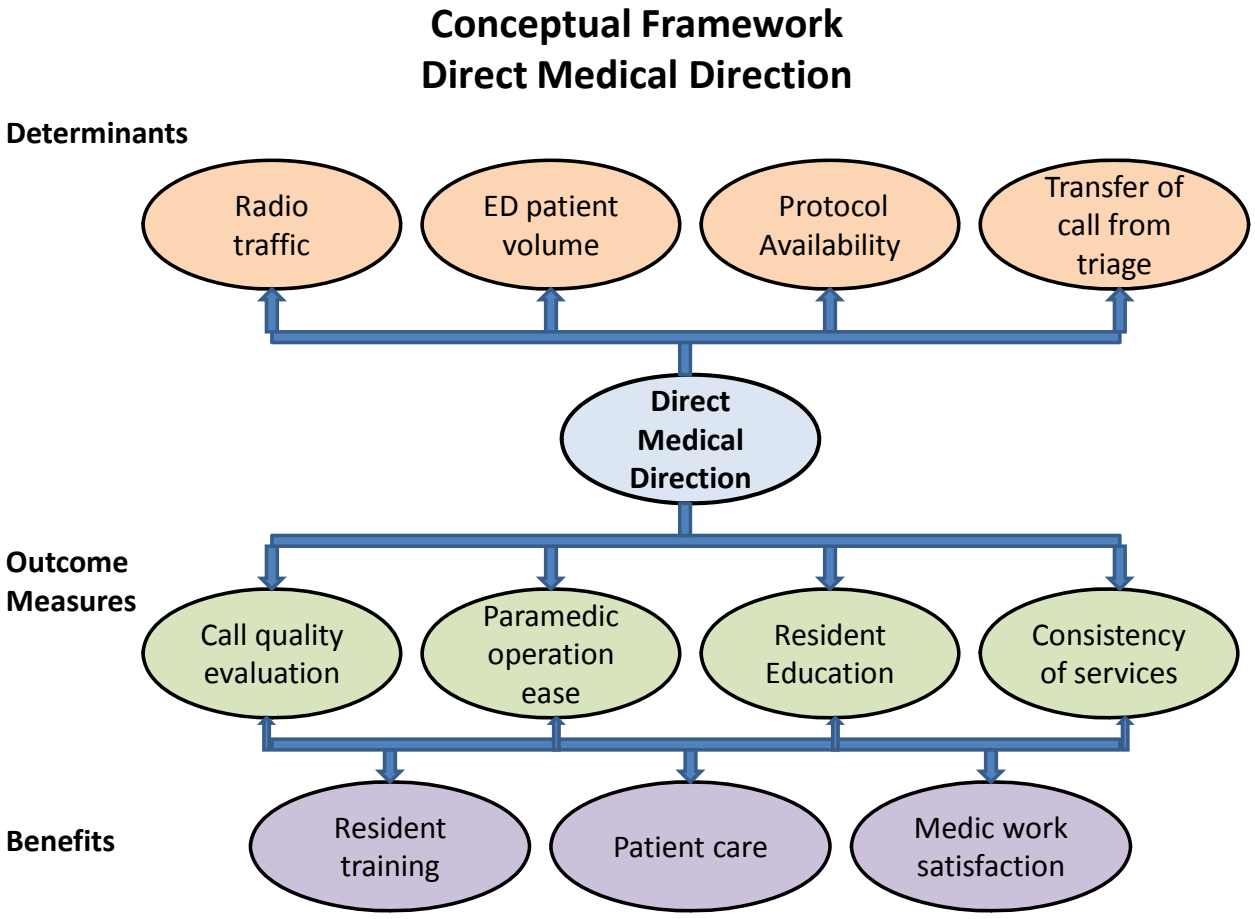


Figure 5: Log Frame outlining the performance indicators and means of verification for the various goals and outputs

CASE STUDY LOG FRAME			
Narrative Summary	**Performance Indicators**	**Means of Verification**	**Assumptions/Risks**
Goal: 1.1 Improve patient flow from the pre-hospital to hospital environment	1.2 Improve sign out ease and patient management from pre-hospital to hospital environment	1.3 Provider satisfaction surveys	1.4 Resources available to initiate and continue the project
Purpose: 2.1.1 Provide educational opportunity in medical direction to EM residents	2.2.1 Protocol based medical direction provided to medics by the residents	2.3.1 Average number of calls taken by the resident and review of call quality	2.4.1 Sufficient call volume for educational purposes
2.1.2 Achieve consistent medical direction provided by a large diverse group of EM physicians to the pre-hospital provider	2.2.2 Consistent medical direction provided based on protocol by all EM physicians	2.3.2 Review of recorded emergency radio calls to look for deviations	2.4.2 Provider willingness to modify current culture
Output: 3.1.1 Quality control feedback for year 3 ED residents	3.2.1 Constructive feedback for all calls taken by the resident for EMS education	3.3.1 Review of recorded calls and feedback to residents using feedback forms in addition to real time feedback by attending	3.4.1 Availability of attending supervision and submission of forms outlining call
3.1.2 Evaluation of quality and consistency of services provided	3.2.2 Consistent medical direction provided based on protocol by all MDs	3.3.2 Review of recorded emergency radio calls to look for deviations from protocol	3.4.2 Clear recorded data to evaluate direction provided

