

CASE STUDY

# How Christiana Care reduced unwarranted variation in stroke care

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Article by Physician Executive Council

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# Overview

## The challenge

In 2015, Christiana Care transitioned their clinical governance from a hospital department model to a system-wide service line model to prepare for value based care. In 2016, they launched a care pathways initiative to optimize patient outcomes, enhance financial viability, and improve patient, provider, and staff experience. Stroke was one of the conditions with opportunity to reduce unwarranted care variation.

## The organization

Christiana Care is a two-hospital system based in Wilmington, Delaware, with a large integrated network of 1,500 providers, including 500 employed providers. The main hospital has over 900 beds and was ranked 22nd in the nation for inpatient volume in 2017.

## The approach

By addressing six strategic questions about care standardization, Christiana Care was able to update their stroke care guidelines to meet the standards set by the Joint Commission for comprehensive stroke centers, while also eliminating duplicative imaging, ensuring appropriate specialist follow up, and improving efficiency of patient rounding.

## The result

Through their CVR efforts, Christiana care was able to increase adherence for best practice guidelines for stroke treatment and reduce the rate of duplicate imaging from 13% to 5%.

# Approach

## How Christiana Care improved COPD outcomes through CVR

CVR helped Christiana Care increase compliance with stroke care guidelines, improve quality performance, and reduce waste through the reduction of duplicative imaging.

### The six questions

Leaders at Christiana Care reduced unwarranted variation in stroke care by addressing six strategic questions:

**01** How much of the care pathway could Christiana Care address?

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**02** Which components of care did Christiana Care standardize?

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**03** What enablers helped translate the standards into practice?

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**04** How did Christiana Care roll out new care standards?

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**05** How does Christiana Care reinforce adherence?

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**06** How does Christiana Care know what's working?

## Overview of Christiana Care’s CVR approach for stroke

The chart below is a summary of how Christiana Care answered six key questions for reducing unwarranted care variation.

	Question	Christiana Care’s decisions
Design	How much of the care pathway could Christiana Care address?	<ul style="list-style-type: none"> <li>• Emergency department</li> <li>• Inpatient setting</li> </ul>
	Which components of care did Christiana Care standardize?	<ul style="list-style-type: none"> <li>• AHA/ASA stroke guidelines and Joint Commission comprehensive stroke center measures</li> <li>• Eliminate unnecessary duplicate imaging</li> <li>• Ensure appropriate specialist follow-up</li> <li>• Improve efficiency of patient rounding</li> </ul>
Embed	What enablers helped translate standards into practice?	<ul style="list-style-type: none"> <li>• Provider PowerPlan</li> <li>• APRN stroke coordinator</li> <li>• PowerPlan alert</li> <li>• Stroke discharge form</li> <li>• Patient-centered rounding tool</li> <li>• Rounding script</li> </ul>
	How did Christiana Care roll out new care standards?	<ul style="list-style-type: none"> <li>• Peer-to-peer education</li> <li>• Care standard document</li> </ul>
Measure	How does Christiana Care reinforce adherence?	<ul style="list-style-type: none"> <li>• Top-down conversations with non-adherent providers</li> </ul>
	How does Christiana Care know what’s working?	<ul style="list-style-type: none"> <li>• System-wide CVR dashboard</li> </ul>

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

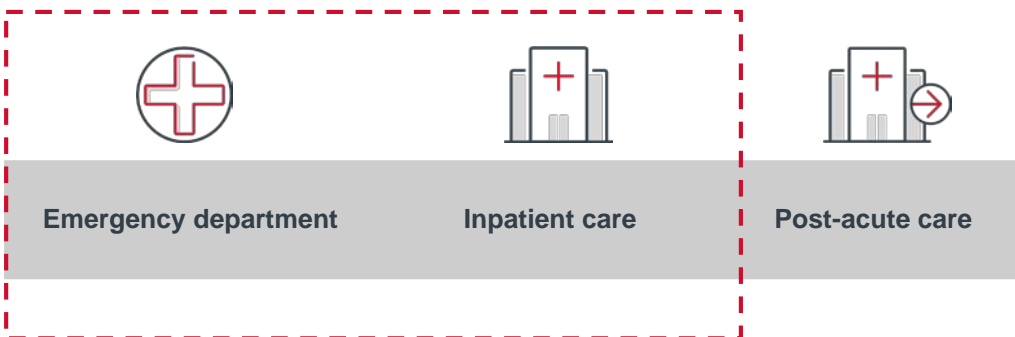
# 01 How much of the care pathway could Christiana Care address?

