

**DEVELOPMENT AND IMPLEMENTATION OF CLINICAL PATHWAYS:
REDUCING VARIATION TO IMPROVE PATIENT OUTCOMES**

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ABSTRACT

There is a wide, unexplained variation in treatment and results for specific medical conditions. Health systems development clinical pathways to reduce clinical variation, improve quality, which ultimately leads to lower cost of healthcare. Much research has already been done to determine best practices for developing clinical pathways, but data supporting the true effectiveness of clinical pathways on reducing variation to improve patient outcomes by providing the appropriate care is limited. The development of robust clinical pathway data analytics will benefit beyond the health systems and have a public health significance by improving quality, reducing clinical variation to provide the most appropriate clinical care, and increasing the understanding and treatment of high-risk disease trends. This paper will focus on the best practices for developing and implementing clinical pathways, and discuss clinical outcome reporting findings and data limitations that should be considered.

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1.0 INTRODUCTION

As both private and public efforts to reform the U.S. healthcare system gain momentum, it is clear that innovation must encompass more than just new medical devices or products. Health care innovation needs to explore new areas, including value based reimbursement, care model design, data analytics, patient engagement, and provider incentives.

Examining clinical variation in medical practice is an important step to measuring efficiency and effectiveness in care delivery. Due to unique patient preferences and care-setting characteristics, there will always be a degree of appropriate variation in the practice of medicine, even for patients with the same diagnoses. It is clear, however, that through the use of evidence-based and data-based approaches to clinical decision-making, hospitals and providers across the country can do much more to reduce inappropriate or unwarranted variation.

2.0 HEALTH CARE REFORM

President Obama enacted the Affordable Care in 2010 with the goals of increasing the quality and affordability of health insurance, lowering the uninsured rate by expanding public and private insurance coverage, and reducing the costs of healthcare for individuals and the government. Healthcare spending in the United States has gradually spiraled out of control, and accounts for 17.5 percent of the gross domestic product (Davis, Stremikis, Squires, & and Schoen, 2014). A 2007 study by the American Journal of Medicine found approximately 62 percent of all personal bankruptcies in the United States were related to medical bills. Even more alarming, 78 percent of those involved had health insurance and were bankrupted due to gaps in coverage (co-payments, deductibles, uncovered services, etc.) (Himmelstein, Thorne, Warren, & Woolhandler, 2009).

The United States also ranks behind most countries on many measures of health outcomes, quality, and efficiency (Davis, Stremikis, Squires, & and Schoen, 2014). Physicians in the United States face particular difficulties receiving timely information, coordinating care, and dealing with administrative hassles. Numerous countries outside of the United States have succeeded in the adoption of modern health information systems, but U.S. physicians and hospitals are still playing catch-up in many regards as they respond to financial incentives to adopt and make meaningful use of multiple health information technology systems.

Additional provisions in the Affordable Care Act have encouraged organizations to find innovative ways to efficiently delivery of health care, as well as investment in important preventive and population health measures. As the focus shifts from filling hospital beds and keeping volumes high to keeping patients healthy and out of the hospital, the culture of healthcare delivery will be forced to change in order to meet these new initiatives.

As healthcare payers and providers seek to transition to new, value-based payment models, clinical pathways are one strategy used to fulfill the goals of the Affordable Care Act and promote appropriate, evidence-based care.

3.0 CLINICAL PATHWAYS

As the Affordable Care Act continues to gain momentum, health systems are forced to adopt new models to provide patients with the highest quality of clinical care. Many health systems are turning to clinical pathways as a way to analyze costs, reduce variation, and improve clinical quality. However, the basic concept of clinical pathways is not a new phenomenon in healthcare today. Clinical Pathways were introduced in the early 1990s in the UK and the USA, but adoption of pathways has increased as the over utilization of low value services has led to high variation and increased costs. This trend has encouraged healthcare systems to look for innovative ways to provide high quality, appropriate clinical care to patients in a cost effective way (OpenClinical, 2005). Clinical Pathways provide detailed guidance for each stage in the management of a patient, such as treatments and interventions, with a specific condition over a given time period. Additionally, the implementation of the Electronic Medical Record (EMR) has improved the data analytic pathway reporting capabilities.

This next section will identify best practices identified through a review of the literature, as well as the current clinical pathway development and implementation process that is used by the University of Pittsburgh Medical Center (UPMC).

3.1 DEFINITION

Three recent articles provide a strong foundation for the modern perception of Clinical Pathways and key points are summarized in Table 1.

