



# Improving Patient Access, Care and Transportation [IMPACT] by Paramedics

Tavares, W., Drennan, I., Abanil, M., Spearon, C., Van Deipen, K., Mercuri, M., Barrette, N.



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No Conflicts of Interest to Disclose

The IMPACT Study

## REB provided by:

- McMaster University
  - Southlake Regional Hospital
  - Mackenzie Health Hospital
  - Markham-Stouffville Hospital
- 
- Supported by the  
Regional Municipality of  
York / York Region  
Paramedic Services



The **IMPACT** Study

# Health Care

System Pressures

**Increasing  
Health Care  
Needs**

**Availability of  
Health Care  
Services**



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# Health Care

System Pressures – An Example

ED Use (and misuse)

As an Indicator of this Problem

Reliance; Availability of other Resources; As Admission  
Pathways

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# Health Care

System Pressures – An Example

ED Use (and misuse)

Financial Incentives / Education (to reduce misuse)

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# Health Care

System Pressures

ED Use (and misuse)

↑Availability of PC / AC (to reduce need)

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# Health Care

## System Pressures

ED Use (and misuse)

↑ Care Coordination / Managed Care  
(to promote integrated care)

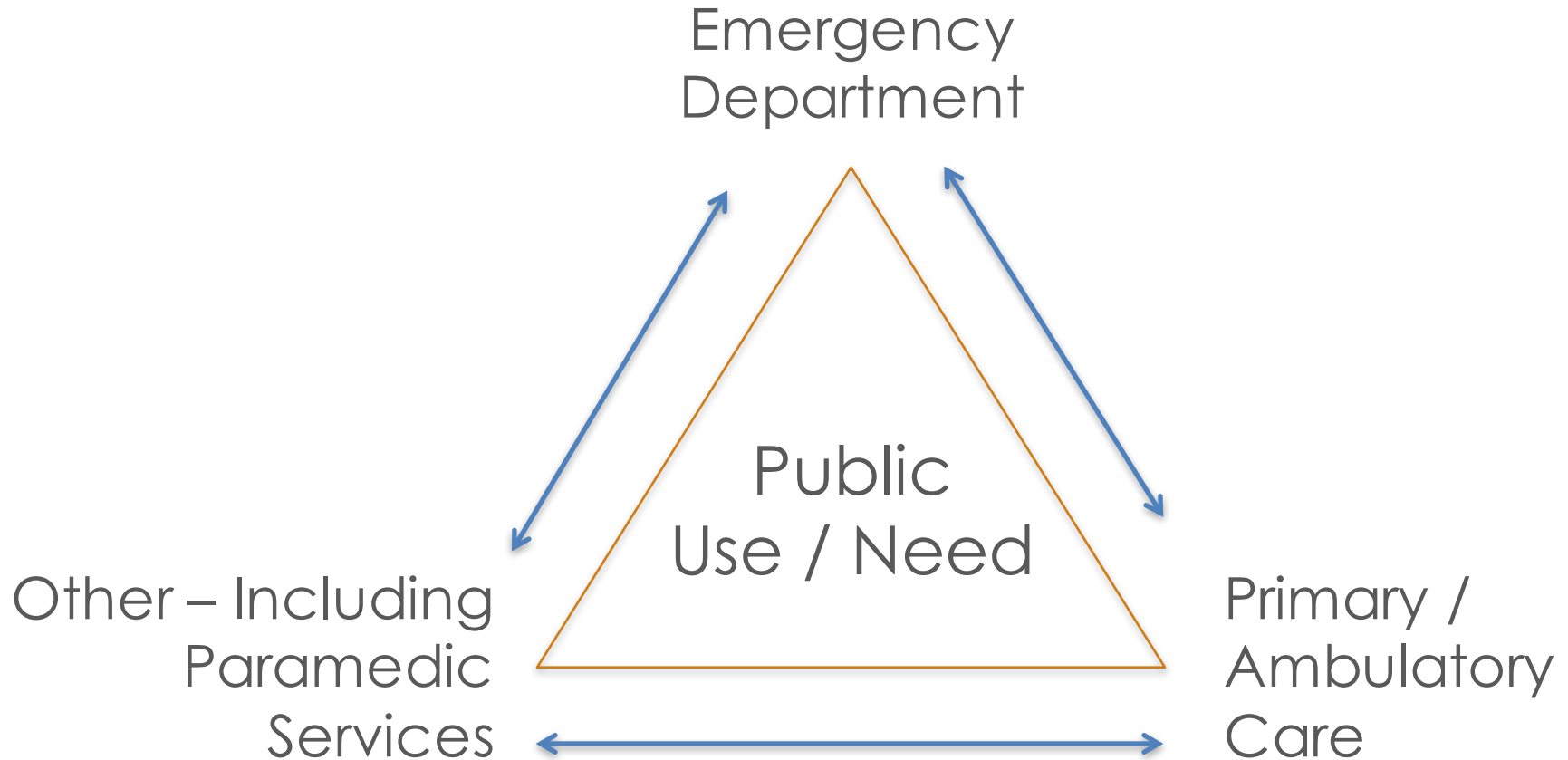
- Feeding back clinical information -

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# Health Care

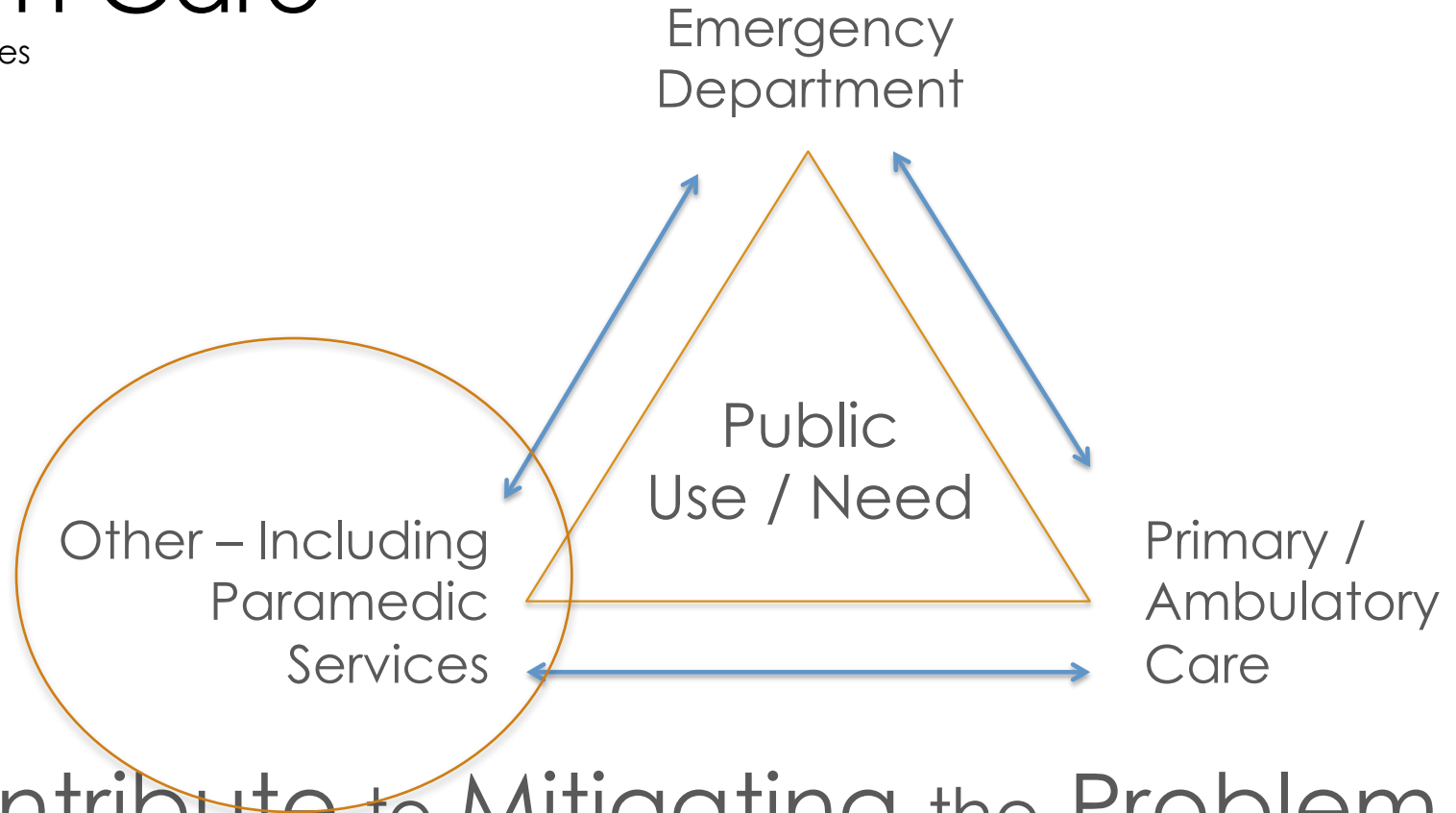
System Pressures



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# Health Care

System Pressures

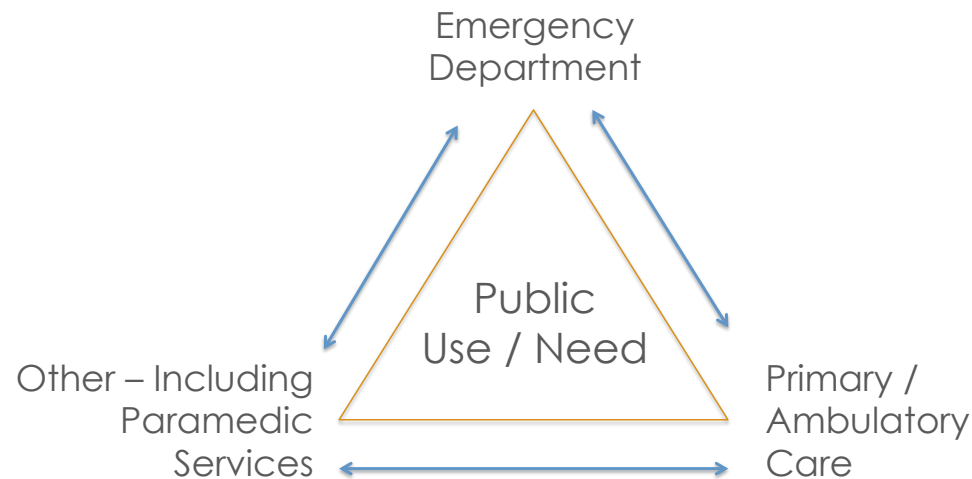


Contribute to Mitigating the Problem  
by ultimately and meaningfully integrating

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# Research Question # 1

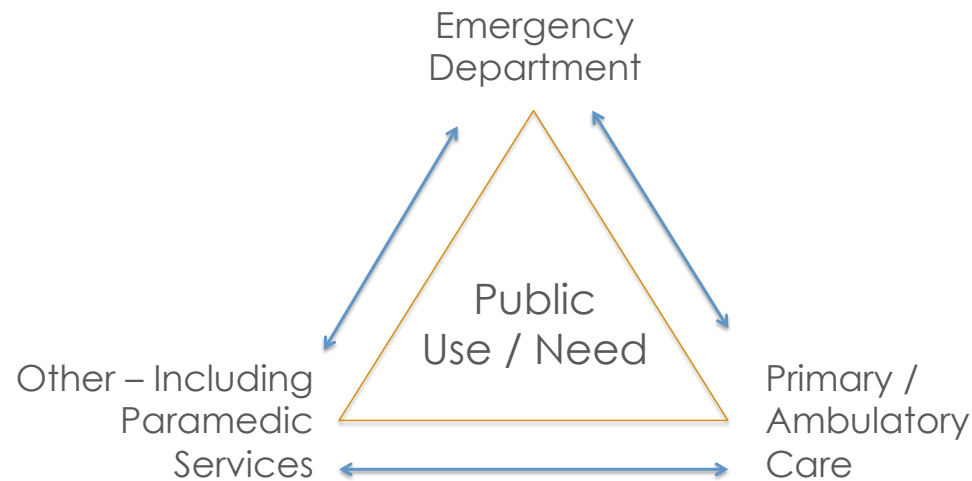
Of patients transported to an ED by paramedic services [following 911 activation], what is the **course of clinical care, disposition and most responsible diagnosis?**



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# Research Question # 2

What additional clinical services provided by paramedics (in a 911 model) would result in the greatest **access, care and intelligent transportation** for patients encountered during emergent / urgent events?



