Published in: Schmid A. and Singh S. (2017), Crossing Borders - Innovation in the U.S. Health Care System, Schriften zur Gesundheitsökonomie, Vol. 84, Bayreuth: P.C.O.-Verlag.

The Geisinger Model

Patrick Walberer

Despite having one of the highest health expenditures internationally, the US health system for many years has only achieved average care outcomes. Additionally, the quality of care is not adequately considered in reimbursement processes. Insufficient individual access to medical care, fragmented care structures, as well as the still high number of uninsured Americans, represent great challenges across the nation. Geisinger Health System, an integrated healthcare delivery system located in Pennsylvania which has operated for more than 100 years, has set a goal to counter sprawling healthcare costs with innovative service, insurance, and remuneration structures. Therefore, Geisinger Health System relies in particular on innovations in information technology, which are based on an electronic health record system that spans all institutions. The approach and implementation of innovations as well as some directive innovations of the Geisinger Health System are examined in this essay. The value added for the patient as well as for Geisinger will also be discussed. Finally, prospects and limitations will be presented to evaluate if and how the innovative thinking of Geisinger Health System can be seen as a beacon for other US healthcare providers.

Contents

1 Status and Hurdles of Health Care Delivery in Rural US Regions

Historically, there exist various parallel healthcare and insurance systems in the United States of America (US) which operate as a "highly inefficient, … extremely fragmented whole" (Smith and Medalia, 2014). The insurance coverage of the US population, defined as access to medical care, is a very heterogeneous mixture of mainly private insurance as well as many state support programs, without a general insurance obligation. Fee-for-service reimbursement dominates the insurance market, but some plans reward good treatment and outcomes (Yuan et al., 2017, pp. 12-14). With costs of $9,403 per-capita in 2015, the US health care system ranks third most expensive in the world, while the treatment quality is only rated as average (World Bank, 2017). Constantly rising treatment costs as well as dissatisfaction of the patients with the care they are provided causes further problems for the health care system.

Usually, US healthcare structures consist of various spatially and organisationally separated outpatient medical practices, emergency services, and inpatient service providers. However, this organisation of care structures no longer corresponds to the demands and possibilities for patient care in the 21st century. Innovative care models are only very slow introduced into healthcare delivery. A well thought-out medical care restructuring including innovative supply components is urgently needed (Prince and Graf, 2015, p. 16).

All the problems previously mentioned resulted in a loss of value in the healthcare system and created the necessity for reorganisation and innovation. This leads to the following research question, which is to be answered within the scope of this paper:

> The aim of this essay is to examine if and how the Geisinger model can be seen as an example for innovative healthcare delivery in the US and describe what generalizable implications can be derived from it for other providers.

2 Classification of Legal Background, Basic Conditions, and Necessities

Access to medical care in the US depends on an individual’s insurance protection through an appropriate health plan. As described in the previous chapter1, health insurance in the US means any type of program that is designed to cover and pay for illness expenses. This includes privately purchased insurance and government funded insurance (Medicare) or social welfare program (Medicaid) (Shi and Singh, 2013, p.139; KFF, 2017; Torgan, 2013).

Fragmented, uncoordinated, and highly variable treatment procedures can be identified within this system. Fragmented healthcare structures often lead to safety risks as well as wasted resources, two main reasons for the low value of US healthcare, defined as the outcome depending on the cost of the input (Porter and Olmsted-Teisberg, 2006, p. 4).

