

Forum

## Accelerating the Use of Best Practices: The Mayo Clinic Model of Diffusion

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Diffusion of strong evidence-based practices in the health care system in the United States is all too often measured in decades rather than months.<sup>1</sup> The challenge of moving translational research to the bedside has challenged health care organizations for years. For example, it took 25 years for the evidence-based practice of beta-blocker administration after an acute myocardial infarction to reach a penetration of 85%.<sup>2</sup> The ability to consistently bring innovations and best practices to scale across entire systems will be a hallmark of the successful health care organizations of the future.

The mission of Mayo Clinic, which provides care at 18 major sites and 24 hospitals across six states, is “to inspire hope and contribute to health and well-being by providing the best care to every patient through integrated clinical practice, education and research.”<sup>3</sup> In translating the mission into everyday practice, we have challenged ourselves with the expectation that every patient receives the best care we collectively know how to provide. The Mayo Clinic Value Creation System is a coherent system engineering approach to delivering a single high-value practice to meet the needs of the patient. This methodology consists of four tightly linked phases—alignment, discovery, managed diffusion, and measurement.<sup>4</sup> In identifying and implementing best practices,<sup>4,5</sup> it became clear that the diffusion of these best practices was the next hurdle we needed to address.

The Mayo Clinic Model of Diffusion embraces engineering principles, leverages spread techniques, and establishes the appropriate cultural environment. In this article, we describe the model’s development, which has entailed learning from the literature and other organizations on an ongoing basis, and the model’s three primary enablers and five key elements.

### Learning from the Literature

According to Rogers, diffusion is the process by which innovations—ideas, knowledge, or processes—are communicated among the members of a social system such as a health care organization.<sup>6</sup> Diffusion can occur virally as a form of social con-

tagion. Because diffusion is measured by the behavior of social system members, it can occur seemingly spontaneously, either as a response to purposive dissemination or not. Thought leaders may promote adoption; if early adopters notice and communicate with their peers and near-peers, diffusion—the spread of the new idea into practice—may result.

An influential study from the 1960s of the diffusion of mathematics teaching methods in Allegheny County, Pennsylvania, showed the importance of interpersonal communication to diffusion.<sup>6,7</sup> This new approach, an evidence-based improvement on the “old math” approach, was widely endorsed yet only slowly adopted across the United States. In Pittsburgh, diffusion occurred more quickly—in five years—across 38 school districts, through a preexisting network among superintendents.<sup>6,7</sup> Yet such models of passive diffusion are not acceptable to ensure that patients receive the very best knowledge and care the health care community has to offer.

According to Øvretveit, in diffusion, best practices are naturally adopted in the absence of efforts to “push” them into practice.<sup>8</sup> In contrast, we have chosen the term *managed diffusion*, with the goal to spontaneously push best practices to all sites as a natural part of the way in which work is done throughout the system). We believe that “spread” structures and strategies,<sup>8</sup> including the Institute for Healthcare Improvement (IHI) Framework for Spread,<sup>9,10</sup> while helpful in promoting implementation of best practices, are insufficient in achieving managed diffusion. The time and resources necessary to formally create projects to spread each new best practice is not sustainable. This might work well for, say, 5, 10, or even 50 best practices, but when trying to transform to an integrated delivery system across multiple sites, a new more spontaneous approach is required.

Greenhalgh et al., in a review of literature on the diffusion of innovations in health service organizations, summarized data from 213 empirical studies and 282 nonempirical studies.<sup>11</sup>

The review yielded several key elements needed for diffusion, such as having proper leadership and top management’s involve-

ment; harnessing the opinion leaders' influence; and most importantly, the development of formal dissemination programs and the creation of the appropriate system antecedents for innovation (for example, information technology [IT], organizational structure). Greenhalgh et al. drew on 4 meta-analyses and 15 empirical studies to conclude that an organization will assimilate innovations more readily if it is large, mature, functionally differentiated, and specialized with professional knowledge and has resources to channel into new projects and decentralized decision-making processes.<sup>11</sup>

Most of the literature included in the Greenhalgh et al. review focused on diffusion or spread within a single site.<sup>11</sup> However, system-level diffusion is now increasingly prevalent, with the increasing trend toward larger health care systems or organizations with multiple sites. The introduction of accountable care organizations at the regional levels will require an increasing number of organizations to become adept at system level sharing.<sup>12</sup> Reports of spread in large systems include those pertaining to Kaiser Permanente's improvement of care for patients with sepsis<sup>13</sup> and Ascension Health's efforts to reduce the incidence of health care-associated pressure ulcers.<sup>14</sup>

### **Benchmarking Other Organizations**

Our approach to developing the Mayo Clinic Model of Diffusion included not just ongoing review of the literature but, since 2004, benchmarking with more than 30 leading organizations in health care and other industries. As part of this process, we made site visits to Cargill, 3M, Federal Express, and General Electric. The challenge of diffusion exists at multiple levels. For example, it can be challenging to standardize best practices within a single hospital, particularly when dealing with a multitude of disparate specialty practices that are not part of the hospital organization. Diffusion has been reported at the regional (for example, the Michigan Keystone ICU efforts<sup>15</sup>), national (for example, the IHI 100,000 Lives/5 Million Lives Campaigns<sup>16,17</sup>), and international (for example, the World Health Organization Surgical Safety Checklist<sup>18</sup>) levels. Diffusion at the system level is common in other industries or business sectors, such as hotels, national food chains, banks, and the auto industry, but is infrequent in health care. Selected examples can be found in the previously cited efforts to standardize best practices such as those addressing sepsis at Kaiser Permanente<sup>13</sup> or pressure ulcers at Ascension Health.<sup>14</sup>

### **Three Primary Enablers**

Effective diffusion necessitates coherent efforts with three primary enablers: culture, engineering, and infrastructure/systems support.

