

## Electronic Medical Instruments For Patient-Centered Care

### Importance of Patient-Centered Care

Traditionally, medicine has been organized around the clinician and specialty, employing a primarily episodic and reactive approach to medical services. Recently, however, professional, policy, and healthcare market leaders have been generating momentum for a move toward “patient-centered care”— a model that elevates the patient’s involvement, preferences, and needs, and reorients the system around the patient.

As early as 2001, the Institute of Medicine (IOM) identified patient-centered care as one of its six aims for clinical quality improvement. The IOM defines it as “healthcare that establishes a partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients’ wants, needs, and preferences, and that patients have the education and support they need to make decisions and participate in their own care.”

This systematic shift has emerged from a combination of healthcare trends. Not only are patients and their families more motivated than ever to be active participants in their own care and decision-making, but there are now significant market rewards associated with patient involvement. For one, the growing trend of pay for performance is leading physi-

cian practices to focus on the need for improved quality of care in order to compete in the increasingly transparent marketplace. And the reimbursement systems currently utilized by Medicare and other payers are in grave need of revision to better reflect ongoing changes in health-care delivery. At the same time, more patients are being diagnosed with chronic conditions, treatment alternatives are multiplying, clinical decisions are becoming more complex, and relevant evidence is less available. Patients are likely to be seen by multiple clinicians and take multiple medications, leading to an increasingly fragmented web of providers and treatments, rather than a centralized hub. Clearly, quality improvement requires a new delivery system model, according to many industry and policy leaders.

As stated in the *Journal of Cardiovascular Nursing*, “when patients with HF [heart failure, or any chronic condition] have knowledge and skills needed to be adherent to treatment, other aims are also realized, such as effectiveness, efficiency, safety, and timeliness of care. Patients and families will be more likely to receive quality healthcare that promotes self-care when healthcare systems develop structures and processes that support customized care, patient control, and transparent sharing of knowledge” (Albert).

Reports by a growing number of health-care leaders confirm that a patient-

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centered practice delivers differentially effective care, and advocates cite a substantial body of research supporting the ability of patient-centeredness to create impressive, measurable results for patients and practices alike. A recent editorial published in the *Journal of the American Medical Association* describes this evidence base as “robust and supported by clinical trials that have demonstrated the desired outcomes” (Bergeson).

Multiple studies indicate that patient-centered care produces better clinical outcomes, greater patient and clinician satisfaction, reduced malpractice claims and greater patient loyalty to the clinician (Meryn, Roter, Lewin, Stewart). Results of patient-centered care in hospitals include improved public perception and increased market share — crucial advantages in the increasingly competitive healthcare marketplace (JCAHO).

### **Implementing Patient-Centered Care**

According to the IOM, an effective patient-centered care delivery model includes the following:

- The definition of clinical problems in terms that both patients and providers understand;
- Joint development of a care plan with goals, targets, and implementation strategies;
- Provision of self-management training and support services; and
- Active, sustained follow-up visits, telephone calls, email, and web-based monitoring and decision support programs (IOM).

Effectively operationalizing these patient-centered care objectives in a working practice requires new types of Internet-

based clinical “instruments,” or tools, which extend limited clinician resources in new ways. The central differentiator in this technology-based, patient-centered implementation is the concept of an interactive health communication. Interactive health communications encompass technology-mediated interactions in which a consumer, patient, caregiver, or professional interacts with or through an electronic device or communication technology: hereafter referred to as an electronic medical instrument or EMI, it provides access to or transmits health information, or provides guidance and support.

EMI interventions involve, support, and engage patients and their families in treating and managing their conditions between episodic encounters. EMIs are thus quite distinct from electronic medical records (EMRs), in that EMIs are intervention oriented while EMRs are documentation oriented. As such, EMIs serve as care delivery interventions with demonstrated effectiveness in improving outcomes and patient satisfaction, while EMR benefits typically relate more to administrative and safety issues.

Each functional requirement of patient-centered care is clinically implemented using a different electronic medical instrument class, as follows:

- The “Comprehension and Mindset” EMI class allows patients and their caregivers to understand their medical situation and choices outside of the confines of brief face-to-face encounters, and in a manner that facilitates engagement and motivation.
- The “Patient Decision Support” EMI class assists patients in making test or treatment decisions in a way that optimizes their satisfaction with and confidence in the quality of the decision. These tools facilitate the IOM

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**Electronic medical instruments can be used by clinicians to impact the patient’s mindset, knowledge, decisions, and behavior so as to amplify the effectiveness and quality of traditional medical therapies.**

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joint care plan development aspect of patient-centered care.

