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W. P. No. 2019-02-01
February, 2019

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Whose Empowerment? National Digital Infrastructure and India's Healthcare sector

Rajesh Chandwani¹, Saneesh Edacherian² and Mukesh Sud³

Abstract

Patient-centric digital infrastructure can potentially enhance the efficiency of the healthcare systems. Even in developed nations evidence suggests low adoption rates for such infrastructure. The Indian government, piggybacking off biometric identity, is setting up digital infrastructure to enable the provision of universal healthcare. Invoking an information ecology perspective, we investigate the physician's perception to this initiative. We find that, equipped with a unique patient identifier and stakeholders' registry, this initiative is perceived to be a game changer and could significantly impact the power dynamics in the healthcare sector. Physicians, who are the key stakeholders in this initiative, are skeptical about the change in the locus of the power, with power residing in 'data' rather than 'professional expertise'. The changes are expected to manifest through monitoring, controlling and managing the data rather than the provision of knowledge-based services. We present recommendations for the design and implementation of this large-scale patient-centric digital infrastructure.

Key words: Power Dynamics, information ecology, India, Aadhaar, Large scale health IT project, PHR

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INTRODUCTION

Due to increasing healthcare costs and its effect on productivity, governments across the world are attempting to design systems that can provide affordable and quality healthcare to their citizens. The potential benefits offered by healthcare technologies such as Patient Health Records (PHR), have prompted governments to design and implement large scale health IT projects (Robertson et al., 2010). While the adoption of technology in healthcare has been generally poor (Baus, 2004; Kaplan & Harris-Salamone, 2009; Littlejohns, Wyatt, & Garvican, 2003) the failure rate has been especially high in large scale projects (Goldfinch, 2007). Large scale health IT projects are highly complex and involve very diverse stakeholders having different requirements, attitudes and constraints (Herzlinger, 2006). As many projects straddle both the public and private sector and across organizations and individuals, they face challenges like differing political agendas and varying degree of government controls.

Examples of large-scale health IT projects include the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act, in the US, where the aim is to build a nationwide information infrastructure, achieve widespread use of PHR to facilitate data exchange and provide incentives to encourage healthcare organizations and providers to adopt and conform to the Health Information Exchange (HIE). Despite projected potential benefits to patients, physicians and hospitals, however, the adoption of these IT systems remain poor (Almoaber & Amyot, 2017). It is estimated that mutual transfer of data happens only between 78.8% of family physicians in Canada and other healthcare organizations (National Physician Survey, 2015), and as of 2013, only 30% of hospitals in the US were participating in HIEs (Adler-Milstein, Bates, & Jha, 2013). Yet another example of a failed large-scale health IT project is England's National Program for IT (NPfIT), which created nation-wide PHR implementation and data exchange similar to the HIE. The project was abandoned in 2011 after it was operational for a decade (Justinia, 2017). Scholars cited several reasons for its failure, including political influences, unrealistic targets and lack of engagement with key stakeholders (Justinia, 2017; Robertson et al., 2010). Large scale IT health projects should be regarded as a continuous process and user engagement should be incorporated in the early stages of the project (Cresswell, Morrison, Crowe, Robertson, & Sheikh, 2011). While several challenges were listed, lack of support from clinicians was cited as one of the critical factors that led to the failure of NPfIT (Brennan, 2007; Justinia, 2017). Though clinician's apathy has been cited as an important aspect of the failure of healthcare IT projects, especially large scale ones, the perspectives of physicians related

to IT projects has largely been underexplored with scholars calling for additional research in this domain (Fuji, Galt, & Serocca, 2008; Kaelber, Jha, Johnston, Middleton, & Bates, 2008; Nazi et al., 2010).

This study has been conducted in the backdrop of a nation-wide health IT initiative being implemented in India, the National Health Protection Scheme (NHPS) or Ayushman Bharat (also known as “Modi care”). The Ayushman Bharat initiative, which has an insurance cover for each household is projected to significantly empower the Indian patient and could be a game changer in Indian healthcare (Bhargava & Paul, 2018). Relying on Aadhar, the nationwide UID project (Singh & Jackson, 2017), the NHPS aims to link the PHR to Aadhar, enabling patients to access healthcare seamlessly. Apart from the Aadhaar linked PHR and health insurance coverage, Ayushman Bharat also envisages the use of digital technologies to regulate India’s fragmented healthcare system. In the new digital infrastructure being implemented- National Health Stack (NHS)- all stakeholders including patients, doctors, hospitals and others will be registered and have the means to interact with each other (NITI Aayog, 2018)

In this study we explore the perspectives of physicians towards the design and implementation of the initiative. The initiative, like other health IT implementation projects, has a focus on patient centricity and shared decision making. However, the ‘shared’ decision making refers primarily to the clinicians. The launch of Ayushman Bharat and implementation of related digital infrastructure has been discussed extensively in the popular press (FE Bureau, 2018; Neelakantan, 2018; PTI, 2018). Therefore, it is important to understand the physicians’ perspectives about the phenomenon as they will not only be key generators but also the users of the data, with their practices and routines significantly affected by its implementation (Nazi et al., 2010). Further, as highlighted above, the acceptance of the initiative is dependent upon early participation of stakeholders, right from the design stages. Traditionally, healthcare professionals have been powerful stakeholders, as they have ‘expert power’ derived from their professional training and experience (Doolin, 2004). Indeed the threat to this power could be a key reason for their resistance to health IT (Chandwani & Kulkarni, 2016; Fayard, Lee, Leitch, & Kettinger, 2012; Walter & Lopez, 2008). Understanding physicians’ perspectives towards the system becomes especially relevant in the Indian context, where the power dynamics are highly skewed towards doctors (Chandwani & Kulkarni, 2016). To comprehend the perceptions of doctors about the NHS, and its effect on their practice, it is important to understand their views about

potential changes in power dynamics in the initiative can cause (Chandwani & Kulkarni, 2016; Doolin, 2004). As discussed previously, an early engagement with key stakeholders is critical for success of large-scale IT health projects.