### **CULTURE**

The cultural aspect of managed diffusion must be acknowledged and leveraged for success and long-term sustainability. The concept of autonomy among health care providers and facilities in which they work has been in place for many decades. Shifting toward a model of teamwork within an integrated system is necessary if managed diffusion is to be accepted and embedded in the care of patients. To be successful and sustainable we must accept the following:

- Accept standard work as the most patient-centered practice.
- Accept standard work as the steady-state foundation for improvement and innovation.
- Accept a psychologically safe environment as patient centered.
- Accept an enterprise network that engenders intra/intersite trust as patient centered.

"Boundarylessness," a business practice introduced by General Electric CEO Jack Welch that refers to a receptivity and openness to ideas, no matter their source,<sup>19</sup> can be applied to an active search beyond one's immediate confines for best practices when approaching problems. It is a model for successful diffusion and an attribute of a learning organization.<sup>19</sup>

Leaders, who play a key role in managed diffusion, should establish the expectation for adoption and dissemination of important learning. At Mayo Clinic, we support diffusion through job descriptions and performance review criteria. Some 28,954 (47.3% of the entire workforce of 61,177) have become Mayo Clinic Quality Academy-certified Quality Fellows, and a key part of this training is the understanding of the value of standardized best practices and boundarylessness. This group of quality fellows has become the informal leadership that helps drive frontline change on a daily basis.

### **ENGINEERING**

After the cultural bed is planted, the core work of discovering and diffusing the preferred care process model can take root. As we reviewed our previous efforts, we recognized that we had been using a variety of different approaches, as shown in Table 1 (page 169). Each approach had benefits, but they were insufficient to provide consistent and complete managed diffusion. We learned that these various approaches work well for the process of discovering and learning new best practices, and we continue to use them for that purpose. However, we have found that each approach lacks consistent infrastructure (for example, standardized order sets, common repository of best-practice description, training methods), and clearly defined processes for managing the implementation, which led to less-than-comprehensive diffusion

Table 1. Mayo Clinic Approaches to Discovery and Diffusion

Mayo Clinic Approach	Brief Description	Pros	Cons
Internal Collaborative	Teams from each site work independently but learn from each other.	Inexpensive Requires little planning or structure	Slow to diffuse Inconsistent results
Noah's Ark Model	Assemble an enterprise team with roughly two colleagues from each operating entity. The group is charged to discover and diffuse a best practice.	Builds trust and relationships Broad-ranging input	Cumbersome Expensive Slow to diffuse
Alpha-Beta Model	A team from a single site defines best practice, with expectation that others will adapt.	More efficient and expedient Provides proof of concept Sets stage for diffusion	Feels more "top down" Limits site engagement
Adopt External Practices	Seek evidence-based best practices from other health care organizations, national groups, professional society, government, etc.	Expedient Can provide broad base of research	Needs to be adapted to local conditions May lack credibility with local experts Limited insight on how to diffuse
Grassroots	Discovery at one Mayo Clinic site, with natural diffusion to all entities.	Trust is built through relationships and experience. Doesn't require structure or formal approvals	May not lead to a single standard practice Can be slow to diffuse Implementation is variable.

across all sites. Too many times, after we had thought that a best practice was fully diffused, we would find that one, two, or even more sites didn't complete the effort or that the "best practice" that a hospital had implemented was different from what we expected, as was the case, for example, with the insertion and maintenance practices for central line-associated bloodstream infection. Such experiences led us to conclude that we would need to use a systems engineering methodology to ensure a disciplined implementation of care process models. The engineering work includes staffing, facility and work-flow analyses, human factors and usability studies, technology, outcomes/impact evaluation, process reengineering, and workload modeling. To support this work, tools such as flowcharts, checklists, control charts, and accountability matrices are used; for example, the Diffusion Work Flow Chart (Appendix 1, available in online article), the Diffusion Checklist (Figure 1, page 170), the Status Tracker (Figure 2, page 171), and the Risk Analysis (Table 2, page 172).

#### INFRASTRUCTURE/SYSTEMS SUPPORT

Infrastructure/systems support is necessary to ensure that the "right thing to do" is the "easy thing to do." IT in health care has become a critical element of fulfilling this need, yet is itself diffusing slowly.<sup>20</sup> Ensuring that every patient receives the very best care can sometimes be daunting to achieve, when doing the right thing every time may seem impossible during the busy daily life of providers. When confronted with the challenge of staying current on the latest knowledge from one's area of ex-

pertise (with delays of months if not years in conferences and journals), complying with external measurement and practice requirements, and understanding the protocols of the local facility, it is easier to understand why the traditional diffusion of best practices is a long-term endeavor.

Our intention is that within six months after determination that an innovation has been established as a Mayo Clinic best practice, that it is diffused to all 24 hospitals (in the case of an inpatient process or system). As a result, we identified a number of key infrastructure areas to target, as follows, if we are to achieve full diffusion within our six-month target:

- **Leadership/organization structure.** Consolidated leadership needed to be in place with the authority to standardize the practice.

- **Information technology.** All Mayo Clinic sites now have fully functional electronic medical records in place with the ability to readily share patient information. Current efforts are focused on expanding functionality, consolidating departmental systems, creating order sets, and developing rules/alerts to assist the practice.

- **Education.** We have learned that it is necessary to provide real-time education and decision support at the time that care is being delivered to inform staff of the latest standards and best practices. AskMayoExpert, a system developed in-house to meet this growing need, provides clearly documented care process and education resources, timely feedback based on critical results, and contact information regarding Mayo Clinic experts on selected topics. At the click of a button, one can learn from Mayo

## Mayo Clinic Model of Diffusion Checklist

### Sponsoring Body

Ensures defined requirements, readiness, and enterprise acceptance are in place prior to launching diffusion efforts. Prioritizes, commissions, staffs, resources, and provides oversight to diffusion projects.