Private health insurance companies, in particular, negotiate health plans with individual supply conditions and payment models with different service provider groups, creating a lot of bureaucracy and inefficiency (Chua, 2006, p. 4; Torgan, 2013).
Governmental reform measured previously proposed mostly focused on better access to care or cost control of healthcare. Thereby, both approaches ignored the basic problem of lower healthcare value for a long time (Porter and Olmsted-Teisberg, 2006, p. 4; Torgan, 2013). It is important to increase the value of healthcare and maximize the benefits of high healthcare expenditures. Productivity and efficiency gains, which are common in other industrial sectors, barely exist or are non-existent in the US healthcare sector (Paulus et al., 2008, p. 1,235). To increase the value of healthcare, a well-thought-out health care system strategy as well as the associated organisational capacity to change is needed. Sustainable healthcare value can only be created when the various stages of the care process are abolished, automated, delegated to appropriate but more cost-effective personnel, or otherwise made more efficient (Porter and Olmsted-Teisberg, 2006, pp. 4-6; Torgan, 2013).
Key components for an innovative change in care processes are:

- Consumers and patients who are actively directed to behaviour that alleviates illnesses or increases the patient-centred performance.
- Safer and more effective medicines or medical devices are used
- Physicians who provide faster, more appropriate and reliable patient-centred care
- Costs of the supply chains are systematically reduced and the value of healthcare increased

These changes offer the greatest sustainability within a supply system, in which the focus is on the creation of value and the output of innovation is measured and appropriately rewarded in the market (Porter and Teisberg, 2006, pp. 4-6; Paulus et al., 2008, pp. 1,235-1,236).
The US healthcare system is not just struggling with the existing lack of value; it also has geographical barriers. The geography and settlement structure can be characterized by a two-track development - various metropolises of millions and many sparsely populated rural regions. The organisation and assurance of an adequate supply structure, especially in rural areas, is often challenging. This is also the case for Pennsylvania, a state in the northeast of the USA with an area of about 120,000 km^2 and a population of 12,702,379. This corresponds to an average population of 106 inhabitants per km^2. The median age is 39.6 years, with an age cohort between 18 and 64 years comprising 62.3% of the population. The number of men and women are almost equal. The Geisinger Healthcare System (GHS), headquartered in Danville, Pennsylvania, is predominantly

active in Pennsylvania and is therefore subject to the issues in design of its care structure described above, especially since the system services rural regions.

3 Geisinger Healthcare System as an Innovator of Need-based Healthcare in the USA

3.1 Historical background, Ideas, and Development of the GHS

More than 100 years ago, in 1915, Abigail Geisinger founded her own hospital modelled on the Mayo Clinic in rural Pennsylvania and set a mission "to make it the best" (Paulus et al., 2008, p. 1,236). Today, this single hospital has developed into its own healthcare system consisting of around 30,000 employees, distributed into three hospitals and 110 network-clinics allocated over 45 counties in Pennsylvania (GHS, 2015, p. 17; Paulus, 2009, p. 123; O´Connell, 2016). The primary care physicians in the 45 mostly rural counties ensure the basic outpatient care of GHS patients in spoke facilities[1] and function as gatekeepers for the downstream and inpatient GHS care provider structures. In these downstream care settings, specialists treat patients who have been recommended to be seen by a specialist within three hospitals, which act as hubs[2] (McKinley et al., 2002, pp. 574-575).

The GHS works as a not-for-profit provider of care in Pennsylvania. The reason GHS places importance on offering innovative healthcare solutions is an established culture of reinvesting a large amount of their profit every year. In 2016, GHS spent 15% of their operating expenses on community support. This amount of community service is three times greater than the necessary amount to meet the standards of a charitable organisation in Pennsylvania. Compared to for-profit organisations, which focus on maximizing their revenue and potentially neglect the quality of care, the GHS mission is to develop a care model based on innovation and value to enhance the quality of care. Because of its clinical and financial success, the not-for-profit mission of GHS is a model for other healthcare organisations nationwide (GHS, 2017).

The GHS was initially an integrated healthcare delivery system[3] (IDS) and later developed into a HMO with central and north-eastern Pennsylvania as the main area of activity[4] (Paulus et al., 2008, pp. 1,236-1,237). As an HMO, the GHS offers four main types

[1] Spokes are to be understood as facilities for the provision of health services, which serve as the first point of contact in the treatment of patients (Porter and Olmsted-Teisberg, 2006, p.197; McKinley et al., 2002, pp. 574-575).