As a designated comprehensive stroke center, Christiana Care’s neurosciences service line was primed for CVR. They had a robust data and reporting infrastructure and a team already committed to continuous improvement. In addition, the service line employed 1.5 FTE experienced advanced practice registered nurse (APRN) stroke coordinators to help with CVR.

Beyond the service line, Christiana Care offers a service called Carelink CareNow, which provides cross-continuum care management services, including post-discharge follow-up.

## Care settings tackled in stroke CVR initiative

Ultimately, Christiana Care scoped their stroke initiative broadly to include the inpatient acute episode, including treatment in the ED and continuity of care across all hospital departments. The established Carelink CareNow service allowed the stroke CVR team to exclude post-acute care.

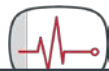


SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

# 02 Which components of care did Christiana Care standardize?

Christiana Care selected components that wouldn't generate controversy. The team started with widely accepted stroke care guidelines: AHA/ASA guidelines for the early management of patients with acute ischemic stroke<sup>1</sup> and Joint Commission comprehensive stroke center measures.<sup>2</sup>

Then they added a few additional components that were easy for clinicians to support: eliminate unnecessary duplicate imaging, ensure appropriate specialist follow up, and improve efficiency of patient rounding. All three focus on optimal use of limited resources.



## Eliminate unnecessary duplicate imaging

- No duplicate cervical vascular imaging within 30 days unless necessary
- Define patient population where ultrasound and other lower-cost imaging equally effective



## Ensure appropriate specialist follow-up

- Discharged patients<sup>3</sup> are scheduled for follow-up with a PCP at 14 days and a specialist at three months, unless:
- Cryptogenic without cardiac monitoring at discharge
  - Cardioembolic not anticoagulated
  - Symptomatic intracranial atherosclerosis



## Improve efficiency of patient rounding

- Clarify all information necessary to assess patient status and facilitate discharge, including:
- PT, OT, ST,<sup>4</sup> and neurology assessments
  - Scheduled testing, procedures, and consults
  - Observed patient behavior and disposition
  - Patient and family preferences for discharge

1. Includes medications, procedures, screenings, and consultations.  
 2. Includes 16 process measures comprehensive stroke centers must report on.  
 3. Different follow-up protocols for patients discharged to a skilled nursing facility (SNF) or nursing home.  
 4. Physical therapy, occupational therapy, speech therapy.

Source: 2018 Guidelines for the Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association; Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

# 03 What enablers helped translate the standards into practice?

Christiana Care then determined what resources were needed to help providers translate new stroke care clinical specifications into practice. The table at right summarizes the enablers Christiana Care put in place to support their new care standards. “Enablers” are people, processes, and technologies that make it easier for frontline clinicians to comply with standards.

Christiana Care utilized people and process enablers when prudent, but leaned most heavily on technology.

## Christiana Care’s enablers to facilitate compliance

Care components	Enablers
AHA/ASA stroke guidelines	<ul style="list-style-type: none"> <li>• Provider PowerPlan</li> </ul>
Joint Commission comprehensive stroke center measures	<ul style="list-style-type: none"> <li>• APRN stroke coordinator</li> </ul>
Eliminate unnecessary duplicative imaging	<ul style="list-style-type: none"> <li>• PowerPlan alert</li> </ul>
Ensure appropriate specialist follow-up	<ul style="list-style-type: none"> <li>• Electronic stroke discharge form</li> </ul>
Ensure appropriate specialist follow-up	<ul style="list-style-type: none"> <li>• Patient-centered rounding tool</li> <li>• Rounding script</li> </ul>














Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.



