Our discussion group set out to add details to the critical and achievable Obama-Biden goal to “reduce inefficiency and waste and improve quality” in our health care system. This is a practical and worthy goal, with widespread support for the need to fundamentally transform the effectiveness of the processes and methods used to develop and implement healthcare delivery processes.

Vision

Our vision calls for practical programs that target high-leverage weaknesses in our current healthcare delivery practices. Through targeted government programs that equip and engage Operational Systems Engineers (OSEs) under the banner of advocating patient safety and cost control, modest government spending can reap much greater financial returns than the amount spent. The gains will be obtained by eliminating waste and inefficiency, improving patient safety, and elevating the quality of care. This untapped resource can contain rising healthcare costs while achieving the best outcomes possible with the resources available. It further promises to alleviate shortages of health care professionals by increasing their productivity through system redesign, training much needed professionals such as healthcare-focused engineers including OSEs, and by enriching the education of physicians, nurses, and other health professionals to include operational training. To achieve this vision we need to set aggressive yet realistic efficiency targets for hospitals and empower them to meet those targets. To this end we propose:

1. Set targets on both the quality of care as well as the efficiency of delivery with rewards for compliance
2. Appropriate funds to support the costs for hospitals to engage engineers and operations management specialists to meet the targets, and
3. Appoint an engineer with extensive expertise in health care delivery systems as part of healthcare reform policy team

The Roadmap

We wholeheartedly support the need to fundamentally transform the effectiveness of the processes
and methods used to develop and implement healthcare delivery processes. However, this worthy Obama-Biden goal of reducing waste and improving quality cannot happen without greatly expanded mechanisms to transform the operational systems that deliver healthcare. There is a long history of professions that have supported tremendous efficiency gains and quality improvements in both manufacturing and services, especially in industries experiencing high levels of competition and cost pressure. The tremendous advances in supply chain and logistics as well as the quality assurance processes required for sophisticated processes such as putting astronauts into space can be more effectively developed to reach new levels in healthcare.

We use the term Operational Systems Engineering (OSE) to refer to the academic disciplines and professional community which support system efficiency, effectiveness, and quality. OSE is most identified with industrial engineering, systems engineering, operations researchers, operations management, and management engineers, but it is not restricted only to these. OSE in healthcare overlaps with public health, public policy, and all healthcare professions. While OSEs have made strides in healthcare, this sector has lagged behind most other industries in its investment in the operational systems part of its workforce. In the coming years, it is undeniable that the healthcare industry will be forced to reach new levels of patient safety and cost-effectiveness at a time when operational technologies and processes are more complex than ever before, especially with rapidly advancing medical technologies and treatments.

We are entering a new era in which these changes are making it worthwhile, indeed critical, that the healthcare sector make unprecedented investments in OSEs and additional training for healthcare personnel. For this reason, we believe that a key component of the policy of the Obama-Biden administration is a comprehensive program that incentivizes the increased involvement of OSE in our nation’s healthcare delivery institutions.

Other countries such as the UK and Canada have already integrated OSE into their healthcare delivery to great effect in terms of cost, quality and access. In the US, we need to achieve the same benefits that have been achieved through OSE in countries like the UK and Canada, but in a manner that works with the privatized, decentralized system we have. To this end we call for a Government Healthcare Safety, Quality, and Efficiency Program to provide incentives and mechanisms that will promote patient safety and healthcare delivery cost reduction in the broadest sense: improving quality of care, reducing medical errors, providing better care outcomes per dollar spent (including cost effectiveness of the delivery systems), and higher performing providers.

We believe that judiciously conceived government programs can drive the change we need, and we have identified the following key components of such a program:

(1) **Standards for Electronic Patient Health Records and Healthcare System Data.** This foundation for a national records system will incorporate the relevant delivery system information that will be needed to advance the improvement of our overall care delivery system. As a complement to the traditional approaches, changes in the needs of society demand a greater role for engineering-based design and modeling to identify the most important information to collect and the system dynamics that link this information to key
metrics and outcomes. This decision-support approach should draw upon the deep systems expertise that has been so effective in improving quality and shrinking cost in other sectors.

(2) **National Healthcare Safety, Quality, and Efficiency Registry.** In Europe, rewards and penalties were imposed upon healthcare institutions, and the result was very effective in driving improvements. For our more privatized system, we propose that the US system be designed to eliminate the existing barriers for information sharing. Hospitals have resisted calls to release data on practice and outcomes for fear of competitors will use it against them. We recommend that the system be implemented in a “Pay for Participation” framework to incentivize hospital participation in providing data on processes and outcomes (without penalties for poor performance that would inhibit participation). It must also be developed in concert with component (1) above. This new database will enable medical and OSE researchers to access the data on a scale and scope that will open up new treatment programs, diagnostics, and operational designs and implementation practices that will drive success.

