

The Distribution of a Fire Priority Dispatch System's™ Call Incident Types and Priority Levels in Selected U.S. Fire Agencies

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ABSTRACT

Introduction: The extent of fire emergencies in our communities is of great concern, not only to the public, but to the nation's fire departments, whose role is not only to respond to them, but to mitigate and, even earlier, to prevent them. The variety of types of fire-related emergencies reported to 911 is of significant interest to this ongoing mandate.

Objectives: The aim of this study was to characterize the distribution of calls handled using a Fire Priority Dispatch System (FPDS™) in the studied agencies.

Methods: This was a retrospective and non-controlled descriptive study involving nine emergency communication centers.

Results: Overall, 205,324 fire calls were handled during the study period. The most commonly used protocol was Protocol 52 (Alarms), which contributed nearly 50% of the total call volume (Fig. 3). The top five protocols were Alarms (52), Outside Fire (67), Structure Fire (69), Citizen Assist/Service Call (53), and Electrical Hazard (55).

Conclusions: Detailed knowledge of the distribution of call types and priority levels can inform fire service planning and operational decisions, including resource allocation and purchase of new apparatus. In the communication center, knowledge of median call type distribution provides the opportunity to track trends and patterns over time and to compare the call distributions of similar agencies.

INTRODUCTION

The extent of fire emergencies in our communities is of great concern, not only to the public, but to the nation's fire departments, whose role is not only to respond to them, but to mitigate and, even earlier, to prevent them. The variety of types of fire-related emergencies reported to 911 is of significant interest to this ongoing mandate. Inherent in this effort is to know the actual numbers and, more specifically, the frequency of the various types of fire response calls that must be evaluated by 911 calltakers, then prioritized, dispatched, and managed remotely until first-arriving crews take command of size-up, scene deployment, and suppression.

Currently four hundred and one (401) 911 dispatch agencies in North America use a structured fire emergency calltaking process known as the Fire Priority Dispatch System (FPDS™).¹ This system utilizes trained and certified emergency fire dispatchers (EFDs) to accomplish the critical tasks of information gathering, call prioritization, determining initial response, and providing caller (critical caller information, post-dispatch, and pre-arrival) instructions. EFDs use standardized, scripted questions to categorize calls by Chief Complaint (CC) (Figure 1) and assign a priority level (Figure 2) and descriptive code (determinant code) to each fire-related 911 event.

Each FPDS Chief Complaint protocol (Fig. 1) handles one call or event type, allowing the calltaker to ask specific questions relevant to the nature of the call and provide safety instructions specific to the situation type or event.¹ The calltaker selects the Chief Complaint based on the caller's response to the Case Entry question, "Okay, tell me exactly what happened." Caller interrogation using the FPDS is based on three priorities: life safety, incident stabilization, and property conservation. Questions dealing with potential life safety issues (whether for callers, bystanders, or responders) are asked first, and other questions elicit information that

influences the selection of an appropriate type and level of response: structure types, size of the fire if in brush or grass, and so on.