### Diffusion Readiness

- Verify Best Practice successful in at least one Mayo Clinic site
- Confirm Best Practice vetted in the appropriate sites that will implement the change
- Provide goal and aim statement
- Ensure metrics are attainable in a sustainable manner
- Define the key principles for the project—what aspects of the practice need to stay in place and where can variation be allowed
- Allocate budget as needed
- Assign Champion, Administrative, and Physician Leader(s)
- Communicate upcoming diffusion to organization

### Diffusion Oversight

- Perform reviews and grant approval to initiate, plan, execute, and close
- Approve local adaptations/customization
- Remove barriers

### Enterprise Diffusion Manager

Oversees the roll-out, coordinates resources, and tracks status. Local diffusion resources are considered part of the Diffusion Team.

- Verify Best Practice in standard format
- Confirm diffusion readiness
- Complete Diffusion Project Charter; gain approval to plan and execute
- Coordinate diffusion budget allocation and resourcing
- Complete stakeholder analysis
- Develop and manage Project Plan
  - o Develop and implement Change Management Plan
  - o Develop and implement Communication Plan: communicate early and often
  - o Establish and monitor Diffusion Project timeline
- Submit status updates
- Close and archive project

### Diffusion Team

Enables the implementation at the local areas/sites

- Define and complete infrastructure elements—for example, AskMayoExpert, forms, IT changes (for example, decision support rules), order sets, public affairs/communication
- Complete readiness assessment and stakeholder analysis
- Create local project plan
- Identify key messages and messengers (“elevator speech”)
- Establish education and training plans
- Coordinate implementation plan with go-live support
- Provide status updates
- Develop self-assessment tool for the work units
- Conduct on-site audits, if necessary
- Monitor implementation and sustainment metrics

### Operational Owners/Work Units

Implement and monitor the daily usage of the Best Practice

- Communicate changes and impact to staff/local areas
- Implement the Best Practice
- Act as a liaison with the implementation team to identify and address barriers
- Operationalize, reinforce, and monitor the adoption of the Best Practice

### Information Technology Liaison

Helps define, coordinate and insure implementation of IT system updates

- Understand the expectations (system requirements) and specific system(s) impacted
- Facilitate review, approval, and prioritization processes of work by appropriate oversight group (ESOC of portfolio owners for EMR applications and other systems; other groups for system enhancements)
- Facilitate communication between the project and impacted application teams, including:
  - o Prioritization and allocation of resources for the project
  - o Estimated date of availability
  - o Work completion confirmation

### Infrastructure Support (for example, Public Affairs, AME, Finance, Patient Education)

Updates infrastructure to enable roll-out and maintenance of Best Practice

- Understand the Best Practice infrastructure needs for education and knowledge management
- Ensure resources allocated for the project
- Coordinate and obtain necessary approvals for the project within the infrastructure domain
- Prioritize and resource the project
- Test infrastructure changes to verify proper functioning
- Confirm work completed and meets needs

### Best Practice Owner

Provides ongoing knowledge expertise and serves as the “go-to” resource

- Review Best Practice on a routine basis for effectiveness and continuous improvement
- Review literature on a periodic basis for Best Practice updates
- Communicate recommendations for Best Practice improvement to MCCPC/Specialty Council
- Update Best Practice, Care Process Model, policies, and education as needed

### Measurement Coordinator

Provides support for the Best Practice/ Diffusion Project newly authorized charter by assisting with planning for the key metrics

- Review research, prior performance, or baseline data to advise the team on key metrics and a measurement plan
- Work with Diffusion Team to establish applicable infrastructure to support measurements for the short- and long-term needs of the diffusion project
- Organize and coordinate data collection efforts in alignment with the accepted Measurement Plan
- Provide support for data analysis and application to the new practice method or process
- Establish timely and accurate reports for team members
- Collaborate on the process for ongoing measurement and hand-off with Best Practice owner
- Incorporate education or training related to ongoing measurement and key metrics for vital stakeholders
- Establish timelines for periodic metric review with Best Practice owner with ongoing measurement and updating

Figure 1. The Best Practice is operationalized in work flows, knowledge management systems, and monitoring. IT, information technology; ESOC, Enterprise Systems Oversight Committee; EMR, electronic medical record; AME, AskMayoExpert; MCCPC, Mayo Clinic Clinical Practice Committee.

## Mayo Clinic Model of Diffusion Status Tracker (Sample)

Diffusion Status Tracker	Enterprise Diffusion Readiness Status	Implementation				MCA	MCF	MCR	MCRS
		Planned Start	Expected Finish						
<b>2010 Continuation</b>									
Central Venous Catheter					★	★	★	★	★
RN Bedside Handoff (SHARE Rounds)					★	★	★	★	★
HAI - C. Difficile					★	★	★	★	★
<b>2011 Quality Tier 1</b>									
Obstructive Sleep Apnea - Dr. Gall		2010	Q1 2012		■	■	■	■	■
VTE - Prophylaxis - Dr. Morgenthaler		Q1 2011	Q4 2011		■	■	★	■	■
Sepsis Bundle (AME) - Dan Bidinger	A	Q3 2011	Q4 2011		■	■	■	■	■
CAUTI - Dr. Orenstein		Q1 2011	Q2 2012		■	★	■	■	■
30 Day Readmissions - Dr. Dawson	B	Q3 2011	Q4 2012						
Intubation - Dr. Diedrich	B	Q3 2011	Q2 2012						
Recognition of the Deteriorating Pt Simulation - Dr. Zimmerman		Q1 2012	Q4 2012						
<b>2011 Quality Tier 2 - Potential Diffusion</b>									
HAI - MRSA		N/A	N/A		□	□	□	□	□
Chronic Disease/Care Management Outpatient		N/A	N/A		□	□	□	□	□
Diamond Depression		N/A	N/A		□	□	□	□	□
<b>2011 Manage to Reimbursement</b>									
Blood Utilization - CV Surgery	C	Q1 2012	Q4 2012		□	□	□	□	□
CVS - 20	A	Q1 2012	Q4 2012		□	□	□	□	□
RED		Q3 2012	Q3 2013		NA	□	□	□	□
Transplant - Kidney		Q3 2012	Q3 2013		□	□	□	□	□
Urology		Q3 2011	Q3 2013		□	□	□	□	□
Cancer		TBD	TBD		TBD	TBD	TBD	TBD	TBD

