Chapter 2
Financial Impact of Acute Coronary Syndromes: The Need for New Care Delivery Models

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Abstract Evaluation and management of the acute chest pain patient in a cost-efficient manner that optimizes clinical outcomes remains a challenging and daunting task for the health-care system. The spectrum of chest pain patients presenting to the emergency department (ED) ranges from those with acute coronary syndrome (ACS) and potentially immediate life-threatening hemodynamic compromise to those without any underlying cardiac disease. The ideal health-care delivery structure is one that is poised to intercept any patient along this continuum at the point of entry and quickly and appropriately triage the patient to the most efficient, evidence-based treatment strategy: patients requiring high intensity of services are expeditiously identified and managed; those without significant disease are assessed to avoid unnecessary admissions; and those with hidden ischemia and potential impending cardiac events are evaluated to minimize inappropriate discharge. The chest pain unit (CPU) has evolved as an operational mechanism to optimally fulfill these clinical needs, improve quality, enhance clinical outcomes, and reduce overall costs.

Keywords Acute coronary syndromes · Reimbursement · Value-based purchasing · Cost · Front-loading care · Point of entry · Efficiency · Chest pain unit · Observation · Quality · Improvements · Outcomes · Y model · ABC model

Introduction

Evaluation and management of the acute chest pain patient in a cost-efficient manner that optimizes clinical outcomes remains a challenging and daunting task for the health-care system. The spectrum of chest pain patients presenting to the emergency department (ED) ranges from those with acute coronary

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syndrome (ACS) and potentially immediate life-threatening hemodynamic compromise to those without any underlying cardiac disease. The ideal health-care delivery structure is one that is poised to intercept any patient along this continuum at the point of entry and quickly and appropriately triage the patient to the most efficient, evidence-based treatment strategy: patients requiring high intensity of services are expeditiously identified and managed; those without significant disease are assessed to avoid unnecessary admissions; and those with hidden ischemia and potential impending cardiac events are evaluated to minimize inappropriate discharge. The chest pain unit (CPU) has evolved as an operational mechanism to optimally fulfill these clinical needs, improve quality, enhance clinical outcomes, and reduce overall costs.

The High Costs of Cardiovascular Disease

Health-care costs have been a major driving factor for change since the 1990s. Yet health-care costs continue to escalate at a rate that exceeds standard inflation [1]. Health care currently consumes 16.2% of the US GDP, estimated at $2.2 trillion in 2007. The Centers for Medicare and Medicaid Services (CMS) estimate that total spending on health care will grow at an average annual rate of 7.3%, to exceed $4 trillion by 2016, or almost $13,000 per US resident (Fig. 2.1). Over half of national expenditures arise from hospital care and physician services, 30.0 and 21.2%, respectively (Fig. 2.2). Not surprisingly, the hospital setting has been the target of multifaceted efforts for cost reduction strategies.

Despite marked advances in the diagnosis and treatment of cardiovascular disease, it remains the number one cause of mortality in the United States. Cardiovascular care accounts for approximately 14 % of the nation's health-care expenditures. Of the nearly 16 million people in the United States with coronary heart disease, 8 million will ultimately be diagnosed with acute coronary syndrome. Over the last two decades, annual inpatient admissions for coronary heart disease (CHD) as the primary diagnosis increased 5% to 1,828,000. The estimated total direct and indirect costs of care of CHD is expected to be $156.4 billion in 2008 [2]. Lost productivity from morbidity related to coronary disease accounts for $10.2 billion and lost productivity from mortality for $58.6 billion, or 6.5 and 38%, respectively, of total cardiovascular disease costs.

Cardiovascular disease impacts total hospital care and costs substantially. Emergency departments see over 5 million visits for chest pain suggestive of ischemia annually, resulting in $10 billion of hospital costs [3]. In 2007, ACS was responsible for 1.57 million hospital admissions. Total costs for coronary atherosclerosis care, including angioplasty and bypass surgery, are estimated to result in $51 billion of hospital charges in 2008. Any strategy that can positively impact quality of care for CHD in the hospital setting has potential for significant fiscal impact.

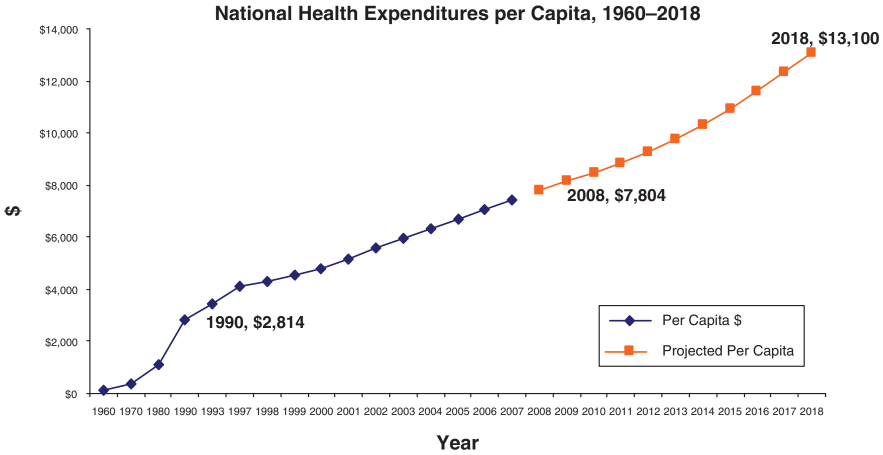


Fig. 2.1 Total expenditures of health care through 2016 (Kaiser Family Foundation, Trends in Health Care Costs and Spending, September 2007)

Notes Set 1:
1. The health spending projection were based on the 2007 version of the National Health Expenditures released in Jan 2009
2. 2000 base year. Calculated as the difference between nominal personal health care spending and real personal health care spending. Real personal health care spending is produced by deflating spending on each service type by the appropriate deflator (PPI, CPI, etc.) and adding real spending by service type.
3. July 1 Census resident based population estimates.
* Numbers and percents may not add to totals because of rounding.
*SOURCE: Centers for Medicare & Medicaid Services, Office of the Actuary.

