ELECTRONIC PAYMENTS IN HEALTHCARE

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Abstract: In this paper the author has developed a theoretical framework for addressing the healthcare costs and based on it he has analyzed the payment system that is an integral part of healthcare payments. The author concurs with the recommendations made in earlier studies that switching from a paper-based system to an electronic system would not only reduce costs but also improve the efficiency of the system. By using an electronic payment system for payment of healthcare claims, huge savings can be achieved on an annual basis, as the numbers of claims processed each year are in the billions.

INTRODUCTION

Healthcare expenditures in the U.S.. have been increasing not only in dollar terms but also as a percentage of GDP (Gross Domestic Product) since 1960. They have reached alarming proportions in recent years. Tables 1 and 2 highlight the seriousness of this problematic long-term trend.

Year	1960	1970	1980	1990	2000	2010
HCE Percent of GDP	5.2%	7.0%	9.0%	12.2%	13.8%	17.3%

Table 1: Healthcare Expenses [HCE] as a Percent of GDP: Long-Term View

Source: Adapted from National Health Expenditure Data: Historical, by U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, 2011, retrieved from http://www.cms.gov /NationalHealthExpendData/02_NationalHealthAccountsHistorical.asp

In 1960, healthcare expenditures were 5.2% of the GDP and in 2010 they were 17.3% of the GDP. This indicates that healthcare expenditures are growing at a much faster rate than the GDP growth rate for the same time period. Average annual GDP growth rate for the period 1960–2010 has been 6.7% in nominal terms and the average annual healthcare-expenditure growth rate for the same period was 9.4% in nominal terms.

Year	GDP (in trillions of $)	Healthcare expenses (in trillions of $)	HCE as a % of GDP
2001	10.3	1.5	14.5%
2002	10.6	1.6	15.4%
2003	11.1	1.8	15.9%
2004	11.9	1.9	16.0%
2005	12.6	2.0	16.0%
2006	13.4	2.1	16.1%
2007	14.1	2.26	16.2%
2008	14.4	2.34	16.6%
2009	13.9	2.5	17.6%
2010	14.5	2.6	17.3%
2020*	26.1*	4.6*	17.6%*

Table 2: Healthcare Expenses, GDP, HCE as a Percent of GDP 2001–2010

Source: Adapted from National Health Expenditure Data: Historical, by U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, 2011, retrieved from http://www.cms.gov /NationalHealthExpendData/02_NationalHealthAccountsHistorical.asp.   Note: * indicates estimate

For the last 10 years (2001–2010), the average annual GDP growth rate has been 3.5%, and the average annual growth rate in healthcare expenditures has been much higher, at 5.7%. Also, Table 3 indicates that the healthcare expenditures for the U.S. constitute about 40% of the global healthcare expenditures for the last 10 years, whereas the U.S. only makes up 4.5% of the world population.

Year	U.S. healthcare expenses (in trillions of $)	Global healthcare expenses	U.S.HCE as a % of global HCE
2001	1.5	3.0	50%
2002	1.6	3.4	47%
2003	1.8	4.0	45%
2004	1.9	4.4	43%
2005	2.0	4.5	44%
2006	2.1	5.0	42%
2007	2.26	5.6	40%
2008	2.34	6.0	39%
2009	2.5	6.0	42%
2010	2.6	6.3	41%

Table 3: U.S. Healthcare Expenditure as a Percent of Global Healthcare Expenditure: 2001–2010

Source: Source: Adapted from National Health Expenditure Data: Historical, by U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, 2011, retrieved from http://www.cms.gov /NationalHealthExpendData/02_NationalHealthAccountsHistorical.asp; Global Lessons for Controlling Healthcare Costs, by P. Behner, R. Edmunds, & E. Powers, August 2011, *Strategy + Business Magazine*.

All these factors indicate that healthcare expenditures in the U.S. need to be moderated and the trends reversed. Policymakers, academicians, economists, and healthcare consultants agree that healthcare costs need overhaul and containment (Congressional Budget Office, 2008).

In this paper we will discuss relevant statistics to show that healthcare costs are abnormally high in the United States. In the second section we discuss the healthcare-revenue cycle and the healthcare-revenue time line. In the third section we discuss the theoretical model, value-chain model, to analyze the costs and develop the value-chain model for the healthcare sector. In this paper we focus only on healthcare-payment costs. Using the value-chain model for the healthcare sector, we analyze how healthcare-payment costs and efficiency of healthcare payments can be improved by switching from a paper-based system to an electronic system. Here, we discuss only the Automated Clearing House (ACH) payment system, which is an electronic payment system that is relevant for healthcare payments. Lastly, we present our conclusions.

