Organizing Healthcare for Patient Needs vs. Our Provider-centric System

How do we best engineer a "system" composed of the people, place and products elements that we introduced last time that can deliver improved value-based care? A key step in engineering any large scale system is the development of a functional architecture that identifies system functional components and their interactions[1]. It defines how the functions will operate together to perform the system mission. Generally, more than one architecture can satisfy the requirements, and good systems engineers use abstract concepts such as internal "cohesion" of a component and inter-component "coupling" to compare alternative architectural approaches, typically seeking system functional architectures that are composed of highly cohesive/loosely coupled components[2].

Today's healthcare system could be viewed as a siloed "provider-centric" functional architecture, designed around medical disciplines (primary care, specialized medicine) and/or types of services (in-patient, out-patient, skilled nursing, etc.). When viewed through the lens of providers, such an architecture could be viewed as "highly cohesive" and "loosely coupled" across components. But when viewed through the lens of a patient seeking improved value based care, where interactions/teamwork between siloed providers is key to improved outcomes, the existing care delivery architecture is, at best weakly cohesive (e.g. patients may seek a second opinion from a specialist), and highly coupled (e.g. frequent high value interactions/coordination across multidiscipline providers on care team critical to outcomes).

We must move away from a system organized around what physicians and institutions "do" and towards a patient-centered functional architecture organized around what patients "need".

The systems engineering principles of "top-down" functional decomposition/allocation of high level system-level requirements (e.g. efficient delivery of measurable patient-centered improved outcomes) and "bottom-up" synthesis of existing siloed components (numerous organizational units, ranging from hospitals to physicians' practices to units providing single services) can be used towards definition of a patient-centered high quality functional health care system architecture[3].

The overarching goal of improved (holistic) value for patients combined with the complexity and inter-relationships of care associated with patients with complex medical conditions (e.g. diabetics with eye disorders, kidney, heart, foot conditions) drives the functional architecture to patient-centered components that cut across existing specialty-care silos and can deal with the entire set of care needed for a specific complex medical conditions such as diabetes or cancer that generally require team-based care. The high level functional components are selected to ensure high levels of care coordination for high value outcomes for common, complex conditions while supporting lower level interactions across components (e.g. across diabetes and cancer providers). Porter and Lee[4] call these **highly cohesive, loosely coupled** healthcare delivery architecture functional components "integrated practice units (IPUs)". Highlight desirable characteristics of IPUs include:

1) An IPU is organized/focused around a medical condition or a set of closely related conditions (or around defined patient segments for primary care). This feature constrains the informatics domain enabling effective use of domain-specific ontologies/terminologies, rules-based guidelines/protocols, machine learning for detection of effective patterns of care in data repositories of patients that share a common condition or closely related conditions, and effective measurements of value/outcomes.

2) Care is delivered by a dedicated, multidisciplinary team of clinicians who devote a significant portion of their time to the medical condition. In addition to the benefits of volume-based team learning, highly coordinated care in enabled through repetitive practice patterns that reduce unwanted variation in care and optimize value-based outcomes.

3) Providers see themselves as part of a common, cohesive organizational unit. The providers on the team meet formally and informally on a regular basis to discuss patients, processes, and results. A physician team captain or a clinical care manager (or both) oversees each patient's care process. Joint accountability is accepted for outcomes and costs. The team measures outcomes, costs, and processes for each patient using a common measurement platform.

4) The team takes responsibility for the full cycle of care for the condition, encompassing outpatient, inpatient, and rehabilitative care, and supporting services (such as nutrition, social work, and behavioral health). Patient education, engagement, shared decision-making and follow-up are integrated into care. The unit has a single administrative and scheduling structure. To a large extent, care is co-located in dedicated facilities.

As defined by Porter and Lee, "in an IPU (integrated practice unit), personnel not only provide treatment but also assume responsibility for engaging patients and their families in care…personnel work together regularly as a team toward a common goal: maximizing the patient's overall outcomes as efficiently as possible. They are expert in the condition, know and trust one another, and coordinate easily to minimize wasted time and resources. They meet frequently, formally and informally, and review data on their own performance. Armed with those data, they work to improve care—by establishing new protocols and devising better or more efficient ways to engage patients, including group visits and virtual interactions. Ideally, IPU members are co-located, to facilitate communication, collaboration, and efficiency for patients, but they work as a team even if they're based at different locations."

The authors also describe important cost benefits of the IPU architecture: "Providers are achieving savings of 25% or more by tapping opportunities such as better capacity utilization, more-standardized processes, better matching of personnel skills to tasks, locating care in the most cost-effective type of facility, and many others… Numerous studies confirm that volume in a particular medical condition matters for value. Providers with significant experience in treating a given condition have better outcomes, and costs improve as well….there are huge value improvement opportunities in matching the complexity and skills needed with the resource intensity of the location, which will not only optimize cost but also increase staff utilization and productivity."