[2] Hubs are large and centralized health care provider facilities (Porter, Olmsted-Teisberg, 2006, p.197; McKinley et al., 2002, pp. 574-575).

[3] An IDS is a network of healthcare organisations where physicians network with or without hospitals (Evashwick and Meadors, 1994).

[4] A health maintenance organization (HMO) is a provider for health services as well as a medical insurance group that offers health plans (Kovner and Knickman, 2011, p.31).

of health plans: one for children, a plan for individuals and families, a plan specific to Medicare recipients, and separate plan for Medicaid recipients (Geisinger, 2017). In 2015, the Geisinger Health Plans (GHP) had 540,172 members, of which approximately 31% were on the Medicaid plan. A total of over 2,640,000 ambulatory patients were seen and over 213,000 patients were treated in the emergency room (GHS 2015). The referrals to GHS facilities are not limited to GHS doctors, but can also be made by doctors outside the GHS (Paulus et al., 2008, pp. 1,236-1,237). With a volume of 33% of the GHS total turnover, the proportion of treated GHP patients is significantly lower than non-GHP patient population (Paulus et al., 2008, p. 1,236). This figure demonstrates that recommendations for patients from outside providers are important to the success of GHS (Paulus et al., 2008, pp. 1,236-1,237).

The GHS can particularly be characterized by its strong affinity toward and focus on improving healthcare delivery. In order to design innovative insurance and reimbursement models, the GHS has always been ready to take risks, believing in the future success of the projects. Their conviction in high-value treatment quality is particularly clear since Geisinger started to offer a reimbursement of costs a few years ago to patients who were not satisfied with their treatment (Burke, 2017; Casale et al., 2007, pp. 613-623).

Geisinger´s decision to take part in the Medicaid managed care program required –especially for the rural areas of Pennsylvania – a suitable and cost-effective strategy for treatment options for patients living in these regions. This was the starting point of an innovative care model, for which e-visits and telemedicine based expert consultations were actively researched (Prince and Graf, 2015, p. 16). Geisinger's understanding of how healthcare is provided is subject to rapid change in treatment options, remuneration models, and communication technologies particularly influenced by demographic changes. Geisinger's strength as a participant in healthcare delivery is that it can effectively adapt to these trends and other conditions. To deliver healthcare that patients need most, GHS has tested various care models, focusing on innovations in the medical, insurance, and technological context. GHS has continually improved these models through adaptations and further developments over time. Furthermore, this positive and innovative image as a healthcare supplier can play a crucial role as a competitive parameter (Prince and Graf, 2015, p. 16; Housley, 2011).

3.2 Understanding the Systematic Implementation of Innovation at Geisinger

To understand GHS´s insight and passion for innovation, it is important to take a closer look at its historically justified guiding culture and principles. The development and implementation of innovation is a very labour intensive undertaking, according to Geisinger. Many other healthcare providers simply add innovative concepts to existing processes. For further development and implementation of GHS´s supply and financing

structures, it is essential to place this task in the hands of an inter-professional team. Such a team at GHS, especially in the case of large innovation projects, consists of GHS employees of different professions, for example clinicians, operators, controllers, payers, and, increasingly, also patients or customers. This team is expected to first assess changes in the patient care and disease spectrum, evaluate the required and available technologies, and examine existing insurance and reimbursement structures. Even though the team members all belong to the same healthcare system, each has their own viewpoint, motivation, and goals. In addition, the group is striving at the beginning of each innovation process for an answer to a simple yet rarely asked question: Which realistically viable care model[5] can most reliably deliver the highest value of health care? Subsequently, there is a continuous search for new options for insurance, reimbursement, and healthcare models to be added to the GHS. This ability to assess and respond adequately to the changes that underlie different inputs is a very important element for future success in GHS´s opinion (Prince and Graf, 2015, p. 16; Paulus et al., 2008, p. 1,237).

