



Services

Managing
Chronic
Diseases and
Promoting
Wellness in
India Schools

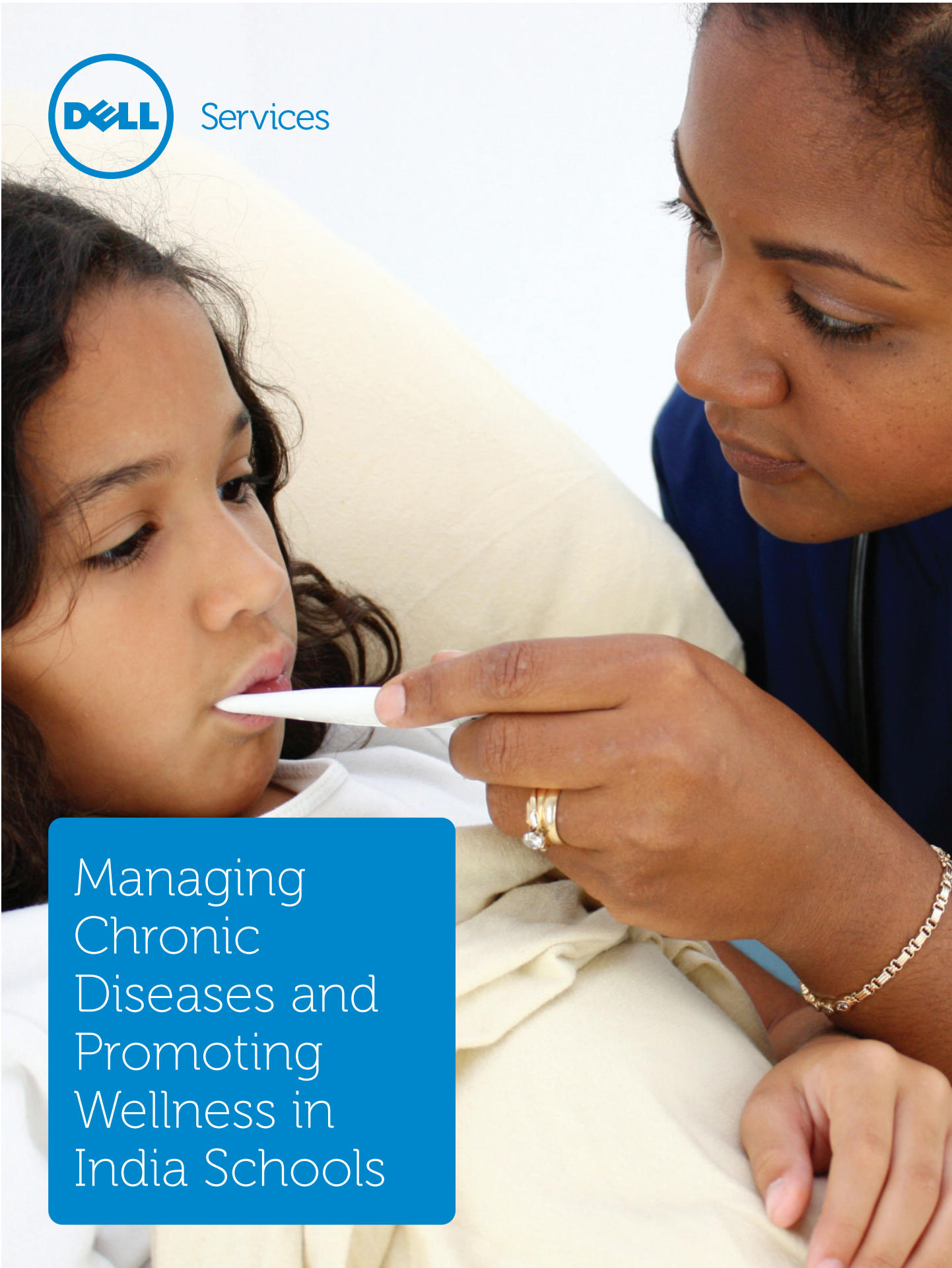


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Managing Chronic Diseases and Promoting Wellness in India Schools

