



Flipping OFF the Switch on HOT Emergency Medical Vehicle Responses

— JULY 7, 2021 | 14:00 ET | FREE —



Kevin Smith
Niagara EMS



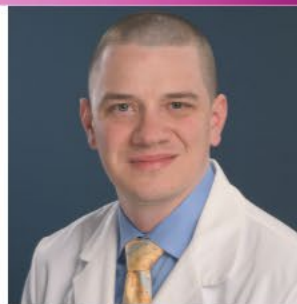
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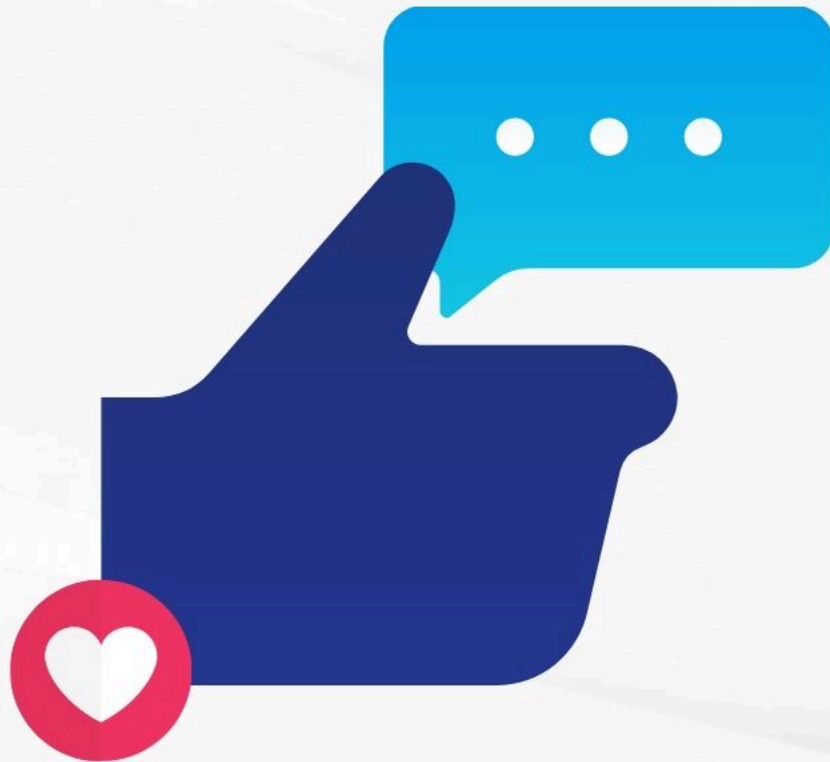
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Like (or ♥) the stream!
Ask questions in the comments.



Submit questions through the
Q&A function.



This session is being livestreamed and recorded!



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Lights & Siren Use by EMS:

Above All,
Do No Harm

Available at:
[ems.gov](https://www.ems.gov)

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Emergency Medical Services (EMS)



Lights and Siren Use by Emergency Medical
Services (EMS): Above All Do No Harm

Author:
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Submitted by Maryn Consulting, Inc.
For NHTSA Contract DTNH22-14-F-00579



Fact: L&S Driving Causes Crashes!

- 12,000 EMVCs / year
- Wake effect crashes
- Delay responses



Are L&S Related to Ambulance Crashes?



Table 3. Crash-related delays and lights and siren* use among ambulance 911 scene responses and subsequent transports.

Phase/Mode	N	Crashes	Rate/100,000	OR (95% CI)	AOR (95% CI)
Response phase					
No L&S	4,468,292	207	4.6	1 [Reference]	1 [Reference]
Any L&S	14,571,803	793	5.4	1.18 (1.01–1.37)	1.50 (1.19–1.90)
Full L&S	14,063,826	779	5.5	1.20 (1.03–1.39)	1.53 (1.21–1.94)
Transport phase					
No L&S	10,700,943	744	7.0	1 [Reference]	1 [Reference]
Any L&S	3,191,402	545	17.1	2.46 (2.20–2.74)	2.90 (2.18–3.87)
Full L&S	2,990,237	494	16.5	2.38 (2.12–2.66)	2.84 (2.12–3.80)

OR, Odds ratio.

*Full L&S means L&S use throughout the phase; any L&S includes responses and transports with L&S use in any part of the phase (ie, full L&S or upgraded to L&S or downgraded from L&S). AOR is adjusted for agency response volume, agency level of service, agency type of service, agency L&S use, agency staffing, run location, and time of day.

Watanabe BL, et al. Is use of warning lights and sirens associated with increased risk of ambulance crashes? A contemporary analysis using national EMS information system (NEMSIS) data. Ann Emerg Med. 2018

Use of L&S in U.S. in 2015

- 76.5% of responses used L&S
- 22.7% of transports used L&S (73.3% did not)
 - Varies 10.3% by urbanicity
 - Varies by 20.8% across U.S. Census divisions

(among 15.7 million 911 responses with transport)

Source: NEMSIS database

FIGURE 1

Graphical presentation of reported use of L&S during **response** as a % of all 911 responses by individual EMS agencies (n=9144 agencies) in 2015.