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# Shifting Clinical Services

And Working Toward Integration / Greater Capacity

**Increasing  
Health Care  
Needs**

**Availability of  
Health Care  
Services**



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# Study Design

## Overview

Retrospective Cross-sectional  
Descriptive Study and Model Simulation

- As a Program of Research –  
Phase 2 of 5

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# Study Design

## Setting

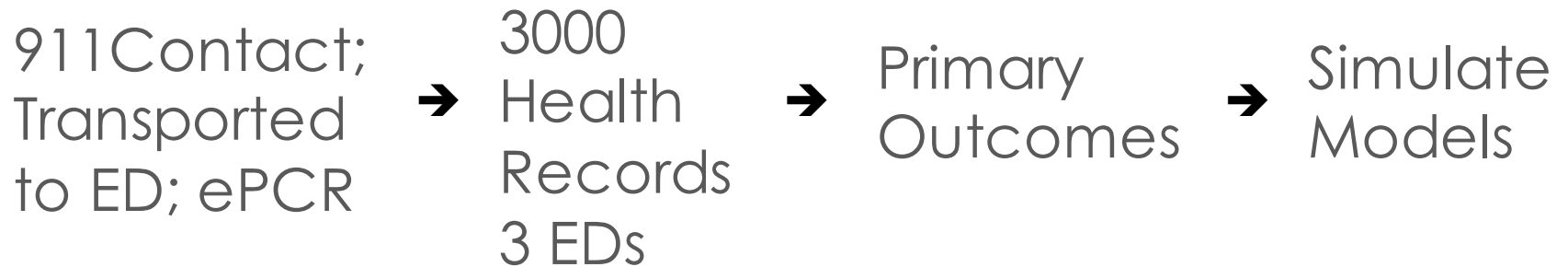


- 1.2 million
- Mix of density
- Res., Comm., Indus.
- Mix of demographics
- 3 Regional Hospitals
- 487 Paramedics
- 26-36 Amb. / 21 stations
- ePCR

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# Study Design

Methods / Procedures



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# Study Design

## Methods / Procedures

911 Contact;  
Transported  
to ED; ePCR

- Resident
- > 18
- 911 activation
- Transported to 1 of 3 regional hospital
- CTAS 2-5 (by paramedic)
- Matching hospital record
- Not inter-facility
- Not bypassed

