E-Health and Healthcare Quality Management: Disruptive Opportunities

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INTRODUCTION

E-health will disrupt healthcare delivery. This disruption will benefit all of healthcare's stakeholders, from providers to patients, and from insurers to enterprises. E-health is a unifying term encompassing telehealth, telemedicine, digital health and remote patient monitoring. E-health is not new medicine; it is new delivery. Furthermore, all elements of the Triple or the Quadruple Aim[1] are addressed by the opportunities present within E-health. Here we move beyond the early iterations of E-health, with its "doc on a screen." We explore what E-health-empowered advances in quality management will mean to the clinician, the patient and society.

Early on in my E-health journey, a friend said, "If all we do with E-health is use e-tools to do what we have always done, we will have wasted a great opportunity." That is to say, if we only replace an office visit with a virtual visit, we will just have scratched the surface. The cost-lowering, clinical efficiency, patient engagement, provider and patient convenience and data-crunching capabilities of E-health can push healthcare to new levels of value (quality AND cost). Over the past 30 years, technology has outstripped imagination. Frequently heard: "It cannot get any faster, more competent, or cheaper than this," but it always does. The healthcare challenge is to push problem solving into areas where technology will likely advance and consider what clinicians will need to do to be "just in time." This parallel track planning is what we need to do to diminish the 17-year gap between innovation and common practice.[3] We cannot say, "Hey, look at this new technology – let's figure how we can use it." We need to be ready when technologies are in development to predict the application and be able to step up with clinical data, quickly close the loop and advocate for implementation.

Technology is evolving to answer the following three questions:

1. Can Augmented Intelligence (AI) and Natural Language Processing (NLP) process a patient encounter (voicing both the clinician and the patient) and produce a structured, parsed visit note in real time? Can we take the visit note and use AI to hold it to expected metrics, indicators and outcomes?
2. Can telehealth create a patient learning environment to capitalize on the innovation most likely to have the greatest impact on value: the engaged patient?
3. Finally, is there a new diagnostic tool (adding to history, physical exam, lab / imaging and genetics) present in remote patient-monitored data?

THE TOOLS OF HEALTHCARE QUALITY MANAGEMENT (HCQM)

Visit notes machine-generated in real time and scanned for quality metrics

The tools of healthcare quality management (HCQM) are applied in every aspect of healthcare from the provider-patient encounter to entire institutions. The heartbeat of these tools is an assessment of the process by which healthcare is provided. At the level of the provider-patient encounter, the tool is chart review. Generally, chart review involves a healthcare professional reviewing a single chart and abstracting data. This is an extremely time-intensive endeavor, so chart review is generally conducted on a small percentage of cases thought to be representative of sought-after quality management data. Data analytics are now run on electronic medical records (EMRs) which depend on specific, named data fields such as in HL7. This has forced the input to be discrete. A free-ranging, dictated history is not "mineable" with this technology and is discouraged. The clinician is forced to acquiesce to the structured, barren landscape of field input or frustrate the data analysts with dictations. E-health can fix this dichotomy.

First, we should consider the enormity of the chart review problem. The Medical Record Review Guidelines of the California Department of Health Services, Medi-Cal Managed Care Division, asks that 10 records of each provider be abstracted on an annual basis.[4] If the average provider sees 3,000 visits annually, this is a chart review rate of 0.33%. During 2017, there were 880 million hospital outpatient visits in the U.S.[5] If 5% were evaluated, the cost would be $293 million (8 minutes per review at a personnel cost of $50/hr). On the hospital side, there were 36.5 million admissions to U.S. hospitals in 2017.[6] If there were an average of 10 healthcare provider visits per hospitalized patient, a 5% review would cost $122 million. Even if the one-time investment in developing automated, real-time chart preparation and review were $250 million (less than the cost of one-year review of 5% of out- and in-patient charts), the resultant tools would decrease risk and steer a more efficient

course to patient-formulated outcomes. It is likely that far less than 0.5% of encounters are being evaluated. This represents a major failure of HCQM although, given the tools and resources, it is probably the best we can do until technical tools are created with IT and clinical input.

NATURAL LANGUAGE PROCESSING (NLP)

This is what will likely evolve: A provider-patient encounter is recorded and is digitized by Natural Language Processing (NLP). The provider will likely have to cue the system as to the problem list item under consideration. Subjective input, currently available only as interpreted by the clinician, will be in the patient's voice, parsed for efficiency. Objective data will be inserted into its appropriate HL7 slot and shared with the patient. The exam will be dictated by the clinician. Assessment and plan will be a conversation between patient and provider, processed and parsed. A patient-voiced summary will be included with documented teach-back. Many clinicians already do some of this, although universal structure is lacking, and the resulting note lacks original patient input. By some estimates, as much as 50% of a clinician's time is relegated to information processing. Preparation of the clinical record may be responsible for 30% of that. Saving 5 minutes 20 times a day for 200 days yields a staggering 333 hours saved annually. This time is added back to the visit, allowing much more time for the critical provider role of teaching and understanding the patient's goals. It also eliminates the keyboard between the patient and provider. A structured record, digitally produced, becomes available for quality management processing 100% of the time. And in real time.[7] The note so prepared can be reviewed as the capstone of the visit, corrected or appended as the team decides.

