ZOLL

SUMMIT

-2016-

Data Driven Airway Quality Management

Samuel Kordik

About Cypress Creek EMS

911 Provider for ESD 11, Harris County, Texas

~650,000 people over 177 square miles

47,000 responses a year in a suburban/urban environment

15 full-time ambulances + 2 peak hour units

My role: Education, QA/QI, Data, PCR

Traditionally—Endotracheal Intubation

Really—Full Spectrum of Airway & Breathing Interventions

AIRWAY ESCALATION

“Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.”

— H. James Harrington

Measure the right thing!

Traditional Measurement: ET Success Rate

Measurements Incentivize Change

Right Goal?: Plastic tube through vocal cords

“First, Do No Harm”

Inappropriate management:

- Not enough or too far on escalation scale

Desaturations

Inadequate sedation

Inappropriate ventilation

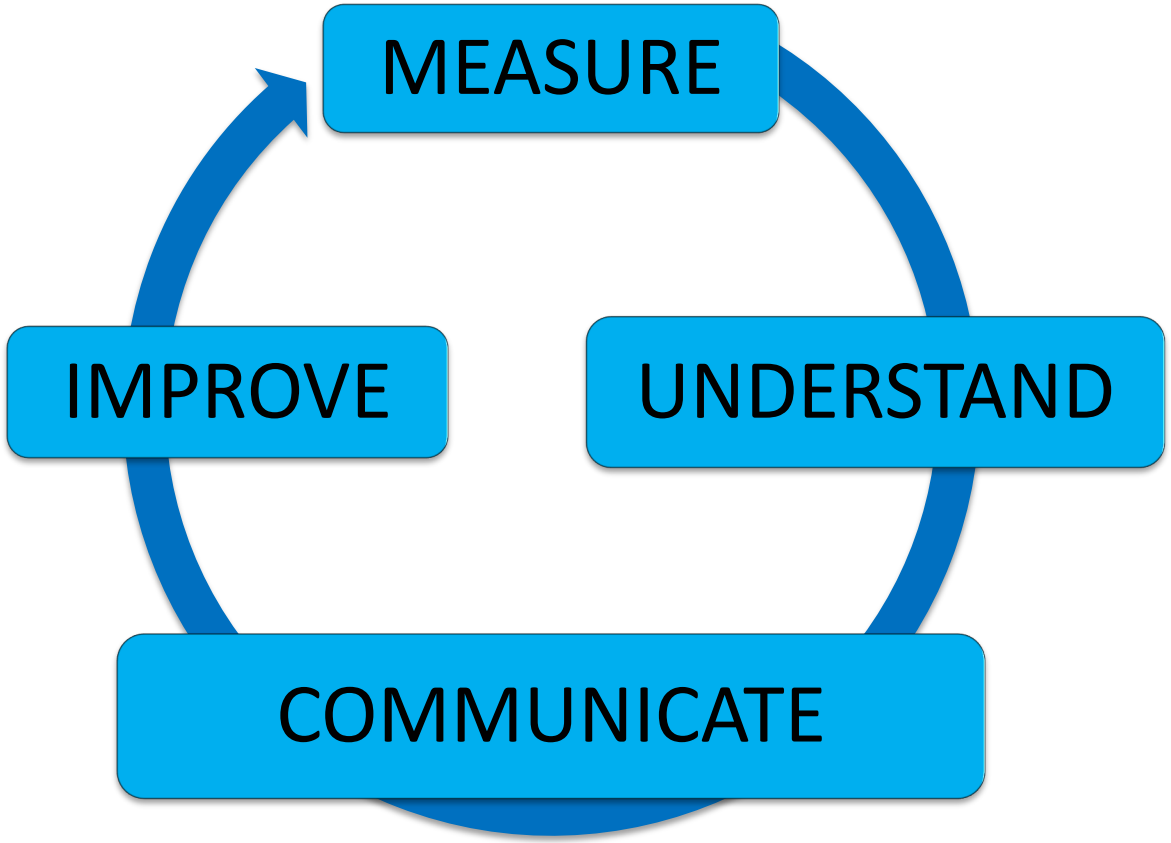
Measure the right thing!

Better Goal: Maintain patent, protected airway *and*
Provide adequate oxygenation and ventilation.

Avoid oxygen desaturation.
Avoid extended laryngoscopy.

Better Measurement: First Attempt Success Rate

AIRWAY QUALITY IMPROVEMENT PROCESS



30,000 ft view: Annual Reports

10,000 ft view: Monthly Reports

Runway view: Case Review

30,000 FOOT VIEW: ANNUAL AIRWAY PERFORMANCE

Cypress Creek EMS Airway Management Report

Abstract

Airway management is a high-risk, low frequency procedure that should have a very high s
and a high first attempt success rate, indicating proficiency of planning and of skill by the p
attempting it. 398 cases from the past year were analyzed and first attempt success rate, m
intubation attempts, and overall success rate were quantified for a number of categorical s
The results found an overall success rate of 96% and a first attempt success rate of 71%. Tr
had the worst first attempt success rate (48%) and medical crash airways had the worst ov
(86%). Cases in which a LEMON assessment predicted a less difficult airway had overall bet
measures than predicted difficult airways, however, performance when the intubation atte
unsuccessful was significantly worse, suggesting that we don't do a good job of planning fo
Cases in which external obstructions or problems were documented had a lower success ra
attempt success rate.

Methodology

I started by collecting data from the 398 cases of airway management between 1/1/2014 a
4/21/2015. This range was selected to include all of last year's cases and the ones to date i
Cases prior to 2014 were not included as the primary goal was to capture data about curre
and no significant change in recommended practices or protocols took place during this da

These cases were grouped into eight categories based on three factors: Trauma vs. Medical, CPR vs. no CPR, and RSI vs. no RSI. Trauma vs. Medical was determined by whether or not the patient had a trauma mechanism of injury as documented by the paramedic. CPR was determined by whether or not the patient had—at any time—a CPR intervention documented. RSI was determined if the patient had—at any time—paralytics administered.

A case was deemed successful if an ET tube was placed successfully. Unsuccessful cases included ones where no ET tube placement was attempted, where the ET tube was unable to be placed, or in cases where the ET tube had to be removed due to improper placement. This study did not analyze the reasons for unsuccessful intubation and did not investigate how we handled failed intubations.

