VA-CASE

VA Center for Applied Systems Engineering

VA QUERI Stroke

Quality Enhancement Research Initiative

A Model to inform VA Policymakers on the Costs Associated with "Making" or "Buying" Stroke Care

Salomeh Keyhani, MD

Nancy Lightner, PhD

VA-CASE

VA Center for Applied Systems Engineering

VA QUERI Stroke

Quality Enhancement Research Initiative

Agenda

present VA make/buy tools in general & stroke in particular

- Introduction to Make/Buy decisions
- Stroke Make/Buy model
- Make/Buy tool live demonstrations
- Policy Implications – Stroke Make Buy
- Questions

VA-CASE

VA Center for Applied Systems Engineering

Acknowledgements

Heather Woodward-Hagg, MS

Dawn Bravata, MD

Linda Williams, MD

Glenn Graham, MD

Tom Kent, MD

Jane Anderson, RN, PhD

Sally Zacharias, MD

Michael Phipps, MD

Eric Cheng, MD

Introduction – Make/Buy decision

Determine the cost to build (MAKE) or pay someone else to provide (BUY) a product or service.

Uses Coase's transaction cost theory of the firm (Coase, 1937) and transaction cost economics (Williamson, 1971) – includes internal & external costs*.

Organizational form modeled as a discrete variable - 'make', 'buy' or 'hybrid'

- Make or buy decisions initially investigated in manufacturing (auto) & services (cable TV franchising) in the 1970's – use continues today in most industries throughout the world
- Drives decisions on vertical integration

Coase, Ronald H. 1937. "The Nature of the Firm," in idem, The Firm, the Market and the Law. Chicago: University of Chicago Press.
Williamson, O. 1971. "The Vertical Integration of Production: Market Failure Considerations". American Economic Review, 61 (May): 112-123.

* Coase won the Nobel prize for Economics in 1991, Williamson won it in 2009.

Introduction – Why VA use?

Excess demand exists for specific medical procedures or policy decisions. The VA is interested in determining the cost to expand care internally (MAKE) or to pay someone else to provide it (BUY).

- Dialysis – compare standalone clinics
- Gastroenterological procedures (GI)
- Sleep Studies
- Radiation / Chemotherapy treatments
- Stroke care
- Home Dialysis

Stroke QUERI in Partnership with VA-CASE

Goal: To develop Make/Buy tool to assist facilities in self designating their level of stroke care:

1) Primary Stroke Center
2) Limited Hour Stroke Facility
3) Supporting Stroke Facility

VHA Directive 2011-038, issued 11/2/2011

OQP Stroke Special Project

- Retrospective national study of 5,000 patients with a primary discharge diagnosis of stroke in the VA in FY 2007
- Detailed Medical Record Review
- 14 Stroke Inpatient Quality Indicators

