Implications of Pre-Alerts for Medical Emergency Calls

Dawn Faudere, EMT-P, EMD-Q[1] ; Jeff Hutchens, EMT-P, EMD-I/EFD-I/ETC-I[2]; Christopher Olola, PhD[3]; Greg Scott, MBA, EMD-QI[3]; Meghan Broadbent; BS[3]; Isabel Gardett, PhD[3]

IAED RESEARCH WORKSHOP STUDY

1. Johnson County Emergency Management & Communications, Olathe, Kansas, USA.
2. Guilford County Emergency Services/ Guilford Metro 911, Greensboro, North Carolina, USA.
3. International Academies of Emergency Dispatch, Salt Lake City, Utah, USA.

Corresponding Author
Dawn Faudere
Johnson County Emergency Management & Communications
11880 S Sunset Dr, Olathe, KS 66061
Phone. (913) 826-1031
Email. DFaudere@jocogov.org

Keywords
Pre-alert, Lights-and-siren, Medical Emergency Calls, Emergency Medical Dispatch.

Citation
Faudere D, Hutchens J, Olola C, Scott G, Broadbent M, Gardett I. Implications of pre-alerts for medical emergency calls. *Ann Emerg Dispatch & Response*. 2018;6(3):10-14.

ABSTRACT

Introduction: In emergency dispatching, pre-alerts are used to send responders to calls prior to getting a final dispatch code. Some studies have showed that pre-alerts can effectively reduce dispatch time for out-of-hospital cardiac arrests, potentially improving overall patient outcome. However, there is also a potential risk in running lights-and-siren on non-fully triaged calls. Although pre-alerts have been used for several years, no research studies have demonstrated its benefit, in general.
Objectives: The goal of this study was to determine the implications of pre-alerts for medical emergency calls, with regard to dispatch priorities, response units, and call cancellation and call downgrading.
Methods: This retrospective, descriptive study analyzed de-identified dispatch and EMS data from two emergency communications centers in the USA: Johnson County Emergency Communications Center (ECC), Kansas, and Guilford County Emergency Services, North Carolina.
Results: A total of 139,815 calls were included in the study, of which 73,062 (52.3%) were downgraded, and 7,189 (5.1%) were cancelled. This indicates a waste of valuable resources and an implied increase in cost and risk. Additionally, in 20.0% of the calls, at least one response unit was cancelled, while only 1.12% were transported with high priority (lights-and-siren). A median elapsed time (-14 sec) from pre-alert to ProQA launch indicates that calls sat in the queue for median time of 14 seconds before first units were assigned.
Conclusions: The study found a significant number of cancelled units and downgraded calls. In addition, the very small percentage of calls where patients were transported with high priority indicates unnecessary pre-alerts for non-critical patients. Study findings demonstrated that calls spent a substantial amount of time in queue, and units were sent without safety/final coding information. To better establish the positive and negative impacts of pre-alerting, a controlled study should be done to compare with findings from agencies that do not pre-alert calls.

INTRODUCTION

In emergency dispatching, pre-alerts are used to send responders to calls prior to achieving a final dispatch code using a structured emergency dispatch interrogation system. A study published in 2013[1] showed that pre-alerts can be effectively used to reduce dispatch time for out-of-hospital cardiac arrests (OHCAs), which has the potential to improve overall patient outcome. However, although this pre-alerting process has been used for several years, no research studies have demonstrated its benefit in general. In fact, there is substantial potential risk of running lights-and-siren on non-triaged, pre-alerted calls,[2] and several studies suggest that the time saved does not affect patient outcomes.[3,4]

As emergency calls are received, each call is entered in the Computer Aided Dispatch (CAD) system as soon as an address, a phone number, and the request for emergency medical services (EMS) is known to the calltaker. This allows for early dispatch of responders, although the patient status is not yet determined, and critical responder information such as safety hazards at the scene and number of patients are typically still unknown. Once the initial pre-alert is given to responders, the calltaker questions the caller using the Medical Priority Dispatch System (MPDS®) (Priority Dispatch Corp., Inc., Salt Lake City, Utah, USA) to arrive at the dispatch determinant code, which indicates high or low priority. The responding units typically respond lights-and-siren (L&S) and are then given the call's updates, which can either downgrade, cancel, or continue their response with lights-and-siren.

