



Databases for EMS-Based Health Services Research: Development & Application of NEMESIS

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**Computers are useless,
they can only give you
answers.**

Pablo Picasso



**You can purchase anything
off the Internet except
common sense.**

**Zoo Director Jim Harrison after receiving 100
snakes confiscated in an undercover sting from a
Kentucky church**

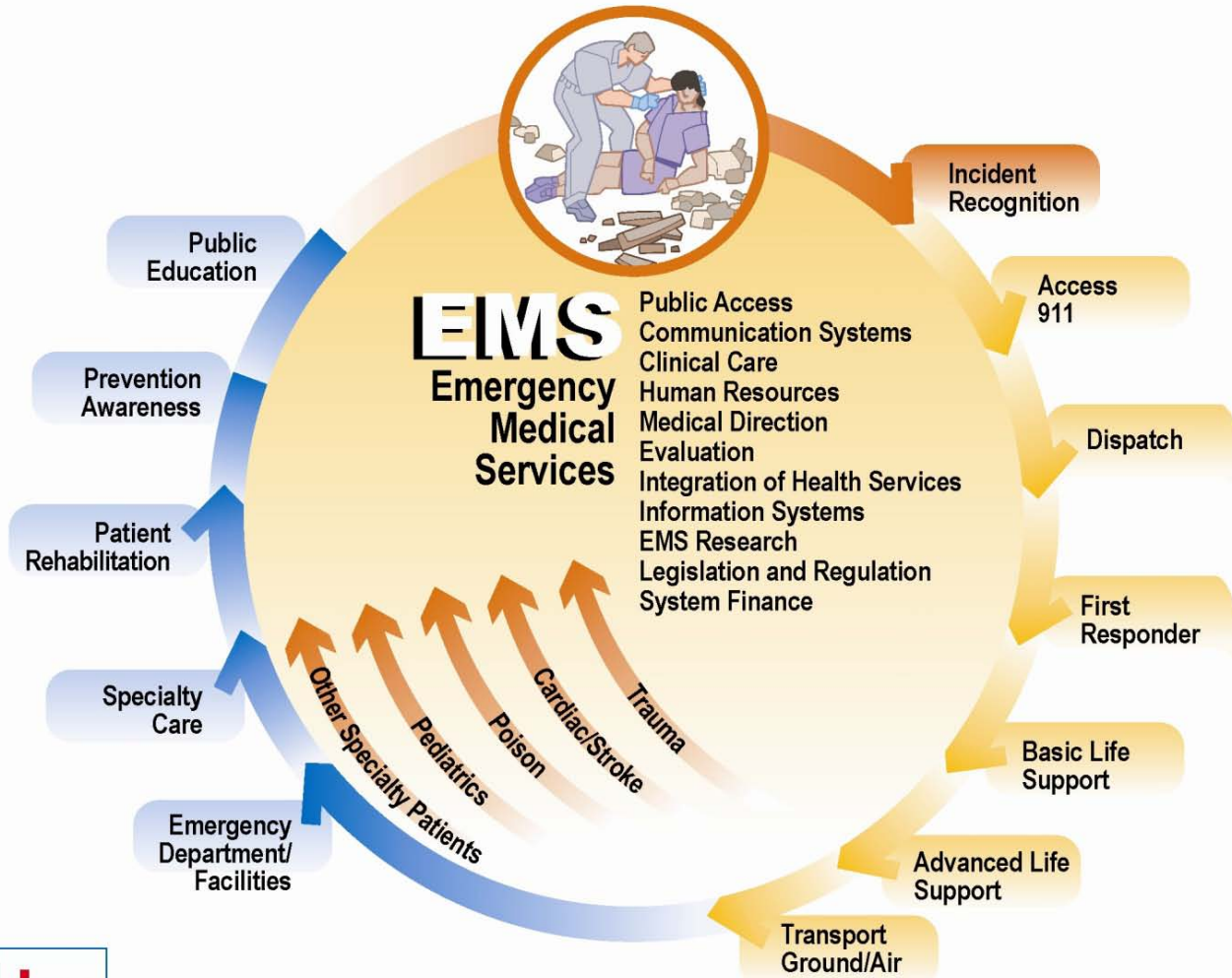
Overview

- ✧ In efforts to improve EMS, absence of data has been a major impediment.
- ✧ The National EMS Information System (NEMSIS) was developed in response to that need.
- ✧ Long-term goal is fully coordinated, comprehensive data-driven and evidence-based EMS systems.



