

## The T.L.L. Temple Stroke Project as an application of Intervention Mapping from start to finish



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Planning Health Promotion Programs: An Intervention Mapping Approach

## Overview

- ✘ Purpose: To increase delivery of acute stroke therapy in non-urban East Texas
- ✘ Funding: TLL Temple Foundation, Lufkin, Texas, Lewis Morgenstern, PI
- ✘ Community: Three county area of Angelina, Nacogdoches and Shelby
- ✘ Community-based intervention guided by a health educator and planning committee from the community

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## Community work group

- ✘ Health educator from local area
- ✘ Resource team: health educators, behavioral scientists and neurologists from an academic medical center about 100 miles from our project area.
- ✘ Community members:
  - ✓ persons who had suffered a stroke (including the mayor of Lufkin)
  - ✓ community organizations such as voluntary health associations
  - ✓ community media – English and Spanish language newspapers, radio stations and television stations
  - ✓ health care providers who treat stroke

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## Needs assessment methods

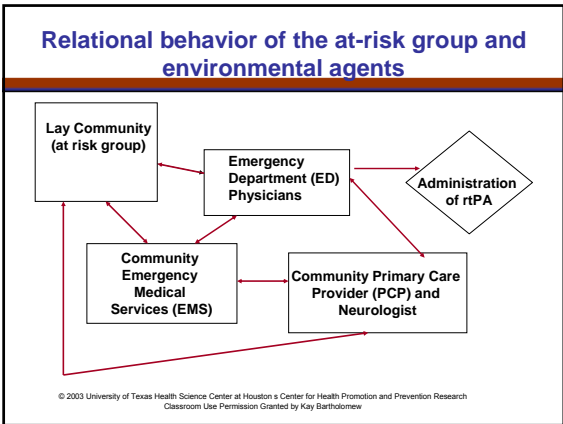
- ✘ Literature review: Prevalence of both stroke and untreated stroke? Factors associated non-treatment for stroke?
- ✘ Focus groups (2), interviews (4), surveys and monthly community work group meetings to explore: recognition of and response to symptoms, attitudes toward stroke
- ✘ Community Telephone Survey: Factors that predict rapid and assertive response to stroke: Knowledge of what to do? Self-efficacy? Perceived norms? Barriers? Outcome expectations? Behavioral intentions? Ethnicity? Gender?
- ✘ Hospital and EMS Meetings

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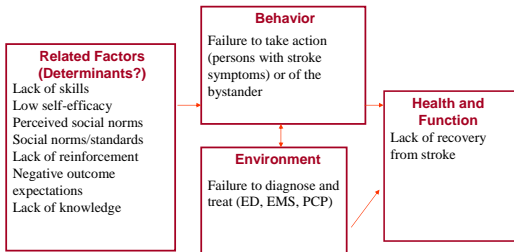
## Health problem

- Each year Approximately 731,000 people in the U.S. suffer a stroke
- Recombinant tissue plasminogen activator (rtPA) only FDA approved treatment
- 3 hour treatment window
- Only 1-2% of ischemic stroke patients currently receive rtPA. Rates may be even lower in non-urban areas

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### Needs assessment logic model of the problem: Failure to treat stroke in East Texas



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### Logic model detail : At-risk community

Proposed Determinants → Persons in Proximity/Person with Stroke	Behavior → Persons in Proximity	Health and Quality of Life → Persons with stroke
<ul style="list-style-type: none"> <li>• Not knowing signs of stroke, that time is crucial, to call 911</li> <li>• Outcome expectations: nothing can be done to decrease disability</li> <li>• Barriers: Cost of calling 911, being female, being male without a partner</li> <li>• Live alone or are retired</li> <li>• Social norms of reluctance to take action for self or others</li> <li>• Lack of self-efficacy for getting treatment</li> <li>• Expectation of needing primary care referral</li> </ul>	<ul style="list-style-type: none"> <li>• Do not note symptoms and compare them to a stroke</li> <li>• Wait to see if the symptoms resolve themselves</li> <li>• Do not call 911 immediately</li> <li>• Call their primary care provider first</li> <li>• Wait in the ER with other untreated patients</li> </ul>	<ul style="list-style-type: none"> <li>• ↓ Discharge functional status</li> <li>• ↑ Hospital case fatality</li> <li>• ↑ Receipt of tPA</li> <li>• ↑ Time from ED contact to acute stroke therapy</li> <li>• ↑ Time in hospital to CT scan, neuro exam</li> <li>• ↑ Time to ready for acute therapy</li> </ul>