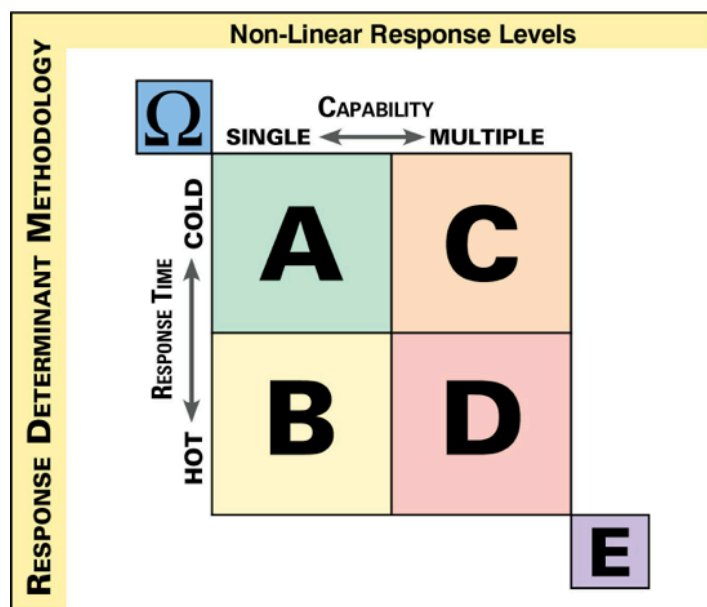
LIST OF PROTOCOLS

50 Case Entry Protocol	63 Lightning Strike (Investigation)
51 Aircraft Emergency	64 Marine Fire
52 Alarms	65 Mutual Aid / Assist Outside Agency
53 Citizen Assist / Service Call	66 Odor (Strange / Unknown)
54 Confined Space / Structure Collapse	67 Outside Fire
55 Electrical Hazard	68 Smoke Investigation (Outside)
56 Elevator / Escalator Rescue	69 Structure Fire
57 Explosion	70 Train and Rail Collision / Derailment
58 Extrication / Entrapped (Machinery, Vehicle)	71 Vehicle Fire
59 Fuel Spill	72 Water Rescue
60 Gas Leak / Gas Odor (Natural and LP Gases)	73 Watercraft in Distress
61 HAZMAT	74 Suspicious Package (Letter, Item) / Bomb Threat
62 High Angle Rescue (Above or Below Grade)	75 Train and Rail Fire

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Figure 1: The FPDS Chief Complaint Protocols v5.0

Six priority levels (Figure 2) are used to define the relative urgency of the response, and several hundred determinant codes are used to describe the specific nature of the event. The local fire department can use these universal codes to craft its own response plan, including an agency-defined response to each determinant code, based on its individual organizational practices, policies, procedures, and geo-political realities.



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Figure 2: Fire Priority Dispatch System Response Determinant Methodology

Figure 2 illustrates the interrelationship and function of the six priority levels in the FPDS. The highest priority level, the ECHO level, represents the most time-critical cases: those that require an immediate response by the

absolute closest available (and capable) responder and life-saving pre-arrival instructions provided over the phone to the caller. DELTA- and CHARLIE-level cases involve the response of multiple units for the incident and the option of running HOT (lights and sirens) or COLD (no lights and sirens). The decision whether to run HOT or COLD is made by the local fire administration prior to the implementation of the FPDS. DELTA- and CHARLIE-level cases also indicate an immediate need for the fire department and multiple personnel due to their high likelihood of escalating in severity and/or number of victims. BRAVO- and ALPHA-level cases primarily call for single-unit responses, with BRAVO going HOT and ALPHA going COLD. These incidents require firefighting operations but make fewer resource demands on the fire department. OMEGA (O) cases receive little or no response from the fire service. Often, incident information is collected, prioritized, and passed to other agencies, and the fire department never responds. To date, no studies have characterized the distribution of FPDS Chief Complaint protocols and priority levels.

OBJECTIVES

The objective of this study was to characterize the distribution of calls incident types handled using the FPDS in the studied agencies.

METHODS

Design and setting

This was a retrospective and non-controlled descriptive study involving nine emergency communication centers, accredited by the International Academies of Emergency Dispatch (IAED) as Fire Centers of Excellence: Guilford Metro 911, Greensboro, NC, USA; Prince George's County Public Safety Communications, MD, USA (PG County); Mecklenburg E.M.S. Agency (MEDIC), Charlotte, NC, USA; Harford County Division of Emergency Operations, MD, USA; Sarasota County Public Safety Communication Center, FL, USA; Metro/Nashville Emergency Communication Center, TN, USA; Union County Emergency Communications, NC, USA; Kent County Department of Public Safety, DE, USA; Manatee County Emergency Communication Center, FL, USA.

MEDIC, PG County, Guilford Metro and Metro Nashville agencies all serve populations between 500,000 and 1,000,000 people. All four agencies cover areas of approximately 500 square miles, with Guilford Metro covering 789 square miles. These agencies are primary public safety answering points (PSAP) and dispatch Fire, EMS, and Law Enforcement responses—with the exception of MEDIC, which dispatches Fire and EMS responses only and is a secondary PSAP.

Sarasota, Manatee, Harford, Union, and Kent agencies all serve populations between 150,000 and 400,000. All

five agencies respond to areas between 640 and 900 square miles, with Harford only covering 526 square miles. All five agencies are primary PSAP centers and dispatch Fire, EMS and Law Enforcement responses.

Study population

The study sites were included on the basis of being current users of the FPDS® (version 5.0, August 2009 release) and also Accredited Centers of Excellence with the IAED. The deidentified data were a convenience sample of all fire dispatch data available during the study period from the agencies being studied; the sample involved three years (2011-2013) of data collected using ProQA® (software version of FPDS) from each site. The specific data elements which were extracted from these ProQA reports included, among others: the Chief Complaints (CCs) selected by the EFDs using the ProQA software, the priority level assigned to each call, and the Determinant Descriptors selected for each call.