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# Study Design

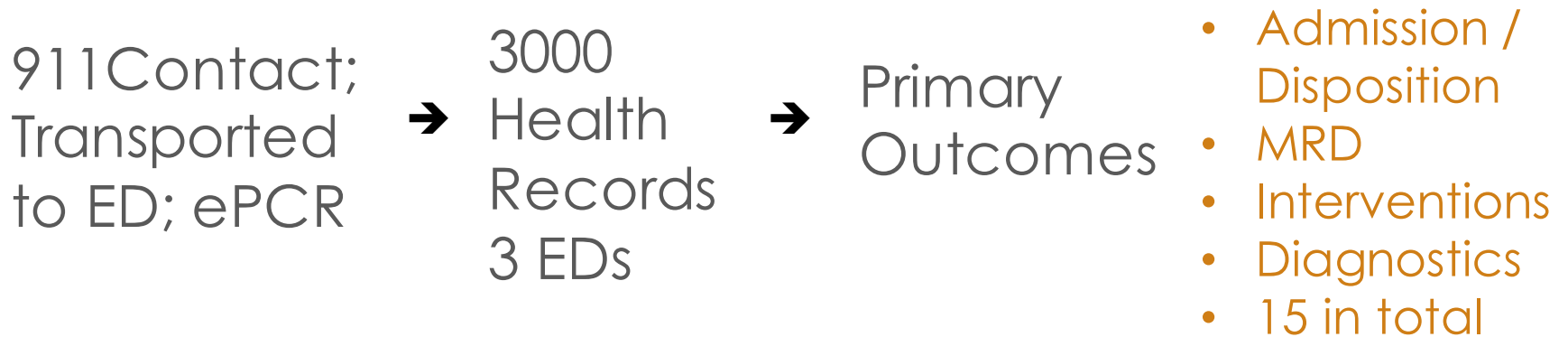
## Methods / Procedures



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# Study Design

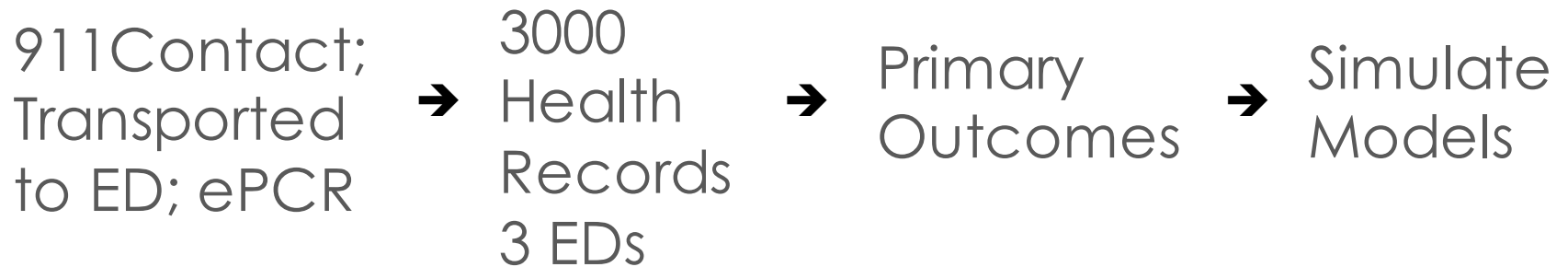
## Methods / Procedures



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# Study Design

Methods / Procedures



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# Study Design

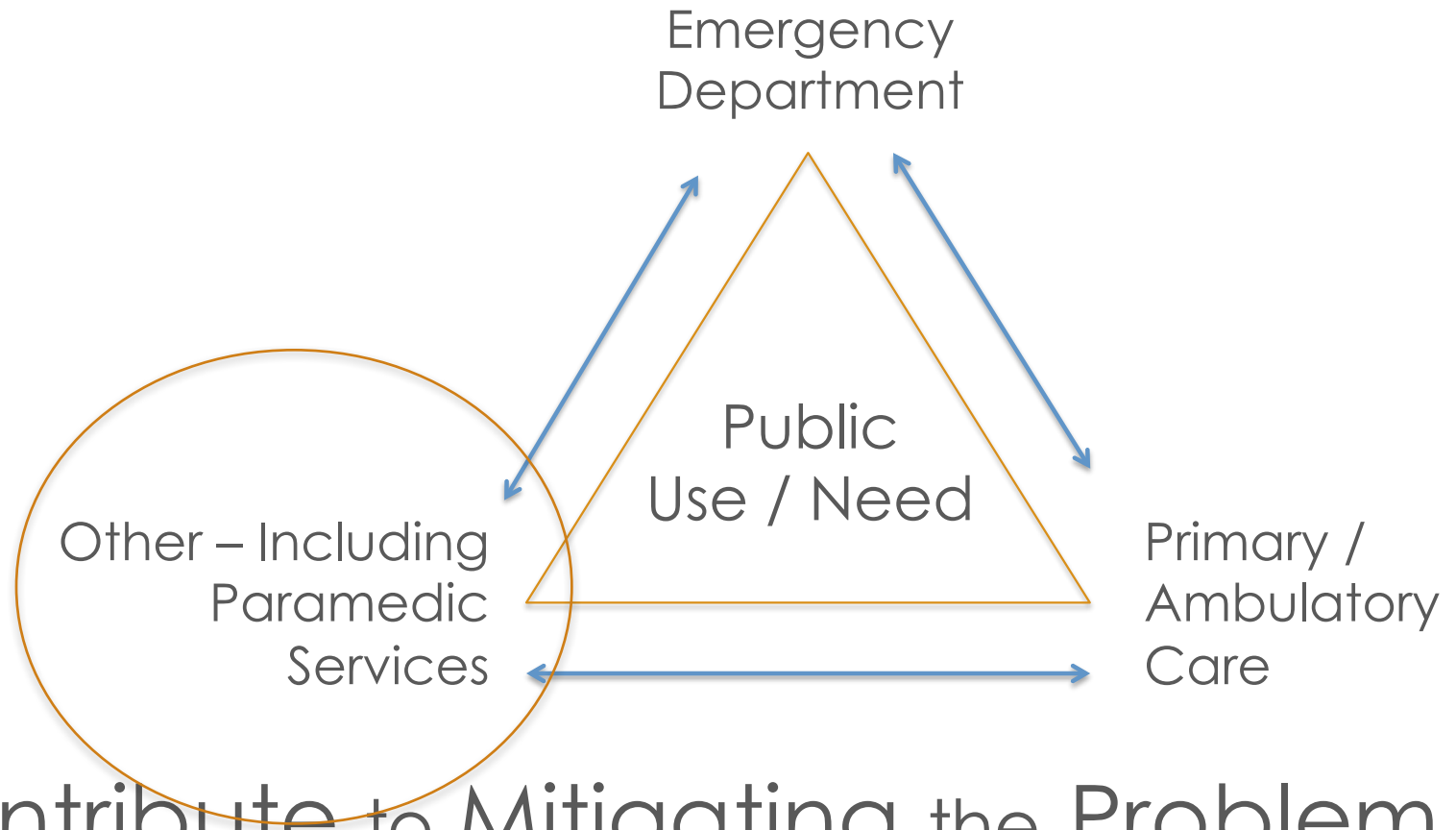
## Analysis Plan

Classification System; Explore  
Interventions and Diagnostics by Group;  
Establish Index [Based on Freq. Assoc. with  
Admission]; Explore MRD [Same Index]

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# Shifting Clinical Services

And Working Toward Integration



Contribute to Mitigating the Problem  
by ultimately and meaningfully integrating

# Results



- 77,864 records
- 55,294 post cleaning 1
- 32,009 post cleaning 2
- 3000
- 1000 records per ED – similar CTAS Distribution
- Mean age = 57.6
- N=1660 had ACP
- 23 Communities

**Table 1:** Descriptive statistics for interventions, diagnostics and admission status for 3000 patients transported by paramedics to local EDs.

Group	Interventions	Diagnostics	Admitted	n	%
1	No	No	No		
2	No	Yes	No		
3	Yes	No	No		
4	Yes	Yes	No		
5	Yes	Yes	Yes		
6	Yes	Yes	Deceased		
7	No	Yes	Yes		
8	Yes	No	Yes		
9	No	No	Yes		
10			Left AMA		



**Table 2:** Descriptive statistics for interventions, diagnostics and admission status for 3000 patients transported by paramedics to local EDs.

Group	Interventions	Diagnostics	Admitted	n	%
1	No	No	No	108	3.6
2	No	Yes	No	611	20.37
3	Yes	No	No	143	4.77
4	Yes	Yes	No	1092	36.4
				<b>1954</b>	<b>65.10%</b>
5	Yes	Yes	Yes	871	29.03
6	Yes	Yes	Deceased	2	0.07
7	No	Yes	Yes	92	3.07
8	Yes	No	Yes	8	0.27
9	No	No	Yes	2	0.07
10			Left AMA	71	2.37
				1046	35.20%

**Table 3:** Top 10 patient types (by CCS Grouping) with the highest frequency and correlation with admission.

<b>Patient Type</b>	<b>Freq.</b> Out of 1954	<b>Discharge</b> Out of 2927	<b>Index</b>
Other injuries / cond. due to ext. causes	184	<b>0.95</b>	174.52
Nonspecific chest pain	145	<b>0.89</b>	128.99
Condi. associated with dizziness/vertigo	91	<b>0.94</b>	85.37
Abdominal pain	88	<b>0.89</b>	78.22
Superficial injury; contusion	74	<b>0.97</b>	72.05
Spondylosis; intervertebral disc disorders; other back problems	65	<b>0.96</b>	62.13
Syncope	76	<b>0.77</b>	58.34
Anxiety disorders	54	<b>0.93</b>	50.28
Open wounds of head; neck; and trunk	44	<b>0.96</b>	42.09
Sprains and strains	43	<b>0.96</b>	41.09

Eg. Trauma to or injury to numerous parts of the body related; heat related injuries; allergens; foreign body; MVC

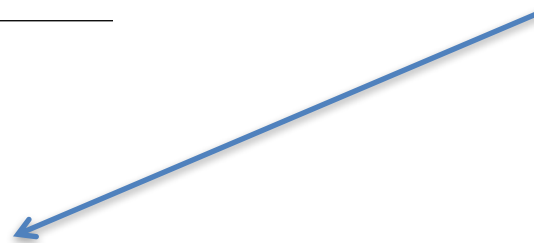
**Table 4:** Top 10 patient types (by CCS Grouping) by group assignment.