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### Logic model detail: Emergency Departments (ED)

Proposed Determinants → Hospital ED	Environmental → Agents' Behavior Hospital ED	Health and Quality of Life Persons with stroke
<ul style="list-style-type: none"> <li>• Believe tPA is dangerous</li> <li>• Lack knowledge, skills and self-efficacy for admin tPA, onset time interview, differential diagnosis, neuro exam</li> <li>• Social norms that no acute treatment as normative</li> <li>• Outcome expectations that tPA does not result in quality of life</li> <li>• No protocol in ED, no stroke team</li> <li>• Believe patients belong to primary care physicians</li> <li>• No reinforcement</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluation not complete in 60 minutes</li> <li>• Differential diagnosis not made</li> <li>• CT scan, lab work not Stat ordered</li> <li>• Onset time not documented</li> <li>• tPA not started</li> </ul>	<ul style="list-style-type: none"> <li>• ↓ Discharge functional status</li> <li>• ↑ Hospital case fatality</li> <li>• ↓ Receipt of TPA</li> <li>• ↑ Time from ED contact to therapy</li> <li>• ↑ Time to CT scan, neuro exam</li> <li>• ↑ Time to ready for therapy</li> </ul>

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### Logic model detail: EMS

Proposed Determinants EMS	Environmental → Agents' Behavior EMS	Health and Quality of Life
<ul style="list-style-type: none"> <li>• Outcome expectations that they cannot make a difference in stroke like in trauma and heart attack</li> <li>• Do not see stroke as urgent</li> <li>• Lack knowledge, skills self-efficacy to treat in transit</li> <li>• Lack stroke protocol for dispatcher and responders</li> <li>• Are not reinforced for efforts (do not see EDs act with urgency or treat stroke)</li> </ul>	<p><b>EMS Dispatchers</b></p> <ul style="list-style-type: none"> <li>• Do not triage highest priority</li> <li>• Do not convey possible stroke and urgency</li> </ul> <p><b>EMS Responders</b></p> <ul style="list-style-type: none"> <li>• Do not "Load and Go"</li> <li>• Give blood pressure lowering meds in transport</li> <li>• Do not call ahead to the hospital</li> </ul>	<ul style="list-style-type: none"> <li>• ↓ Discharge functional status</li> <li>• ↑ Hospital case fatality</li> <li>• ↓ Receipt of TPA</li> <li>• ↑ Time from ED contact to therapy</li> <li>• ↑ Time to CT scan, neuro exam</li> <li>• ↑ Time to ready for therapy</li> </ul>

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### Logic model detail: Primary Care Provider

Proposed Determinants Primary Care Providers	Behavior & Environment Primary Care Providers	Health and Quality of Life
<ul style="list-style-type: none"> <li>• Social norms: Perceive inadequate acute stroke treatment as normative</li> <li>• Outcome expectations: Do not expect TPA to result in quality of life</li> <li>• Lack protocol in office for staff to instruct stroke symptom calls</li> <li>• Feel ambivalent about remanding patients to treatment by ED</li> </ul>	<ul style="list-style-type: none"> <li>• Demand to consult on ER patients before treatment of stroke</li> <li>• Delay when called to ER</li> <li>• Fail to warn high risk patients to call 911 for symptoms</li> <li>• Fail to train office staff on protocol for phone call with stroke symptoms</li> <li>• Tell patients with symptoms of stroke to wait or to come to the office</li> </ul>	<ul style="list-style-type: none"> <li>• ↓ Discharge functional status</li> <li>• ↑ Hospital case fatality</li> <li>• ↓ Receipt of TPA</li> <li>• ↑ Time from ED contact to therapy</li> <li>• ↑ Time to CT scan, neuro exam</li> <li>• ↑ Time to ready for therapy</li> </ul>