★ Completed   ■ On Target   ◊ Underway, but behind schedule   ⊕ High risk of not meeting plan   □ Planned diffusion   ◻ Potential diffusion  
 A - Ready   B - Planning Underway   C - Significant Gaps

Figure 2. Senior leadership uses the Status Tracker, which is updated by the Enterprise Diffusion Manager, to monitor progress on all active projects. The grid shows whether an individual project is on track for diffusion and whether certain sites are struggling with implementation issues. (Color version available in online article.)

Clinic's foremost experts what the current knowledge is, for example, regarding long QT syndrome, and can page them with a mouse click.

■ **Measurement.** The metrics of success typically occur at multiple levels, such as the percentage of staff educated on the best practice, compliance with process measures where appropriate, and tracking outcomes to determine if the best practices are improving the ultimate care of patients. We have also found it beneficial to routinely track financial impacts to reinforce the finding that improved quality can in fact reduce costs.<sup>21</sup>

■ **Center for the Science of Health Care Delivery.** This research-based group was established to assist in analyzing care and the standardized practices to ensure that they truly provide the best care. This group also assists in publishing to diffuse knowledge beyond the Mayo Clinic boundaries.

The key infrastructure components of a managed diffusion system require oversight, ownership, planning, education and awareness, a clinical knowledge management system, and the ability to meet specific needs associated with the practice (for example, equipment, supplies, IT system support). It is important to note that many changes, such as in policies and education, can and do occur across systems without this level of structure or support. However, our experience has shown that

the more complex practice changes do not occur without it.

## Five Key Elements

We have identified five key elements for managed diffusion: leadership, Value Creation Teams, diffusion actions, operational implementation, and best practice review and maintenance (Figure 3, page 172).

### LEADERSHIP

There are three ways in which knowledge or a care process model may diffuse within a social system. One is when the decision is optional, which would entail a spontaneous “passive” diffusion throughout a social system—as in, for example, sharing a safety alert that informs staff of an error that may have been reported at another site without explicit expectations about implementing a standard practice. The second is a collective decision, in which choices to adopt or reject an innovation are made by consensus among the members of a system. After a decision is made, all units within the system must usually conform to that decision. The third means is the authority decision, in which choices to adopt or reject an innovation are made by relatively few individuals in a system who possess the power, status, or expertise.<sup>6</sup> The key care process models that we decide to disseminate through our managed Model of Diffusion are a combination or hybrid of collective and authoritative institutional decisions.

Mayo Clinic has substantially reorganized its practice oversight to support and facilitate the concept of a single high-value practice. Since 2008 a single Clinical Practice Committee with practice (physician and administrative) leaders from each major campus has had oversight and authority for practice activities across all sites. A significant amount of capital and operational funding has been consolidated under the auspices of this group, which reinforces its authority. In addition, new groups—the Specialty Councils—are in place across all major clinical areas. These councils consist of 10 to 15 individuals, including department chairs, nursing, and administrators from each site that provides care of a particular type (for example, orthopedic surgery, neurology, infectious diseases).

### VALUE CREATION TEAMS

Value Creation Teams lead the discovery process that starts with divergent thinking (that is, generating new unique ideas) and then moves to convergent thinking (combining and selecting from many unique ideas into the best practice or outcome). The discovery process, having ended with convergent thinking, now moves via diffusion into an organization that has a natural

Table 2. Mayo Clinic Model of Diffusion Risk Analysis\*

**Potential Challenges/Risks for Diffusion Initiatives**

By anticipating potential risks, the organization can take early actions to mediate them. The following are areas of concern that have been identified.

1. Documentation of the Best Practice and required support elements
2. Identification of long-term Best Practice ownership
3. Measurement/reporting infrastructure (baseline, implementation, and ongoing)
4. Information Technology:
  - a. Approval process—centralized versus site-specific approval and prioritization of required changes
  - b. Timely changes to EMR and departmental systems to support new process flows; standardization across sites (for example, order sets and rules/alerts)
5. Physician category time (FTE designation) to participate in diffusion initiatives and 90-day calendar delay due to physician clinical schedules
6. Competing priorities affecting ability/timeliness to diffuse (bandwidth)
7. Cultural acceptance of standardized work

\* EMR, electronic medical record; FTE, full-time equivalent.

**Mayo Clinic Model of Diffusion: Spreading & Standardizing Excellence**

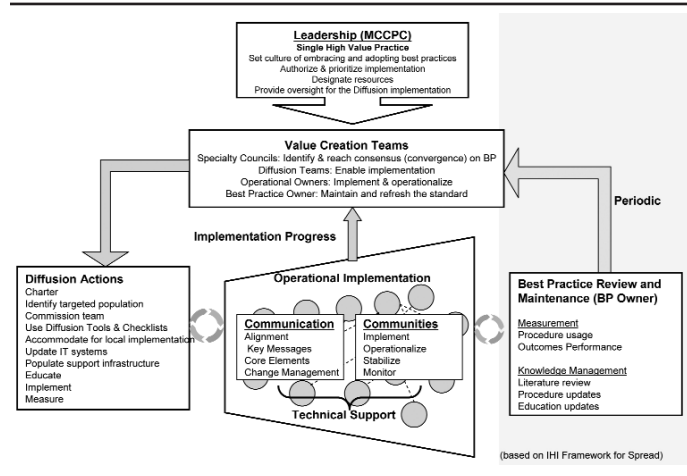


Figure 3. This figure depicts the five key elements of the diffusion model and how they relate to one another. Leadership groups such as the Mayo Clinic Clinical Practice Committee or Specialty Councils may initiate the development of a new best practice, or it may evolve from frontline staff. After a best practice is identified and approved, the expectation is that it will be broadly diffused and constantly monitored and updated as necessary. MCCPC, Mayo Clinic Clinical Practice Committee; BP, best practice; IT, information technology. Adapted from Massoud M, et al. A Framework for Spread: From Local Improvements to System-Wide Change. IHI Innovation Series white paper. Cambridge, MA: Institute for Healthcare Improvement, 2006. (Available on www.IHI.org.)