We have utilized an information ecology lens to understand the broader changes in the healthcare system that could result from the NHS. The ecological approach to information systems explicitly acknowledges the inter-linkages between human and technology factors (Davenport & Prusak, 1997). The IE lens incorporates people into the design of technological solutions and user interfaces (Nardi & O'Day, 1999). IE centralizes “how people create, distribute, understand, and use information” (Davenport & Prusak, 1997). “Information” hence is a loaded term in IE, as it is embedded in a complex environment and can have multiple interpretations beyond technology. IE acknowledges that diverse stakeholders ascribe different meanings to information and that people and technology co-evolve as these meanings unfold in the form of behavior such as user resistance to new technology (Nardi & O'Day, 1999). Accordingly, the IE lens is important in understanding the meanings ascribed by the physicians to the emerging ecology. Further, though the IE lens acknowledges embedded diverse stakeholders in a complex relationship, it also recognizes that stakeholders have an opportunity for local action and hence can influence information ecologies around them (Nardi & O'Day, 1999; Nazi, 2013). As a result, the information ecology lens permits the investigation of the broader healthcare ecology and also highlights the physicians' views on power dynamics in the ecology.

To understand the physicians' perspectives on the evolving power dynamics within the ecology, we draw on Foucault's conceptualization of power (Foucault, 1980). Foucault considers knowledge and power as inseparable and posits that power is evident in the numerous knowledges, practices, routines and technologies that facilitates the actions of other individuals (Hindess, 1996). Thus, power is relational and is exercised in social action (Clegg, 1989), for example in the physician-patient (Chandwani & Kulkarni, 2016) or in the manager-physician interaction (Doolin, 2004). Foucault's conceptualization of power, therefore, complements the information ecology perspective which recognizes the stakeholder's capacity for local action within the ecology.

BACKGROUND

Indian Healthcare System

With few financial protection options and low penetration of health insurance among the Indian population, the healthcare system is characterized by high out of pocket expenses. Further, with three fourths of healthcare facilities- infrastructure and manpower- concentrated in urban areas (accounting for one third of the nation's population) the rural-urban divide is significant (Patil, Somasundaram, & Goyal, 2002; Srivastava & Shainesh, 2015). Apart from this divide, the inter-state variation in healthcare provision and financing is also significant, with some like Tamil Nadu having reasonably good healthcare infrastructure as compared to other states such as Orissa (Balarajan, Selvaraj, & Subramanian, 2011). This variation is attributed to the varying efficiency of state governments under whose responsibility this domain lies. The role of the central government has been confined to the implementation of national programs targeting specific diseases (Reddy et al., 2011). Consequently, the quality and scope of health care services varies across states (Reddy, Shah, Varghese, & Ramadoss, 2005).

Furthermore, Electronic Health Record (EHR) penetration in India is extremely low, limited to a few big hospital chains in cities, and often exist in silos without any interoperability (Koppar & Sridhar, 2009; Srivastava, 2016). Most of the available health data has been captured through paper based records during visits to hospitals. The data collected at the points of healthcare delivery such as hospitals, pharmacy, labs etc. are often customized to the requirements of billing and data retrieval with limited focus on a its meaningful secondary use. With health data standards and guidelines at a very nascent stage and the resulting lack of standardization of data, the usefulness of available data is also very limited. In other words, the quality of healthcare data in India is a major concern (Balsari et al., 2018).

Conceptualization of Ayushman Bharat

In an attempt to provide universal health coverage, in 2018 the government of India announced the National Health Protection Scheme (NHPS) (Bhargava & Paul, 2018). NHPS, also known as Ayushman Bharat, is a large-scale public health insurance program that offers INR 5,00,000

(approximately \$7000) to roughly 500 million Indian citizens. Unlike the previous government insurance schemes that were fragmented across different states, NHPS will be under a central government directive to link health outcomes to an economic agenda. Earlier insurance schemes, designed by both state and central governments, have often proved inefficient and have been largely ineffective in providing health care (Selvaraj & Karan, 2012). The shortcomings of these schemes included ineffective penetration among beneficiaries, insufficient participation of providers, lack of accountability, incompetent and/or fraudulent detection and rudimentary information technology systems. Lessons learned from previous schemes and the large scale nature of the NHPS compelled the government to consider a national level digital infrastructure that can serve as the backbone for effective implementation and also ensure seamless functioning (NITI Aayog, 2018). To address these issues, in July 2018 NITI Aayog — the policy think-tank of the government — proposed the blueprint for National Health Stack (NHS), the national digital infrastructure. In the next section we have discussed this.