OBJECTIVES

The purpose of this study was to determine the implications of pre-alerts for medical emergency calls, with regard to dispatch priorities, response units, and call cancellation and call downgrading.

METHODS

Design

A retrospective study was done on data from two emergency communications centers in the United States of America (USA). The data used was de-identified data from the computer-aided dispatch (CAD) software, ProQA (the software logic engine version of the MPDS), and the electronic patient care record (ePCR). The study was approved by the International Academies of Emergency Dispatch (IAED) Institutional Review Board.

Setting

The two agencies included in the study were: Johnson County Emergency Communications (JECC), Kansas, and Guilford County Emergency Services (GCES), North Carolina. The two agencies pre-alert all medical calls, using moderate (JCECC) or high (GCES) dispatch priorities (Table 1).

The priority identifiers of interest for Johnson County were 1 (L&S and closest responders regardless of jurisdiction), 2 (L&S and closest responders within jurisdiction), 4 (closest responder with L&S and any others respond without L&S), and 6 (all responders respond without L & S), while those for Guilford County were P (Echo), 1 (Delta), 2 (Charlie), 3 (Bravo), 4 (Alpha), 5 (Omega), and 6 (Interfacility transfers). These priority levels are assigned to emergency medical calls to indicate priority of response (L&S or not, number of responders, and ALS or BLS responders). All calls are initially dispatched (pre-alerted) at the same level—dispatch level 4 at JECC and level P at GCES—and then updated based on the ProQA code when appropriate (Table 1).

Priority Dispatch	Dispatch Priority Codes	
	JECC	GCES
High	• 1 (L&S and closest responders regardless of jurisdiction) • 2 (L&S and closest responders within jurisdiction)	• P (Echo) • 1 (Delta)
Moderate	• 4 (closest responder with L&S and any others respond without L&S)	• 2 (Charlie) • 3 (Bravo)
Low	• 6 (all responders respond without L & S)	• 4 (Alpha) • 5 (Omega)
Others*	• 5 (erroneous priority used-accidental application to a medical call type) • 8 (erroneous priority used-accidental application to medical call type) • 10 (erroneous priority used)	• 6 (Interfacility transfers) • 7 (Convalescent)

L&S, Lights-and-siren.
*These priority codes were excluded from analysis because they were never pre-alerted by the agencies.

Table 1. Pre-alert priorities and codes

Johnson County ECC is a secondary Public Safety Answering Point (PSAP) that dispatches for the ALS ambulance service and ten fire departments. Johnson County has an approximate population of 500,000 residents and covers approximately 500 square miles. Johnson County processes about 40,000 medical calls per year and maintains MPDS® protocol compliance with 52% of calls at High Compliance, 27% of calls Compliant, 7% of calls Partial Compliance, 3% of calls Low Compliance, and 11% of calls Non-Compliant. Units are dispatched upon receipt of address and general medical nature by the calltaker. A response of lights-and-siren varies by department on initial dispatch, which utilizes GPS data to pull the closest jurisdictional response.

Guilford Metro 911 Emergency Services is one of the two primary PSAPs (providing a single centralized point of contact for all Guilford County and Greensboro residents to make one call to one center and receive one source for all public safety response needs). Guilford Metro 911 dispatches for one EMS service (Guilford County EMS), two fire services (City of Greensboro Fire Department and Guilford County Fire), and two police services (Police Department and Guilford County Sheriff's Department). The approximate population of Guilford County is 520,000 residents. The total medical call volume for the year 2016 was approximately 78,000. Guildford County is a recognized Accredited Center of Excellence meaning that the MPDS® protocol is followed with a high percentage of compliance. Currently, there are two PSAPs in the county. One is the City of High Point, which only dispatches City of High Point Fire Department and High Point Police Department. When they receive a call for EMS, they transfer the call to the main PSAP—Guildford Metro 911. For the rest of the county, the EMS calls come into Guilford Metro 911.

