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Implementing a New Intelligence Solution Using DMAIC Principles

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ABSTRACT

The Readmission Prevention Solution, co-developed by Advocate Health Care and Cerner Corporation, has now been live at Advocate since June 2013. This paper will detail how a new intelligence solution was developed and implemented.

Keywords: *Intelligence solution, process, user feedback.*

1. INTRODUCTION

In 2012, Advocate Health Care (AHC) and Cerner Corporation formed the Advocate Cerner Collaboration (ACC), a team focused on creating data driven models designed to improve patient outcomes and safety. Combining Cerner's health care technology and data management capability with AHC's population risk and clinical integration expertise, the collaboration aims to develop predictive models and advanced analytic tools to enhance patient care.

Recent reimbursement guidelines enacted by the Centers for Medicare and Medicaid (CMS) are holding hospitals accountable for unplanned, preventable hospital readmissions as defined by CMS. Increasingly used as a metric to gauge quality of care, hospitals with high rates of readmissions are subject to financial penalties under the guidelines. Hospital readmission rates in the Chicago metropolitan area are consistently higher than the national average according to a report from the Robert Wood Johnson Foundation.

To address the issue of readmissions, ACC developed the Readmission Risk Model, an algorithm for predicting individual patient readmission. To maintain this level of accuracy and predictability, the model can be evaluated and updated periodically according to the latest available data. The Readmission Prevention solution was designed around this algorithm, piloted in two hospitals within AHC in July 2012, and deployed to six additional sites in the following months.

Section 2 describes the workflow assessment performed. Section 3 summarizes the development and implementation of a new solution, the ACC Readmission Risk Model. Section 4 explains how user feedback drives change in the model and the creation of an improved solution. Section 5 concludes the assessment of implementing a new solution using DMAIC (define, measure, analysis, improvement, control) principles.

2. WORKFLOW ASSESSMENT

The ACC team conducted site visits at eight of the AHC hospitals with goals to better understand the process used to identify readmission risk, and review site specific tools/technologies used to evaluate readmission risk in order to define the problem. Additional goals were to, detect gaps in the readmission risk process, and gather suggestions for improvement. These goals were guided by LEAN process principles and DMAIC. Approximately 70 care managers (CM) were observed while conducting their work and also interviews of Directors and Managers of care management at the respective sites were conducted as well.

The previous workflow for CMs at AHC was a very time consuming, and wasteful process. In order to determine an individual's risk for readmission, a CM would first spend time looking in a patient's chart, and then manually assess factors that contribute to an individual's risk. Second, a CM must then look through one of as many as four electronic medical records to create their patient roster. Third, a CM identifies new patients, or those who may need to be assessed again. The CM participates in a huddle with the RN assigned to the patient to learn more about the patient's current status. A CM takes this information, and also searches through the patient's chart to find information that will be used to fill out a Readmission Risk Tool Form (RRTF). After this process, the CM would have created a patient risk score that was valid at that point in time. The intensive effort around creating the risk score put significant barriers to true adoption and prevented the ability to get secondary benefits by having the CMs place additional interventions for high risk patients.

The RRTF was a manual questionnaire that a CM completed to determine an individual's risk of readmission. The tool was to be completed on all new inpatients within 24-48 hours of admission. The questionnaire consisted of check boxes with weighted risk factors such as acute myocardial infarction, chronic obstructive pulmonary disorder, etc. A CM checked off boxes that they deemed appropriate for the patient. If the

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patient scored above an eight, the patient was deemed high risk.

However, the RRTF had its limitations, including there was a chance of error on the accuracy of the score, and individuals could be scored lower or higher than expected due to CM error when checking boxes. Furthermore, the statistical weights assigned to factors were subjective and they had no verifiable statistical significance. The purpose of the RRTF was to assist in the discharge planning process. However, use by CMs was very infrequent, despite being mandatory to complete.

