

## Modelling of Healthcare Delivery Based on Health Metrics Models

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Received: 29/03/2016

Revised: 27/04/2016

Accepted: 29/04/2016

### ABSTRACT

The adoption of various time-tested concepts within health care has been slow and the measurement process to quantify this healthcare is absolutely ineffective. Most of the measurement systems are manual and paper based and experts cite paper-based as a major barrier towards reducing medical error. The lack of automated networked measurement systems among healthcare delivery makes it difficult to assess performance. As we inch towards an era of P4 medicine a term coined by biologist Leroy Hood, seem to replace current medical practices, which are going to be revolutionized by technology to manage a person's health, instead of managing a patient's disease. The convergence of systems approaches to disease, new measurement and visualization technologies, and new computational and mathematical tools can be expected to allow our current, largely reactive mode of medicine, where we wait until the patient is sick which is an expensive form of care, to be replaced by a proactive care strategies of personalized, predictive, preventive, and participatory (P4) medicine that will be cost effective and increasingly focused on wellness. <sup>(1)</sup> The excerpts are directed more towards a concept known as patient centered health care. The ever-changing health sector reform and decentralization, health systems are managed as closely as possible to the level of service delivery. This shift in function as well as transformation of healthcare delivery generates new information needs, and calls for the restructuring of information systems to collect and use information for decision-making at local, district and national levels. To optimize these actions, there is need for developing clear strategies for e-health capacity building at the national level. So keeping in view the above statement this study reviews various delivery models, network models and information concepts, which have evolved over time.

**Key words:** Health Care Model, Patient Centered Medical Care, Health Metrics Models.

### INTRODUCTION

Mankind billions of years ago began with practice of hunt and gather, whereas in the era of information technology we more often perceive the world from point and click. With the evolution of information technologies and its amalgamation into health that probably could be best defined under the umbrella term composed of two elements: "Health informatics. (related to the collection, analysis and movement of health information and data to support

health care), and Telehealth (related to direct, e.g. videoconferencing, or indirect, e.g. website delivery of health information or health care to a recipient)." <sup>(2)</sup> So Health informatics can be seen as appropriate and innovative application of the concepts and technologies of the information age to improve health care and health.

Quote by Eric S. Lander "The "great embarrassment" of twentieth-century medicine, despite its many strides, is that most therapeutics was directed at symptoms,

not cause. <sup>(3)</sup> This is in fact true; let's look at a real work situation the patient's chart is in a bin outside the examining room. The clinician arrives, her mind still on the prior patient, and she looks at the chart for maybe 30 seconds as she makes the transition to the current case. If she's good at transitioning and not overwhelmed by prior events, she has about enough time to get the high points of the patient's recent history, the nurse's BP reading, and the reason for the visit before she walks into the room. If not, she acquires this information from the patient, on the fly. Either way, more often than not, she examines, diagnoses, and prescribes with insufficient information. <sup>(4)</sup> What may be the outcome of this real encounter, wrong prescription resulting in serious injury or death, poor handwriting on charts and drug prescriptions resulting in medical error, errors in drugs that have similar names, sending people home from the emergency room who need diagnostic tests and who later die of a stroke or heart attack or internal bleeding, surgical errors that include operating on the wrong body part, improper administration of anesthesia, leaving an instrument inside the body and more, failure to wash hands leading to severe wound infection. <sup>(5)</sup> This may seem only the tip of the iceberg.

The concern towards lack of patient safety mechanism, needless test ordered by the doctor, increase in patient stay, lack of information for patient care decision at bed site, lack of reporting and screening process and medical errors and adverse events occurring rampantly without check mechanism has no doubted made automated systems the choice for the future to counter balance this nuances in the delivery system.