Outcome Measures

The study endpoints included: (a) distubutions of dispatch priorities, call outcomes following assigned MPDS Code, and on-scene outcome (disposition), (b) average elapsed time from call pick-up to pre-alert time (T1) and to final dispatch code assignment (T2) and/or to unit re-notification and update of the final code (T3)—for high vs. low priority and upgraded vs. downgraded calls, and (c) mean/median difference between time T1 and T2/T3 values.

Data Analysis

Using the priority levels assigned within CAD, the calls were determined to be high priority, moderate priority, or low priority as identified by each agency. Any identifiers that populated a priority outside the desired set for each agency was excluded from the data (6 calls from Johnson County and 2 calls from Guilford).

RESULTS

A total of 150,973 medical calls, collected from May 1, 2015 to July 31, 2017, were analyzed. Eight calls (6 calls from JECC and 2 calls from GCES) were excluded because they were erroneous entries, interfacility transfers, or convalescent responses. Of the remaining 139,815 (92.6%) calls, 75,045 (53.7%) involved female patients, and 80,516 (57.6%) were made by second party callers. Patients had an overall median age of 63.0 years (Table 2).

Measure	Guilford (N = 64,735) n (%)	Johnson (N = 75,080) n (%)	Overall (N = 139,815) n (%)
Gender			
Female	32,582 (50.3)	42,463 (53.6)	75,045 (53.7)
Male	26,152 (40.4)	31,250 (41.6)	57,402 (41.1)
Unknown	6,001 (9.7)	1,367 (1.8)	7,368 (5.3)
Median age (years)	58.0	67.0	63.0
Party-type			
1st	13,537 (20.9)	11,831 (15.8)	25,368 (18.1)
2nd	35,641 (55.1)	44,875 (59.8)	80,516 (57.6)
3rd	13,363 (20.6)	17,838 (23.8)	31,201 (22.3)
4th	2,187 (3.4)	530 (0.71)	2,717 (1.9)
Unknown	7 (0.01)	6 (0.01)	13 (0.01)

Table 2. Caller demographics

Overall, 100,250 calls (71.7 %) were initially dispatched (pre-alerted) as high priority, meaning with lights-and-siren (Fig. 1). Additionally, 11.9% were dispatched as moderate priority, meaning the closest unit going lights-and-siren and subsequent units responding without lights-and-siren. Thus, overall 83.6% of calls across the two agencies were pre-alerted with at least one lights-and-siren unit.