3.1.3 Ease of operation for paramedics **Activities:**	3.2.3 Smooth transition of calls by triage nurse to MD	3.3.3 Review of recorded calls to check for appropriate transfer by triage nurse	3.4.3 Consistently smooth transition of calls from triage to MD
4.1.1 Train year 3 ED residency students on radio operation and feedback forms	4.2.1 Legible forms submitted for each call taken and radio etiquette observed on recorded calls	4.3.1 Review of forms along with call review and observance of call review for etiquette	4.4.1 • Availability of physicians/ residents for training • Effective trainers • Functional equipment. Material (forms) availability • Appropriate form completion for calls taken
4.1.2a Train triage nurses to transfer EMS calls to ED physicians or answer patient status questions	4.2.2a Develop consistency in use of medical direction call codes	4.3.2a Triage nurse records on type; ED Physicians call log list; Recorded emergency radio calls	4.4.2a-b • Availability of nurses/ physicians/ residents and medics for training • Functional equipment, Material (forms) availability, effective trainiers
4.1.2b Train ED physicians and paramedics on proper radio operations	4.2.2b Two-way radio used as sole communication equipment between paramedics and ED	4.3.2b Triage nurse records of device paramedics calls were received on: radio or phone	
4.1.3a Review recorded calls received from the paramedics to the ED	4.2.3a Establish uniformity in ED physicians' medical direction	4.3.3a Recorded emergency radio calls	4.4.3a Availability and clarity of recordings to be reviewed
4.1.3b Survey paramedics regarding ease of operation since institution	4.2.3b Improve paramedics' facilitation of pre-hospital emergency care and transfer of patient to hospital setting	4.3.3b Delivery of pre-hospital emergency services satisfaction survey through online survey tool	4.4.3b Good objective response to the survey with a high response rate

