Mayo Conference on Quality

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Thank you so much for including me in this the 9th Conference on Quality here at the Mayo Clinic. As most of you may know after my invitation to serve on the Board of Trustees, I had the unexpected pleasure of actually using the Clinic – and I do concur – the patient is at the center of everything you do. Today I would like to share with you some thoughts on how we bring that goal forward into the 21st Century.

Before I share some of those thoughts I would like to set the stage by reviewing the environment that surrounds us as we meet today.

I believe we are at the tipping point in the transition to patient responsibility for his/her own health care. Why do I say this?

(Show Slide 1- Costs)

- Inflation in health care costs continues to skyrocket at rates five times other inflation
- In the past four years the amount paid directly by consumers out of pocket has doubled from an average of $50 to $90/month. (That is made up of shares of premium, co-pays, deductibles, limitation of benefits).
- If you are a Medicare patient your cash benefit increased 2.6% while your health premium increased 6.2% resulting in wiping out your cash benefit increase. Simultaneously, corporations are decreasing if not eliminating their retiree health benefit (the Medicare "Drug" bill will only accelerate that trend
- The same Medicare bill includes a side section which makes tax free Medical Savings Accounts – permanent and national. Already many companies are moving in that direction.

What is the outcome? A 401(k)-like plan for health care moving the burden from corporations and government to you

An Aside

As that occurs our market research begins to identify patient segments – ranging from ones who never want to interact with the system using the nets and web instead, those who have shifted to alternative medicine as their major provider of care, to those who would have an MRI built into their scales at home to gain reassurance they have no major disease today.

At the same time there is a squeeze on providers to keep their unit costs under control. The Medicare Reform Bill includes $300 Billion for reversal of decreases in payments to doctors and hospitals. Yet as we are here today, we are focusing on the issue of quality and safety. I noticed in the agenda that there are both presentations from the health system which is a fully integrated organization to care for the continuing needs of patients in this geographical area and the major work of the clinic — the care of patients with complex diagnostic and treatment problems.

What is remarkable to me is that there seems less outcry from the public about costs than the equally dismal news about quality. Since John Wennberg identified the wider variation in procedures

(SHOW SLIDE 2 - Quality) across small areas, through to Beth McGlynn's careful study that only a bare majority 55% of chronic illness patients are receiving the care that they should to control their condition.

The number of institutions with a real focus on quality and (Show Slide 3 – Implications) safety as core competences is few – and Mayo is one them. You stand as one of the examples of an institution because it is integrated corporately with a long history of patient centered and cooperation. As you know I am a battle scarred survivor of 25 years in academic medicine, first at Mass. General, then New England Medical Center, and back to the MGH. (Like many of you, one does not like to wander to far from home.) One of the reasons I am so delighted to have been asked to serve on the Board of Trustees, is that the Mayo Clinic is at the forefront of the patient's care, yet with a robust academic medical component and a vibrant research community. I will say this in a "*whisper"*, patient care comes third at the leading AMCs. In some ways you were fortunate. The Clinic was founded before hospital medicine became the 800 lb. gorilla in the middle of the table, and since its peak in the 70s ambulatory medicine has again become the focus of the majority of care – surely in volume if not dollars. Thus, the clinic's roots and values are a firm foundation to go

forward. It is evident in several ways already. You have fully automated the medical record – a rare success in medical care. It gives you the foundation for many improvements, continuing quality monitoring, integrated care for patients and doctors across all the specialties, efficiency in the care process, and data base to understand the disease process and continue the extraordinary epidemiologic data base you have had from the clinic's beginning.

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The challenge before you is to use your strengths and success to push forward to the next level of performance. As I suggested earlier, we are heading toward a perfect storm – rising costs/declining quality. However, there is an opportunity to accept the challenge and lead the way forward.