propensity, like any organization, to be divergent and resistant. Organizations also have a natural tendency toward variation. The managed diffusion process is an organizational tactic to make best practices known and thus counteract non-patient-centered variation. This is accomplished through the development of a proposed best practice by the Value Creation Teams, each of which is led by a frontline expert. Diffusing a best practice may entail care process models, clinical decision support rules, communications, forms, order sets, protocols, patient education material, policies/procedures, staff education materials, specific equipment/supplies/technology, and measurement plans and reports. After the teams have thoroughly vetted and documented the best practice, it goes to the Specialty Council if it is a specialty-specific practice (for example, knee replacement) or the Clinical Practice Committee for more generic practices that affect many specialties (for example, warfarin management) for final approval. There are now more than 50 Specialty Councils (for example, orthopedics, transplant, neurology) in place. These groups, each of which represents the entire enterprise, consist of members appointed by the Clinical Practice Committee, from all major sites.

**DIFFUSION ACTIONS**

After a clearly documented best practice is approved, it moves

into the managed diffusion phase. The early diffusion activities tended to follow a structured spread formula. A physician leader is identified, and a diffusion team is formed with other members (for example, clinical staff, project manager, systems engineering analysts, IT liaisons, measurement coordinators) as appropriate. This team formalizes the implementation plan with time lines, accountabilities, and so on. The Diffusion Work Flow Chart (Appendix 1, Diffusion Checklist (Figure 1), Status Tracker (Figure 2), and Risk Analysis (Table 2) are all part of the toolkit used to ensure that this process is managed and complete. It is also during this stage that the practice is entered into AskMayoExpert; any order sets, rules, or alerts would be completed; and training materials prepared. Diffusion managers at each site shepherd this diffusion process, serving as “agents” to help carry out the change. They work with the practitioners who established the best practice to ensure that a free flow of the new knowledge, help manage and promote the change, address the resistance inevitable with any change, and work with local clinical and administrative champions for a smooth transition to the new level of service. Diffusion managers drive and monitor the progress of the diffusion and ensure assessment of the improve-

ments in the standard of care until they are fully in place among the designated work units.

### OPERATIONAL IMPLEMENTATION

Operational implementation involves the work necessary for communication, training, and management of local issues necessary to complete the diffusion. Spread focuses on the tactical steps needed to move from a current state to a future best practice, while change management focuses on the people side of change. An important component of the operational implementation is an effective change management plan. Change management ensures that individuals are aware of, understand, and accept/buy-in to the change, and have the ability to make and sustain the change in their daily work. Mayo Clinic uses the ADKAR change management model,<sup>22</sup> as follows:

- Awareness—of need for change
- Desire—to participate and support the change
- Knowledge—how to change
- Ability—to implement required skills and behaviors
- Reinforcement—to sustain the change

Understanding and leveraging social networks is critical for effective diffusion. Social networks are enhanced if site leadership sets an unambiguous expectation for accepting diffusion with minimal or negligible reinvention locally. Local ownership for the implementation is critical for initial success and ongoing sustainability. The Mayo Clinic governance structure includes enterprisewide committees, specialty councils, and administrative shared services that are responsible for diffusion. These groups also establish collegial interpersonal relationships that pay dividends in creating cultural acceptance of diffusion.

### BEST PRACTICE REVIEW AND MAINTENANCE

Establishing clearly defined measures of success is a critical element of success for every best-practice project. These measures typically take the form of process compliance and outcomes metrics to ensure that the practice is achieving the desired goal. After the new practice is firmly entrenched, which requires an average of 18 months, it is critical to have a mechanism to revisit the practice periodically to ensure that it is current and relevant. We assign long-term best-practice owners (typically, the physician leader of the diffusion effort) to monitor the literature, to review the metrics on a regular basis, and to generally stay informed on other activities that may warrant changes to the best practice. They then have the authority to modify the practice in small ways or to reconstitute a Value Creation Team, if necessary, to update the practice.

The Mayo Clinic Model of Diffusion is a hybrid centralized-

Table 3. Mayo Clinic Standardized Best Practices

#### Diffused as of December 31, 2012

- Central Venous Catheter Insertion and Maintenance Practice Standardization
- RN Bedside Rounds (Shift Handoffs)
- *Clostridium difficile* Prevention
- Orthopedic Knee and Hip Protocols
- Obstructive Sleep Apnea.
- Sepsis Resuscitation Bundle
- Venous Thromboembolism Prophylaxis
- Catheter-Associated Urinary Tract Infection (CAUTI)
- Mortality Management for Deteriorating Patients
- Preventable Harm Metric
- Intentional Rounding by Nursing
- Warfarin Management
- Long QT Syndrome Alert and Decision Management
- Airway Management—ICU Intubation
- Computerized System for Quality Monitoring
- Value-Based Purchasing Measures Compliance

#### Other Initiatives in Process

- Medication Administration with Bar Codes
- Unit-to-Unit Handoffs
- 30-Day Readmissions
- Blood Utilization

decentralized system. In a pure centralized system, all ideas emanate from central research and development and are spread by a change agent to the operating entities. In such a model, the Clinical Practice Committee assigns a discovery team to determine a best practice and spread it. A purely decentralized model is one in which local innovators make improvements in practice and in which the best practice is then passively diffused to other entities during an extended period. Most practices that Mayo Clinic is diffusing are ideas, discoveries, and innovations from the front line. To have patients at each of our 24 hospitals benefit from these practices in a timely manner, we have found it necessary to have a formal managed methodology for diffusion, measurement, and control, as represented in Figure 3.