Summary Description
Total cases
Male gender
Age
Pediatric (< 16y)
16-45 years
45-65 years
65-75 years
> 75 years
Weight
<100 lbs
100-150 lbs
150-200 lbs
200-250 lbs
>250 lbs

Figure 1: Characteristic

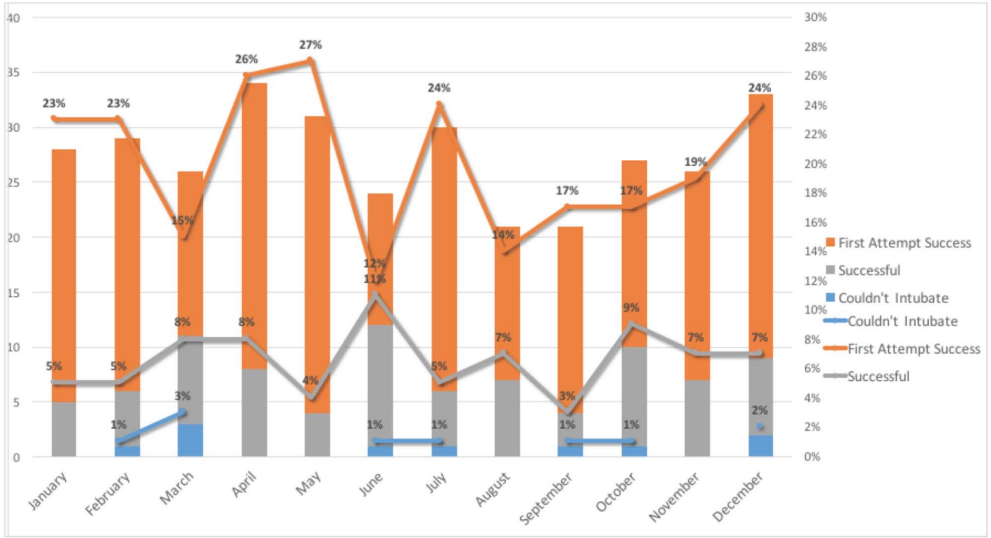
Cypress Creek EMS

2015 Airway EOY Summary

Statistics

	2015 Values	*(% change from 2014)*
Total Cases:	**330**	▲ 9%
First Attempt Success (%):	**241 (73%)**	▲ 14%
Failed To Intubate (%):	**10 (3%)**	▲ 2%
> 3 attempts (%):	**8 (2%)**	▲ 83%
Mean age:	**59**	▲ 2%
Case Type:		
RSI—Cardiac Arrest (%):	**31 (9%)**	▼ 14%
RSI—Other Medical (%):	**88 (27%)**	▲ 52%
RSI—Trauma (%):	**21 (6%)**	▼ 13%
Crash Airway: CPR (%)	**182 (55%)**	▼ 8%
Crash Airway: Medical (%):	**5 (2%)**	▼ 49%
Crash Airway: Trauma (%):	**3 (1%)**	▼ 8%

Monthly Data



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ANNUAL REPORT STARTS WITH TWO DATASETS

Exported from Crystal Reports to Excel for data exploration/analysis

Details on each airway call

Details on each intubation intervention

TYPES OF CASES ENCOUNTERED

Summary Descriptions	Count (%)
Total cases	398
Male gender	
Age	
Pediatric (< 16y)	
16-45 years	
45-65 years	
65-75 years	
> 75 years	
Weight	
<100 lbs	
100-150 lbs	
150-200 lbs	
200-250 lbs	
>250 lbs	

Figure 1: Characteristics

Case Type	FASR	Success Rate
CPR, no RSI, medical cause:	67.12%	97.75%
RSI, no CPR, medical cause:	68.42%	96.05%
CPR with RSI, medical cause:	71.79%	95%
Trauma RSIs (no CPR):	48.15%	96.30%
Trauma CPR, no RSI:	70.59%	100%
Medical crash airway (no CPR or RSI):		
Trauma crash airway (no CPR or RSI):		
Trauma RSI with CPR:		

Figure 3. Success Rates by case type.

	2015 Values	*(% change from 2014)*
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First Attempt Success (%):	**241 (73%)**	**▲ 14%**
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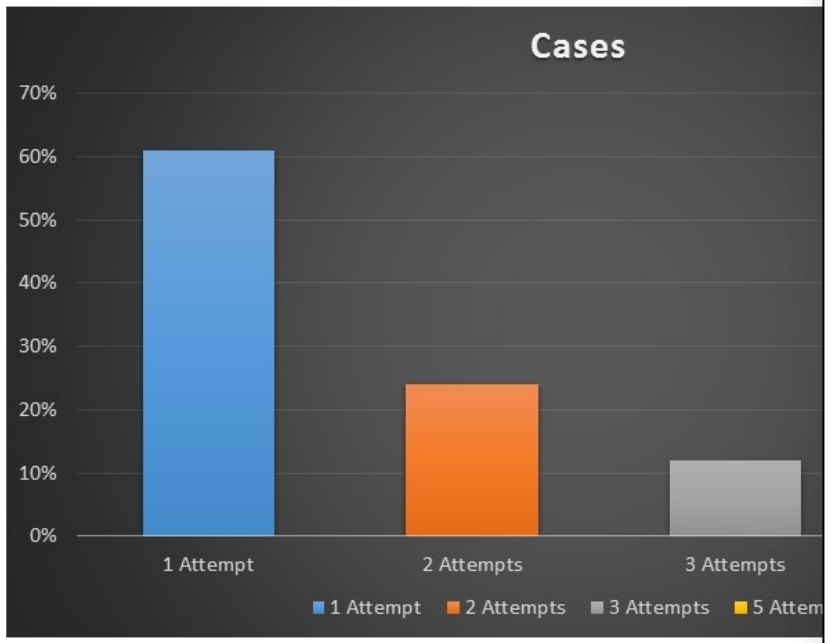
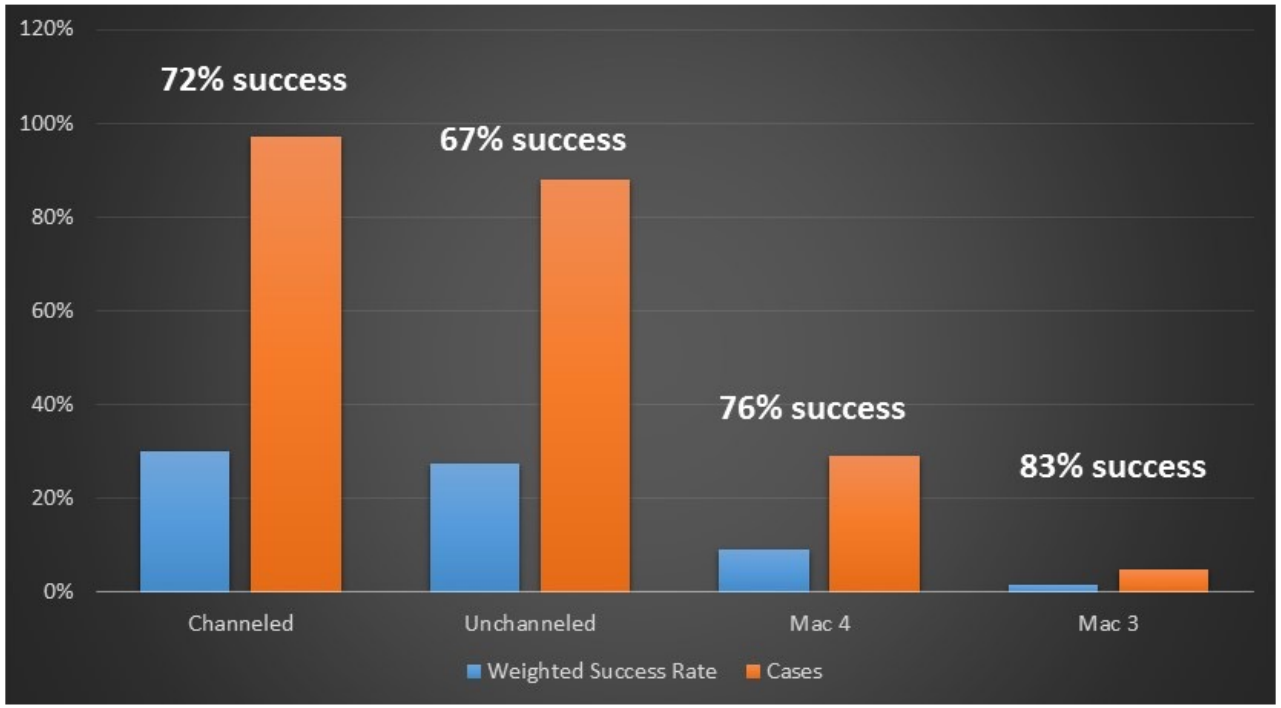
Number of Attempts