- The “Adherence Support” EMI class employs a customized series of information, communication, and support tools that instruct and persuade patients regarding adhering to the prescribed treatment plan, including post-care, follow up visits, medication regimens, and secondary prevention programs.
- The “Self-management” EMI class provides Internet delivery of the skills training and support resources needed to engage and motivate patients, families, and caregivers in managing chronic conditions. Portal-based secure messaging and transactions allow for more efficient and effective communication between patient and provider, as well as the capture of patient reported outcomes. These portals provide a platform for IOM’s recommendation regarding proactive clinician follow-up, and web-based monitoring and support programs.

### **Effectiveness of Electronic Medical Instruments**

The effectiveness of EMIs in terms of achieving appropriate patient-centered care outcomes has been measured and the evidence published in a substantial body of research. For example, the Cochrane Collaboration has published several substantive reviews regarding decision support, patient adherence and self-management instruments, including evidence regarding the comparative effectiveness of different instrument types and settings.

Five key principles of effectiveness can be distilled from this scientific and clinical domain. They are (1) tailoring, (2) access and interactivity, (3) relationships, (4) autonomy, and (5) incentives and feedback.

**Tailoring.** Tailoring refers to the customization of information to a particular patient, or sometimes to a patient subgroup (which is technically called targeting). Content, functionality, tool type, and media are common areas for tailoring, and demographics, health status, condition, and disease course often guide the tailoring process. An example of how heart disease information might be tailored is the provision of symptom management materials post-surgery for one patient, versus chronic illness management material for someone who has had and controlled the disease for many years.

**Access and Interactivity.** The degree and nature of an instrument’s accessibility to and interactivity with the patient user directly drive interest and usage, and, in turn, instrument effectiveness. For example, the unprecedented accessibility, convenience, and social networking capabilities afforded by the Web have been tied to higher potency. Research also indicates that employing multiple types of communication media and accommodating various health literacy levels is linked to effectiveness. Finally, more interactive instruments generate more user buy-in and usage.

**Relationships.** The relationship between information sender and recipient is crucial to effective impact. A trusted agent must deliver it and show caring toward the recipient. The emphasis should be on connectivity and community.

**Autonomy.** A sense of self-efficacy that results from the promotion of self-care skills allows the patient to feel in control of his or her own health. Fostering independence is not only essential to potent intervention, but has a positive effect on mental health.

**Incentives and feedback.** Providing patient incentives and feedback on progress

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operationalizes the active and sustained follow up that the IOM says must be a part of patient-centered care. Feedback data can be very powerful in increasing motivation, as can financial and other incentives.

These five principles can be translated into functionality requirements for each electronic medical instrument class (see Table). They thereby serve as a guide to designing, selecting, and implementing effective instruments, and are supported by a substantial base of published studies.

### **I. Patient Comprehension and Mindset**

Patients cannot feel empowered if they don't have a good understanding of their options and their condition; this requires the provision of patient education content in plain language and using a medium like the Web to encourage repeat access and sharing with family and caregivers.

The "patient comprehension and mindset" EMI class includes Internet tools that define clinical problems, tests, and treatments in "plain language" terms that the patient and their caregivers can understand. Comprehension and mindset Internet instruments securely deliver interactive content that provides explanations regarding a patient's specific medical situation. Objectives include improving patient and family knowledge levels, health literacy, confidence, and stress levels.

Intervening to shape mindset (e.g. attituded, beliefs, perceptions) is a critical role clinicians can play using these tools. Research indicates that for patients with some common chronic conditions, the patient's mindset or confidence is a stronger predictor of positive clinical outcomes than is their behavior. Thus, addressing how the patient thinks and feels about

their medical situation is an opportunity to potentially impact clinical effectiveness and outcomes.

The effectiveness of this subclass of instruments can be measured in terms of "endpoints" that include patient knowledge, sense of readiness or degree of anxiety, activation, confidence, and perceived ability to control outcomes. Each of these endpoints has been demonstrated to directly or indirectly improve outcomes, either clinical or patient reported. For example, cardiac education interventions have significantly and measurably impacted blood pressure and mortality (Mullen et al), while positive change in activation levels "is related to positive change in a variety of self-management behaviors" (Hibbard). One study correlated knowledge with readiness for reconstructive pelvic surgery, and others have correlated knowledge with patient-reported satisfaction (Kenton et al, Smith et al). Similar research revealed that perceived control of the target condition, such as asthma, resulted in improved quality of life (Olajos-Clow et al).