Electronic Health Records
and Mobile Phones Can
Help Children, Schools, and
Public Health Agencies

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Introduction

In India in 1961, the Rennuka Ray School Health Committee laid the foundation for school health by emphasizing health education and services in schools. Today, some schools give health checkups, and some high-end city schools provide sick rooms or infirmaries for which students pay. For most schools, however, health checkups are isolated events with little continuity from one checkup to the next. This non-integrated tracking approach does little to build the overall health management capacity of the school even if there is a full-time or part-time healthcare worker (usually a nurse) stationed there. The question then becomes, can a country as renowned in IT and mobile networks as India use technology to better manage a well-defined population like schools?

What Can Technology Deliver?

Electronic Medical Records (EMRs) as shown in the Glossary of Terms at the end of this paper are increasingly creating a cross-sectional picture of a person's current medical condition. Since EHRs are longitudinal in nature, the central data repository is meant to hold all the medical data of all the people in the system, and EMRs and EHRs create different views of this database.

Disease Registry offers another view of this same database, so that all persons with that particular disease get listed. This disease registry is not necessarily dependent on the diagnosis entered by the healthcare provider. The records can show up in the disease registry based on complex algorithms consisting of signs, lab test results, and other parameters. The patients listed in a disease registry can be managed through a Chronic Disease Management system for prescribing customized care plans and sending reminders. Therefore, an EHR consists of various components to store, retrieve, and process the information included. This entire EHR can be a hosted model, either as stand-alone in an intranet or hosted on the Internet (Glossary). The EHRs can be accessed through laptop, desktop, and business phone devices, and the EHRs can send SMS (Short Message Service) to mobile phones.

EHRs Can be Used to the Advantage of Students, Schools, and Public Health Agencies

1. Emergency Management at the School Level: In today's technological world, it is possible for schools to gather relevant information from parents and students in standardized formats, conduct a baseline student health checkup, and enter the entire data through desktops or laptops into a central data repository. Over a period of time, the EMRs turn into a complete EHR. The EHR contains information that can be easily retrieved on demand through desktops/laptops, or business phone devices. By looking at the Disease Registry and further simplifying analysis of the EHR data by slicing and dicing through data warehousing and the reporting engine (Glossary) the school management could know, for instance, how many students have asthma, the medications they use and the seriousness of their illness. They would be able to identify students at risk for emergencies and their emergency care plans. This information would help schools to equip the infirmary, respond more quickly if issues arise, and have arrangements with a nearby physician/hospital for emergencies. For instance, if an asthmatic student were to report to the sick room, the nurse could refer to the EHR and be alerted to the possible level of severity in this particular student.

Even if the student is confused or too sick to inform about their medications, the nurse would know from the EMR which medication they typically use. The school EHR can transmit an emergency SMS (Short Message Service) to the mobile phone of the family physician and/or the school physician whose name would also be stored as a first contact in the EHR in consultation with the parents. Alternatively, if there is an EMR/EHR of the child in the nearby hospital, or with the family physician, and it is connected to the school EHR, then the hospital would automatically get an alert about the emergency. Delays could be avoided to help avert tragic events.

2. Chronic Disease Management at the School Level: In addition to providing important emergency management benefits to children and school authorities, EMRs overlaid with Chronic Disease Management systems (Glossary) would help ensure that students receive assistance in managing certain chronic diseases such as diabetes, or risk factors including obesity, smoking, hypertension, epilepsy, asthma, and more.¹ EHRs could assist schools in implementing guidelines and protocols, while students and caregivers would have information about what to do in specific situations, such as if blood sugar reaches a certain level in a diabetic student. Relevant information can be accessed directly by logging onto the Internet or through mobile phones and business phone devices, which are fast becoming ubiquitous and personalized.