Success Rate by Blade



Excludes pediatric cases. Weighted success rate compensates for number of cases.

# of Cases

Laryngoscopies

Placements

First Attempt Success Rate

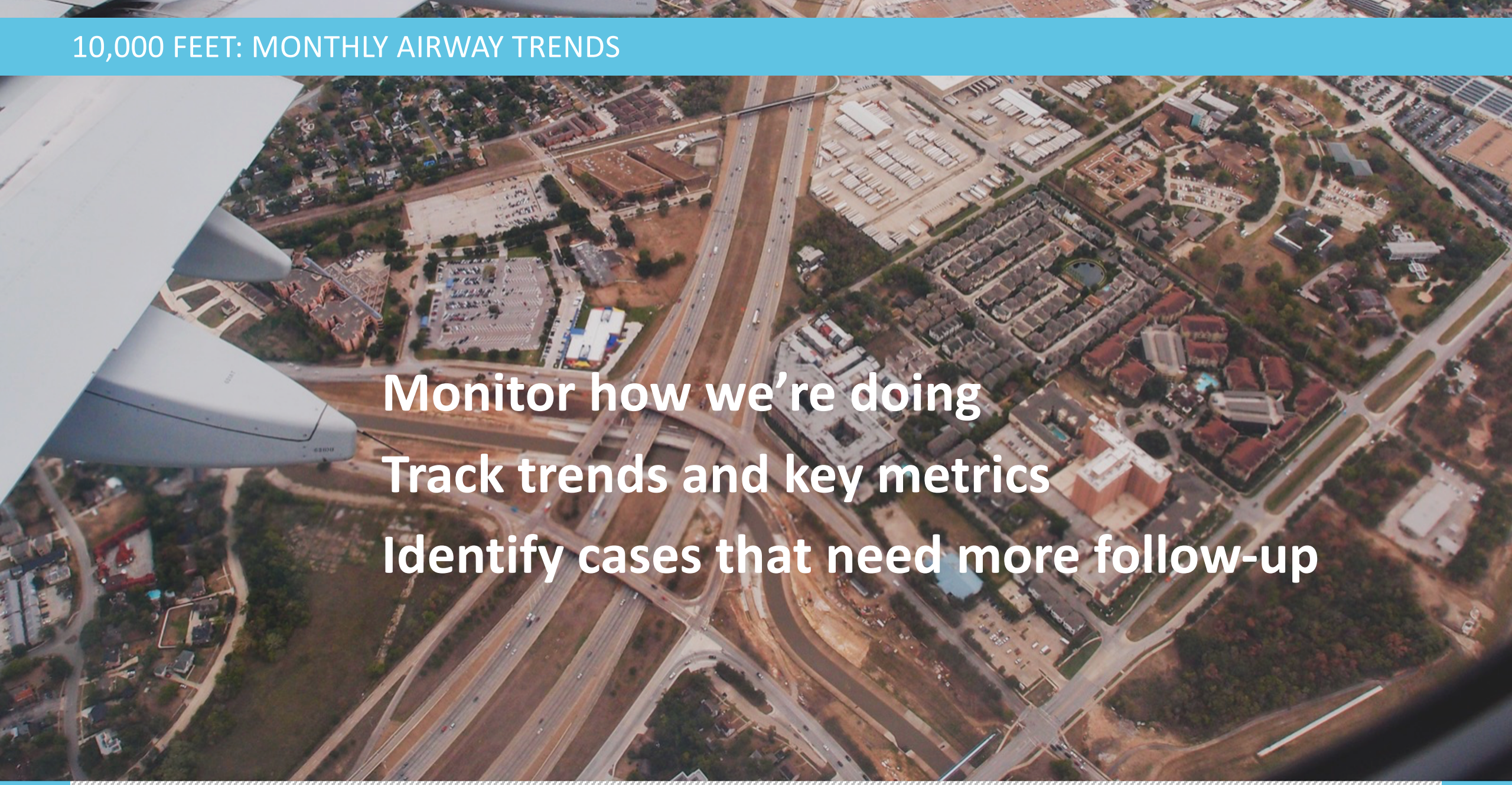
Name	Laryngoscopies	Placements	FAS	No FAS	FASR
Marva Rivers	39	16	24	16	0.6
Arron Bobbie Tran	23	15	16	24	0.4
Sophie Kellie Warren	15	7	14	8	0.636364
Marcie Lenard Booker	14	8	14	8	0.636364
Luciano Jacobson	37	26	14	48	0.225806
Jim Decker	13	10	12	10	0.545455
Serena Evans	9	5	10	4	0.714286
Arline Swanson	9	7	10	6	0.625
Pierre Elizabeth Campb	4	4	8	0	1
Herminia Cook	12	6	8	8	0.5
Mauricio Thornton	10	8	8	10	0.444444
Victor Farmer	23	13	8	28	0.222222
Kermit Frazier	3	3	6	0	1
Virgie Dean	3	3	6	0	1
Shirley Austin	5	3	6	2	0.75
Maryellen Morgan	6	3	6	2	0.75
Sergio Johnathan Lynch	7	1	6	2	0.75
Cleo Ashley Wilkinson	5	3	6	2	0.75

