CARE DELIVERY

From Risk Prediction to Delivery Innovation: Envisioning the Path to Personalized Cancer Care Delivery

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Because of the high cost and variability of unplanned acute care (emergency department visits and hospitalizations), substantial work has been devoted to improving algorithms that model the risk of this potentially preventable care. Applied across an array of different populations, this work has generated excitement in oncology as it has been widened to include patients with cancer. Much of the innovation has involved amassing clinically rich data sets with comprehensive utilization records and then applying sophisticated analytical techniques, including clinical score building and machine learning, to model the risk of unplanned acute care with increasing precision. However, Osterman et al[1] bring up a glaring question: How does risk prediction positively affect patient care? More specifically, why has there been comparatively little progress turning risk prediction models into delivery innovation realities?

The clearest reason why risk prediction outpaces delivery innovation in the literature is because of the nature of the work: It is relatively straightforward to generate papers using retrospective data. In contrast, to develop a risk-factor targeted intervention and implement it in a clinical setting—to turn a risk prediction model into delivery innovation reality—the planets must align to coordinate the timing of funding, health system interest, clinical champion excitement, and the availability of a multidisciplinary network of investigators. Understanding this inherent challenge, we should consider how to make the most of future delivery innovation efforts.

Beyond the banal realities of the research enterprise, it is not very clear how to operationalize predictive models into risk-stratified care delivery. We suggest using some key questions as a guide when developing and implementing interventions to reduce avoidable acute care. First, are the identified risk factors modifiable? Second, does a meaningful intervention exist for these risk factors? Third, can the intervention be applied in a streamlined, timely, and logical fashion that reflects the needs of each individual patient? Fourth, does the intervention provide meaningful reduction in avoidable acute care for the costs (time, teams, and processes) incurred? By using these questions, one can move closer toward the goal of personalizing cancer care delivery.

The Challenge of Risk Factor Modification

Identifying modifiable risk factors is not as easy as one might hope. The most common set of risk factors described in risk prediction models are demographic and social determinants of health variables. Even in patients with heart attack, chronic obstructive pulmonary disease, and congestive heart failure, hospitals serving populations with a higher prevalence of social risk factors consistently have higher 30-day rehospitalization rates.[2] However, while a clinical team can identify social determinants of health issues and offer referral resources, they cannot be tasked with solving the complexities of socioeconomic inequalities, and these risks may be insurmountable even with intensive supportive care.[3] Simple identification of these risk factors belies the deeper-rooted challenge of mitigating them.

Another set of questionably modifiable risk factors are the clinical conditions, including comorbid chronic diseases, measures of frailty, specific cancer treatment modalities, certain thresholds of abnormal laboratory findings (eg, serum albumin and sodium), and the emerging data on differing microbiome impacts. Again, while these are compelling signals for increased risk of future unplanned acute care, they seem more likely a bellwether of tenuous physiology and social supports rather than treatable conditions.

The last common set of risk factors is the increased risk of future emergency department use on the basis of a patient's prior emergency department use, in line with the maxim that the best predictor of future behavior is past behavior. This risk factor might suggest an addressable underlying behavior. However, it is not clear what underlies this pattern of frequent hospital use and whether it truly indicates a modifiable behavior of individual patients or whether it reflects the geographic availability of different sites of care.

Matching Intervention to Patient

As for meaningful interventions, we know that early palliative care, alternative sites of acute care, clinical pathways for symptom management, systematic collection of patient-reported outcomes,[4] care coordination, and navigation[5] show promise at reducing unplanned acute care. However, many of these

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interventions have yet to be tested in different sites to demonstrate widespread effectiveness. Additionally, while some of these are more flexible than others, deploying a single intervention to address disparate risk factors that nonetheless produce the same high-risk score seems unnecessarily awkward. Furthermore, we do not know how best to systematically apply these interventions to individual patients.

High-Value Interventions

Perhaps a comprehensive redesign of care delivery that integrates these interventions would be most effective, as has been attempted by a variety of patient-centered models of care in both primary care[6] and oncology.[7,8] This all-in approach is intriguing but brings up the fourth question (Does the intervention provide meaningful reduction in avoidable acute care for the costs incurred?), as findings from such programs have not been universally successful in reducing unplanned acute care or otherwise curb costs.[9,10] This may be due in part to a discrepancy between what is offered and what a patient needs. A frail elderly high-risk patient may have different needs than a young patient with a history of using the emergency department as their primary site of care, but without a deeper understanding of individual patient needs, even offering a wide range of interventions may fall short. Intensive automated hovering remote monitoring, such as for heart failure,[11] can engage patients, but those with limited digital literacy may have difficulty participating. Delivery innovators should remain cautious not to let the intricacy of an intervention take priority over the underlying patient needs.

Effectively Engaging Patients to Personalize Care

On the one hand, we have robust risk prediction models but lack clarity on how to act on predicted high risk. On the other hand, we have promising delivery innovations but less clarity on which patients to apply them to. Although it is laudable to apply a multitude of innovations to all, this still seems to fall short of the goal of personalizing care delivery in the hope of improved effectiveness. How should we move forward?

One promising approach is to simply ask patients what they need, regularly engaging them in their care. Increasingly, through electronic patient-reported outcomes surveys, many are doing so although at the cost of wearing out their welcome with frequent, repetitive, and impersonal contacts. This leads us to the last guiding question of when and how to engage patients once they have been identified as high risk for unplanned acute care.

From a patient perspective, it is odd to receive an unsolicited offer of additional assistance without an explanation of why they were selected and what the extra care is intended to do. If we are applying a risk score to all patients, perhaps they should be informed from the outset, rather than surprising patients when they are later flagged as high risk. It seems obvious to fold this into the on-boarding introduction to a cancer center, but it is also easy to recognize how forgettable this might be amid all the other information the patient receives that day. We need a more careful examination of how far upstream in the patient care journey this should occur, how often it should be reinforced, and acknowledge that the timing may not be the same for every patient.

A solution also lies in what might make the more comprehensive delivery reorganizations effective: encouraging the use of a single point of trusted contact to help triage acute issues. It is striking that patients often visit the emergency department without calling their cancer team beforehand,[12] regardless of clinical acuity, but given continued patient desire for such guidance and triage,[13,14] this may reflect inadequate awareness, immediate availability, or integration of existing resources.

As we move more toward personalizing cancer care delivery, there is surely value in risk prediction, but it may be more fruitful to identify modifiable risk factors over maximizing model precision. Given the diversity of patient needs and the difficulty in predicting the appropriate interventions, a more prudent approach might be simpler risk stratification, reserving the complexity of the program for fitting interventions to the needs of the population. Targeting a broader group of high-risk patients, such as patients with gastrointestinal cancer receiving chemotherapy, with a flexible set of interventions may be a more practical and successful way to address unmet patient needs. In this way, risk prediction tools would also encourage cancer care providers to focus on finding the right intervention for individual patients, rather than being stymied by heterogeneous groups of high-risk issues. This approach acknowledges that not all patients need all interventions at all times and could help identify the right patients to receive the right care intervention at the right time and in the right place. Such an adaptive approach is what risk stratification programs should be seeking—cancer care that proactively addresses the unique needs of an individual in a timely, streamlined, and meaningful fashion. Cancer care that is truly personalized.

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