Implicit in the establishment of the Model of Diffusion is a progression from suggesting that colleagues adopt a best practice to expecting that they do so. A list of the diffusion initiatives is presented in Table 3 (above). One of these best-practice initiatives is described in Sidebar 1 (pages 174–175) to illustrate the application of the Model of Diffusion.

### Discussion

As Mayo Clinic gained early success with spread tools and structures,<sup>23</sup> we refined the diffusion approach now known as the Mayo Clinic Model of Diffusion. This involved blending the

Sidebar 1. Case Study: Central Venous Catheter Insertion and Maintenance Practice Standardization

**Rationale**

Improper placement of central venous catheters (CVCs) can lead to harm, including death, to patients. Through the discovery efforts of expert physicians across Mayo Clinic, a care process model was approved by the Clinical Practice Committee in early 2010. This process set expectations about who has privileges to insert catheters, staff competencies, use of ultrasound and venous confirmatory tests, and the associated infection prevention guidelines.

This is a well-defined process with clear procedures. Anyone placing a catheter—regardless of specialty, patient indication, or location—is expected to follow it. Training is completed with the use of an instructional video for experienced physicians or simulation for resident learners.

**Diffusion**

The challenges of diffusion focus on how to communicate the expectations, train (or retrain) staff through the use of instruction or simulation techniques, test for competency, and ensure that the support systems make the “right thing to do, the easy thing to do.” Implementation success was measured by auditing initial compliance with core care process model requirements; sustained success is ensured by monitoring the number of adverse events and central line–associated bloodstream infections (CLABSI).<sup>1,2</sup>

Key steps for CVC diffusion, as represented in the Mayo Clinic Model of Diffusion Work Flow Chart (Appendix 1, available in online article), are now described.

The Sponsoring Body—in this case, the Clinical Practice Committee—approved the diffusion of a Standard CVC practice that built on previous discovery work performed at Mayo Clinic Arizona and in December 2009 commissioned a multisite, multidisciplinary CVC Standardization Project Team to draft and vet the new enterprisewide Central Venous Cannulation Clinical Practice Guideline, the Prevention of Central Venous Catheter–Associated Bloodstream Infections Clinical Practice Guideline, and an associated CVC Practice Standardization Plan. This ensured alignment with the institutional priorities and sponsorship from enterprise leadership. The Clinical Practice Committee also appointed an enterprise physician leader and project manager, as well as assisted with the identification of local physician leaders at all campuses who would lead the local project teams and efforts, providing the foundation for an enterprise oversight committee and the local multidisciplinary diffusion teams.

The enterprise Value Creation Team for CVC took on the task of completing the project charter, stakeholder analysis, and project plan, including working with public affairs to develop a robust communication plan.

In March 2010 the physician leader and enterprise team, along with the local leadership, conducted a review of the performance and processes at each practice location, performed a best-practice literature review, and drafted a standard care process model. They then invited key stakeholders to provide input, discussion, and vetting. Visible, hands-on high-level leadership from the enterprise leader,

combined with a consultative “comment period” and Specialty Council involvement, were key to the success of developing one standard for CVC insertion and maintenance. In July 2010 the new standard was updated on the basis of this input, resulting in a better guideline and organizational buy-in. Local implementation teams were also formed during this time.

In August 2010, after approval to execute the plan was obtained from the Clinical Practice Committee, the local Multidisciplinary Diffusion Teams created site-specific implementation, measurement, and communication plans. Having this happen at the local level with coordination from the enterprise team is imperative so that local systems issues (such as different electronic medical record [EMR] fields and decision support alerts with different EMR products), local committee approval pathways, and local preferences (such as communication from the CEO/Chief Administrative Officer at smaller sites versus intranet home pages at larger sites) can be addressed while maintaining the integrity of the project and demonstrating local leadership support. Executive leadership also referred to this project in conjunction with standardizing best practices across the enterprise, furthering alignment with business needs and supporting change management through awareness and sponsorship. This also had the effect of building a higher level of confidence within the project team to request needs and surface issues, as they felt confident that the organization had received communication and expectations and that they were going to be backed up by the active and visible leadership.

**Implementation**

In the implementation phase, the enterprise Value Creation Team for CVC worked with AskMayoExpert (AME) to document a uniform care process model for the placement and maintenance of central lines for practitioners to follow at all Mayo Clinic hospitals. This standard is published in AME and embedded in the credentialing and privileging system for all providers.

Concurrent work was undertaken to modify order sets and clinical decision support rules to meet the new standard. Standard equipment was selected and purchased to aid in the placement of central lines. The team also developed standard education, training, and simulation programs to enable the transfer of knowledge and skill for consistent application of the CVC guidelines. In deploying the training, the complexity of multiple training platforms across the enterprise had had to be addressed so that the core content could be delivered consistently, independent of location and resources. If clinicians had no need to insert CVC lines, then they could opt out of the training and thus the privileging and credentialing. Successful completion of mandatory CVC education for all Mayo Clinic consultant/resident staff with CVC insertion privileges (1,055 people) was achieved. Education for care team members who monitor and assess central lines (7,791 people) was also deployed and tracked. As of December 2010, training for providers and care team members was 100% and being maintained through the privileging process.