National Health Stack

The NHS, described as a set of cloud-based services, is intended to build a framework for digital infrastructure that can be shared between state and central governments and help achieve seamless care across various levels. This is a federated, patient centric digital ecosystem that aims to achieve significant reduction in healthcare costs for beneficiaries (Balsari et al., 2018). The proposed NHS is expected both to cater to beneficiary needs as the NPBS is rapidly rolled out while also finding innovative solutions within the complex healthcare system. This integrated system would allow for diverse stakeholders such as NGOs, researchers, and watchdog organizations to engage in the emerging digital marketplace, which in turn would enhance the efficiency of the system (NITI Aayog, 2018).

A key requirement for an efficient health information exchange such as NHS is the ability to identify each participant through a unique identifier (Yasnoff et al., 2004). In this case, the feasibility of the nation-wide patient centric digital infrastructure is built on the high penetration of Aadhaar, a biometric ID, among the citizens of India. NHS has proposed that the entire system should be built on the unique identity of all participants in the ecosystem. According to this blueprint, the base layer of the NHS comprising the master data of all programs named as National Registries Layer. Other layers above this involve stacks that target specific programs and initiatives. Despite the current debate over privacy

in Aadhaar (Mali & Avila-Maravilla, 2018; Srinivasan & Johri, 2013), the has proposed a commitment to privacy as an integral component of the health infrastructure design. An effective digital infrastructure entails a roadmap for effective use of collected patient data, such as using real time data as an input for policy decisions and research (Rodolfo, Correia, Sousa, Sá, & Duarte, 2016). Further, NHS will provide an existing base through an application program interface (API) (Balsari et al., 2018) for entrepreneurs and new entities to harness the power of data while devising innovative solutions for Indian healthcare problems.

RELATED LITERATURE

Large Scale IT projects in Healthcare

Increased interest in providing safety, quality and efficient healthcare has encouraged the use of IT across nations (Catwell & Sheikh, 2009; Protti, 2007). Compared to small scale projects, large nationwide IT initiatives have additional benefits including the use of data for secondary purposes such as policy, research and even commercial objectives (Cresswell et al., 2011). Despite the proven benefits of IT in healthcare, the adoption rates are low and failure rates relatively high (Lapointe & Rivard, 2005; Sligo, Gauld, Roberts, & Villa, 2017). While IT project implementations have been prone to failure, there has been an increase in recent in failures as compared to rates documented in previous decades (Ashurst, Doherty, & Peppard, 2008). These failures are especially high for large scale IT initiatives (Goldfinch, 2007). Previous attempts to implement national health IT systems in the UK (Cresswell et al., 2011) and the USA (Furukawa et al., 2014) have either failed or experience abysmally low adoption rates .

Unlike small scale IT systems where the major challenge lies in integrating clinical and workflow of the organizations, in large IT systems the major challenge lies in customizing the national level IT to the local context (Coiera, 2009). Benefit of the secondary use of data from large scale IT projects is only possible if the project adopts interoperability as a fundamental characteristic of the project design. However, this makes customizability to the local organizational context an uphill task. Prior studies have found that this challenge increases if the implementation of large projects involve upgradation and integration of existing individual local IT systems (Jensen & Aanestad, 2010).

HCI researchers have also found that involvement of stakeholders at the local level is crucial to the success of large national level health IT systems (Cresswell et al., 2011). In healthcare settings,

involving professionals with defined roles, power structures that regulate the workflow practices will emerge. The implementation of new IT systems can influence the information flow within the organization and result in a redistribution of power, leading to resistance from some sections of the organization. In the example of national health record implementation, contracts were negotiated at the national level, leaving very little inclusivity locally. This design could lead to a lack of communication between local organizations and design level representatives.

Another significant challenge faced in large health IT implementations is judging costs and timelines for implementation. Prior research has documented that ambitious timelines often lead to failure both because the planning phase is often unrealistic and does not accommodate additional costs in scaling up (Sligo et al., 2017). Projects should allow for customization in the design as they evolve. It has also been observed that projects should involve end-user groups in all phases through guidance, training and feedback sessions to facilitate its smooth implementation. Large scale IT projects such as PHR implementation and the significant change they entail have been illustrated adopting an information ecology perspective (Bogers, van Kollenburg, Deckers, Frens, & Hummels, 2018).

Information Ecology

The idea of ecology as a lens has recently gained prominence in HCI research and practice (Norris & Suomela, 2017). Consequently, frameworks employing the idea of “ecology” such as information ecology have been proposed to analyze and understand technology in a system of complex relationships in its entirety. Information ecology, a multidimensional framework is based on the idea of a biological ecosystem and comprises a complex system of individuals, routines, moral standards and technologies pertinent to a specific local environment (Nardi & O’Day, 1999). Unlike other perspectives that assume technology as being politically neutral and beyond the control of individuals who use and consume it, the information ecology perspective views technology as being influenced by social and human factors within the local context. The information ecology perspective entails that the expertise and agency required for technological change is not limited to the designers and administrators of the technology but also extends to the users and the local context (Hart-Davidson, 2000).

HCI researchers have used the information ecology perspective to study the design of technology for connected interactive ecosystems such as personal health ecosystems (Bogers et al., 2018). Its connected nature creates complexity due to multinodal interactions among users, and physical and

digital artifacts (Frens & Overbeeke, 2009). The information ecology perspective broadens the scope of analysis and encompasses the interdependencies, interactions and dynamics amongst the environment, artifacts, users, and information (Blevis et al., 2015).

