

Tomorrow's Innovations, Today

Integration of Advanced Forensics and Medical Information with Network Visualization Techniques for Rapid Disaster Response



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Presentation Overview



- Project Purpose
- General Concept – Phased Approach
- Network Visualisation Project Components
 - ❑ Hereditary Risk Factor Analysis
 - ❑ Infectious Disease Management
- Presentation Summary & Questions

Project Purpose – Why?

- Identification of victims of:
 - Mass natural disasters
 - Terror attacks
 - Airplane crashes
 - Missing persons cases
 - Etc.
- Aid first response personnel to provide accurate and appropriate care to patients



Phase I Personal Identification: A Multi-Faceted Approach



- Single system of identification is insufficient
- Multi-faceted approach:
 - ❑ Finger and foot prints
 - ❑ DNA
 - ❑ Dental Records

Phase II – Rapid Access to Medical & Emergency Data (RAMED)

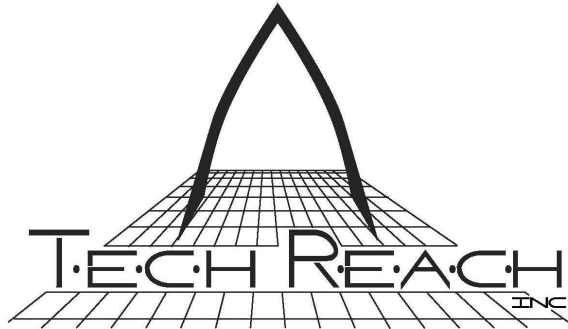


- Rugged USB Flash Drive carried by the individual
- Critical medical alerts
- Write-capable software for licensed medical personnel
- Read-only software available for patient, pharmacies, etc.
 - ❑ Varying levels of access
- HIPAA

Phase III – RAMED National Health Care Database

- Secure National Network
- Track & control infectious diseases
- Homeland Security applications





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Network Visualization Project Components

- Hereditary Risk Factor Analysis
- Infectious Disease Management

Hereditary Risk Factor Analysis

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Name: _____
 Sponsor's SSN: _____
 DOB: _____ Rank: _____
 Home Phone Number: _____
 Work Number: _____

1. Reason for being seen today

2. Do you have now or have you ever had

<input type="checkbox"/> Diabetes	<input type="checkbox"/> Hypertension
<input type="checkbox"/> Depression	<input type="checkbox"/> Seizures
<input type="checkbox"/> Thyroid problems	<input type="checkbox"/> Migraines
<input type="checkbox"/> Concussion	<input type="checkbox"/> Heart Attack
<input type="checkbox"/> Urinary Tract Infections	

3. List any medications, herbs, supplements or vitamins you take on a regular basis

4. Have you ever had any type of surgery? (list)

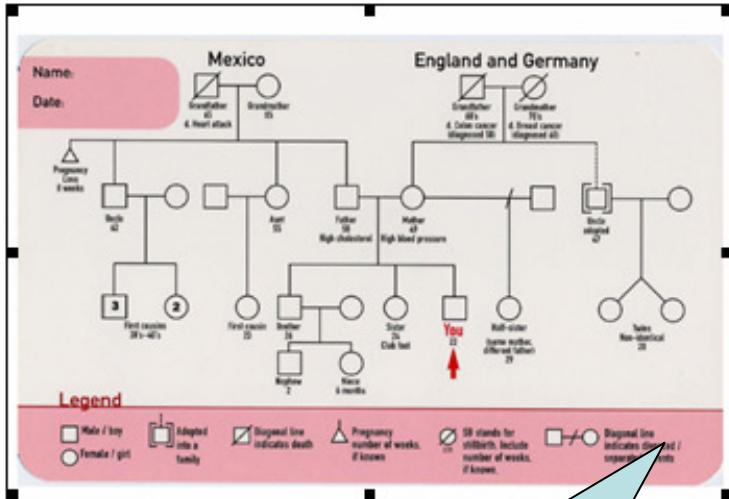
5. Do you have any family history (mother, father, brother or sister) of any of the following? (Check all that apply)