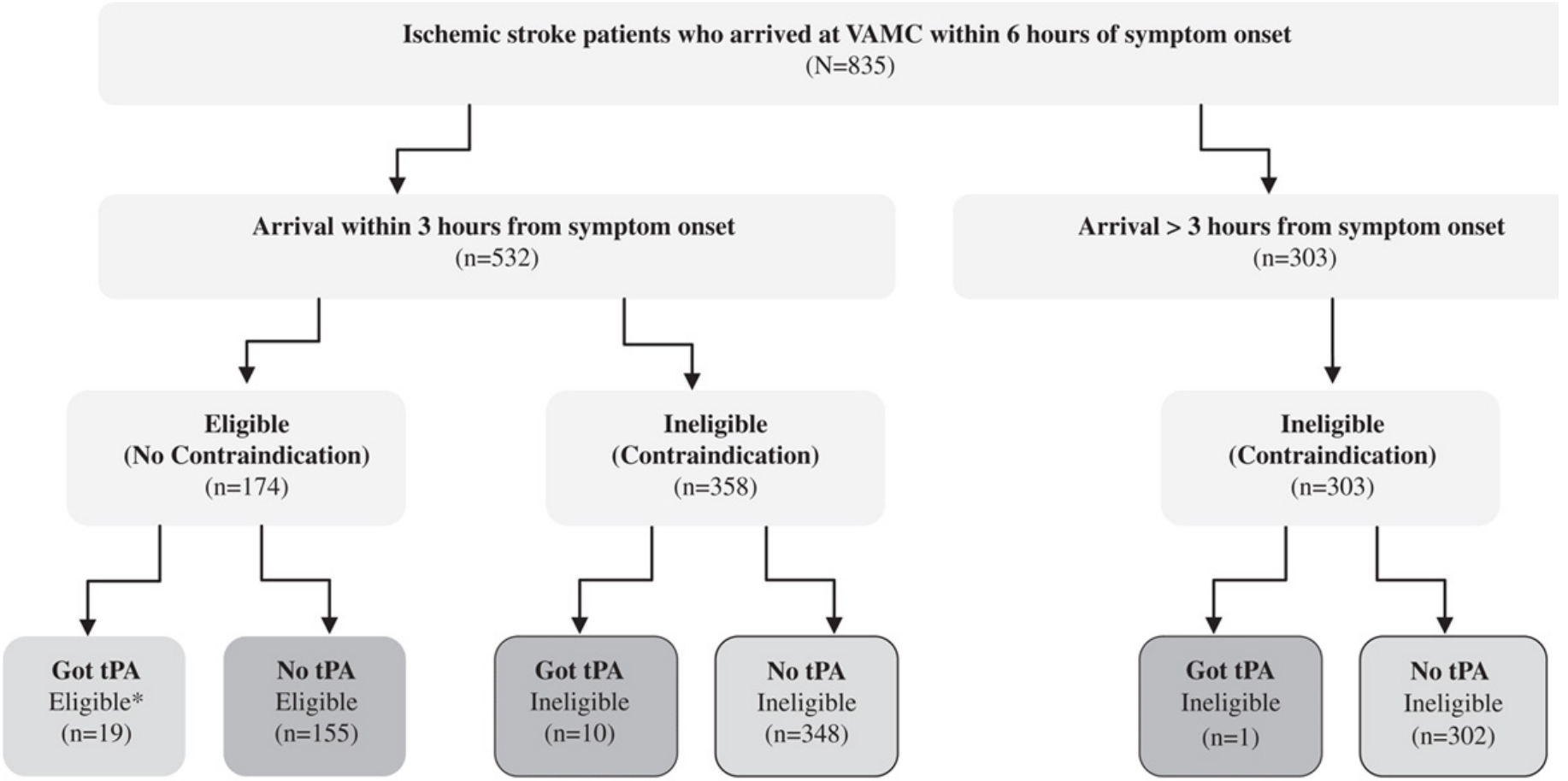
VA-CASE

VA Center for Applied Systems Engineering

VA QUERI Stroke

Quality Enhancement Research Initiative

tPA in the VA



* The rate of tPA use among clinically eligible patients who arrived within 3 hours of symptom onset was 19/174 (10.9%). Among the 135 patients who arrived within 2 hours of symptom onset which allowed adequate time for testing and evaluation, 19 (14.1%) received thrombolytic therapy.

The Use and Misuse of Thrombolytic Therapy Within the Veterans Health Administration.
Keyhani, Salomeh; Arling, Greg; Williams, Linda; Ross, Joseph; MD, MHS; Ordin, Diana; MD, MPH; Myers, Jennifer; Tyndall, Gary; Vogel, Bruce; Bravata, Dawn
Medical Care. 50(1):66-73, January 2012.

VHA Primary Stroke Center (PSC)

- Facility or system with the necessary personnel, infrastructure, expertise, and programs to diagnose and treat stroke patients emergently including administration of r-tPA to appropriate candidates, *24/7, 365 days a year* in the ED or in the facility.

- Will have a stroke unit or other designated location within the hospital where stroke patients are admitted, staffed by medical personnel with additional training and expertise in stroke care.

VHA Limited Hours Stroke Facility (LHSF)

- Same as PSC except care is provided *during normal business hours only*, as defined by local policy.

- Acute patients potentially eligible for tPA presenting outside these hours are referred or diverted to a Stroke Center as designated according to local policy.

VHA Supporting Stroke Facility (SSF)

- Facility with limited capabilities related to staffing, technician coverage, study interpretation, or appropriate numbers and types of beds that *does not allow for consistent care* of patients presenting with acute stroke.
- All patients presenting with stroke symptoms are diverted or transferred to a PSC according to local policy.
- Robust transfer agreements required.
- VHA SSFs can, however, provide post-stroke medical (excluding thrombolytic therapy), rehabilitation and follow-up care.

Annual volume of tPA-eligible patients in the VA

No. Facilities	All VAMCs* 85	Equipped VAMC† 29	Nonequipped VAMC† 56	P
Eligible patients per facility (%)				
Mean	7.4%	5.3%	8.5%	< 0.01
Median	5.2%	5.3%	6.7%	
Range	1.7%–29.2%	1.7%–11.1%	1.8%–29.2%	
Eligible patients per facility (N)				
Mean	2.3	2.4	2.8	0.49
Median	2	2	2	
Range	1–7	1–7	1–7	
Time from symptom onset to arrival (minutes)				
Mean	72.6	82.0	67.8	0.18
Median	75.6	85.0	61.0	
Range	1–180	1–165	1–180	
Time from symptom onset to brain imaging (minutes)				
Mean	147.9	126.3	159.2	0.13
Median	137.8	130.0	147.3	
Range	1–360	1–269	1–360	
Eligible patients receiving tPA (%)	8.6%	10.3%	7.7%	0.58

*VAMC refers to Veterans Administration Medical Center.
†Equipped refers to VAMCs with both level-1 and level-2 intensive care units and computed tomography technologist available inhouse 24/7 or on-call within 30 minutes.

Given the Low Annual Volume Per Facility Does it Make Sense for Facilities to Make Stroke Care vs. Buy Stroke Care?