Affecting mindset is essential to creating potent instruments, as Beranova and Sykes say in the example of myocardial infarction (MI), "Past research shows that patients' beliefs and perceptions about their illness are key determinants of recovery after MI. Patients who believed that their MI would have more long-lasting consequences had greater levels of illness-related disability and their return to work was slower. Similarly, patients who believed they had less control over their heart condition were found to be less likely to attend cardiac rehabilitation."

**Tailoring** - The first way to address mindset is through tailoring, which happens through assessing patient knowledge, learning style, motivation, barriers, and

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needs. By addressing these and any functional and cognitive limitations or misconceptions, the educational interventions have a greater chance of success (Paul). Again with MI, tailored web information was superior to non-tailored and print materials in terms of self-efficacy, in one study (Kukafka et al).

**Access and Interactivity** - Building these instruments on a web platform allows anytime/anywhere/with anyone patient access, as well as tailored interactivity, both of which promote usage and utility. Research indicates these sorts of Web interventions can be even more effective than in-person training. Computer-based heart failure education increased patient knowledge more than nurse-

led education (Stromberg et al) in one study, and its use “is associated with improvements in patient satisfaction, better health outcomes, better compliance, more empowered patient decision making, and reduced medical malpractice” (Beranova and Sykes). Furthermore, when these interventions actively involve patients and carers in discussion and evaluation, versus passively providing information, there is a greater effect on patient mood and access (Paul).

**Relationships** - In order to optimally affect mindset, the intervention should come from a trusted agent and be free of perceived bias. Social support from peers and caregivers is important too. One study that assessed features engendering patient

Table – Five Potency Principles Across Four EMI Classes

	Tailoring	Access and Interactivity	Relationships	Autonomy	Incentives and feedback
<b>Comprehension and mindset</b>	Tailored to knowledge, motivation, learning style	Web-based, interactive, multi-media, proactive and repeated patient touches	Trusted agent without bias, free of advertising, expert review	Functionality facilitates self-pacing and self-customization, information imparts self-confidence	Proactive check-ins to assess status, behavior-modification based education
<b>Decision support</b>	Tailored to preferences, values	Web-based, interactive, and self-navigating; Multimedia; Patient can select level of detail, evidence, technicality; Secure messaging	Delivered by trusted agent – no biases (no ads), balanced views of trade-offs; Credibility of source, content recently reviewed, based on evidence; Social support from peers, family, caregivers	Explicitly guides treatment option trade-offs and application of personal values	Treatment plan “contracts” and shared decision making with clinician; Consumer Health Savings Accounts – financial benefits
<b>Adherence support</b>	Tailored to mindset (concerns, beliefs); Personalized communications; Target to stage of change or early non-adherence	Multiple approaches (e.g. behavioral, educational), touch points, types of media; Interactive telecommunication system between visits	Delivered by trusted agent who checks in every visit; Includes means for social support; Affective component; Virtual channel with provider for counsel; Spouse support	Model behavior with experienced patient accounts / training; Cognitive aids and reminders; Behavior skill training; Problem solving skills	Signed agreements and contingency contracts; Self-monitoring tools and progress reports
<b>Self-management</b>	Tailored to clinical situation, demographics, mindset; Cognitive model of costs and benefits; Dynamic content adapts to answers	Web-based, multiple proactive touches; Content continually changing	Trusted messengers; Communication with peers, ancillary providers, family; Story telling develops empathy, caring	As for adherence; Self-assessment and problem solving skills; Office visit preparation materials	Self-monitoring tools; Telemonitoring; Tailored feedback on progress

trust in these portals found that being free of advertising or commercial sponsorship and being regularly reviewed and updated by medical experts were critical indicators of trustworthiness (Kerr).

***Autonomy and Incentives, Feedback*** - The other two instrument functions linked to potency relate to promoting patient autonomy and providing usage incentives and motivational feedback. For example, instruments employing self-paced instruction with automated, immediate feedback facilitate autonomy and motivate. Moreover, instruments that drive autonomy through Internet dialogues that enable frequent “check-ins,” as well as use behavior modification-based education, have been shown to increase potency dramatically.