Patient Type	Group Assignment			
	Of 1954 Non-Admitted Patients			
	1	2	3	4
Other injuries / cond. due to ext. causes	n=18;9.78%	n=60;32.6%	n=17;9.24%	<b>n=89;48.3%</b>
Nonspecific chest pain	n=0;0%	<b>n=71;48.9%</b>	n=1;0.6%	<b>n=73;50.3%</b>
Condi. associated with dizziness/vertigo	n=3;3.3%	n=34;37.3%	n=6;6.59%	<b>n=48;52.7%</b>
Abdominal pain	n=1;1.14%	n=23;26.1%	n=1;1.14%	<b>n=63;71.5%</b>
Superficial injury; cont.	n=0;0%	<b>n=48;63.1%</b>	n=0;0%	n=28;36.8%
Spondylosis; intervertebral disc disorders; other back	n=11;14.8%	<b>n=33;44.5%</b>	n=1;1.3%	n=29;39.1%
Syncope	n=2;3.08%	n=7;10.77%	n=17;26.1%	<b>n=39;60%</b>
Anxiety disorders	n=1;1.82%	n=16;29.0%	n=2;3.64%	<b>n=36;65.4%</b>
Open wounds of head; neck; and trunk	n=3;5.56%	<b>n=28;51.8%</b>	n=4;7.41%	n=19;35.1%
Sprains and strains	n=0;0%	n=7;15.56%	n=2;4.44%	<b>n=36;80%</b>

**Table 5a:** Impact of models on group Assignment.

BL	n=108 (5.53%/Δ0%)
ACP	n=146 (7.47%/Δ35.19%)
<b>Diagnostics</b>	
1	n=463 (23.69%/Δ328.7%)
2	n=463 (23.69%/Δ328.7%)
3	n=454 (23.23%/Δ320.37%)
<b>4</b>	<b>n=507 (25.95%/Δ369.44%)</b>
Interventions	
5	n=186 (9.52%/Δ72.22%)
6	n=216 (11.05%/Δ100%)
7	n=214 (10.95%/Δ98.15%)
8	n=215 (11%/Δ99.07%)
Interventions + Diagnostics	
9	n=584 (29.89%/Δ440.74%)
10	n=645 (33.01%/Δ497.22%)
11	n=617 (31.58%/Δ471.3%)
12	n=691 (35.36%/Δ539.81%)

**Diagnostics** with  
greatest IMPACT  
on Group 1  
overall and by  
patient type

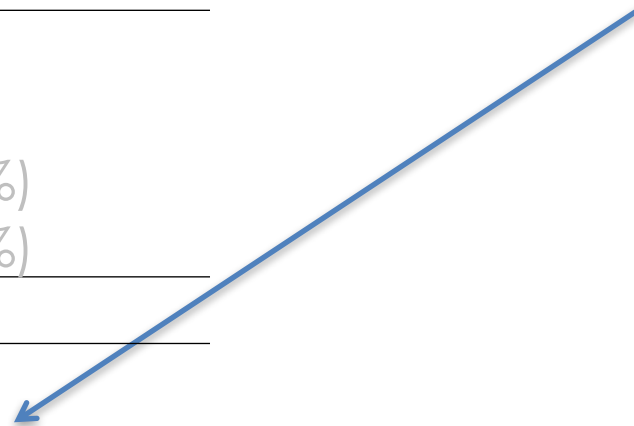


CBC/Differential  
Chem7  
X-ray  
Consult with Crisis  
Troponin  
INR  
Creatine Kinase  
Consult with GEM  
PTT  
Urinalysis[POC]

**Table 5b:** Impact of models on group Assignment.

BL	n=108 (5.53%/Δ0%)
ACP	n=146 (7.47%/Δ35.19%)
Diagnostics	
1	n=463 (23.69%/Δ328.7%)
2	n=463 (23.69%/Δ328.7%)
3	n=454 (23.23%/Δ320.37%)
4	n=507 (25.95%/Δ369.44%)
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12	n=691 (35.36%/Δ539.81%)

**Intervention** with  
greatest IMPACT  
on Group 1  
overall and by  
patient type



Zofran  
Percocet  
Tylenol 3  
Ativan  
Sutures  
TD  
Hydromorphone  
Metoclopramide  
Ranitidine  
Foley]

**Table 5c:** Impact of models on group Assignment.

BL	n=108 (5.53%/Δ0%)
ACP	n=146 (7.47%/Δ35.19%)
Diagnostics	
1	n=463 (23.69%/Δ328.7%)
2	n=463 (23.69%/Δ328.7%)
3	n=454 (23.23%/Δ320.37%)
4	n=507 (25.95%/Δ369.44%)
Interventions	
5	n=186 (9.52%/Δ72.22%)
6	n=216 (11.05%/Δ100%)
7	n=214 (10.95%/Δ98.15%)
8	n=215 (11%/Δ99.07%)
<b>Interventions + Diagnostics</b>	
9	n=584 (29.89%/Δ440.74%)
10	n=645 (33.01%/Δ497.22%)
11	n=617 (31.58%/Δ471.3%)
<b>12</b>	<b>n=691 (35.36%/Δ539.81%)</b>

**Interventions +  
Diagnostics** with  
greatest IMPACT  
on Group 1  
overall and by  
patient type



CBC/Differential;  
Chem7; X-ray; Consult  
with Crisis; TroponinI;  
INR; Creatine Kinase;  
Consult with GEM; PTT  
Urinalysis[POC]

Zofran Percocet; Tylenol  
3; Ativan; Sutures; Td;  
Hydromorphone;  
Metoclopramide;  
Ceftriaxone; Pink Lady

**Table 6:** Example of models on sample patient types

	Other injuries / cond. d/t external causes (n=184)	Nonspecific chest pain (n=145)	Abdominal pain (n=88)
None	n=18 (9.78%)	n=0 (0%)	n=1 (1.14%)
ACP	n=21 (11.41%)	n=1 (0.69%)	n=1 (1.14%)
1	<b>n=84 (45.65%)</b>	n=41 (28.28%)	n=3 (3.41%)
2	n=84 (45.65%)	n=41 (28.28%)	n=3 (3.41%)
3	n=59 (32.07%)	n=69 (47.59%)	n=3 (3.41%)
4	n=64 (34.78%)	<b>n=72 (49.66%)</b>	<b>n=4 (4.55%)</b>
5	n=26 (14.13%)	n=1 (0.69%)	n=1 (1.14%)
6	n=28 (15.22%)	n=1 (0.69%)	n=1 (1.14%)
7	n=28 (15.22%)	n=2 (1.38%)	n=1 (1.14%)
8	n=27 (14.67%)	n=2 (1.38%)	n=1 (1.14%)
9	n=108 (58.7%)	n=46 (31.72%)	n=4 (4.55%)
10	<b>n=117 (63.59%)</b>	n=47 (32.41%)	n=4 (4.55%)
11	n=84 (45.65%)	n=80 (55.17%)	n=4 (4.55%)
12	n=89 (48.37%)	<b>n=84 (57.93%)</b>	<b>n=5 (5.68%)</b>

# Discussion

Shifting Clinical Services [and working toward integration]

