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GLEANING DATA FROM DISASTER: A HOSPITAL-BASED DATA MINING METHOD TO STUDYING ALLHAZARD TRIAGE AFTER A CHEMICAL DISASTER

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IRB Approvals

- Institutional Review Board of the University of South Carolina
- Institutional Review Board of the South Carolina Department of Health and Environmental Control
- All databases were linked within the South Carolina Office of Research and Statistics, de-identified, and provided with a unique personal identification number prior to our receipt of the study data

Photo source: Environmental Protection Agency, Region 4, Southeast

Objective of This Presentation

To describe a successful approach to collect and extract clinical data for disaster-related triage effectiveness research

Participants: victims who received emergency care in South Carolina

Setting

January 5, 2005 2:39 AM
Graniteville

Photo source: Environmental Protection Agency, Region 4, Southeast

Norfolk Southern freight train crashed into a parked train on a side track in the center of town

Challenges of Mass Casualty Events

- Validity and effectiveness of triage data used to make life and death decisions about the priority of care
- Large numbers of injured patients that quickly overwhelm existing healthcare resources
- Identification and treatment of patients that have the greatest chance for survival with healthcare intervention

Incorrectly Performed Triage:

- Underestimates the need of critically injured patients for immediate care, resulting in preventable deaths or deformities (undertriage)
- Overestimates the extent of minor injuries, resulting in mortality or disability of patients with more severe injuries (overtriage)

Mass Casualty Incidents:

- Do not lend themselves to randomized, controlled, experimental trials
- Require special procedures for data collection storage and analysis
  - Ability to collect accurate, timely and valid data at the time of an incident is difficult

Nellis Air Force Base - Media Gallerywww.nellis.af.mil

Research Methods Rely Predominately On:

- Detailed observational field notes
- Collecting and analyzing data produced by responding agencies
- Mass media sources such as photography and video
- Interviews and surveys which pose potential bias and recall errors

Method For This Study

Retrospective Study Secondary Data Analysis

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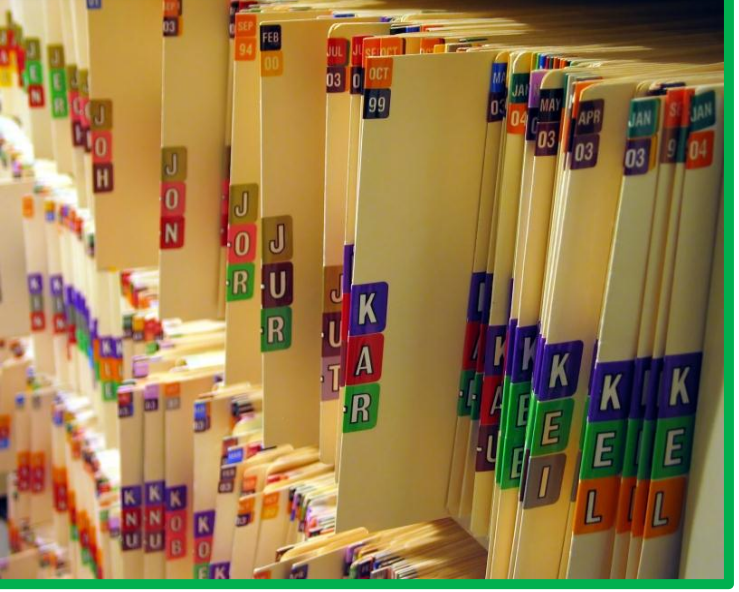
infolytics.wordpress.com



www.councilforresponsiblegenetics.org

Data Were Abstracted

From hospital records of victims

Sample: victims who received medical care after the 2005 chlorine release

- South Carolina Department of Health and Environmental Control (SC DHEC) in conjunction with
- Centers for Disease Control and Prevention (CDC)