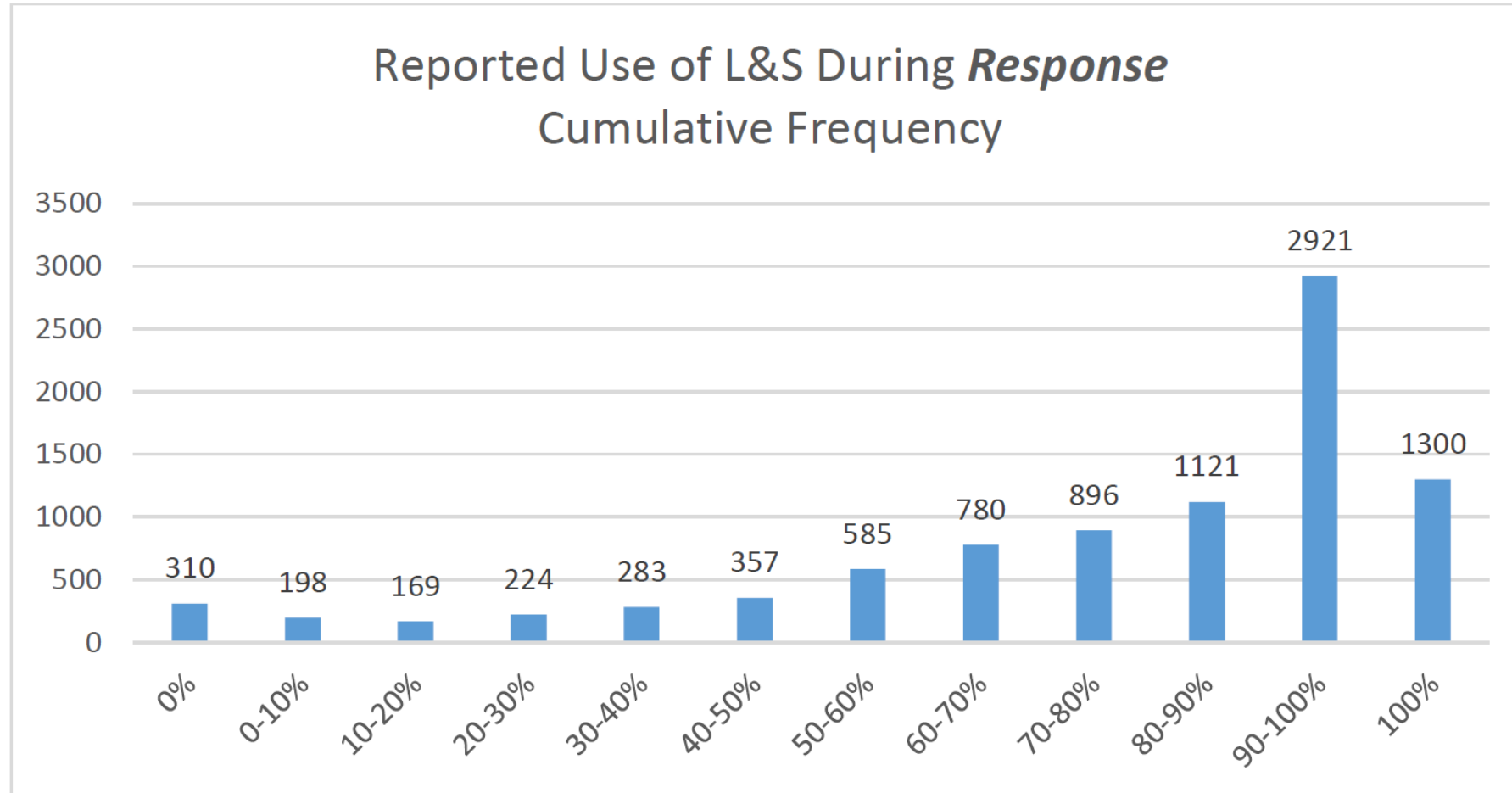


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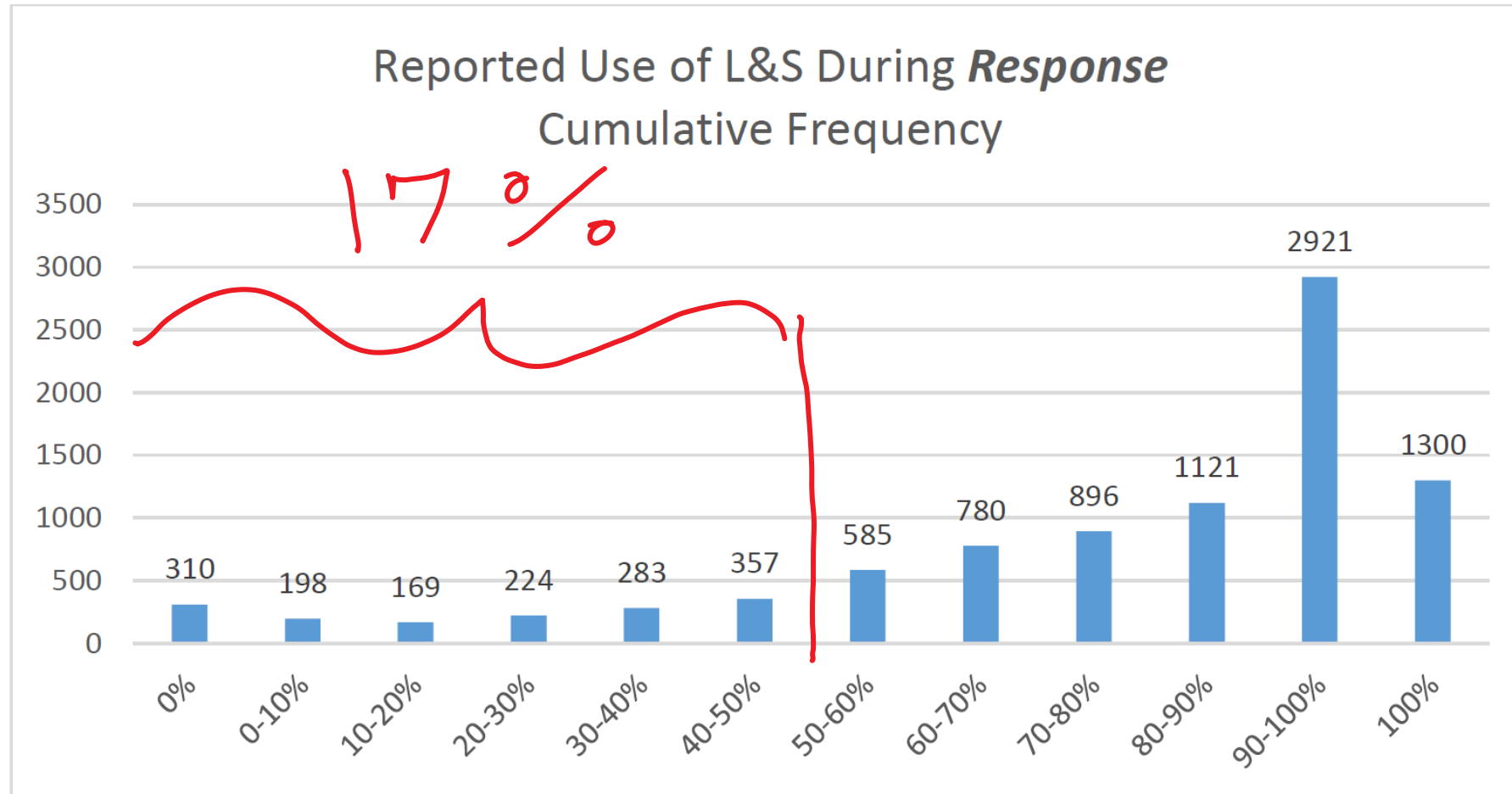
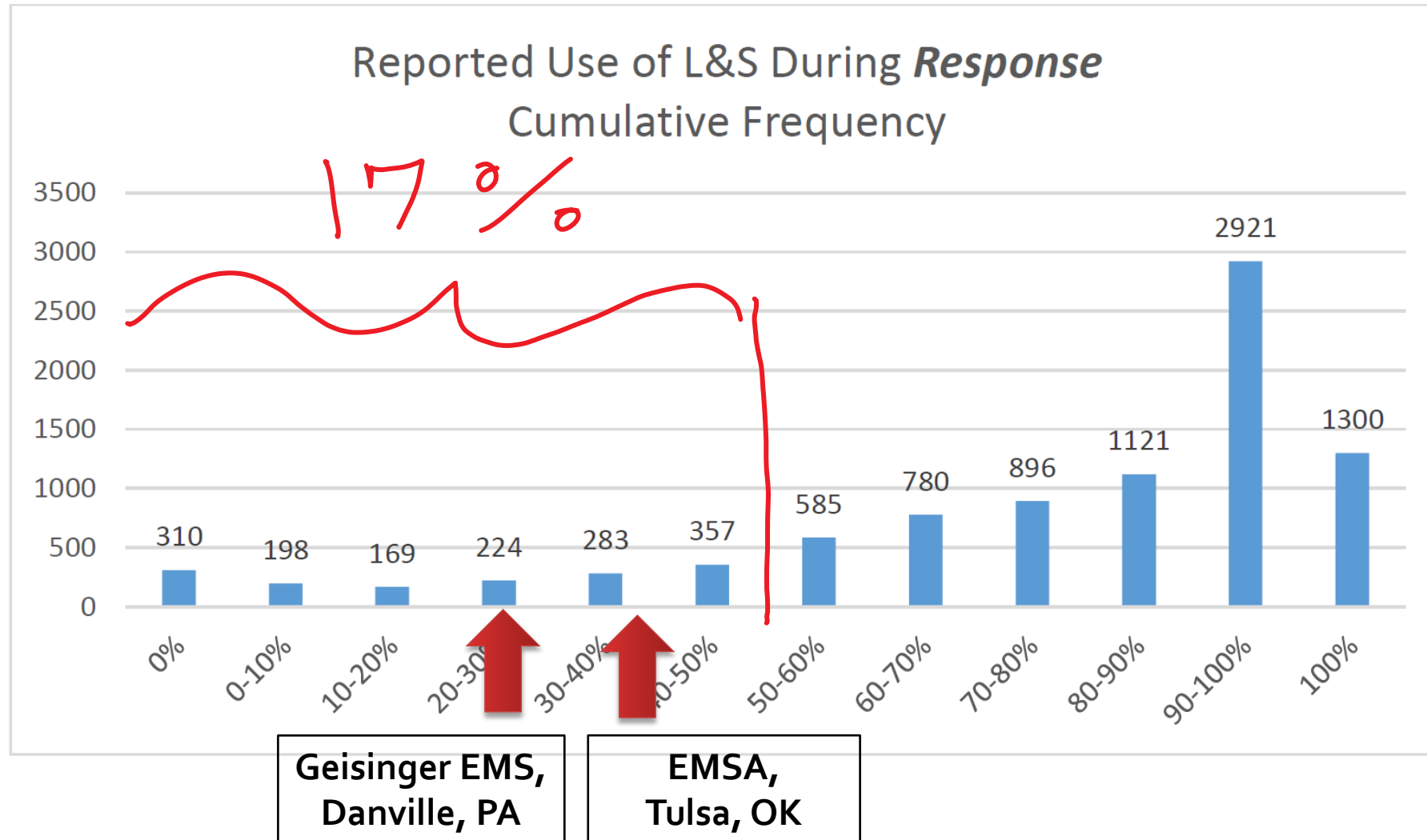


FIGURE 1

Graphical presentation of reported use of L&S during **response** as a % of all 911 responses by individual EMS agencies (n=9144 agencies) in 2015.



Time saved with L&S (response) 7 studies (1.7 – 3.6 min saved)

TABLE M Mean <u>response</u> time interval differences related to L&S use (from seven studies as shown)				
Author	Year of Study	Community/Geographical Location	Time Saved (in minutes)	Notes
Dhindsa	1994	Washington, DC	3.6	Poster Abstract
Zachariah	1994	Suburban Texas	1.7	Poster Abstract
Ho	1998	Minneapolis, MN	3.0	
Brown	2000	Syracuse, NY	1.8	
Ho	2001	Becker County, MN (rural)	3.6	
Williams	2005	Anne Arundel County, MD	2.2	Fire Department Report
Yeh	2011	San Francisco, CA	1.9	Response to Stroke Symptoms

Benchmark/ Performance Measure

EMD reduces the need for L&S Response

Rate of L&S Response to 911 Calls $< 50\%$

Public Perceptions and Expectations

“Competence is more often shown by quiet deliberateness than by noisy bravado.”