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## II. Patient Decision Support

The patient decision EMI class is designed to enable patient participation in decisions regarding their care, including whether to undergo testing and which treatment option to pursue. Consumers are being asked to take a more active role in their healthcare, from selecting a health plan to choosing among treatment options, often for fuzzy “preference-sensitive conditions” for which there are no significant, evidence-based differences between alternatives. These trends are driving support for “shared decision making” and “patient decision aids” that facilitate informed treatment decisions. Research suggests that 96 percent of patients prefer to be offered choices, asked their opinions, and included in the decision-making process (King).

Patient decision aids guide patients in the steps of deliberation and communication so that a choice can be made that matches their informed values. They are interactive media, video or audiotapes, or leaflets designed to provide high-quality, bal-

anced, and up-to-date information about treatment options and alternatives so that patients can make informed decisions about those choices. During the shared decision-making process, the patient reviews the decision aid and then discusses the risks, benefits, and his or her own personal values with the clinician. Together, the physician and patient determine how each treatment option coincides with the patient’s preferences for risk taking and health outcomes. After reaching a decision on treatment, the patient signs an informed consent form (King).

The endpoint of interest in decision instruments is patient satisfaction with the treatment, and decision quality.

***Tailoring*** - The more tailored the information is, the more relevant and thus potent. “There is strong and increasing evidence that patient decision aids are superior to standard counseling in improving patients’ knowledge and expectations about procedures, as well as improving patients’ perceived involvement, agreement between values and choice, and decisional conflict (Elwyn). According to a systematic review of more than 50 randomized clinical trials by The Cochrane Collaboration, decision aids help patients make informed choices consistent with their values and help make patients active participants in the decision-making process” (O’Connor).

***Access and Interactivity*** - In terms of access and interactivity, the more web-based and self-navigating the instrument is, the more effective. Experts have observed that optimal implementation of decision aids depends on usage of electronic infrastructures and tools to deliver the aids to patients, such as secure messaging (O’Connor et al.).

***Relationships*** - Social support and a credible source that provides a balanced view of

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**No one type of [adherence] intervention has been shown to be consistently superior to the others, but evidence suggests that interventions employing more than one approach are more effective (Roter).**

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trade-offs are recommended for potency.

**Incentive, Feedback** - Treatment plan “contracts” have recently been adopted and shown to be effective. The act of signing an agreement with their clinician tends to improve patient accountability and decision making.

### III. Adherence Support

The objectives of or endpoint “metrics” for adherence-focused EMIs include compliance with medication and follow-up, clinical and patient-reported outcomes, and quality of life.

**Tailoring** - Communications personalized for a patient and authored by their physician have been reported most effective, but even a personalized mailing from a health plan improved adherence by 17 percent in one randomized controlled trial of beta blockers post-myocardial infarction (Smith). Some researchers have argued that tailoring both the type of intervention and its messaging content to the patient is critical to its ability to successfully improve adherence. In a study of 810 hypertensive patients, Hopfield and colleagues identified six types of patient segments that predicted medication adherence, with category distinctions based on patients’ self-assessments regarding level of involvement in their care, knowledge of their condition and treatment, concerns about their condition, beliefs about the safety and efficacy of medications, and interactions with their clinicians. For example, matching the patient’s attitudinal segmentation to an intervention might entail focusing differentially on the seriousness of the condition, the benefits and safety of the treatment, or the implications of discontinuing the medication to optimally bolster adherence (Hopfield). Not only can adherence programs be tailored to patient-indicated

content and needs, but to stage of change or level of non-adherence.

**Access and Interactivity, Autonomy** - There are multiple approaches to access and interactivity in adherence instruments, including technical (focused on simplifying packaging and dosage regimens), behavioral (such as reminders and incentives), and educational (communications and technologies to improve knowledge and address concerns). No one type of intervention has been shown to be consistently superior to the others, but evidence suggests that interventions employing more than one approach are more effective (Roter). A multidisciplinary task force of the American Heart Association echoed this sentiment. Their report, *The Multi-level Compliance Challenge*, “details the reality that adherence must be addressed on several levels, including the patient, the provider, and the health care system. Patients need the knowledge, attitude, and skills to follow an appropriately prescribed regimen” (Ockene and Hayman et al). They also found that clear, written instructions were more effective than oral communications.