Figure 6: Communications Pathway

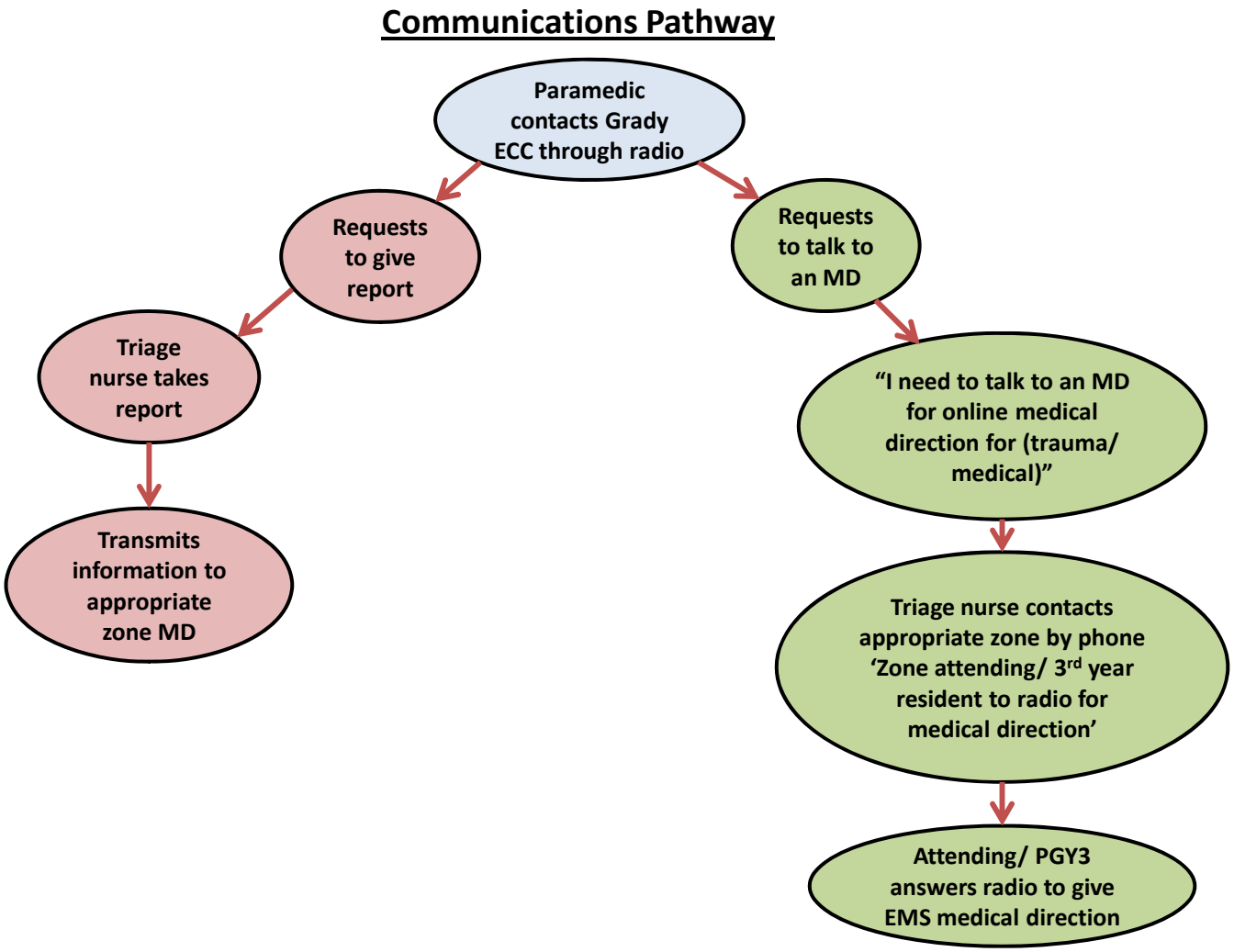


Figure 7: Triage Nurse's Call Log

Grady Emergency Department Call Log

Date: _____

Call Time (24-hr)	Patient Name	Unit #	Device Used	Call Type
Example: *0145*	*Grady Jackson*	*100101*	☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"
			☐ 2-way Radio ☐ Cell Phone	☐ "Nurse Report" ☐ "MD to Radio"

Figure 8: Direct Medical Control Form

Direct Medical Control Form

Attending Name: _____ Resident Name (if applicable): _____

Date: _____ Time (24-hour): _____ Unit #: _____

ETA: _____ Destination: _____

Patient Name: _____ Gender (circle one): Male Female

Chief Complaint:

GCS:

Vital Signs:
Pulse: _____/min BP: _____mm/Hg SpO2: _____

Resp rate: _____/ min Accucheck: _____

Medical Direction:
Reason for Paramedic's Call:

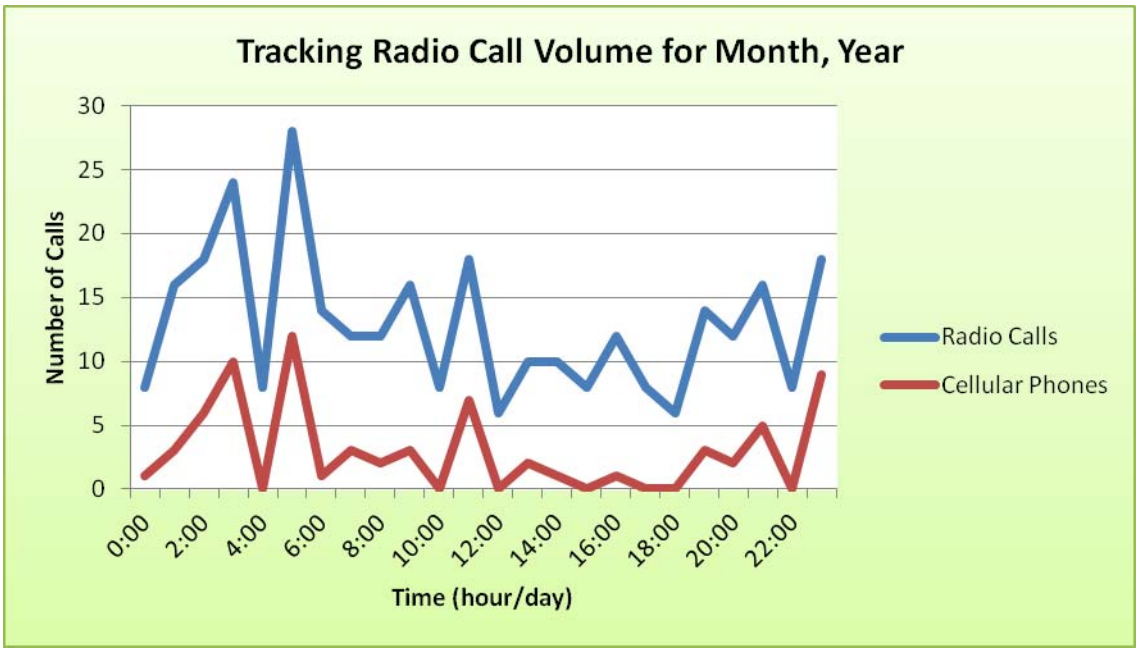
Medical direction provided:

Feedback:

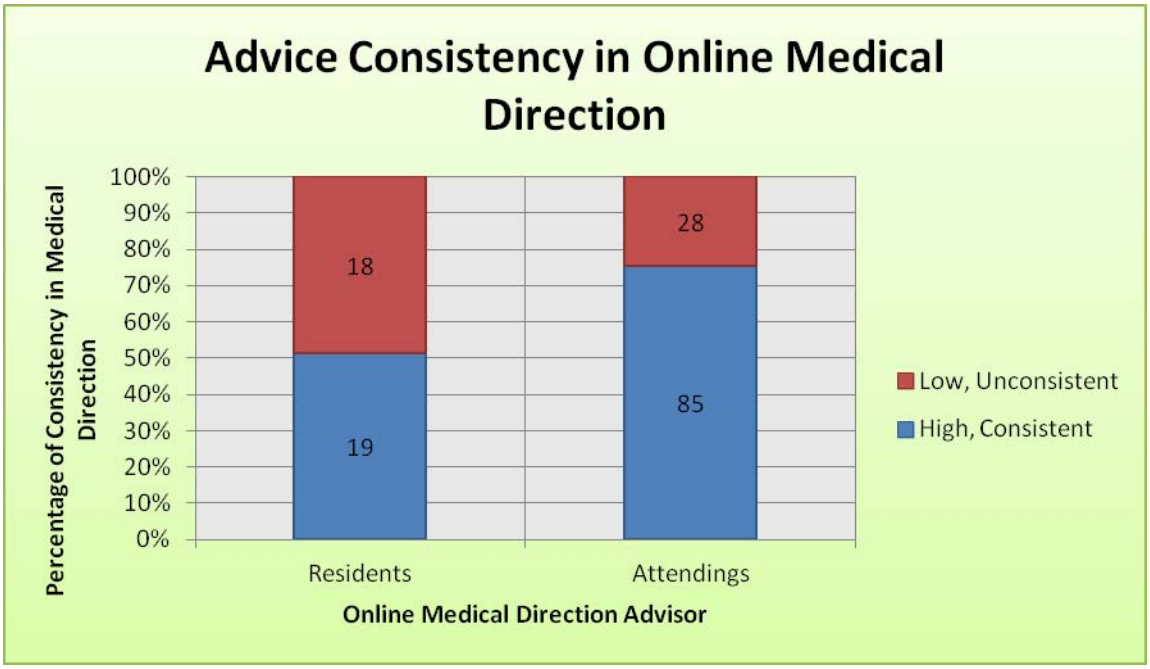
Figure 9: Gantt Chart

GANTT CHART	Year 1 (2011)				Year 2 (2012)				Year 3 (2013)				Year 4 (2014)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Activates																
Create DMD protocols	x															
Train triage nurses to notify ED physicians by phone		x														
Train new triage nurses and ED physicians			x		x		x		x		x		x		x	
Emergency radio operations training for ED physicians and paramedics		x														
Refresher training for EMS paramedics on updated emergency radio operations						x				x				x		
Training on DMD protocols and emergency radio operations for 3rd year residency students			x				x				x				x	
Monitor emergency calls			x	x	x	x	x	X	x	x	x	X	x	x	x	x
Have 3rd year medical residents complete the Direct Medical Control forms				x	x	x		X	x	x		X	x	x		x
Conduct phone interview with paramedics					x		x		x		x		x		x	
Provide feedback from interviews to ED physicians						x		X		x		X		x		x
Update DMD protocols					x				x				x			
Evaluation of all DMD project components																x