<input type="checkbox"/> Diabetes	<input type="checkbox"/> Hypertension	<input type="checkbox"/> Kidney Disease	<input type="checkbox"/> High Cholesterol
<input type="checkbox"/> Asthma	<input type="checkbox"/> Cancer	<input type="checkbox"/> Osteoporosis	<input type="checkbox"/> Migraines
<input type="checkbox"/> Seizures	<input type="checkbox"/> Stroke	<input type="checkbox"/> Alcoholism	<input type="checkbox"/> Thyroid Disease

6. Are you pregnant or nursing? YES/ NO
 7. Do you use caffeine? YES/ NO
 8. Do you use tobacco? YES / NO
 9. Do you drink alcohol? YES / NO

10. Are you experiencing any of these symptoms today? (Check all that apply)

<input type="checkbox"/> Feeling tired or poorly	<input type="checkbox"/> Difficulty Breathing	<input type="checkbox"/> Excessive thirst
<input type="checkbox"/> Fever	<input type="checkbox"/> Cough	<input type="checkbox"/> Muscle Weakness
<input type="checkbox"/> Recent change in weight	<input type="checkbox"/> Wheezing	<input type="checkbox"/> Rash
<input type="checkbox"/> Headache	<input type="checkbox"/> Vomiting/Nausea	<input type="checkbox"/> Back pain
<input type="checkbox"/> Sinus pain	<input type="checkbox"/> Abdominal pain	<input type="checkbox"/> Muscle Aches
<input type="checkbox"/> Eye Problems	<input type="checkbox"/> Blood in stool	<input type="checkbox"/> Dizziness
<input type="checkbox"/> Loss of Hearing	<input type="checkbox"/> Diarrhea	<input type="checkbox"/> Fainting
<input type="checkbox"/> Earache	<input type="checkbox"/> Constipation	<input type="checkbox"/> Muscle weakness
<input type="checkbox"/> Sore throat	<input type="checkbox"/> Blood in urine	<input type="checkbox"/> Numbness
<input type="checkbox"/> Nasal Discharge	<input type="checkbox"/> Frequent urination	<input type="checkbox"/> Feeling of hopelessness
<input type="checkbox"/> Chest Pain or Discomfort	<input type="checkbox"/> Pain during urination	<input type="checkbox"/> Sleep Disturbances
<input type="checkbox"/> Palpitations	<input type="checkbox"/> Menstrual Problems	<input type="checkbox"/> Loss of interest in activities



➤ Visual vs. auditory information retention

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QinetiQ

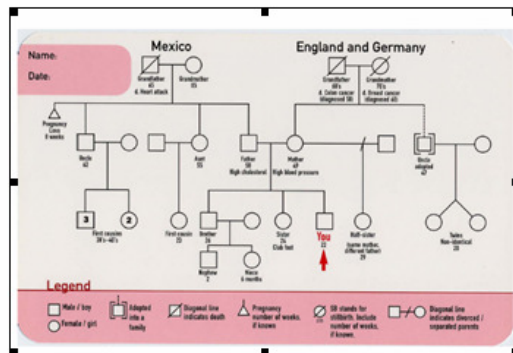
Hereditary Risk Factor Analysis

➤ Use NATO RTG research and techniques to improve on AMA design

Family Member	Race/Country of Descent	Relationship (i.e. blood/half or step/adopted)	Age Died	Children	
				Sex	Age Died
Maternal Grandmother	Caucasian/Germany	Blood	79	Female (Twin)	53
				Male (Twin)	N/A
Maternal Grandfather	Caucasian/Germany	Blood	N/A	Female	N/A
				Male (Twin)	53
Paternal Grandmother	Caucasian/Ireland	Blood	77	Female	N/A
				Male	N/A
Paternal Grandfather	Caucasian/England	Blood	81	Female	N/A
				Male	N/A
Mother	Caucasian	Blood	53	Female	N/A
				Female	N/A
Father	Caucasian	Blood	N/A	Female	N/A
				Female	N/A
Children	N/A	N/A	N/A	N/A	N/A
Aunt (as applicable)	N/A	N/A	N/A	N/A	N/A
Uncle (as applicable)	N/A	N/A	N/A	N/A	N/A