Prior to designing a new care model, a clinical business plan is developed that includes the expected outcomes based on the appropriate processes, outcome measurements, and management responsibilities for each implementation step. The development teams are supported by clinical evidence of existing workflows, analyses of financial reimbursement policies, and legal frameworks. To redesign specific supply and reimbursement models, Geisinger pays particular attention to the following four areas:

- Service providers with the greatest impact on the patient population or resource consumption
- Services with the greatest degree of unauthorized variations
- Models with evidence-based or consistently derived best-practice and easily accessible outcome measurements
- Healthcare services with the highest expected diversity in outcome performance

In addition, GHS managers are particularly focused on initiatives that are expected to have a noticeable effect on the healthcare system as soon as possible. Newly designed supply processes are linked directly to expected efficiency and quality goals. After completion of the new approach to clinical care, the reimbursement, incentive structures, and non-financial remuneration are negotiated between managers of the service provider units and GHP executives (Paulus et al., 2008, p. 1,238).

[5] In this context, the care model is defined as a step-by-step approach, personalized to provide preventive care as well as diagnoses, treatments, management, and involvement of ill patients resulting in increased value (Paulus et al., 2008, p. 1,237).

For the introductory stage of innovation projects GHS usually tries to address the "sweet spot", the one-third of the patients with a GHP for whom Geisinger is financially responsible as well as their primary medical service provider. These innovations are not kept from the other two-thirds of GHS´s patient group, but this approach makes it easier for Geisinger to measure the impact of the innovation on the medical as well as on the financial aspects of healthcare. Particularly in the case of new GHP reimbursement models, GHS service providers are given the opportunity to experiment extensively on whether new interventions have the potential to develop commercial market models for quality and value-based care. As a marketing aspect for any GHP, only patients with a GHP enjoy the privilege of being the first to benefit from such innovations (Paulus et al., 2008, p. 1,237; Stock et al., 2014, pp. 1,540-1,548).

To evaluate the innovative approaches and create measurement data for ongoing process improvements, Geisinger relies on scientifically recognized methodologies, which include continuous quality improvements, six-sigma, or lean restructuring. These methodologies examine the influence of the approaches on the healthcare supply and also show potential for further improvement for subsequent innovation efforts. This systematic approach to developing, introducing, and evaluating innovations at the same time allows GHS to create a culture of self-learning and draw conclusions from its own setbacks for future projects. To that end, the members of the innovation team build modular innovation components which can be utilized to further develop functions, technologies, or components of already successfully established healthcare supply models at every stage of development. Such reusable innovation model components, for example, consist of the use of human resources, hardware and software tools, technologies, or analysis instruments. In addition, this approach and the use of modular innovation components allows the GHS to design future supply models faster, creating an optimized and cost-effective process. (Paulus et al., 2008, p. 1,238). Previous experience associated with the GHS innovation culture shows that the failure rate of innovation projects has declined since the introduction of this procedure, and the share of expectations that have been reached or even surpassed has risen. This process of scientifically supervised and evaluated innovation is repeated over and over again, and thereby plays a decisive part in increasing the production of value in the healthcare system (Paulus et al., 2008, p. 1,238).

In 2013, the GHS launched a new business unit called Geisinger Ventures (GV), whose task is to improve the introduction and growth of new business areas as an extension of existing structures in healthcare. Up to now, GV has been supporting the implementation of different retail clinic[6] model projects in various organizational forms. These GHS

[6] Retail clinics or micro clinics are small primary care facilities, staffed by nurse practitioners or unmanned through use of telemedicine applications (Dunn, 2014).

retail clinics exists as a number of walk-in business model facilities, including in-store clinics, stand-alone retail clinic sites, and combined models with basic healthcare practices and emergency services at the same site. For each model, various benefits and challenges arose in terms of patient care, marketing, personnel composition, and clinical integration. However, this was effectively countered by GV through the ability to access various modular innovation components and the efforts to create innovative supply models which can be continually optimized (Prince and Graf, 2015, p. 16).