Figure 10: Data Summary

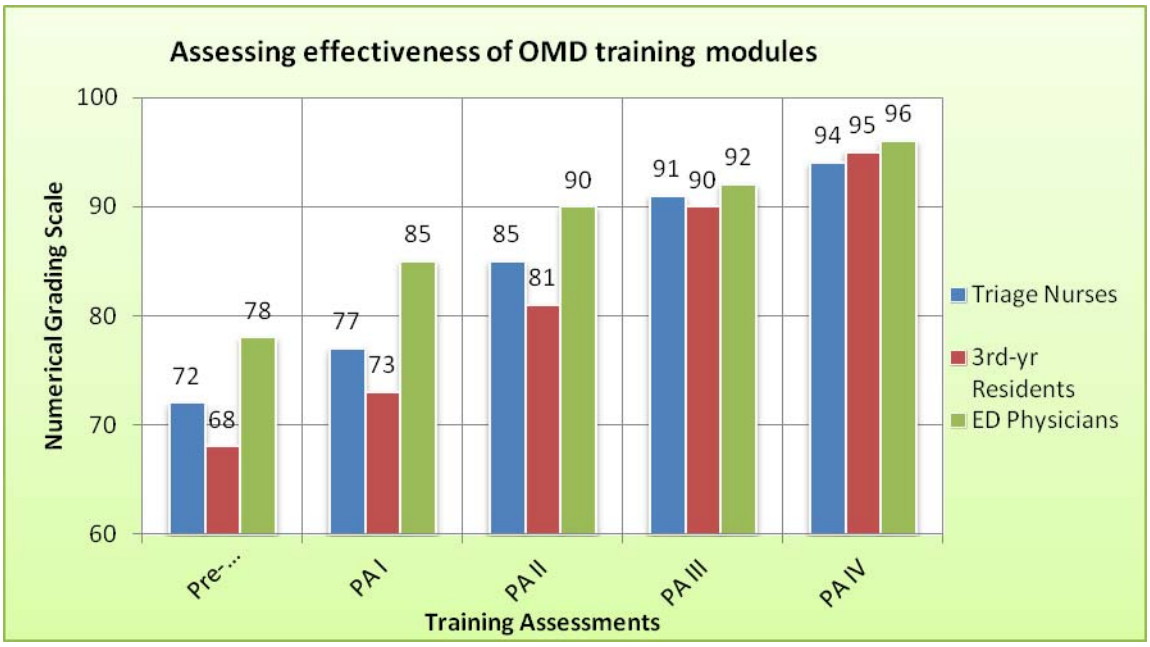


This graphical summary will show the call volume, as well as, the prevalence of nonstandard cellular phone use to make these calls. With this information, we can decide whether adding another radio frequency is needed to improve the use of two-way standard radio in order to record calls.



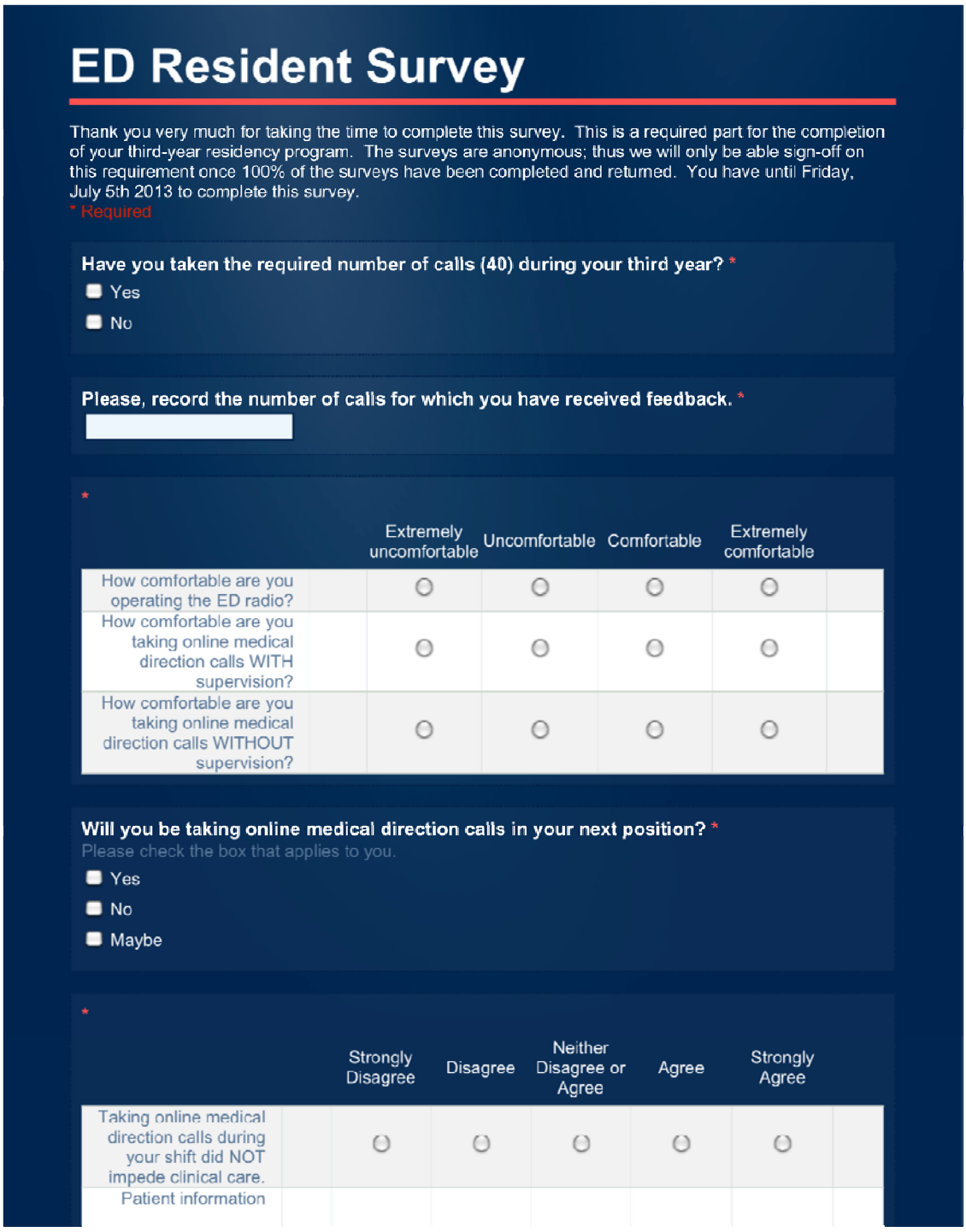
This graph shows the deviation in information consistency between residency students