HEALTHCARE REVENUE CYCLE

The healthcare revenue cycle can be thought of as a series of activities that are associated with the generation of revenues for healthcare providers. It is a highly complex process with numerous participants providing various services to individuals who can be thought of as the ultimate customers. Figure 1 provides an overall view of the process and its participants. The activities associated with the process can be broadly classified into three areas: pre-service, management of care, and post discharge. LeCuyer and Singhal (2007) provided an estimate of the aggregate number of transactions that take place at each stage for each activity shown in Figure 1 for the year 2006.
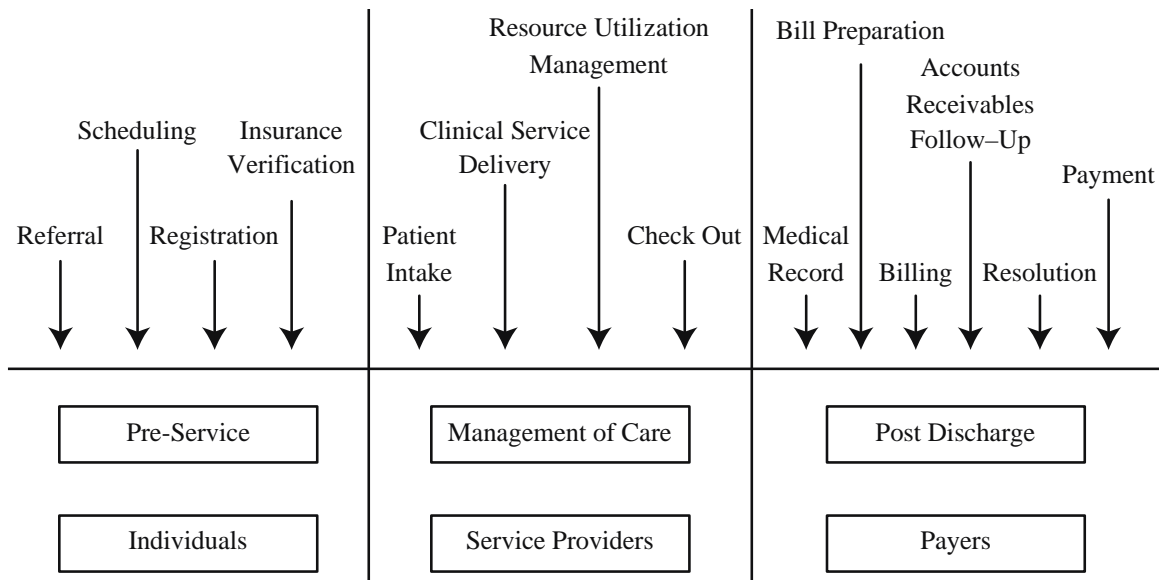
Figure 1: Healthcare Revenue Time Line

Source: (Modified from) Muller, Ralph. W., "Transforming Hospitals Through Reform of the Care Process" in Engineering a Learning Healthcare System: A Look at the Future, Eds. Grossmann, Claudia., Goolsby, Alexander.W., Olsen, Leigh, Ann., and McGinnis, Michael. J. The National Academic Press, 2011.

Table 4 shows an estimate of the number of transactions (in billions) that take place annually.

Type of Transaction	Annual Transactions (In Billions)	% of Annual Transactions that are Electronic
Eligibility Verification	1.4–3.5	30–50
Referrals/pre-authorization	0.6–1.6	10–25
Claim Submission	4.4–7.2	40–60
Claim status Check	0.7–2.4	30–50
Claim Remittance	1.2–3.4	40–60
Total*	8.3–18.1*	

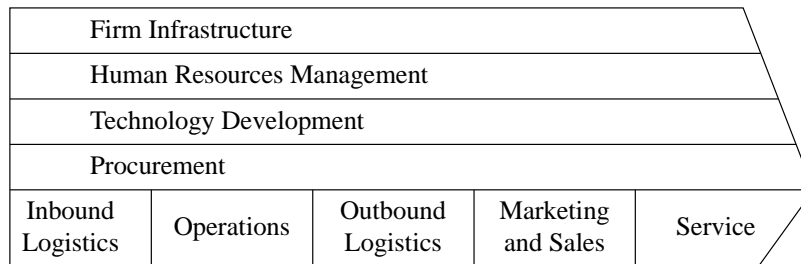**Table 4: Estimated Transaction Volume between Healthcare Providers and Payers: 2006 Estimate**