CMs view of the tool was that it did not truly assist them in determining readmission risk, they would still visit with the patient to assess and determine true risk. Many CMs also felt the tool was incomplete; it either had or was missing variables that did not truly paint a complete picture of the patient's illness. Due to these perceptions and the time required to accurately complete the form, a CM would often identify the individual's risk from their view and click the required fields to make the individual the level regardless of relevance.

CMs quotes on the manual readmission risk tool:

- “Doesn't paint a complete picture of the patient”
- “Doesn't adequately identify a patient at risk”
- Seems more like a “task” than an indicator of who is really at risk and who needs discharge resources
- “Score doesn't represent what drives decisions”
- Use “Spidey Senses” to determine high risk patients

If an individual is deemed high risk and being discharged home, a CM must set up a follow-up appointment with the patient's PCP within 48 business hours. The documentation of the follow-up visit varies from site to site and tracking compliance has been a challenge at many of the sites. In addition to a follow-up visit, a CM would set patients up with a transitional visit.

Transitional visits are offered to the patient at no cost. This gives an individual an opportunity to speak with a nurse regarding issues he/she may have about post discharge. We identified a clear need not only to improve the process, but to put a significant amount of education around predictive analytics and what that number is really telling them.

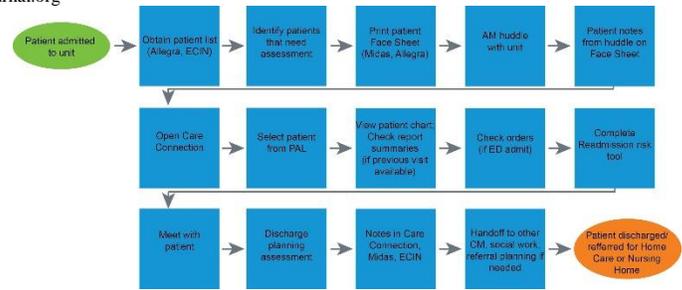


Figure 1: Initial workflow

Figure 1 demonstrates the previous workflow of the CMs. Many steps were required for them to calculate an individual's risk score. After implementation of the tool, 57% of the process was eliminated:

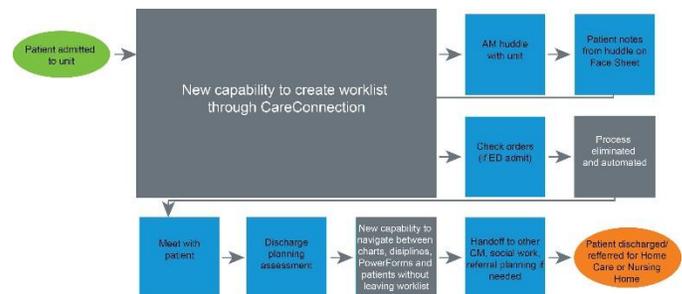


Figure 2: Optimized workflow

Figure 2 demonstrates the optimized workflow the solution can provide.

2.1 Development of a New Solution

To improve the process and in order to develop a new model for readmission risk stratification, time was spent with the CMs to identify gaps in the current (or existing) tool. Several CMs were consulted to identify the specific characteristics which likely lead to readmission of an individual. Important to CMs was the ability to easily identify, assess, and intervene on a high risk patient.

Then, a multi disciplinary team was put together, including members from Cerner, to design and develop the new solution. Three design sessions and three review sessions were held with team members to determine how the solution would improve workflow. The team concluded that the new tool should have three functions that would help improve readmission prevention.

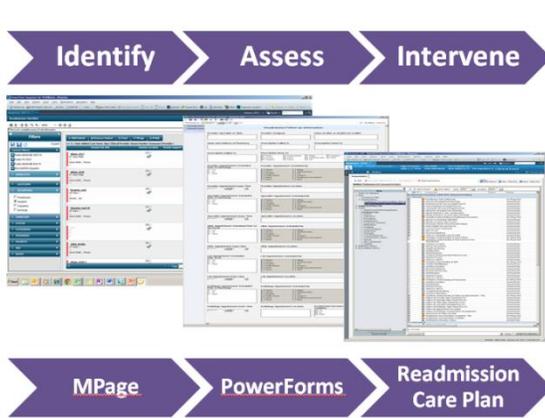


Figure 3: New workflow

In addition, a new method of identifying risk was introduced to CMs. Known as the All-Cause Readmission Risk Algorithm; CMs would no longer have to manually calculate an individual's risk for readmission. The algorithm is a Microsoft Cloud based model that takes into account not only CMS factors for readmission, but also other conditions that may lead to readmission.