Note: Software would generate additional fields for data related to children of aunts and uncles as applicable

Medical Condition	Self	Mother	Father	Sibling(s)	Child(ren)	Maternal		Paternal		Aunt(s)	Uncle(s)
						Grandmother	Grandfather	Grandmother	Grandfather		
Arthritis		X				X	X	X		X	X
Asthma (Chronic Respiratory Disease)				X							
Birth Defects									X		
Dementia									X		
Depression											
Diabetes											X
Cancer							X				
Breast							X				
Colon											
Endometrial											
Ovarian								X	X		
Prostate									X		
Thyroid											
Other											
Hearing Loss	X							X		X	
Heart Disease											
High Cholesterol									X		X
Hypertension (High Blood Pressure)									X		
Infertility											X
Mental Retardation											
Multiple Miscarriages											
Obesity							X			X	
Osteoporosis		X					X		X		
Physical Abnormalities											
Stroke									X		
Vision Loss											



Infectious Disease Outbreak

- Infectious diseases have caused havoc in the health systems world-wide
 - ❑ E.g. Severe Acute Respiratory Syndrome (SARS)
- Recognition of this new microbial threat prompted the World Health Organization (WHO) to issue a historic global alert for SARS on the 12th March 2003.
- An intense worldwide response led to control measures that contained the outbreak within 4 months.
- The official end of the global public health emergency took place on 5th July 2003.

Infectious Disease Management



- It showed the effectiveness of the control measures, but also the need for continued surveillance and awareness of the situation.
- The speed of the spread of the disease and the high levels of morbidity and mortality associated with SARS call for:
 - ❑ Careful monitoring for the reappearance of SARS-CoV
 - ❑ Emergence of other infectious diseases and
 - ❑ Preparations for the rapid implementation of the appropriate control measures.

Infectious Disease Management Framework

- Need for a framework that is able to:
 - ❑ manage comprehensively and cohesively the network of disease information,
 - ❑ provide facilities to analyse the available data and information
 - ❑ communicate the resultant information to relevant bodies
- Define and implement effective control measures to halt or contain transmission and spread.

Network of Information Disease Management System

- Detection and monitoring - disease and threat surveillance.
- Analysis and interpretation - facilities for extracting information from the massive amount of data and for real-time evaluation of live feeds.
- Information resources and knowledge management - providing access to reference data and integrated distance learning content.
- Alerting and communications - dissemination of data/information, emergency alerting and routine collaborative activities.
- Decision support (and potentially logistics support).
- Response: management support of recommendations, vaccination etc.

Challenges

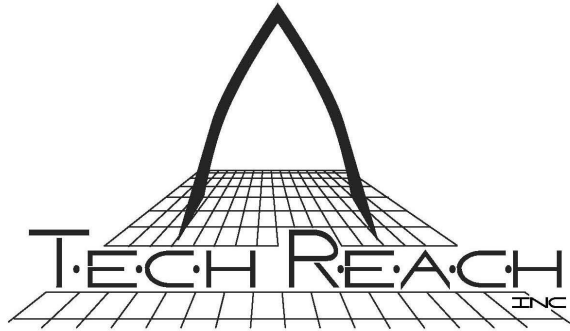
- Multiple incompatible disease specific systems that exist currently.
- Incomplete and delayed data.
- Burden on health care systems to report disease.
- Overwhelming volume of data to be managed by health departments.
- Lack of state-of-the-art information technology.

Infectious Disease Network Visualisation

- A wide variety of network visualisation tools have been developed specifically or can be adapted for health related tasks
- None of them provide the capabilities that encompass all the requirements for:
 - Managing the dynamic and unpredictable scenario of detecting,
 - Monitoring and managing the possible outbreak of infectious disease.
- Much work is still required to develop an infectious disease network visualisation tool that can manage the dynamic and unpredictable nature of any potential infectious disease outbreak.

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QUESTIONS?