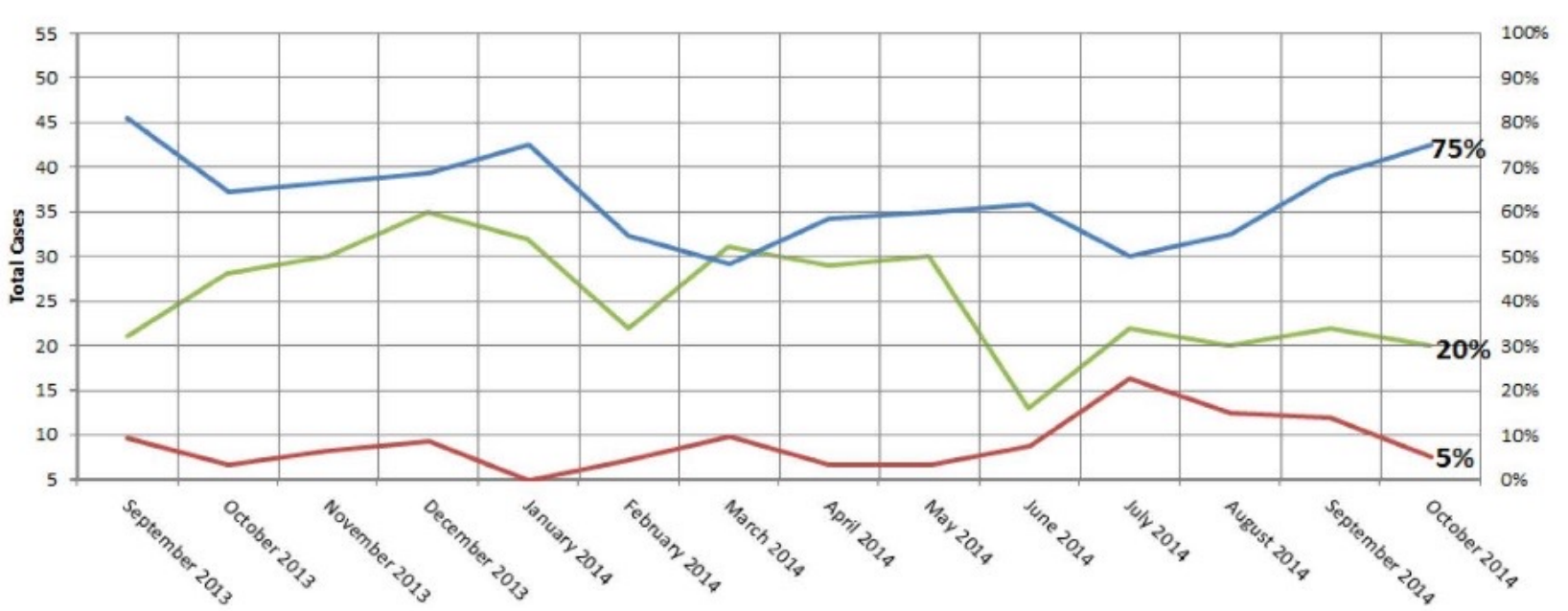
Guides **documentation** improvements

Guides **practice** changes

Guides **educational** planning

10,000 FEET: MONTHLY AIRWAY TRENDS

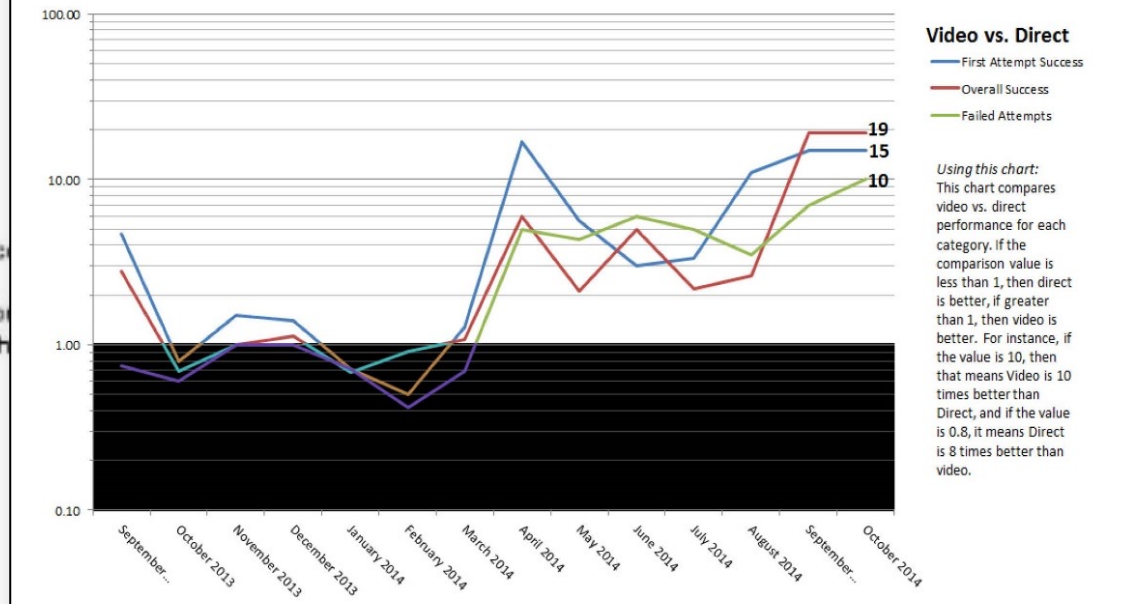




Summary for Augu

Total Intubation Cases: **21**
Total Intubation Attempts: **32**
First Attempt Successes: **14 (67%)**
Failed to Intubate: **0 (0%)**
Mean attempts: **1.52**

Definitions:
First Attempt Success means the call had one suc
attempts.
Overall Success means that the call had at least o
Failed Intubation means a laryngoscopy attempt th



Dan DeLuca

Case [redacted]

Included because advanced airway management failed.

Crew
[redacted]

Additional Crew
[redacted]

Patient Information:
[redacted] year old African American Female, weighing 73 kg.

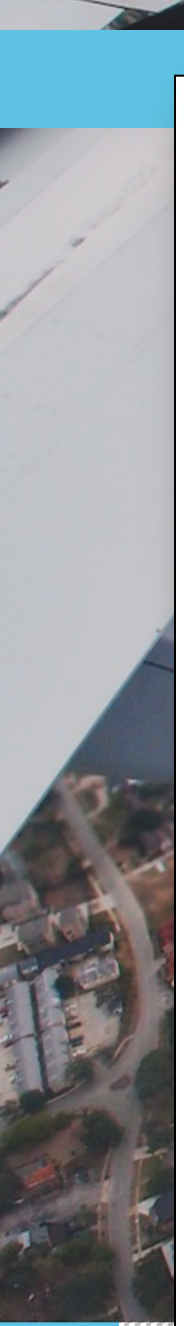
Call Information:
Dispatched as 11 - Choking at 13:45:01
M55 arrived to scene in zip code [redacted] at 13:54:36 and at patient at 13:55:00.
Spent 57:34 on scene, then transported at 14:51:10 to Houston Northwest Medical Center and arrived at 15:05:39
The primary impression was Choking.

