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ATTITUDES OF GPs TOWARDS USING HI SYSTEMS FOR PATIENT DATA: A QUALITATIVE STUDY

ABSTRACT
This paper reports on the attitudes of 20 practitioners in South Australian General Practice towards adopting Health Informatics (HI) systems. HI systems are aimed at improving the overall quality and management of healthcare, but adoption of the technology may require a change in the General Practitioner’s (GP) approach to the way they perform their healthcare delivery role. Findings indicate behavioural changes including adopting electronic patient records were associated with the increasing familiarity and usage of the technology. Adoption increased as users experienced valued advantages in performing their professional role. Increased exposure to HI and interaction with professional networks also positively influenced perceptions of the importance and certainty of potential system implementation outcomes. The findings highlight the desirability of ensuring that HI systems are associated with benefits to the practice rather than burdens for the practitioner.

Keywords: Barriers to knowledge sharing, Socia-technical change, Tacit knowledge, Technological change, Resisting change

RESEARCH BACKGROUND AND CONTEXT

This paper explores General Medical Practitioner (GP) reaction to utilising Health Informatics (HI) systems for patient data in South Australia. Health Informatics is an emergent interdisciplinary label for the ‘…application of computers to assist the gathering, storage, processing and use of information to improve the procedures or outcomes of health care…’ (Sullivan 2001:251). Aimed at improving the efficiency and effectiveness of healthcare management, HI systems can include decision support and expert applications to potentially assist the medical practitioner in their tasks (Jones and Craig 2000). Findings indicate that whereas HI systems that can reproduce accepted models of clinical reasoning and can be viewed as providing immediate patient benefit have been adopted, systems aimed at improving the overall macro efficiency and effectiveness of healthcare more generally appear to be resisted (Arroll, Pandit, Kerins, Tracey and Kerse 2002; Bolton, Mira, Kennedy and Lahra 1998; Walsh 2004).

Understanding why people accept (or not) innovation, particularly in information systems research, remains one of the most challenging and complex issues (Davis, Bagozzi and Warshaw 1989; Frambach and Schillerwaett 2002). Medical practitioners have often been cited as classic examples of ‘professional’ populations, and understanding decisions of what innovations are adopted and when in professional organisations has been especially problematic (Fitzgerald, Ferlie, Wood and Hawkins 2002; Greenhalgh, Glenn, McFarlane, Bate and Kyriakidou 2004; Mintzberg 1979). Ford, Menachemi
and Phillips (2006) identify implementing HI systems require practitioner adoption of electronic patient records and potentially the need to reengineer traditional workflows and disrupt existing business and clinical processes. Yet implementing HI systems is also seen to have the potential to reduce the cost of chronic care and significantly raise the overall level of public health (Kelly 2000; Warren, Noone, Smith, Ruffin, Frith, Van der Zwaag et al. 2001). Bhalsale, Miller, Reid and Britt (1999) have estimated, for example, that 76 percent of unintended events that could or did ‘harm a patient’ in Australian General Practice were preventable with such technology. Total government expenditure on healthcare delivery (9.8 percent of the Australian Gross Domestic Product in 2004-05) is further projected to become unsustainable and unfundable within four decades without a change in approach toward health and aged care (Commonwealth of Australia 2002, 2006). The rapid development of technological systems coupled with the push for adoption by governments underscores the need to identify factors affecting Medical practitioner decision making (Chau and Hu 2002b).

HealthConnect is an example of a HI network initiative to routinely collect, store, exchange and download patient information at the point of care (Commonwealth of Australia 2001). Despite all levels of government having supported development of HealthConnect, it remains a complex and multi-tiered collection of isolated programs and piecemeal projects (Commonwealth of Australia 2004). Dependent on a proposed electronic patient record populated by sources across the continuum of healthcare, the majority of HealthConnect data was to come from General Practice (Commonwealth of Australia 2005). Estimated to see 85 percent of healthcare consumers annually, GPs are seen as gatekeepers to the wider health system and integral to delivering any comprehensive, coordinated and continuing healthcare strategy (Weller and Dunbar 2005). To facilitate HealthConnect, the Federal Government has targeted GPs with funding initiatives such as Practice Incentive Payments to increase the use of electronic prescribing (AMWAC Report 2005). Nowadays, almost all practices have at least one computer, and some are seen to have increased the use of technologically supported systems and to have consciously redesigned their processes in order to increase practice income (Powell-Davies and Fry 2005; Rudd and Watts 2005). However Henderson, Britt and Miller (2006) found some GPs who had access to computers and clinical software chose not to use them, and only 32.8 percent kept
all patient data in an electronic format. The purpose of this study is to gather more detailed and in-depth information on why GPs tend to resist (or not) Health Informatics systems