**Results**

From a change management perspective, the desire, knowledge, and

*(continued on page 175)*



Sidebar 1. Case Study: Central Venous Catheter Insertion and Maintenance Practice Standardization (continued)

ability components were addressed. The ultimate impact of CVC insertion and maintenance standardization is known by measuring the patient harm and patient infections. Early returns are promising:

- Sentinel events have been rare in the past, and, thus far, no sentinel events associated with line placements have occurred since the new practice was put in place (more than two years).
- The number of CLABSIs was reduced by 30% from the 2010 baseline through June 2011 (1.28–0.90 BSI/1,000 line-days).

**Annual Review of the Care Process Model**

In March 2012, during the annual review of the care process model, the team recognized the substantive outcomes improvements but reported that there were periodic serious harm events occurring with the removal of the lines. This led to the creation of a new guideline,

Removal of Non-Tunneled Central Venous Catheter, which was standardized and published in May 2012. The key steps of communication, identification of affected providers, education, tracking and ongoing surveillance, and so on, in the Model of Diffusion Work Flow Chart, were addressed, but the underlying cultural environment and leadership expedited the change with little institutional fanfare. The natural acceptance and adoption of standard practice is becoming the norm.

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diffusion approaches found in the literature<sup>8–11</sup> with our own experience and tailoring them to the Mayo Clinic environment. The next challenge was to extend the approach beyond a single site such that the best practice is consistently implemented across the entire system of 24 hospitals in six states. We have found the model to be very effective. The experience with the five key elements for managed diffusion—leadership, Value Creation Teams, diffusion actions, operational implementation, and best practice review and maintenance—has been positive, and these elements are now consistently used for all major diffusion efforts. Fourteen best practices have been implemented with this approach since January 2011. Yet, we have found, as expected, that this structured approach is still slower than desired, given the average of 18 months required, as stated earlier, to complete systemwide implementation.

This is where the true value of managed diffusion comes into play, that is, near-spontaneous systemwide use of best practices. Learning and using the five key elements and other spread techniques has been critical to the success but is insufficient as a comprehensive solution to developing standardized care models and best practices across the system. The model must expedite the transition to these standards if we are to transform health care rather than simply see marginal improvement from one year to the next. This is where leadership and the cultural changes are critical to success.

The organizational leadership must clearly set the expectation that best practices will be identified and followed throughout Mayo Clinic. The leaders must both educate and model this expectation. They also must help staff to understand that reducing variation will both enhance quality and reduce costs (that is, increase value). Introducing the concepts of boundarylessness with the goal of establishing a culture predisposed toward idea sharing

is critical to a learning organization,<sup>19</sup> however long the journey. One significant shift that is palpable at Mayo Clinic during the past five years is the change in language. Leaders and frontline staffs alike now routinely talk about being in the “discovery” phase of an effort, and words such as *standardization* and *best practice* are now a part of the everyday lexicon. Another critical aspect of the move toward managed diffusion has been the development of a Specialty Council across the enterprise for each major discipline. These groups have created the communications forum among the key stakeholders to not only identify best practices but to rapidly share and implement them without the formality of having a Value Creation Team for every initiative. For example, the Transplant Specialty Council has now standardized all aspects of the kidney transplant program across all sites, including selection criteria, protocols, and medications. Standardization work is being done as a part of the councils’ regular meetings.

We now routinely see groups initiate discovery and diffusion efforts without formal leadership direction or formal Value Creation Teams. The concepts are well enough established, the leadership support is in place, and the cultural bias toward action and doing the right thing for the patients are now the key drivers to standardizing care through the Specialty Councils.

Although many formal improvement efforts continue to be prioritized, we are seeing a growing number of informal groups leading the charge to improved care, which is expediting standardization of practice. These efforts are predominantly driven through the Specialty Councils and use of the Model of Diffusion techniques.

**Conclusion**

We understand that there is a limited capacity for change in any

social system. We seek to attain a dynamic equilibrium at which the rate of change in the social system occurs at a rate that is commensurate with our ability to adapt to it. A stable equilibrium is unacceptable for our future viability, while a disequilibrium in which change occurs at a rate that is too rapid for us to adjust is also counterproductive.

Our core business is to transform knowledge into the delivery of health care. Our operating plan calls for us to “transform Mayo Clinic’s knowledge management and healthcare delivery process in order to deliver the highest value care that is the most trusted and affordable.” Specifically, it calls for us to “standardize, improve effectiveness (outcomes, safety, service) and reduce costs in all practice settings, core clinical processes and core business processes.”

The managed diffusion model is still evolving, but it has demonstrated the ability to help scale change across a large health care system. Implementing large and complex practices—such as managing infections, reducing readmissions, or handling patient care transitions—across an entire system are well supported by a more structured approach with spread techniques. It has also taught us that simple changes, such as sharing patient safety alerts and educating staff on procedural changes and those practices that have strong consensus among the key stakeholders, can more spontaneously be implemented with managed diffusion. Effective managed diffusion of excellence bolsters our most precious possessions: our patients, our esprit de corps, and our reputation. **J**