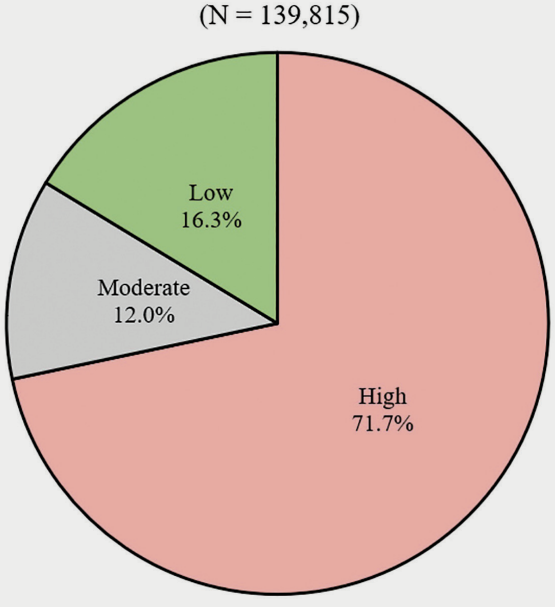

Figure 1. Overall dispatch priorities at pre-alert

These calls, initially responded to with a moderate or high priority, were often downgraded, had units cancelled, and/or had a low-acuity patient. Of the 71.7% of calls initially dispatched as high priority, 5.1% were cancelled, 52.3% were downgraded, and 29.0% had at least one unit cleared from the initial response (one or more units cancelled but some response continued) (Table 3). Calls that were placed to 911 by a fourth-party caller, recorded the highest percentage of cancelled calls (15.0%), downgraded calls (76.4%), and calls where one ore more response units were cleared (37.4%).

Overall, those calls assigned a BRAVO Priority Level in ProQA had the highest number of cancelled calls (8.6%), while the ALPHA-level calls had the majority of downgraded calls (97.2%), and ECHO-level calls registered the highest percentage of calls with one or more cleared response units (54.1%). Additionally, the highest percentage of cancelled calls, downgraded calls, and calls in which a response unit was cleared were confined in two Chief Complaint Protocols: Falls and Sick Person. The Falls Protocol had the highest number of cancelled calls (7.9%), while the Sick Person Protocol had the highest number of downgraded calls (80.3%). Calls in which at least one response unit was cleared were essentially identical in the Falls and Sick Person Protocols (31.7% and 31.9%, respectively).

Out of the total 139,815 calls, 56,236 total units were cleared from continuing responses. In the majority of these cases, only a single unit was cleared; however, some cases cleared ("stood down" or cancelled) up to 18 units without cancelling the overall response.

Further analysis of the data shows that it took 3 minutes to cancel a call from the time the call was pre-alerted (Table 4). On average, an emergency medical call was pre-alerted 49 seconds from the receipt of the call, with ProQA opened an average of 31 seconds after receipt of the call. This only allowed calltakers an average of 18 seconds to obtain scene safety information and patient acuity information, and could put responders at a disadvantage for personal safety. A final determinant or coding was acquired 71 seconds from the time that ProQA was launched, and a responder arrived on scene approximately 7 minutes after that. The time from call received to a responder arriving on scene was just over 9 minutes, the time from pre-alert to responder arriving on scene was just over 8 minutes, and the time from a final determinant to a responder on scene was just over 7 minutes.

Overall, 39.4% of patients were treated on scene and transported by EMS to the hospital (Table 5). Additionally, the data showed that only 1.1% of patients were critical and required a lights-and-siren transport. Another 29.4% were transported without lights-and-siren, and 5.3% of the patients refused care.

DISCUSSION

This study found that there was a significant percentage of calls that were downgraded from initial dispatch, often with some of the initially-dispatched units being cancelled or the call ultimately being given to a different unit. It was also found that there was a small percentage of calls that ended up being

Measure	Calls			Calls with a response unit cancelled (N=40,539; 29.0%) n (%)
	All (N=139,815) n (%)	Cancelled (N=7,189; 5.1%) n (%)	Downgraded (N=73,062; 52.3%) n (%)	
Dispatch priority level				
OMEGA	1,065 (0.76)	71 (6.7)	964 (90.5)	460 (43.2)
ALPHA	35,718 (25.6)	2,534 (7.1)	34,725 (97.2)	13, 276 (37.2)
BRAVO	23,212 (16.6)	2,001 (8.6)	11,355 (48.9)	6,821 (29.4)
CHARLIE	32,251 (23.1)	924 (2.9)	12,191 (37.8)	6,576 (20.4)
DELTA	45,790 (32.8)	1,596 (3.5)	13,821 (30.2)	12,444 (27.2)
ECHO	1,779 (1.3)	63 (3.5)	6 (0.34)	962 (54.1)
Party-type				
1st	25,368 (18.1)	1,299 (5.1)	15,354 (60.5)	6,998 (27.6)
2nd	80,516 (57.6)	3,499 (4.4)	39,952 (49.6)	23,154 (28.8)
3rd	31,201 (22.3)	1,982 (6.4)	15,680 (50.3)	9,364 (30.0)
4th	2,717 (1.9)	408 (15.0)	2,075 (76.4)	1,017 (37.4)
Unknown	13 (0.01)	1 (7.7)	1 (7.7)	6 (46.2)
Top 5 Chief Complaints				
17	24,147 (17.3)	1,908 (7.9)	16,037 (66.4)	7,655 (31.7)
26	22,450 (16.1)	826 (3.7)	18,028 (80.3)	7,157 (31.9)
31	14,317 (10.2)	462 (3.2)	1,622 (11.3)	3,586 (25.1)
6	13,969 (10.0)	358 (2.6)	5 (0.04)	2,905 (20.8)
10	11,726 (8.4)	209 (1.8)	5,906 (50.4)	2,301 (19.6)