APPROACH – QUESTION 3

## PowerPlan<sup>1</sup> facilitates compliance with stroke guidelines

Christiana Care’s first enabler to ensure compliance with guidelines is a stroke PowerPlan. They made the stroke PowerPlan easy for physicians to find by embedding it as a subplan in the hospitalists’ admissions order set.

Component	Details	Stroke Patient 
<b>Medications</b>		
 <input checked="" type="checkbox"/> tPA (Tissue Plasminogen Activator)	▼ IV	<input checked="" type="checkbox"/>
 <input type="checkbox"/> Aspirin	▼ 325 mg PO	<input type="checkbox"/>
 <input type="checkbox"/> Warfarin	▼ 325 mg PO	<input type="checkbox"/>
 <input type="checkbox"/> Statin	▼ 325 mg PO	<input type="checkbox"/>
<b>Diagnostic Testing</b>		
 <input type="checkbox"/> CT Head		<input type="checkbox"/>
 Use ultrasound instead of MRI for carotid imaging <a href="#">Link to algorithm</a>		<input checked="" type="checkbox"/>
 <input type="checkbox"/> MRI		<input type="checkbox"/>
 <input checked="" type="checkbox"/> Carotid Ultrasound		<input checked="" type="checkbox"/>
<b>Referrals</b>		
 <input checked="" type="checkbox"/> Physical Therapy	▼ 2x 60 min	<input checked="" type="checkbox"/>
 <input type="checkbox"/> Occupational Therapy	▼ 2x 60 min	<input type="checkbox"/>
 <input type="checkbox"/> Speech Therapy	▼ Initial	<input type="checkbox"/>
 <input type="checkbox"/> Behavioral Health	▼ Assessment	<input type="checkbox"/>

Stroke PowerPlan added as subplan to hospitalist’s admission order set

## Coordinator ensures all stroke patients are on PowerPlan

The second enabler to ensure compliance is the APRN stroke coordinator. The coordinator monitors stroke patients to ensure that care standards are followed. A “stroke patient” indicator in the chart helps coordinators filter and follow all stroke patients, even when housed outside of the designated stroke unit.

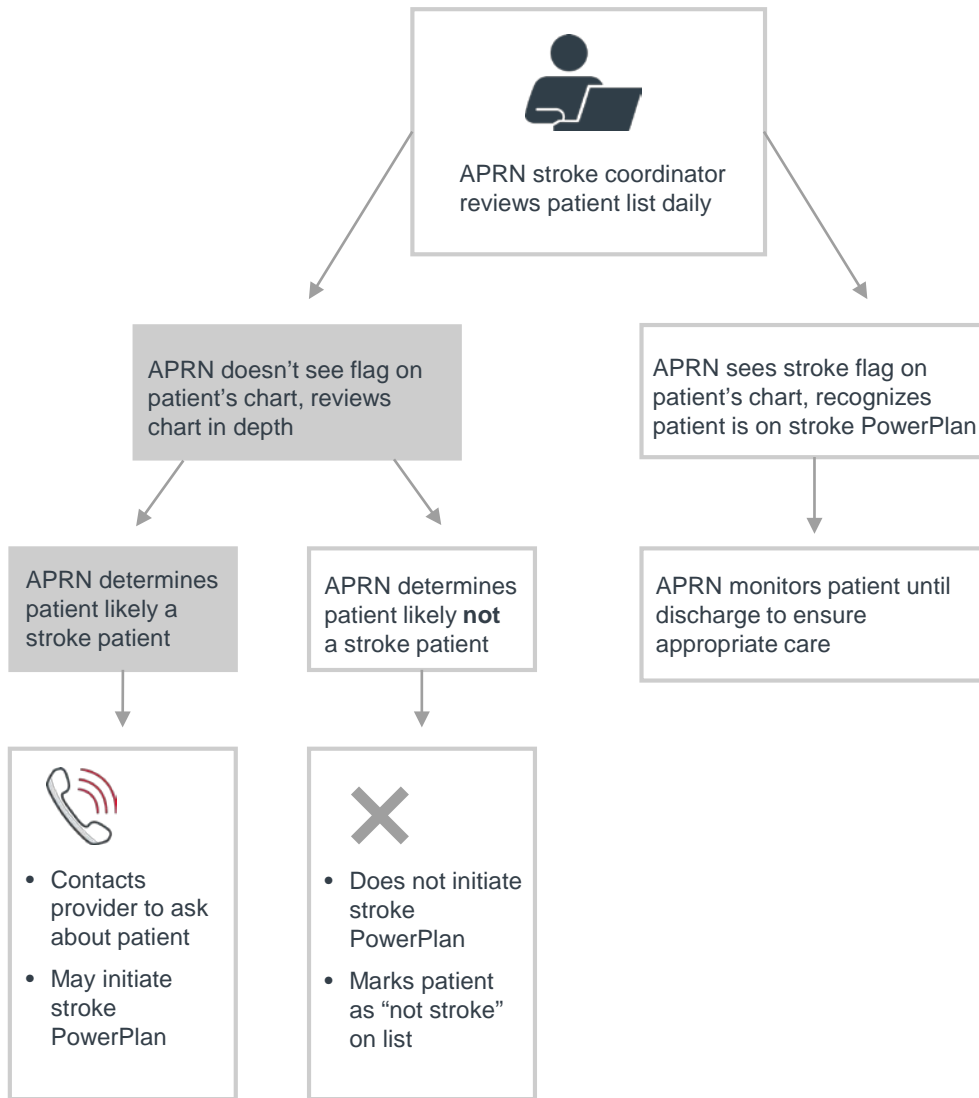
Stroke coordinators also identify potential stroke patients who are not yet on the PowerPlan. Christiana Care designed a surveillance trigger to flag charts with symptoms such as weakness, aphasia, and facial droop. Stroke coordinators then meet with physicians to decide whether the stroke PowerPlan is appropriate.