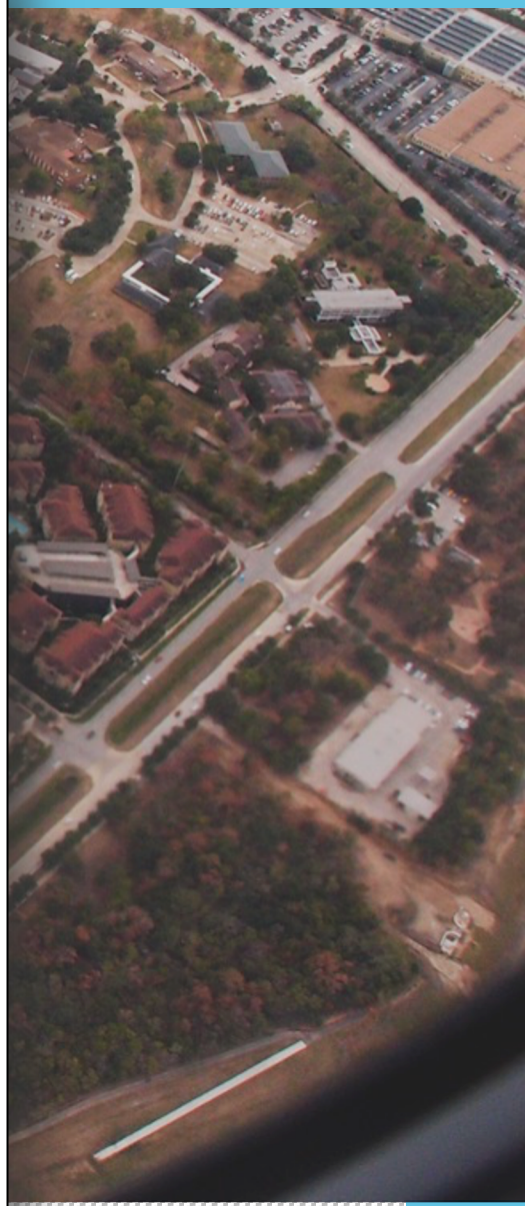
Airway Assessment:
[redacted] choking

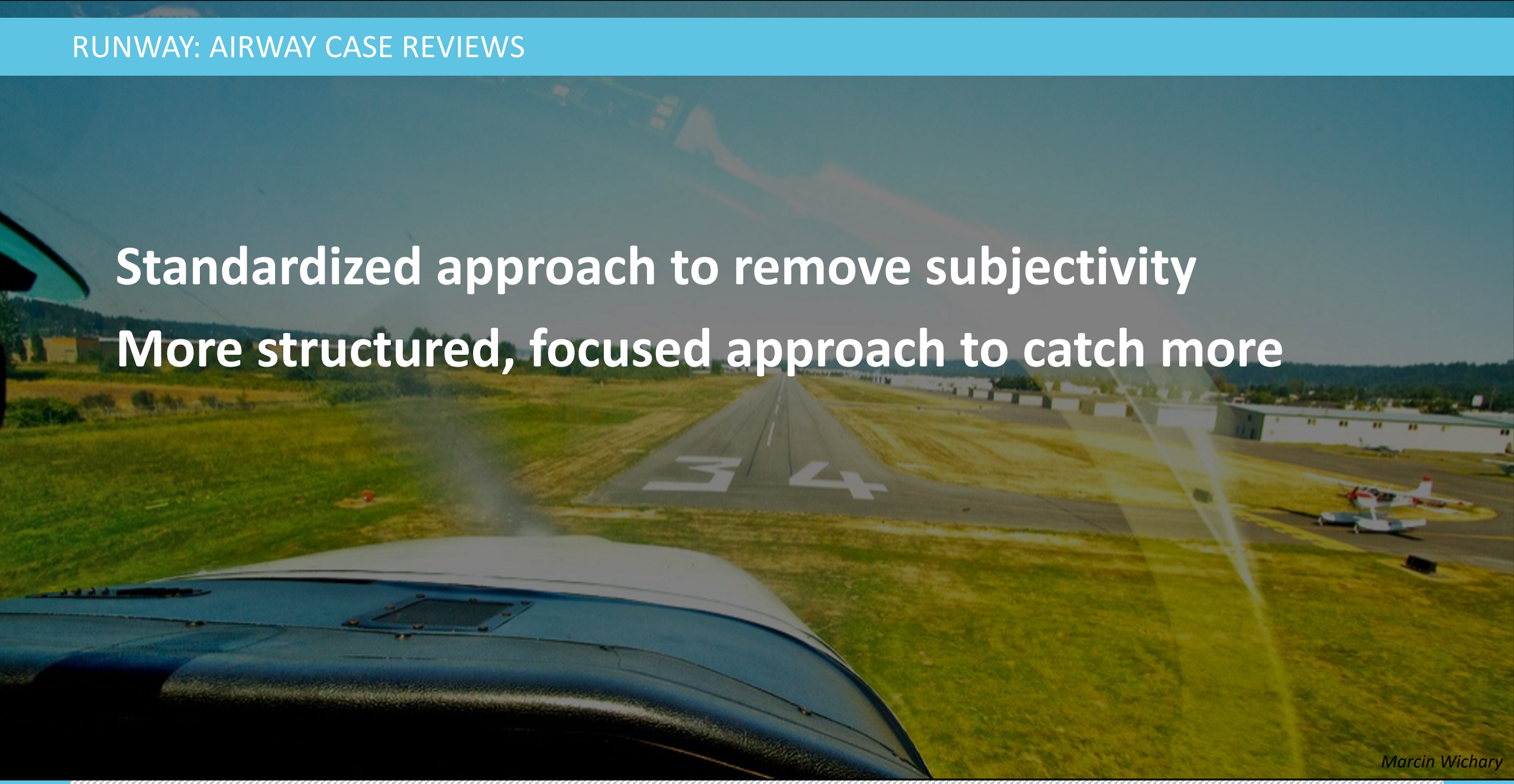
Airway Management:

First Attempt Success?	No	*Laryngoscopy duration:*	n/a	*Number of attempts?*	2
Overall Success?	No	*Airway type:*	CPR (ROSC)	*Number of VL attempts?*	2
Failed intubation?	Yes			*Number of DL attempts?*	0
				Number of placements?	0

14:01:08	Oxygen provided via Bag Valve Mask (Adult) at rate of 15 LPM by [redacted]
14:06:48	Size #4/ Red King LT placed unsuccessfully attempted by [redacted]
14:07:36	[redacted] suctioned Orally to clear secreations with result of no change.
14:07:48	Size #4/ Red King LT placed unsuccessfully attempted by [redacted].
14:08:08	Oxygen provided via Bag Valve Mask (Adult) at rate of 15 LPM by Firefighter
14:13:36	[redacted] suctioned Orally to clear secreations with result of no change.
14:15:18	Video laryngoscopy performed using King Vision 3 - Channeled by [redacted], with patient elevated on stretcher to treat Respiratory Arrest 0% POGO and a Cormack-Lehane of Grade 4.No tube placed because of Inability to Expose Vocal Cords.
14:19:18	Video laryngoscopy performed using King Vision 3 - Channeled by [redacted], with patient elevated on stretcher to treat Respiratory Arrest 0% POGO and a Cormack-Lehane of Grade 4.No tube placed because of Inability to Expose Vocal Cords.
14:22:36	[redacted] suctioned Orally to clear secreations with result of no change.






