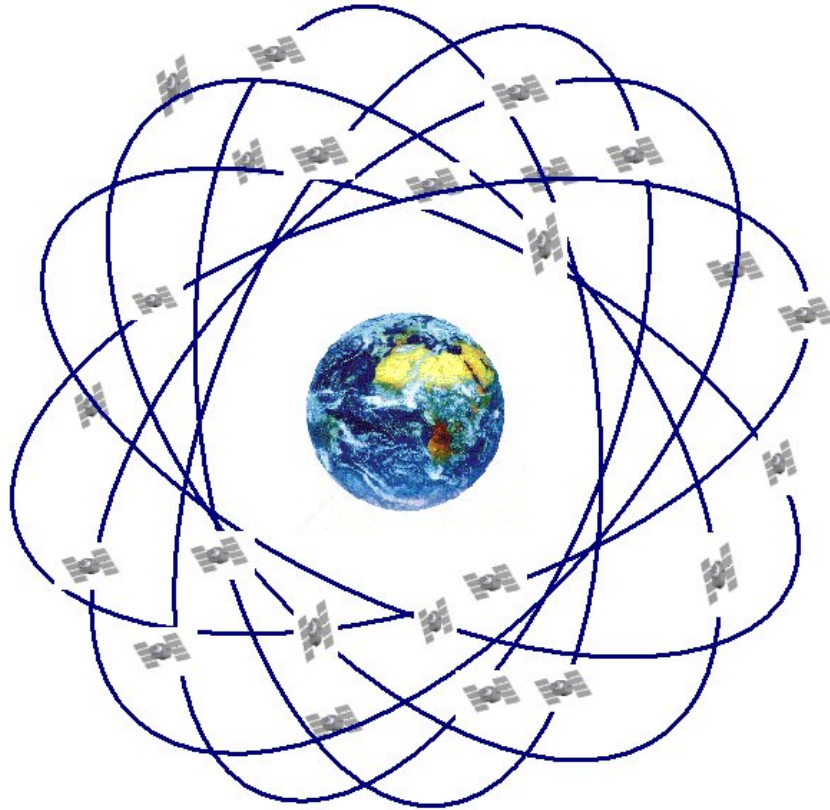


Next Gen Clinical Pathways:

Applying context For Payers, Providers, Patient

Utilizing Artificial Intelligence for Contextual Interpretation



Landscape

Clinical Decision Support Systems and applied Clinical Pathways (CPs) have been around for several years¹. The benefits of these technologies are non-refutable. Reduction in clinical waste, variation of care, improved outcomes and reduction of costs are all documented as having positive impact². Advancements have been made however; there have been many limitations on the implementation and usefulness of these solutions to date³. Some of this is due to technology, some to process and some to adoption. This paper will look at where we are, what's needed and a roadmap for success.

Let's start first with a definition: "CPs are defined as structured and **multidisciplinary care plans** used to detail essential steps and **timing** in the care of patients with a **specific clinical problem**"⁴. CP's are typically developed by providers or third-party pathway vendors using nationally recognized clinical practice guidelines (CPGs), which are then modified as needed by advisory boards or committees⁵. Some providers have created CPs independently, often using clinical practice guidelines (CPGs) as a starting point and making modifications based on their own clinical experience. Payers most often implement vendor-developed programs that are likely to include preferential positioning for preferred treatments. Cost reduction being the driving factor, it is not a surprise that the current implementation of CPs is either in high cost conditions where there are large avoidable cost elements⁶. To date, the pathway developers have focused mainly on oncology⁵, especially for common cancers, such as breast and lung cancer, and those that are resource intensive to treat, such as pancreatic cancer. However, the development and application of CPs in other clinical areas, such as cardiology, gastroenterology, and immunology are gaining traction^{7,8,9}. As we look at new care giver roles, and the desire to keep patients out of the hospital, there is a trend toward providing pathways for continuum of care and post discharge.

Clinical Pathways: Where to start?