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### Outcome objectives

- Increase the proportion of eligible patients who receive tPA to 50% at the five hospitals in the intervention community
- Increase the proportion of all stroke patients who receive tPA to 5% in the intervention community
- Decrease disability from stroke (however, used treatment as a proxy objective)

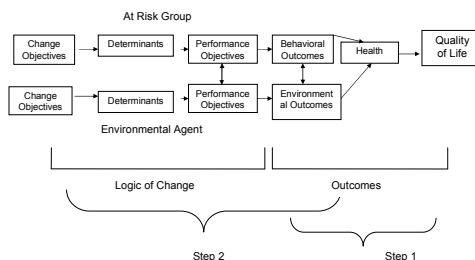
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## Step 2: Matrices of Change Objectives

- ✘ The primary planning tool is the matrix of change objectives
- ✘ Change objectives state what needs to be achieved in order to accomplish performance objectives that will enable change in behavior of the at-risk group or environmental agent

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## Logic Model of Change



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## Matrices – Stating what health behaviors and environmental conditions need to change

- ✘ **Health related behavior outcome for the at risk group:** arrive at the hospital within several minutes of experiencing symptoms of stroke
- ✘ **Environmental outcome:** provide acute stroke therapy for all eligible patients (those who arrived at the hospital with time for a work-up within the three-hour window and for who rtPA was not contraindicated)

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## Performance objectives for the at-risk group (persons in proximity to stroke)

- PO.1. Note symptoms and compare to those of possible stroke
- PO. 2. Call 911 immediately (do not call primary care provider for triage)
- PO.3. Insist on rapid care from the EMS (transport at highest level)
- PO.4. Ask about treatment for stroke and rapid care in the ED

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## Performance objectives for the emergency department

- PO.1. ED physicians complete stroke eval in 60 minutes
- PO.1.a. Triage nurses have patient seen by physician in 10 minutes
- PO.1.b. Physicians notify stroke team within 15 minutes
- PO.1.c. ED stroke teams send lab work STAT (HCT, platelets, glucose, PT, PTT)
- PO.2. ED physicians and stroke teams make rapid diagnosis of stroke (use modified NIH scale/protocol)
- PO.3. Stroke teams perform pulse oximetry, attach cardiac monitor, and perform EKG
- PO.4. Stroke teams obtain accurate onset time of stroke symptoms

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## Performance objectives for the emergency department

- PO.5. Stroke teams assure patient receives CT scan within 25 minutes and notify on-call radiologist
- PO.6. Radiologists and stroke teams read the CT scan within 45 minutes of arrival
- PO. 7. Stroke teams rule out contra-indications
- PO.8. Stroke teams manage diagnosed stroke
- PO.8.a. Stroke teams insert an IV in each arm if not done by EMS
- PO.8.b. Stroke teams administer rtPA within 60 minutes
- PO.8.c. ED physicians treat blood pressure appropriately
- PO.8.d. Stroke teams give appropriate dose of rtPA; infuse properly; document time (do not give heparin or cumodin)

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## Performance objectives for the EMS

- PO.1. Dispatchers triage to highest priority of transport
- PO.2. Dispatchers convey stroke possibility and urgency to responders
- PO.3. Responders load and go
- PO.4. Responders call ahead to the hospital
- PO.5. Responders encourage family member or witness to accompany to the hospital
- PO.6. Responder interviews patient and/or witness to determine symptom onset
- PO.7. Responders deliver patient with IV in both arms (perform in ambulance)

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## Performance objectives for primary care providers

- PO.1. Receptionists and nurses tell the person with the possible stroke to call 911
- PO.2. Primary care providers identify high risk patients and tell patients about stroke risk, how to identify symptoms and to call 911
- PO.3. Primary care providers educate office staff regarding signs of stroke and what to tell patients – (i.e., call 911)

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## Format of matrices of change objectives

Combines performance objectives with proposed determinants of behavior and environmental conditions.