### **ENVISIONING TO REALITY**

The goal for any enterprise can be stated as “doing the right thing at the right time for the right individual to get the best possible results.” <sup>(6)</sup> This same goal can be articulated in regard to high-quality health care and health information systems. In fact, it holds for achieving high quality in all three areas of effort of healthcare delivery—patient care, education, and research. To

accomplish this it might be useful to create a value/mission model that would identify both the options available to any healthcare delivery and the areas where informatics would be important for their accomplishment. Envisioning our twenty first century health care is like viewing through the crystal ball. To achieve those visions towards efficient systems, many countries have adopted models and concepts, which could bring value to the system. Talking of value in health care Michael Porter, one of the world's leading management thinkers, in New England Journal of Medicine article elaborates: “Since value depends on results, not inputs, value in health care is measured by the outcomes achieved, not the volume of services delivered, and shifting focus from volume to value is a central challenge”. <sup>(7)</sup> So does the Institute of medicine define quality as the “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.” <sup>(8)</sup>

### **NEW APPROACHES TO PROMOTING HEALTH AND DELIVERY OF CARE**

One of the approaches widely applied is the patient centered care model a term initially conceptualized by American pediatric association and currently extensively used in family practice. It refers to primary care that emphasizes timely access to medical services, enhanced communication between patients and their health care team, coordination and continuity of care and an intensive focus on quality and safety.

#### ***Patient Centered Medical Home***

The Patient Centered Medical Home is a care delivery model whereby patient treatment is coordinated through their primary care physician to ensure they receive the necessary care when and where they need it, in a manner they can understand.

The objective is to have a centralized setting that facilitates partnerships between individual patients, and their personal physicians, and when appropriate, the

patient's family. Care is facilitated by registries, information technology, health information exchange and other means to assure that patients get the indicated care when and where they need and want it in a culturally and linguistically appropriate manner, supported by primary physician group settings, patient group and insurance. Within this framework there are four clearly defined components

1. Practice organization; an engaged and productive staff and an organized and disciplined approach to finances
2. Health information technology; automates business and clinical processes, depends on clinical decision support tools, and connects patients with the health care team
3. Quality care; which sets up a project team, identifies measures and creates a patient registry, data collection in place.
4. Patient Experience; a fundamental, transformational shift from the practice designed to enhance physician workflow. <sup>(9)</sup>

By creating appropriate model for example, In Denmark, each primary care physician is responsible for about 1,500 patients. This model—known as a “medical

home”—helps to lay out the rights and responsibilities of both patient and physician and creates a seamless system of care. Physicians are paid through monthly per-enrollee fees as well as fees for individual services. <sup>(10)</sup> Additional patient-centered attributes include same-day or walk-in appointments, an electronic prescribing system connected to local pharmacies, and an off-hours telephone service staffed by physicians with electronic access to patients' health information. <sup>(10)</sup> The greatest challenge this model faces is the integration with the tertiary level of specialty and subspecialty care levels

### **Model of Chronic Care with E-Health**

The Chronic Care Model (CCM) is an organizing framework for rising chronic health problem care and a wonderful tool for improving care at each the individual and population level. The model is predicated on the idea that improvement in care needs as an approach that includes patient, provider, and system level interventions. <sup>(11)</sup>

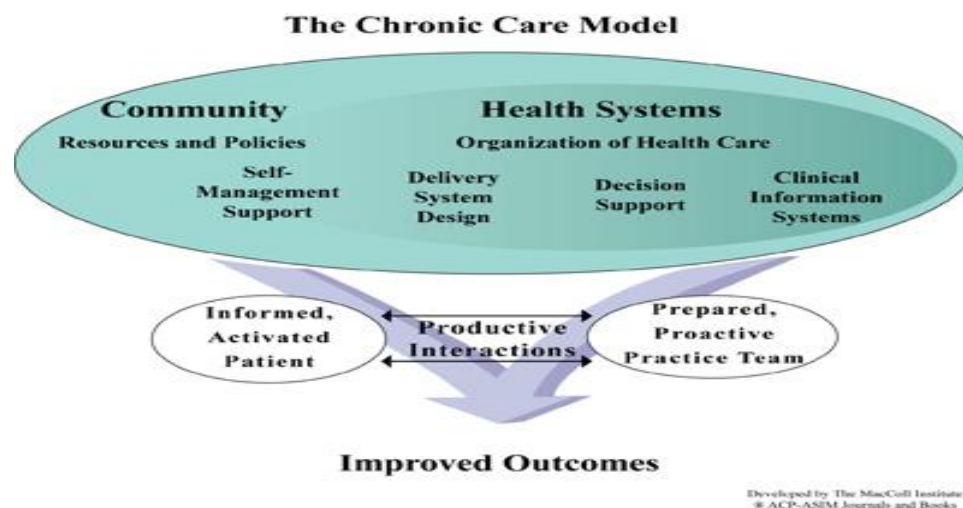


Figure 1: The chronic care model. Source [improvingchroniccare.org](http://improvingchroniccare.org) <sup>(12)</sup>