E. Marie Wilson
Conn. EMS Patient Survey
1980

Conclusion

Recommendations for EMS vehicle operations

- L&S use is a medical intervention
- Performance Parameter Benchmarks
 - L&S Response <50% of 911 responses
 - L&S Transport < 5% of 911 responses
 - L&S transport could be a sentinel QI event
- EMD protocols should be used to implement an evidence-based approach to L&S response
- Appropriate use of L&S is everyone's responsibility: dispatcher, EMSVO, EMS providers, first-in units, and medical director

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Lights and Siren Use by Emergency Medical
Services (EMS): Above All Do No Harm

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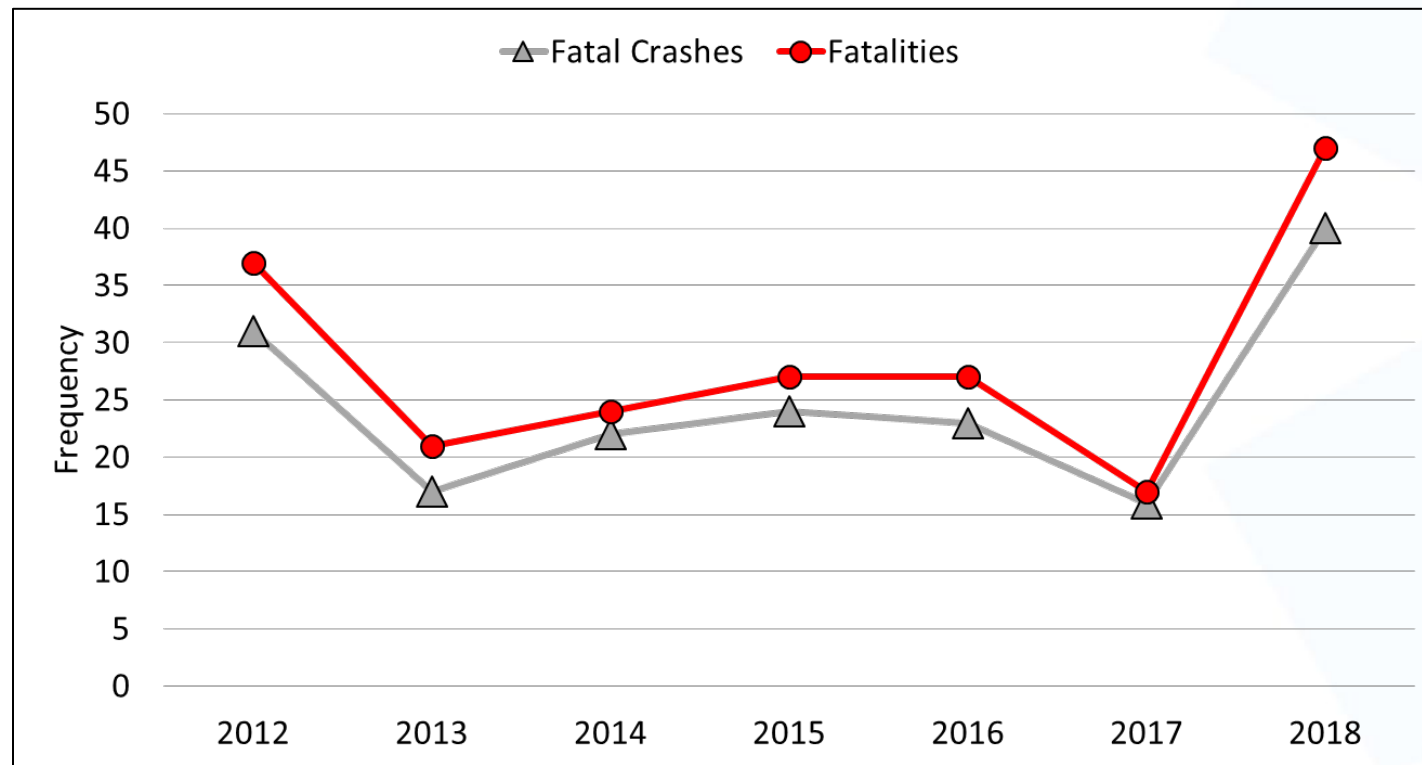


Ambulance-Involved Crash Data for 2012-2018



Annual Fatal Crashes

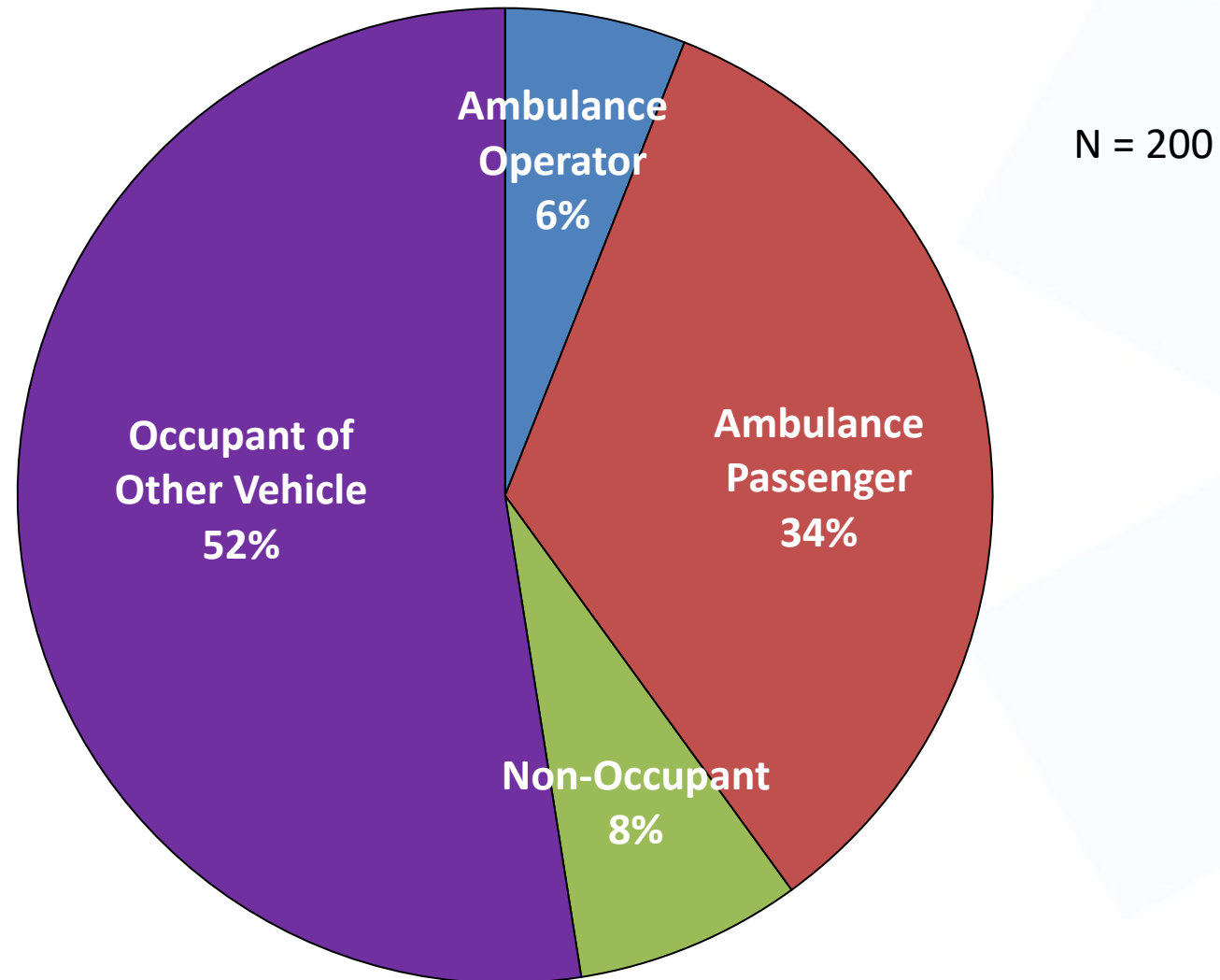
- ▶ Average of 25 fatal crashes per year
- ▶ Average of 29 fatalities per years