	Determinant 1	Determinant 2
Performance Objective 1	Change Objective	Change Objective
Performance Objective 2	Change Objective	Change Objective

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## Matrix example: Community bystander

Performance Objectives:	Personal Determinants				
	Self-Efficacy	Knowledge	Perceived Social Norms	Skills	Outcome Expectation
Persons in proximity	•Express confidence in recognizing stroke symptoms	•Recognize possible symptoms of stroke: Numbness Weakness ↓ Vision ↓ Speech ↓ Walking Tingling Vertigo Headache	•Recognize that others in the community take symptoms of stroke seriously	•Recognize signs of stroke	• Expect that identifying symptoms signifying stroke can improve outcome
Note symptoms and compare to those for possible stroke					

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## Matrix example: Community bystander

Performance Objectives:	Personal Determinants				
	Self-Efficacy	Knowledge	Perceived Social Norms	Skills	Outcome Expectations
Persons in proximity	•Express confidence in getting response from 911	•Describe importance of calling 911 for all stroke-like symptoms • Recognize need to bypass primary care and pre-authorization	•Recognize that others in the community would call 911 for symptoms of stroke – that this is not an over reaction	•Demonstrate describing stroke symptoms and requesting highest level of emergency response	• Expect that calling 911 can improve outcome •Expect that 911 will get to hospital fastest •Expect quick ED arrival to allow treatment to minimize stroke effects
Call 911 immediately (do not call primary care provider for triage)					

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## Matrix example: Community bystander

Performance Objectives:	Personal Determinants				
	Skills and Self-Efficacy	Knowledge	Perceived Social Norms	Threat	Outcome Expectation
Persons in proximity	• Demonstrate skills and confidence to insist on CT scan •Express confidence in being able to describe symptoms of stroke and insist on priority care	•Recall what to say to operator; I believe someone is having a stroke and they need to go to the ED right away. •Describes what to do in ED: ask for CT scan; tell last time normal	•Recognize that others in the community are assertive about stroke	•Believe stroke is a brain attack •Believe stroke can happen to any adult	• Expect that by acting assertively can get prompt stroke treatment and possibly minimize damage.
Insist on rapid care from EMS (transport at highest level) and in ED					

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### Matrix example: Community bystander

External Determinants		
Performance Objectives:	Social Norms	Barriers in Health Care System
Persons in proximity  • Note symptoms and compare to stroke  • Call 911 immediately  • Insist on rapid care from EMS (transport at highest level) and in ED	• Community will demonstrate greater assertiveness in responding to stroke symptoms	• Primary care policy to advise to go directly to ED via EMS • Primary care physicians remind high risk about symptoms

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### Matrix example: Emergency department

Personal Determinants				
Performance Objectives:	Skills and Self-Efficacy	Knowledge	Perceived Social Norms	Outcome Expectation
Complete evaluation in 60 minutes • To physician 10 minutes • To stroke team notification 15 minutes • To CT scan 25 minutes • To CT scan interpreted within 45 minutes • To needle 60 minutes • To monitored bed 3 hours	• Express confidence that time limits can be met  • Demonstrate skill in rapid assessment and triage	• Recall time window for rTPA administration  • Recall goals for time to various assessment activities	• State that others in the community take symptoms of stroke seriously  • State that other EDs in the U.S are lowering their work-up time for stroke	• Expect that by acting assertively can get prompt stroke treatment and possibly minimize damage

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### Matrix example: Emergency department