Steps to Model Development

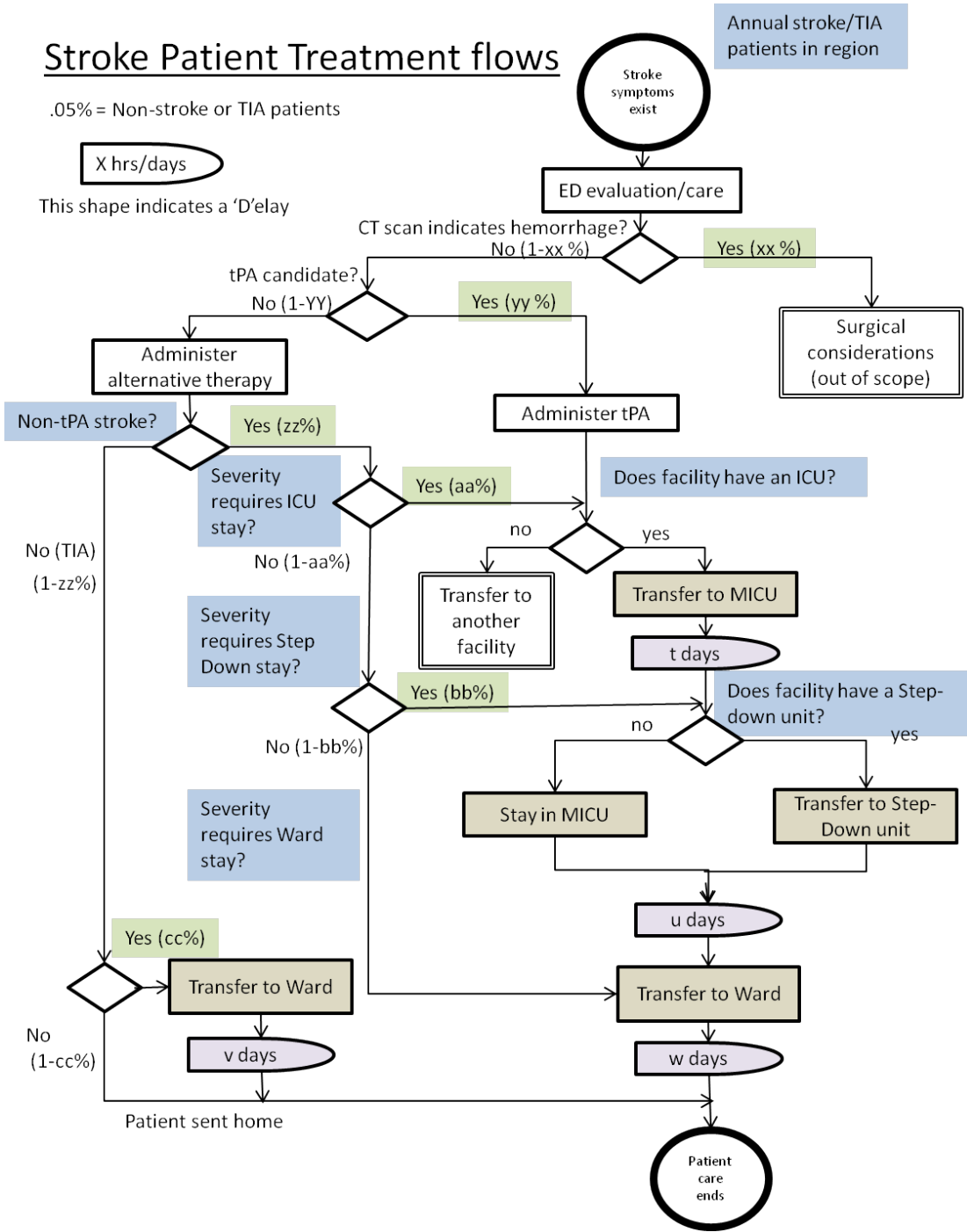
1 - Develop a treatment flow pattern

2 - Develop model based on the flow

3 - Identify data to fill model

4 - Model testing

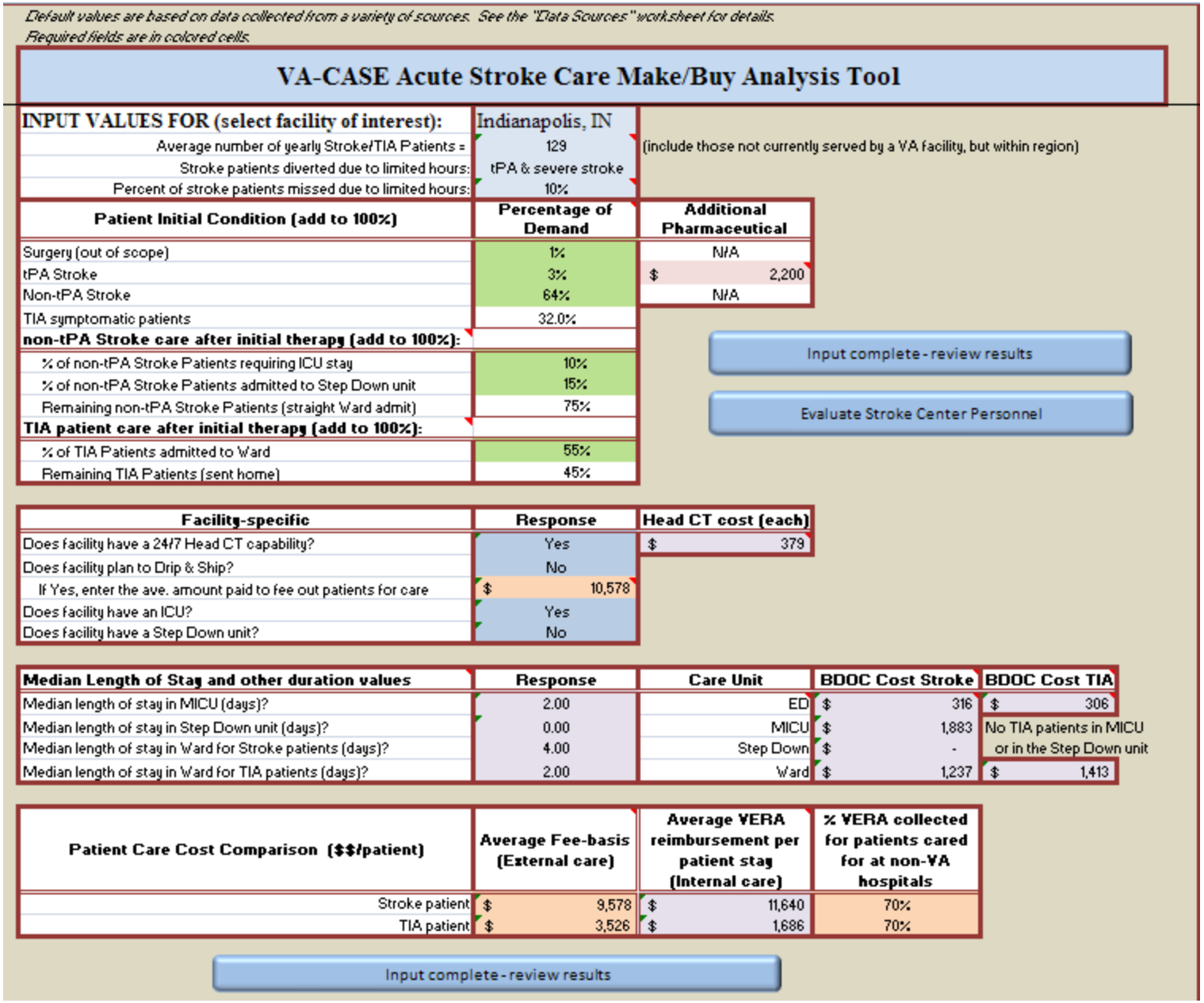
Model assumption – useful for medical centers that have necessary facility space (ED, ICU, radiology) to provide stroke care. It analyzes the effect of hiring additional personnel.


Stroke Patient Treatment flows
.05% = Non-stroke or TIA patients
X hrs/days
This shape indicates a 'D'elay
Annual stroke/TIA patients in region
Stroke symptoms exist
ED evaluation/care
CT scan indicates hemorrhage?
No (1-xx %)
Yes (xx %)
Surgical considerations (out of scope)
tPA candidate?
No (1-YY)
Yes (yy %)
Administer alternative therapy
Administer tPA
Non-tPA stroke?
Yes (zz%)
Severity requires ICU stay?
Yes (aa%)
No (1-aa%)
Does facility have an ICU?
no
yes
Transfer to another facility
Transfer to MICU
t days
No (TIA)
(1-zz%)
Severity requires Step Down stay?
Yes (bb%)
No (1-bb%)
Does facility have a Step-down unit?
no
yes
Stay in MICU
Transfer to Step-Down unit
u days
Severity requires Ward stay?
Yes (cc%)
Transfer to Ward
Transfer to Ward
No
(1-cc%)
v days
w days
Patient sent home
Patient care ends

Input screen to collect flow values and fee-basis costs

Colors on flow match the cell colors

Other values are shaded light orange



Default values are based on data collected from a variety of sources. See the "Data Sources" worksheet for details.
Required fields are in colored cells.