Currently most of the country have acute care model a shift from acute to chronic is seen as an ideal potential in reducing the constrained resources burden in the society. A new model of chronic care—based on community involvement, information-sharing between healthcare providers, self-management, continuous monitoring of patients, and the use of

clinical information systems to track and monitor patient care - is allowing doctors to detect and treat chronic illness earlier than ever. The goal is to keep people as healthy as possible, or prevent those with chronic illness from developing complications. It is more over similar to the concepts of patient centered models where in it address the deficiencies in current practice of chronic

care including; 1) Rushed practitioners not following established practice guidelines, 2) Lack of care coordination, 3) Lack of active follow-up to ensure the best outcomes, 4) Patients inadequately trained to manage their illness.

These models require countries to develop cross platform models of Health Information systems and electronic patient records for sharing of distributed patient information. At present local or enterprise-wide information systems are typically not intended for cross-organizational access of patient data. Many a country have adopted

local, regional and national Health information platform for transfer of secure patient information. And developing cross-organizational e-health applications require sharing and access of patient records among different healthcare stalk holder and even patients own records, on-line tele-consultation, and tele-monitoring for efficient delivery of health care. With this shift to occur requires transformation of care process to occur beyond department or the enterprise level and adoption of robust health information strategies among different countries to avoid failures.

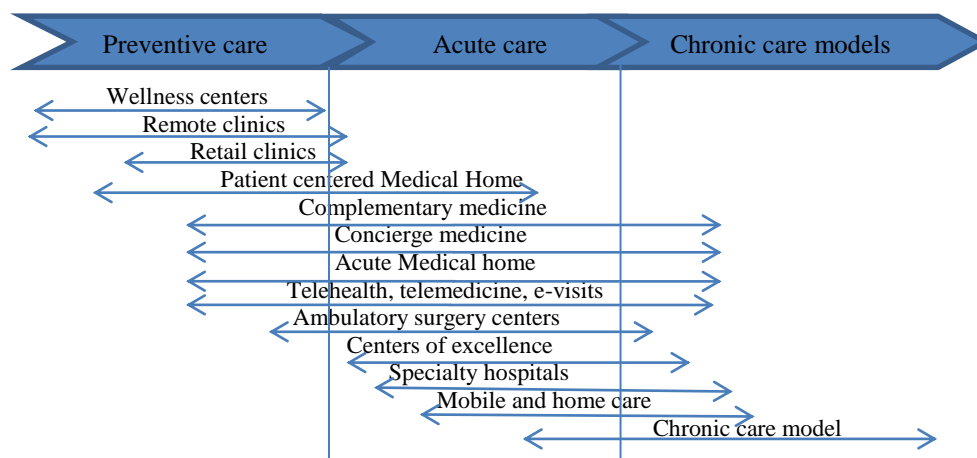


Figure 2: Source: Examples of evolving models of care (Institute of Business value, IBM). (13)

### Health Metrics & Evaluation

Accurate, reliable and timely health information is the essential foundation of any public health initiatives, and for the planning implementation and evaluation of all health programs and health systems strengthening, both nationally and internationally. Health Networks Metrics was one of such initiative built on global partnership based on health system strengthening involving the entire health information, statistical systems and concentrate efforts on strengthening country leadership for health information production and use. (14) The action plans to be built need assessment of program access, quality of services and health outcome and operation research. To assess a disease burden, the health impact of disease and injury needs to be assessed quantitatively at population level. Useful indicators include environmental, health and environmental

health indicators, in most of the country they are routinely processed but are not yet processed into health information. Thus it necessitates each country to have a sound health information system depending upon the processes for gathering, sharing, analyzing and using health-related data for decision-making. Many of the existing health information systems frameworks are evolved in a haphazard and fragmented way and are mainly diseases specific. To strengthen reforms of national health information systems necessities investments and innovations, the system will require new technologies adoption for patient identification, appointment systems, patient tracing, electronic patient records for data collection and analysis of health outcomes.