The subject is something that has core meaning in every other manufacturing and service sector. You read about its importance in economic growth and the fact that in the third quarter it was the highest yet. But it has such a negative and misunderstood meaning in fields of education and medical care. (Show Slide 5 – Productivity) Okay – I'll say it "*Productivity*" – now don't be like the Wellesley College Faculty when I brought it

up 5 years ago. They hissed quietly and spoke of me as the Trustee who used the "P" word.

If you could suspend your hostility at the thought of being told to see more patients per hour with less support staff as being what you understand Productivity to mean, I'll try to explain how it is perceived in other parts of society.

In almost every other industry, Productivity is the holy grail of the production of a good or service. It is the constant quest to produce a product or service at a decreasing unit cost – or more ideally a better quality, safer product at that continuing decrease in unit cost.

Why is Medicine a Special Case?

WHY NOT UNTIL NOW

Measuring the prices of medical care services presents many challenges, both conceptual and operational. The medical care sector has undergone, and is continuing to undergo, considerable technological progress and institutional prices paid by patients and insurers for medical care goods and services should, in principle,

be adjusted for some, perhaps all, such quality changes in medical care. Consumers' health status, however depends not just on their physicians and the medicines they are prescribed but also on their own behavior and life-styles and on the environment in which they live. Thus, one cannot automatically equate changes in health status with changes in the quality of medicine services. There are, in addition, profound ambiguities concerning the identity of the consumer and the individual making the consumer's choice: Is it the patient? The patient's family or other caregivers? The physician acting as an agent for the patient?

There are also ambiguities about exactly what kinds of services the health care sector provides and hence what outputs should be priced. Diagnostic services that lead to the identification and successful treatment of a symptom can, for example, be included as part of the cost of treating a specific condition and generating a specific output. New diagnostic services that mainly allow a physician or a patient to reject an unlikely diagnosis are more difficult to classify and assess, since they may mainly delivery peach of mind rather than health. Alternatively, such diagnostic services may make patients worry about possibilities that they did not consider before, as can occur from false positives yielded by the prostate-specific antigen (PSA) test for prostate cancer or the Pap smear test for cervical cancer.

Since productivity is a measurement of output per unit input, the metric differs according to how one chooses to define output and input. We may be interested in the productivity of a single specific input, such as labor, or of all inputs combined. For example, labor productivity measures output per worker. Labor productivity might increase because capital investments make workers more productive, or because general changes in the production process boost per-worker output. By contrast, multi-factor productivity (also often called total factor productivity; see Hulten 2001) measures changes in output not caused by more capital and more labor. Improved multi-factor productivity typically originates with changes in the production process itself. Both kinds of productivity are important; neither is currently well measured for medical care.

An accurate multi-factor productivity measure needs to account for all resource use and all health enhancements, which may differ according to disease and time period. Inputs include

capital and information systems as well as all labor costs. Productivity improvement could in some cases flow from replacing some kinds of specialized labor (e.g., physician time) with others (e.g., nurse practitioners) and/or with information technology and decision support tools.

For health care, could measuring productivity alone lead to improved performance? Productivity metrics by themselves do not constitute a "roadmap" for re-engineering the delivery system. But they come close: they allow measurement, at each point along the road, of how close or how far we are from the destination. Moreover, evidence from other industries confirms that managers and firms respond to how one measures "success." In centrally planned economies, for example, "when glass was planned in tons, it tended to be too heavy. One classic article in the *Academy of Management Journal* was titled "On the Folly of Rewarding A, While Hoping for B." (Kerr 1975). In health care, how can we hope for improved quality and efficiency if we do not reward it?

As we look more intensely at the concept of industrial productivity, it gives us a framework for integrating the quality and cost of medicine. It is a far more complex and complicated endeavor than more PATs per hour, or turnover in the OR. It is as I say, developing the tools and knowledge that integrate the management of the enterprise.

(SHOW SLIDE 6 – Research Projects)

At the HCDP, we have begun the planning of examples of how to measure the productivity of well run systems and innovation.