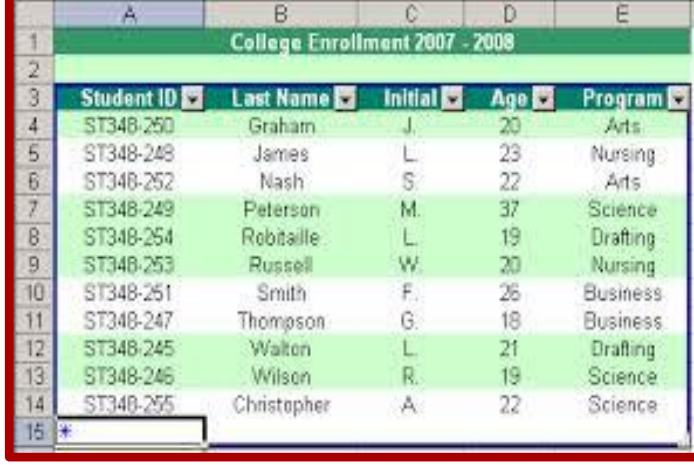
Datasets Used In The Study

- **Hospitalization database** - (n=72) records abstracted
  - Included: demographics, clinical presentation, physical examination, laboratory, pulmonary, and radiological studies, pulse oximetry, medical treatment, medical outcome category (duration of hospitalization and need for intensive care support) and diagnosis
- **Multiple Emergency Room Admitted Patients** - (n=49) records abstracted
  - Included: demographics, clinical presentation, physical examination, laboratory, pulmonary, and radiological studies, pulse oximetry, medical treatment, medications, medical outcome category (duration of hospitalization and need for intensive care support), and diagnosis

Datasets Used In The Study

- **Medical Service Provider Reports** – (n=631) Included: exposure information, symptoms experienced, details about decontamination and transport to medical care, preexisting cardiac or pulmonary medical conditions, and exposure severity ratings (5 point scale)
  - Patient classified according to nine medical categories
  - Demographic characteristics of people who received medical care are stratified by primary exposure location and duration

The Process
Step 1



	A	B	C	D	E
1	College Enrollment 2007 - 2008				
2					
3	Student ID	Last Name	Initial	Age	Program
4	ST348-250	Graham	J.	20	Arts
5	ST348-248	James	L.	23	Nursing
6	ST348-252	Nash	S.	22	Arts
7	ST348-249	Peterson	M.	37	Science
8	ST348-254	Robitaille	L.	19	Drafting
9	ST348-253	Russell	W.	20	Nursing
10	ST348-251	Smith	F.	26	Business
11	ST348-247	Thompson	G.	18	Business
12	ST348-245	Walton	L.	21	Drafting
13	ST348-246	Wilson	R.	19	Science
14	ST348-255	Christopher	A.	22	Science
15	*				