VA-CASE Acute Stroke Care Make/Buy Analysis Tool

INPUT VALUES FOR (select facility of interest):	Indianapolis, IN
Average number of yearly Stroke/TIA Patients =	129
Stroke patients diverted due to limited hours:	tPA & severe stroke
Percent of stroke patients missed due to limited hours:	10%

(include those not currently served by a VA facility, but within region)

Patient Initial Condition (add to 100%)	Percentage of Demand	Additional Pharmaceutical
Surgery (out of scope)	1%	N/A
tPA Stroke	3%	$ 2,200
Non-tPA Stroke	64%	N/A
TIA symptomatic patients	32.0%	
non-tPA Stroke care after initial therapy (add to 100%):		
% of non-tPA Stroke Patients requiring ICU stay	10%	
% of non-tPA Stroke Patients admitted to Step Down unit	15%	
Remaining non-tPA Stroke Patients (straight Ward admit)	75%	
TIA patient care after initial therapy (add to 100%):		
% of TIA Patients admitted to Ward	55%	
Remaining TIA Patients (sent home)	45%	

Input complete - review results

Evaluate Stroke Center Personnel

Facility-specific	Response	Head CT cost (each)
Does facility have a 24/7 Head CT capability?	Yes	$ 379
Does facility plan to Drip & Ship?	No	
If Yes, enter the ave. amount paid to fee out patients for care	$ 10,578	
Does facility have an ICU?	Yes	
Does facility have a Step Down unit?	No	

Median Length of Stay and other duration values	Response	Care Unit	BDOC Cost Stroke	BDOC Cost TIA
Median length of stay in MICU (days)?	2.00	ED	$ 316	$ 306
Median length of stay in Step Down unit (days)?	0.00	MICU	$ 1,883	No TIA patients in MICU
Median length of stay in Ward for Stroke patients (days)?	4.00	Step Down	$ -	or in the Step Down unit
Median length of stay in Ward for TIA patients (days)?	2.00	Ward	$ 1,237	$ 1,413

Patient Care Cost Comparison ($$/patient)	Average Fee-basis (External care)	Average VERA reimbursement per patient stay (Internal care)	% VERA collected for patients cared for at non-VA hospitals
Stroke patient	$ 9,578	$ 11,640	70%
TIA patient	$ 3,526	$ 1,686	70%

Input complete - review results

FTEE specifications

Base salary for GS-# or applicable level---alter to reflect local conditions

Includes locality pay increase & benefits

Return to Input Sheet | Return to Summary Sheet

The formulas used are explained belo

Positions - specified in Houston stroke care documentation	Staffing Requirement	Number to Hire	No. of FTEE Recommended: PSC (24/7, 365)	No. of FTEE Recommended: LHSF (8.5/5, 355)	Base Salary $$	Total Cost* $$ (1 FTEE)	Total Salary $$: PSC (24/7, 365)	Total Salary $$: LHSF (8.5/5, 355)
ED Stroke Team					Enter annual base pay			
Stroke Center Assistant Director (Nurse)	1 total	0.0	1	1	$ 75,000	$111,813	$ -	$ -
Indicate the combination of staff to hire for desired coverage.			6	2	Enter annual base pay			
Neurology Attending Physician		0			$125,000	$186,355	$ -	$ -
Neurology Resident		0			$ 40,000	$ 59,634	$ -	$ -
Telemedicine Neurologist		0			$ 30,000	$ 44,725	$ -	$ -
Contract/Moonlighting Staff (enter total pay/year)		0			$ 40,000	-	$ -	$ -
Radiology - added if new Radiology unit or additional staff planned.			6	2	Enter annual base pay			
Radiology Technician		0			$ 75,000	$111,813	$ -	$ -
Radiologist		0			$125,000	$186,355	$ -	$ -
Telemedicine Radiologist		0			$125,000	-	$ -	$ -
Neurosurgery - added if add'l staff planned to prevent Drip & Ship.			6	2	Enter annual base pay			
Neurosurgery Attending Physician		0			$150,000	$223,626	$ -	$ -
Neurosurgery Resident		0			$ 60,000	$ 89,450	$ -	$ -
Contract/Moonlighting Staff (enter total pay/year)		0			$ 50,000	-	$ -	$ -
Personnel - added if new unit(s) planned.	Select "No" on input sheet to plan unit				Enter annual base pay			
Nurse - MICU	1:2 beds	0	0	0	$ 75,000	$111,813	$ -	$ -
Nurse - Step Down unit	1:4 beds	0	0	0	$ 75,000	$111,813	$ -	$ -
*includes benefits and locality pay increase						Totals:	$ -	$ -

Enter FTE Utilization rate: 80%

% of annual hours (2,080) each FTE is available to work

Use FTE utililization of 95% if 2 weeks of vacation and 2 weeks of sick time expected.

2,080 - 80 = 2,000/2,080 = 95%

Use FTE utilization rate of 90% if educational time of 2 weeks plus vacation and sick time expected.

2,080 - 80 - 80 = 1,920/2,080 = 90%

Use other values if circumstances warrant.

The following values are used in the FTEE requirement calculations.

Benefits rate of salary:	30%	percent of base salary + locality pay, based on national norm
Locality pay increase is:	14.68%	based on government publications for each location
Number of FTEE hours per year:	1,664	Based on utilization rate (specified above)
Number of operational hours PSC	8,760	24/7, 365 days
Number of operational hours LHSF	3,018	~8.5/5, 355 days

Live Demos

Example A – effect when no investment needed – personnel caring for other patient types already.