Source: NHTSA's FARS database

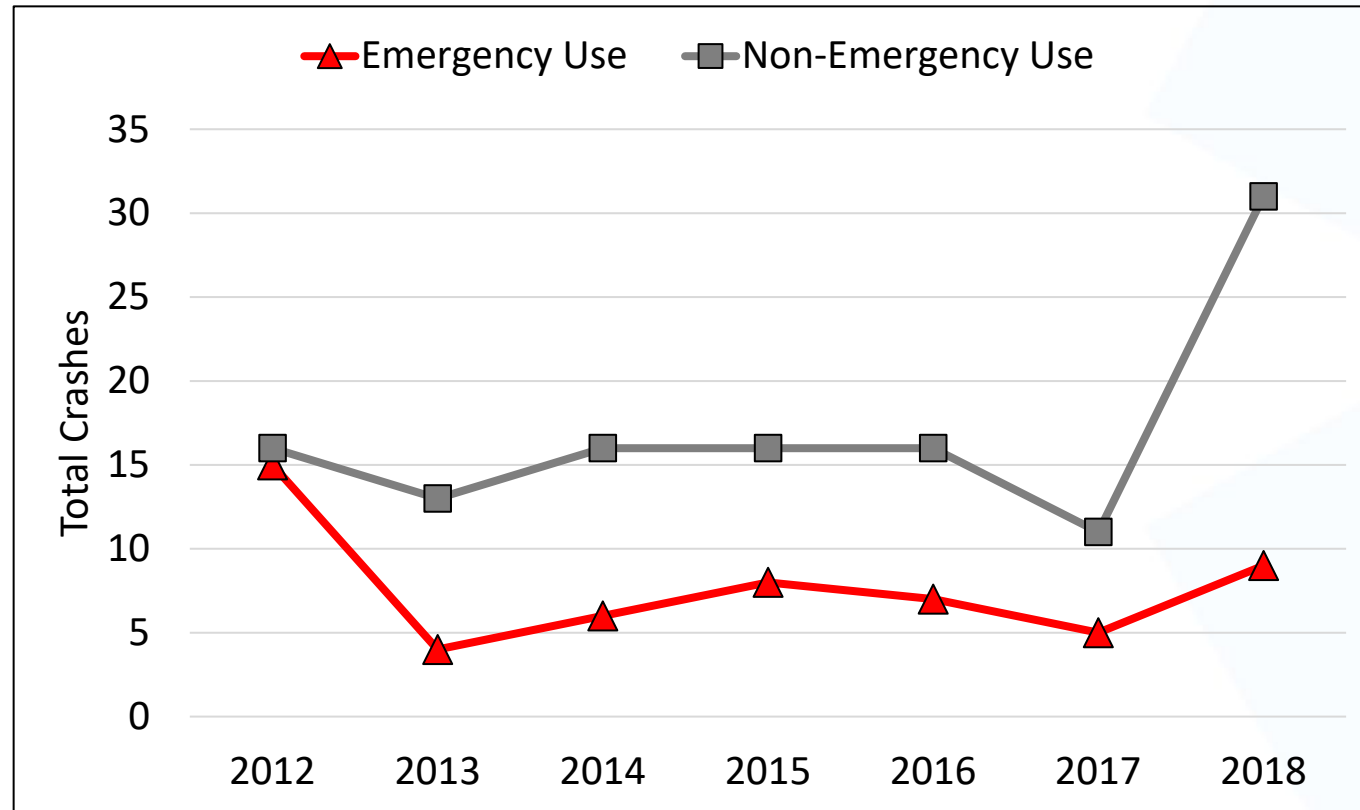
Note: Fatality counts include non-occupants (e.g., pedestrians, pedalcyclists)

Position of Persons Killed



Emergency Use in Fatal Crashes

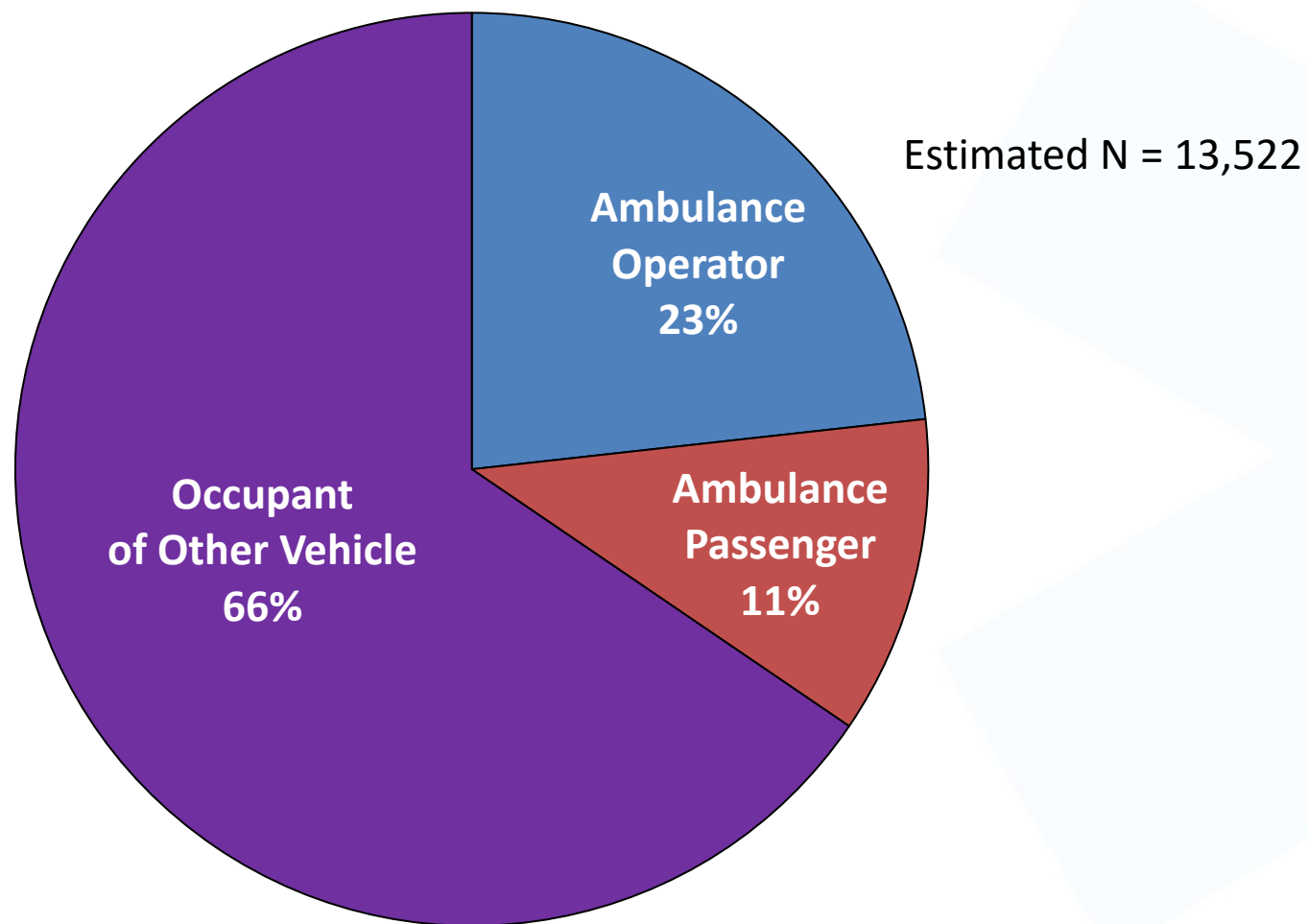
- ▶ 32% of fatal crashes involved emergency lights and sirens use



Source: NHTSA's FARS database

Note: Fatality counts include non-occupants (e.g., pedestrians, pedalcyclists)