The following five criteria were derived from these three sentinel articles: (1) the intervention was a structured multidisciplinary plan of care (Campbell HHR, 1998); (2) the intervention was used to channel the translation of guidelines or evidence into local structures (Campbell HHR, 1998); (3) the intervention detailed the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, or protocol (De Bleser, et al., 2006); (4) the intervention had timeframes or a criteria-based progression (De Bleser, et al., 2006); and (5) the intervention aimed to standardize care for a specific clinical problem, procedure or episode of healthcare in a specific population (Vanhaecht K, 2006).

Table 1. Characteristics of Clinical Pathways Derived from Sentinel Articles

| De Bleser et al | Campbell et al. | Vanhaecht et al. |
|---|---|--|
| Guides care management for a well defined group of patients for a well defined period of time | Structured multidisciplinary care plan | Facilitate variance management |
| States goals and key elements of care based on evidence and best practice | Detail essential steps in care of patients with a specific clinical problem | Support multidisciplinary care |
| Sequences the actions of a multidisciplinary team | Facilitate translation of national guidelines into local protocols | Support evidence-based clinical practice |
| Allow documenting, monitoring and evaluating of variances | Help communication with patients by providing a clearly written summary of care | |

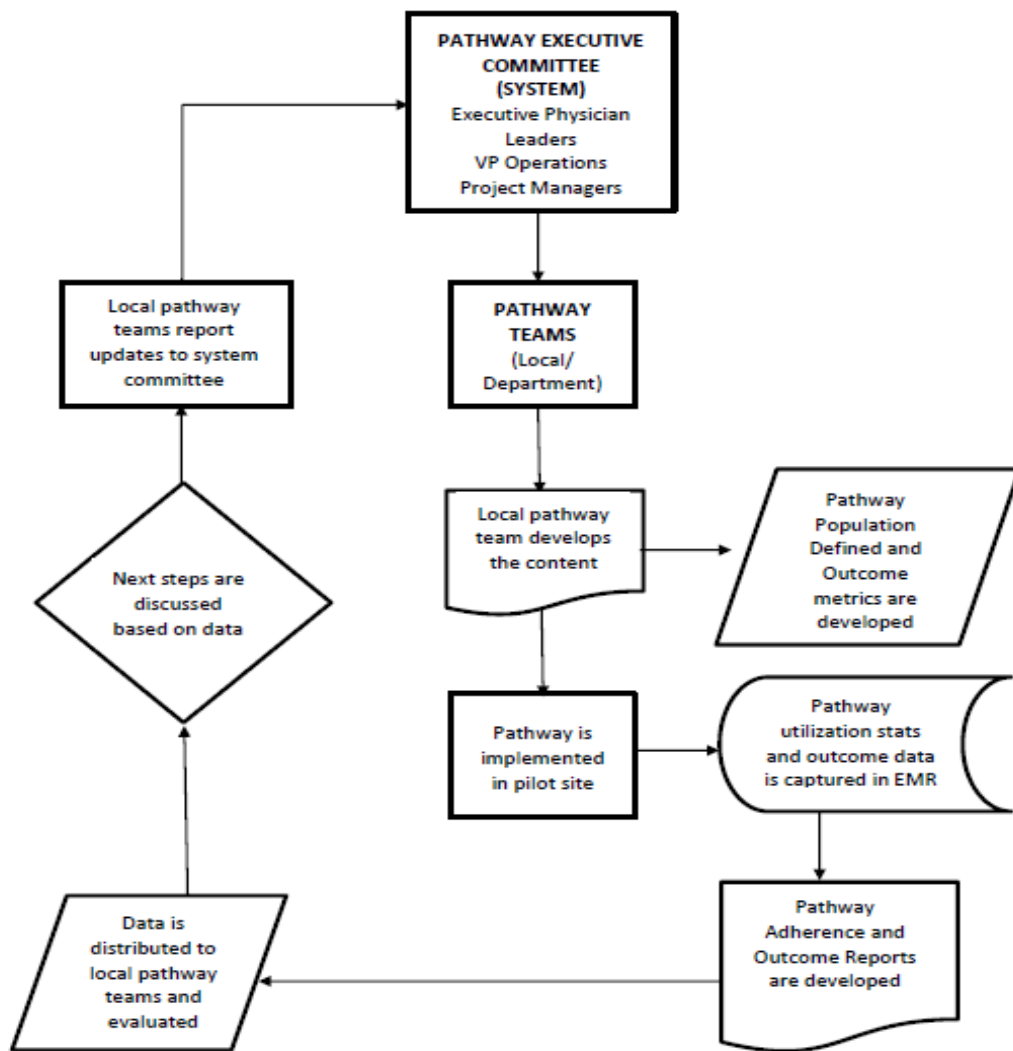
(Source: What is a Clinical Pathway? Kinsman, Rotter, James, Snow, & Willis, 2010)