3. Health Education and Wellness Promotion: Similarly, health education can be provided to students individually in unobtrusive and non-condescending ways. For example, links can be provided through the EMR to sites that show the harms of smoking, and that may include contact details for counselors, social sites of quitters, and other relevant information. For obese or overweight students, a Chronic Disease Management system can be linked to mobile phones, and SMS reminders for exercise can be sent automatically at a time pre-set by students themselves. Students could be guided to choose their own daily fitness program through the Chronic Disease Management system with assistance from counselors and automatic schedule reminders. Systems could also be set up to send an SMS to parents to further reinforce programs.

Since EHRs facilitate instant feedback electronically, they can be tailor-made and to facilitate specific health education and wellness promotion messages over mobile phones. In addition, Internet usage could facilitate further connectivity and prompt students to form support groups, such as those with diabetes or those trying to quit smoking (Glossary). A further advantage is that indirect contact can prompt added confidence and disclosure, perhaps even to a counselor. Greater connectivity can also be useful in certain situations that are perceived as embarrassing, an example could be issues related to sexual health. In these instances, the student portal (Glossary) provides functions similar to a social networking site but for specific and health-related issues.² Since parental feedback can be highly valuable to school nurses and teachers, there are times when parents can provide health information and specific feedback regarding their children.

4. Benefits to Public Health Agencies at District, State, and National Levels: There are multiple potential advantages of automating and standardizing school health records. Looking up

the Disease Registry and further analysis of EHR data could help identify and understand the prevalence of certain diseases/risk factors while assisting in formulating appropriate public health policies. EHRs can also help enable systematic surveillance. For instance, data could be gathered from 200 schools in a state on student lifestyle factors such as smoking, sexual behavior, and obesity as well as diseases like anemia or dental caries— all done through six-month or even yearly checkups. Building in pre-defined filter indicators in EHR systems can make access, output, analysis, and reporting more efficient. Chronic Disease Management along with EMR systems can ensure implementation of standardized guidelines and care, assist in targeting health education effectively, and facilitate evaluation of services and resources.

5. Better Care and Increased Student Safety: Technology can deliver less labor-intensive, more accurate, and up-to-date information to schools that is useful to provide appropriate and timely health services that promote wellness among students. Technology can enable greater control for students to participate in managing their chronic diseases and modifying risk factors. To public health agencies, it could provide systematic information useful for planning and evaluation.

Feasibility

Availability and Affordability of Equipment and Services.

Most schools currently have or will acquire in the near future computers with broadband Internet services for academic and administrative purposes. In addition, there are approximately 400 million mobile phone users in India, and the number is rapidly rising.³ Mobiles offer cheap, user-friendly, and personalized service in many ways. Most users regularly send and receive SMS and download music, pictures, and games from the mobile Internet service according to their preferences. Mobile devices have gained a widespread and every-increasing level of comfort, use, and affordability across the population. The use of business phone devices is on the rise, where voice, text, email, Websites, and social media networks can be accessed and managed simultaneously.

Technical Feasibility/Interoperability. EMRs/EHRs are becoming common in large corporate hospitals. The trend is now percolating to medium-sized hospitals and physician clinics, and can be expected to move more into government systems as well. Most of the good EMR/EHR systems support interoperability through adoption of standard norms (Glossary). In many cases, these open standards make it technically possible and advantageous to integrate various systems of EMRs/EHRs, school/physician/hospital EMRs/EHRs, Web-hosted EMR/EHR systems, Chronic Disease Management systems, social networking sites, and various mobile networks. Systems are also in place for making the EHRs unique through student registration and to avoid duplication through an Enterprise Master Person Index (Glossary). In most cases, mobile phones can make an effective healthcare management platform because sending an SMS from an EHR to a mobile phone network involves relatively simple technology.

Standard Language. In the world of medicine, there is not always a standard nomenclature, for example: congestive cardiac failure or CCF can also be called congestive heart failure or CHF. EHRs have a standard terminology dictionary, such as

SNOMED, to help ensure that everyone uses the same sets of keywords; congestive cardiac failure is CCF and not known by another acronym or synonym. The diagnosis and procedures could be described by standard codes, such as the International Classification of Diseases (ICD) and Current Procedure Terminology (CPT), which provides obvious benefits for building the disease registry and data analysis.