1. Illustration simplifies PowerPlan layout for teaching purposes.

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

APPROACH – QUESTION 3

## APRN stroke coordinator process to encourage guideline compliance



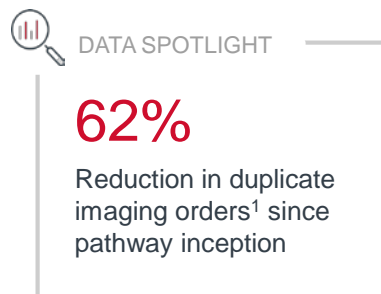
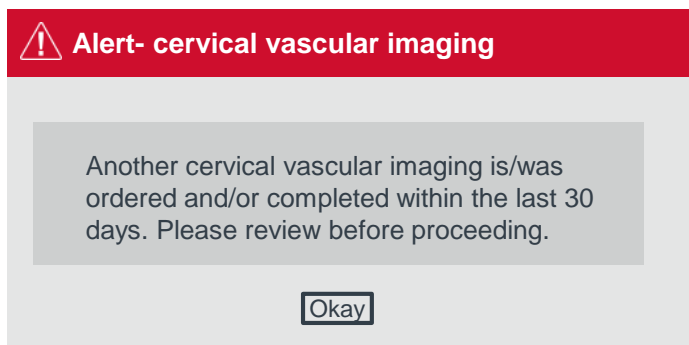
1. Illustration simplifies PowerPlan layout for teaching purposes.

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

APPROACH – QUESTION 3

## Pop-up alert warns against duplicate imaging orders

The enabler that Christiana Care built to reduce duplicate imaging was simple—an alert that pops up if a similar imaging order has been placed within the last 30 days. After introducing the alert, duplicative orders dropped precipitously, lowering costs and creating imaging machine capacity for other patients. This is because the typical root cause of duplicate imaging orders is simply providers’ lack of awareness that the requested image is already available.



## Discharge form ensures appropriate follow-up

Christiana Care’s enabler to support appropriate specialist follow-up is an electronic stroke discharge form. The tech team embedded a point-and-click form in neurologists’ discharge workflow. The form requires the neurologist to indicate whether a post-discharge neurology or psychiatry consult is warranted. If so, a system-generated follow-up request email is sent to outpatient scheduling and then their staff schedules the required follow up with an appropriate specialist. Absent this indication, patients are scheduled to see a primary care physician (PCP).