Indianapolis facility
- ICU
- No Step-down unit

Number of patients	Internal cost	VERA funds	Difference (benefit)
5	$15,864	$30,023	$14,159
50	$202,045	$480,048	$278,003
129	$514,786	$1,216,818	$702,032

Results - with no investment stroke care subsidizes other care

RESULTS - values reflect total calculated cost for each directive option:

Stroke Center Cost:	Annual $ (PSC)	Annual $ (LHSF)	Annual $ (SSF)
In-house patients:	129	127	0
Stroke Center Personnel:	$0	$0	$0
tPA Cost:	$8,800	$8,800	$0
Head CT Cost:	$48,891	$48,133	$0
Other stroke patient care (time in units):	$379,221	$375,138	$0
Other TIA patient care (time in units):	$77,874	$45,367	$0
Internal - Total	$514,786	$477,438	$0
VERA reimbursement - stroke patients*:	$1,000,997	$989,358	$0
VERA reimbursement - TIA patients*:	$215,821	$70,816	$0
Total VERA reimbursement:	$1,216,818	$1,060,174	$0
External patients:	0	2	129
Stroke patient care:	$0	$19,155	$823,672
TIA patient care:	$0	$0	$144,579
Transfer to external ICU (Drip & Ship):	$0	$0	$0
External - Total	$0	$19,155	$968,251
VERA reimbursement - stroke patients*:	$0	$16,295	$700,698
VERA reimbursement - TIA patients*:	$0	$0	$48,391
Total external VERA reimbursement:	$0	$16,295	$749,089
Total cost for each stroke center designation:	$514,786	$496,593	$968,251
Total cost minus VERA reimbursement:	-$702,032	-$579,876	$219,162

*VERA dollars are reimbursed for patient care, regardless of care location. This figure is subtracted from the internal cost calcu

PSC=Primary Stroke Center (24/7); LHSF=Limited Hours Stroke Facility (normal business hours); SSF=Stroke Support Facility (plan

Per Patient Cost Comparison

Patient Care Cost Comparison ($$/patient)	Fee-basis (External care)	VERA reimbursement per patient stay (Internal care)	Total Internal care cost
Average Stroke patient care	$ 9,578	$ 11,640	$ 2,963
Average TIA patient	$ 3,526	$ 1,686	$ 1,854

Example B – add salary cost to expand care.

Indianapolis facility

- Add 0.5 FTEE Stroke Center Assistant Director ~$60,000
- ICU
- No Step-down unit

Number of patients	Internal cost	Difference (benefit)	Previous Difference (benefit)
5	$71,771	$41,747 cost	$14,159
50	$257,952	$222,096	$278,003
200	$912,096	$981,445	Unable with staff

Results - with $60,000 investment can care for more patients

RESULTS - values reflect total calculated cost for each directive option:

Stroke Center Cost:	Annual $ (PSC)	Annual $ (LHSF)	Annual $ (SSF)
In-house patients:	150	148	0
Stroke Center Personnel:	$55,907	$55,907	$0
tPA Cost:	$11,000	$11,000	$0
Head CT Cost:	$56,850	$56,092	$0
Other stroke patient care (time in units):	$444,752	$440,669	$0
Other TIA patient care (time in units):	$88,191	$51,444	$0
Internal - Total	$656,700	$615,112	$0
VERA reimbursement - stroke patients*:	$1,175,590	$1,163,950	$0
VERA reimbursement - TIA patients*:	$251,229	$80,933	$0
Total VERA reimbursement:	$1,426,818	$1,244,883	$0
External patients:	0	2	150
Stroke patient care:	$0	$9,578	$967,336
TIA patient care:	$0	$0	$169,263
Transfer to external ICU (Drip & Ship):	$0	$0	$0
External - Total	$0	$9,578	$1,136,599
VERA reimbursement - stroke patients*:	$0	$8,148	$822,913
VERA reimbursement - TIA patients*:	$0	$0	$56,653
Total external VERA reimbursement:	$0	$8,148	$879,566
Total cost for each stroke center designation:	$656,700	$624,690	$1,136,599
Total cost minus VERA reimbursement:	-$770,118	-$628,341	$257,033