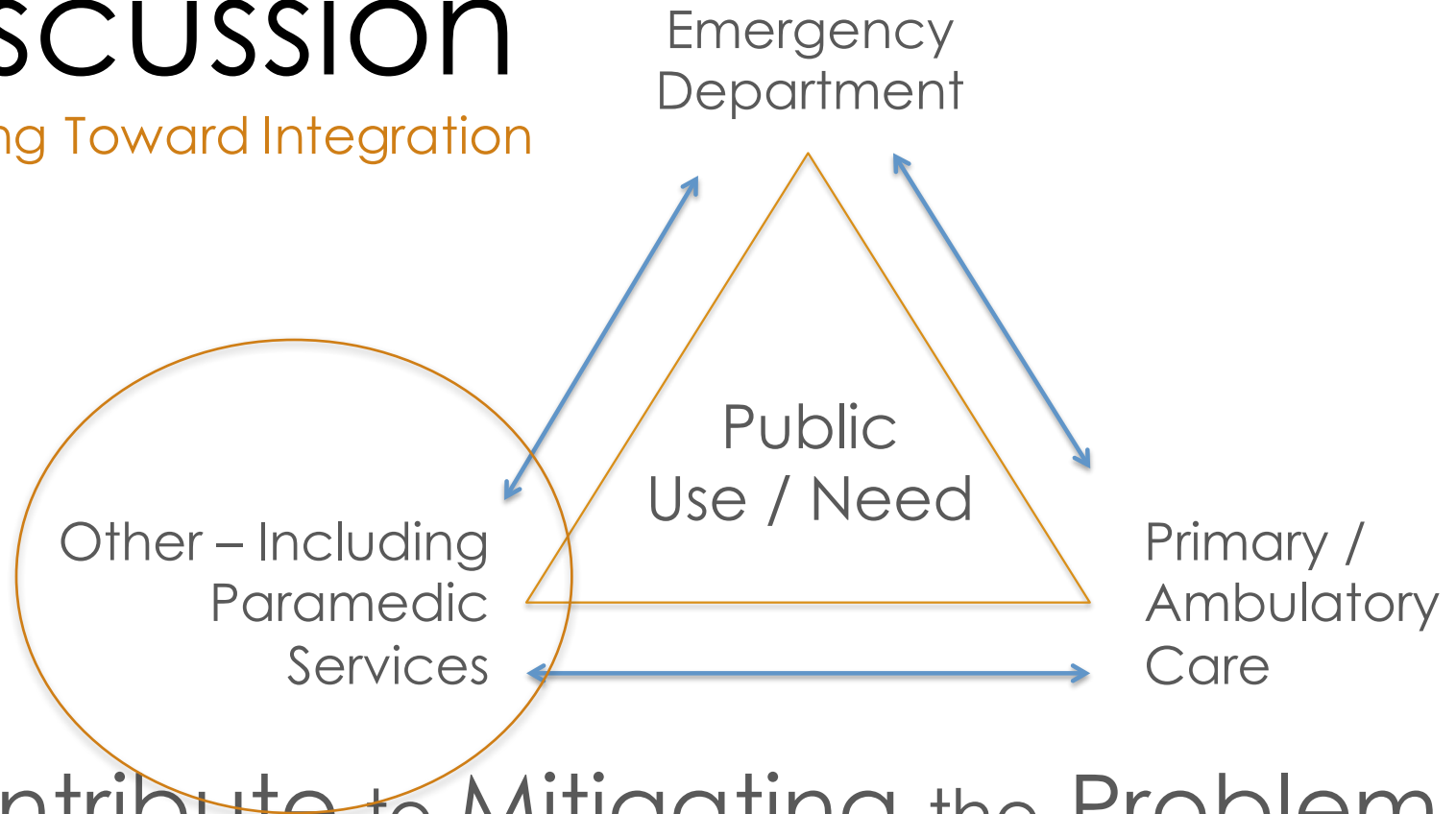
Having an **IMPACT**





# Discussion

Working Toward Integration



Contribute to Mitigating the Problem  
by ultimately and meaningfully integrating

The **IMPACT** Study - As a Program of Research -

# Discussion

Opportunity; Diagnostics; Patient Types and Culture

## Having an IMPACT

- Opportunity with 65% non-admission rate (n=1954/3000)
  - Extrapolated = ~35,000 pts
- Still some risk
- Interventions and Diagnostics alone are insufficient [obviously]
  - Clinical Reasoning!

### Discharge Rates

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0.95

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0.89

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0.94

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0.89

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0.97

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0.96

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0.77

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0.93

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0.96

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0.96

The IMPACT Study

# Discussion

Opportunity; **Diagnostics**; Patient Types and Culture

## Having an **IMPACT**

- **Diagnostics** matter most
- Interventions have less of an impact
- Best when combined but gains may be limited
  - Training / costs

CBC/Differential  
Chem7  
X-ray  
Consult with Crisis  
Troponin  
INR  
Creatine Kinase  
Consult with GEM  
PTT  
Urinalysis[POC]

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# Discussion

Opportunity; **Diagnostics**; Patient Types and Culture

## Having an **IMPACT**

- **Diagnostics** matter most
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# Discussion

Opportunity; Diagnostics; Patient Types and Culture

## Having an IMPACT

- Patient Types matter
- Some minimal impact (e.g., Abdo pain)
- Others significant (e.g., MSK / Non-specific CP)