Prior to implementing the point-and-click form, scheduling instructions were less specific and manually entered. The schedulers defaulted to making appointments with specialists even if a PCP could provide appropriate follow-up for many patients.

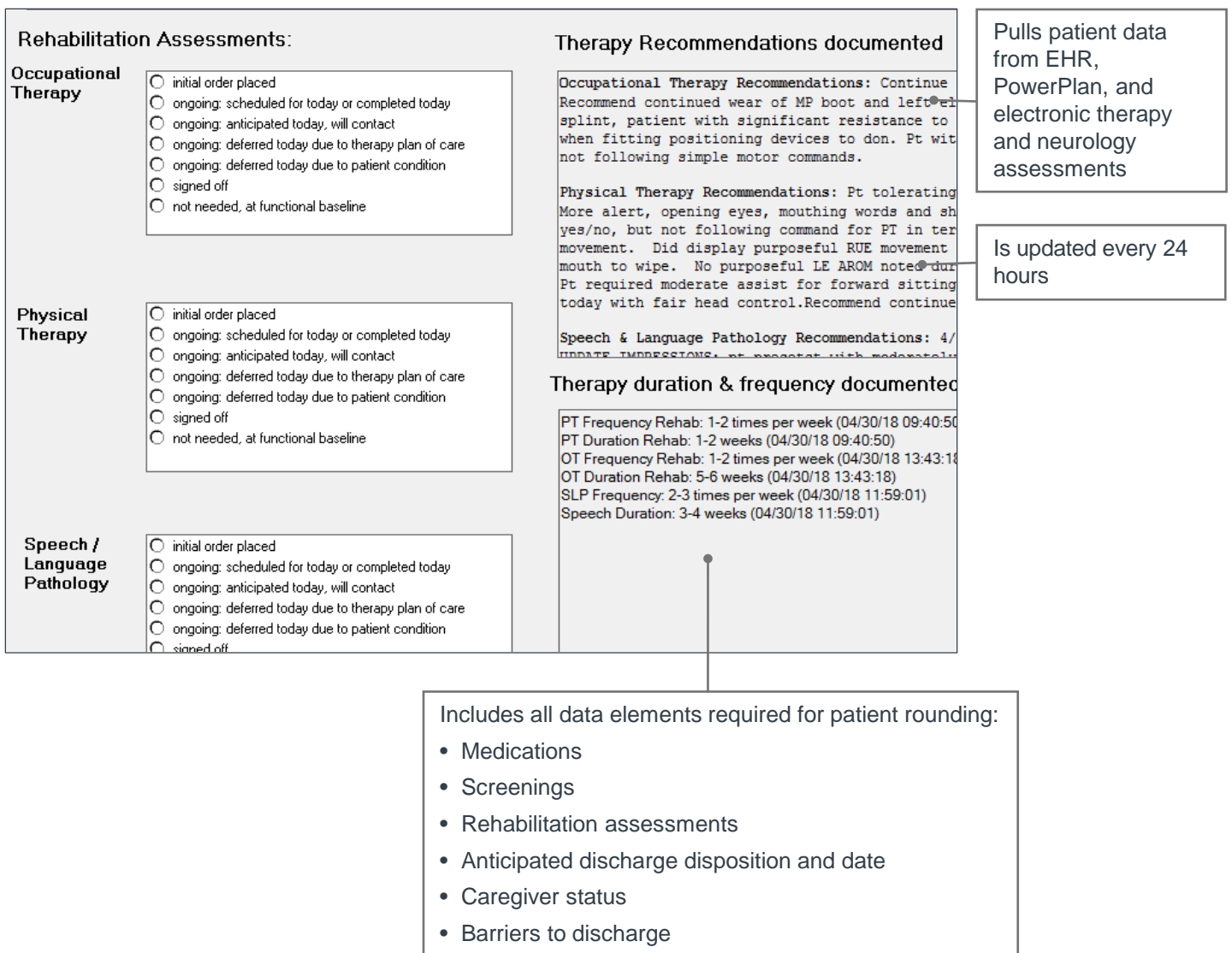
1. Duplicate image orders identified through database query.