The overall purpose of clinical pathways are to improve outcomes by providing a mechanism to coordinate care, reduce fragmentation, and increase the use of appropriate medical testing,

medications, and procedures. Clinical Pathways differ from practice guidelines, protocols, and algorithms as they are utilized by a multidisciplinary team and have a focus on the quality and coordination of care (OpenClinical, 2005). Reducing the amount of unnecessary, non-value adding inappropriate clinical care will contribute to the overall cost reduction of healthcare.

3.2 DEVELOPMENT

Successful development of a new clinical pathway, or adaptation of a currently existing clinical pathway, requires the formation of a group that will develop, implement and evaluate the proposed Clinical Pathway. Figure 1 illustrates the clinical pathway management workflow at UPMC.



Source: UPMC Chief Medical and Scientific Office, 2016

Figure 1. UPMC Pathway Development Process

The Pathway Executive Committee manages all of the clinical pathways for the entire system, but anyone (usually physician led) can propose a request for a new clinical pathway. High-volume, problem-prone or high-risk issues serve as the keys to identifying the focus of need for clinical pathways. Clinical areas with poor health outcomes and low quality scores may also be examined. Similarly, the dynamics of cost and/or physician or payer interest may help isolate the issue to be addressed. UPMC aims to implement pathways that will improve quality by providing the appropriate intervention and reducing clinical variation, affect a large number of patients, which downstream effects should reduce the total cost of care for hospitals and patients. If the disease specific area falls into one of those three buckets, the pathway will most likely be accepted.

When forming a Clinical Pathway development group (local pathway team), it is important to think about the various clinical roles that will be affected by the introduction of the pathway. The pathway team usually begins by engaging physicians, but it is important to also obtain the perspective and expertise of nurses, pharmacists, therapists, and any other key components of the care team. Each local pathway team will have a slightly different makeup, and it is critical to engage the appropriate people based on the scope of the proposed clinical pathway.

It is important to consider the necessary tasks that the group will need to complete to implement the pathway and all of the skills required for the project such as data collection, outcome analysis, training, and continuous education. For example, the local pathway team for a UPMC Foot and Ankle surgery pathway will have a different composition than the Acute Kidney Infection (AKI) pathway team. Due to the surgical nature, the first step in identifying the pathway focus started with the surgical supply cost. The financial analyst pulled the supply costs

for employed and non-employed physicians that performed surgery at a UPMC hospital. This created the starting point for discussion when the pathway team was trying to determine the appropriate coding, supply use, and clinical procedures. In contrast, the AKI pathway team at was comprised solely of employed physicians within the department of Renal-Nephrology. The objective of the AKI pathway was to determine the appropriate criteria for recognizing and diagnosing AKI since creatinine ratios is a highly disputed topic between nephrologists. For the scope of this pathway, there was no need to include a financial analyst on the AKI local pathway team.

In addition to determining whether to include data and financial analysts in the pathway team, equal consideration should be given to the inclusion of certain physicians and administrators within the care spectrum. In a health system as large as UPMC, local pathway teams should aim to obtain buy-in from colleagues from the urban academic setting, community setting, and even some key private physician groups that have a strong presence in a UPMC facility. It is important to closely examine the areas within the care continuum that the proposed pathway may affect. Some clinical pathways may span more than one disease area or specialty. The local pathway team should always try to engage physicians and where appropriate, some key administrators, to represent each clinical area within the pathway to ensure buy-in.

3.3 IMPLEMENTATION

Computerized physician order entry (CPOE) is defined by the Healthcare Information and Management Systems Society (HIMSS) dictionary as an "order entry application specifically designed to assist clinical practitioners in creating and managing medical orders for patient

services and medications" (HIMSS, 2010). The CPOE is an electronic medical record technology that allows physicians to enter orders, medications, or procedures directly into the computer instead of handwriting them (HIMSS, 2010). Traditionally, physicians would enter orders, medications, and procedures by writing them on a piece of paper, however many institutions have switched to the electronic medical record started to enter these orders through the use of an "order set". An order set is a group of related orders, and can be general or disease specific. One of the benefits to using an order set is that it allows users to issue "prepackaged groups of orders that apply to a specified diagnosis or a particular period of time," which ultimately reduces the time that the physician spends finding and entering the specified orders (Franklin et.al, 1998).