There are many thousands disease conditions, procedures, to choose from. Deciding what pathways to consider depends on the key stakeholders and their drivers. For example, Payers, whom often drive adoption of pathways, may have cost reduction as a high priority so they will be looking at the cost of management of a condition as a method of ranking and also as a way to see if some of these costs are avoidable without adversely affecting outcomes¹⁰. Likewise, for the providers, they may be driven by those pathways that are aligned with financial incentive and/or penalties or quality measures associated with the management of the condition¹¹. Clinical justification such as improvements in the outcomes and reduction in variability that can be improved through standardization may be the drivers³. Also considered are the direct and indirect costs of development, deployment, maintenance and organizational restructuring. These may include: administrative burden of dealing with multiple payer pathways for same conditions and the cost of integration and disruptions⁶.

Of course to get acceptability of clinical pathways it will depend on the quality of the evidence base, its validity and transparency⁵. Clinicians are looking for autonomy, flexibility and choice. It is essential that it aligns with their existing work-flow, its ease of use and if it save time¹². There must also be a perceived need; complexity of the decision making, streamlining of routine clinical chores such as documentation, consenting, ordering, discharge summaries and letters.

Implementation Challenges:

As more and more payers are promoting the use of clinical pathways the clinicians are now, or soon will be, starting to have to deal with the administrative burden of dealing with multiple payer developed clinical pathways. To manage this there needs to be a single disease management pathway that allows the clinician to switch on and off between different payer pathways for the same patient. Doctors want to be doctors and not cook book

readers. Pathway approved treatments should be made available but all treatment options should be presented for clinicians and patients to make the right personalized decisions.

Transparency of the decision-making process and audit trails of the decisions made with supporting evidence presented will allow clinicians, patients and administrators to see and measure outcomes more effectively. Highlights of pathway approved treatments should be presented at point of care but also access to all available treatment options will preserve complete clinical autonomy and also support patient preference and participation. CP development lifecycles need to be shortened and also they need to change as new evidence is presented. Organizations need to set policy and ranking for evidence. Customization of national and international clinical pathway guidelines will allow providers to tailor to suit local requirements. How do we shorten the authoring process of pathways and make pathways come alive? By having modular content management functionality, teams can quickly implement updates as there are changes in evidence.

Limitation of Rules Engines and Decision Tree Logic

“If you smoke, you ought to use an ashtray”

Most CDSS solutions are built around rules engines and decision trees. This has helped with simple clinical pathways but not all pathways follow a straight line. The logic of a statement such as: “if you smoke you ought to use an ashtray”, cannot be computed by rules engine technology. The same is true for many complex clinical decisions making. Context needs to be applied. Complex clinical decisions need to support many paths and change instantaneously as new evidence is presented. Much like GPS, an adaptive pathway solution needs to re-navigate to meet the changing patient route. They need to use patient data to locate a patient on a treatment plan and render personalized clinical evidence and recommendations at point of care.

Next Gen Clinical Pathway



Advanced clinical pathways/clinical decision support systems must support decision functionality- be able to contextualize the information presented and allow for argumentation, ie: with similar efficacy which treatment are best tolerated by the patient an what are the overall costs. Non-linear workflows combined with decision functionality will support complex clinical pathways and allow clinicians to be clinicians and patients to be engaged in their own care.

Analytics and Clinical Pathways/CDSS

What's Missing With Big Data? Human Filters*

“While the advances of technology are awe-inspiring, the pure amount of information available is staggering, and will quickly overwhelm a traditional organization”.

“It is important to remember that gathering data points are not the same as gaining a situational understanding. Big Data can show you what is happening, but it falls short of contextualizing why it is happening. Sound decision-making demands more”.

**General Stanley McChrystal, US Army*

Machine learning, natural language processing, analytics, big data all provide value in the manipulation of data and solving for “what”. There needs to be a layer applied upon the data that solves for “why” and allow for intelligent data usage/interpretation by human beings. Artificial intelligence

Next Gen Clinical Pathways

around clinical pathways and clinical decision support provides just that. Having the ability to accurately model clinical logic can semantics, integrated with individual patient data, will allow for personalized clinical decision support, personalized clinical pathways and coherent complex clinical decision making.