In the value-based world, it is likely that Current Procedural Technology (CPT) evaluation and management coding will be put aside. The structure of the CPT code which yields purposeless repetitive entries will have to give way to accounting for case-specific metrics and Patient Centered Outcomes (PCOs). Also, in an environment where most healthcare providers will be employed by large practices or institutions, there will need to be tools to track provider efficiency and results. To ensure their organizations are meeting their quality targets and subsequent reimbursement, administrators will need to be able to process visit records for metrics and PCOs.

ROLE OF INFORMATION TECHNOLOGY

Accomplishing this level of chart preparation and review requires that thousands of digitized encounters be made available to the Information Technology (IT) professionals.[2] Identifying process metrics and individualized outcomes requires a kind of successive approximations using learning algorithms to become increasingly accurate. Each approximation is evaluated by a clinician; its success or failure discussed with IT and the process recycles. The E-health asset that can make this happen is the video-conferenced encounter both as Direct To Consumer (DTC) and scheduled patient-provider encounters. This is a bountiful resource, unique to telemedicine and the reason this advance will be an E-health development. Getting it right will require an investment of significant clinician time, most likely as a part of a research grant. This research will start with a single clinical entity (such as DMII) and grow to involve a significant percentage of problem-list entries. If we care about efficiency (value) and engagement, this is the investment that the clinical community should see as the answer to endless hours spent documenting and not enough time with the patient.

UNIVERSAL CHART REVIEWS

The Institute of Medicine defines health care quality as "the degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."[8] I propose that (1) data for individuals generates data for populations, (2) even for the same diagnosis, patient-centered, insurer, and societal outcomes will vary, and (3) the extent of the application of "current professional knowledge" will also vary from case to case (based on patient preference, the patient's underlying physiology and societal resources). Each case is unique. It follows that the goal must be universal chart review wherein every encounter is measured for (1) that encounter's progress to one or more outcomes and (2) situationally sculpted best-practice care. Universal chart review for progress to outcomes that are centered on the patient are technologically in sight. The provider community has already spent significant time in defining metrics, indicators and outcomes.[8] This work will need to be sculpted to operate within the parameters needed by the IT community. This work will likely be done by clinicians working within a grant. Getting it right is, after all, a process of successive approximations. There are commercial applications similar to the HCQM tools needed to accomplish this.[9] Forming provider / corporate partnerships will accelerate the progress as corporations recognize the extent to which HCQM improvements will positively affect their bottom line.

THE ENGAGED PATIENT

Physicians have been experimenting with coached patient autonomy (aka: guided self-determination,[10] self-management,[11] and shared decision-making[12]) for some time. Conceptually, a patient and their support group are educated on aspects of their condition that are consistent with independent management. E-health is a natural partner in developing a program of patient education focused on structured and documented acquisition of knowledge leading to guided patient autonomy. Expecting patients to understand and participate in their healthcare will engage and empower patients.[13] Patients who are individually responsible for their actions in an environment of coached autonomy are

engaged patients. An all-encompassing presentation of many aspects of engagement is presented by Catalyst.[14]

Coached patient autonomy is not for everybody. The clinician must consider a number of variables prior to going down this path. Historically, the culture of healthcare delivery has been parental. This must morph into relationships that are empathic, reciprocally communicative and share decision-making. Many clinicians have brought elements of these characteristics into their practice. The availability of telehealth (the educational activity of E-health) will help in advancing and strengthening reciprocal communications and shared decision-making. The clinician should titrate the introduction of these elements into their practice at rates that coincide with patient competency. Providers will find that the titration is not against a preconceived end-point but rather that the end-point expands as the process progresses.

Telehealth is the exact vehicle to help patients learn, assess their learning and come to the provider-patient encounter with an opinion. Two E-health direct-to-consumer products[15,16] lead the patient up a clinical decision-making tree to a tentative diagnosis or brief differential. These products may be white-labeled so that their patient-facing appearance is that of the practice or institution. The provider sees the patient only after they have developed a set of possible diagnoses, either as a store and forward report, as an immediate virtual visit encounter or as a scheduled face-to-face visit. First, this has the potential to streamline an encounter, saving time for both the provider and the patient. Second, these are great learning tools as they fix critical elements of a diagnosis in the patient's mind.