To accomplish this, adapting global health information standards that are aligned to broader efforts to improve the availability and quality of statistics must reinforce

national establishments and leadership structures. (15-17)

Health Metric Framework [HMN] describes the six components of a health information system and the standards needed for each as shown above. It is further subdivided into inputs, processes and

outputs. Inputs refer to resources, while processes touch on how indicators and data sources are selected and data is collected and managed. Outputs deal with the production, dissemination and use of information. (15)

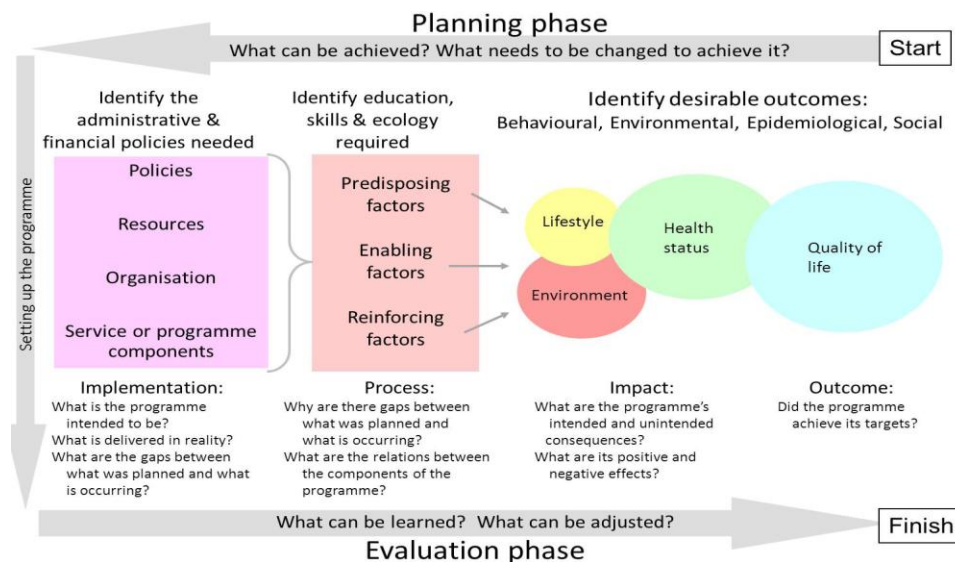


Figure 3: Source: The Precede-Proceed Model of Health Program Planning & Evaluation (15)

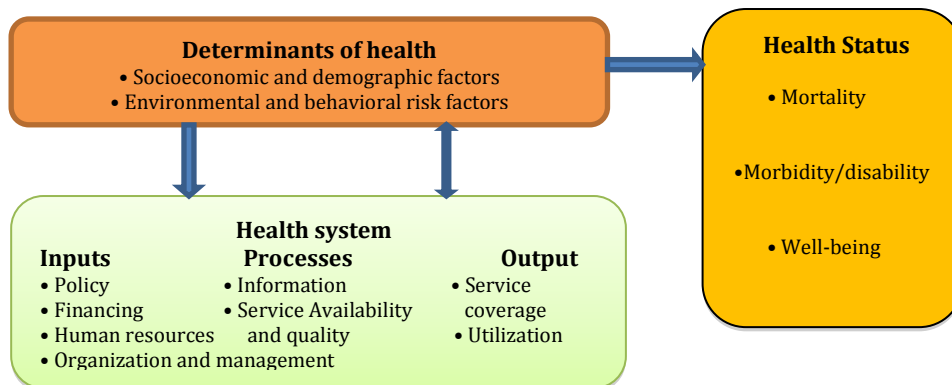


Figure 4: Source, HMN Framework and Standards for Country Health Information Systems (2008) (WHO, 2008)