UPMC uses the CPOE in Cerner in all of its inpatient facilities, and each inpatient clinical pathway algorithm developed at UPMC is turned into a PowerPlan. A PowerPlan is very similar to an order set, and can include multiple phases. Some of the key benefits of PowerPlan usage include improved care quality and patient safety through interdisciplinary planning by use of a phased approach to patient care based on organizational standards (Cerner, 2014).

It is important to establish a timeframe for implementation with the intent that the pathway team meets frequently during the initial months to allow for feedback and discussion. Before the pathway can be rolled out to all sites, an initial pilot site should be determined for the first round of "go-live". Once the local pathway team has developed the clinical content, the pathway algorithm is integrated into Cerner and turned into a PowerPlan. Training sessions are held at each site before go-live to ensure that all end-users are aware of the pathway are educated on the benefits and technical components of using the pathway and accessing the PowerPlan.

3.3.1 Barriers and Facilitators to Implementation

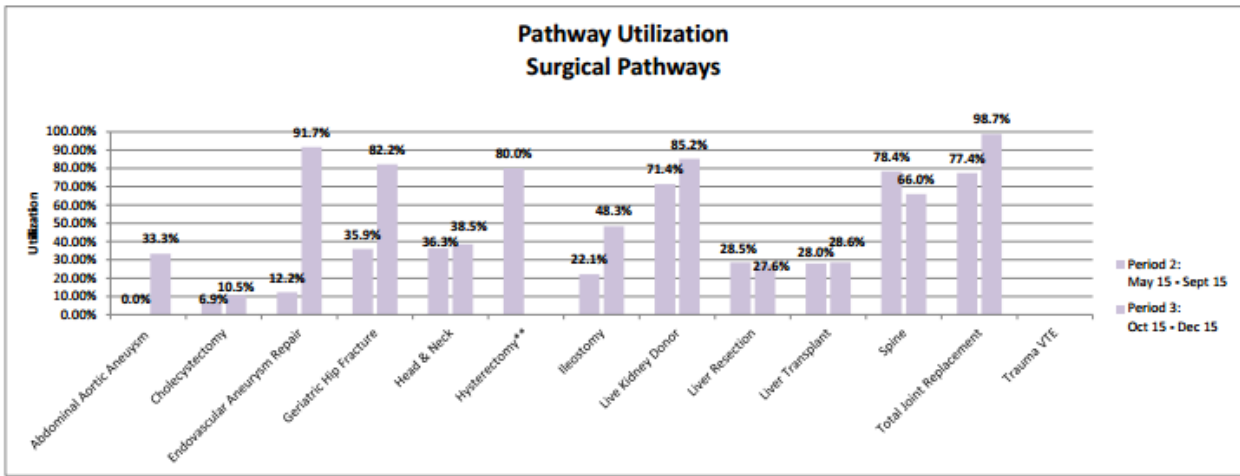
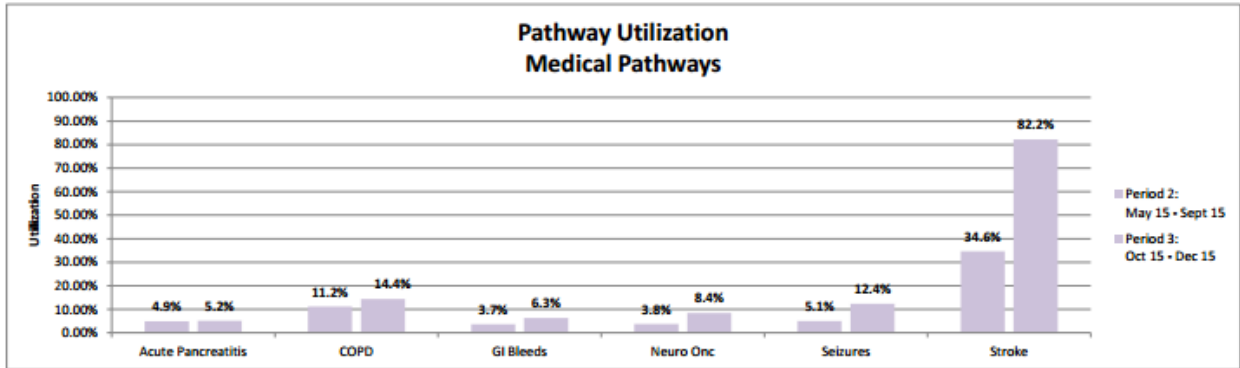
Some physicians have embraced the use of clinical pathways, while others have resisted. One of the most common responses from physicians when asked about their resistance to clinical pathways say it's too much of a “cookie-cutter approach” to practicing medicine (Gisme & Wiseman. 2011). In a 2011 Journal of Oncology Practice article, Dr. Bruce A. Feinberg, Vice President and Chief Medical Officer of P4 Healthcare, quoted:

“I always derived my greatest satisfaction from making the diagnosis, managing toxicity, and managing patient care throughout the process. That's where the art of medicine is— not in selecting which three-drug combination I'm going to prescribe” (Gisme & Wiseman. 2011).

A survey of thirty-two UPMC physicians in 2014 revealed that the top three most significant barriers to successful implantation of clinical pathways were engagement of providers, integrating the pathway into the workflow and care of the patient, and resistance to changing clinical practice. Although the local pathway teams are predominately physician led, it is critical to engage providers and obtain input from physicians at *all* sites and not just ones within the academic medicine setting. It is extremely common for variation of clinical practice to occur between physician groups in addition to urban and community hospital setting. Furthermore, many physicians create their own customized order sets and pick and choose the orders they need for treating a patient. It was reported that the layout and location of the PowerPlan was not conducive to their workflow. The purpose of a clinical pathway and PowerPlan is to streamline the process for treating disease specific conditions, but lack of provider PowerPlan training and education make some physicians revert back to using order sets because they feel more

comfortable and can access more quickly. The most important factor identified as integral to adherence and successful implementation was leadership from the Chair/Departmental level.

When asked their opinions and suggestions for accelerating physician led developments of pathways across all major disease and procedure areas, many physicians said that there needed to be a change in the compensation model. Consequently, the data shows that the pathways that are tied to compensation have the highest utilization. Total Joint Replacement and Spine Fusion Surgery pathways have two of the highest utilization levels, and both are tied to bundled payments and shared savings programs. The UPMC Department of Surgery has already started to include pathway utilization in physician incentive plans, and effects of this inclusion can be seen in Figure 2.



**Data is reported on the fiscal calendar Jul15-Dec15. Baseline is defined as FY15 due to modifications of case inclusions

Source: UPMC Chief Medical and Scientific Office, 2016

Figure 2. Pathway Utilization, May 2015-December 2015

3.4 INPATIENT PATHWAY UTILIZATION

Inpatient pathway utilization is calculated by the total number of times the physician appropriately initiated the PowerPlan for a patient, divided by the total number of patients within that population in which the PowerPlan *should* have been initiated. For example, if a patient presents to the hospital with COPD, the attending physician should initiate the COPD PowerPlan on that patient. If the physician sees ten patients with COPD but only initiates the PowerPlan on five of those patients, the physician's COPD pathway utilization would be 50%. However, this calculation does not exclude instances where the physician launches the PowerPlan but does not actually use it. The physician can open the PowerPlan and immediately close out, and it would still count positively towards the overall pathway utilization.

The goal of pathway utilization should never be 100%, and should allow for some degree of variability. The pathway will never be appropriate for 100% of the patient population due to complications and confounding conditions. To account for this expected degree of variation, we based our recommendation of expected pathway usage on the "80/20 Pareto Rule" and set the pathway utilization goal at 80%.

4.0 OUTCOME REPORTING

One of the most important steps to implementing a new project or intervention is developing the criteria that will be used to evaluate the overall progress and effectiveness of the intervention. The first step to developing outcome reporting for clinical pathways is to determine the patient population definition. The definition serves as the denominator for utilization statistics and is also used to pull outcome metrics. Some pathways definitions can be defined by current clinical guidelines; some surgical pathways such as Total Joint Replacement were defined based on CMS definition; and other medical pathways can be defined by a combination of physician clinical expertise and personnel experienced with billing and coding. It is important to remember that the clinical pathway is not designed to treat 100% of the patients that initially present with the specified diagnosis or procedure. The definition should not be all-encompassing and should not try to capture patients that may be a clinical outlier for which the pathway may not apply.