**Relationships** - Adherence is fostered by delivering information through the physician, the trusted agent who checks in at every visit and provides affective support and counsel. Spousal support is often integral to this stage. Practical social support has been found to be particularly powerful, but all types — cognitive, behavioral, and affective — are advantageous. Some researchers have suggested having experienced and successful patients work with healthcare providers to share their own tips and tricks that facilitated their own adherence, thereby bestowing this knowledge on other patients (van Dulmen et al).

**Incentives, Feedback** - Signed agreements, contingency contracts, and financial incentives have been tied to better adher-

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**Application of multiple potency principles - The highest degree of potency is reached via comprehensive Web interventions that combine cognitive, behavioral (reminders and incentives), and affective (empathy, concern, support) strategies.**

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ence, as have self-monitoring tools and progress reports.

#### **IV. Self-management Support**

Self-management support instruments facilitate and advance the clinician's ability to deliver patient instructions for self-care and management skills, based on best practices, and to arm the patient with a sense of control and self-efficacy. Self-management can also be defined as the patient's ability to make behavioral changes over time, such as decreasing dietary sodium or initiating and maintaining an exercise program. As with adherence, endpoints tend to include clinical outcomes, quality of life, lifestyle changes, and perceived sense of control.

One of the prototypes for self-management instruments is an interactive health communication application, or "IHCA", which includes software modules that interface with the patient end user. The important defining feature of an IHCA is that it does not simply provide health information, but combines such information with at least one (and frequently more than one) additional service. This additional service can be decision support, behavior change support, or peer support. *HeartCare* and *HeartLink* are two prominent examples in cardiology. The addition of a patient portal with results for tracking progress takes the IHCA concept one step further by incorporating other services such as patient peer groups, online message boards, or family discussions.

**Application of multiple potency principles -** The highest degree of potency is reached via comprehensive Web interventions that combine cognitive, behavioral (reminders and incentives), and affective (empathy, concern, support) strategies.

**Tailoring -** They can be tailored to the

clinical situation, demographics, and mindset through dynamic content that adapts to the patient's answers. Research indicates that personal relevance and motivation – which can be achieved via tailoring – were top indicators of whether the user would return to and act on the intervention (Brouer et al).

**Access and Interactivity -** When these programs are web-based and allow for multiple proactive touches as well as continually changing content, they also meet the criteria for potent interactivity and accessibility.

**Relationships -** The research on social support and relationships as they pertain to self-management is vast. Empathic communication between the patient and nurse or case manager, secure messaging, and discussion groups that are available online 24 hours a day are all very effective. The *HeartLink* program, for example, a web-based education and support solution for secondary prevention of coronary heart disease, resulted in significant reduction in cardiac events and greater weight loss (Southard et al).

**Autonomy and Feedback -** As with the other support interventions, self-management instruments become potent when the patient feels autonomous. The teaching of problem-solving skills as well as "an empowered approach [that provides] a combination of knowledge, skills, and heightened self-awareness regarding values and needs, so that patients can define and achieve their own goals" one particularly effective (Tavafian et al). Some other ways that autonomy can be worked into web interventions for self-management are the provision of office visit preparation materials, self-assessments and self-care skills, medication reminders, and specific behavior skill training. Signed contracts, telem-

onitoring, and tailored feedback bolster these programs as well.

## Conclusion

How a clinician interacts and communicates with a patient is at an inflection point. With a new focus on measuring and rewarding clinical performance, and a burgeoning evidence base linking the degree and quality of a patient's involvement to their outcomes, a mandate for patient-centered care has surfaced. As a corollary to this mandate, clinicians require new approaches and new tools for including the patient in "the center" of their care. With a concomitant constraint on resources, automated Internet applications have emerged as the core platform solution. We have introduced the term "electronic medical instruments" or "EMIs" to describe this new field of electronic clinical applications. EMIs include four basic classes of instruments – (1) patient comprehension and mindset; (2) patient decision support; (3) adherence support; and (4) self-management support.

Most clinicians are likely unaware that a relatively mature scientific foundation exists to guide the design, development and implementation of EMI instruments. Five central principles denote what makes these instruments effective or "potent." They include the degree to which an instrument is **tailored** to a particular patient segment, engages through improved **access and interactivity**, facilitates sup-

portive **relationships** with the patient, encourages patient **autonomy** or sense of control, and integrates some form of **incentive or feedback** related to adoption and usage of the instrument. The published literature is replete with studies demonstrating that instruments designed and developed in concordance with these potency principles resulted in superior outcomes. As electronic medical instruments are further disseminated throughout clinical care, practitioners have a solid scientific base to guide their adoption and implementation.

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