The EMS System

The Emergency Medical Services System



Brief Overview of NEMSIS

- Developed at request of the National Association of State EMS Officials
- NEMSIS is a standardized approach to EMS patient care data collection and reporting, including:
 - A uniform dataset - Data Dictionary
 - XML Schema to ensure portability of data



Need for NEMSIS

- 📁 EMS Education Standards
- 📁 EMS Performance Measures
- 📁 EMS System Evaluation & Outcomes
- 📁 EMS Research
- 📁 EMS Reimbursement
- 📁 Filling Gaps in Electronic Health Record



Major Milestones



📁 2001 – Initiated development of NEMSIS Data Dictionary through NASEMSO

📁 2005 – NEMSIS implementation begun with creation of NEMSIS Technical Assistance Center.

NEMSIS – Current Status

States contributing: National EMS Database

- 23 states (>7 million records)

National and State-level Reporting Tools

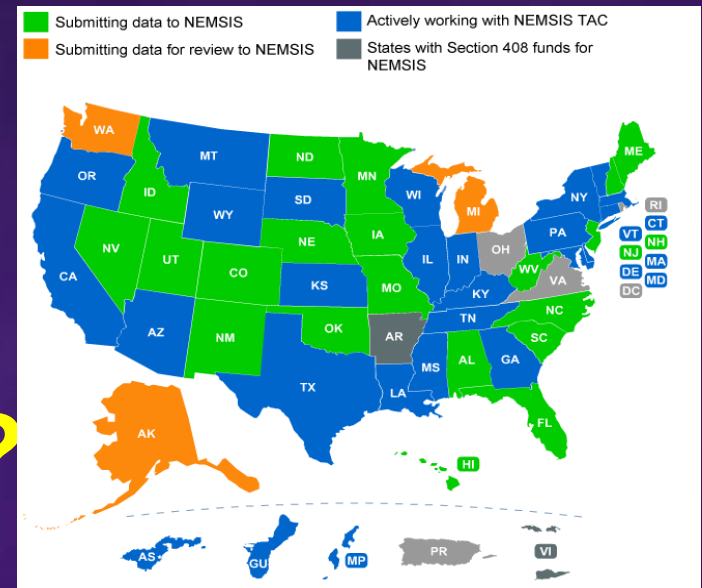
- Characterize EMS care
- Benchmark to National and State data

EMS Research Database

- Available end of July

SDO Approval through HL7

36 States by 2010?



Available Reporting Tools

“Real Time” National Reports

■ Report Domain

- ✓ *Data Quality reports*
- ✓ *Demographic reports*
- ✓ *Elapsed Time reports*
- ✓ *Medical and Trauma reports*
- ✓ *Disposition reports*
- ✓ *Agency reports*
- ✓ *Cardiac Arrest reports*
- ✓ *Financial Aspects reports*
- ✓ *Delay reports*
- ✓ *Ad-hoc reports*