So, advanced clinical pathways driven by artificial intelligence can provide both prospective and retrospective value to both the payer and the provider markets. Prospectively, it can be used by clinicians, patients, and administrators to implement clinical guidelines and pathways at the point of care, and simultaneously capture and review clinical decision compliance status in real time and at periodic audit. This function can use predictive analytics outputs as an input, alongside subjective evidence from guidelines, pathways, protocols, patient preferences, to the decision functionality. This would be integrated with the electronic medical record (EMR). Retrospectively, payers or providers could run high volume historical individual patient data or claims data retrospectively through clinical guidelines and pathways to review clinical decision compliance status individually and as a population. Compliance data generated in this way can then be used a substrate for predictive analytics. This would not require integration with the EMR.

Summary

The value of clinical pathways and clinical decision support is evident. To garner the adoption, next generation solutions that support a higher level of contextual decision making, that are easy to author and are highly modular such that they can be used to configure application quickly for any clinical niche and adapt as new evidence and patient data is presented will help standardize clinical performance, reduce cost and increase patient safety by implementing personalized, evidence-based care across a population.

References:

1. Vanhaecht, K., Panella, M., van Zelm, R., & Sermeus, W. (2010). An overview on the history and concept of care pathways as complex interventions. *International Journal of Care Pathways*, 14(3), 117–123.
<http://doi.org/10.1258/jicp.2010.010019>
2. Rotter, T., Kinsman, L., James, E., Machotta, A., Gothe, H., Willis, J., ... Kugler, J. (2010). Clinical pathways: effects on professional practice, patient outcomes, length of stay and hospital costs. *The Cochrane Database of Systematic Reviews*, 7(3), CD006632.
<http://doi.org/10.1002/14651858.CD006632.pub2>
3. Chawla, A., Westrich, K., Matter, S., Kaltenboeck, A., & Dubois, R. (2016). Care pathways in US healthcare settings: Current successes and limitations, and future challenges. *American Journal of Managed Care*, 22(1), 53–62.
4. Kinsman, L., Rotter, T., James, E., Snow, P., & Willis, J. (2010). What is a clinical pathway? Development of a definition to inform the debate. *BMC Medicine*, 8(31), 1–3.
5. DeMartino, J. K., & Larsen, J. K. (2012). Equity in cancer care: pathways, protocols, and guidelines. *JNCCN Journal of the National Comprehensive Cancer Network*.
6. LLC, A. H. (2015). *Clinical Pathways: Overview of Current Practices and Potential Implications for Patients, Payers, and Providers*.
7. McNamara, R. L., Wang, Y., Herrin, J., Curtis, J. P., Bradley, E. H., Magid, D. J., ... Krumholz, H. M. (2006). Effect of Door-to-Balloon Time on Mortality in Patients With ST-Segment Elevation Myocardial Infarction. *Journal of the American College of Cardiology*, 47(11), 2180–2186.
8. American Gastroenterological Association. “Use of Biologic Drugs for Inflammatory Crohn's Disease: Clinical Decision Support Tool.” 2013.
<http://campaigns.gastro.org/algorithms/crohns/>
9. Cardinal Health. “New Studies Show Cardinal Health Specialty Solutions' Clinical Pathways Improve Cost

Effectiveness and Quality of Treatment of Cancer and Rheumatoid Arthritis.” 2014.

<http://ir.cardinalhealth.com/news/news-details/2014/New-Studies-Show-Cardinal-Health-Specialty-Solutions-Clinical-Pathways-Improve-Cost-Effectiveness-and-Quality-of-Treatment-of-Cancer-and-Rheumatoid-Arthritis/default.aspx>

10. Kreys, E. D., & Koeller, J. M. (2013). Documenting the benefits and cost savings of a large multistate cancer pathway program from a payer’s perspective. *Journal of Oncology Practice / American Society of Clinical Oncology*, 9(5), e241-7. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/23943896>
11. Newcomer, L. N. (2012). Changing physician incentives for cancer care to reward better patient outcomes instead of use of more costly drugs. *Health Affairs*, 31(4), 780–785.
12. Polite, B. N., Page, R. D., & Nabhan, C. (2016). Oncology Pathways-Preventing a Good Idea From Going Bad. *JAMA Oncology*, 2(3), 297–8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/26847876>