Notes Set 2.
1. Census resident-based population less armed forced overseas and population of outlying areas. Source: U.S. Bureau of the Census.
2. U.S. Department of Commerce, Bureau of Economic Analysis.
* Numbers and percents may not add to totals because of rounding. Dollar amounts shown are in current dollars
*SOURCE: Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group; U.S. Department of Commerce, Bureau of Economic Analysis; and U.S. Bureau of the Census.

The Chest Pain Dilemma

Chest pain accounts for 5–6% of emergency department visits [4]. Eighty percent of chest pain patients actually present through the ED. Sixty to seventy percent of patients with chest pain are admitted, but only 10% have a diagnosis of acute myocardial infarction and 10% have unstable angina. Approximately three-fourths of chest pain patients presenting to the ED do not have ACS and would not require the intense and costly treatments afforded to ACS patients.

ACS patients are presenting to the ED earlier in the clot progression sequence, often making an accurate diagnosis in the early stages difficult. This

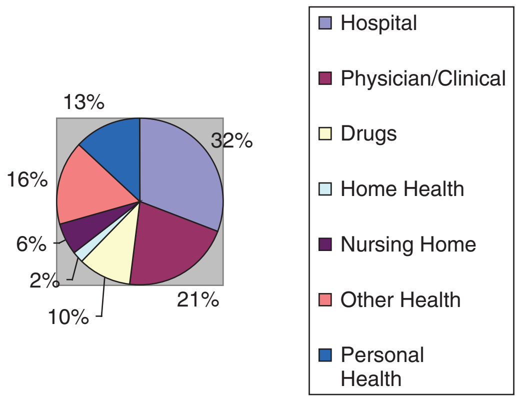


Fig. 2.2 Distribution of national health expenditures (Kaiser Family Foundation, Trends in Health Care Costs and Spending, September 2007)

gives rise to a worrisome subgroup of 2–5% of chest pain patients who actually will have a myocardial infarction but who are discharged from the emergency department. This patient population has an unusually high subsequent incidence of poor outcomes [5].

At the inception of the coronary care unit, most chest pain patients with even a remote chance of potential for ACS were admitted to the CCU awaiting a "rule-in" or "rule-out" diagnosis of myocardial infarction. This practice was a time- and resource-inefficient method for finding those patients at highest risk. The goal of cardiac care today is to accurately and expeditiously identify the high-risk group for immediate interventions and cautiously, but efficiently, sort out the low-risk group who requires a substantially lower level of resource utilization. A well-designed chest pain unit (CPU) affords that opportunity.

Historical Perspective of CPU

Reimbursement forces in health care are moving many aspects of care delivery to the outpatient setting. Care in such settings is usually more efficient and less costly. The emergence of the chest pain center in the 1990s demonstrated a more efficient way of ruling out myocardial infarction for those patients in a low-risk population subset.

Traditionally, patients with chest pain have been evaluated in the emergency department and a decision is made to admit to the acute level of care hospital based on an assessment of the likelihood of a diagnosis of acute coronary syndrome. Because of the limitations of the sensitivity and/or the specificity of tests used in this evaluation—ECG, cardiac markers—the common practice has been to admit the majority of patients, even with a moderately low level of suspicion in order to avoid sending a patient home with an acute myocardial infarction. This practice has led to cost and resource inefficiencies since only 15–20% of patients admitted to the coronary care unit with chest pain are demonstrated to have sustained a myocardial infarction [6].

In an effort to reduce unnecessary admissions while reducing inappropriate discharges, the concept of the chest pain short-stay unit emerged and later developed into the chest pain unit or observation unit. CMS defined observation status as that commonly assigned to patients who present to the emergency department and who then require a significant period of treatment and/or monitoring before a decision is made concerning their next placement. This clinical decision unit is a 23-hour observation unit in which patients are assessed by a physician and a determination made of which patients need subsequent hospitalization. Such units focused on chest pain patients with low probability of acute coronary syndrome, expediting the evaluation to exclude ACS. This "rule-out MI" evaluation was a "telescoped" version of that provided in a traditional inpatient setting. The CPU is really a clinical decision unit (outpatient telemetry unit) that is designed to place the patient in the "correct" disposition. The unit should be viewed as a corrective action component through process improvement versus a stand-alone unit designed to merely generate revenue for the facility and physicians alike.

The original CPU served as a temporary holding area for the patient who was likely to be discharged without the evidence of ischemia. This triaging function allowed appropriate and expeditious care to the low-risk patient, while maintaining open bed availability in the inpatient units for patients requiring higher acuity care. The traditional CPU holding area resulted in cost savings predominantly by reducing the overall length of stay (LOS). Additionally, the ability to off-load chest pain patients from the ED helped to reduce ED overcrowding and gridlock [7], therefore enhancing ED throughput.

Chest pain units utilize a risk stratification approach in the immediate minutes of a patient's entry to make a decision on the subsequent clinical pathway. High-risk patients or those identified with ACS are admitted to the acute care facility or triaged directly to the catheterization laboratory for angiography and possible PCI. Low-risk patients remain in the CPU for further risk stratification with serial cardiac ischemia markers and exercise testing. The goal upon entry into the CPU is to render a decision on the pathway of the patient in an expeditious, but finite, amount of time. For instance, the decision to administer thrombolytics or divert ACS patients to a cath lab ideally should be done in less than 20–30 min. The decision to discharge the nonischemic chest pain patient can be made within 2–16 hours. The ultimate goal of the CPU is to transition many of the services now performed in the inpatient setting to the CPU for earlier treatment—the true "short-stay coronary care unit or (outpatient telemetry)."