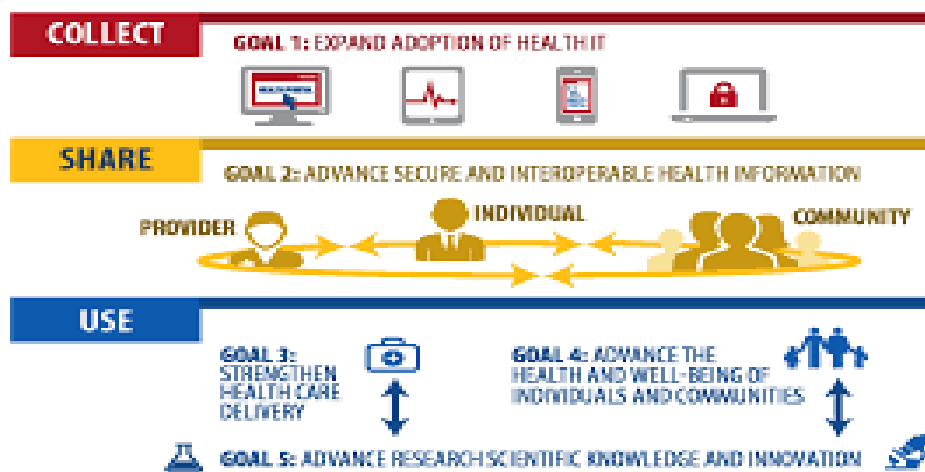


Figure 5: Source: Federal Health IT Strategic Plan Goals (Healthit.gov, 2015). (19)

## Vision of the Health IT Ecosystem

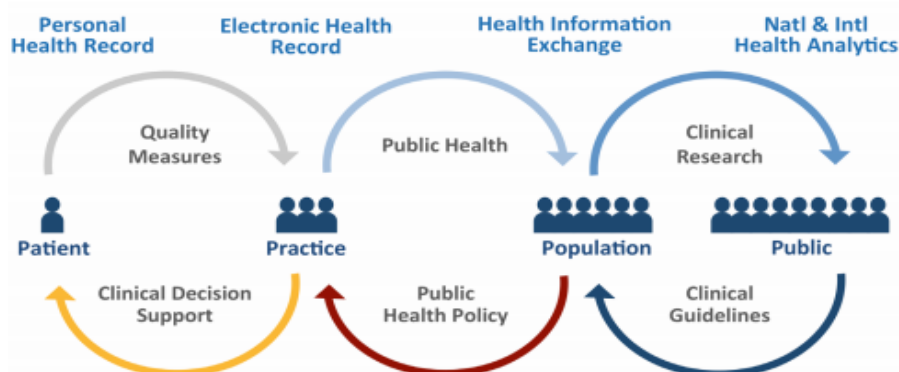


Figure 6: The Health IT Ecosystem as a Learning Health System Source: The Office of the National Coordinator for Health Information Technology. (18)