3.3 Milestone Innovation Examples from Geisinger Healthcare System

The following examples illustrate pioneering innovations of GHS.
In 1995, the platform for an electronic health record (EHR), which covered the complete array of outpatient services, was introduced. Today, all inpatient facilities have fully implemented integrated EHRs in place (Paulus et al., 2008, p. 1,237). The approach of the Geisinger-EHR is innovative in that physicians who are not part of the GHS, but are involved in the treatment process of a GHS patient, receive reading and writing authorization via a web portal. Even patients can access their own data via the web portal online, albeit to a limited extent. This gives patients direct access to their data and helps them to become partners within the care system. Providing patients digital tools within the EHR enables them to better manage their own care and improve the value of treatment given (Paulus et al., 2008, pp. 1,244-1,245). Geisinger has also aided in the implementation of integrated electronic systems and centralization of innovation and quality support in many freestanding medical practices and small independent hospitals. This approach divides the best practices of GHS into individual care process steps and integrates these steps into decision support and other tools that are designed to help deliver performance at the right place and at the right time (Paulus et al., 2008, pp. 1,244-1,245). GHS´s innovative and transparent culture of digital data workflows and the integrated EHR infrastructure within the healthcare system also enable a strategic analysis of long-term, comparable supply data. In addition, this digital data and workflow make it possible to provide most of the services with high value near to the patient, minimizing long trips for the patient to treatment hubs (Paulus et al., 2008, p. 1,237).
In 2007, Geisinger launched the community health initiative called MyCode. MyCode is a system-wide genomic biobanking program and a platform for value-based precise medicine. It links DNA-samples and EHR data for broad research use, particularly projects focused on learning more about DNA and patient outcomes. The DNA-samples are used to generate molecular data, including a comprehensive genotype and exome sequence data. Key elements for MyCode are the stable patient population, EHR infrastructure, and the integrated health system. MyCode is free for all GHS patients and is also open to primary care and emergency patients. More than 90,000 people now participate in MyCode, with an additional average enrolment rate of 4,000 people per month

and consent rate of about 85%. Compared to traditional clinical research approaches, the MyCode model is more flexible, faster and more cost-effective. Because the model is nearly unlimited in scale, it can be adapted across multiple platforms to create and use an even broader range of data with growing resources. MyCode and genomic medicine is seen to have the potential for disruptive innovation. Furthermore, the value of healthcare can be increased using this kind of precise medicine. Mycode underscores the importance of an EHR, because without the underlying EHR infrastructure this innovative model of healthcare is not able to work (Carey et al., 2016, pp. 906-913; Avellino et al., 2013, pp. 151-152; Faucett and Davis, 2016, pp. 33-35; Wade et al., 2014, pp. 112-116). The complete and integrated EHR at Geisinger enabled more than MyCode; it also paved the way for one of the latest innovations positively influencing healthcare delivery - the use of big data technologies in a clinical context (Cohen, 2017). Innovative, analytical big data technologies are already used successfully in many branches of industry worldwide. However, the breakthrough of this technology-based analysis methodology, which processes and systematically uses large, unstructured, and digitally collected data packages, is still largely absent in healthcare, despite the large amount of digital health data which are collected every day (Dedic and Stanier, 2017). The main obstacles to this breakthrough are data protection concerns, legal restrictions, as well as a lack of technical possibilities or internally available knowledge (Erskine et. al., 2016; Cohen, 2017). A basic prerequisite for the use of big data analysis at GHS was the complete conversion to electronic data collection, storage, and use in the form of an integrated EHR in 1996, as described at the beginning of this section. To structure the collected data and to make it strategically usable, a multi-stage innovation process within the EHR was needed, which required the definition of standards for all process steps. The lack of uniform standards and lack of compatibility of individual information systems are the biggest obstacles for most hospitals seeking to implement big data technologies.

In 2015, GHS introduced an IT system called Unified Data Architecture (UDA). The UDA can import the huge amounts of data into the data analysis and management systems already present at GHS. The synthesis of the data enables Geisinger to not only record the outcome parameters of their patients, but also evaluate them in a structured manner and derive conclusions or patterns from them. Furthermore, a correlation between the clinical care data and the genomic sequences of individual patients from MyCode can be established, as well as the visualization of health data on patient cohorts and care provider networks (Erskine et al., 2016; Cohen, 2017).