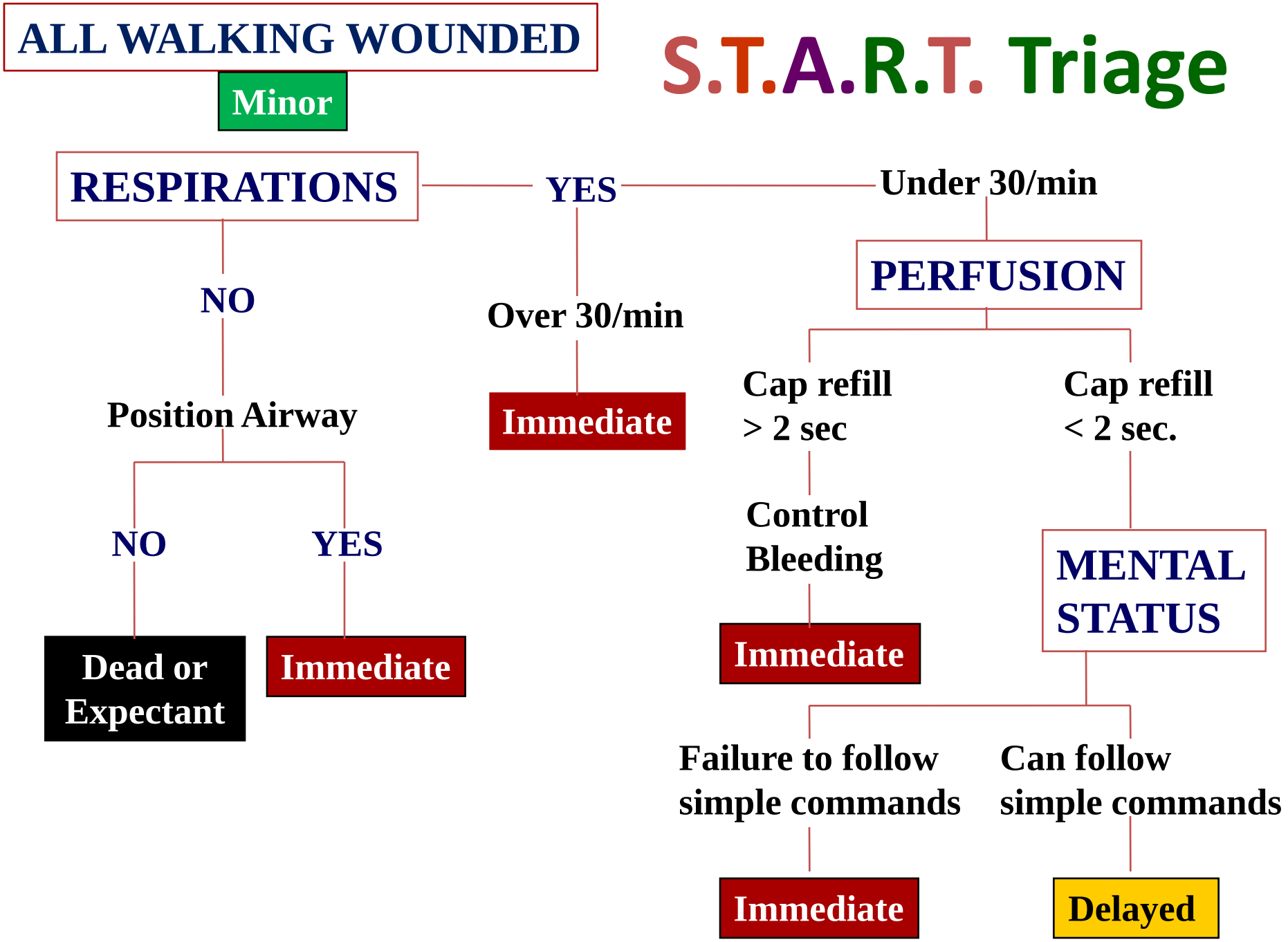
www.dreamstime.com/

Create a merged de-identified research dataset from these abstracted data to include:

- Data points for triage model
- Patients' clinical outcome
- Demographics

Step 2
Input Data Points For Triage Model

S.T.A.R.T. Triage



Step 2

Input Data Points For Triage Model

Simple Triage And Rapid Treatment (S.T.A.R.T.)

- Ability to walk
- Respirations
  - If > = 8 years old >30 or <10
  - If < = 8 years old >45 or <15
- Perfusion: capillary refill >2 sec
- Mental Status
  - Ability to follow commands

Step 3
Patients' Clinical Outcome

Observed Outcome*	S.T.A.R.T. Triage Category
Deceased	Black
ICU/Ventilator	Red
Hospitalized 3+ days	Red
Hospitalized 1-2 days	Red
ED Repeat Visits	Yellow
ED With Significant Symptoms	Yellow
ED With Moderate Symptoms	Green
ED Without Symptoms	Green
Physician Office Visit	Green

Wenck MA, Van Sickle D, Drociuk D, et al. Rapid assessment of exposure to chlorine released from a train derailment and resulting health impact. *Public Health Rep*. 2007;122(6):784-792

*

Step 4
Chart Abstraction Form Mapping

IV. Data from Emergency Room	
Questionnaire Name	**Further Analysis / Used**
Date	Yes / Yes
Time	Yes
Vital: Temp	Yes
BP	Yes
Respiratory rate	Yes / Yes
Heart rate	Yes / Yes
Time	
O_2 Sat	Yes / Yes
On room Air	Yes / Yes
On liters of O_2 via nasal canula(NC) or face mask	Yes
On 100% non-rebreather (NRB)	Yes
On continuous Positive Airway Pressure (CPAP) with O_2	Yes
On ventilator with ____ % O_2	Yes
Notes from Emergency Room	Yes / Yes