(3) **Dedicate Funding to Research on Patient Safety and Efficient Healthcare Delivery.** Using the data from the database above will generate a quantum leap in our ability to analyze the systems that deliver care to reach new levels of patient safety and delivery effectiveness. Historically, insignificant amounts of research and development support have been available to fund OSE driven improvement of the systems and processes for delivering care, as most healthcare research funding has been allocated to treat medical conditions, not the systems that are key to delivering them. The time is ripe to recognize this critical area because it is one of the few areas that allow us to achieve better outcomes at lower cost. Also, due to historically low levels of investment in healthcare OSE research, there is a significant amount of low hanging fruit in this area. Research funding must be increased for basic and applied research on cost-effective care delivery modeling, technology, and processes, including enterprise service engineering, service chain engineering, and improved operational innovations within healthcare operations. Funding should encourage healthcare-based and systems engineering research teams to collaborate on the design of healthcare systems solutions. The money should be available to university researchers working with hospitals and nonprofit healthcare systems research organizations. Part of the funding can go to special education/training grants to develop and pilot new OSE educational programs.

(4) **Identify Healthcare Best Practices.** Additional gains can be made by setting government reimbursement rates and providing financial incentives for improved quality and efficiency of care delivery. The above three components are intended to support the use of the National Safety and Efficiency Database to track institutional efficiency metrics and ensure that researchers and engineers have access to the best information possible and to spread successful practices quickly.

(5) **Appoint an Engineer to the Healthcare Reform Policy Team.** It is essential to have someone with extensive expertise in health care delivery systems engineering and redesign as part of healthcare reform policy team. This is consistent with the lessons learned in the successful British effort to improve healthcare via OSE methods and incentives for performance.

Below we detail our vision for the specific high impact improvements based in OSE that need to be made for our health care system to both be sustainable and to serve the people to maximum potential. The opportunity areas for healthcare delivery transformation are broken into three critical categories:

1. **Reduce Cost and Improve Quality**
2. Standardize, Communicate, Coordinate
3. Access for All

1. Reduce Cost and Improve Quality

1.a. Process Waste

Problems
1. Excessive waiting and unnecessary delays in care delivery
2. Wasteful use of expensive emergency department and other tertiary care resources
3. Inattention to workflow and effective processes (e.g., time wasted looking for equipment, excessive waiting for test results, errors and waste transferring patient information, unavailability of key services on weekends, etc.)
4. Uncoordinated elective admission scheduling practices waste billions of dollars a year and leads to congestion of critical hospital resources.
5. Duplicated work (tests, examinations etc.)
6. Hospitals have not adopted proven six sigma and lean methodologies to eliminate waste

Solutions
1. Government needs to set up a system that defines terms, metrics, and the process for incentivizing hospitals to meet efficiency targets and continuous improvement standards based on initial baseline performance. This system should also facilitate the transfer and spread of systems best practices nation-wide.
2. To move to a more advanced and successful level of operational performance, quality, and safety, Engineers need to be integrated as part of the health care delivery team to bring knowledge of industrial engineering best practices including lean and six sigma.

1.b. No System Level Coordination of Services

Problems
1. Authority is distributed across multiple providers and, within an organization, multiple departments and administrators.
2. Decisions are made piecemeal based on local/departmental objectives, but without the benefit of any attempt to model and predict the effect on their overall organization/system.
3. Hospital resources get overloaded unnecessarily, creating barriers to timely treatment, access and more

Solutions
1. Decision makers in hospitals need decision-support tools to be able to better support system level functioning. Having hospital-level efficiency targets would help achieve this.
2. Hospitals should be encouraged to use national system operational data, OSE, and best practices to make decisions.
1.c. Data not Used Effectively

Problems
1. Data systems are not designed optimally to meet the needs of clinicians, patients, researchers, managers, and policymakers even though this is rectifiable.
2. Currently, process measures are routinely changed to cover up system inefficiencies and make hospitals look better than they really are. We need measures to expose inefficiencies that can then be eliminated.
3. Operational data is not effectively used to make decisions / drive improvement efforts.
4. Process measures are not always well connected with outcomes.
5. Data is often not used to manage materials inventory effectively.
6. From a basic IT perspective, it is obvious that data standards for electronic medical record systems must be developed so that information conveyance is efficient and maintains integrity.