Outcome measures

The primary endpoints were the frequencies distributions of calls, categorized by the CCs and Priority Levels, as selected by the EFDs in the nine centers.

Data analysis

STATA software for Windows® (STATA Statistical Software: Release 13.1 ©2013, StataCorp, College Station, TX, USA) was used for data analysis. Descriptive statistics such as frequencies and percentages were used in the tabulation of incidents of calls by CC, and Priority Level, by agency, and overall.

RESULTS

Overall, 205,324 fire calls were handled in the nine agencies during the study period. Of these calls, 191 (0.1%) were excluded from the study since call prioritization time (CPT) was five seconds or less ($n=39$) or more than 10 minutes ($n=152$). Of the cases that had a CPT of five seconds or less, 84.1% ($n=33$) were ECHO, 10.3% ($n=4$) were BRAVO, and 5.1% ($n=2$) were ALPHA calls. Of the cases that had a CPT of more than 10 minutes, 42.8% ($n=65$) were BRAVO, 27.0% ($n=41$) were CHARLIE, 16.4% ($n=25$) were DELTA, 10.5% ($n=16$) were ALPHA, 2.0% ($n=3$) were ECHO, and 1.3% ($n=2$) were OMEGA calls. The remaining 205,133 (99.9%) calls were included in the study.

Overall, Protocol 52 (Alarms) contributed nearly 50% of the total call volume from the nine agencies (Fig. 3). The top five protocols (i.e., Alarms [52], Outside Fire [67], Structure Fire [69], Citizen Assist/Service Call [53], and Electrical Hazard [55]) contributed 83.6% of the total call volume, while the top 10 protocols (i.e., the top five above plus Vehicle Fire [71], Gas Leak/Gas Odor (Natural and LP Gases) [60], Smoke Investigation (Outside) [68], Elevator/Escalator rescue [56], and Fuel Spill [59]) contributed 97.0% of the total call volume. Analysis by agency showed similar distribution patterns.

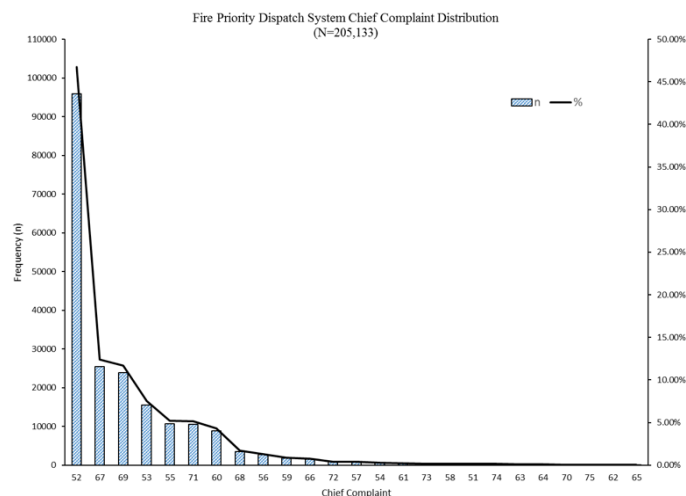


Figure 3: Fire Priority Dispatch System Chief Complaint Distribution

The FPDS BRAVO priority level was the most frequent (35.3%), followed by CHARLIE (35.0%), DELTA (15.7%), ALPHA (9.9%), OMEGA (4.0%), and ECHO (0.2%) priority levels (Table 1). The BRAVO and CHARLIE levels contributed over 70% of the total call volume. Together, the top 3 priority levels (BRAVO, CHARLIE, and DELTA) contributed over 86% of the total call volume.

By agency, PG County had the highest percentage of ALPHA (13.2%) and OMEGA (8.2%) calls. Union, Manatee, Kentucky, and Sarasota had the highest percentage of BRAVO (44.7%), CHARLIE (45.2%), DELTA (21.1%), and ECHO (0.7%), respectively.