Standardized approach to remove subjectivity
More structured, focused approach to catch more
Marcin Wichary

Structured Approach catches more:

Adverse events

Desaturations

Inadequate sedation

Inappropriate Ventilation

Marcin Wichary

CUSTOM REPORT FROM RESCUENET REPORTING

Cypress Creek EMS
Airway Quality Review
Run [redacted]

Date of Service:
Medic:
Crew: [redacted]

Airway Assessment:
Patent

Airway Management:

05:35:22 **Cardiac Monitor** by
Indication:

05:40:00 **Extrication Device**
First Device Used:
Third Device Used:

05:45:03 **Oxygen** by [redacted]
Device:
LPM:

05:48:56 **12 Lead ECG** by [redacted]
Lead 1:
Lead 3:
AVF:
V2:
V4:
V6:
V4 Right:
V6 Right:
V8:
Location:
Skin Prep:

Cypress Creek EMS
Airway Quality Review
Run [redacted]

Date of Service: [redacted]
Medic: M513
Crew: [redacted]

Patient Information:
81.00 year old Male, weighing 122.73 kg.

Call Information:
Dispatched as 17B01 - Falls - Poss Dangerous Area at 05:13:33
[redacted] arrived to scene in zip code [redacted] at 05:30:38 and at patient at 05:33:31.
Spent 55.77:46 on scene, then transported at 06:26:24 to [redacted] and arrived at 06:46:07

Patient History: CHF, Hyperlipidemia, Hypertension, Other: gout

Management Overview:

Airway type:	RSI	*Number of attempts?*	1
First Attempt Success:	Yes	*Number of VL attempts?*	1
Overall Success:	Yes	*Number of DL attempts?*	0
		Number of placements?	1

Best Practices:

LEMON Assessment	☐	Induction agent:	
Preoxygenation	☐		
Airway adjuncts	☐	Paralytic:	
Positioning	☐		
Apneic oxygenation	☐	Sedative:	
Preparation	☐		
No desaturations	☐	Paralytic:	
Proper sedation	☐		
Proper ventilation	☐		

Quality Review:

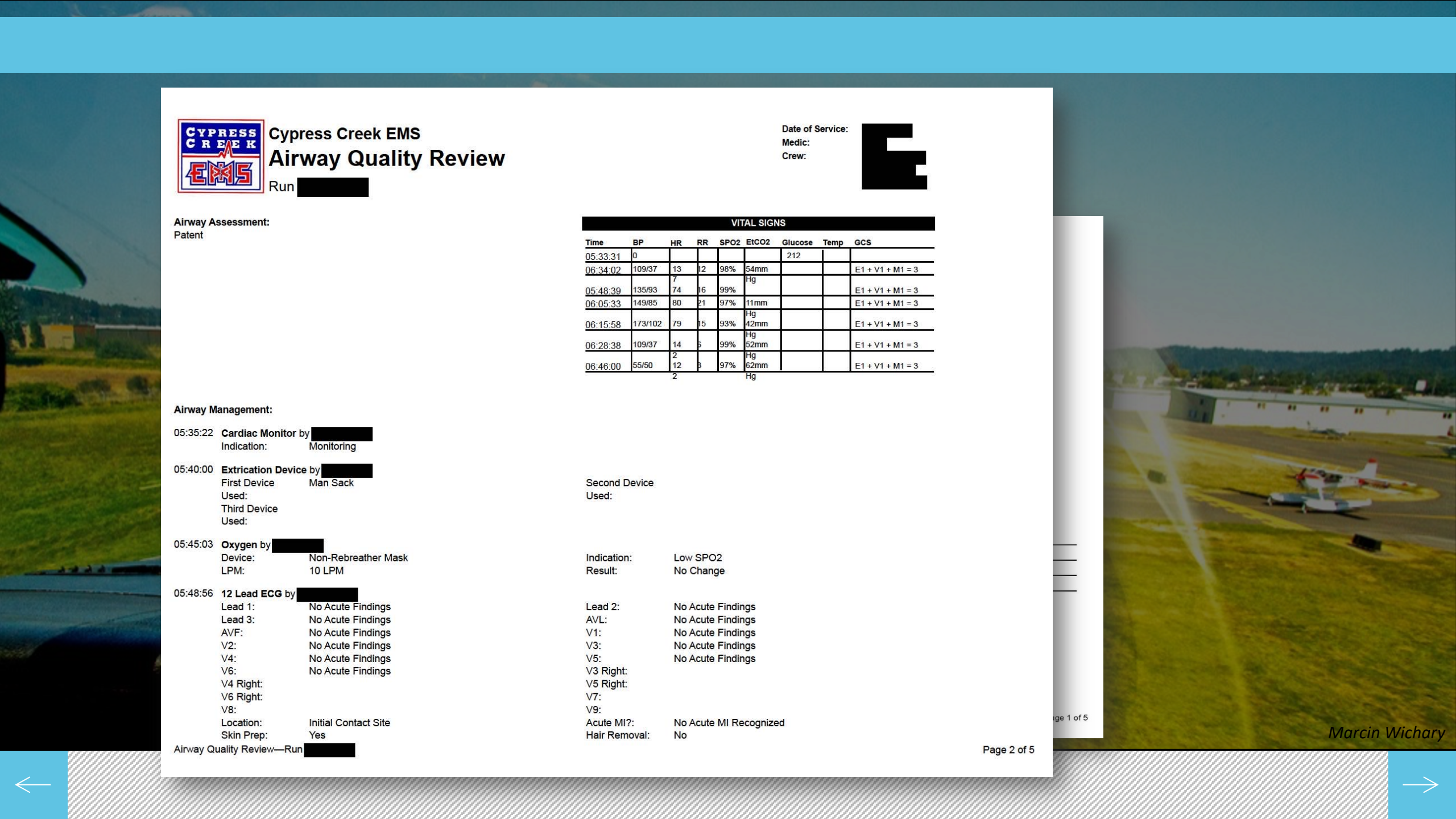
Supplemental done? ☐
ZDC Graph? ☐
Reviewed with crew? ☐
Followup data? ☐

Reviewed by: _____ *Date:* _____

Contains core call information, vital signs, patient information, interventions list.

Structured review process.