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# Discussion

Opportunity; Diagnostics; Patient Types and Culture

## Having an IMPACT

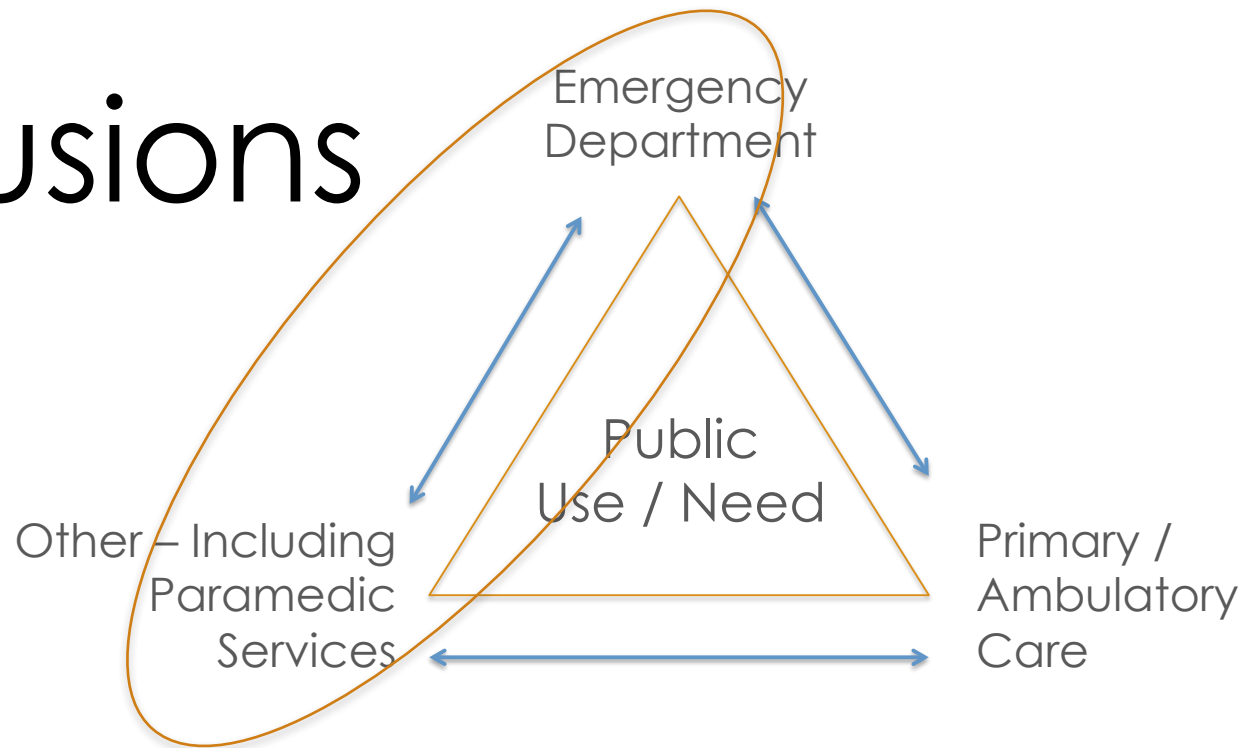
- Culture of practice matters
- Many transported unnecessarily
- Culture of “transport” requires attention
- ACP Skill set alone can have an impact (if permitted)

# Limitations

- Aspirational / assumes no limitations
- Isolated to one region
- Multiple models possible / multiple approaches are possible
- These are simulations that cannot possibly consider all possible factors
  - Both over and underestimations are possible
- Feasibility limitations

# Conclusions

## IMPLICATIONS



## Having an **IMPACT**

- **Consumption** of health care not likely to decline – shift to other settings
- **Underserved** population
- **Integrate services** / collectively expand services
- **Stop contributing and** begin mitigating
- We didn't discuss **ACSC**





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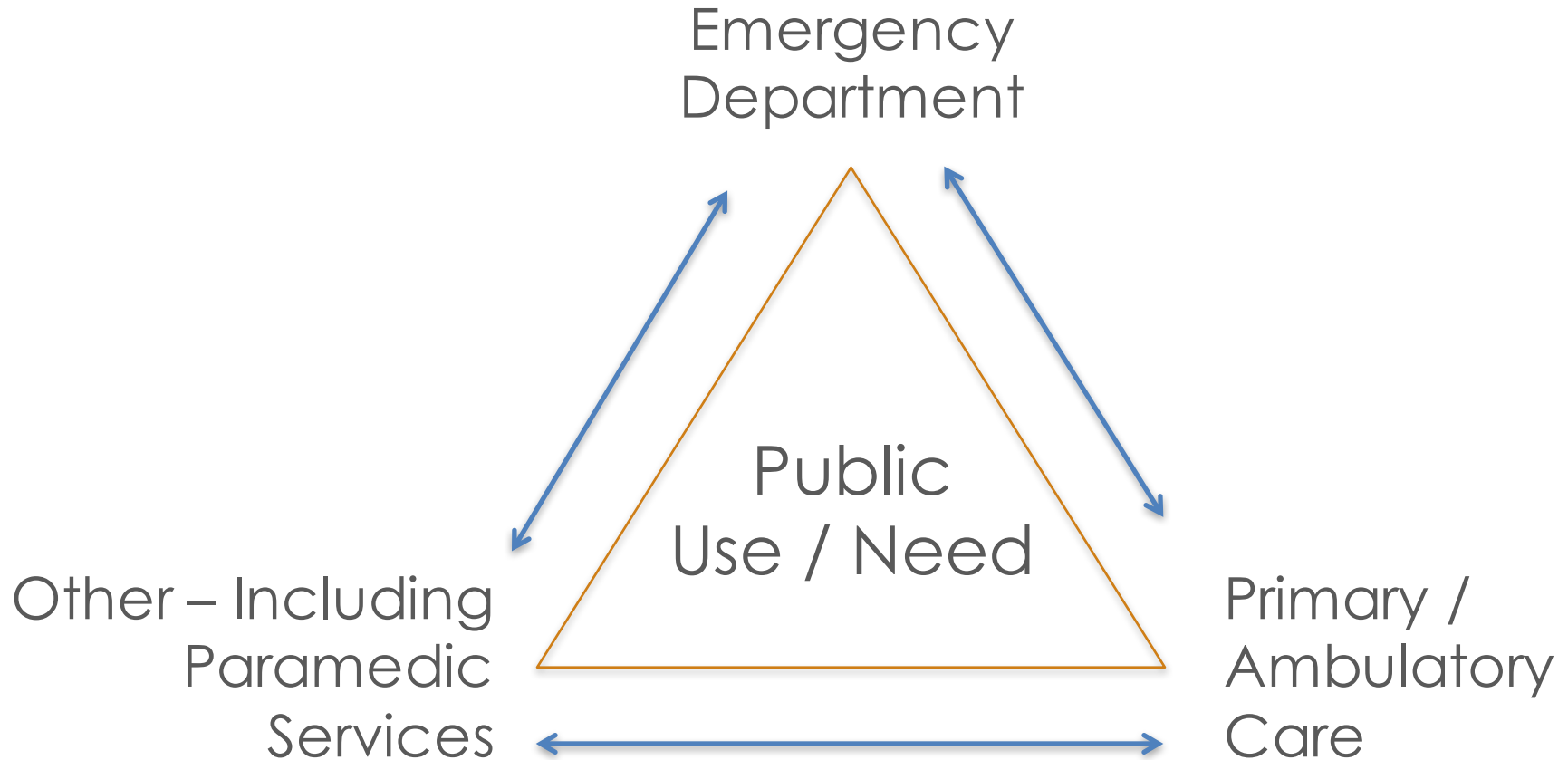
## THANK YOU!