Qualitative data was taken from interviews of other CMs and clinicians as well as chart reviews and a review of the relevant literature was performed to better understand patient risk factors. The result is a model which scans a patient's chart every two hours after admission, and updates the risk of readmission as factors such as labs and vitals are added to the chart or are updated. Analysis showed that there is no significant variation of risk during admission.



Figure 4: Risk factors

2.2 Readmission Prevention Solution Features

In addition to an improved readmission risk score, the Readmission Prevention solution that was developed contains a number of new features which assist CMs and clinicians to proactively mitigate readmission risk. These features include:

- Readmission worklist
- Readmission prevention education
- Chronic illness perception form
- Readmission prevention interdisciplinary plan of care (IPOC)
- Condition-specific education
- Pneumonia
- Heart Failure
- AMI
- COPD

The readmission work list provided the greatest change for the CMs' daily work. Before, CMs had no specific patient list to do their work. The solution provided them with a comprehensive worklist to use. The worklist included patient information, room, and most importantly, readmission risk level. By comparison, the new worklist allowed CMs to better organize their workday. The new list enabled the CMs to sort by name, room number, and risk level, and CMs had the option to choose what works best for them.

The first version of the worklist relied heavily on icons. The icons provided CMs with visual cues for status of consults, orders, and documentation. The icons were updated by computer operation jobs that ran in the background, which resulted in slower load times for data updates.

The chronic illness perception form was net new documentation for the CM. The form was geared toward high risk patients with a chronic illness. The assessment provided a better understanding of patient's educational needs, family support, and quality of life, how they are currently living with their illness, and to address any gaps that the CM observed. If any gaps are identified, the CM will order extra education for the patient besides readmission prevention education.

The readmission prevention interdisciplinary plan of care (IPOC) is specific to the solution and ordered by CMs for highrisk individuals. While all highrisk individuals receive readmission prevention education, IPOC is an amplified discharge education provided by the bedside nurse. Topics include care instructions, medication education, chronic illness management, follow-up visit information, and if applicable, disease specific education. This education should be started early in the patient's stay so that the patient and nurse can discuss any concerns the patient may have.

2.3 Implementation of a New Solution

The traditional method for user training at AHC is to "Train the Trainer". In this method, each site has super users who, following a training session led by representatives from IT, will train their peers. After the

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user training, the sites are supported by IT for the week of go-live. After the first week of go-live, users are supported by the IT Help Desk.

2.4 “Just in Time Training”

A team from ACC implemented two training methods for the Version 1 pilot. One site requested “Train the Trainer” while the second site was trained by ACC Clinical Process Designers (CPD). The CPDs were heavily involved in design and testing of the solution, so the argument was training the end users would be not be a difficult task. At both sites, support was provided by CPDs and Cerner representatives during and after the period of go-live.

A rolling “just in time training” methodology was implemented at the non-pilot sites then implementation of the solution. CMs were able to keep their training fresh in their mind, which helped when they first used the new solution. User guides, and other reference materials were also available for use by the CMs.

2.5 Intelligence Training

The ACC team trained the CMs not only on the features of the worklist, but also the new intelligence built in to the solution. CPDs taught the importance of the new intelligence, and to trust an algorithm that was still a mystery to many CMs. There were numerous questions about the new readmission risk score, and why it should be trusted over how they were currently doing their job. CMs eventually understood the features of the solution, and how it improved their workflow.

2.6 User Feedback to Drive Change

Feedback was instantaneous because CPDs were directly accessible by end-users. Furthermore, CPDs held one-on-one sessions with CMs to help CMs understand the new workflow, if the new workflow enhanced what they did, and encourage direct feedback about the solution. During these sessions, CPDs found that while waste was removed by eliminating the manual risk score, there were limitations of the solution.