Forces Affecting Cardiac Care Reimbursement

Multiple external and internal forces are affecting cardiac care delivery in the United States. Increasing third-party regulation and oversight impacts what care will be reimbursed.

Medicare is probably the most significant force in this reimbursement transformation, and many third-party payers follow Medicare's lead.

Medicare is increasingly pushing for evidence-based *and* cost-effective care. Demonstration projects have been created to gather objective data on the current system as a basis for future change efforts. Key pieces of current government focus include elimination of waste, reallocation of payment structures, quality accountability, fraud detection, and consumer accountability [8].

For the future, however, CMS is proposing to transform Medicare from a passive payer of claims to an active purchaser of care. In looking at care provided, CMS is centering its focus on clinical outcomes that are attained (or not) as a result of care provided. Simple provision of services will not suffice for optimal reimbursement in upcoming years. To that end, CMS is planning to base reimbursement on outcomes measures (e.g., morbidity, mortality, complication rates), risk-adjusted ICD-9 codes, and value-based purchasing programs.

The MS-DRG (Medicare Severity DRG) severity-adjusted payment system represents an attempt to alleviate a disparity in payments based on the old one-size-fits-all DRG payments for several conditions [9]. The previous set of 538 DRG codes has been expanded to 745 to take into consideration disease severity. The difference in reimbursement can be substantial, based on the presence or the lack of certain complications or comorbidities. For ACS, the initial reimbursement stratification point is based on coding a DRG for STEMI versus non-STEMI, and then further stratification is based on the types of interventions performed. It is critical for the acute care facility to accurately code ICD-9-CM and CPT codes to reflect the patient's severity in order to obtain appropriate reimbursements for the intensity of care provided.

Improving cost-efficiency and quality of care are no longer buzz words. Medicare has targeted inpatient care of acute myocardial infarction as one of the conditions for which quality of care indicators is being measured [10]. Five of the Medicare's ten quality process indicators focus on STEMI [11]. In 2007, CMS introduced a new quality effort that puts hospital payments at risk. The new program submitted by Congress would reduce payments to hospitals, with hospitals later "buying back" monies through high performance on quality measures. This new design is a value-based purchasing program whereby a defined percentage of a hospital's DRG payment will be based on the facilities meeting a set of performance measures. It is likely that this system will evolve over several years, with initial payments based on a hospital merely reporting the relevant data to CMS. Over time, increasing percentages of facility payments will be based on performance measures. Theoretically, ultimately the entire payment could be performance based.

Additionally, Medicare is targeting areas at high risk for payment errors. The Program to Evaluate Payment Patterns Electronic Report (PEPPER) is an initiative looking at hospital claims likely to have errors [12]. Target areas for this project include 1-day stays, hospital readmissions, and several DRGs known to have a high rate of errors. DRG 143, chest pain, was one of the top 20 DRGs nationwide for 1-day stay discharges in 2007. Just over 40% of these

Table 2.1 Volume of 1-day stays for DRG 143 (chest pain)

	2004	2005	2006	2007
One-day DRG 143	105,418	99,412	91,008	43,709
All DRG 143	245,146	234,089	217,418	103,691
One-day stay (%)	43.0	42.5	41.9	42.2

admissions involve 1-day discharges (Table 2.1). One-day stays are a focus of the initiative, as these short stays stand out as a potential area of improvement where medically necessary care might have better been provided on an outpatient basis or in an observation unit.

These reimbursement initiatives make it critical for acute care facilities to enhance data-capturing capabilities, improve coding accuracy, apply risk stratification to care pathways, and focus on clinical outcomes in order to remain financially sound.

Reimbursement for Chest Pain and ACS

CMS is the payer for a majority of acute cardiac patients who are largely of Medicare age. In its reimbursement policies, CMS is trying to shift unnecessary inpatient volume back to the point of entry for more efficient risk stratification, assessment, and intensive treatment. This influence, attained through reimbursement initiatives, has evolved rapidly over the last 5 years.

In 2002, CMS established a new coding and separate payment system for observation status for the diagnoses of chest pain, asthma, or heart failure if they met certain criteria for diagnostic testing, minimum and maximum time limits for observation, and documentation in the medical record. APC 0339 was designed to relieve some of the pressures of treating CHF, chest pain, and asthma patients aggressively on the front end of the care process versus admitting them to an acute care setting. Most diagnostic tests ordered during this observation stay were separately reimbursable, resulting in optimal reimbursements for the acute care facility. Another benefit of APC 0339 was that any revisits within 30 days or hospital admission after an OU stay were reimbursable when meeting medical necessity, unlike when the patient was admitted directly as an inpatient initially. This new coding system resulted in a financially favorable reimbursement for low-risk chest pain patients who could be discharged from the observation unit or CPU. Over the next 4 years, observation unit claims increased substantially (Table 2.2).

In 2008, CMS deleted the code, APC 0339, and created two composite APCs for extended assessment and management, of which observation care is a component. CMS views this as “totality of care” provided for an outpatient encounter (Table 2.3). The new codes are as follows:

Table 2.2 Observation unit claims

Year	Claims
2003	56,000
2004	77,000
2005	124,000
2006	271,000

- **APC 8002 Level I:** Extended Assessment and Management (observation following a direct admission or clinic visit) reimbursed at $351
- **APC 8003 Level II:** Extended Assessment and Management (observation following an emergency level four or five visits) reimbursed at $639.

Additionally, the use of an observation status is no longer limited to chest pain, heart failure, and asthma. Any medical condition that meets medical criteria can be placed in such status. Although the overall reimbursement for an ED plus observation status episode of care has been reduced slightly from 2007 to 2008, an expected increase in volume will offset this reduction. Now patients with a lengthy ED stay, 1-day stays, and a traditional inpatient observation could receive this beneficial change.