The data gathered and stored by GHS, for example from clinical department systems such as radiology, patient satisfaction surveys, and data from various health-related apps, enable Geisinger to create detailed long-term reports of their patients. However, Geisinger's Big Data usage strategy is not limited to the data collected individually in

its institutions. Rather, with the patient´s prior consent, Geisinger tries to incorporate health-related data from outside sources into the UDA. These include, for example, data from grocery shopping and loyalty programs from various traders, as well as smartphone and app data. The UDA offers each patient extra storage space and has designed software to ensure that the addition and storage of data is very easy. With the UDA, Geisinger pursues the goal of closing the gap between data, which are digitally collected and stored in many areas of life, but are not systematically and structurally linked to each other. This is a common challenge for conventional health data systems. Processing large amounts of data and importing them from a variety of sources is no longer a problem for GHS, making it a unique system (Erskine et al., 2016). At present, Geisinger has the largest big data application in health care with the UDA. (Erskine et al., 2016).

4 Geisinger Health System as a Beacon for Change in US Healthcare

Geisinger Healthcare System is an innovative microcosm in national healthcare which can serve as an example for other systems. Their willingness to continue ongoing development of healthcare delivery and insurance structures centred on the 21st century patient´s needs makes it an exceptionally innovative US healthcare provider system. Parts of Geisinger´s approaches for offering health-insurance plans as well as delivering healthcare are unique and influence decision-makers of other health plans and organizations (Paulus, 2009). Its health plans, reimbursement structures, and, especially, its focus on innovation and value-based treatments are a beacon for change in US healthcare. As described in the previous sections, two central ideas can be derived from Geisinger's experience in innovation to solve the initially described problems in US healthcare delivery and possibly effect national health policy (Robeznieks, 2015).

Develop and align incentives and reimbursement structures toward value for the patient to improve experience and generate financial success

Geisinger´s integrated health system is both a service provider system and an insurance provider. For its GHP patients, it can offer better incentive structures, as opposed to other traditional health care provider organisations. Because of its innovative care models and its financial success, it is easier for GHS to use monetary and non-monetary incentives to attract physicians. The ability to cross-subsidize unprofitable services is another advantage of the GHS. Even offering patients the right to reclaim payments for treatment if they are unsatisfied is an attractive marketing strategy (Paulus and Steele, 2008, pp. 1,243-1,244; Casale et al., 2007, pp. 613-620). Beside the innovative incentive and reimbursement structures, the digital-based business models are also important aspects of GHS´s pioneering role in healthcare delivery.

Digital-based business models and infrastructure are essential to create sustainable changes in healthcare provision:

The central element of nearly all GHS technological innovations is based on the integrated use of EHR and the associated digital data workflow infrastructure. This helps to automate care processes, overcome geographical barriers, involve patients more closely in the treatment process, and increase overall safety and healthcare value. Many of the current political discussions in the US suggest that EHRs can fundamentally change health care provision. According to the evidence gathered at Geisinger, there are indications that no fundamental change can be expected from the introduction of an her alone, but this can be the starting point of a long-term digital change, and thus fundamentally change way in which health services are provided. Nevertheless, there are some barriers, such as prohibitive implementation costs and low acceptance of EHR technology in some areas, as well as the need for stable patient populations. The local applicability and use of EHR technology can be difficult if these requirements are not met.
These lessons from GHS have the ability to guide other health organizations and insurance providers towards healthcare which is value-based and beneficial to patients as well as future innovation. Putting these ideas into action through US policy could dramatically change not only Medicare and Medicaid programs, but transform the entire health delivery system.

References

Avellino, S., Colonie, R. and Carey, D. (2013), 'PS2-7: Automated Ordering and Sample Collection to Leverage Electronic Medical Record Based Genetic Research: The Geisinger MyCode Project', *Clinical Medicine & Research*, vol. 11, no. 3, pp. 151–152.