Table 3. Call outcomes following assignment of true MPDS Determinant Code

transported lights-and-siren. Approximately 5% of calls ended up being cancelled. These findings suggest not only a safety issue to responders but a potential increased cost for starting a unit to a call with no information. Substantial cost savings, increased safety to responders and bystanders, and increased training and building inspections due to time and manpower reductions can also be achieved through proper triage of emergency calls using MPDS®.[5]

For both centers, calls were routed to the dispatch queue very quickly, and on average a unit was pre-alerted within 49 seconds of the call coming to the EMS dispatcher's queue. While this seems fairly quick to get responders en route, it did not appear to have a significant reduction in time to getting personnel on scene. In fact, there were times where the call may not have finished getting processed, not allowing the calltaker to get critical safety information to responders prior to them arriving on scene. It also showed an unnecessary use of lights-and-siren to many of the calls because not all of the information had been given to the units to determine the acuity of the patient.

This study compared times from pre-alert to arrival (crew-on-scene) with times from ProQA final coding to arrival. On average there was around a 56 second difference, which means a unit would take less than a minute to get the full information prior to being dispatched. This would allow the agency to correctly recommend the right resource, to the right patient, at the right time. Instead, valuable paramedic units are being sent on every call, even when the call ends up coding as a low acuity call not requiring a paramedic-level unit. This process also wicks away resources and makes them unavailable for actual high-priority calls, such as cardiac arrests, where sending the closest responder might make a difference.

Measure		Median elapsed time (in seconds)							
		Pre-alert* (49)	ProQA launch* (31)	ProQA launch§ (31)	Final coding+ (71)	Call cancelled§ (180)	Crew on-scene* (548)	Crew on-scene§ (491)	Crew on-scene¥ (435)
Caller-party type	1st	55	34	37	62	196	559	496	451
	2nd	48	30	29	73	148	540	484	427
	3rd	48	30	21	73	229	556	501	440
	4th	64	36	45	66	363	615	547	503
	Unknown	35	17	61	75	272	539	447	382
Dispatch priority	High	54	32	35	68	316	557	494	446
	Moderate	43	30	10	82	122	519	471	421
	Low	40	29	12	76	103	537	492	396
Cancelled calls	No	49	31	28	71	-	549	492	436
	Yes	53	32	46	72	180	507	447	390
Downgraded calls	No	43	29	14	70	146	493	445	384
	Yes	58	33	36	72	231	614	545	496
One or more units cleared€	No	49	31	28	71	162	544	487	430
	Yes	50	31	34	71	186	564	506	451

*Measured from call pick-up time
§Measured from pre-alert time
+Measured from ProQA launch time
¥Measured from final coding time
€One or more units cancelled or removed from response, but some response ongoing

Table 4. Elapsed time during the call processing life cycle.