These recent changes have significant potential impact on acute care facilities. In order to remain financially viable in caring for chest pain and ACS patients, the hospital must develop new care delivery models, utilize evidence-based pathways, optimize point of service efficiency, and enhance data analytic capabilities. Front-loading care will allow facilities to have greater control over the variables that introduce out-of-range variations within daily operations.

Clinical and Fiscal Rational for a CPU

The success of the CPU depends on the provision of at least equivalent clinical outcomes compared to inpatient stays, but at reduced costs. Studies show that observation of carefully selected emergency chest pain patients results in improved clinical outcomes. One study showed that the use of an observation unit resulted in a tenfold decrease in the error rate for missed diagnosis of myocardial infarction [13]. The Chest Pain Evaluation Registry (CHEPER) study reported a significant reduction in missed MIs from 4.5 to 0.4%, a change that enhances quality, reduces the risk of potential high-cost medical/legal payouts, and decreases readmissions from erroneous diagnoses [14].

The current CPU is not merely a holding area for low-risk patients and a conduit to the cath lab for high-risk ischemic patients. The use of a CPU has been shown to demonstrate resource advantages over the typical hospital admission, even when the same tests are performed. For typical lowrisk chest pain patients admitted to the hospital, the average length of stay is 2–3 days, while for an observation unit or CPU, the average is 12–18 hours [15]. Each outpatient CPU bed frees 2.2–3.5 inpatient beds that can then be allocated to high-acuity patients [16].Additionally, from a DRG standpoint, all charges

Table 2.3 New observation unit payment summary 2008

Year	ED visit level	ED w/ OBS (criteria met)	Direct admit (criteria met)	ED & direct admit (criteria not met)	Diagnosis
2007	Level V $325	Level V $325 APC0339 $442 Pmt $768 + Ancillaries $$ (30% penetration)*	APC 0604 $442	APC 0604 $51 (70% penetration)*	Chest pain CHF Asthma
2008	Level IV or V $348	Level IV or V $0 APC 8003 $0 Comp pmt $639 + Ancillaries $$ (70% penetration)*	APC 8002 $351	APC 0604 $53 (30% penetration)*	Any medically necessary diagnosis (excl. status "T" and "V")**
Pmt impact	Inc $23	Dec $129	Dec $91	Inc $2	

*Note penetration of claims shift in 2008 to higher payment.
**Postprocedure or postsurgery codes.

originating in the ED are debited from the total payment for which the patient is admitted. The difference between coding DRG 14 (chest pain) now MS-DRG 313 versus DRG 140 (unstable angina) now MS-DRG 311 could potentially cause the hospital opportunity revenue losses from $4000 to $6000 per case.

The current shift in patients from the traditional inpatient treatment protocol to a more efficient plan of care initiated in a CPU has resulted in a significant economic impact on the acute care facility (see Table 2.4) [17].One multicenter study showed that the use of a CPU resulted in a lower incidence of missed MI (0.4 versus 4.5%, $P<0.001$) and a lower final rate of hospital admission (47 versus 57%, $P<0.001$). These clinical benefits were accompanied by an average saving of more than $120 per patient [18]. In a prospective, randomized trial of patients seen at a CPU, there were no cases of missed primary cardiac events or erroneous discharges and resource utilization was more efficient when ACS patients were seen in the CPU than when they were admitted to the coronary care unit [19].

Another potential benefit to the acute care facility is the reduction in ED burden resulting from a CPU. A study by Pines at the University of Pennsylvania evaluated the clinical impact of overcrowding in the ED on outcomes in ACS patients [20]. Of 6646 patients presenting with chest pain, 831 had an ACS diagnosis. Patients were more likely to have a complication or adverse outcome when the ED was crowded. Pines concluded that ED overcrowding is not solely an issue for the ED, but it is a measure of a more global system-wide dysfunction. The ED crowding puts pressures on all parts of the hospital—lab, X-ray, housekeeping, etc.—and has a domino effect on services for inpatients as well.

These preliminary data suggest that a well-designed CPU affords the hospital a mechanism to streamline care of the chest pain patient more efficiently, expeditiously, and scientifically appropriately with resulting improved quality of care indicators, overall reduced costs compared to the traditional approach, and with more favorable reimbursements.

Re-engineering the Chest Pain Delivery Model—New Solutions

As reported in the Institute of Medicine's Report Brief in June of 2006, tools developed from engineering and operations research have been successfully applied to a variety of businesses, from banking and airlines to manufacturing companies.

These same tools have been shown to improve the flow of patients through hospitals, increasing the number of patients that can be treated while minimizing delays in their treatment and improving the quality of their care. One such tool is queuing theory, which by smoothing the peaks and valleys of patient admissions has the potential to eliminate bottlenecks, reduce crowding, improve patient care, and reduce cost. Another promising tool is the clinical decision unit, or 23-hour observation unit, which helps ED staff determine whether certain ED patients require admission. Hospitals should use these

Table 2.4 Acute myocardial infarction financial outcomes

AMI financial outcomes:							
Core measure: AMI	#Patients	Average LOS		Total cost		Average cost per case	
Feb–June 2005 (pre-EPA)	319	5.41	$	6,286,443.02	$	19,707	
Feb–June 2006 (post EPA)	269	5.25	$	5,106,669.57	$	18,984	
Comparison		↓ 0.16 days			$	723	Savings per case
					$	194,487	Total Savings
AMI clinical outcomes:							
Core measure: AMI	# Patients	# Complications	Complications (%)		# Readmits		Readmits (%)
Feb–June 2005 (pre-EPA)	319	35	10.97		6		1.88
Feb–June 2006 (post EPA)	269	21	7.81		2		0.74
Comparison			↓ 3.16				↓ 1.14

tools as a way of improving hospital efficiency and, in particular, reducing ED crowding [21].