Marcin Wichary



Cypress Creek EMS
Airway Quality Review
Run [redacted]

Date of Service:
Medic:
Crew:

[redacted]

Airway Assessment:
Patent

VITAL SIGNS

Time	BP	HR	RR	SPO2	EtCO2	Glucose	Temp	GCS
05:33:31	0					212		
06:34:02	109/37	13	12	98%	54mm			E1 + V1 + M1 = 3
05:48:39	135/93	7 74	16	99%	Hg			E1 + V1 + M1 = 3
06:05:33	149/85	80	21	97%	11mm			E1 + V1 + M1 = 3
06:15:58	173/102	79	15	93%	Hg 42mm			E1 + V1 + M1 = 3
06:28:38	109/37	14	6	99%	Hg 52mm			E1 + V1 + M1 = 3
06:46:00	55/50	2 12 2	8	97%	Hg 62mm Hg			E1 + V1 + M1 = 3

Airway Management:

05:35:22 **Cardiac Monitor** by [redacted]
Indication: Monitoring

05:40:00 **Extrication Device** by [redacted]
First Device Used: Man Sack
Second Device Used:
Third Device Used:

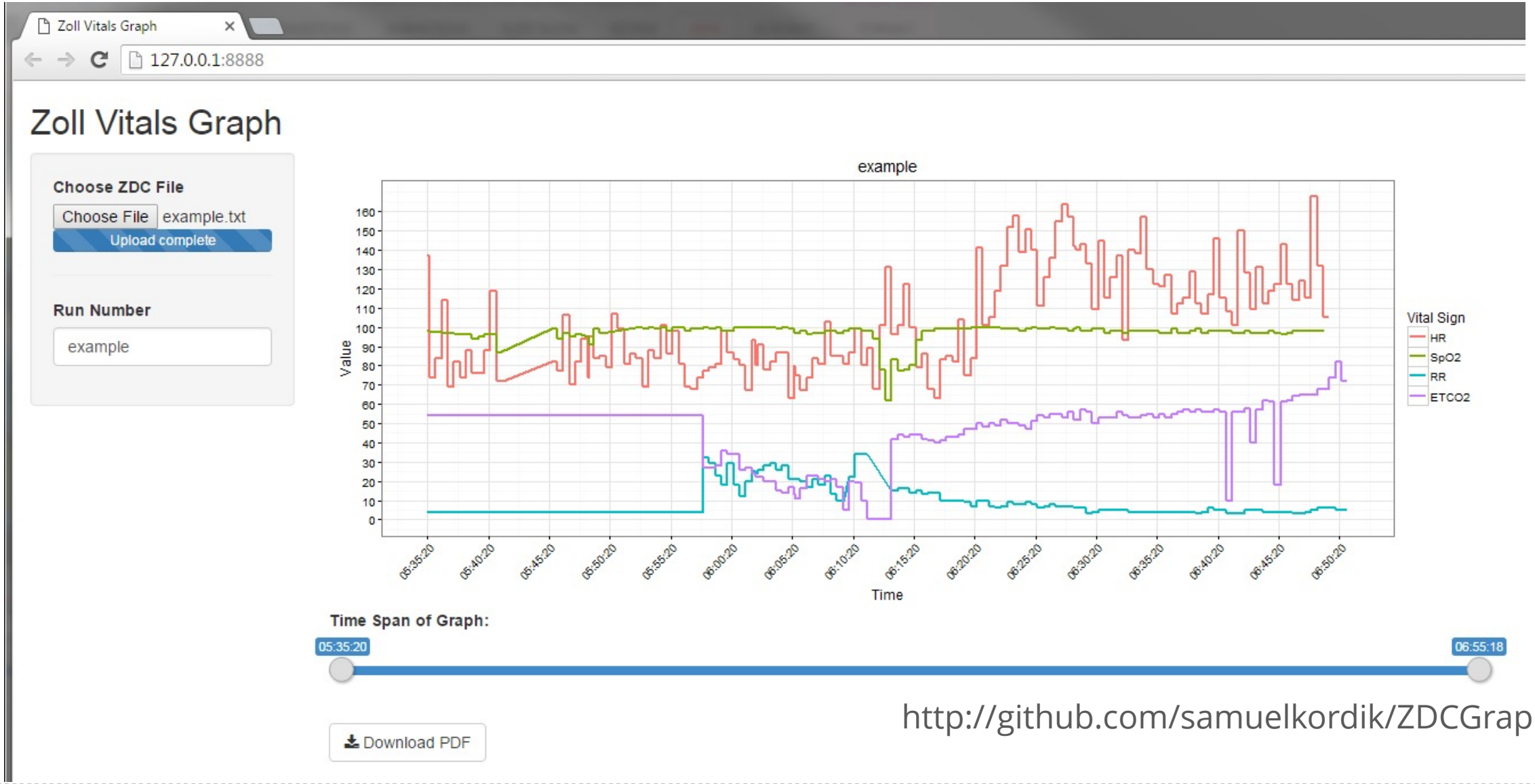
05:45:03 **Oxygen** by [redacted]
Device: Non-Rebreather Mask
LPM: 10 LPM
Indication: Low SPO2
Result: No Change

05:48:56 **12 Lead ECG** by [redacted]

Lead 1:	No Acute Findings	Lead 2:	No Acute Findings
Lead 3:	No Acute Findings	AVL:	No Acute Findings
AVF:	No Acute Findings	V1:	No Acute Findings
V2:	No Acute Findings	V3:	No Acute Findings
V4:	No Acute Findings	V5:	No Acute Findings
V6:	No Acute Findings	V3 Right:	
V4 Right:		V5 Right:	
V6 Right:		V7:	
V8:		V9:	
Location:	Initial Contact Site	Acute MI?:	No Acute MI Recognized
Skin Prep:	Yes	Hair Removal:	No