www.nemsis.org

“Real Time” Searchable Query System

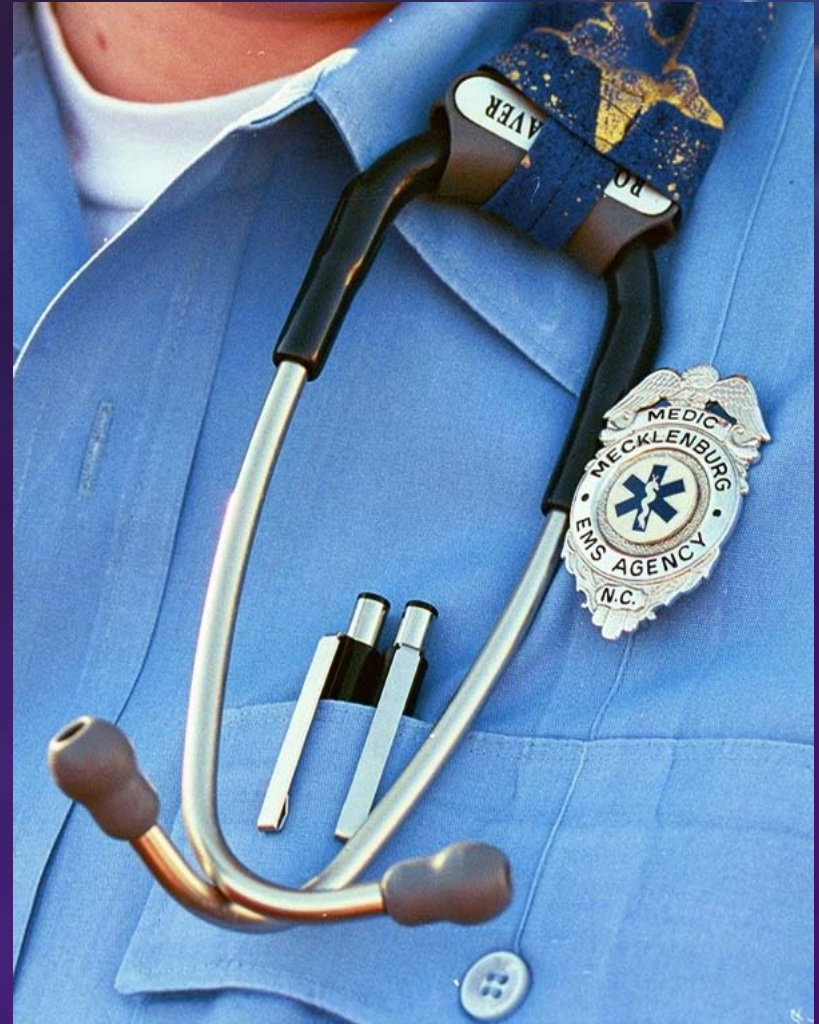
- Cardiac Arrest - Pediatrics
- Trauma - Urbanicity

OLAP Data Cubes Multi-Dimensional Queries

EMS Research Database

📁 Release July, 2009

- Data request and release protocol
- Single year (2008) ~ 4 million records
- Release on a single DVD
- Three different datasets
 - ✓ *Full DVD encryption*
 - ✓ *SAS and ASCII files*
 - ✓ *Data users manual*



EMS Performance Measures

- Movement toward Evidence Based EMS
- Identifies Best Practices
- Allows a Cost Benefit Analysis
- Enables Benchmarking
- Focuses Funding
- Targets Research
- Ultimately Improves Outcomes



EMS Structure of Operations

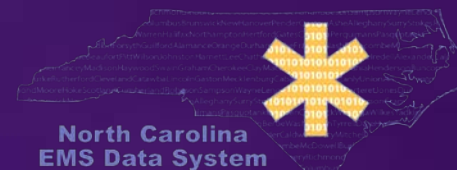


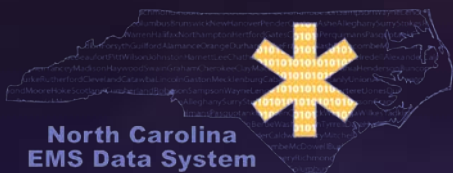
livery

Time

Curitiba

90% Fractal 911 Call to Arrival on Scene Time





Resources vs. Demographics

2000 North Carolina Census	Top 50 NC Counties (mm:ss)	Bottom 50 NC Counties (mm:ss)	Difference
Median Age	7:49	7:32	3.6% slower EMS response in counties with increased age
Education Level	7:09	8:22	14.5% faster EMS response in counties with higher education levels
Poverty Level	8:51	7:23	16.6% slower EMS response in counties with higher poverty levels
Fatal Injury Rate	9:04	7:15	20.0% slower EMS response in counties with higher injury fatality rates
Cardiovascular Disease Death Rate	7:56	7:02	11.3% slower EMS response in counties with higher cardiovascular disease death rates