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

APPROACH – QUESTION 3

## Rounding tool makes relevant data more accessible

The enabler that Christiana Care built to support interdisciplinary rounding was a custom designed patient-centered rounding tool. The rounding tool automatically pulls information from various source systems into one easy-to-interpret screen. Now rounding runs smoothly, and clinicians can access all the information they need right at their fingertips. This tool was highlighted as best practice by the Joint Commission and recommended for other stroke centers.



APPROACH – QUESTION 3

## Keep rounds on track with a script

The stroke team developed an additional enabler to enhance the efficacy of interdisciplinary rounds. The stroke patient rounding script clarifies roles, responsibilities, and sequence to prevent confusion, inconsistency, and unnecessary delays.

The script also improves patient-centered care by prompting conversation about patient and family concerns, and clarifies the anticipated discharge date and destination. More predictable rounds also improve timely discharge. Rounds are now consistently held mid-morning to facilitate same-day discharge.

Excerpts from Christiana Care’s interdisciplinary stroke patient rounding script	
Presenter	Data category
<b>Patient summary and interval history</b>	
Nurse	Age/sex Date of admission Overnight events
<b>Stroke pathway summary</b>	
Neurologist	Dashboard red flags Psychology needs Rehab therapy orders
<b>Rehab therapy recommendations</b>	
Rounder <sup>1</sup> /therapists	PT/OT/ST recommendations
<b>Caregiver/family goals/discharge planning</b>	
Neurologist asks:	What is family/caregiver structure? Are there family concerns?
<b>Discharge planning summary</b>	
Rounder	Anticipated disposition Anticipated discharge date Summary of action items

Clarifies attendee roles and responsibilities

Sequences presentation of patient information from general to specific

Prompts team to discuss patient discharge plan during every session

1. The nurse leading rounds reviews rehab therapy recommendations when therapists are not present.

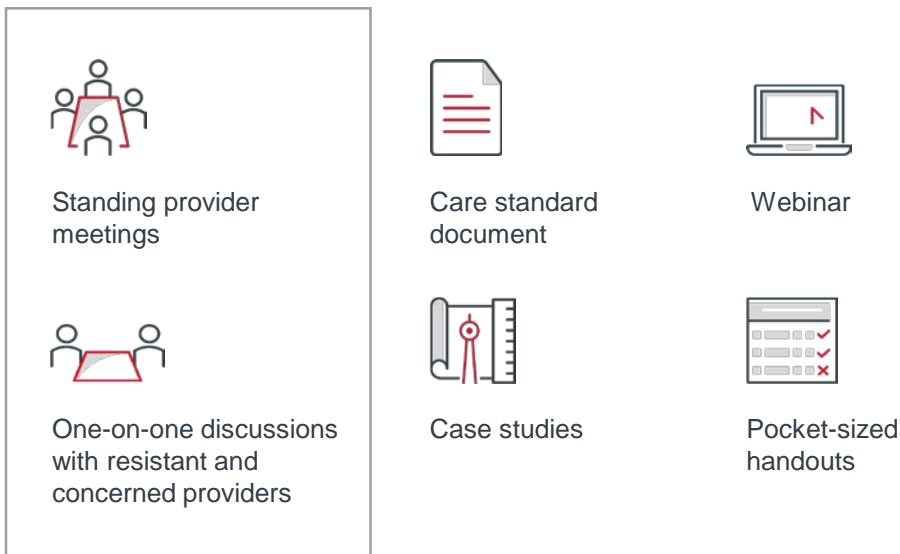
Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

# 04 How did Christiana Care roll out new care standards?

Christiana Care chose to capitalize on their small size and leverage peer-to-peer relationships as the primary communication approach. Liaisons from each discipline engaged in the stroke CVR work educated their peers on new standards. This approach was particularly effective given the breadth of specialties represented on the stroke CVR team, including neurologists, therapists, hospitalists, ED physicians, and nurses.