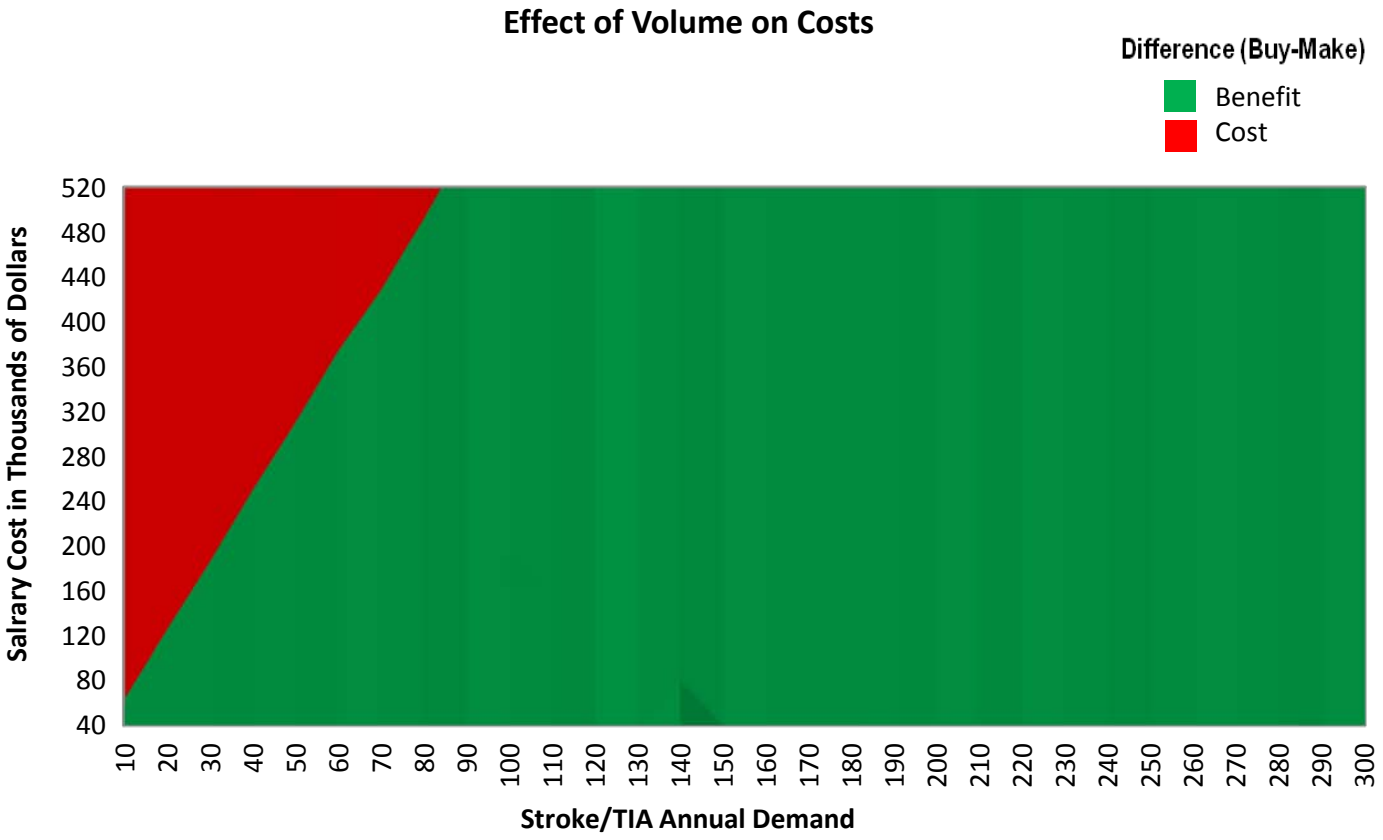
*VERA dollars are reimbursed for patient care, regardless of care location. This figure is subtracted from the internal cost calcu

PSC=Primary Stroke Center (24/7); LHSF=Limited Hours Stroke Facility (normal business hours); SSF=Stroke Support Facility (plan

What are the Policy Lessons Learned from the Stroke Make-Buy Model?