HCI researchers have also attempted to position their work based on various characteristics of information ecology, namely system, diversity, coevolution, keystone species and locality (Bogers et al., 2018). The system characteristic emphasizes the relationship between artifacts and users. It is helpful to understand various relationships such as artifact-human and artifact-artifact. The diversity characteristic deals with the differences in the roles and functions defined in the ecosystem. The ecology is not static with the members, artifacts and relationships constantly evolve. Koshy 2014 describes how doctors redefine their existing role in terms of a new hybrid function as a clinician-IT professional. Information ecology allows us to study how technology change occurs by the influence of local action (Khosy, 2014).

Nazi (2013) studied how the introduction of secure messaging, a new service, altered the nature of relationships in the existing ecology (Nazi, 2013). Keystone species are artifacts or individuals who hold the information ecosystem together (Nardi & O'Day, 1999). Physicians and the patients in a 'shared decision making model' can be regarded as the keystone species that are critical for the information system. Specifically, in the Indian context, which is characterized by low doctor population ratios and a physician dominated strong hierarchical structure, the role of physicians is extremely vital for a health information system (Chandwani & De, 2013). While in the recent past there has been an increasing emphasis on data-driven work-ecologies in healthcare, scholars have raised concerns over a change of relationship involving key stakeholders that can impact the long-term sustainability of the ecosystem (Bossen, Pine, Ellingsen, & Cabitza, 2016).

Physician and EMR adoption

HCI researchers have studied the impact of introduction of information systems such as EHR in healthcare settings (Hartswood, Procter, Rouncefield, & Slack, 2003; Sharda, Das, & Patel, 2003). Since conventional healthcare organizations are heavily dependent on human resources the introduction of EHR in these settings necessitates changes in the existing workflow practices and realignment to suit the new technology configuration (Tang, Chen, Semaan, & Roberson, 2015). Majority of the research on EMR focuses on understanding either the benefits of implementing an EMR or challenges and barriers for accepting EMR within the organization.

HCI researchers have also found that amongst the barriers to adoption of EMR physician-system interaction has a significant role (Chen, 2010; Reddy & Bradner, 2005). Physicians are the primary users of EMR in healthcare and a majority of the EMR has not met the expectations of primary users in terms of support offered to their workflow (Tang et al., 2015). Healthcare professionals often find that the EMR design creates challenges in their workflow, resulting in dissatisfaction and adoption failures. There is also evidence that inefficiency caused by EMR deployment has resulted in medical errors (Boonstra & Broekhuis, 2010; Campbell, Sittig, Ash, Guappone, & Dykstra, 2006)

Despite its proven benefits, physician resistance to EMR implementation has been attributed to the high cost of implementation, uncertainty about benefits, lack of training and psychological barriers (Boonstra & Broekhuis, 2010). One of the key barriers to EMR adoption has been physician's perceived threat to professional autonomy (Walter & Lopez, 2008). In hierarchical setups like healthcare, physicians value their professional autonomy and fear that the advent of EMR will enable government or other parties control over their professional decisions. Moreover, physicians perceive the access of patient data in EMR as being beyond their control and accessible by any other individual or entity. Since physicians are on the front line their resistance can significantly impact both the adoption and effectiveness of EMR in health care (Ford, Menachemi, Peterson, & Huerta, 2009).

METHOD

Our methodology has been driven by the objective of the research - to explore the perceptions of physicians about upcoming large scale health IT implementation program and especially the NHS. In India this is the first nation-wide IT health implementation project and can potentially impact the ecology of the healthcare system for all stakeholders. The unique context of Indian health care and the need to understand the physician's perspectives made us adopt an exploratory approach in the study. Accordingly, we conducted an in-depth qualitative inquiry of the phenomenon, recognizing contextual relationship and allowing for a situated understanding to arise, rather than advancing the paper from preplanned theoretical lenses.

Data Collection

Data was collected through a series of focus group discussions and in depth interviews with physicians. Focus groups "involve small groups of people with particular characteristics convened for a focused

discussion of a particular topic,” (Kitzinger, 1994). Focus group discussions (FGDs) are especially opportune in deriving insights on the participants’ creation of meaning (Kruger & Casey, 2000).

Further, in investigating perceptions about a novel phenomenon, group work and group discussions are extremely useful as the participants draw from each other’s accounts and narratives (Karen, 2001). Accordingly, we used FGDs to generate discussion that enabled the creation of jointly produced narratives on physicians’ perception about the NHS. The lead author of this paper, a medical professional, was conducting a residential professional development workshop for physicians. We were hence able to recruit physicians from regions across the country for our study both for FGDs and the interviews. We adopted a convenience sampling method, as it provides a rich and captive audience and enables researchers to derive significant insights, especially with a niche group of respondents such as physicians (Kardes, 1996). Further, convenience sampling allows for a relatively homogenous group of respondents affected similarly by the phenomenon and hence provides data with less noise.

We conducted five FGDs, with each group comprising six participants. Each FGD lasted between 60-90 minutes. Based on the insights from the FGDs, we prepared a set of guiding questions for the in depth semi-structured interviews with the physicians. Following the FGDs, we conducted in depth interviews with 14 practicing physicians. We interacted with physicians from diverse settings: urban, semi-urban and rural areas; public and private sectors; and large and small hospitals. The physicians were asked open ended questions regarding their perception of the Ayushman Bharat and NHS. Specifically, they were encouraged to elaborate on how the initiative is going to impact their practice going forward. Audio recorded interviews were transcribed verbatim. Interview data was next analyzed systematically in alignment with the interpretivist approach (Walsham, 2006). The initial step in the analysis was coding, which involved data segregation, patterns recognition, and shemes and concepts generation.