Position of Persons Injured

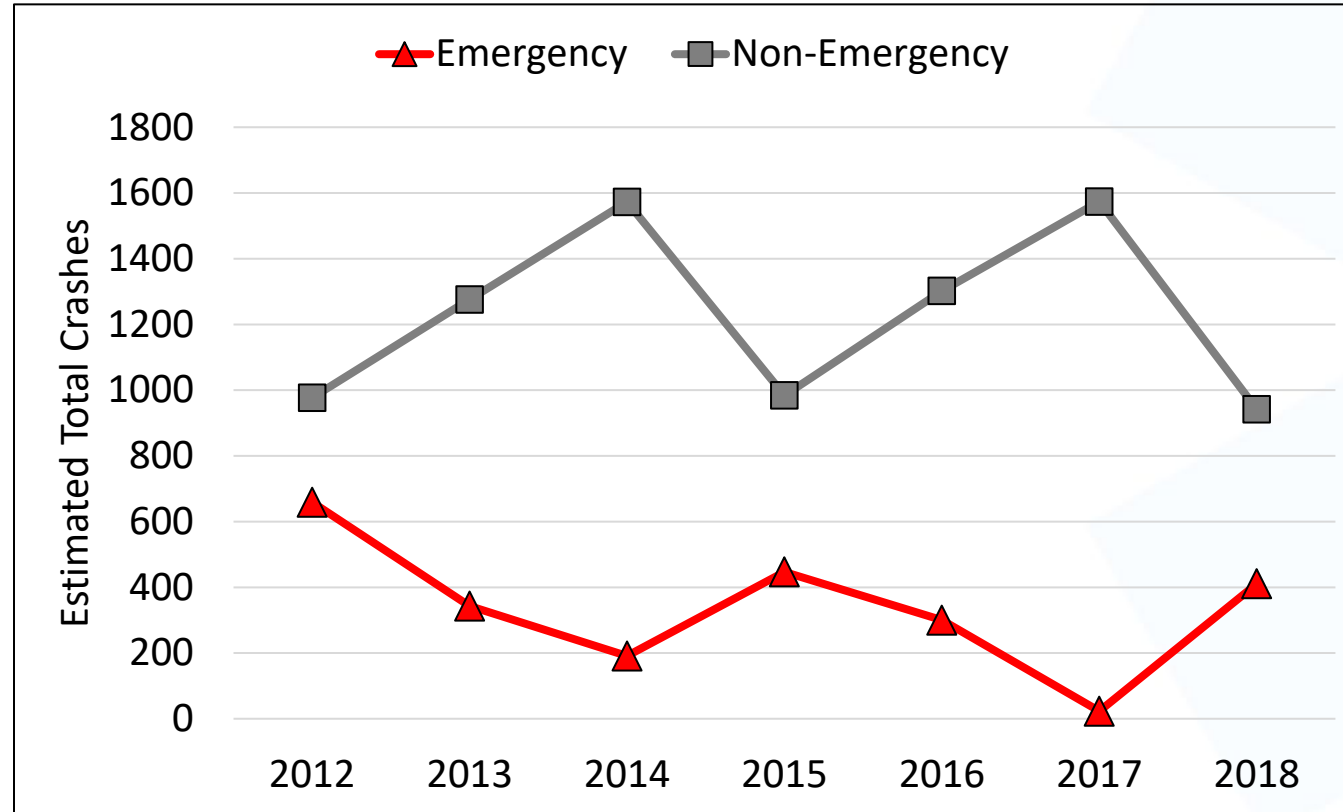


Sources: NHTSA's GES and CRSS databases

Note: Does **not** include data on injured non-occupants of a vehicle (e.g., pedestrians and pedalcyclists) because so few were involved in ambulance crashes in the databases that the estimates were not reliable.

Emergency Use in Injury Crashes

- ▶ Estimated that 22% of injury crashes involved emergency lights and sirens use



Sources: NHTSA's GES and CRSS databases

Note: Does not include data on injured non-occupants of a vehicle (e.g., pedestrians and pedalcyclists)

WHEN AMBULANCES CRASH

EMS Provider & Patient Safety

DATA COLLECTED BETWEEN 1992-2011



4,500

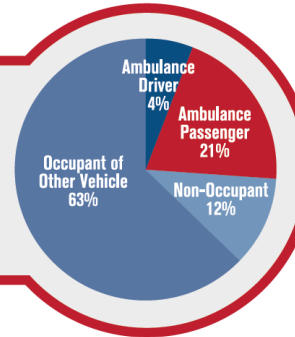
vehicle traffic crashes involving an ambulance per year
ESTIMATED ANNUAL AVERAGE

34%

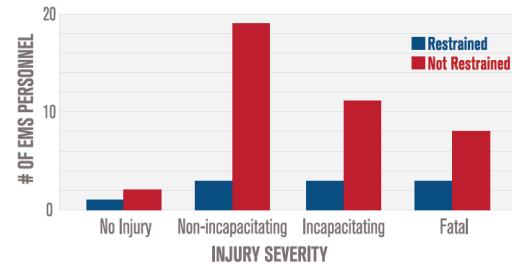
resulted in injuries

33

people killed per year



Injury Severity and Use of Safety Restraints in EMS Providers*



84%

OF EMS PROVIDERS
IN THE PATIENT COMPARTMENT



WERE NOT RESTRAINED*

ONLY 33%

OF PATIENTS

WERE SECURED*

WITH SHOULDER AND LAP RESTRAINTS

*IN SERIOUS CRASHES
INVESTIGATED BY
NHTSA

44%

of patients were
ejected from the cot
in serious crashes*

61%

restrained
with lateral
belts only*

38%

shoulder
harnesses
were
available
but were
not used*



WHEN AMBULANCES CRASH

EMS Provider & Patient Safety

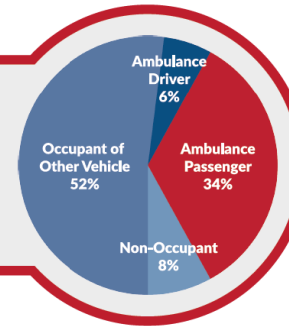
DATA COLLECTED BETWEEN 2012-2018



173 fatal
crashes
Fatality Analysis Reporting System

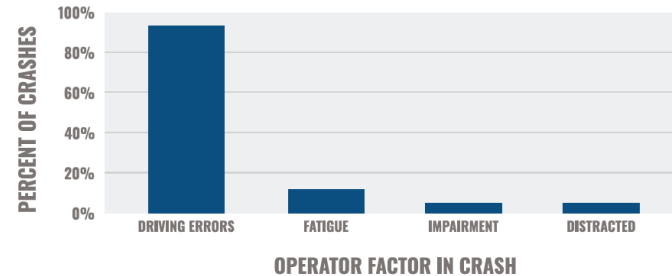
200
fatalities

29
people killed
per year



NHTSA Conducted 27 Special Crash Investigations

crashviewer.nhtsa.dot.gov



91%
OF THE 34 EMS PROVIDERS
IN THE PATIENT COMPARTMENT
WERE NOT RESTRAINED



ONLY 17%
OF THE 23 PATIENTS
WERE SECURED
WITH SHOULDER & LAP RESTRAINTS

30% of the 23 patients were
ejected from the cot in
serious crashes

78%
restrained with
lateral belts only

48%
shoulder harnesses
were available
but were not used

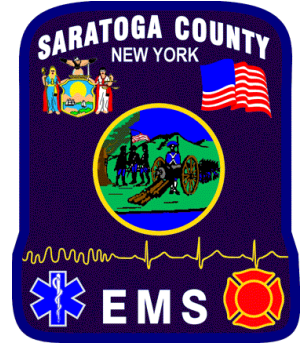


Saratoga County, NY – Bravo Responses



- 18+ year review – Jan 1, 2001 through June 30, 2018
- Examined 59,970 Bravo responses for *call disposition*
- Multiple datasets (NEMESIS, NYS EMS, emsCharts, DOH hospital data)

Saratoga County, NY – Results



n=	Disposition	%
2,910	Assistance Call (Lift or Other)	4.9%
3,940	Cancelled	6.6%
740	Dead at Scene, NO Resuscitation Initiated	1.2%
4,670	No Patient Found	7.8%
10,670	RMA BLS or ALS Treatment, NO Transport	17.8%
16,630	Treated, Transported ALS - No Lights / Sirens	27.7%
3,550	Treated, Transported ALS - Lights / Sirens	5.9%
16,860	Treated, Transported BLS - No Lights / Sirens	28.1%
59,970		100.0%

- 38.2% not transported
- Of 37,040 transported:
 - 565 admitted
 - 3 admitted to ICU beds
- Suggests that risks to patients are significantly less than RLS response risks to public and responders *and* increased costs of wear and tear on vehicles

Flipping OFF the Switch on HOT Emergency Medical Vehicle Responses

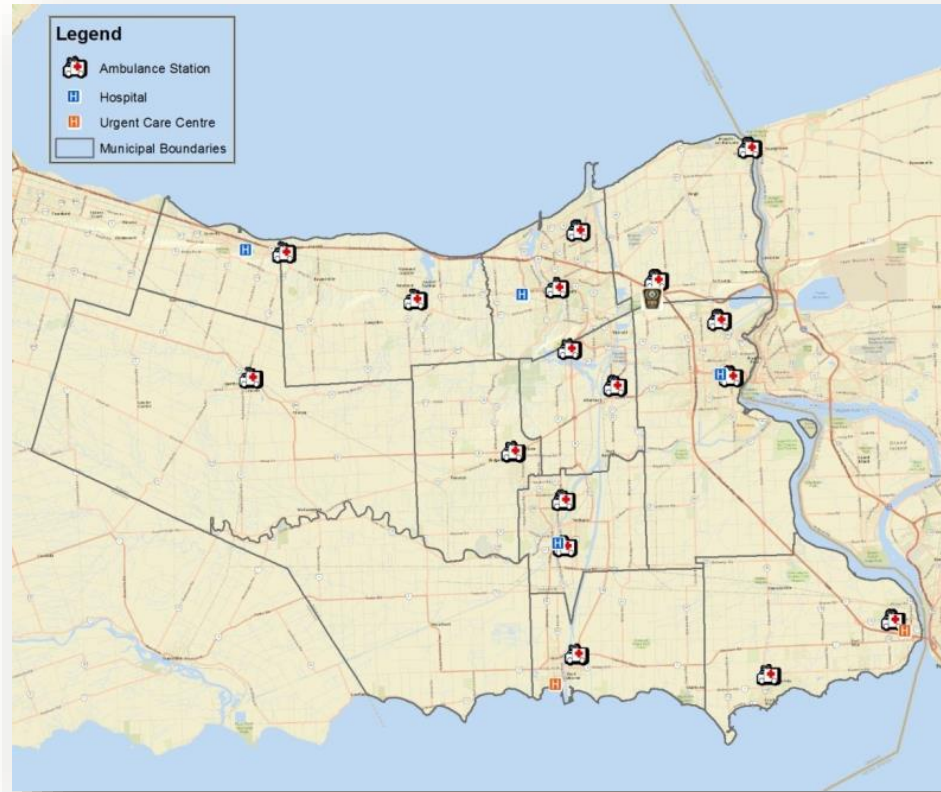


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It's Better to be Right Than Fast*