## Stroke pathway education channels



SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

# 05 How does Christiana Care reinforce adherence?

Christiana Care uses technology and peer pressure to ensure everyone is on board with the new standard and reinforce adherence.

A core measure compliance audit tool pulls data from the EHR in near-real time, with only a five-hour data lag. The audit tool's color-coded grid design allows coordinators to quickly identify gaps in care. Green indicates that the requirement has been met. Red indicates failure to meet a measure or missing documentation. Pink reflects an unsatisfied measure that still has time on the clock. This safety net confirms that all patients receive "perfect stroke care" while still in-house.

## Screenshot of Christiana Care's stroke patient audit tool

Patients 1	Admission				Stroke Prevention				Care Coordination				Discharge														
	NIH by 12hr	Reverse Dysphagia	Aspirin Day 2	VTE Day 2	Pw/Isochemic	Orderset	Consult	Aspirin ordered	Statin ordered	HiStatin	Pharm VTE	Articoag/afib	Neuro Note	Recent NIH	Depression	Cognition	SLP	OT	PT	Education	PCR	LOS/Status	Stroke DC form	Destination	Caregiver ready	Cardiac monitor	
John Doe	18	N	S	N	Y	N	Y	N	N	N	Y	NA	I	13	Un	B	C	C	C	C	Y	Y	22	N	R	NH	NA
Jane Smith	1	N	P	N	Y	N	Y	N	Y	Y	N	Y	NA	I	0	N	B	C	C	C	Y	Y	5	N	R	NC	NA
Tom Buck	11	N	S	N	Y	N	Y	N	N	Y	N	Y	N	10	N	D	C	C	C	Y	P	1	N	P	NH	NA	
Sue Jacks	10	Y	S	U	U	Y	Y	N	Y	Y	Y	P	I	23	Un	B	C	C	C	Y	Y	15	Y	S	NH	N	
Sarah Jane	18	Y	S	Y	Y	Y	Y	N	Y	Y	Y	NA		14	N	D	C	C	C	Y	P	1	P	P	NA	P	
Nester Rhodes	8	N	S	N	Y	N	Y	N	N	Y	Y	Y	N	7	N	D	C	C	C	Y	P	2	N	P	NH	NA	
Jane Alonzo	0	Y	F	Y	Y	Y	Y	I	Y	Y	P	Y	NA	I	0	N	D	B	C	C	Y	Y	3	Y	HH	NC	N
Carol Brown	3	Y	P	Y	Y	Y	Y	N	Y	Y	Y	NA	I	5	N	B	C	C	C	Y	Y	10	Y	R	NH	Y	

Squares are populated using data from the EHR

Non-green squares indicate care that should have been given but not yet accounted for

Five-hour data lag

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.



APPROACH – QUESTION 5

If a stroke patient is discharged without following the stroke PowerPlan, the stroke coordinator emails the noncompliant provider. The email explains the rationale behind the stroke care standards and encourages the provider to use the PowerPlan for future stroke patients.

Since 98% of stroke patients do receive perfect care—most likely due to an effective PowerPlan—this level of follow-up is very rarely needed. In most cases, email recipients are new to the organization or see very few stroke patients. This email nudge increases the likelihood they will use the PowerPlan for future stroke patients.

<input type="button" value="Send"/>	To:	
	Subject	Acute ischemic stroke PowerPlan utilization

Hello,

You recently admitted an ischemic stroke or TIA diagnosis patient and on behalf of the stroke program we want to thank you for caring for this specialized population. The Neurosciences Service Line has created an evidenced based clinical pathway for the management of acute ischemic stroke patients. The goal of the pathway is to optimize the care of acute stroke patients by standardizing the process of clinical care based on available best evidence.

**You were part of the healthcare team who admitted an ischemic stroke pathway patient and noted the Neuro stroke/TIA admission PowerPlan MD5215 or associated module was not utilized. This PowerPlan includes standardized orders and nursing tasks that facilitate best practice and adherence to stroke Joint Commission requirements. Please utilize the MD5215 PowerPlan or associated module 5981 for future stroke and TIA admissions.**

If you have any questions please do not hesitate to contact the Stroke Program Medical Director or the Stroke Program Associate Director and Medical Director for Neurocritical Care service.