One of the reasons that the shift is possible is that information technology has made it possible to undertake this activity in doable chunks with each practice leader working with skilled professionals to develop standards for the number of levels that are subsumed within a disease condition. Mayo's DSS already has the capability to group episodes by ICD9 codes and has the cost per input unit as well. So as I suggested, Mayo has the opportunity to be a first mover advantage – taking the risk to innovate the care process as well as the diagnosis and treatment of individual patients early, thus moving a giant step in the reengineering of the management of the system.

While Mayo has among the best infrastructures in the current environment, technology is rapidly advancing. Thus it makes things that were too expensive affordable (positive ROI) and makes tools and techniques from other industries applicable to the enterprise as well.

Dr. Cortese and I have had the opportunity of serving on a joint committee of the National Academy of Engineering and the IOM directed at developing both a research agenda for a joint effort and a structure to carry it forward

(Show Slide 7 – IOM Vision …. Slide from Proctor)

What is emerging is the division of activities into two interconnected opportunity sets. The first one is focused on the interaction of the developing expansion of microtechnologies and telecommunications.

(SHOW SLIDES 8-11 – from Budinger's workshop)

Microsystems: Making Every Room an ICU

While improvements in handling information could have dramatic effects on making the health-care system more efficient and on eliminating errors, much more will be needed to meet the challenges that confront us during the coming decades. We will somehow have to provide much better monitoring and diagnostics to substantially more patients, and we will have to do it with fewer nurses and physicians. Microelectronics, by itself, can only interface with other electronic systems, occasionally displaying data for interpretation by physicians. While software to distill data into conveniently readable forms and suggest treatments may emerge, just as systems for checking drug interactions are emerging today, none of these systems will fully meet the challenges of the health care system unless we can obtain better data in the first place.

In parallel with developments in microelectronics, there has been a move to develop sensors based on the same technology.

The resulting integrated sensors have evolved to microelectromechanical systems (MEMS), and combined with microelectronics and wireless interfaces are now emerging to form wireless integrated microsystems (WIMS). These microsystems (Wise, 1996, 2002) will merge sensors with embedded microcomputers and wireless transceivers in volumes of 1cc or less and operate at power levels below 1mW, consistent with long-term operation from batteries or even energy scavenging from the environment. They have the potential to turn every hospital room into an intensive care facility. They are small enough to be worn comfortably and unobtrusively, communicating with a bedside receiver that, in turn, communicates with monitoring stations and the larger health care facility. While present-day examples of such systems are still few and limited in performance, they are emerging. Blood oximeters, heart rate monitors, and temperature sensors are all candidates for WIMS use, and swallowable capsules for internally viewing the digestive tract have been reported (**reference**). Wearable devices for blood pressure (hypertension),

breathing patterns (sleep apnea) and other variables are certainly possible in the near term. The major challenges in this area are the interfaces with the body itself, but technology now appears ready to address an expanding array of such problems.

Swallowable capsules for all kinds of internal viewing and measurement could significantly improve our ability to diagnose a variety of conditions and could improve the quality of health care. DNA analysis chips are another example of technology that can be expected to have a broad impact. Such chips (Mastrangelo et al., 1998; Burns et al., 1998) will take advances in genetics into the hospital and even into the local doctor's office. They should produce substantial improvements in both diagnostics and preventative medicine. But although these developments will improve health care quality, their impact on costs will likely be indirect. There are also substantial issues of privacy to be dealt with.

Wireless integrated microsystems for health care are expected to be technically feasible within the coming decade, but in order to

reduce costs, a complete *system* in which they can be used must emerge. Bedside receivers and wearable monitors could be a technical triumph but could also be an economic disaster for the company producing them unless a larger system exists that can make use of such devices. Similar situations have existed for at least 20 years in the process control industry, where sophisticated sensors have been prototyped but have been very slow to be applied because controllers able to use their features have not existed. In the transportation industry, the entire control system of the automobile engine had to be redesigned to take advantage of microprocessors and electronic sensing. Thus, although an increasing number of wearable and implantable monitoring devices are possible, the larger system needs to be available to make use of them, and that calls for efforts (and coordination) at every level of the health care system.