The data was independently coded by all the authors. One of the authors, as mentioned above, is a medical practitioner, while the others are HCI scholars. The diverse background of the researchers facilitated that the data was explored from varied perspectives. In the first-level (open coding) operation, textual data was analyzed to identify common patterns and extract relevant categories. The initial codes were intricately linked to the data; for example, ‘poor infrastructure in rural areas’, ‘difficulty in understanding the implication of PHR for an illiterate patient’, ‘emergence of new business firms like aggregators’, etc. In subsequent levels of coding, we moved from data to conceptual

explanation and themes. The data analysis progressed iteratively, moving back and forth between the theoretical concepts and empirical data, exploring emergent themes and ascertaining recurring patterns. The final themes were arrived at through brain storming sessions amongst the authors. The findings were then presented to a number of physicians for their feedback.

FINDINGS

This section presents the six different themes that emerged. The themes represent the perspectives of physicians on various aspects of the technology embedded in NHS, the changing relationships between key stakeholders and NHS's implication for their practice.

Who is watching? Concerns around surveillance

The study found that physicians were worried about the consequences of collecting data and storing it in the cloud. They recognized that the current system was about to change and were concerned that the collected data could possibly be used against them. Moreover, they were apprehensive that if, on the basis of new evidence, a doctor changed her diagnosis it could reflect on her or his competency.

“so there is no private party involved in that as of now. What you are saying is that the data collection and if a person comes to the hospital and we admit him the data is getting collected in the hospital. So, we are all submitting that data to the government portal”

A physician commented:

“It is not only about the patient even you can study the behavior of the doctors – their prescription manners/behavior; how they make the diagnosis; how is their competency or is there any variation from doctor to doctor and if that doctor is wrong – suppose after 2-3 hours or after one day or two days he makes another diagnosis then what is the impact to his profession and impact to the patient also.”

The physicians also felt that every action of theirs and the hospital would be logged into the system. Hence, without clear guidelines on the possibility of human error, these recordings could prove detrimental to the physician community.

“...because human error is bound to happen and now human error will get recorded – your sister (nurse) has not given that injection in the day will get recorded in the system.”

Being manipulated

The study found that the new system could impact a physician's professional reputation and their establishments. This availability of data for building business models may invite new ratings devised by firms that can use aggregated patient feedback data. For example, existing appointment scheduling companies have in the past previously tried to create ratings based on patient feedback.

A physician commented:

“Jugglery of rating agencies themselves will come into play. Then if the payments are linked to it then there will be unnecessary focus on just improving the numbers and then the patients who are high risk..”

Another physician felt:

“So that also has to be taken into consideration and you have to protect the profession of the doctor and that should not be used by the government or patient to harass or sue the doctors.”

One of the physicians raised the issue of expected change in power distance between doctors and patients as patients would have more information to choose a doctor. However, he also opined that this may not have a significant impact on their practice due to the paucity of medical professionals in the country.

“The power relationship will be more skewed towards the patients rather than the doctors because they will have more options to choose but there is nothing to lose even because the pool of patients is quite large.”

Physicians also felt that this could motivate hospitals to prefer patients with simple medical histories and avoid handling complex cases. This could cause a serious dent in the government's effort to increase the accessibility of healthcare in the country.

“Here you do all choosing, cherry pick the cases and do simple 100 and show 2 mortality and get a high rating agency and operate only cherry picked cases. So what will happen is that cherry picking will also be done by the patients. When will they cherry pick – when they are stable. So the good cases will naturally line up to the so-called rating and then the rating will be created by absolutely cherry picking”.

Moving the goal posts - Changing the rules of the game

The study found that new players entering the field (insurance companies, the government, call centers, intermediaries, etc.) could change the dynamics of the health care sector. For example going ahead a patient's feedback could become an important part of healthcare quality. This could have an impact on the reputation of the doctor.

"A patient would now have the ability to tarnish a physician's reputation."

"They will never speak good about somebody but they will easily speak negative things about somebody. So these things are likely to..they may emerge. People may not go and write a good point but they may go about and rate a bad thing".

A physician commented that this data could also help an insurance company get more information on a patient. Eventually, this could lead to an increase in premiums and the cost of healthcare.

"Your illness is a private part of your life and if you cannot protect the data about his illness then the insurance companies will take advantage of it. When I have someone for example for the diseases that are not covered and if the insurance companies know and decides that this person has these pre-existing conditions and they have a doctor like me to guide them as to the risk of these pre-existing conditions and they will increase the insurance premium".

Health care providers would constantly be looking at their bottom line.

"He may need a drug that costs a little bit more. But my hands are tied because if I do all those things the cost is going to exceed the budget and the hospital will say that man you are treating a patient and producing a loss. You cannot treat a patient and produce a loss because the hospital cannot fail as a business model. If there is no profit it is fine but at least don't make a loss on every patient. If you keep on making loss on every patient better don't admit and don't treat the patient."

"All this could result in unethical practices"

"What I have heard is that in Ayushman in the caesarean section the charges are around 9,000. In Rs. 9,000 you have to admit the patient; you have to do the surgery; you have to pay the anaesthetist; you have to give the anaesthetic agents; you have to give the antibiotics; you have to treat the baby; you have to give food to the patient; you have to do all the follow ups for free; you have to pay your staff;

you have to pay electricity at commercial rates; you have to earn out of it and you have to pay taxes also. How on earth is anybody going to earn out of that. If those rates are going to be there then there is bound to be either unethical practice or people will opt out of the scheme.”