and physicians. Also, the graph displays the percentage of call inconsistencies for both residents and attending, which will determine the need for and type of DMD training needed to improve patient transition from pre-hospital to the hospital environment.



This graphical summary shows the average scores of the pre-assessments and the various post-training assessments for the three personnel categories requiring continual DMD training. These grades will be used to determine the need to modify the training module curricula and/or instruction. Also, these grades could be used to determine the effectiveness of the trainers.

Figure 11: Sample Resident Survey



ED Resident Survey

Thank you very much for taking the time to complete this survey. This is a required part for the completion of your third-year residency program. The surveys are anonymous; thus we will only be able sign-off on this requirement once 100% of the surveys have been completed and returned. You have until Friday, July 5th 2013 to complete this survey.

* Required

Have you taken the required number of calls (40) during your third year? *

- ☐ Yes
- ☐ No

Please, record the number of calls for which you have received feedback. *

*

	Extremely uncomfortable	Uncomfortable	Comfortable	Extremely comfortable
How comfortable are you operating the ED radio?	○	○	○	○
How comfortable are you taking online medical direction calls WITH supervision?	○	○	○	○
How comfortable are you taking online medical direction calls WITHOUT supervision?	○	○	○	○

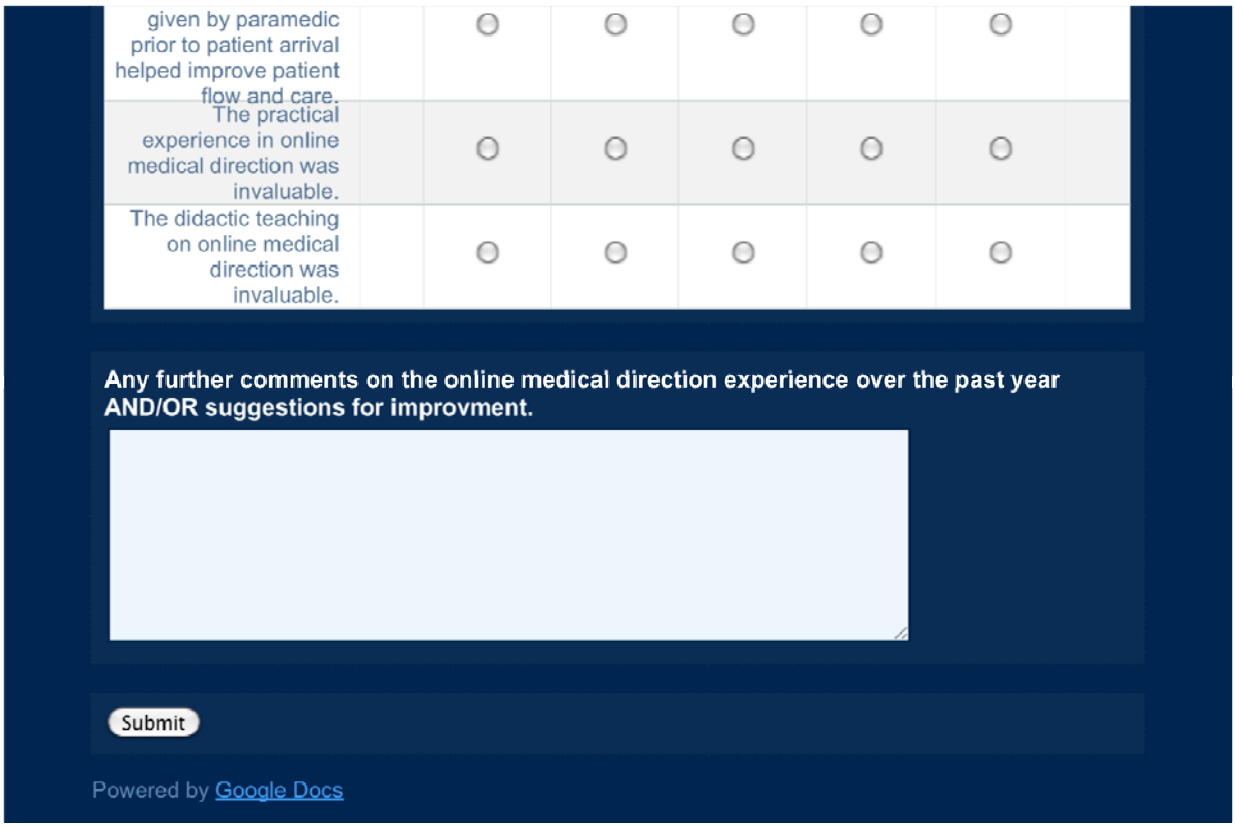
Will you be taking online medical direction calls in your next position? *