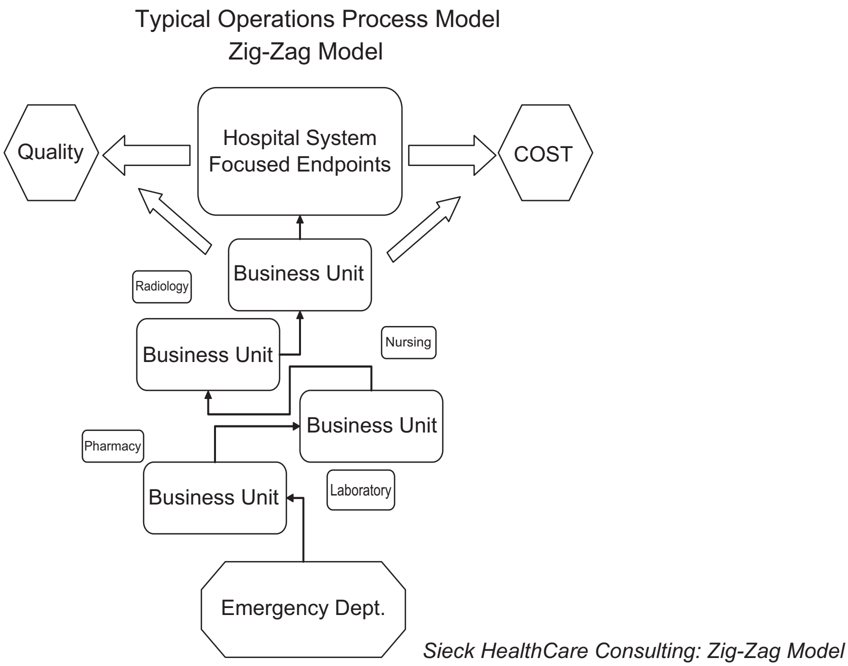
It is becoming increasingly clear that improving hospital efficiency and patient flow is a critical piece in improving the delivery model of acute level of care that can result in better quality and reduce costs of care. Implementing small changes to the current inefficient hospital structure will not afford the degree of impact that will enhance long-term viability of health-care systems in today's marketplace. Only the introduction of innovative new models will insure success. To that end, tools commonly used in the business and engineering world to improve operational efficiencies are now finding their way into the halls of medicine [22].

The Y model is an approach that allows facilities to closely examine different aspects of operations within their systems [23]. It encompasses the concept of health-care delivery along a continuum from the point of entry into the "system" through to discharge. The Y model is a vertical process, in which patients are "pulled through" rather than "pushed through." It attempts to align clinical and financial balance to find an optimal breakeven point. The Y model is best applied to the overall operations of the hospital systems. But initial projects can target one specific disease or condition, such as ACS. By applying variations of the Y model, which all focus on two endpoints, quality and cost, facilities can recognize ways to turn ACS from a negative contribution margin to one that breaks even or contributes favorably.

Understanding the application of the Y model to the health-care setting involves comparing health-care services to the industrial setting. Industrial facilities can detail the exact route from raw material to finished product with detailed accuracy. The end-product is priced to the market based on the operating costs within the process. If the manufacturing process varies greatly over time, costs of production rise and are passed on in a higher market price. In order to keep prices down, actions must be taken to get the variances under control. If not, the contribution margin is eroded and eventually could become negative. The objective is to keep the contribution margin at its maximum without compromising quality.

This model can be similarly applied to an ACS patient routing through the health-care delivery setting. Patients receive services within different "care units" within the acute hospital setting. These care units are analogous to the industrial setting's business units. By understanding how each care unit's operational strategies affect each subsequent care unit from point of entry to discharge, a seamless transfer of patient care in both outpatient and inpatient settings can optimize quality improvement and positive economic value. Without each care unit providing vital information to others in this holistic approach, moving patients efficiently through the system is challenged.

The current processes in the health-care delivery for most patients in a hospital setting are more characteristic of a "zigzag model " (Fig. 2.3). For example, an ACS patient usually enters through the ED and receives treatments and evaluations through multiple disconnected service sectors or "care units" (known as business units in the commercial sector). These care units are represented by nursing, EKG department, radiology department, pharmacy,



2008 Update: Sieck S. Cost effectiveness of chest pain units. Cardiol Clin 2005; 23(4):598.

Fig. 2.3 Zigzag model of care (2008 Update: Sieck S. Cost effectiveness of chest pain units. Cardiol Clin 2005; 23(4):598)

laboratory, etc. Each of the care units is viewed and acts as a single independent business unit from the standpoint of the hospital. The outputs of these care units' activities are collated by the provider, usually once the patient has been admitted to the acute hospital bed. It is then—at the "back end" of the process— that care treatment plans are decided upon. The zigzag model is disconnected and fragmented, which can adversely impact quality, costs, efficiency, patient satisfaction, and clinical outcomes.

The Y model represents a different approach and provides a framework to facilities to optimize a disease management model covering costs of care by placing the proper resources at the "front end" of the point-of-care entry. This concept begins at the point of entry and ends at discharge and marries a clinical and financial strategy that meets quality indicators while producing desirable profit margins. Beginning in the ED, this concept emphasizes an efficient, rapid assessment and action centered on a seamless integration of ancillary services such as the laboratory, diagnostic imaging, and skilled nursing while understanding the economic impacts on decisions made as the patient is directed through the system.