Solutions
1. Data system redesign: One national set of standards that is compatible with existing and emerging data systems to allow for real-time information sharing across patients, providers, researchers, managers, and policymakers, in an appropriate, secure framework.
2. Process data is minimal and systemically flawed in hospitals, and we need a government standard for data collection on critical hospital processes. The “pay for participation” proposal can be used to incentivize efforts to collect clean, well-defined, useable data. It may be possible to hold hospitals accountable through accreditation.
3. The government must set standard process measures that are connected with system performance. Need government incentives for hospitals to work with engineers to design management systems that use the data to make decisions that are good for the hospital’s health as well as our national healthcare network.

1.d. Heterogeneity of Insurer Practices

Problem
1. Insurers lack standardization with regard to claims administration and medical necessity; this adds unnecessary confusion to the health care system.

Solutions
1. Creation of national standards on claims processing and medical necessity language to reduce confusion, incompatibilities between insurance providers, wasted time spent by physicians and staff to perform payment/reimbursement processes.
2. One dimension of the proposed National Healthcare Safety, Quality, and Efficiency Registry can collect key information on the financial/insurance performance of providers. Consistent with the goal of this umbrella initiative, the concept is to make information available for analysis and innovation so that best practices can be developed and communicated.
2. Standardize, Communicate, and Coordinate

**Problem**

1. A lack of communication and coordination between hospitals and healthcare providers treating the same patient leads to wasteful, inefficient, and uncoordinated care. Such operational and quality problems arise in part as a side-effect of competition between hospitals. **Example:** One attendee mentioned having to visit 2 hospitals right next door to each other. In hospital A, the cardiologist told the patient that his heart was healthy enough to proceed on the recommended treatment path. The patient then went to hospital B for the treatment and was told that they had no record of hospital A’s cardiology report and that the patient would need to be seen again by hospital B’s cardiologist. Hospital B’s cardiologist decided that the patient shouldn’t move forward on the treatment. This all occurred within a very short time period, and the two cardiologists never consulted one another. The patient was told that hospital B has to do everything in house and could not rely on information from hospital A, nor would they contact hospital A’s cardiologist to determine the hospital A cardiologist’s recommended treatment and obtain the diagnostic results.

**Solutions**

1. Incentivize more collaborative, integrated health care delivery that can coordinate care. Incentivizing good performance, efficiency, and outcomes will drive hospitals to take this need more seriously.
2. Provide incentives for the development of networks of collaborating hospitals with coordinated care plans for cross-listed patients
3. Development of a standardized electronic patient records architecture and standard formatting of patient records so patients can have a seamless transition between providers without loss of information.

3. Access for All

3.a. Too Few Alternatives to ER Treatment Exist for Uninsured/Underinsured

**Solution Concept**

1. Expand coverage and increase incentives for providers to offer 24 hour urgent care clinic services. Cost pressures should induce hospitals to use the Emergency Department (ED) to route arriving patients who do not require ED care to urgent care clinics.

3.b. Hospital Backlogs and Waiting Times Make it Difficult to Get an Appointment

**Solutions**

1. OSEs can work with scheduling practitioners to design the more robust and efficient scheduling systems to:
a. Increase hospital throughput to reduce backlogs and prepare for increased volumes
b. Reduce unnecessary patient waiting as well as doctor idle time
c. Reduce chronic system-wide congestion and delays

2. Government funded research, development, and innovation can work on next-generation systems to better meet patient needs. Hospitals that have implemented next-generation systems to coordinate with one another can route patients away from overly congested hospitals to hospitals with spare capacity (thus leveling the load across a group of hospitals) when it is in the patient’s best interest.

3.c. Lack of Public Knowledge of Available Healthcare Services Increases Perception of Inaccessibility

Solutions
1. Patient education campaign to increase public awareness of their health care options

Conclusion
The government can set the health care system back on the right track by

(1) developing the necessary infrastructure to innovate, evaluate, and communicate healthcare best practices, setting appropriate efficiency targets,

(2) providing funding and incentives for hospitals to meet those targets by working with systems engineers and researchers, and

(3) using “pay for participation” and accreditation to ensure data standards are being met.

Currently, systems engineering is a key element that is greatly underutilized, despite the fact that it is the vehicle for reducing waste and inefficiency while simultaneously improving quality and care outcomes. The key is to facilitate research and development while empowering hospitals and engineers to work together to meet the challenges facing our health care system.