*And Sometimes, it's Right to be Fast

Service Profile



- 1854 sq km/1152 sq mi
- >90k calls
- ACE – MPDS & ECNS
- 911 service provider
- 43 ambulances (daily peak staffing of 33, Approx. 75% ALS)
- Emergency Communications Nurse (ECN) 16 hours/day
- MIH Teams

It's not about us...



The Stakes are High

'Patients will literally die': Times when no ambulances available on the rise



Code zero incidents rising again at alarming rates



Adam Carter · CBC News · Posted: Aug 02, 2017 11:54 AM ET | Last Updated: August 2



WOMAN DIES WHILE WAITING FOR AN AMBULANCE

Wednesday, September 13th 2017 - 5:49 am



Photo: iStock/matt gush

The Ontario coroner's office is investigating after a senior died alone in her apartment after waiting nearly half an hour for paramedics to arrive.

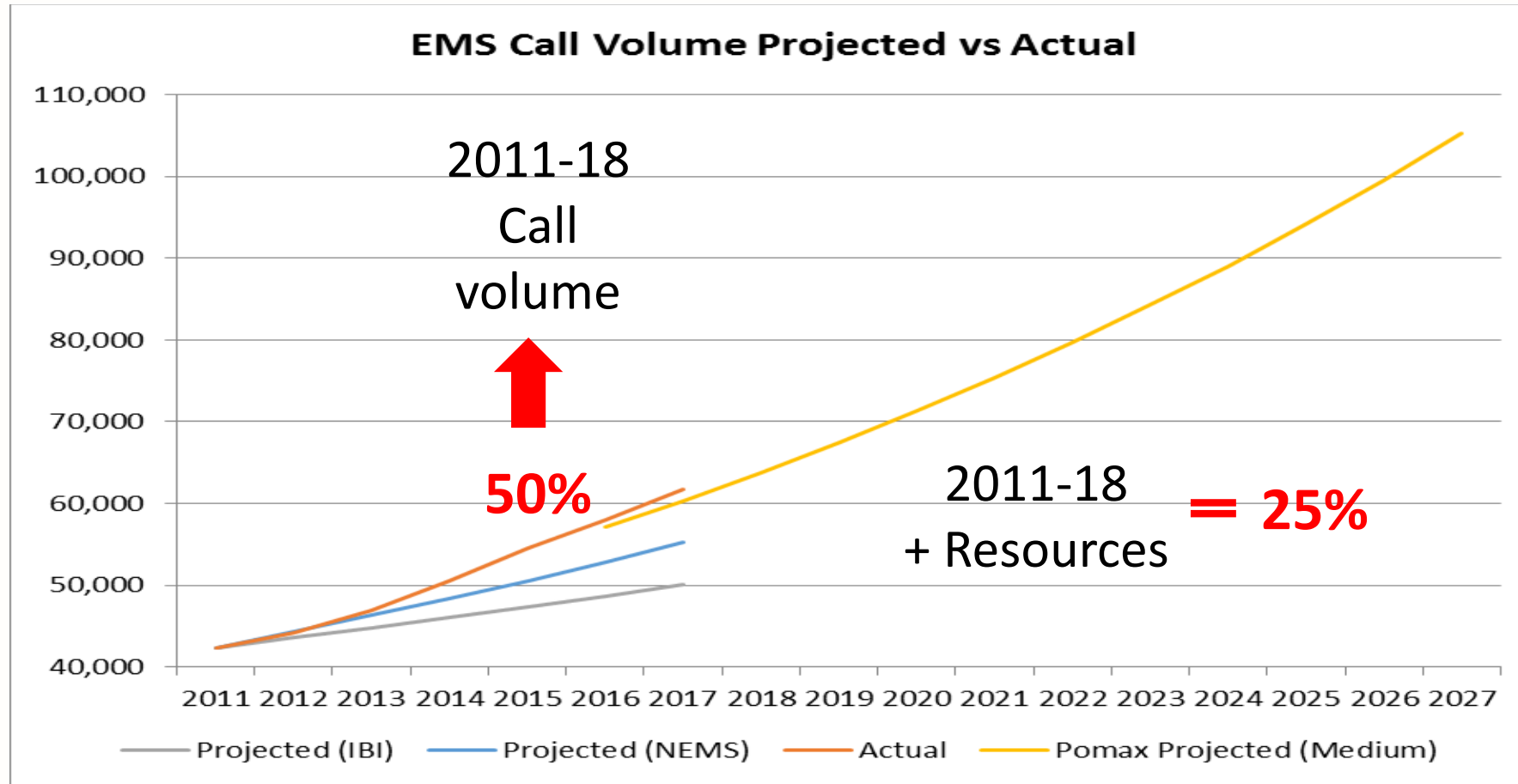
The investigation comes after the CBC reported 71 year old Catherine Terry died of a heart attack July 10th during a code zero alert in the city.

Code Zero means there is one or less ambulances available to take a call.

The tragedy highlighted the ongoing ambulance shortage in

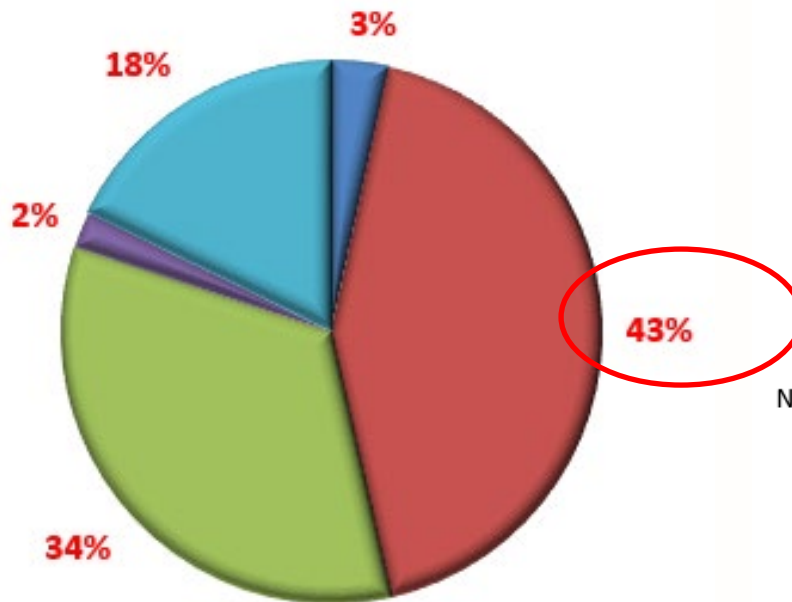
Premier Wynne has written to the Terry family assuring them the province is aware of the shortages and is

System Demands

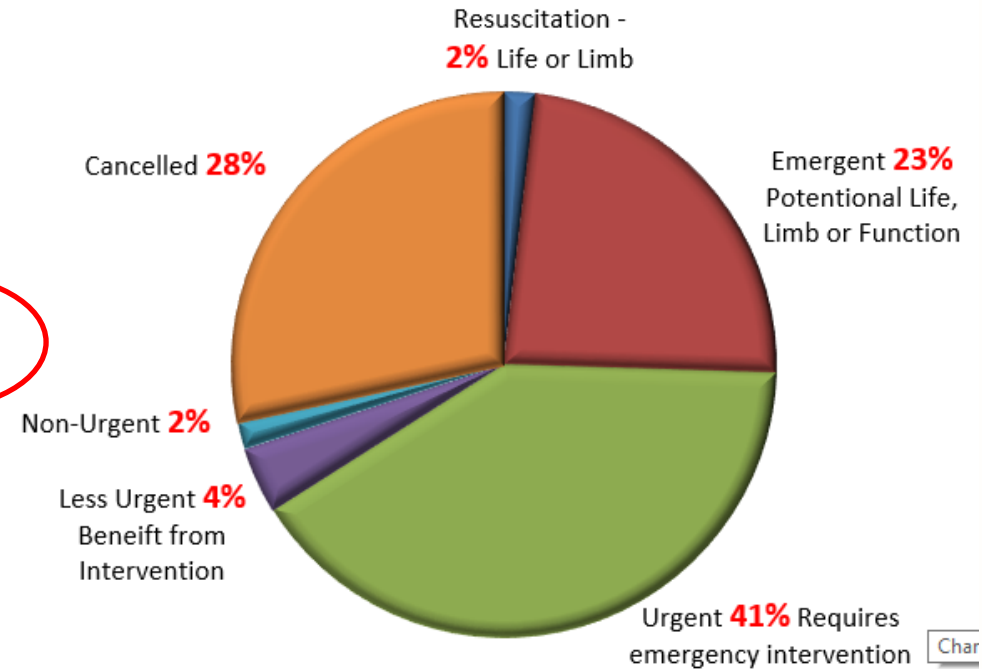


By the Numbers...