Accurate data analysis is a critical piece toward successfully implementing the Y Model. Baseline analysis of ED admissions drills down on the exact volume of cases by ICD-9 codes instead of the inpatient DRG, providing a more accurate picture of the number of patients that are passing through the outpatient door within a system. With this analysis and the proper guidance, facilities can target individual diseases more effectively. Patients who require an inpatient admission are properly admitted and those who could be effectively treated in the outpatient setting are treated and properly released. The placement of more critical patients in the inpatient acute care setting impacts the case mix index (a currently used severity of illness adjustor) positively because the patients are simply sicker and require more resources.

Creating a new care delivery system for the ACS patient that is based on the Y model can positively impact the contribution margins when ACS patients are carefully identified, risk stratified, and given appropriate early treatment during the interaction (Fig. 2.4). This model emphasizes a multidisciplinary team approach to align the “care units” that affect an ACS patient’s progress through the current system. Additionally, low-risk patients that are evaluated and discharged from the CPU reduce unnecessary resource utilization, thereby efficiently “saving” such resources that are required for high-risk-only patients.

The emphasis of the Y model is on front-end compliance that sets up the pathway the patient will follow (Fig. 2.5). A patient is not “arbitrarily” admitted to an inpatient bed, treated, and then discharged. A decision is made up front on the most ideal care venue for the risk-stratified patient to be admitted to and undergo tailored treatment. It also initiates the financial pathway with identified markers throughout the patient interaction that allows facilities to know

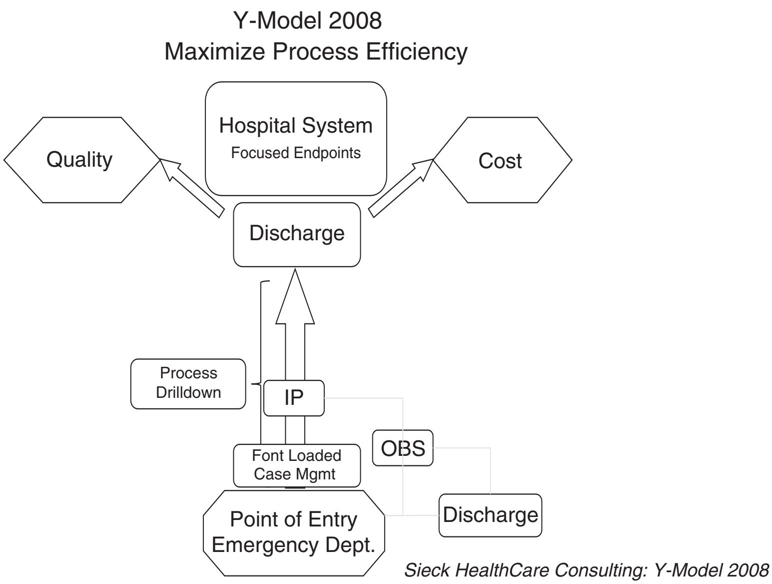


Fig. 2.4 Y model using risk stratification and ABC approach (2008 Update: Sieck S. Cost effectiveness of chest pain units. Cardiol Clin 2005;23(4):597)

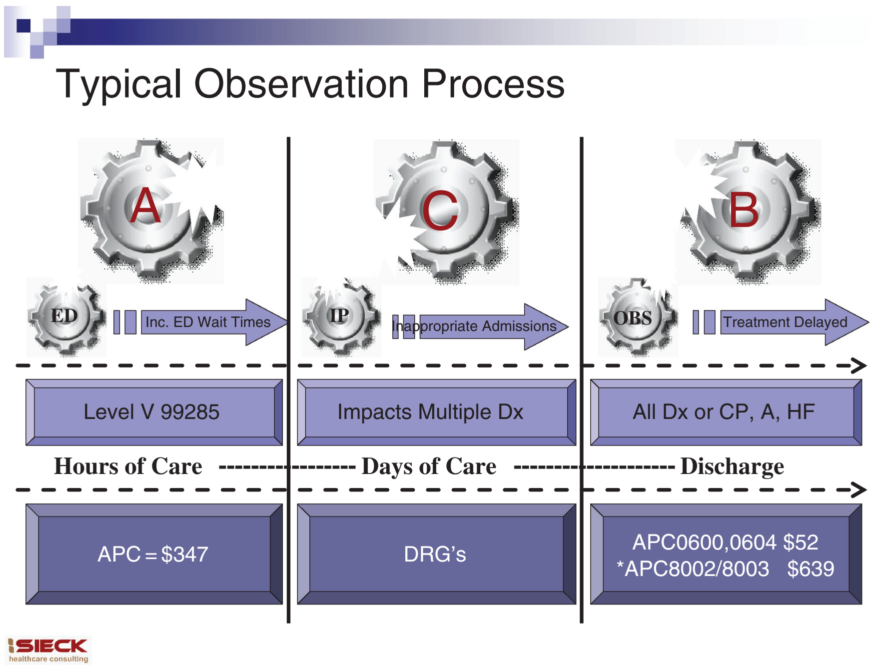


Fig. 2.5 ACB process

the ramifications of making random decisions versus following a protocol designed to emphasize quality while optimizing economic results. The Y model places an emphasis on process improvement while targeting the end-points of quality and contribution margin.

One medical center has successfully implemented part of the model for an Acute Coronary Syndrome (ACS) Process Improvement Project [24]. Prior to the initiative the hospital had a "zigzag" model of care. Patients entered through the ED and were admitted to the acute care bed, diagnostics completed, and treatment was then initiated. With initiation of the Y model, stratification was performed and appropriate therapy initiated in the ED with point-of-care testing in a patient-centric improvement effort. The new design resulted in improvements in turnaround time for therapy, reduced LOS, enhanced patient placement in the most appropriate bed venue (e.g., CCU, telemetry, or clinical decision unit), and improved patient satisfaction. Improvements demonstrated in the ACS redesign can be translated to the ADHF setting. Similar to the ACS patient, not every HF absolutely requires inpatient admission. And similarly, not all HF patients are candidates for the OU. Point-of-entry triaging to the most appropriate care unit where an individualized treatment plan is rendered allows a facility to better merge quality care with positive financial outcomes [25, 26].