We look forward to any questions you have and thank you so much for the great care you provided to this patient population and appreciate your time.

Sincerely,  
The Christiana Care Stroke Team



SIX QUESTIONS USED TO REDUCE CARE VARIATION FOR STROKE

# 06 How does Christiana Care know what's working?

Christiana Care uses multiple measurement tools to understand the clinical and financial impacts of their new standards. Three are listed below.

Most of these tools are required for Joint Commission comprehensive stroke center accreditation and existed before Christiana Care's CVR initiative. Christiana Care was already monitoring the metrics they hope to inflect through CVR. Moving forward, Christiana Care plans to enhance reporting capabilities to more accurately measure the stroke pathway's impact on variable costs of care.

Stroke program dashboard	System-wide CVR dashboard	Chart abstraction
<ul style="list-style-type: none"> <li>• One-month data lag</li> <li>• Includes outcome and process metrics</li> <li>• Modified Rankin Scale<sup>1</sup></li> <li>• Patients receiving ideal care<sup>2</sup></li> <li>• LOS</li> <li>• Discharge destination</li> <li>• Hemorrhage rates</li> <li>• Mortality rates</li> <li>• Hospice</li> <li>• Duplicate imaging orders</li> </ul>	<ul style="list-style-type: none"> <li>• One-month data lag</li> <li>• Monitors pathway adherence and select outcome metrics for each service line</li> <li>• Service lines commonly use PowerPlan adherence as proxy measure for pathway adherence</li> </ul>	<ul style="list-style-type: none"> <li>• Two-month data lag</li> <li>• Dedicated abstractor for stroke patient chart abstraction</li> </ul>

1. Measures degree of disability or dependence in daily activities.  
2. Measures number of stroke patients that meet all *Get with the Guidelines* and Joint Commission core stroke measures.

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.

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**APPROACH – QUESTION 6**

Stroke was among Christiana Care's first CVR projects. The organization's experience helped executives identify where they wanted to better support service line leaders through centralized resources.

Initially, each service line relied largely on their own resources. After auditing early CVR projects, system leaders found that many service lines lacked core CVR skills like project management and data analysis.

To remedy this, the system created an in-house consulting group called the Pathway Integration Team (PIT). The PIT offers CVR consulting and cross-department liaison services. Their consulting support includes project management or project management training, data analysis, and current and future state workflow mapping. On the liaison side of things, the PIT connects pathway teams with IT to build EHR tools, learning and development to create education content, and the health disparities department for culturally appropriate communication guidance.

The PIT also created a central repository of tools for service line CVR teams to use. These include learning modules, videos, templates, and tools to help teams at each stage of the CVR process.

# Results

## Christiana Care’s stroke outcomes after CVR initiative

Christiana Care used CVR to tackle both care quality and cost. Their focus on cost containment and cutting waste is reflected in their reduction of duplicate imaging. Additionally, they’ve shown strong quality performance driven by adherence to best practice guidelines for stroke treatment. Of more than 2,000 stroke patients treated annually, 98% meet the high bar for quality set by the Joint Commission for comprehensive stroke centers.

62%

Reduction in duplicate imaging order rates<sup>1</sup> (13% to 5%)

98%

Of stroke patients received care consistent with all Joint Commission core measures

96%

Stroke PowerPlan adherence across the health system

1. Duplicate image orders identified through database query.

Source: Christiana Care Health System, Wilmington, DE; Physician Executive Council interviews and analysis.



## Related content

 TOOLKIT  
The Stroke CVR Starter Kit  
<http://advisory.com/pec/8020-CVR>

 INFOGRAPHIC  
Four keys to engage physicians  
in care variation reduction  
[advisory.com/pec](http://advisory.com/pec)

 RESEARCH REPORT  
Create Care Standards Your  
Frontline Will Embrace  
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