Entry of new players would in effect change the existing status quo. The new entities could adversely impact already slim profit margins. Many hospitals were not profitable and the entry of new player could reduce margins even further

“So, the third party becomes a key player in this whole issue who may not be considered with health care in actual terms but because they provide the data for ultimate rating parameters then they could keep”.

Who is responsible? Issues around privacy and liability

The issue of privacy was an overriding concern and kept coming on numerous occasions in the interviews. Since patients have the sole authority to permit access, there was a chance of data being leaked to other entities.

“Suppose some data which is not relevant to my care may get revealed – whether we are impinging on his privacy. It may have a lot of impact on his social life, married life, family and all. Sometimes insurance knows all these things and may not insure him also”

“Healthcare data is very sensitive and there can be emotional and social ramifications if the patient’s health data became widely available. I think the first and foremost thing that you mentioned that the data pilferage; secrecy of the patient; the data loss; the hospital data and not only the collective data but individual data may be”.

A physician commented that since data was co-generated in the physician-patient interaction, without any clear laws on privacy the liability could fall on the doctors. With the ensuing privacy debate in the country, there could potentially be a huge issue with the liability associated with data safety.

“Who is liable if the data is lost? For example, as you said in the morning somebody is HIV positive and somewhere it is leaked in some portal and this patient comes and sues and says that I got operated at your hospital and except you I have not got my tests done anywhere else and your lab knew I was HIV positive ultimately you the doctor, you hospital and your lab is responsible because I don’t know anybody”.

One of the physicians felt that with patient data and clinical notes likely to be shared with non-health professionals, personal information about the patient would no longer be sacrosanct.

“Why should my personal information be shared with somebody who is not going to be the healthcare delivery provider which is a doctor or the hospital. If you go by the law the hospital knows through the doctor only. The hospital is not supposed to hold the records for your personal disease or disorders. It is through the doctor that the hospital holds your secrecy code of disclosure”.

Are we ready? Concerns about infrastructure

The participants also raised concern over the government’s own readiness to implement a scheme of this magnitude. A scheme of this size and technology insensitivity requires the availability of the internet at the government hospitals, which currently lack even basic facilities.

“But government themselves don’t have the infrastructure. Nine of ten government hospitals still believe in paperwork”

Other doctors added that the situation is not different in many private hospitals smaller cities.

“India has the slowest rate of network connectivity. From what I know it is worse than Bangladesh and Pakistan. If your facilities are not of that standard you can’t implement ideas only. If your network is failing and 500 people are queuing up in a line, there will be chaos, it will fail ultimately... everybody has to be geared up for that....the report cannot be generated, the report cannot be ordered, there will be chaos. And if you mix, today the system is not working, do it by paperwork then the system completely fails. It has to be 100% all or none”.

There were suggestions that the scheme should be implemented in phases.

“Do it in the metros first than gradually to tier 2 (smaller) cities and then rural areas”.

Being patient centric; ensuring better care

There was acknowledgement that the patient would gain immensely from the new arrangement. The interoperability of patient history would potentially benefit physicians as often patients were not knowledgeable or educated enough to explain prior treatment. This could also reduce costs by avoiding replication of costly tests.

“For example, if I am a cardiologist the data that he underwent appendectomy five years ago is shown but details of the appendectomy of that time of perforation, was taken out, was necrotizing, how was

the specimen, what was the histology, what happened or did not happen after the surgery, was it eventful or not, want to the slides of it which has no relevance to me”.

“All the data wherever you go, whichever hospital he goes it can be stored in that docket. It can be linked through his unique identity –whatever it could be. It could be whatever and it is made accessible to the treating doctors and it is good because what all previously happened they come to know. Patients sometimes may not reveal anything also. They may feel it is not relevant to this scenario or they may not want to reveal also.”

Physicians felt that with the current penetration of smartphones patients could benefit from this new arrangement.

“With the mobile phone all your data will be with the company. Suppose patient X develops heart attack in the village and he gives the call that doctor I got a heart attack immediately you open his number and you see all the data and you send the doctor to the ambulance driver and the ambulance driver knows all the data and by the time he reaches the doctor on duty knows everything that he has hypertension; is a diabetic, he is a smoker, has had a previous heart attack, had a previous bypass surgery – every data is there in the emergency room”.

DISCUSSION

In this study, that utilized the information ecology perspective, we have analyzed the perception of physicians on the proposed NHS that aims to transform the health sector and provide universal health coverage to all residents of India. The analysis reveals the potential power dynamics emerging with the implementation of NHS could have significant implications on physician’s adoption of the system. Particularly, the perceptions about changing power relations with respect to the government and external stakeholders such as aggregators would be a major concern. We have invoked Foucault’s perspective of power to comprehend the changing power dynamics in the proposed ecology.

Foucault’s conceptualization of power through knowledge is specifically opportune in comprehending the changing power dynamics in the emerging information ecology with implementation of NHS (Alderman & Edberg, 2011). Foucault’s theory highlights the epistemology and possible use/misuse of information and knowledge, as it posits that power is expressed in the collection and use of information or in the expression of knowledge (Foucault, 1977; Rouse, 1994).