* The total does not include 3 billion pharmacy claims, 7 billion clinical-lab and pharmacy orders, 4 billion patient-to-provider payments, and 1 billion government-to-provider payments. Source: Adapted from Overhauling U.S. Healthcare Payment System, by N. A. LeCuyer & S. Singhal, June 2007, *The McKinsey Quarterly.*

The analysis is conducted at each step in the healthcare-revenue cycle in an effort to reduce the overall expenditures of the healthcare system in the U.S. Obviously, given the total value of the expenditures, the cost savings, if achieved, would be on the order of hundreds of billions of dollars, if not trillions. In this paper, we will only be looking at one particular process of the revenue cycle, namely the *payment process*. The Congressional Budget office (CBO, 2008) has estimated that a cost of $300 billion per year is incurred by administrative costs by healthcare providers and public and private payers. LeCuyer and Singhal (2007) and Pellathy and Singhal (2010) indicated that the U.S. healthcare-payment system that processes more than $2.5 trillion a year is quite "inefficient" by consuming 15% of each dollar spent in healthcare compared to 2% for the payment processing incurred by the retail industry.[1] The main reason is the high rate of electronic-payment processing used by the retail industry. The high administrative costs incurred by healthcare providers is attributed mainly to burdensome paperwork that requires manual handling of documents for claim processing, record keeping, and payments processing. Even after taking into account the complexity of the healthcare system, savings by the healthcare-payment system would be enormous by adopting a much higher rate of electronic-payment processing. Similar recommendations are advocated by researchers who have studied the problem (Pellathy & Singhal, 2010). In recent years, some large providers and payers have derived significant savings by using electronic submission and auto-adjudication of

claims, which has resulted in the shortening of the process cycle. These savings have only occurred on a small scale and a majority of claims processing, payments processing, and payments still use paper-based systems.[2]

VALUE-CHAIN MODEL

The value-chain model was first developed by Porter (1985) to increase the operational efficiency of private firms.[3] According to Porter, a firm's competitive advantage increases due to the value the firm is able to create for its customers. This can come about in two ways: lower price for equivalent benefits or a special benefit that justifies a higher price. The value-chain model breaks down a firm into relevant value-added activities or processes in an effort to better understand the structure of underlying costs and benefits. These processes enable the firm to strategically analyze the value-added activities and processes to reduce costs or increase efficiency, or both. Figure 2 shows a firm conceptualized as a collection of value-added activities like inbound logistics and operations.[4] Each of these value-added activities can then be analyzed, and based on this analysis, new procedures and processes could be developed, or existing ones modified to reduce costs or increase efficiency, or both. This type of analysis can be completed in the healthcare sector as well.

Firm Infrastructure				
Human Resources Management				
Technology Development				
Procurement				
Inbound Logistics	Operations	Outbound Logistics	Marketing and Sales	Service

Figure 2: The Value Chain Model

Source: *Competitive Advantage: Creating and Sustaining Superior Performance,* by M. E. Porter, 1999, New York, NY: The Free Press.

VALUE CHAIN MODEL FOR THE HEALTHCARE PROVIDERS

Figure 3 shows how the value-chain model can be applied to the healthcare industry. For example, each of the activities shown in Figure 1 can be analyzed to reduce costs or improve efficiency, or both. Basically, individuals receive services from healthcare providers and healthcare providers receive payments for their services from payers like health-insurance companies, nonprofit organizations, government, and individuals. Healthcare providers also have a complex web of relationships with a host of other related service: providers like clinical laboratories, the pharmaceutical industry, healthcare equipment manufacturers, payers, etc. Table 4 shows various types of transactions that are associated with the complex web of relationships. These transactions are generally very large in scale and are on the order of billions of dollars for each type. Economic consultants have shown that converting these billions of transactions from paper-based systems to electronic systems can substantially reduce costs, increase efficiency, and dramatically reduce the scope for overbilling and other types of fraudulent claims (Trautman, Lisi, and Mayerick, 2010). In the next section we focus on cost reductions and improved efficiency that result from the implementation of electronic payments.
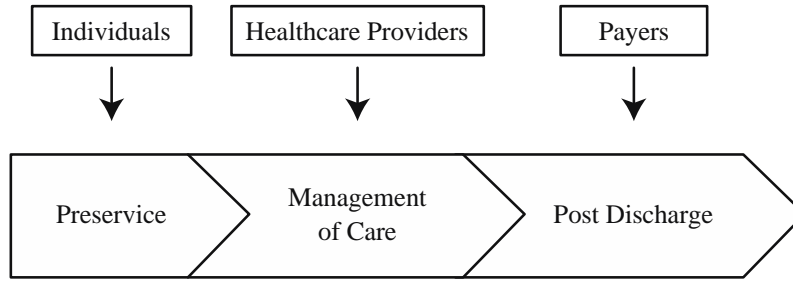
Figure 3: Healthcare Value Chain Model