Each local pathway team at UPMC developed a set of outcome metrics, and the Pathway Executive Committee created a reporting package for each individual pathway. In addition, the Executive Committee also created a core outcome executive summary reporting dashboard that displayed utilization, 30-day readmission, length of stay, and length of stay in the Intensive Care Unit (ICU). Baseline period for all pathways was defined as twelve months prior to pathway go-live. Period 1 was defined as pathway go-live through April 2015, so Period 1 varies slightly

between pathways. Period 2 was defined as May 2015 through September 2015, and Period 3 was defined as October 2015 through December 2015 for all clinical pathways.

The clinical pathway outcome reporting process at UPMC was developed largely through trial and error. Through this process, the main areas of concern that emerged were:

1. The conversion mapping of ICD-9 codes to ICD-10
2. Access to granular data to compare outcomes of patients on pathway vs. off pathway
3. Limited availability of cost data to determine cost-effectiveness of each pathway
4. Determining the success of clinical pathways when utilization was low

4.1 THE CONVERSION FROM ICD-9 TO ICD-10

Prior to October 1, 2015, most clinical pathways were defined by a particular set of ICD-9 codes, procedure codes (CPT), a Diagnosis-Related Group code (DRG), or some combination of the three. That method of classification and coding changed dramatically on October 1, 2015 when ICD-10 coding was implemented in all HIPAA-covered entities. In June 2015, Centers for Medicare and Medicaid Services (CMS) released the following statement in regards to this change:

ICD-10-CM will replace ICD-9-CM diagnosis codes in all health care settings for diagnosis reporting with dates of service, or dates of discharge for inpatients, that occur on or after October 1, 2015. ICD-10-PCS will replace ICD-9-CM procedure codes (CMS, 2015).

CMS provided a mapping document that serves as a cross-walk for ICD-9 and ICD-10 conversions. Since the electronic medical record and many other reporting systems no longer

recognize ICD-9 codes, the mapping document is the only way to compare a population from pre and post conversion.

4.1.1 Benefits of the ICD-10 Conversion

CMS reported that the implementation of ICD-10-CM and -PCS will ultimately result in a “lower coding error rate than ICD-9-CM” and fewer erroneous and rejected reimbursement claims because ICD-10 codes are “less ambiguous” and more “logically organized and detailed” (CMS, 2015). In a perfect world, the increased specificity of codes will make it easier to compare reported codes with clinical documentation, check for consistency between diagnosis and procedure codes, and check for illogical combinations of diagnoses (Bowman, 2008). The use of ICD-10-CM and -PCS, if used correctly, may also improve fraud detection capabilities. Additionally, increased specificity of detail may lead to a better justification of medical necessity. Although cumbersome to primary users, U.S. public health officials at the federal, state, and local level rely on the receipt of ICD-9-CM (and now ICD-10) coded data from HIPAA-covered entities to conduct many disease-related reports. From a public health perspective, this change in coding will hopefully provide better data for measuring care furnished to patients, designing payment systems and processing claims, tracking public-health, and conducting research (CMS, 2015).

In summary, the increased specificity of codes should allow physicians to improve the accuracy of clinical pathway definitions and provide higher quality of care to the most appropriate population.

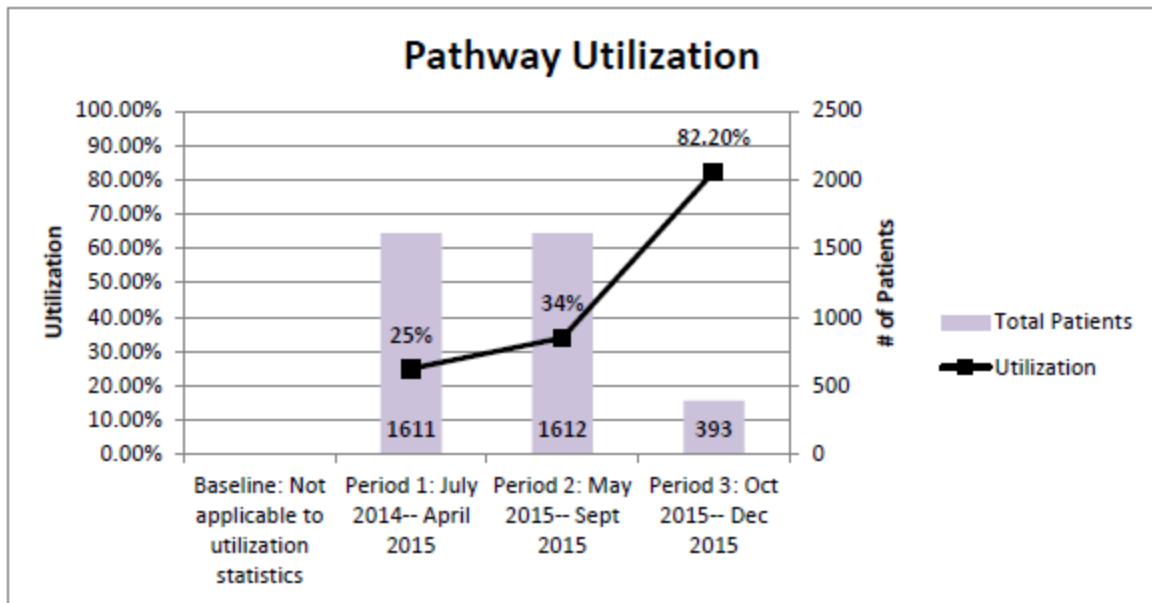
4.1.2 Disadvantages of the ICD-10 Conversion