Presented by **Walter Tavares**, ACP, PhD  
[Walter.Tavares@york.ca](mailto:Walter.Tavares@york.ca)

# Health Care

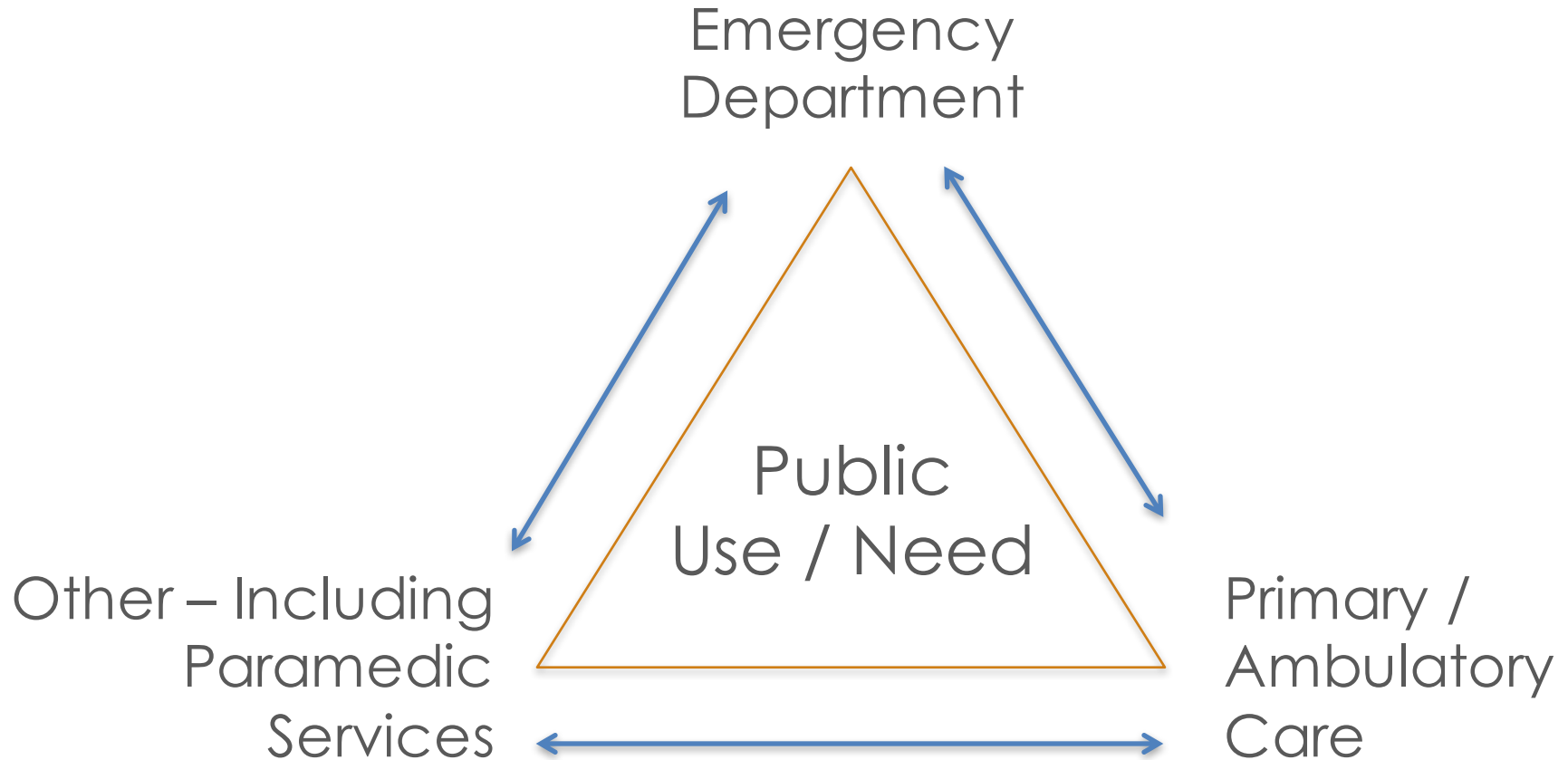
System Pressures



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# Health Care

System Pressures



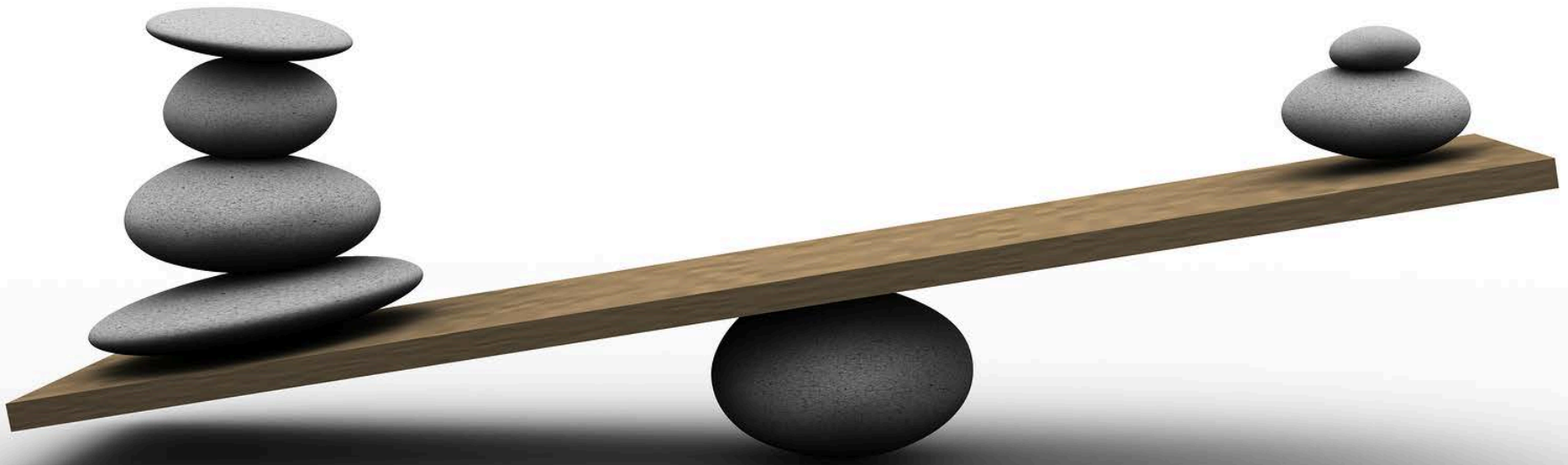
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# Health Care

System Pressures

**Incr. Health  
Care Needs**

**Availability of  
Health Care  
Services**



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