Please check the box that applies to you.

- ☐ Yes
- ☐ No
- ☐ Maybe

*

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
Taking online medical direction calls during your shift did NOT impede clinical care.	○	○	○	○	○
Patient information					



given by paramedic prior to patient arrival helped improve patient flow and care.						
The practical experience in online medical direction was invaluable.						
The didactic teaching on online medical direction was invaluable.						

Any further comments on the online medical direction experience over the past year AND/OR suggestions for improvment.

Submit

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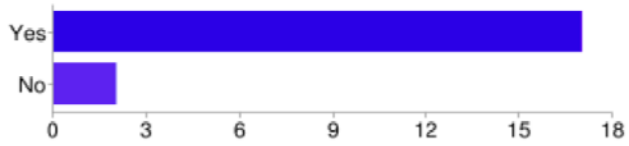
Figure 12: Sample Post Project Implementation Survey Responses

19 responses

Summary See complete responses

Have you taken the required number of calls (40) during your third year?



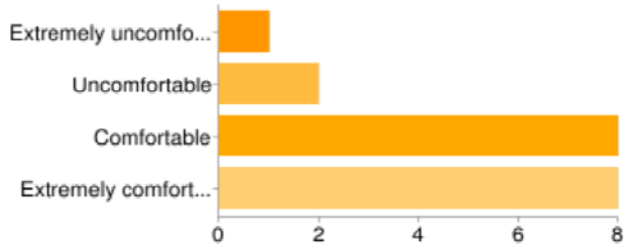
Yes	17	89%
No	2	11%

People may select more than one checkbox, so percentages may add up to more than 100%.

Please, record the number of calls for which you have received feedback.

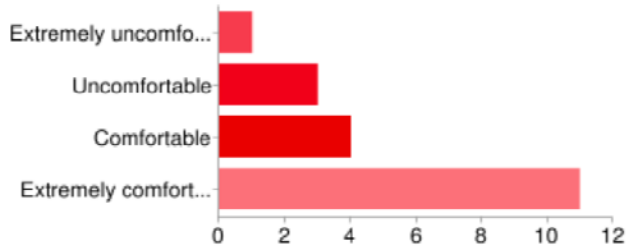
55 40 30 44 44 55 54 47 41 52 42 44 39 50 40 42 41 43 45

- How comfortable are you operating the ED radio?



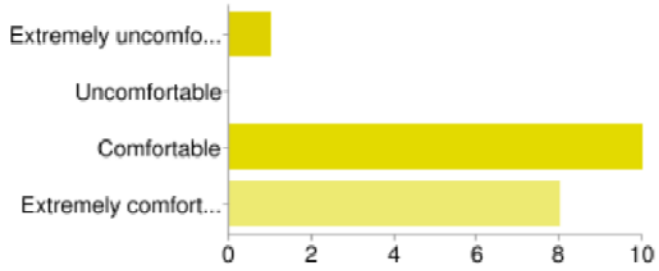
Extremely uncomfortable	1	5%
Uncomfortable	2	11%
Comfortable	8	42%
Extremely comfortable	8	42%

- How comfortable are you taking online medical direction calls WITH supervision?



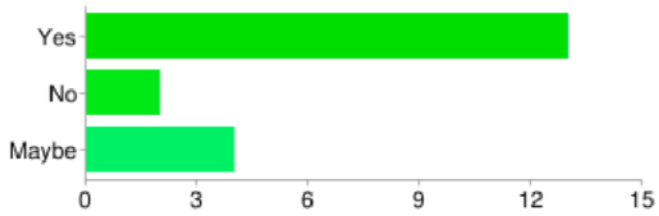
Extremely uncomfortable	1	5%
Uncomfortable	3	16%
Comfortable	4	21%
Extremely comfortable	11	58%

- How comfortable are you taking online medical direction calls WITHOUT supervision?