The perspective of power is even more important in the context of IT implementation in healthcare organizations where power dynamics constitute an important aspect and where, traditionally, physicians have enjoyed expert power from their professional training and experience. Our study reveals that knowledge power, in the new ecosystem, as perceived by the physicians, has shifted from a historical 'expert knowledge power' to power related to 'data management'. The new episteme of power (Rouse, 1994) relates to the use of data for surveillance and manipulation.

Professionals in general, and medical practitioners in particular, have had significant 'expert power including exclusive ownership of their area of expertise...to define the nature of problems and...have control of access to potential solutions (Evetts, 2013). Expert authority, historically, stems from a knowledge base built from extensive training and experience (Abbott, 1988; Freidson, 1985). The use of scientific knowledge and expertise, traditionally, has resulted in physicians being powerful stakeholders in the healthcare delivery system, enjoying a position of significant autonomy and dominance.

Current discourse on healthcare policy, highlights the shift in the healthcare system towards patient centeredness, emphasizes the role of doctors evolving from expert authorities to professional guides (Fox, Ward, & O'Rourke, 2005). Other researchers have questioned whether patients, especially if poorly educated, are competent or even willing to take on this responsibility (Greenhalgh, Potts, Wong, Bark, & Swinglehurst, 2009; Mol, 2008). This phenomenon has significant influence on the perceived changing power dynamics between doctors and patients in the healthcare sector.

The shift towards patient centeredness and empowerment, especially through technology, potentially threatens physicians' authority and expert power vis-a-vis the patient, and this could have significant implications for their resistance to technology such as internet health information (Chandwani & Kulkarni, 2016), PHR (Korica & Molloy, 2010). Doctors' concerns about internet information and an informed patient was more about perception of the challenge to expert power when patients begin to argue with the doctor about treatment options available and participate in the 'shared decision making' process. Our study extends the literature beyond the power dynamics between doctors and patients by examining physicians' perspectives about the changing power dynamics in the ecosystem implied by a proposed large scale digital infrastructure with respect to the several stakeholders envisaged to be the part of the new system. The information ecology lens is appropriate for understanding the relationships and dynamics amongst various stakeholders

We discovered that while physicians acknowledged the ‘inevitability’ of the technology push by the government, and also recognize some potential benefits that can accrue to them as well as to their patients, the perceptions about government and aggregators were particularly adversarial. The perceived dynamics amongst physicians vis-à-vis other stakeholders are described below.

Physicians and the government

The increasing costs of healthcare worldwide has prompted governments to impose funding restrictions, propose rationalization of expenditure and focus on efficiency, thus promoting a managerial perspective in this sector. Prior scholars have highlighted the resulting managerial dominance impacts the autonomy and authority of doctors (Freidson, 1985), and that this includes the role of markets and the state (Evetts, 2013). According to Hanlon (1999:121) ‘the state is engaged in trying to redefine professionalism so that it becomes more commercially aware, budget focused, managerial, entrepreneurial and so forth’. Systems such as the NHS which are designed to empower patients could in fact become a source of political control over the physician community, influencing their routines, processes, work practices and funding (McGivern & Fischer, 2012).

Our research also highlights the perception of physicians about the government in the new ecosystem as ‘panopticon’ (Foucault, 1977), in which the physicians and the healthcare organizations in the private sector will be under a continuous disciplinary gaze involving monitoring and surveillance through the data (Ball & Wilson, 2000; Orlikowski & Baroudi, 1991; Sewell & Wilkinson, 1992). While physicians recognize that this can mitigate fraud in the healthcare insurance sector, they were skeptical that the lack of representation of physicians and specialists in the decision making bodies in government would result in faulty implementation leading to unnecessary cost cutting measures. The lack of representation of specialists in decision making bodies emphasizes undermining of expert power and overstresses data-based manipulation.

Physicians and new data related companies

Physicians were wary about the role of companies that rely on mining and managing data to influence other stakeholders, such as established aggregators. They emphasized that while government and NHS were supporting these stakeholders by allowing margins of 20 per cent, the healthcare providers themselves were being squeezed. They feared that these stakeholders would capture most of the value

while physicians, who are the creators of the value, would be undermined. This concern, again, highlights the shift of power balance from expertise to data management.

Physicians and their peers

There was concern that various aspects of data infrastructure could lead to ‘unhealthy’ competition amongst physicians themselves, which could be detrimental to the whole system. The accessibility and transferability of PHR in the seamless Aadhar-linked NHS was perceived as a concern as it would lead to ‘unhealthy’ competition amongst healthcare providers. Physicians emphasized that this could be a serious issue in the Indian context where most of the patients were uneducated and health awareness low. Prior research has underlined that clinical staff feel uncomfortable with PHR because their notes would be visible to several stakeholders and could potentially be monitored and audited (Jensen & Aanestad, 2010). Physicians in our study were concerned that the naïve Indian patient could be easily influenced by competitive peers to ‘implicate’ them and that litigations against doctors might increase significantly.

They also feared that the government or other stakeholders, who have access to and can manage data, may set evaluation criteria without in-depth expert knowledge, that could result in enforcing faulty norms and penalize those who deviate from them. They explained that not only might these norms encourage unhealthy competition amongst healthcare providers but also promote ‘unethical practices’ such as selecting only those patients for whom the ‘returns’ were reasonable while referring the ‘unrewarding’ cases to government hospitals.