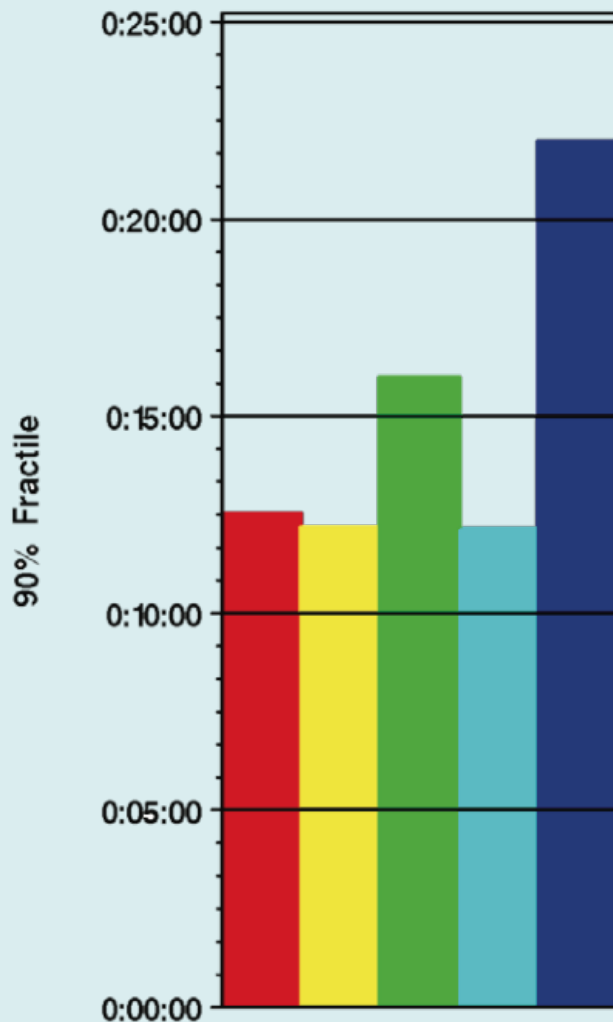
Resources vs. Outcomes

EMS Systems by 90% Fractal Total EMS Response Time		
EMS System	Total 90% Fractal EMS Response Time (mm:ss)	Injury Fatality Rate (deaths/100,000 Pop)
Top 10 Average	14:00	62.4
Bottom 10 Average	35:12	75.0

- ⚡ There is a 21:12 (151%) difference between the top 10 and bottom 10
- ⚡ There is a 20% increase in the injury fatality rate
- ⚡ The average EMS System Total Response Time for North Carolina is 21:40 (mm:ss).

Benchmarking

EMS Agency Stroke Patient Total Response Time Report



System	Events (n)	Avg Value	90% Fractile
EMS System (All Emergent)	42,317	0:08:20	0:12:33
EMS System (Acute Stroke)	2,605	0:08:10	0:12:11
State	39,474	0:09:46	0:16:00
Similar EMS System (by Pop)	14,649	0:08:10	0:12:07
Similar EMS System (by Area)	3,177	0:11:29	0:22:00

- **SAMPLE (All Emergent)**
- **SAMPLE (Only Acute Stroke)**
- **State**
- **Similar EMS System (by Population)**
- **Similar EMS System (by Area)**

This report is based on the following events:

- Type of Service = 911 Scene Response
- Response Mode = Lights and Sirens
- Patient Type = Acute Stroke Patients
- Total Response Time = 911 Call Time through EMS Arrival on Scene Time

North Carolina Example



Chest Pain: Cardiac and STEMI



History

- Age
- Medications
- Viagra, Levitra, Cialis
- Past medical history (MI, Angina, Diabetes, post menopausal)
- Allergies (Aspirin, Morphine, Lidocaine)
- Recent physical exertion
- Palliation / Provocation
- Quality (crampy, constant, sharp, dull, etc.)
- Region / Radiation / Referred
- Severity (1-10)
- Time (onset / duration / repetition)