Incidents by Priority



Priority 2 Outcomes



By Policy L&S Use on P1 & P2

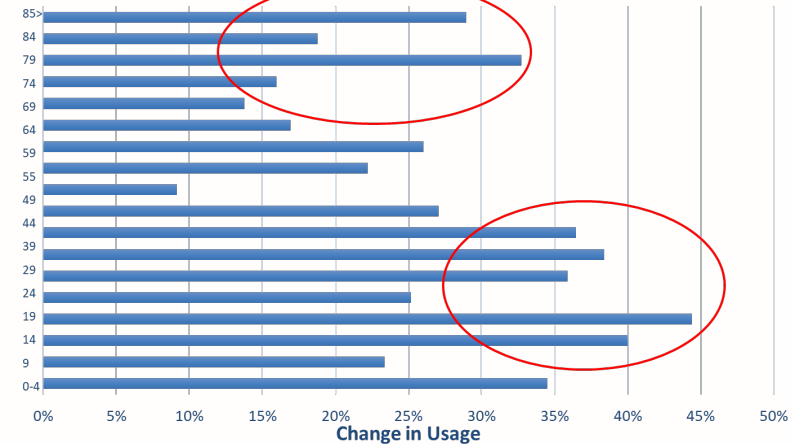
2016 Data

Follow the Evidence

Top Five EMS Transports to EDs in Niagara (2013-2015)

Niagara	1	2	3	4	5
0-1 years	Resp. Distress	Seizure/Post Ictal	General Illness/Weakness	Other Medical/Trauma	Newborn/Neonatal
1-4 years	Seizure/Post Ictal	General Illness/Weakness	Resp. Distress	Soft Tissue Pain/Trauma/Edema	Other Medical/Trauma
5-9 years	Musculoskeletal Trauma	Seizure/Post Ictal	Soft Tissue Pain/Trauma/Edema	Behaviour/Psychiatric	Resp. Distress
10-14 years	Musculoskeletal Trauma	Behaviour/Psychiatric	Soft Tissue Pain/Trauma/Edema	Syncope	Seizure/Post Ictal
15-19 years	Musculoskeletal Trauma	Behaviour/Psychiatric	Alcohol Intoxication	Soft Tissue Pain/Trauma/Edema	Drug Overdose
20-24 years	Musculoskeletal Trauma	Behaviour/Psychiatric	Abdominal Pain NYD	Soft Tissue Pain/Trauma/Edema	Seizure/Post Ictal
25-44 years	Musculoskeletal Trauma	Abdominal Pain NYD	Behaviour/Psychiatric	Soft Tissue Pain/Trauma/Edema	GI Problems/Pain/Vomiting/Nausea
45-64 years	General Illness/Weakness	Musculoskeletal Trauma	Abdominal Pain NYD	Soft Tissue Pain/Trauma/Edema	Ischemic Chest Pain
65-74 years	General Illness/Weakness	Resp. Distress	Musculoskeletal Trauma	Abdominal Pain NYD	GI Problems/Pain/Vomiting/Nausea
75-84 years	General Illness/Weakness	Musculoskeletal Trauma	Resp. Distress	GI Problems/Pain/Vomiting/Nausea	Abdominal Pain NYD
85+ years	General Illness/Weakness	Musculoskeletal Trauma	Resp. Distress	Soft Tissue Pain/Trauma/Edema	GI Problems/Pain/Vomiting/Nausea

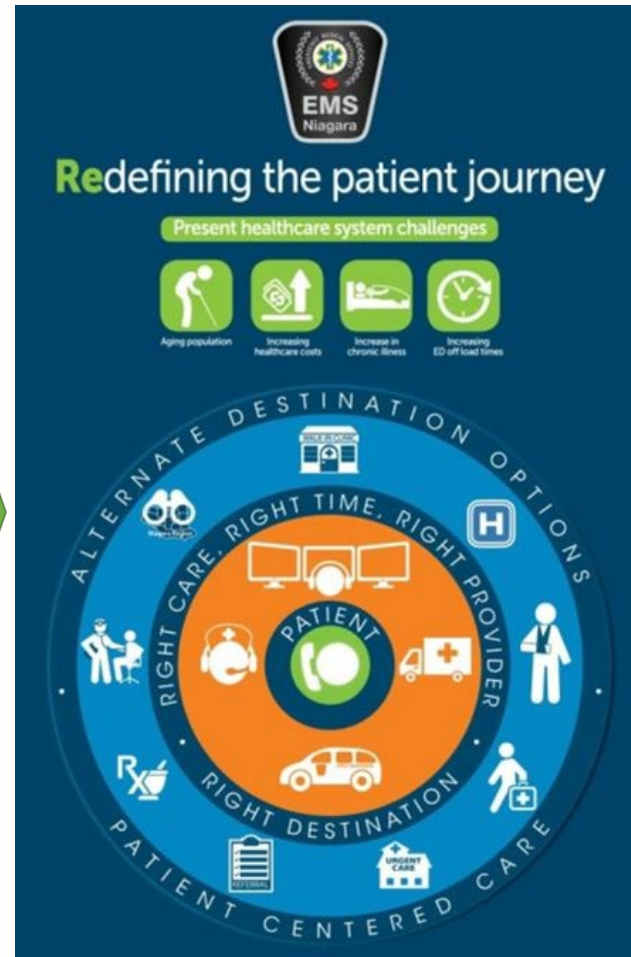
Change in Usage Rate by 5 Year Cohort - Niagara 2011 v 2016



Priority

Year	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+
2015	20,488	21,925	22,672	26,572	30,485	27,282	24,694	24,212	26,076	30,113	36,534	34,503	31,229	28,564	21,782	16,148	12,599	8,409	4,811
2016	20,620	21,879	22,558	25,664	30,277	27,964	25,245	24,250	25,275	29,264	36,296	35,197	32,174	29,215	22,630	16,700	12,626	8,672	5,196
2017	20,894	21,768	22,536	25,115	29,570	28,741	25,803	24,288	24,788	28,720	35,298	35,912	33,011	28,944	24,497	17,406	12,699	8,816	5,571
2018	21,151	21,666	22,594	24,687	28,951	29,247	26,176	24,481	24,676	28,058	33,869	36,619	33,710	29,318	25,771	18,306	12,923	8,876	5,912
2019	21,390	21,553	22,710	24,282	28,327	29,482	26,703	24,817	24,597	27,404	32,491	37,081	34,304	30,162	26,644	19,172	13,255	8,894	6,249
2020	21,628	21,524	22,772	24,106	27,500	29,384	27,338	25,239	24,445	26,721	31,395	37,341	34,883	31,030	27,600	19,947	13,569	9,038	6,512
2021	21,840	21,650	22,721	24,022	26,681	29,161	27,917	25,789	24,524	25,944	30,534	37,054	35,623	31,971	28,272	20,768	14,085	9,105	6,822
2022	22,031	21,910	22,603	24,020	26,184	28,505	28,572	26,339	24,897	25,485	29,968	36,032	36,364	32,822	28,092	22,536	14,729	9,193	7,059
2023	22,186	22,165	22,494	24,107	25,802	27,355	29,027	26,708	24,822	25,388	29,306	34,600	37,099	33,556	28,520	23,770	15,541	9,393	7,239
2024	22,307	22,413	22,388	24,239	25,473	27,362	29,253	27,230	25,170	25,338	28,661	33,225	37,600	34,195	29,368	24,644	16,325	9,680	7,406
2025	22,380	22,676	22,369	24,328	25,337	26,623	29,200	27,855	25,597	25,219	28,012	32,146	37,681	34,826	30,271	25,586	17,033	9,970	7,613
2026	22,411	22,911	22,508	24,301	25,306	25,892	29,016	28,422	26,130	25,327	27,270	31,328	37,699	35,618	31,233	26,276	17,798	10,417	7,814
2027	22,396	23,117	22,787	24,205	25,351	25,445	28,447	29,063	26,646	25,434	26,849	30,788	36,603	36,392	32,125	26,207	18,449	10,942	7,989