Affordability of Technology. To share costs, EHRs could be hosted centrally and multiple schools could pay for use over the Internet to save the costs of software and individual installation at each facility. Instead, each school (or school system) could pay a license fee based upon the number of users (i.e., students and teachers), which creates a more economical option. This delivery and costing model is a type of cloud virtualization computing that has gained popularity in the business sector for cost and performance efficiencies.

Administrative Feasibility. When EHRs and relevant data are located centrally, instead of separately in each school, public health agencies can have easier access without the need for integration between various third-party EMR systems.

Access Rights and Privileges. Good EMR/EHR systems provide privacy and security of the patient data. To set and control usage privileges, healthcare providers will access the system through a provider portal, students through the student portal, and parents and teachers through the school portal (Glossary). Through the administration portal, the system administrator will grant the levels of access to various stakeholders (Glossary). Levels of access can be decided based on consultations with parent bodies, student leaders, school authorities, education institutions, health agencies, and relevant NGOs. Also, privacy and security of data can be further handled by tight contracts between the schools, physicians, hospitals, reputable IT service providers, and the EHR product vendor. Additional security protocols can be built in as needed; for instance, broad trend data search could be programmed to be done without student identifiers.

Privacy Precautions

Selection of school EHR systems and the methodologies to implement them requires that the needs of schools, students, and public health agencies are adequately met.⁴ One primary up-front challenge to address is that information sharing is a huge issue. Confidentiality is of paramount importance for students who are minors and for schools to a certain extent.

The system administrator, through the administration portal, can keep information anonymous by granting different levels of access to different stakeholders. The students could get full access to their information, whereas school authorities could get composite information on each class or the entire school, but not on individual students. Students could feel comfortable entering their smoking status with the assurance that teachers will not know individually who smokes. On the other hand, teachers and administrators will know how many smokers they have in school and whether smoking is a serious issue. They will not know the individual smokers, unless students choose to come forward themselves. States could similarly get district-wide or region-wide information on the general health status of schools. The exact extent of information sharing can be worked out in consultation with parent bodies, schools, and health authorities.

Standardized guidelines need to be followed by schools, which would involve consultations with healthcare providers and parents. This does increase responsibility for the school, but is a positive step to make schools safer for students while protecting privacy.^{5, 6}

Summary

The Central Board of Secondary Education in India conducted a Global School Health Survey (GSHS) in 2007 using a standardized questionnaire developed and supported by the WHO and the CDC.⁷ The survey collected information from 13-15 year-olds on lifestyle risk factors, tobacco use, and sexual health including HIV among many other things. The Global Youth Tobacco Survey studies this same age group for tobacco usage only. However, these surveys do not include information on important diseases and risk factors important in India. Though it does ask about vegetables and fruit consumption, simple height, weight, and BMI are not recorded. Similarly, immunization, refractory errors, other correctable deformities, and important medical conditions are left out, including asthma, epilepsy, and anemia.

The Role of EHRs. Collecting and managing important health data is possible with the use of EHRs. The benefits of EHRs are far-reaching and can include but are not limited to: emergency management, chronic disease management, health education, wellness promotion, and public health data analysis. With the implementation of EHRs, tragic incidents such as an asthma death⁸ might be prevented.

Software, mobile airtime, traditional technology, and the type of tele-health broadcasts used to provide health care in some schools can be costly approaches.⁹ Web-based software for health service models in schools also raised the question of cost-effectiveness.¹⁰

With a large pool of IT experts, high computer penetration, broad mobile phone use, and availability of services at affordable prices, India schools can use technology to advantage in identifying and managing important chronic diseases and risk factors in children. In this article, we have tried to show that improvement in management of emergencies and chronic diseases, and promotion of wellness among school children is possible, through technology, and that mobile phones are an available – and at present perhaps under-utilized – way to effectively disseminate information.

Glossary

(Note: We are presenting the “solution architecture” from a functional perspective. The more complex and complete “technical architecture” of the system is beyond the scope of this paper).