Step 5
Select Data Points

- Used a combination of data points to build variable(s) for the triage model when the required data point was not directly collected and recorded

http://office.microsoft.com/en-us/images/results.aspx?qu=building+blocks&ex=1#ai:MC900055273|

Example of Building Variables

Ability to walk - S.T.A.R.T. triage data point

- Assumptions:
  - The chlorine exposure victims did not present with other physical injuries; therefore just because a patient was brought in on a litter or by ambulance did not necessarily indicate they could not walk
  - Able to walk unless intubated or was hypoxic (<90% oxygen saturation measured by pulse oximetry)

http://office.microsoft.com/en-us/images/results.aspx?qu=walking&ex=1

Variable Creation for "Able to Walk" (EDWALK)

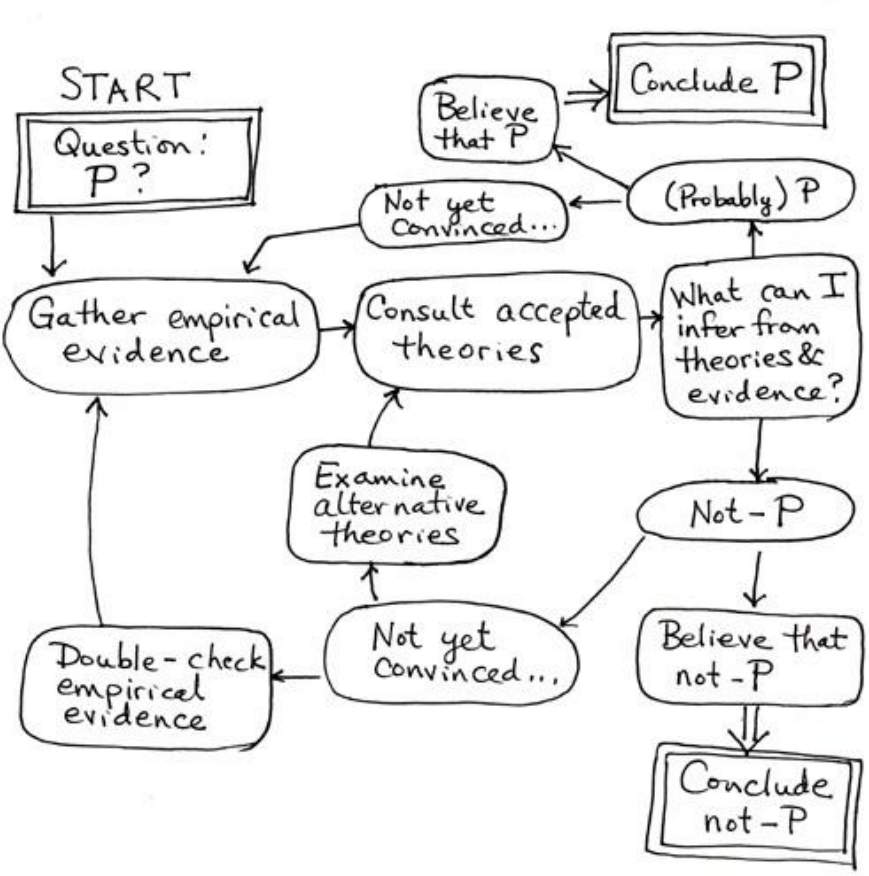
EDWALK – Set to 'N' (No) when any of the following are true; all other 'Y' (Yes)

- NOTESFROME = 'Intubated'
- EDHYPOXIAO = 'Yes' (In ED Hypoxia on O_2)
- EDHYPOXIAAR = 'Yes' (In ED Hypoxia on room air)

Problems

- Incomplete data
- Missing data
- Similar data were found across the available datasets
- Additional data points not referenced in the available documentation related to the data sets

http://office.microsoft.com/en-us/images/results.aspx?qu=animal+problems&ex=1#ai:MC900037033



Conclusions

- The methodology outlined in this paper can be followed or extended in evaluating performance efficacy of triage models

- The steps are reliable and repeatable and can easily be extended to other triage models or applied to other data sets or data sources

QUESTIONS