Signs and Symptoms

- CP (pain, pressure, aching, vice-like tightness)
- Location (substernal, epigastric, arm, jaw, neck, shoulder)
- Radiation of pain
- Pale, diaphoresis
- Shortness of breath
- Nausea, vomiting, dizziness
- **Time of Onset**

Differential

- Trauma vs. Medical
- Angina vs. Myocardial Infarction
- Pericarditis
- Pulmonary embolism
- Asthma / COPD
- Pneumothorax
- Aortic dissection or aneurysm
- GE reflux or Hiatal hernia
- Esophageal spasm
- Chest wall injury or pain
- Pleural pain
- Overdose (Cocaine) or Methamphetamine

Universal Patient Care Protocol

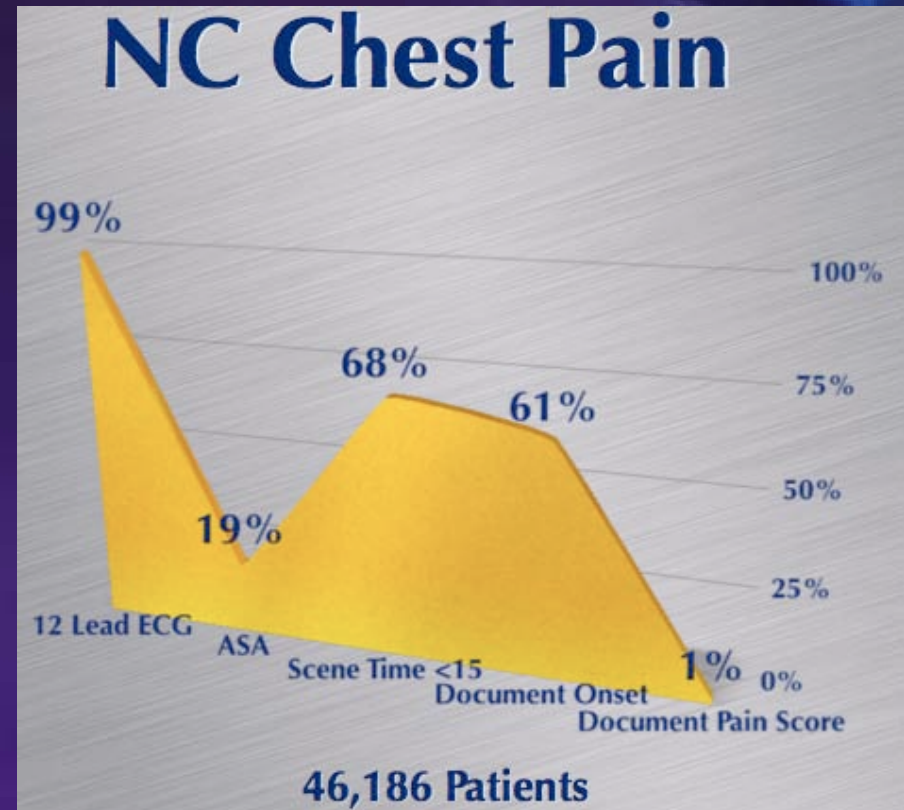
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: #f2f2f2;">P</td><td>Rhythm Assessment</td><td style="background-color: #f2f2f2;">P</td></tr> <tr><td style="background-color: #d9ead3;">B</td><td>12 Lead ECG</td><td style="background-color: #d9ead3;">B</td></tr> <tr><td style="background-color: #d9ead3;">I</td><td>IV Protocol</td><td style="background-color: #d9ead3;">I</td></tr> <tr><td style="background-color: #d9ead3;">B</td><td>Aspirin (Unless allergy)</td><td style="background-color: #d9ead3;">B</td></tr> <tr><td style="background-color: #d9ead3;">I</td><td>Nitroglycerin SL</td><td style="background-color: #d9ead3;">I</td></tr> <tr><td style="background-color: #d9ead3;">I</td><td>Consider Nitroglycerin Paste</td><td style="background-color: #d9ead3;">I</td></tr> <tr><td style="background-color: #f2f2f2;">P</td><td>Continued Pain Morphine Fentanyl Dilaudid</td><td style="background-color: #f2f2f2;">P</td></tr> <tr><td style="background-color: #f2f2f2;">P</td><td>Nausea