An Electronic Health Record system is the term used to encompass Electronic Medical Records, Disease Registry, Chronic Disease Management system, portals, and more. The hosted model is a system that is hosted on a remote server and accessed through various portals by users over a network.

1 – Healthcare provider portal: Portal for physicians, hospitals, public health agencies, and emergency medical response teams to access the system.

2 – School portal: Portal for school nurses, teachers, and parents to access the system.

3 – Student portal: Portal for students to access the system.

4 – Administrative portal: Portal to provide access rights to all stakeholders. Only the person who needs rights gets to see it or use it. Data privacy, security, and monitoring of the system will be managed by the system administrator, and is usually provided by a trusted IT vendor.

5 – Mobile phones/business phones: Examples of business phone devices are Blackberries or Palmtops that are hand-held computing devices that also serve the function of mobile phones. SMS can be received on basic mobile phones and business phones. The latter (and not the former) can also directly access the relevant portal.

6 – Laptop/desktop: All eligible stakeholders can access the system on laptops or desktops through the network (Internet/intranet).

7 – Standard terminology engine: Ensures that the system has a standard terminology dictionary such as SNOMED so everyone uses a standard set of keywords e.g., congestive cardiac failure is CCF and not known by another acronym or synonym. The diagnosis, procedures, and other terminology are identified by standard codes, such as the International Classification of Diseases (ICD) and Current Procedure Terminology (CPT).

8 – Enterprise Master Person Index: A system that ensures that there are no duplicate records in the system. EMPI is a statistical system used for distinguishing between similar and different identities e.g., EMPI can find out if Ram K. Singh, Ram Singh, and Ram Kumar Singh are the same person based on % match of demographics, such as parent/guardian name, address, gender, date of birth, etc.

9 – Data warehousing and reporting engine: Used for data analysis such as slicing and dicing. It's a tool used to filter and pick up only the relevant pieces of data from a bigger data set.

10 – Student registry: A unique list of all the students in the system. If a student transfers from one school to another, the school checks the registry before making a new record. EMPI works with the student registry to make sure there are no duplicates.

11 – Disease Registry: A list of diseases prevalent in the students.

12 – Central data repository: A store of all data from different sources such as hosted EMR, stand-alone EMR, feedback from hospital EMR systems, feedback from physician, and more.

13 – Social networking system: Websites promoting horizontal networking through the Internet, such as: Facebook, Twitter, LinkedIn, etc.

14 – Disease Management system: A computer-based system for prescribing customized care plans and sending reminders, primarily to chronic disease patients. Disease management systems for asthma, diabetes, smoking, and other common chronic conditions are available commercially.