Currently providers are challenged by the Internet, generally unhappy with "Dr. Google"[17-19] (searching "Dr. Google" yields 5.9 billion hits). It is more productive to leverage the patient's energy and curiosity.[20] The patient who has researched a complaint is engaged. Some complain that it often takes more energy to walk the patient back from an Internet diagnosis than their presenting "de novo." If practices meet the challenge prospectively, giving their patients URLs of quality websites or providing a practice-based library to help patients learn as they surf, their patients will increasingly present with well thought-out differentials, saving significant time for the provider. Clearly, these learning modules must be aware of the patient's underlying competencies. In the ideal world (and this needs no more technology that we currently have) the patient will be expected to present with a plan. This value-producing visit structure will go a long way to optimizing patient engagement.

DIGITAL HEALTH

There are now seemingly endless arrays of mobile phone (mHealth) applications (apps) that engage the patient in tasks of self-evaluation, often associated with the capability of transmitting data to a healthcare provider's office for integration into the practice's EMR. This aspect of E-health is digital health. The commercial consolidating venture AppScript[21] serves to aggregate digital health and encourages healthcare professionals to evaluate and electronically prescribe the most useful/directed evidence-based digital health apps, devices and content to patients. As of September 2019, AppScript has reviewed and scored 688 apps. The vast majority of these apps are single-purpose (7 categories such as patient experience, lifestyle and stress, medicine minders and others) with only the category of Disease Management Devices (there are 188 entries in this category) subcategorized with entities such as diabetes, hypertension, ADHD, Alzheimer's, and others (13 total). On the non-commercial side, the American Medical Association, the Healthcare Information and Management Systems Society, the American Heart Association and the DHX group[22] have formed Xcertia, dedicated to "improving the quality, safety, and effectiveness of mobile health apps."[23] In many ways like a pharmaceutical, and in their ability to empower the patient, the healthcare provider's competency in navigating mHealth and digital health will become a highly patient-engaging clinical competency.

THE FIFTH DIAGNOSTIC HIDING IN MONITORING DATA

Anybody who has been to a hospital is accustomed to the sight of a monitor with its pattern flying by on a screen. Processing that data goes back to 1982 when Bruce Del Mar and Jeff Holter inaugurated what is still the Holter Monitor.[24] It might be considered that their instrument, with its ability to spot dangerous arrhythmias, was the initiation of E-health almost forty years ago. Remote patient monitoring with an element of processing is at the more complex extreme of the digital health spectrum. A particularly useful application is that of seizure monitoring. With published research dating back to 2010, Rosalind Picard's team at MIT developed a now commercially available wrist band device using galvanic skin data to predict a seizure with enough advance warning for the patient to stop what they are doing and prepare.[25] Over the past 10 years there have been a proliferation of non-invasive (e.g.: digital health devices such as FitBit, Apple Watch), minimally invasive (glucometers fitted with an insulin-delivery pump) and invasive monitoring devices (pulmonary pressure monitoring to detect nascent decompensation of CHF).[26]

The CHF warning system noted above alerts providers through a prediction algorithm[26] looking for divergence from the norm. The question is whether a stream of multiple, simultaneously monitored parameters might have predictive competency for many diagnoses. A patient is monitored with a multi-channel non-invasive patch (for example,[27] measuring general activity, postural classifications, vital signs and sleep metrics). The patch is polled by the patient's mobile device at set intervals with the data going to a remote processing center. The processing center would develop a profile of the patient under a variety of situations such as eating, walking, sleeping and so on. The scenario is that of a nursing home patient visited by his 16-year-old grandson who has just returned from the West Coast. The grandson

coughs a few times while in the room. Later that evening the nursing home is contacted by the data processing center and is informed that patient has a divergence of his pattern consistent with early flu. According to the patient, he feels a "slight chill" but is not concerned. The patient is moved to an isolated, reverse airflow filtered room, an IV is started, and he is given an antiflu agent and acetaminophen. He has a sick few days, but early intervention works for him and the other residents that he may have otherwise exposed. In the absence of this intervention, he may have infected other residents producing several ED visits, hospitalizations, ICU intervention, and perhaps deaths.

The work to be done involves monitoring a large number of patients and carefully looking at the records generated. With a statistically significant sampling, a number of patient records will, in retrospect, indicate nascent flu. The records are examined for common divergences from baseline. Algorithms developed are then tested for their diagnostic competency. This is the work of predictive analytics where monitoring has shown value.[28,29]

CONCLUSION

E-health in all its facets (telehealth, telemedicine, digital health, and remote patient monitoring) invites monumental advances in healthcare delivery, surveillance, insight and quality management. In order to efficiently incorporate the expected advances, the healthcare community must work closely with information technology professionals. Neither side can work effectively waiting for the other to set the table. We have painted several examples of advances that can be reasonably expected to materialize over the next few years. Innovation management teaches that advances not synched with culture will face a difficult, time consuming path to acceptance. Think the EMR that, after 40 years, has still not meshed with the reluctant medical culture that eats innovation for breakfast.[30] It is incumbent upon all healthcare providers to understand what we can expect and share their enthusiasm and vision with each other, with every other healthcare worker and with their patients. This is the behavior most likely to change the culture of healthcare and usher in advances, with less patient-provider stress and with long successful strides right out of the gate.

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