One of the important concerns of the CMs was speed to work through the solution. Since the worklist was icon driven, there were computations that had to run in the background for the page to load. At times users experienced wait times of up to thirty seconds per page load. This was far in excess of the time limited suggested by a New York Times article [4] which contends that users will abandon a website if it does not load within three seconds.

Users stated that the icons were at times visually overwhelming. Although they provided a visual cue, the icons took over the entire page. Users complained that the icons strained their eyes, and it was difficult at times to

differentiate the icons between individuals. The delays and overall look of the worklist made using the solution very frustrating, and some CMs stopped using the solution all together. The processing of data in the background also caused near monthly downtimes ranging from a day up to one week. Feedback was given directly to Cerner, and the Readmission team worked together to solve the issues of Version 1 of the worklist.

In order to increase create a competitive environment among users, rewards were given to CMs who ordered all education and completed all chronic illness perception forms. Creation of a competitive environment among CMs spurred them to be ranked as the top user at their site. A 75% compliance rate is the goal of the solution.

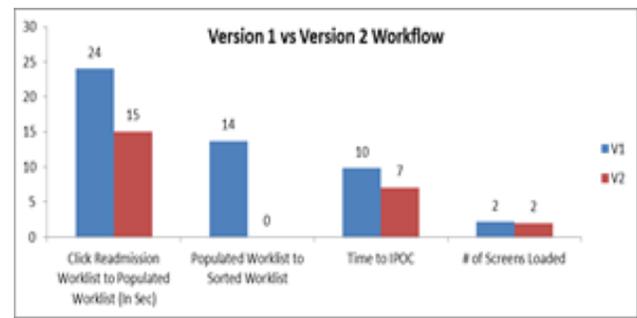


Figure 5: Workflow comparison

2.7 Readmission Risk Solution Version 2

Because of feedback from users on what could improve the solution, Cerner released Version 2 of the worklist to AHC in October 2014. The redesigned worklist removed background operations, which resulted in faster load times. This also changed the perception of the CMs about the process. For instance, during training many of the CMs stated that the new version was a substantial improvement over Version 1.

Version 2 contained a number of important improvements over the previous version. For example, the overall look of the worklist changed, with icons being replaced by cards, and the worklist was more streamlined. Tabs within the list held items such as consults, documentation, and follow-up visit information. Load times of the new version ranged from 3-5 seconds; a great difference from the 30 second load times from the previous version.

Because go-live of Version 2 contained numerous enhancements, , a rolling go-live as done in with Version 1 was not possible. However, to help CMs understand and work with the new solution, CPDs split time at all 8 sites, with one covering the north, and the other covering the

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south. More time was spent at the larger sites; however one on one time with CMs at all sites was provided.

Results of the new worklist showed greater compliance of ordering readmission prevention education and completion of the chronic illness perception form.

Feedback from CMs included such comments as:

- “This is nice”
- “Much, much faster”
- “Oooooo I like it”
- “Easier to use”

3. CONCLUSION

The implementation of a new solution to eliminate waste and improve workflow suggests that a partnership between a provider and vendor is vital in driving change. By having CPDs on site, CPDs were able to analyze the use of the tool, send requests to Cerner directly, have the modifications made, and re-analyze the solution faster than a traditional arrangement.

The use of train the trainer vs hands on training was a good tactic for training CMs, however it would have been useful to have more super users on site that could answer questions instead of relying on CPDs. However, having CPDs on site did allow for faster communication to the development team for bug fixes and improvements.

3.1 Value to the End User

- Decreased “double documentation”
- Provided more effective time-management
- Focused on moderate/high risk patients
- Provided a visual aid for all disciplines
- Summary screen
- Promoted communication between disciplines
- Promoted continuity of care

Analysis is ongoing to measure success of the tool. Improvements have been seen in the use of the solution as time progresses.

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