An increased number of codes to choose from can lead to an increased amount of confusion by physicians, billing and coding specialists, and data analysts. There is not a 1:1 ratio of ICD-9 codes to ICD-10 codes. Currently, there are 68,000 ICD-10-CM codes and 87,000 ICD-10-PCS codes; compared to 14,000 ICD-9-CM codes and 4,000 ICD-9-PCS codes available (CMS, 2015). The complicity of data inaccuracy occurs when an ICD-9 defined population is compared over a period of time that includes data from before and after October 1, 2015.

For example, the Total Joint Replacement pathway had previously been defined by two ICD-9 procedure codes: 81.51, 81.54. After the conversion, codes 81.51 and 81.54 mapped to twenty-four ICD-10 procedure codes. The Geriatric Hip Fracture pathway was defined by eight ICD-9 diagnosis codes and five ICD-9 procedure codes. Post conversion, the original eight diagnosis codes mapped to eleven ICD-10 diagnosis codes, and the five original procedure codes mapped to *ninety-five* ICD-10 procedure codes. The Seizure pathway also experienced a substantial bump in the number of codes, increasing from twenty-four ICD-9 codes to fifty-two ICD-10 codes.

The conversion to ICD-10 coding also identified areas where some conditions may have been improperly coded, or if not coded improperly, were coded differently than what the ICD-9 pathway definition had originally included. An example of this discrepancy occurred in the Stroke pathway, and is shown in Figure 3. Even at measuring just three months of data, Period 3 is significantly lower than what would be expected based on historical volumes from Periods 1 and 2. ICD-9 to ICD-10 crosswalk was verified and no human error was found in the conversion process. In order to determine the root cause of the volume discrepancy, a chart review is

recommended to gain an understanding of how stroke patients are being identified post ICD-10 conversion.



Source: UPMC Chief Medical and Scientific Office, 2016

Figure 3. Stroke Pathway Utilization

4.2 OUTCOMES OF PATIENTS ON PATHWAY VS. OFF PATHWAY

One of the limitations of the data is that it does not portray the clinical outcomes of patients treated on the pathway versus off of the pathway. In this scenario, the data we collected shows the outcome metrics of a disease specific population over a specified period of time. Pathway utilization is not the driver of these metrics, but only an additional outcome metric in itself. Our current reporting capabilities do not compare the outcomes of patients that were treated by using

the pathway, compared to patients that were treated off the pathway. In order to truly assess the viability of the clinical pathway, a like-population would need to be identified and compared to outcomes of like patients treated on the pathway. Comparing outcomes of patients treated on pathway vs. off pathway is the most accurate way to determine whether or not the intervention is truly most effective. This type of data is necessary to evaluate the effectiveness, both quality and cost, of each decision point within the pathway. The granular level of data could be achieved manually through abstract and chart review, but it is very time and resource intensive. Furthermore, once sub-groups within the pathway were identified to assess outcomes of each clinical decision point, the sample size becomes extremely small. Clinical pathways aim to provide physicians with a tool to guide them through administering the most appropriate care based on evidence and best practice. Access to granular order data is needed in order to evaluate outcomes associated with each decision point within the pathway.

4.3 LIMITED ACCESS TO COST DATA

A cost accounting system is a system for recording, analyzing, and allocating cost to the individual services provided to patients such as medications, procedures, tests, and hospital room and board. Like many United States health systems, UPMC is currently in the process of developing a sophisticated cost accounting system that will correlate the cost of care with individual quality outcomes. Clinical pathways aim to improve quality of care by reducing clinical variation. If implemented and adopted successfully, the decrease in over-utilization of low value services should lead to a reduction in the overall cost of healthcare.