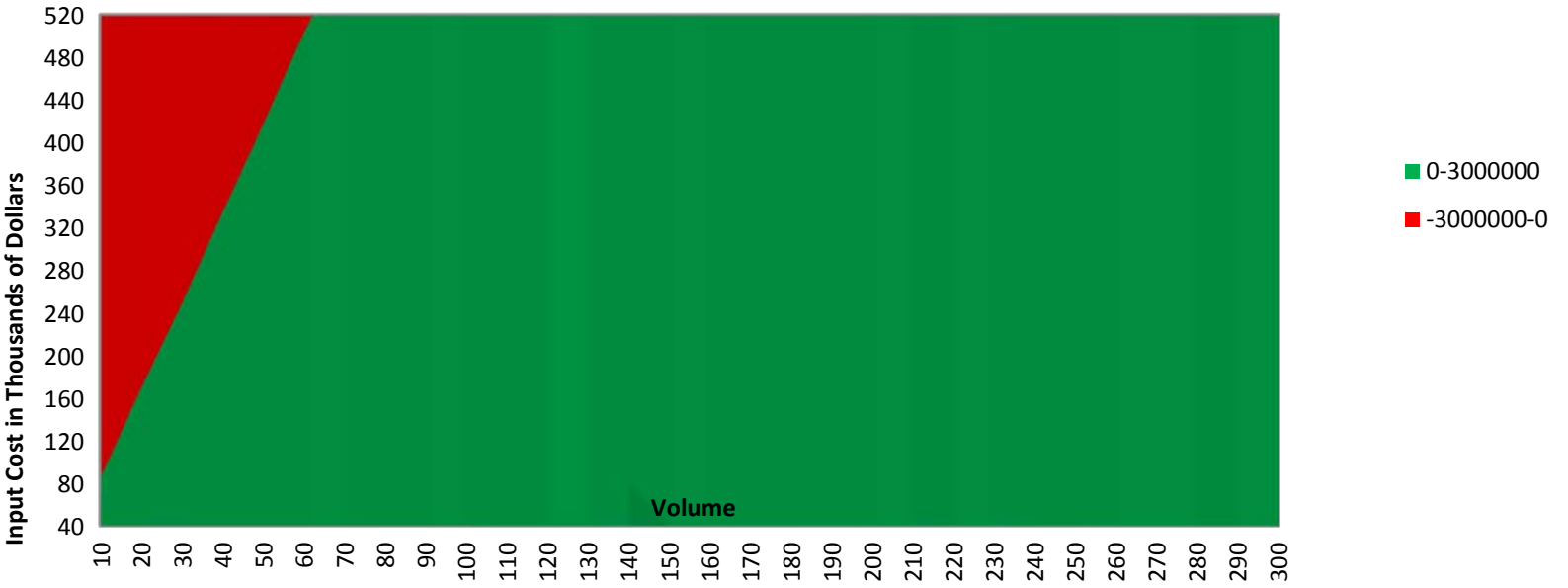
VAMC with head CT, ED & ICU

Cost to "Buy" minus Cost to "Make"



VAMC with head CT, ED & ICU

Cost to "Make" minus Cost to "Buy"
Assuming Higher Non-VA Stroke Care costs

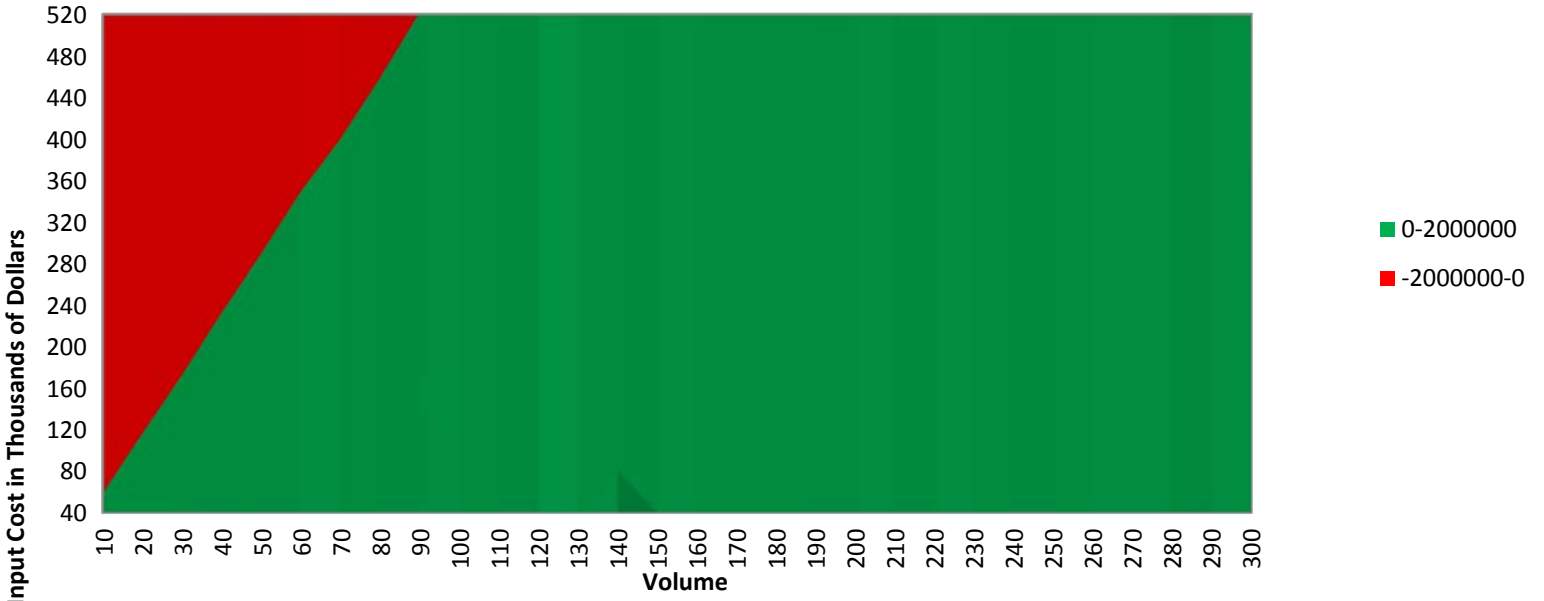


Salary Expense Req'd to Provide TIA/Stroke Patient Care ($,000)

Annual TIA/Stroke Patient Demand

Cost to "Make" minus Cost to "Buy" Assuming Higher Non-VA Stroke Care costs and 100% VERA reimbursement

Salary Expense Req'd to Provide TIA/Stroke Patient Care ($,000)



What have we learned?

Variables Impacting the Decision to Make or Buy Stroke Care

- Even at low volumes may make more sense to “make” stroke care
- The difference in the decision to make or to buy largely rests on non-VA costs and VERA dollars.
- Stroke subsidizes other services for each VAMC because of the $13,574 VERA reimbursement for each case and lower costs of care in the VA.

Thank you …

Questions?