How Might This Operate At Mayo

Among the next generation of communication there is the idea of every home or (hospital room) an ICU. The advances in wireless communication and broadband internet do and will make it possible to advance the monitoring of patients to 7x24x365. The VA (another closed system) has implemented the early stages of such a concept. Let me push the boundaries on the idea. Presently we divide levels of care between home, clinic, hospital room, and ICU. What if, through such wireless technology, we were able to have the lead physician or surgeon and were able to follow the progress of this patient through a virtual system. Visiting the patient or observing his/her progress, could occur on a continuous basis with computer software and screening the data for unexpected variances. The role of the nurse begins to change as she focuses on function and trust in her relationship. One of the interesting observations I made when I was in the hospital was that so many different caretakers responded or initiated activities that it took a family of Ph.D.s to keeps us on track. But it was a terrific outcome – I was on my way home only four days later and am delighted to say I had a successful full recovery from the surgery.

The second is to use engineering tools, system design, analysis, control tools and associated research to advance understanding of processes and system interactions; and

improve/optimize dimensions of system performance in the face of constraints to connect the front line of patient care – the clinic with all the support systems as shown in the (SHOW SLIDE 12) slide that Dr. Cortese used in November. Another way of showing the bottom half is as I describe the activities in our Eastern Academic Medical Centers. (Show Slide 13 – done by Cara).

What might it be like in an enterprise that moved from CPOE and complex implementation of those orders to a next generation of "reengineered medicine"?

(Show Slide 14 – An Example)

Simultaneously to take advantage of these microsystems which I am sure many of you say will result in information overload, let me move on to using another potential transformation of an industrial technique -- CAD /CAM (computer aided design and computer aid management).

Again there are a number of pieces in place. The idea of evidence based medicine is spreading and expanding. Disease management protocols and implementation are now a decade old. I feel sure many of you have developed your own algorithms to

assure that every patient receives the best (and the same standard adjusted for special conditions).

Let's walk through the differences. Presently you use CPOE to enter orders and the system (of people) takes and then implements them.

In a well designed CAD/CAM system, the team takes the data mined from the data base which describes the actual care patients with those conditions have received. Is there wide variation? How does it differ from industry standard (evidence based medicine) based on those inputs? One actually designs a standard process for the care of a patient with the given condition. From their the design it is translated into a process management system in which one examines – who does what – when – (which may lead to job restructuring , or assignment of responsibility). It also crosses the boundary from care team to supporting enterprise. Where my slides and Dr Cortese's are only modestly different (his is Mayo and mine are the MGH). The major shift is the implementation of automated process management. The system follows the process and the responsibilities for carrying them out and tracks if there is a failure in doing the next step and can inquire if there is a problem. Even more importantly for each data point of

symptom any unexpected finding results in the instant delivery of a message to the responsible party along with his/her stored array of possible responses. The system becomes the driver both for quality and completeness. If one were to look for the major source of errors, they are in the hand-off of information or the failure to carry out a key step in an acute process (Children's).

I have postulated a complicated and time consuming detailed process. However, within this framework the issues of responsibility, coordination, and adaptability are addressed. Once in place it becomes a vehicle for being a continuous learning and innovating enterprise.

Who should do this work? What is the ROI? Can it be staged? There has been a concern that the clinical physician researchers are becoming rarer. One could imagine those interested in learning the intellectual underpinnings as well as the skills and techniques, could then develop a new type of laboratory to develop and test these new approaches in collaboration with the practice groups as well as engineers, economists and social scientists – creating a new and different lab team. One could conceive of the project as the next "Genome" project, but this time of the patient care delivery system.

In conclusion I have tried to suggest some ways to push the quality agenda into new territory taking advantage of Mayo's structures and infrastructure to date. However, I would not like to leave you without putting these efforts in context.

(Show Slide 15 – done by Cara)

The HCDP is working on a larger canvas to help the U.S. move to a coherent quality and affordable system – of which the things I have talked about are a key aspect.

Thank you for letting me share these thoughts with you today.