Personal Determinants				
Performance Objectives:	Skills and Self-Efficacy	Knowledge	Perceived Social Norms	Outcome Expectation
Make a rapid differential diagnosis of stroke (perform a neurological exam using modified NIH scale/protocol)	• Demonstrate rapid differential diagnosis of stroke  • Perform rapid neuro evaluation	• Recall goals for time to various assessment activities and describes the urgency of assessment to treatment window  • Describe diagnostic protocol – aspects of history, physical and studies that will allow differential diagnosis	• State that others in the community take symptoms of stroke seriously  • State that other EDs in the US are lowering their work-up time for stroke	• Expect that stroke patients (especially those with moderate presenting disability) can recover function with acute treatment

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### Matrix example: Emergency department

Personal Determinants				
Performance Objectives:	Skills and Self-Efficacy	Knowledge	Perceived Social Norms	Outcome Expectation
• Order CT scan immediately • Interpret CT scan in ED • Send lab work immediately (HCT, platelets, glucose, PT, PTT) and get it back	• Demonstrate skill and self-efficacy to interpret CT scan for blood • Demonstrate interpretation of CT scan for hypodensity greater than 1/3 of MCA • Correctly use CT to verify time	• Describe the necessity to order CT stat and to interpret in the ED	• Believe that others in the community order CT stat • Believe that others in the community interpret CT in ED	• Expect that stroke patients (especially those with moderate presenting disability) can recover function with acute treatment

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### Matrix example: Emergency department

Personal Determinants				
Performance Objectives:	Skills and Self-Efficacy	Knowledge	Perceived Social Norms	Outcome Expectation
Obtain accurate onset time of stroke symptoms  Document onset time of stroke symptoms	• Demonstrate skill and self-efficacy for interviewing about stroke symptom onset time	• Describe the necessity to establish accurate onset time through interview • List steps and questions for interview to establish "last time seen normal"	• Describe how others in the medical community interview patients or bystanders to determine "last time seen normal"	• Expect that stroke patients (especially those with moderate presenting disability) can recover function with acute treatment

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### Matrix example: Emergency department

External Determinants		
Performance Objectives:	Reinforcement	Barriers in Health Care System
Complete the evaluation in 60 minutes • To physician 10 minutes • To stroke team notification 15 minutes • To CT scan 25 minutes • To CT scan interpret within 45 minutes • To needle 60 minutes • To monitored bed 3 hours	• Feedback about times to various events • Feedback about successful treatments	• Protocol in ED with standing orders for CT, lab work, venous access, O2, electrocardiogram, cardiac monitoring and chest radiograph, blood glucose • Protocol in ED for administration of rTPA

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### Matrix example: Emergency department

Performance Objectives:	External Determinants	
	Reinforcement	Barriers in Health Care System
Make a rapid differential diagnosis of stroke (perform a neurological exam using modified NIH scale/protocol)	•Evaluation and feedback regarding exam skills	•Assessment protocol in ED
<ul style="list-style-type: none"> <li>Order CT scan stat</li> <li>Interpret CT scan in ED</li> <li>Send lab work stat (HCT, platelets, glucose, PT, PTT) and get it back</li> </ul>	<ul style="list-style-type: none"> <li>Successful treatments are reported back to emergency department, Radiology and Lab</li> </ul>	<ul style="list-style-type: none"> <li>Radiology involved in protocol</li> <li>Radiologist on call for stroke</li> <li>CT tech involved in protocol</li> <li>CT tech on call for stroke</li> </ul>

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### Step 3: Theory-based Methods and Practical Strategies

- ✗ Review program ideas with the intended participants and use their perspectives to identify methods and strategies
- ✗ Use core processes to identify theoretical methods that can influence change in determinants
- ✗ Choose program theoretical methods
- ✗ Select or design practical strategies for applying the methods to the intervention program
- ✗ Assure that the final strategies [still] match the change objectives

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### Definition of theory-informed methods and practical strategies