Improvements demonstrated in the ACS redesign can be translated to any patient who would otherwise be admitted to the acute hospital setting. Similar to the ACS patient, not every patient absolutely requires a critical care, telemetry, or even medical-surgical bed. And similarly, not all ACS patients are candidates for the CPU.

An additional component of a redesign strategy involves the ABC model of outpatient observation unit care. The ABC model defines a new approach to observation unit or chest pain unit processes. The current care flow in most hospitals is actually an "ACB" process (Fig. 2.5). The patient spends several hours in the ED (A), after which is admitted to the hospital (C), and only then are treatment and observation initiated (B). Overall there is not only treatment delay but increased backlog in the ED. Essentially most of the "front-end" time in the ACB sequence is inefficiently wasted—both clinically and financially. When appropriate care and treatment are "front-loaded," the more efficient ABC process can take place (Fig. 2.6). In this case, the ED stay is shortened to a minimum of less than 2 hours—just enough time to assess the patient's clinical status and triage to the next point of care—either the CPU for those low-risk patients who are likely to be discharged or to the cath lab, telemetry or the CCU for higher risk patients.

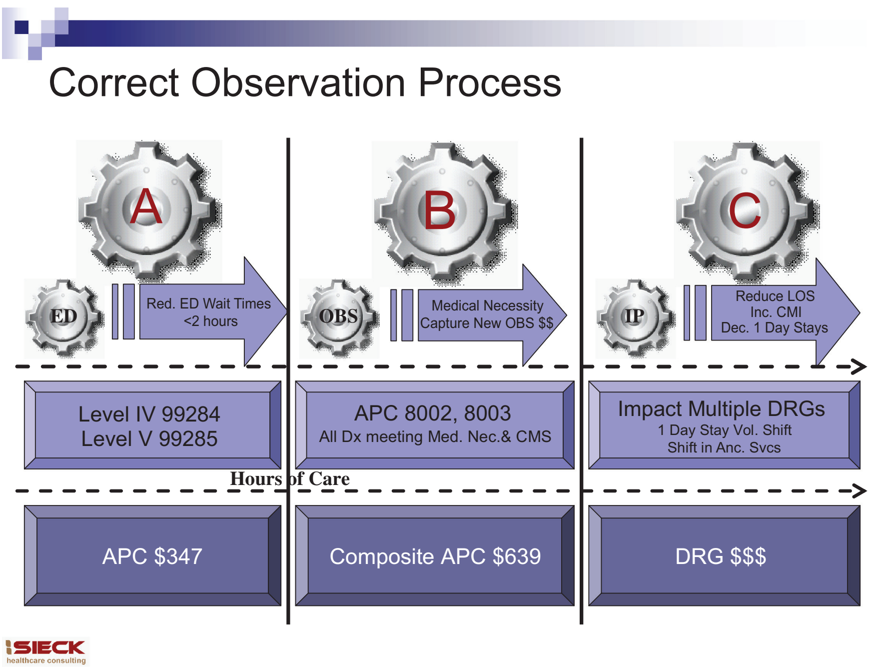


Fig. 2.6 Current location of the indeterminate patient

The observation status of the CPU can be equated with an outpatient telemetry unit in function. The patient with chest pain is not any less "cared for" in this unit than he/she would be on the telemetry unit. In fact, the level of care and observation is the same, but with enhanced efficiency resulting in a more timely disposition and resolution to final diagnosis and ultimate treatment. In the ABC model, the use of clinical pathways or treatment protocols is front-loaded with the assistance of case management. In this instance, the case manager plays an integrative role early in the evaluation and care of the chest pain patient rather than late in the course of hospitalization when most of the intensive resources have already been utilized and there is little opportunity for enhanced efficiencies beyond merely expediting discharge of the patient.

The use of the ABC and Y models also reduces ED crowding by expediently enhancing flow through the ED. Additionally, they reduce unnecessary admissions by truncating the total evaluation time for low-risk patients. Finally, LOS for inpatient admissions is reduced because there are no treatment initiation delays. Since almost half of chest pain patients can be safely evaluated and treated in the CPU, the financial implications of this model can be substantial (Fig. 2.7).

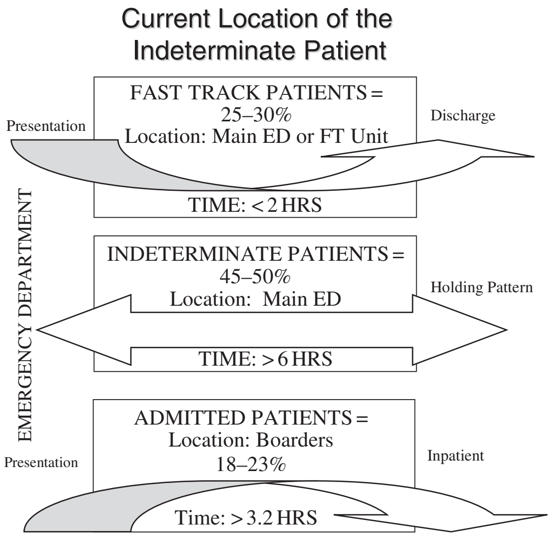


Fig. 2.7 ABC process

As noted in Fig. 2.8, Beta site testing and results demonstrated clinical and financial benefits of front-loaded care. In one facility applying components of the model to core measure conditions, quality ranking of the index facility compared to all other facilities within their system resulted in moving from being 25th out of 26 facilities to becoming number 1 [27]. ED volume increased from 47,000 to 60,000 patient visits annually, while the rate of patients leaving without being seen decreased from 10.1 to 3.2%, and full ED status fell from 10 days/month to 2 days/month. On the inpatient side, LOS decreased from