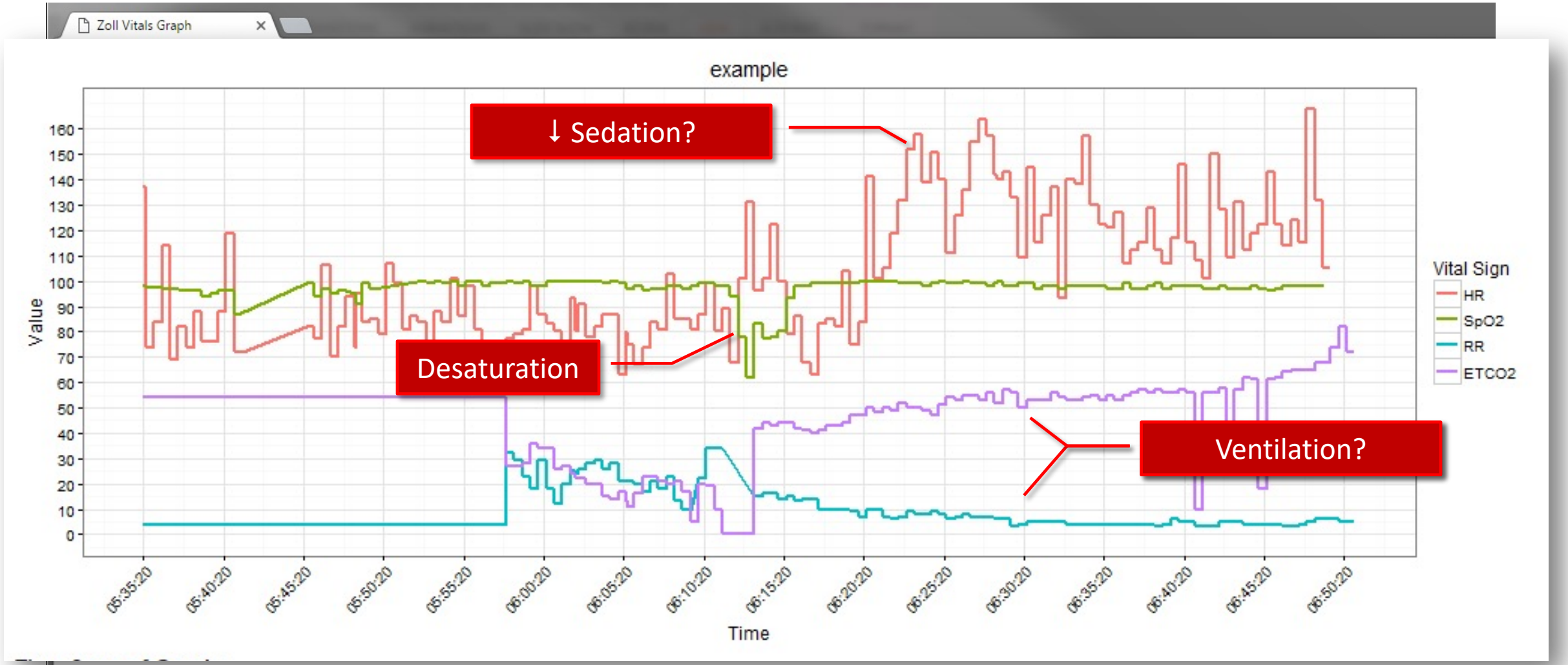
Marcin Wichary

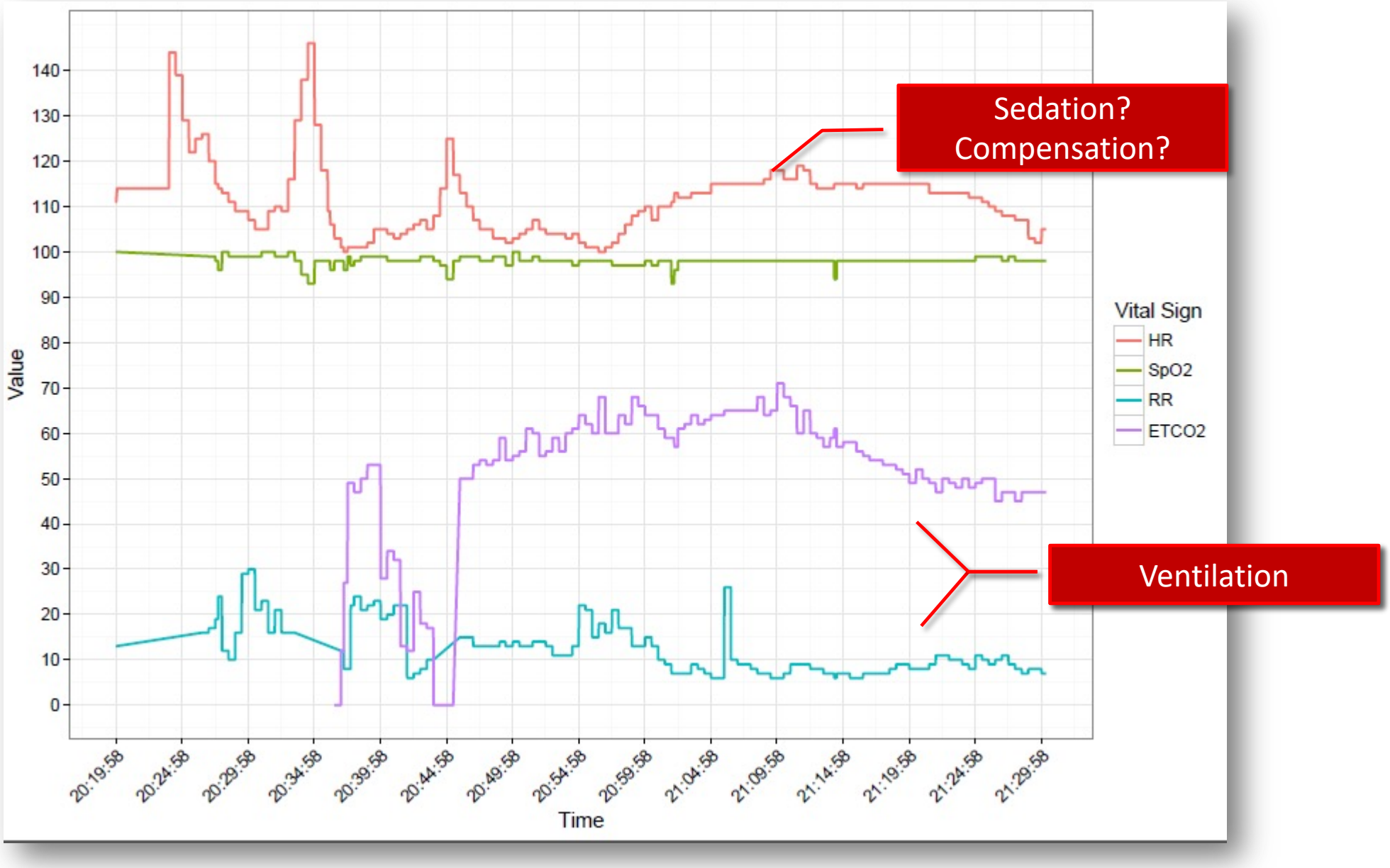
AIRWAY GRAPHS



http://github.com/samuelkordik/ZDCGraph

INTERPRETING VITAL SIGN TRENDS




Sedation?
Compensation?
Ventilation
Vital Sign
HR
SpO2
RR
ETCO2
Value
Time
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
20:19:58
20:24:58
20:29:58
20:34:58
20:39:58
20:44:58
20:49:58
20:54:58
20:59:58
21:04:58
21:09:58
21:14:58
21:19:58
21:24:58
21:29:58

Individual Case Review *most valuable—and most expensive*

Group knowledge review

Focused in-field skills training

Periodic continuing education *driven by real needs*.

What gets measured can be improved.

Leverage reporting to get “Big Picture”

Provide system-wide training to meet needs

Hold providers accountable for individual results

CONTACT INFORMATION

Samuel Kordik
Cypress Creek EMS
skordik@ccems.com
Twitter: @samuelkordik
http://github.com/samuelkordik/ZDCGraph