and Vomiting Consider Ondansetron Promethazine Metoclopramide</td><td style="background-color: #f2f2f2;">P</td></tr> <tr><td colspan="3">Use Protocols as Needed</td></tr> <tr><td colspan="3">Hypotension Protocol Dysrhythmia Protocols</td></tr> <tr><td style="background-color: #f2f2f2;">M</td><td>Notify Destination or Contact MC</td><td style="background-color: #f2f2f2;">M</td></tr> </table>	P	Rhythm Assessment	P	B	12 Lead ECG	B	I	IV Protocol	I	B	Aspirin (Unless allergy)	B	I	Nitroglycerin SL	I	I	Consider Nitroglycerin Paste	I	P	Continued Pain Morphine Fentanyl Dilaudid	P	P	Nausea and Vomiting Consider Ondansetron Promethazine Metoclopramide	P	Use Protocols as Needed			Hypotension Protocol Dysrhythmia Protocols			M	Notify Destination or Contact MC	M	Positive Acute MI (STEMI = 1 mm ST Segment Elevation in 2 Contiguous Leads) Transport based on EMS System STEMI Plan with Early Notification Keep Scene Time to < 15 Minutes <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="background-color: #d9ead3;">B</td><td>If Transporting to a Non-PCI Center</td><td style="background-color: #d9ead3;">B</td></tr> <tr><td style="background-color: #d9ead3;">I</td><td>Consider NS Bolus for Inferior MI</td><td style="background-color: #d9ead3;">I</td></tr> <tr><td style="background-color: #d9ead3;">I</td><td>Consider 2nd IV en route</td><td style="background-color: #d9ead3;">I</td></tr> </table>	B	If Transporting to a Non-PCI Center	B	I	Consider NS Bolus for Inferior MI	I	I	Consider 2 nd IV en route	I
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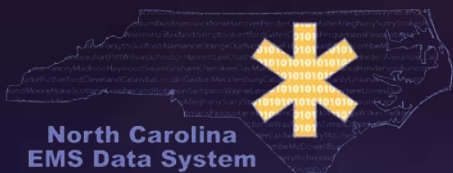
Pearls