Burke, G. F. (2017), *Geisinger´s Refund Promise: Where Things Stand After One Year*, NEJM Catalyst [Online]. Available at: http://catalyst.nejm.org/geisinger-refund-promise-one-year/ (Accessed May 20, 2017).

Carey, D. J., Fetterolf, S. N., Davis, D. F., Faucett, W. A., Lester-Kirchner, H., Mirshahi, U., Murray, M. F., Smelser, D. T., Gerhard, G. S. and Ledbetter, D. H. (2016), 'The Geisinger MyCode Community Health Initiative: An Electronic Health Record-Linked Biobank for Precision Medicine Research', *Genetics in Medicine*, vol. 18, no. 9, pp. 906–913.

Casale, A. S., Paulus, R. A., Selna, M. J., Doll, M. C., Bothe, A. E., McKinley, K. E., Berry, S. A., Davis, D. E., Gilfillan, R. J., Hamory, B. H. and Steele, G. D. (2007), '"ProvenCareSM": A Provider-Driven Pay-for-Performance Program for Acute Episodic Cardiac Surgical Care', *Annals of Surgery*, vol. 246, no. 4, pp. 613–623.

Chua, K. P. (2006), *Overview of the U.S. Health Care System*, American Medical Student Association [Online]. Available at: http://www.amsa.org/AMSA/Libraries/Committee_Docs/HealthCareSystemOverview.sflb.ashx (Accessed March 22, 2017).

Cohen, J. K. (2017), *Geisinger Health System Taps Stanson Health for Clinical Decision Support*, Becker´s Health it & Cio Review [Online]. Available at: http://www.beckershospitalreview.com/healthcare-information-technology/geisinger-health-system-taps-stanson-health-for-clinical-decision-support.html (Accessed April 30, 2017).

Dedić, N. and Stanier, C. (2017), 'Towards Differentiating Business Intelligence, Big Data, Data Analytics and Knowledge Discovery', in Piazolo, F., Geist, V., Brehm, L. and Schmidt, R. (eds.) *Innovations in Enterprise Information Systems Management and Engineering: 5th International Conference*, Cham, Springer International Publishing, pp. 114–122.

Dunn, L. (2014), *Are Micro Clinics the Future of Healthcare Delivery?*, Becker´s Hospital Review [Online]. Available at: http://www.beckershospitalreview.com/hospital-management-administration/are-micro-clinics-the-future-of-healthcare-delivery.html (Accessed May 30, 2017).

Erskine, A. R., Karunakaran, B., Slotkin, J. R. and Feinberg, D. T. (2016), *How Geisinger Health System Uses Big Data to Save Lives*, Harvard Business Review.

Evashwick, C. and Meadors, A. (1994), 'Defining Integrated Delivery Systems', *AHSR FHSR ANNU Meet Abstr. Book*, vol. 11, pp. 31–32.

Faucett, W. A. and Davis, F. D. (2016), 'How Geisinger Made the Case for an Institutional Duty to Return Genomic Results to Biobank Participants', *Applied & Translational Genomics*, vol. 8, pp. 33–35.

Geisinger (2017), *Pick the Right Plan* [Online], Geisinger Health Plan. Available at: https://www.geisinger.org/health-plan/plans (Accessed May 30, 2017).

GHS (2015), *2015 Annual Report: Enhancing the Patient Experience*, GHS [Online]. Available at: https://www.geisinger.org/-/media/OneGeisinger/Images/GHS/News%20and%20Media/Annual%20Reports/ar-2015.ashx?la=en (Accessed May 30, 2017).

GHS (2017), *Our Not for Profit Mission* [Online], GHS. Available at: https://www.geisinger.org/about-geisinger/in-our-community/our-not-for-profit-mission (Accessed May 30, 2017).

Housley, D. D. (2011), *Make it the Best: A History of Geisinger Health System 1912-2011*.