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## Online-Only Content

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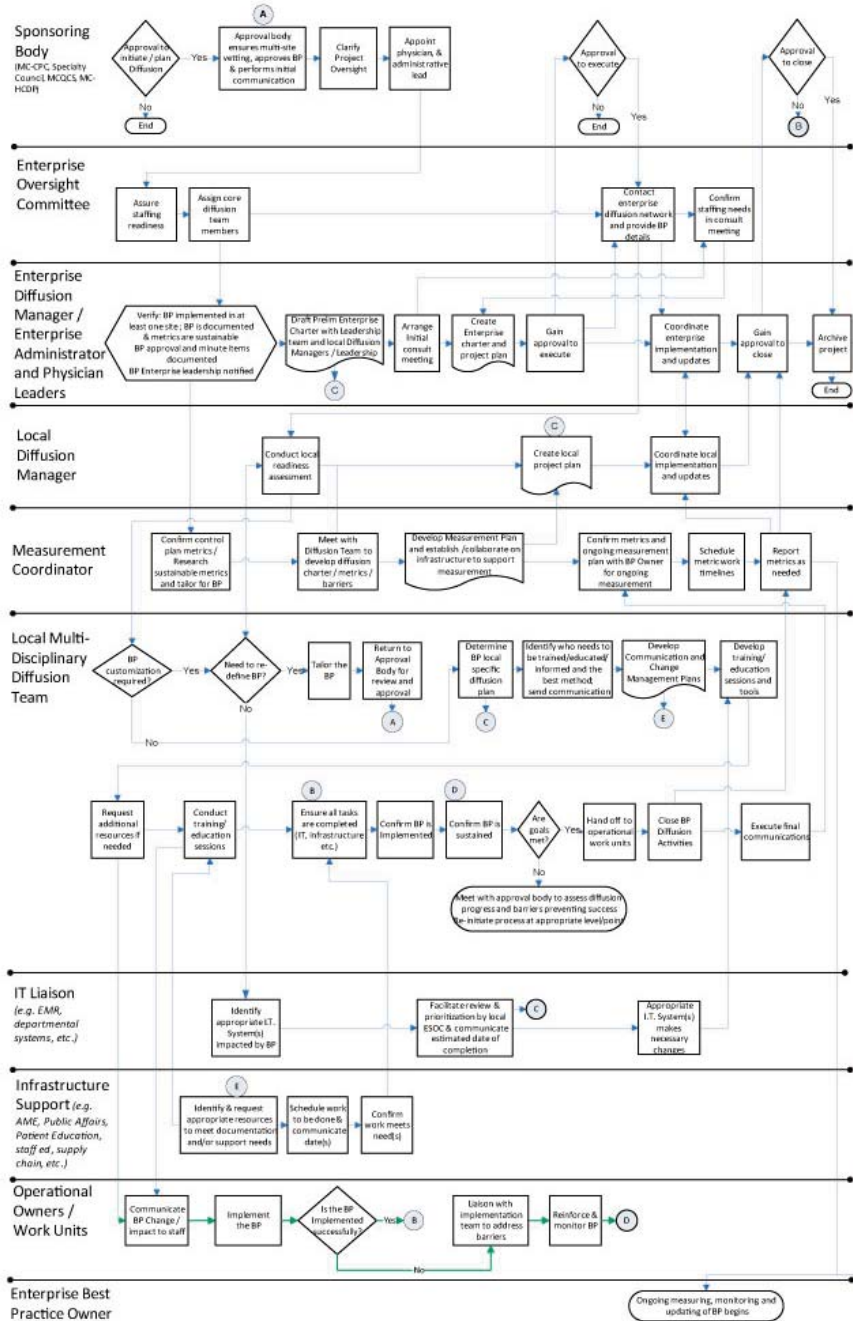
Appendix 1. Mayo Clinic Model of Diffusion Work Flow Chart

Figure 2. Mayo Clinic Model of Diffusion Status Tracker (Sample) (color version)

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Appendix 1. Mayo Clinic Model of Diffusion Work Flow Chart



The work flow chart depicts the process steps, decision points, and key groups/individuals (and their roles and expectations) at various points in the diffusion process. MCQCS, Mayo Clinic Quality of Care Subcommittee; MC-HCDP, Mayo Clinic Hospital Care Delivery Platform; ESOC, Enterprise Systems Oversight Committee.

Mayo Clinic Model of Diffusion Status Tracker (Sample)

Diffusion Status Tracker	Enterprise Diffusion Readiness Status	Implementation					
		Planned Start	Expected Finish	MCA	MCF	MCR	MCHS
<b>2010 Continuation</b>							
Central Venous Catheter				★	★	★	★
RN Bedside Handoff (SHARE Rounds)				★	★	★	★
HAI - C. Difficile				★	★	★	★
<b>2011 Quality Tier 1</b>							
Obstructive Sleep Apnea - Dr. Gali		2010	Q1 2012	■	■	■	■
VTE - Prophylaxis - Dr. Morgenthaler		Q1 2011	Q4 2011	■	■	★	■
Sepsis Bundle (AME) - Dan Bidinger	A	Q3 2011	Q4 2011				
CAUTI - Dr. Orenstein		Q1 2011	Q2 2012	■	★	■	■
30 Day Readmissions - Dr. Dawson	B	Q3 2011	Q4 2012				
Intubation - Dr. Diedrich	B	Q3 2011	Q2 2012				
Recognition of the Deteriorating Pt Simulation - Dr. Zimmerman		Q1 2012	Q4 2012				
<b>2011 Quality Tier 2 - Potential Diffusion</b>							
HAI - MRSA		N/A	N/A	+	+	+	+
Chronic Disease/Care Management Outpatient		N/A	N/A	+	+	+	+
Diamond Depression		N/A	N/A	+	+	+	+
<b>2011 Manage to Reimbursement</b>							
Blood Utilization - CV Surgery	C	Q1 2012	Q4 2012	▽	▽	▽	▽
CVS - 20	A	Q1 2012	Q4 2012	▽	▽	▽	▽
RED		Q3 2012	Q3 2013	NA	▽	▽	▽
Transplant - Kidney		Q3 2012	Q3 2013	▽	▽	▽	NA
Urology		Q3 2011	Q3 2013	▽	▽	▽	▽
Cancer		TBD	TBD	TBD	TBD	TBD	TBD

★ Completed   
 ■ On Target   
 ◇ Underway, but behind schedule   
 ○ High risk of not meeting plan   
 ▽ Planned diffusion   
 + Potential diffusion

A - Ready   
 B - Planning Underway   
 C - Significant Gaps

Figure 2. Senior leadership uses the Status Tracker, which is updated by the Enterprise Diffusion Manager, to monitor progress on all active projects. The grid shows whether an individual project is on track for diffusion and whether certain sites are struggling with implementation issues.