Extremely uncomfortable	1	5%
Uncomfortable	0	0%
Comfortable	10	53%
Extremely comfortable	8	42%

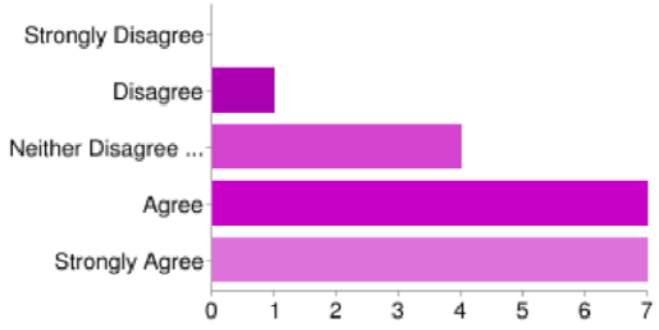
Will you be taking online medical direction calls in your next position?



Yes	13	68%
No	2	11%
Maybe	4	21%

People may select more than one checkbox, so percentages may add up to more than 100%.

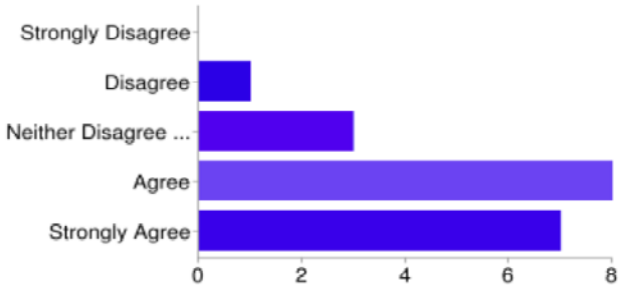
- Taking online medical direction calls during your shift did NOT impede clinical care.



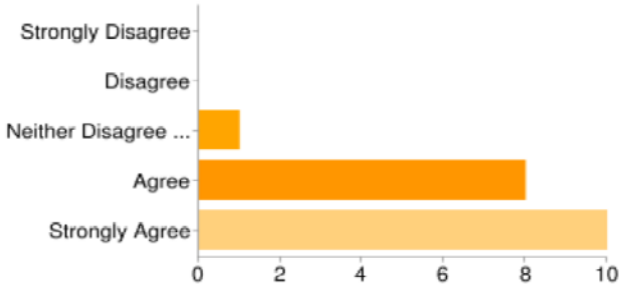
Strongly Disagree	0	0%
Disagree	1	5%
Neither Disagree or Agree	4	21%
Agree	7	37%
Strongly Agree	7	37%

- Patient information given by paramedic prior to patient arrival helped improve patient flow and care.

Strongly Disagree	0	0%
Disagree	1	5%
Neither Disagree or Agree	3	16%
Agree	8	42%
Strongly Agree	7	37%

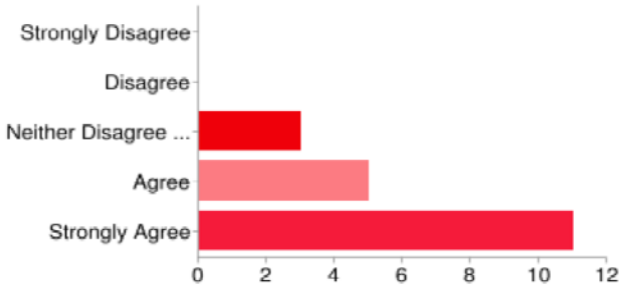


- The practical experience in online medical direction was invaluable.



Strongly Disagree	**0**	0%
Disagree	**0**	0%
Neither Disagree or Agree	**1**	5%
Agree	**8**	42%
Strongly Agree	**10**	53%

- The didactic teaching on online medical direction was invaluable.



Strongly Disagree	**0**	0%
Disagree	**0**	0%
Neither Disagree or Agree	**3**	16%
Agree	**5**	26%
Strongly Agree	**11**	58%

Any further comments on the online medical direction experience over the past year AND/OR suggestions for improvment.

More hours of instruction prior to taking the online medical calls would be helpful. Nothing. I have no suggestions as of now. Maybe having one more fellow or helper for the fellow to provide us the summary of call feedback bi-monthly. I would like more hands-on experience with the online medical direction. Nothing. The program was too hard! I'm so glad that I was able to be a part of this program. I think the program is beneficial to 3rd years and I learned so much more than I would of in school.