Source: Adapted from *The Health Care Value Chain: Producers, Purchasers and Providers,* by L. R. Burns and Wharton School Colleagues, 2002, San Francisco, CA: Jossey-Bass.

ELECTRONIC PAYMENTS

The most widely used electronic-payment system in the United States is the ACH network, also referred to as the electronic funds transfer (EFT) system.[5] Electronic payments have had a high rate of adoption in recent years in the areas of employee payroll, consumer bill payments, and federal or state government payments. It is also a low-value and high-volume payment system.
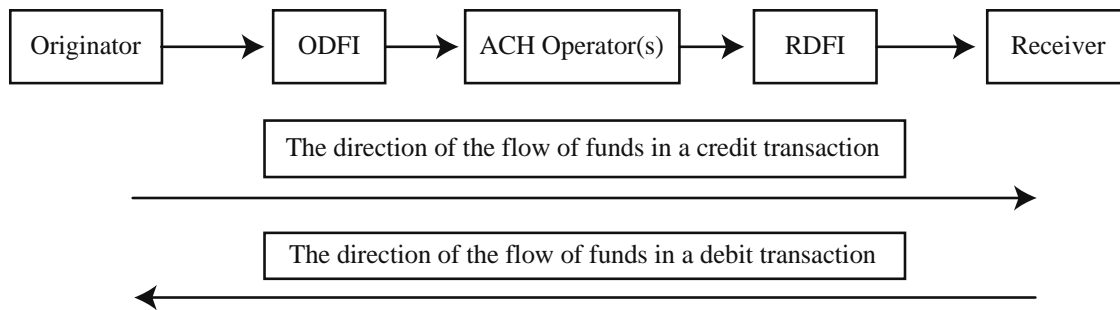
THE AUTOMATED CLEARING HOUSE (ACH) SYSTEM.

The ACH first was established in 1972 to provide an alternative to paper checks and to simplify the processing of paperless check transactions. In 1974, the National Automated Clearing House Association (NACHA) was established in order to develop a national ACH electronic network. By 1978, the United States had a nationwide ACH electronic network that was capable of transferring funds between accounts electronically. The ACH network was partially privately owned and partially owned by the Federal Reserve. Currently, the ACH network is an all-electronic-funds-transfer payment system that is used by more than 14,000 financial institutions, more than 3.5 million businesses, and more than 150 million consumers to make or receive EFTs. Table 5 shows that in 2010, 19.4 billion transactions were made with a value of over $38 trillion using the ACH network. Today, 85% of ACH transactions are handled by the Federal Reserve. Also the ACH system has the capability to process healthcare payments efficiently. Currently, NACHA's primary role is to develop and maintain NACHA operating rules to promote the growth in ACH volume and to provide electronic solutions to improve the payment system. Their latest project is to promote electronic payments in the healthcare industry.

Year	Transaction volume (in billions)	Total Value of transactions (in $ trillions)
2010	19.4	38.7
2009	19.1	37.2
2008	18.2	38.8
2007	18.0	36.6
2006	16.0	34.1
2005	14.0	31.1
2004	12.0	28.6
2003	10.0	27.4
2002	8.9	24.4
2001	8.0	22.2

Table 5: Automated Clearing House Annual Transaction Volume and Total Value of Transactions 2001–2010

Source: *ACH Primer for Healthcare,* by National Automated Clearing House Association, 2011a, Herndon, VA; Adoption of EFT and ERA by Health Plans and Providers (White Paper), by National Automated Clearing House Association, 2011b, Herndon, VA; The Federal Reserve System (2011), "The 2010 Federal Reserve Payments Study". Washington. DC: Author

Figure 4 shows the various participants associated with an EFT.