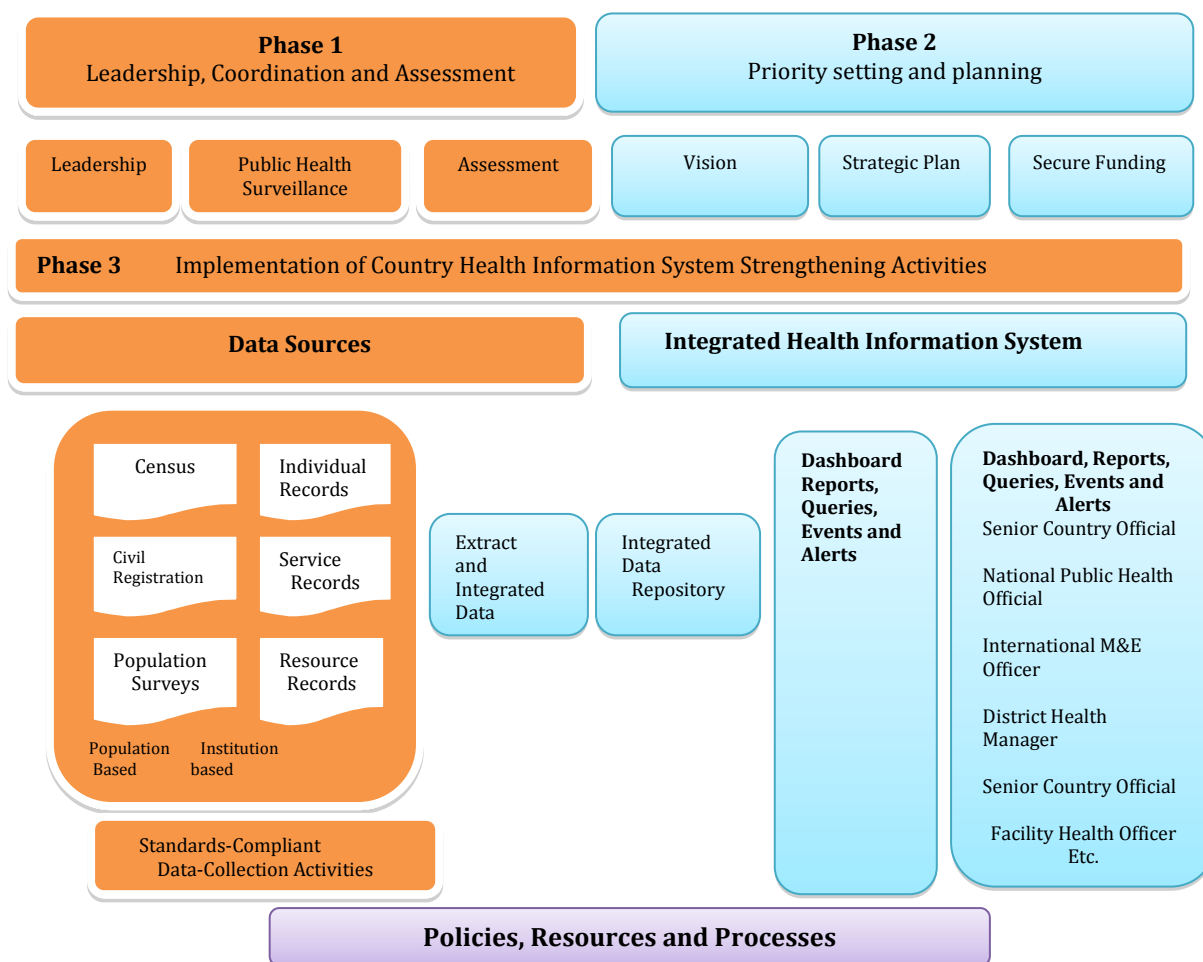


Figure 7: Source: HMN Framework and Standards for Country Health Information Systems. (17)

“The Federal Health IT Strategic Plan 2015-2020 describes a set of overarching goals aims of improving health care quality, lowering health care costs and improving the U.S. population’s health”. This Nationwide Interoperability Roadmap describes pathways to realize the goals set in this framework through nationwide Learning Health systems. (17)

In 2005 the institute of medicine (IOM) conceptualized a learning health system. The learning health system is continuous learning cycle as shown in the figure below and includes many stake holders in the health care delivery process, diagnostic laboratories, public health and the research communities. It also incorporates models that include technology, such as groupware and

collaborative medium and Internet of things remote devices and telehealth that improve access to care across clinical and nonclinical settings. <sup>(18)</sup>

In the past many countries have come up with national networks frameworks and foundations of health IT infrastructure for creating a robust Health IT infrastructure one of them is the Health Information Networks established in the year 2005 by the world health organization which was at the experimental stages of Health IT initiation for strengthening health information systems in low and middle income countries. <sup>(20)</sup> It was established as some of the national health information according to the set framework in 85 countries and implemented successful in Belize, Tanzania, Mali, Bolivia, South Africa, and Papua New Guinea. The Network's operations dissolved on 31 May 2013 and the work pioneered by the organization are now passed on to the HMN Health Statistics and Information Systems Department in the WHO Secretariat. <sup>(21)</sup> It is noted from different that the current scenario of electronic health information exists in many of the countries but there exists several barriers like insufficient structures and the standards lack of financial motives, misinterpretation of existing laws. Data security and privacy standards were not defined adequately across systems fragmentation and duplication of data and reporting standards. <sup>(20,22)</sup>

## CONCLUSION

There is no end to the future developments and its future innovations that occur in health care. With this changing trend, the future physician or hospitalist should be relentless managers of the inpatient stay, less about traditional views of physician ship and more about driving teams and technology to make hospitalizations more efficient and increase adherence to practice standards.

The escalating costs towards managing patients disease has led to advancement of new models in health care delivery, and to keep pace with the present

and future trends countries should build robust e- health strategies. The challenges for advancement of a public health informatics agenda are large. The long list includes funding, governance, information architecture, electronic infrastructure, standards, vocabulary, research, evaluation, privacy, global healthcare village, characterized by fundamental changes in practice, learning, and conduct of research, confidentiality, security, and training. <sup>(23)</sup>

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How to cite this article: Purshottam KH, Albejaidi F, Kumar N. Modelling of healthcare delivery based on health metrics models. *Int J Health Sci Res.* 2016; 6(5):369-376.

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