System Transformation



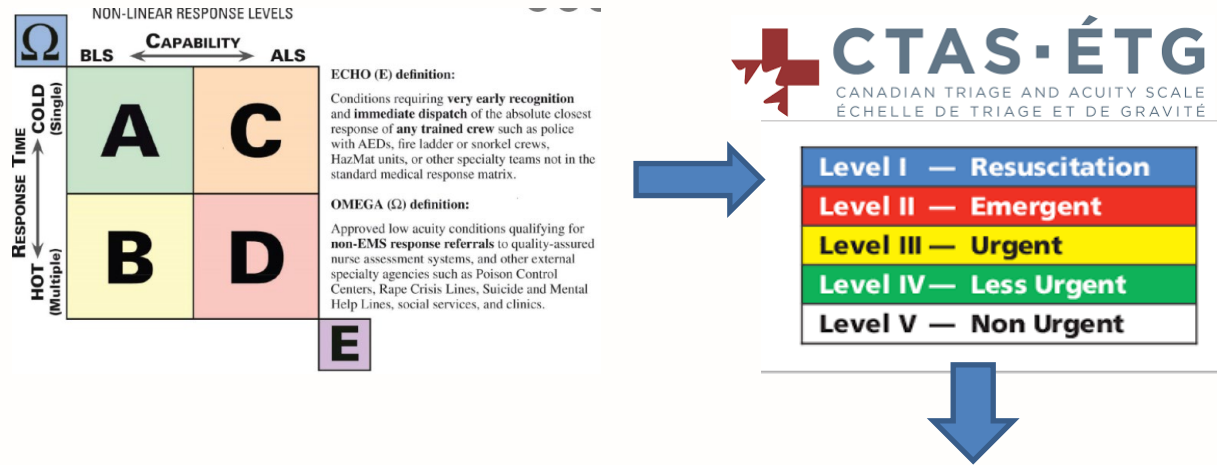
- Revisit response policies
- Emergency Communications Nurse System (ECNS)
- Mobile Integrated Health (MIH)
- Alternative Transport and Destination Options
- Clinical Response Plan**

***shifts response planning from a solely time-based model, to an evidence-based model using clinical evidence and outcome data to inform decision making*

Importance of Clinical Evidence in Response Planning

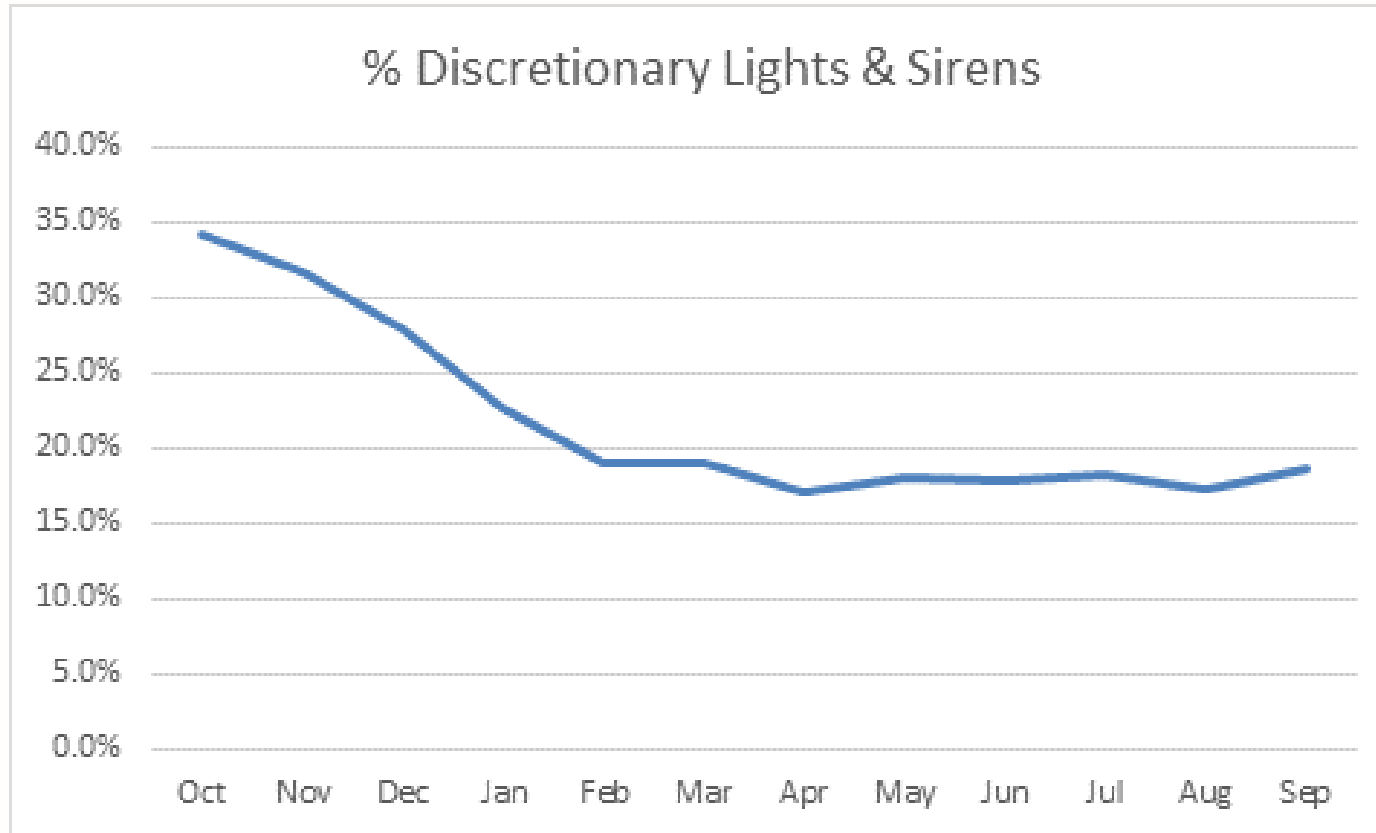
- Lights and Sirens use impact on time, provider & public safety
 - Numerous studies demonstrating very little impact on time, significant danger to providers and public
 - Should be applied as a clinical procedure
- Need to 'get it right'
 - Impact of resource shortage on ability to respond as well as impact of under-triage
- What are Paramedics doing on scene?
- Impact of 'Time' on patient outcomes
 - Little evidence positively linking evidence with outcomes in most cases

Nomenclature



Priority	Lights & Sirens	Call Processing (T0-T1)	Initial Assignment (T1-T2)	Chute Time (T2-T3)	Response Time Target (T2-T4) (*T0-T4)	Maximum Hold Based on Alert Level
1	Yes	1:45	0:15	1:30	8:00	00:00
2	Optional*	2:30	1:00	1:30	15:00	00:00
3	No	3:00	10:00	3:00	30:00*	1:00:00
4	No	3:00	30:00	3:00	1:00:00*	3:00:00
5	No	3:00	1:00:00	3:00	2:00:00*	6:00:00

Discretionary L&S—Change Management



Clinical Response Plan Year 1 Results (using paramedic impression—CTAS)

By Policy	2018-2019	2019 - April 2020
Lights and Sirens Responses	24983	5708
Lights and Sirens %	42.4%	10.3%
% Acute Capture	5.8%	24.7%
Under Triage %	0.7%	1.3%
Crew Election L&S (pri 2)		457
Adjusted Under Triage% (incl pri 2)		0.9%

Combined = **20.8%** of all responding vehicles – this includes multiple vehicle response to single incident



Redefining the patient journey

Contact

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 YouTube

Niagara EMS





Integrated System Design for Implementation

- Department or Agency Protocol
 - Community Risk Assessment/Assessment of Incident Density
 - Customer Expectations
 - Public Education Campaign
 - Protocol should be developed with the guidance from medical director
 - The department/agency needs to maintain control
- Dispatch
 - Call In-take using an approved Emergency Medical Dispatch System to appropriately triage the call and identify the priority
 - Dispatch Closest Available/Appropriate Unit
- Medical Director
 - QA & QI review of calls
 - Data Collection
 - On-going Evaluation



No Excuses!

- Departments/Agencies must still provide adequate resources to meet demand.
- Set reasonable response time goals based on priority.
- Evaluate and adjust as needed to maintain safe and effective operations for both the provider and patients.
- Ensure all personnel are properly trained in Emergency Vehicle Operations.



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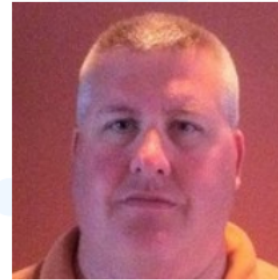
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