- ✗ A *theoretical method* is a general process for influencing changes in the determinants of behavior and environmental conditions
- ✗ A *strategy* is a practical technique for the application of methods in ways that fit with the intervention group and the context in which the intervention will be conducted

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### Theory-informed methods and practical strategies in the community intervention

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|---|--|
| <b>Methods from Theory</b> <ul style="list-style-type: none"> <li>● Modeling</li> <li>● Social comparison and normative belief change</li> <li>● Skill training</li> <li>● Information</li> <li>● Cue to action</li> <li>● Reinforcement</li> </ul> | <b>Practical Strategies</b> <ul style="list-style-type: none"> <li>● Use of community members who have had strokes in billboards, posters, news articles, brochures</li> <li>● PSAs on radio and television</li> <li>● One-on-one instruction</li> <li>● Brochure for take home</li> </ul> |
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### Theory-informed methods and practical strategies in the ED intervention

- |   |  |
|---|--|
| <b>Methods from Theory</b> <ul style="list-style-type: none"> <li>● Modeling</li> <li>● Social comparison and normative belief change</li> <li>● Skill training</li> <li>● Information</li> <li>● Cue to action</li> <li>● Reinforcement</li> <li>● Organizational development</li> </ul> | <b>Practical Strategies</b> <ul style="list-style-type: none"> <li>● Meetings with hospital teams</li> <li>● Meetings with ED and primary care physicians</li> <li>● Protocol development</li> <li>● Newsletters with success stories</li> <li>● Newspaper stories</li> <li>● Mock stroke code in community</li> </ul> |
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### Methods and strategies for community

Determinants/ Change Objectives	Methods	Strategies
Knowledge of stroke symptoms	Modeling, Information	-Community members telling their stories in newspaper articles
Knowledge of stroke as emergency – to call 911	Modeling, Information, Cues to Action	-Community members telling their stories in newspaper articles, public service announcements (PSAs), billboards, posters -- showing stroke as emergency and to call 911
Skills and self-efficacy for symptom recognition	Modeling, Skills Training, Information	-One-to-One instruction at worksites accompanied by a brochure -Community members telling their stories in newspaper articles

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## Methods and strategies for community cont'

Determinants/ Change Objectives	Methods	Strategies
Perceived social norms to intervene and call 911	Cues to action, Modeling, Social comparison, Reinforcement	Newspaper stories and PSAs of person recognizing symptoms, intervening and being reinforced
Perceived social norms to intervene and ask for priority transport and ED care	Cues to action, Modeling, Social comparison, Reinforcement	PSAs, billboards, newspaper stories with person intervening and reinforced verbally and by person's stroke recovery
Outcome expectations	Modeling	Billboards with local role models – showing good recovery
Barriers	Modeling	PSAs with doctor saying go straight to ED, don't call primary care

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## Step 4: Program

- ✗ Consult with intended participants and implementers
- ✗ Create program scope, sequence, theme and materials list
- ✗ Develop design documents and protocols
- ✗ Review available materials
- ✗ Develop program materials
- ✗ Pretest program materials with target groups and implementers
- ✗ Oversee materials production

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## Scope and sequence

Phase 1	Phase 2	Phase 3
<b>Professional Module 1:</b> Change-planning meetings with hospital ERs	<b>Professional Module 2:</b> Orientation meetings with hospital medical staff	<b>Professional Module 3:</b> Training meetings for ED and EMS
Change-planning meetings with local EMS	Guideline and protocol development with med staff and quality committees	<b>Community Module 1:</b> One-to-One train the trainer + brochure
	Guideline and protocol development meetings with EMS directors and medical directors	

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## Scope and sequence cont'

Phase 4	Phase 5
<b>Professional Module 4:</b> Review training meetings for ED and EMS teams	<b>Professional Module 5:</b> Reinforcement for protocol use
<b>Community Module 1:</b> One-to-one t-train-the-trainer + brochure	<b>Community Module 2A:</b> Change out billboards and PSAs
<b>Community Module 2:</b> Placement of billboards and PSAs	<b>Community Module 2B:</b> Change out newspaper stories and news releases
<b>Community Module 3:</b> Newspaper stories and news releases	