KFF (2017), *Health Insurance Coverage of the Total Population 2015,* Kaiser Family Foundation [Online]. Available at: http://kff.org/other/state-indicator/total-population/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D (Accessed May 30, 2017).

Kovner, A. R. and Knickman, J., eds. (2011), *Jonas and Kovner's Health Care Delivery in the United States*, 11th edn, New York, Springer Publishing Company LLC.

McKinley, K. E., Bryan-Smith, L., Dosch, T. L., Hamory, B. H. and Fillipo, B. H. (2002), 'A Hub-and-Spoke Model of Care: Providing Specialty Care in Patients' Own Communities', *The Joint Commission Journal on Quality Improvement*, vol. 28, no. 10, 574–575.

O´Connell, J. (2016), *Geisinger Agrees to Purchase the Commonwealth Medical College*, The Citizens´ Voice [Online]. Available at: http://citizensvoice.com/news/geisinger-agrees-to-purchase-the-commonwealth-medical-college-1.2096559 (Accessed May 20, 2017).

Paulus, R. A. (2009), 'ProvenCare: Geisinger´s Model for Care Transformation through Innovative Clinical Initiatives and Value Creation', *American Health & Drug Benefits*, vol. 2, no. 3, pp. 122–127.

Paulus, R. A. and Steele, D. K. (2008), 'Continuous Innovation in Health Care: Implications of the Geisinger Experience', *Health Affairs*, vol. 27, no. 5, pp. 1235–1245.

Porter, M. E. and Olmsted-Teisberg, E. (2006), *Redefining Healthcare : Creating Value-Based Decision on Results*, Boston, Mass., Harvard Business School Press.

Prince, D. B. and Graf, T. (2015), 'Geisinger´s Retail Innovation Journey', *Frontiers of Health Services Management*, vol. 31, no. 3, pp. 16–31.

Robeznieks, A. (2015), *Geisinger´s Second Century of Innovation: Health System Spreading Best Practices Through New Company,* Modern Healthcare [Online]. Available at: http://www.modernhealthcare.com/article/20150214/MAGAZINE/302169982 (Accessed May 30, 2017).

Shi, L. and Singh, D. A. (2013), *Essentials of the U.S. Health Care System*, Burlington, Jones & Bartlett Learning.

Smith, J. C. and Medalia, C. (2014), *Health Insurance Coverage in The United States: 2013,* United States Census Bureau.

Stock, S., Pitcavage, J. M., Simic, D., Altin, S., Graf, C., Feng, W. and Graf, T. R. (2014), 'Chronic Care Model Strategies in the United States and Germany Deliver Patient-Centered, High-Quality Diabetes Care', *Health Affairs*, vol. 33, no. 9, pp. 1540–1548.

The World Bank (2017), *Health Expenditure per Capita (current US$).* [Online], The World Bank. Available at: http://data.worldbank.org/indicator/SH.XPD.PCAP?contextual=default&end=2014&locations=US&start=1995&view=chart&year_high_desc=true (Accessed May 08, 2017).

Torgan, C. (2013), *Patient Outcomes Improved by Pay-For-Performance,* National Institutes of Health [Online]. Available at: https://www.nih.gov/news-events/nih-research-matters/patient-outcomes-improved-pay-performance (Accessed May 30, 2017).

Wade, J. E., Ledbetter, D. H. and Williams, M. S. (2014), 'Implementation of Genomic Medicine in a Health Care Delivery System: A value proposition?', *American Journal of Medical Genetics*, vol. 166, no. 1, pp. 112–116.

World Health Organization (2000), *World Health Organization Assesses the World´s Health Systems,* World Health Organization [Online]. Available at: http://www.who.int/whr/2000/media_centre/press_release/en/ (Accessed May 31, 2017).

Yuan, B., He, L., Meng, Q. and Jia, L. (2017), 'Payment Methods for Outpatient Care Facilities', *Cochrane Database of Systematic Reviews*, vol. 3, 1-14.