Disposition	n (%) (N=139,815)
Treated and transported	55,108 (39.4)
Transported, no L&S	41,165 (29.4)
Treated, not transported	15,298 (10.9)
No patient found on scene	7,710 (5.5)
Patient refused care	7,354 (5.3)
Call cancelled	7,189 (5.1)
Transported, L&S	1,570 (1.1)
Others*	4,421 (3.2)

L&S, Lights and Siren
*Dead on scene (1.0%); treated, transferred care (0.51%); no treatment/transport (0.67%); not applicable (0.35%); false alarm (0.36%); assist (0.24%); standby only (0.01%); personnel aiding in transport (0.01%).

Table 5. Patient on-scene outcomes (disposition)

The data clearly show that on average, the calltakers are coding calls within 2 minutes of the call being received (median 92 seconds). While there are some outliers to this because of issues determining the address and other basic information, the relatively minimal extra time spent gathering all pertinent patient, situation, and scene safety information is vital to responder safety and correct dispatching of the units.

Guilford County uses a tiered dispatch system where fire departments are sent on certain medical calls with a BRAVO level or higher coding for the county and CHARLIE level and above for the city departments. The city department has an average response time of 4 minutes, and the county departments 6-8 minutes. With this in mind, there is little to no delay in the patient receiving immediate care from at least a BLS provider prior to a paramedic unit arriving on scene. The downside is that this speed could actually pose a risk to these first responders if safety information is not provided to them before arriving on scene; in some cases, police should even be notified to enter the scene first—a decision that can only be made when all the information is known.

Johnson County is also a tiered system but is saturated with ALS providers on fire apparatus for more than half of the fire jurisdictions that are dispatched by Johnson County. The fire department first responders are sent with the transporting unit on high-or moderate-priority calls, which is the pre-alert level for any 911 call for service. With an average response time of 5-8 minutes in the urban areas and a slightly higher time of 8-10 minutes for the more rural areas of the county, the rapid posting of medical calls without detailed information on scene safety or patient condition is potentially dangerous to responders, dangerous to the community, and costly to the department.

Limitations

It was difficult to compare some data because there was no comparison to agencies that do not pre-alert calls. Also, pre-alerting policies are different at every agency that uses pre-alerts, so findings may not be perfectly generalizable to all pre-alerting agencies.

CONCLUSION

This study indicates there is a clear risk to responders being sent on a pre-alert call with no information besides a nature code. The lack of scene safety information is a critical component to responder safety. The goal on every call is to have the right information to choose the right resource, for the right patient, at the right time. The MPDS has early send points built in to the protocol, which allow resources to be sent at the right time, even for very high-acuity calls. This study could be used for future developments of the protocols in order to achieve earlier send points if needed. Future research could expand the data sample size and incorporate agencies that do not pre-alert calls.

ACKNOWLEDGEMENTS

Many thanks to FirstWatch, the research gurus at IAED, and Johnson and Guilford Counties for contributing their data.

REFERENCES

1. Weiser, C. et al Dispatchers impression plus Medical Priority Dispatch System reduced dispatch centre times in cases of out of hospital cardiac arrest. Pre-alert—a prospective, cluster randomized trial. *Resuscitation*. 2013;84(7):883-888.
2. Robbins V. The pros and cons of using lights and siren. JEMS. Jul 1, 2017. Accessed Jul 20, 2018. Available at: https://www.jems.com/articles/print/volume-42/issue-7/departments/management-services/the-pros-and-cons-of-using-lights-and-siren.html.
3. Kupas D, Dula D, Pino B. Patient outcome using medical protocol to limit "lights and siren" transport. *Prehosp Disaster Med*. 1994;9(4):226-229.
4. Brown L, Whitney C, Hunt R et al. Do warning lights and sirens reduce ambulance response times? *Prehosp Emerg Care*. 2000;4(1):70-74.
5. Clawson J, Dale B. Lights-and-Siren. *J Emerg Dispatch*. Feb 2, 2018. Accessed Jul 18, 2018. Available at: https://iaedjournal.org/lights-and-siren/.