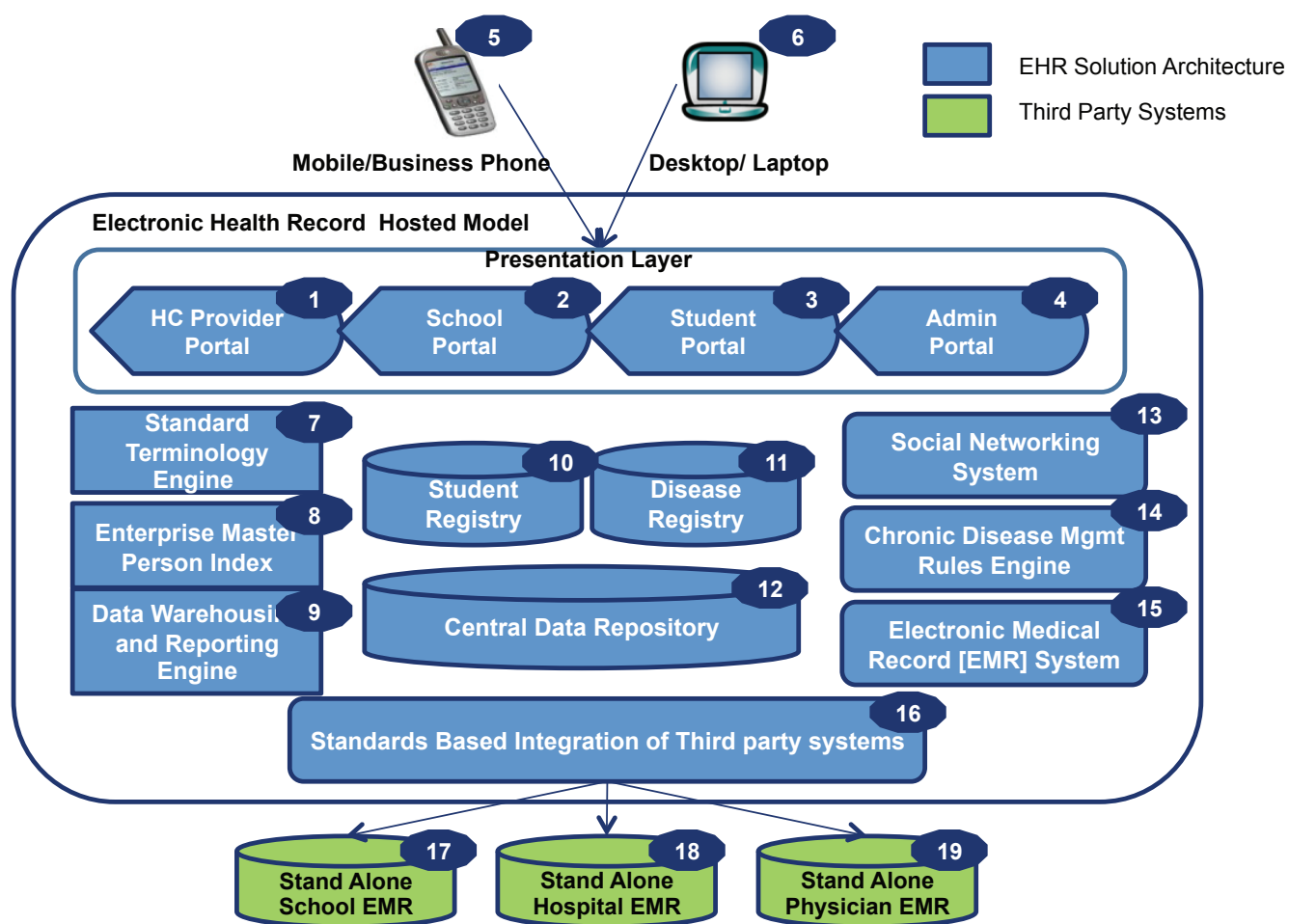
15 – Electronic Medical Record (EMR): A category of computer-based systems used to capture, store, and retrieve patient data. It can also offer additional functions to alert care givers about drug-drug, drug-food, drug-lab interactions, allergies, etc. EMRs are cross-sectional whereas Electronic Health Records (EHR) are longitudinal and give a picture over a time period.

16 – Standards-based integration of third-party systems: Items 17, 18, and 19 below are not part of the Web-hosted EHR model and are regarded as third-party systems. Standards-based integration systems link these third-party systems into the Web-hosted EHR environment. As an example: HL7 is one common standard for connecting two or more healthcare IT computer systems.

17 - Stand-alone school EMR: Some schools may have their own EMR, but may also want to link into the disease management and social networking features offered by the hosted model. Such stand-alone EMR systems can be integrated with the hosted model through a standards-based integration approach.

18 – Stand-alone hospital EMR: EMR at hospitals can be integrated with the hosted model through a standards-based integration approach. This connectivity can be accomplished for hospitals that have a pre-existing tie-up with the school. Later it can be extended for other hospitals as EMR becomes common in all major hospitals.

19 – Stand-alone physician EMR: EMR at physician office can be integrated with the hosted model through a standards-based integration approach. This connectivity can be accomplished for the physicians having a pre-existing tie-up with the school. Later it can be extended for other physicians as EMRs become more prevalent.



Solution Architecture of an Electronic Health Record System [EHRs] from a functional perspective

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