Physicians and the system

While the physicians welcomed the PHR based on Aadhar, which could enable seamless provision of healthcare, one of the aspects where they had significant concerns was with the ownership of data. Prior research has also highlighted the blurring of boundaries of the ownership of patient data with PHR implementation, as records are accessible by multiple stakeholders (Ueckert, Goerz, Ataian, Tessmann, & Prokosch, 2003). Physicians were concerned that they might be rendered liable for patient data theft and implicated wrongly, even if the source of leak originated with other stakeholders. One of the aspects where physicians were positive about the system was the efficiency embedded in the design. Their major complaint while participating in government sponsored insurance schemes

was the excessive delay in receipt of payments. Hence, they welcomed the provision that the data infrastructure would enable speedy payments.

To summarize, the findings suggest that physicians value the seamless connectivity accruing to the patients, efficiency of the payment system and minimizing frauds in health insurance as envisaged in the NHS. However, their concerns were related to the changing power dynamics in the emerging ecology where ‘data’ and not ‘expert knowledge’ would be the source of power and that the stakeholders with access to data power would undermine the actual service provider’s position in the emerging ecology.

CONCLUSION

In this research, we investigate the physicians’ perspectives about a planned large-scale IT implementation in the Indian healthcare sector, NHS. NHS envisages linking a personal unique identifier (Adhaar) to a nationwide healthcare IT infrastructure with registries for diverse stakeholders involved in healthcare delivery, including, but not limited to, hospitals, doctors, insurance providers, aggregators and governments. According to the government, the system would be ‘patient centric’ and the Adhaar- enabled tracking would enable the patient to access healthcare facilities seamlessly. The NHS further entails tracking of various transactions which would potentially enhance the efficiency and effectiveness of the healthcare system. Indeed, the government’s focus on the data-enabled and empowered NHS emphasizes the power of data, the “new, vast, and growing natural resource.” (Rotella, 2012).

The study contributes to the extant literature by bringing to the fore physician’s perspectives on large scale IT infrastructures in the healthcare sector. Prior scholarship largely has been focused on patients or policy makers (Nazi, 2013). It is important to explore physicians’ perspectives, as they are key and powerful stakeholders in healthcare delivery. They are not only affected by the system design and implementation, but also hold the key to successful implementation. Further, the study illustrates the use of the information ecology perspective in analyzing large scale information infrastructural changes. The ecology perspective is opportune for understanding the dynamics between the stakeholders, both existing and potential entrants. Furthermore, as the study reveals the perceptions about emerging power dynamics in the ecology, we have invoked Foucault’s conceptualization of knowledge power in comprehending the phenomenon.

We find that the physicians' perspectives have largely been undermined and their resistance underestimated in the rhetoric of patient empowerment and the ubiquity of data systems exercising control over the healthcare system. Our findings indicate that the skepticism amongst the physicians stems from their past experience of government's initiatives to control the 'profession'. Notably, the Indian political discourse and projections in the popular media in the recent past has emphasized that the 'government acted for patients' benefit by regulating the excessive margins applied to medical devices such as stents, implants, etc, that resulted in excessive costs of procedures' (Neelakantan, 2018; PTI, 2018). Physicians' enhanced resistance to the government's planned initiative and the skepticisms about the intent of government in design and implementation of NHS needs to be understood in this context. Past research has also highlighted the importance of historical context and path dependency in response to policy changes (Smith & Abbott, 2014). For example, in their study, Pal et al (2018) highlighted the power of the nation-building discourse that accompanied the demonetization move, showing that the governments narrative of 'sacrifice for national interest' was instrumental in shaping opinion towards government's push towards digital payments and demonetization (Pal et al., 2018). Indeed, the authors reported that the perception about negative effect of demonetization was lower, even amongst those who were affected adversely. Therefore, the narrative and popular discourse about physicians, which has been significantly adverse, might be influential in shaping not only the initial attitude towards the NHS, but could influence the adoption of the initiative. Future researchers should examine the contextual narrative and its effect on adoption of the NHS.

The study has significant implications for the design and implementation of large-scale IT initiatives. While the failure rates of IT initiatives are high in general, the failure of large IT implementations are particularly more frequent (Goldfinch, 2007) due to potential power restructuring in the ecology and issues in integrating already existing fragmented systems (Fukami & McCubbrey, 2011). Previous research has highlighted status quo bias as one of the aspects of resistance (Kim & Kankanhalli, 2009). In our study, we find that the perception of changes in power dynamics are related to the skepticism amongst physicians. We explain the different aspects of skepticism which need to be considered before implementing a large-scale change process. We further highlight the significance of 'path dependency' in the perception of initiatives especially if the general environment is perceived by a set of key stakeholders as adversarial (Smith & Abbott, 2014). This research emphasizes creation of a conducive environment and multi-stakeholder participation in the design and implementation process.

Specifically, the concerns and anxiety of physicians must be alleviated before the implementation not only because they are key stakeholders involved in delivery of healthcare services, but also central to the success of the proposed data based ecology.

Previous experience of similar patient-centric databases has encouraged secondary use of healthcare data for purposes such as policy analysis, marketing, accreditation and private certifications. Though secondary use of healthcare data has enriched patient experiences, promoted public health awareness and strengthened patient compliance, use of healthcare data for secondary use is bounded by ethical, political and social concerns. Yet, at this juncture NITI Aayog's strategy note on NHS leaves this unaddressed. With the engagement of market players as one of the key design components of NHS, the discussion on standard best practices and supportive policies that govern secondary data use for legitimate purposes is warranted.

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