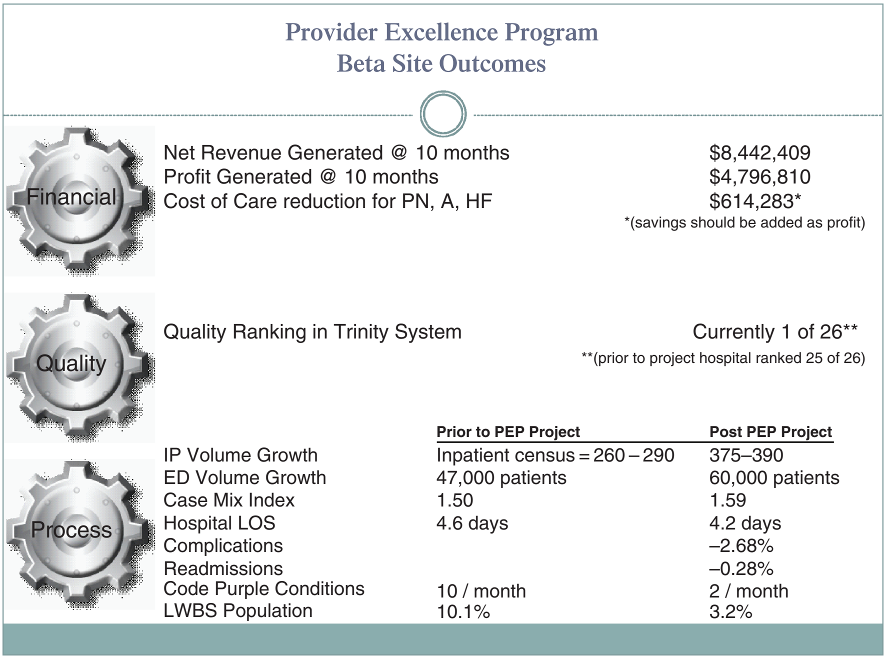


Fig. 2.8 Beta site outcomes: Fresno, CA

4.6 to 4.2 days, readmissions dropped by 0.28%, complications decreased by 2.68%, and their case mix index increased from 1.50 to 1.59%. It should also be noted that specifically AMI data improved overall, see Fig. 2.5.

While both the Y model (disease management) and ABC model (observation) appear inherently understandable and conceptually "easy" in overall structure and objective, the actual implementation of the specific design and the management of the change process required for alignment of incentives, stakeholder buy-in, and participation are the critical factors upon which the success of such a project hinges. Although the final objective of merging quality and resource efficiency is the goal of any organization, the specific implementation plan and strategy must be individualized to each hospital based on a complete analysis of the baseline processes, time and resource constraints, training needs, and willingness to change of the participants.

Measuring Changes Is Critical

Finally, the importance of data is crucial. The critical success factor in the implementation of any of the preceding programs is the knowledgeable use of accurate metrics [28]. Prior to the initiation of any redesign, a detailed assessment must be conducted of the current processes in place, patient flow patterns, and clinical practice patterns. From this assessment, a key set of measurable indicators related to the proposed process improvement is then measured at baseline. It is important to select the most appropriate measurements that will impact objectives rather than merely using standard metrics that may be routinely measured for other initiatives (e.g., HEDIS), which may not always be appropriate for the new initiatives. As the programs are implemented, metrics are utilized to gauge and manage the change process. If a change process cannot be adequately measured, it will not be effectively or successfully managed.

Conclusion

Although death rates for acute coronary syndromes declined between 1999 and 2006 due to the impact of pharmacologic and interventional treatments, the numbers of patients with chest pain and ACS are likely to increase over the next decade as the Baby Boomer generation "comes of age" [29]. Expensive advances in diagnostic and therapeutic alternatives add to the economic burden of chest pain and ACS. With ACS representing a large volume of ED patients, changes in the care delivery model afford the opportunity for economic and outcomes benefit. Thus, it has been a major area of focused activity over the last 5 years.

Increased patient volumes and overcrowding of EDs have already impacted care for emergent medical conditions [30]. From 1997 to 2004, the average wait times for AMI patients increased 11.2% per year compared to 4.1% for all ED patients. An 8-minute wait time from ED door-to-care in 1997 increased to 20 minutes by 2005. More alarming, one out of four AMI patients experienced a wait of almost 1 hour before receiving care after arrival in the ED. Add these ED problems to the difficulties that are encountered when trying to create a system of acute cardiac care regionalized centers for AMI patients, and you have a health-care system that, if not broken already, is certainly in trouble and destined to be unable to deliver the quality care that is scientifically available to cardiac patients [31].

The 2001 Institute of Medicine report on Crossing the Quality Chasm describes a health-care system that is in need of a major redesign, not small changes:

> As medical science and technology have advanced at a rapid pace, however, the health care delivery system has floundered in its ability to provide consistently high-quality care to all Americans [32].
>
> The health care system as currently structured does not, as a whole, make the best use of its resources.
>
> The costs of waste, poor quality, and inefficiency are enormous. If the current delivery system is unable to utilize today's technologies effectively, it will be even less able to carry the weight of tomorrow's technologies and an aging population, raising the specter of even more variability in quality, more errors, less responsiveness, and greater costs associated with waste and poor quality.

To meet the demands of the current forces in the health care, such as, increased quality, continued resource efficiency, and cost reductions in the face of severity-adjusted and value-based reimbursements, the hospital must be ready to totally redesign the flow of care from the ED to an individualized optimal care pathway. The CPU is one step in this major overhaul redesign process.

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