- Recommended Exam: Mental Status, Skin, Neck, Lung, Heart, Abdomen, Back, Extremities, Neuro
- Items in Red Text are the key performance indicators for the EMS Acute Cardiac (STEMI) Care Toolkit
- Avoid Nitroglycerin in any patient who has used Viagra or Levitra in the past 24 hours or Cialis in the past 36 hours due to potential severe hypotension.
- Patients with STEMI (ST-Elevation Myocardial Infarction) or positive Reperfusion Checklist should be transported to the appropriate destination based on the EMS System STEMI Plan
- If patient has taken nitroglycerin without relief, consider potency of the medication.
- Monitor for hypotension after administration of nitroglycerin and narcotics (Morphine, Fentanyl, or Dilaudid).
- Nitroglycerin and Narcotics (Morphine, Fentanyl, or Dilaudid) may be repeated per dosing guidelines in Drug List.
- Diabetics and geriatric patients often have atypical pain, or only generalized complaints.
- Document the time of the 12-Lead ECG in the PCR as a Procedure along with the Interpretation (EMT-P)

Protocol 21
Any local EMS System changes to this document must follow the NC EMS Protocol Change Policy and be approved by GEMS

2009

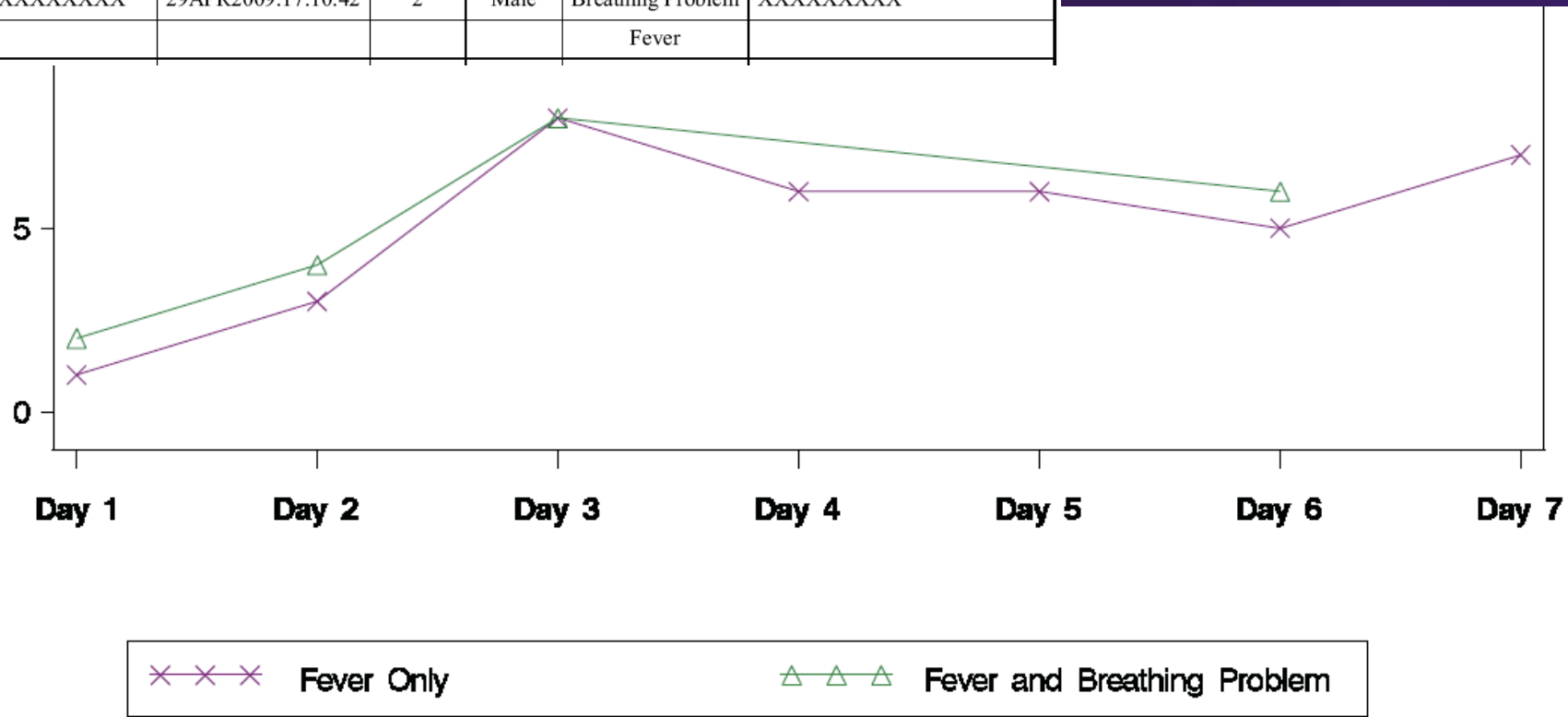




H1N1 Surveillance

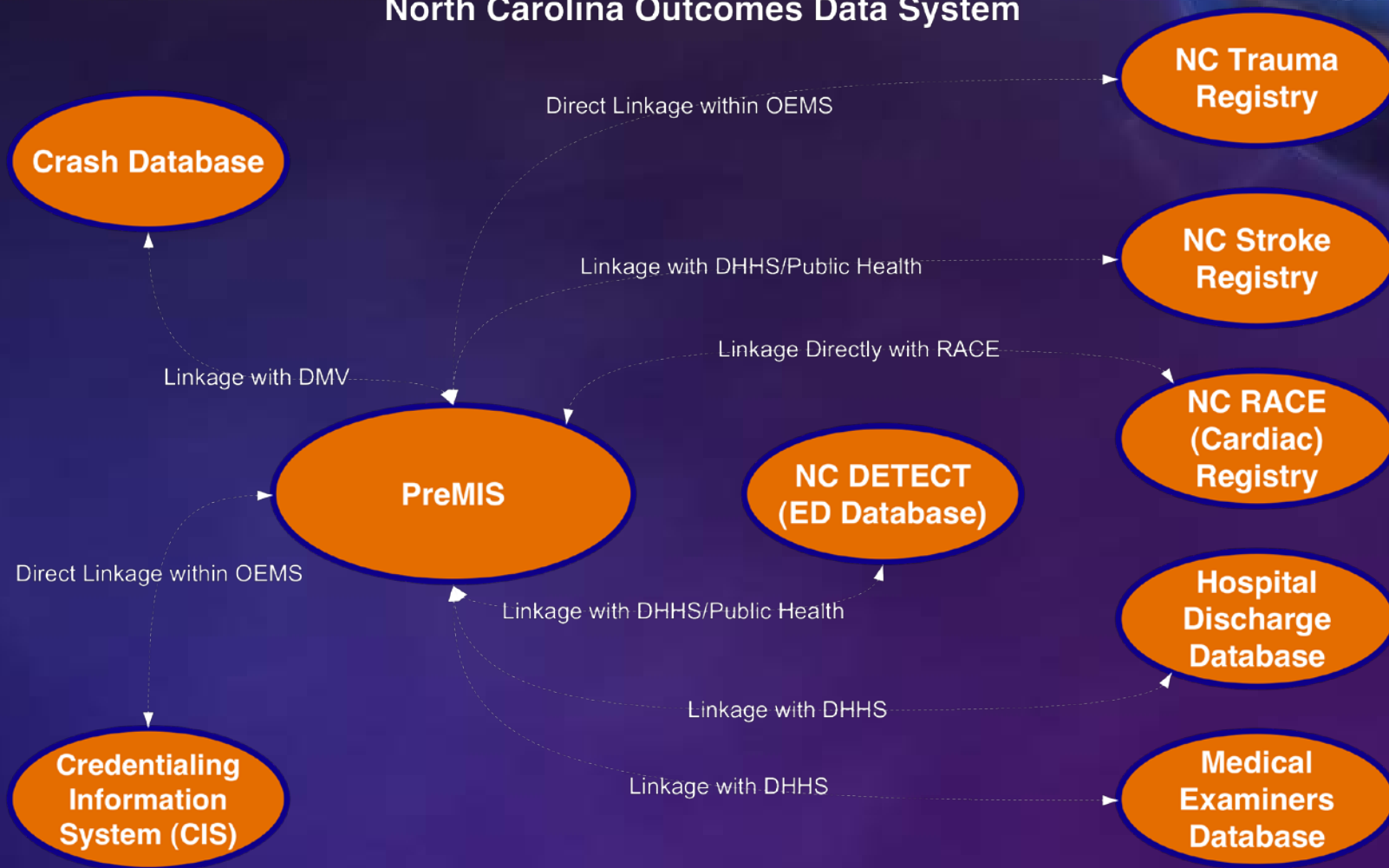
EMS H1N1 Influenza Surveillance Report
EMS Data System Report
From 04/24/2009 To 04/30/2009

PCR Number	Date/Time	Age (Years)	Gender	Symptoms	Transport Destination
Fever and Breathing Problem					
XXXXXXXXXX	30APR2009:20:57:18	66	Male	Breathing Problem	XXXXXXXXXX
				Fever	
XXXXXXXXXX	29APR2009:17:10:42	2	Male	Breathing Problem	XXXXXXXXXX
				Fever	



Key to Our Future

North Carolina Outcomes Data System



Injury/Illness

Outcome

NEMESIS Version 3

📁 Systems of Care Approach

- Trauma
- STEMI
- Stroke

📁 Movement to HL7

- HITSP SDO Standardization
- Exchange with Other Healthcare Providers

📁 National Performance Measures

📁 Focus on Quality

- Patient Care instead of Transport
- Outcomes and Effectiveness



Thank You



www.NEMSIS.org



www.EMSPIC.org