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## Message development for EDs and primary care providers

Vehicles	Change Objective Grouped by Determinants	Methods	Message Content
Newspaper article	<b>Social norms</b> Recognize other MDs in community respond quickly to stroke; believe other EDs are lowering workup times	Modeling through role-model stories	"I had a stroke patient who got to the hospital on time; the ED treated my patient."
Newsletter	<b>Outcome expectations</b> Expect patients can recover function with acute treatment of stroke <b>Reinforcement</b> Patient success stories; there may be lack of feedback to ED staff	Testimonials  Vicarious reinforcement	"I wasn't sure about this new treatment, but I'm really pleased with the improvement I saw in my patient."  From patient's or family's point of view: I am back to full functioning. The doctor saved our quality of life by acting quickly."

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## Stroke project billboard



FIGURE 7.2 Billboard for the T.L.L. Temple Foundation Stroke Project



### Step 5: Adoption and Implementation Plan

- ✘ Identify adopters and users
- ✘ Specify adoption, implementation and sustainability performance objectives
- ✘ Specify determinants and create matrix
- ✘ Select methods and strategies
- ✘ Design intervention to affect program use

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### Implementation Summary

- 488 community train-the-trainer workshops resulting in 634 'trainers' to deliver personal messages to 49,527 persons
- 60,000 brochures, 5,000 posters, 5 billboards, two rounds of PSAs
- Systems change intervention with providers – protocol development meetings, trainings, mock stroke codes, newsletters
- Linking community and professional education through news media

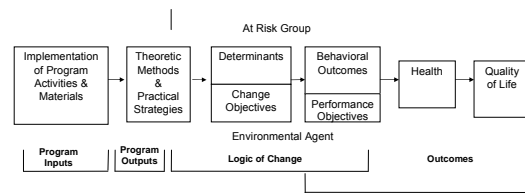
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## Step 6: Evaluation plan

- ✘ Describe the program
- ✘ Describe program outcomes and effect questions
- ✘ Write questions based on matrix
- ✘ Write process questions
- ✘ Develop indicators and measures
- ✘ Specify evaluation plan

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## Step 6: Evaluation Logic Model



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## Outcome evaluation question

- Did the community with the intervention perform more stroke treatments than the comparison community?

OR

- What was the effect of the program on the proportion of patients treated with rtPA

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## Evaluation design

- Non-equivalent comparison group design

	Baseline (10 months) 2-1998 10-1998	Intervention (15 months) 1-1999 3-2000	Post-intervention (6 months) 4 - 2000 9 - 2000
Intervention	O	XO	O
Comparison	O	O	O

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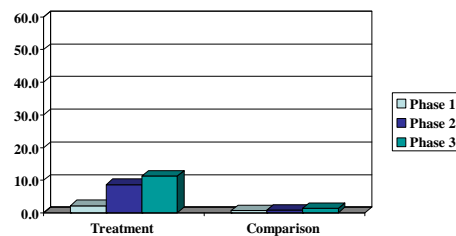
## Measurement

- Cases of stroke were ascertained actively from emergency room records daily and screened for stroke by fellowship trained neurologists
- Stroke case records were abstracted for study variables including:
  - Receipt of rtPA
  - Delay time from symptom onset to hospital
  - Mention of possible use of rtPA in physician notes

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## Changes in treatment rates for all ischemic

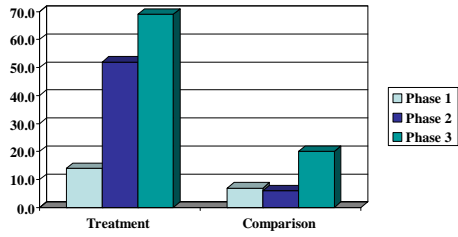
Fisher's Exact Test



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## Changes in treatment rates for all eligible stroke

Fisher's Exact Test



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