Finally, the authors describe how IPUs would scale nationally: "…a hub-and-spoke model. For each IPU, satellite facilities are established and staffed at least partly by clinicians and other personnel employed by the parent organization. In the most effective models, some clinicians rotate among locations, which helps staff members across all facilities feel they are part of the team. As expansion moves to an entirely new region, a new IPU hub is built or acquired."[4]

IT as a force multiplier in an IPU architecture

This is perhaps the key component of the transformational strategy…the ability to develop an interactive supporting information system that performs as a "force multiplier" in enhancing the performance of the IPU. The IPU IT system follows patients across services, sites, and time for the full cycle of care, including hospitalization, outpatient visits, testing, physical therapy, and other interventions. Care coordination is enabled by the common platform since data are aggregated around patients, not departments, units, or locations. In effect the IPU can be considered a "community of interest", a term used by the DoD to define a collaborative group of users that exchange information in pursuit of its shared goals, interests, missions, or business processes using a shared vocabulary for the information it exchanges[5]. In an IPU, ontologies, terminology and data fields related to chief complaints, diagnoses, lab values, treatments, and other aspects of care are standardized in proper context (the clinical domain of interest to the IPU like diabetes, cancer, etc.) so that everyone is speaking the same language, enabling data to be understood, exchanged, and queried across the whole system.

IPUs also represent a form of "horizontal integration", another term used in the DoD that refers to the desired end-state where intelligence of all kinds flows rapidly and seamlessly to the warfighter, and enables information dominance warfare[6]. In our case, data from the entire care continuum is made available for optimal decision-making at the point-of-care.

The patient's medical record data should be available to all care providers to achieve the goals of integration. In addition to furthering care coordination, data registries across patients can be effectively used to "learn" from prior experiences of similar patients enhancing IPU care protocols and point of care decision support (e.g. patient safety alerting) systems since all patients in the IPU share a common context. Since the IPU scope includes improved value across the entire care continuum, the patient medical record is accessible to all parties involved in care including support clinicians (e.g. therapists, home nurses, pharmacists, patients and families) for enhancing outcomes. Integration occurs over the physical, temporal, organizational and functional dimensions, while adaptation occurs over the monitoring, feedback, cybernetic and learning dimensions.

Since the IPU is focused on a specific domain, context-specific templates make it easier and more efficient for the IPU teams to enter and find data, execute procedures, and use standard order sets, and measure outcomes and costs. Artificial intelligence systems (rules, machine learning, natural language processing) can help clinicians identify needed steps (for example, follow-up for an abnormal test) and possible risks (e.g. emerging infections that may be overlooked if data are simply recorded in free text, for example). Since the IPU is designed to deliver improved value/enhanced outcomes, the data needed to measure outcomes, track patient-centered costs, and monitor/control for patient risk factors can be readily extracted and put into patient context using structured terminologies and natural language processing. Such systems also give patients the ability to report outcomes on their care, not only after their care is completed but also during care (e.g. using telemonitoring devices) , to enable better ongoing clinical decisions.

Even in today's most advanced systems, the critical capability to create, extract and share such data remains poorly developed. Semantic interoperability remains an elusive goal in today's fragmented health IT environment relying on "standards" to achieve computable information exchanges. As a result, the value of IT in fragmented care coordination is diminished and measuring outcomes and costs across

providers is unnecessarily increased. A common IPU-based IT platform organically enables effective collaboration and coordination within IPU teams, while also making the extraction, comparison, and reporting of outcomes and cost data easier.

Thus, the IPU-based healthcare system components can be viewed as a well-engineered, integrated and adaptive set of people, processes and products, "supercharged with domain-focused informatics", and organized to encompass all services or activities that jointly determine success in meeting a set of patient needs, to efficiently and effectively deliver improved health outcomes to meet the highly diverse care (preventive/routine, emergent, acute, chronic, and palliative) needs and expectations of patients with specified conditions.

Transformational agendas such as creating IPUs will require sustained leadership/commitment to adoption of the goal of patient-centered value through formation of high-performance learning teams and associated processes/facilities dedicated to continuous measurable improvement in outcomes that really matter to patients. Current organizational reputations that are based on perception and adherence to processes and not actual outcomes will fade. Maintaining current cost structures in the face of demands for measurable value will be untenable….a new, significantly more effective and efficient delivery model is needed…..the IPU model may not be perfect and will involve tradeoffs such as reducing scope/refocusing of organizational services, or dealing with physical location inconveniences for example, but the potential for such "patient-centered horizontal integration" models, particularly if they enable the unleashing of the enormous power of "continuously learning" expert teams and digital data sciences in improved care resulting in improved outcomes, is true disruptive innovation in achievement of the vision of global leadership in value-based care.

[1] http://www.acqnotes.com/acqnote/careerfields/functional-architecture

[2] http://www.eng.auburn.edu/~dbeale/ESMDCourse/Chapter2.htm

[3] http://www.acqnotes.com/acqnote/careerfields/functional-analysis-and-allocation

[4] https://hbr.org/2013/10/the-strategy-that-will-fix-health-care

[5] http://link.springer.com/chapter/10.1007%2F978-3-642-14292-5_46#page-1

[6] https://fas.org/irp/agency/dod/jason/classpol.pdf