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┌────────────┐      ┌────────┐      ┌─────────────────┐      ┌────────┐      ┌────────────┐
│ Originator │ ───▶ │  ODFI  │ ───▶ │ ACH Operator(s) │ ───▶ │  RDFI  │ ───▶ │  Receiver  │
└────────────┘      └────────┘      └─────────────────┘      └────────┘      └────────────┘
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┌──┐
│ The direction of the flow of funds in a credit transaction   │
└──┘
──▶

┌──┐
│ The direction of the flow of funds in a debit transaction   │
└──┘
◀──

Figure 4: ACH Network Participants

Note: ODFI = originating depository financial institution; RDFI = receiving depository financial institution

       The main participants in EFTs are the originator, the originating depository financial institution, the ACH operator(s), the receiving depository financial institution, and the receiver. NACHA operating rules provide the legal framework for effecting transactions through the ACH network and establish the responsibilities, liabilities, and warranties for various participants. The ACH is a high-volume low-value EFT system. Normally, it takes 2 to 3 days to complete a transfer. The ACH system is a credit and debit batch processing system. Financial institutions accumulate ACH transactions and send them to the ACH operator at predetermined times, rather than processing each transaction separately. The ACH system is able to process credit and debit transactions and fund transfers. Messages can be transmitted using appropriate formats. In a credit transaction, the originator initiates a funds transfer and the funds are transferred from the originator's account to the receiver's account. In a debit transaction, funds flow from the receiver's account to the originator's account. In this case, it is necessary to get preauthorization from the receiver. Figure 4 shows the direction of the flow of funds for both credit and debit transactions. The ACH system is a flexible system and accepts a variety of formats for different types of transactions.

       In this section, we will discuss two formats that are relevant for healthcare payments. Two formats that are being standardized for healthcare payments are Corporate Credit or Debit Plus Addendum (CCD+) and Corporate Trade Exchange (CTX) formats. CCD+ format is designed for the transfer of funds within or between firms. Only a limited amount of remittance information can be sent using this format. The addenda record is 94 characters long and includes 80 characters of descriptive data. The CTX format is designed for company-to-company trade payments. It consists of a standard ACH transaction and a variable-length message addendum designed to include remittance information in the ASC X12 data standard. The addendum can accommodate 9,999 records of 80 characters each. CTX is used for payments related to multiple invoices and those with a considerable amount of invoice detail.

       Apart from ACH, American National Standards Institute (ANSI) ASC X12 837 format can be used for electronically submitting healthcare claims by the providers in the context of electronic data interchange. ANSI ASC X12 835 format is used for electronic remittance advice (ERA) by the payer. In this case, CCD+ format is used to transfer funds. Combined ERA and EFT can be completed using CTX format and also CTX can be used for payment on multiple claims. Pilot studies by NACHA (2011d) have shown an estimated total savings of $11 billion to $30 billion per year by switching from paper-based payment system to a completely electronic-payment system. The cost of processing paper-based checks per claim is $0.21 whereas using EFT the cost would be $0.019 per claim. According to the pilot study, the estimated cost of paying 145 million claims using paper-based system is $30.7 million, whereas the cost of paying 145 million claims using electronic system is $2.7 million. In addition to the direct cost savings, the average time taken for claim processing is reduced from 49 days for the paper-based system to 14 days for the electronic system and the electronic system allows for consolidation of claims.

CONCLUSIONS

In this paper we developed a theoretical framework for addressing healthcare costs and based on that, we analyzed the payment system associated with healthcare payments. We endorse the recommendation of switching from a paper-based system to an electronic system that would not only reduce costs but also improve the efficiency of the system. By using an electronic-payment system for payment of healthcare claims, huge savings can be obtained on an annual basis, as the number of claims processed each year number in the billions.

ENDNOTES

1. Healthcare payments are compared with the retail industry because of the size involved. The retail industry processes $9 trillion and healthcare processes $2.5 trillion.

2. All these systems have to comply with numerous federal regulations; the discussion of regulations is beyond the scope of this paper.

3. Even though the value-chain model was developed for private firms, Burns (2002) discussed how these concepts can be applied to healthcare.

4. The vertical columns at the bottom of the figure indicate value-added processes; horizontal blocks at the top of the diagram indicate support functions.

5. There are three electronic-funds transfer systems in the United States. The other two, Fedwire and CHIPS, are not suitable for healthcare payments, as they address large-value payments and are more expensive to use.

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