Current availability of the cost accounting data is limited. Estimates based on claims payments and historical cost averages can be used as place holders, but those numbers are not entirely accurate and should not be used when trying to determine the true cost-effectiveness of decision points within the pathway. Once the cost accounting system is available, analysts should be able to determine the total cost of a patient treated using the pathway compared to a patient not treated on the pathway. Further analysis should examine the cost of each decision point within the pathway, and when correlated to each decision point's quality outcomes, will provide physicians with a true cost effective analysis of the clinical pathway. This level of detailed analysis is required in order to provide physicians with meaningful data and actionable feedback.

4.4 IMPROVING CLINICAL OUTCOMES

Success of the pathway should not be measured by utilization alone. Figure 4 illustrates the Acute Pancreatitis Pathway outcomes. Utilization of this pathway is extremely low at 5%, but all metrics are trending in the desired direction. If a pathway only has 5% utilization but clinical outcomes are trending in the desired direction, can one still make the conclusion that the pathway is working? If we measure success of a pathway by the ability to improve the health outcome of the population, then the Acute Pancreatitis Pathway should be viewed as a success. Clinical pathways establish outcome metrics to measure impact and effectiveness of the implementation. Comparing these metrics to the baseline period prior to implementation and after shows the change that the intervention had on the population.

UPMC physicians identified PowerPlans as being a burden to workflows and that it was more convenient to use their own customized order sets. However, a customized order set could

potentially look almost identical to a clinical pathway PowerPlan; further data mining should occur to determine whether the customized order sets contain similar labs, tests, and medications as the disease specific PowerPlan. As discussed previously, it is imperative to identify the actual orders that are being used and the outcomes associated with those orders.

Additionally, there are many external factors that are not captured in a clinical pathway that still may impact the overall outcome of the pathway. Factors such as training, education, and organizational initiatives such as hand washing may impact some of the metrics captured in clinical pathway reporting.

Acute Pancreatitis Outcomes

1. Baseline period is defined as 12 months prior to pathway inception for all pathways
2. Period 1 is defined as pathway inception through April 2015 for all pathways
3. Period 2 is defined as May 2015 through Sept 2015 for all pathways
4. Period 3 is defined as Oct 2015 through Dec 2015 for all pathways



Source: UPMC Chief Medical and Scientific Office, 2016

Figure 4. Acute Pancreatitis Pathway Outcomes

5.0 CONCLUSION

Provider engagement is key to successful implementation. In a large health system, it is crucial to have input from multiple provider groups even within the same specialty, because best practices can vary. Clinical Pathway utilization is low in instances where they are not tied to payment incentives, but further analytics need to occur in order to justify the use of clinical pathways over other care models.

Additional reporting capabilities need to be implemented in order to truly assess the impact that pathways have on the health system. An essential part of the clinical pathway process is the collection and analysis of information for when patient care deviates from the pathway. Not all patients are appropriate candidates for pathway use, but an analysis of variation provides useful and accurate information on the frequency and causes of variation and deviation from the pathway. Not all deviation and variation is bad, but it is important understand the root cause and reasoning behind the variation. In order for providers to administer the most appropriate care, an analysis must be done on each decision point within the pathway to determine the outcomes associated with each decision.

Complications associated with the ICD-10 conversion contributed to inaccuracies in coding some clinical pathway definitions. The current outcome reporting mechanisms assesses the outcome of the pathway as a whole. In the current state of outcome reporting, it is difficult to determine where a change should be made since the outcomes are reported as the sum total of all

pathway decisions. The development of a sophisticated cost accounting system will allow physicians to view the correlation between quality outcomes and cost of care provided. This mechanism should be used to review each order within a pathway, and can be used as evidence to support clinical decisions within the pathway.

Overall, clinical pathways aim to improve quality by reducing clinical variation and providing the patient with the most appropriate orders, labs, tests, and medications. Clinical pathways aim to decrease the over utilization of low value care which is usually costly and not medically beneficial to the health system or patient. Outcome reporting is an essential step in the clinical pathway process, and detailed analytics is necessary to develop meaningful feedback to the physicians and care teams. Further analysis of granular data at the individual order level is still needed to determine the true success of the intervention and to identify improvement opportunities within each clinical pathway.

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