Protocols 66 (Odor (Strange/Unknown)) and 53 (Citizen Assist/Service Call) had the highest percentages of ALPHA-level calls (86.4%) and the highest percentage of OMEGA-level calls (19.3%), respectively. Protocol 63 (Lightning Strike (Investigation)) had the highest percentage of BRAVO-level calls (88.7%), while Protocol 74 (Suspicious Package (Letter, Item)/Bomb Threat)) had the highest percentage of CHARLIE-level calls (82.0%), and Protocol 62 (High Angle Rescue (Above or Below Grade)) had the highest percentage of DELTA-level calls (93.5%). Protocol 72 (Water Rescue) had the highest percentage of ECHO calls (19.2%) (Table 2).

DISCUSSION

Protocol 52 (Alarms) was by far the most commonly-used FPDS Chief Complaint protocol in the agencies studied. Somewhat unexpectedly, Protocol 67 (Outside Fire) was used slightly more frequently than Protocol 69 (Structure Fire), although structure fires, in the authors' experiences, are often perceived to be the most common fire service calls after alarms. This finding is especially interesting given that the agencies studied were almost all located in the Eastern states of the United States, with no agencies studied from the Western states. Typically—according to sources in multiple fire service agencies—structure fires

Agency	n	Priority level: n (%)					
		OMEGA	ALPHA	BRAVO	CHARLIE	DELTA	ECHO
Guilford	29,157	1,885 (6.5)	2,131 (7.3)	9,574 (32.8)	11,010 (37.8)	4,512 (15.5)	45 (0.15)
Harford	10,496	80 (0.76)	951 (9.1)	4,078 (38.9)	3,368 (32.1)	2,018 (19.2)	1 (0.01)
Kent	10,800	52 (0.48)	904 (8.4)	4,214 (39.0)	3,344 (31.0)	2,278 (21.1)	8 (0.07)
Manatee	13,814	90 (0.65)	1,152 (8.3)	4,631 (33.5)	6,244 (45.2)	1,683 (12.2)	14 (0.1)
MEDIC	9,152	195 (2.1)	648 (7.1)	3,680 (40.2)	3,330 (36.4)	1,296 (14.2)	3 (0.03)
Nashville	42,113	353 (0.84)	3,625 (8.6)	15,091 (35.8)	18,034 (42.8)	4,993 (11.9)	17 (0.04)
PG County	64,955	5,313 (8.2)	8,589 (13.2)	20,743 (31.9)	19,475 (30.0)	10,741 (16.5)	94 (0.14)
Sarasota	16,320	131 (0.8)	1,687 (10.3)	6,629 (40.6)	4,717 (28.9)	3,048 (18.7)	108 (0.66)
Union	8,326	142 (1.7)	665 (8.0)	3,725 (44.7)	2,254 (27.1)	1,532 (18.4)	8 (0.1)
Total	205,133	8,241 (4.0)	20,352 (9.9)	72,365 (35.3)	71,776 (35.0)	32,101 (15.7)	298 (0.15)

Table 1: Call volume distribution for each agency categorized by priority level

are believed to be more common in Eastern states than in Western states (due to older structures, denser population centers, and other factors), so this study suggests that, if Western states were included, outside fires might be found to be even more prevalent than shown here.

Other Chief Complaint protocols that fell higher in the distribution list than expected were Protocol 53 (Citizen Assist/Service Call) and Protocol 60 (Gas Leak/Gas Odor). Citizen Assist calls are part of the larger trend toward using fire responders in medical cases, often as first responders but sometimes, as with Citizen Assist calls, simply to provide manpower or equipment.^{2,3} More critically, given the occurrence of several recent high-profile building explosions, the position of Protocol 60 in the top seven Chief Complaints in the agencies studied may point to a potentially dangerous trend that should be studied further. Longitudinal studies of gas leak call prevalence and outcome, for example, could help confirm or refute the importance of this finding.

The overall median percentage of BRAVO- and CHARLIE-level calls was nearly identical (35.3% and 35.0% of total call volume, respectively), and although this varied somewhat by agency, these two levels combined made up more than 70% of call volume in every agency studied. This is particularly interesting given that 120 of the 278 total Determinant Descriptors in the FPDS (43.2%) are DELTAs, while the CHARLIE (n=46) and BRAVO (n=60) levels combined only contain 106 (36%) of the total available Determinant Descriptors. This might be in some part explained by the fact that DELTA-level calls often deal with high-priority incidents that may require specific, unusual response vehicles, apparatus, or teams. As a result, these DELTA call types are often broken down into

more-specific types by Determinant Descriptor. For example, all but one of the 12 DELTA codes on the Structure Fire Protocol classify various types of structures—but all are structure fire calls. The number of structure fires, then, essentially dictates the number of DELTA determinants on the structure fire Protocol 69, since each determinant is simply a different type of structure fire. The same is true of a number of other protocols. CHARLIE and BRAVO determinants, however, more often describe different types of events, rather than different variations on the same event type.

CONCLUSION

The study findings demonstrated that detailed knowledge of the distribution of call and event types is possible, using the FPDS. This added information can assist fire services with planning and operational decision making, including call response need, crew resource allocation, and even the purchase of new equipment and apparatus (for example, the finding that Outside Fire calls are even more common than Structure Fire calls suggests a potential need for more apparatus specific to outside fires, such as a brush truck). In the communication center, knowledge of call type distribution provides the opportunity to track trends and patterns over time and to compare the call distributions of similar agencies. Knowing which call types are common and which are rare can drive more effective training that focuses on ensuring calltaker proficiency with common calls and preventing loss of familiarity with call types that are rare but potentially serious if mishandled.

CC	n	Prior level: n (%)					
		OMEGA	ALPHA	BRAVO	CHARLIE	DELTA	ECHO
51	295	40 (13.6)	26 (8.8)	4 (1.4)	95 (32.2)	130 (44.1)	*
52	95,904	4,680 (4.9)	*	31,972 (33.3)	59,252 (61.8)	*	*
53	15,454	2,982 (19.3)	9,495 (61.4)	2,387 (15.5)	590 (3.8)	*	*
54	613	*		399 (65.1)	17 (2.8)	197 (32.1)	*
55	10,732	*	834 (7.8)	6,507 (60.6)	3,391 (31.6)	*	*
56	2,650	75 (2.8)	2,220 (83.8)	332 (12.5)	*	23 (0.87)	*
57	852	*	*	703 (82.5)	*	149 (17.5)	*
58	300	29 (9.7)	*	158 (52.7)	*	113 (37.7)	*
59	1,774	*	*	868 (48.9)	906 (51.1)	*	*
60	8,898	*	*	3,022 (34.0)	2,923 (32.9)	2,953 (33.2)	*
61	494	*	36 (7.3)	165 (33.4)	53 (10.7)	240 (48.6)	*
62	92	*	*	6 (6.5)	*	86 (93.5)	*
63	185	*	*	164 (88.7)	21 (11.4)	*	*
64	156	*	*	18 (11.5)	*	138 (88.5)	*
65	53	*	14 (26.4)	28 (52.8)	*	11 (20.8)	*
66	1,556	*	1,345 (86.4)	*	211 (13.6)	*	*
67	25,448	421 (1.7)	3,118 (12.3)	18,087 (71.1)	*	3,745 (14.7)	77 (0.30)
68	3,461	*	2,660 (76.9)	*	801 (23.1)	*	*
69	23,919	*	*	*	2,568 (10.7)	21,298 (89.0)	53 (0.22)
70	118	*	*	*	10 (8.5)	108 (91.5)	*
71	10,607	*	576 (5.4)	7,301 (68.8)	706 (6.7)	2,024 (19.1)	*
72	876	*	12 (1.4)	77 (8.8)	*	619 (70.7)	168 (19.2)
73	324	*	*	135 (41.7)	*	189 (58.3)	*
74	278	*	16 (5.8)	32 (11.5)	228 (82.0)	2 (0.72)	*
75	94	14 (14.9)	*	*	4 (4.3)	76 (80.9)	*
Total	205,133	8,241 (4.0)	20,352 (9.9)	72,365 (35.3)	71,776 (35.0)	32,101 (15.7)	298 (0.15)

CC: Chief Complaint protocol

*No data

Table 2: Call volume distribution for each chief complaint protocol categorized by priority level

An increase in the use of data to drive decision-making in the fire service has encouraged fire dispatch centers to adopt dispatch practices that include a standardized process for gathering key information and assigning a specific FPDS code (Determinant Descriptor). These specific codes can help fire services track their incident and call types with precision.

This study represents a baseline for future studies by classifying the distribution of FPDS Chief Complaint protocols and priority levels in nine accredited agencies. Alarms was the most frequent Chief Complaint protocol used, followed by Outside Fire, Structure Fire, Citizen Assist/Service Call, and Electrical Hazard. BRAVO was the most frequent priority level, followed closely by

CHARLIE, then DELTA. Future research should examine differences in distribution frequency among agencies and geographic regions.

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