PREVIOUS RESEARCH AND THEORETICAL UNDERPINNING

Greenhalgh et al.'s (2004) review of clinician behaviour studies suggests innovation is not always better, resistance always bad, nor adoption more worthy of study than resistance. However understanding technology acceptance behaviour has largely drawn on application of research models such as Rogers’ (1995) innovation diffusion theory or behavioural intention constructs (see Venkatesh, Morris, Davis and Davis 2003). Innovation diffusion theory views innovation adoption as a process of reducing uncertainty about outcomes rather than as a single event, and studies of the introduction and penetration of innovations in healthcare generally validate Rogers’ (1995) S shaped curve of adoption over time (see for example Gosling, Westbrook and Braithwaite 2003). Behavioural intention models posit determinants of both intention to use technology and technology usage behaviour. This allows for perceptions of a behaviour to influence the level of effort and persistence exerted in pursuit of performing that behaviour, and behavioural scientists have agreed a commonality of factors that facilitate (or inhibit) intention translating into behaviour (Bandura, 1986; Fishbein, Middlestadt and Hitchcock 1991). Thus the perception of an innovation’s relative technological advantage can not by itself be seen to guarantee widespread adoption in a health care environment (Fitzgerald et al. 2002).

Gallivan (2001) has nonetheless argued traditional frameworks do not necessarily reflect the reality of innovation adoption and diffusion, and Gatignon and Robertson (1989) have argued that rejection is not simply the mirror image of adoption. Furthermore, earlier studies have tended to take place within large and complex organisations whereas General Practice in South Australia mostly operates as solo practices, partnerships or incorporated bodies averaging 2.9 GPs each (AMWAC Report 2000). Chau and Hu (2002a) have also criticised behavioural intention studies in healthcare environments as lacking consistency with studies using non-professionals. Larsen (2003) similarly identifies there is little diffusion research that examines the impact of organisational context. Limited relevant information systems research literature has attributed resistance to new technology to technological, individual, organisational and external factors (see for example Enns, Huff and Golden 2001).
Debreceny, Putterill, Tung and Gilbert (2002) for example, found key inhibitors to be uncertainty about future business models and perceptions of inadequate technical, legal and policy infrastructure.

It seems reasonable that technology adoption within general practice may be influenced by structural and cultural complexities different even from other healthcare settings, yet previous technology acceptance research has only made limited usage of the literature from professional groups (Swan and Newell 1996). So while technology adoption models have arguably been generalised to a commonality of factors that lacks regard for contexts and settings, professional interactions in terms of adoption and diffusion are seen to assume greater importance than predicted by extant literature (Fitzgerald et al. 2002; Kaplan 2001). Early evidence suggests that change such as making skills programmable triggers resistance for example, because it is perceived as both an assault on professional autonomy and also a driver of change in the organisational form (Mintzberg 1979). Such findings indicate technological innovations are likely to be resisted if the change process, change agent, risks or outcomes are perceived to be incompatible with the professional’s values, goals, skills or ways of working (Bayless 1996; Edwards, Kornacki and Silversin 2002). Thus even if the efficacy of the technological innovation is accepted, perceptions of anticipated implementation outcomes could still lead to resistance, rejection or non-adoption. Petrini and Hultman (1995) have divided such adoption resistance into active (such as fault finding) or less obvious passive behaviour (such as feigning ignorance or withholding agreement to adopt). This research explores the question: - What do practitioners in general practice medicine perceive as barriers to implementing Health Informatics systems that can potentially routinely collect, analyse and redistribute information?

Drawing from the paradigms and the empirical studies cited above, the authors have developed a research framework (see Figure 1 below) to illustrate the process by which theory suggests a GP develops a perception of the relative advantage of adopting a particular HI system. Despite differences among the above approaches, there nonetheless appears to be convergence in the importance of individual and environmental characteristics. Innovation diffusion theory further posits adoption as a process of forming an attitude towards the innovation, deciding to adopt (intention to perform a behaviour), implementing the innovation (performing the behaviour), and subsequent outcomes
confirming (or not) the decision to adopt (or not). Behavioural intention constructs posit factors that facilitate (or inhibit) intention translating into behaviour whereas contingency organisational theories suggest the process of a professional adopting an innovation is also impacted on by influences that originate from the profession the professional belongs to. The research framework posits that the process by which a GP develops a perception of the relative advantage of adopting a particular HI system can be seen as the emergent outcome of individual and environmental characteristics and the perceived potential for change if the innovation is adopted. Hence the perceived relative advantage of a particular HI system, behavioural intention and subsequent behaviour of a GP contemplating adoption within a particular context is potentially influenced by individual perceptions of environmental antecedents and the professional value and role of GPs. [Insert Figure 1 here]

**RESEARCH METHODOLOGY**

Interviews were conducted with GPs in member practices of South Australian Divisions of General Practice. Practices varied in size (from solo to 22 full time equivalent GPs), structure (2 solo, 2 only partners, 14 partners and associates, and 2 incorporated) and location (13 Metropolitan and 7 Rural). All member practices of three local health divisions of general practice were offered the opportunity to participate in the study through initial communication with Practice Managers. Subsequently practices from other Divisions were involved and this paper reports on interviews with 20 GPs (10 full time and 16 Male). The GP’s experience ranged from residency to ‘25 plus’ years, and qualifications ranged from an overseas trained Doctor awaiting Australian recognition to post graduate qualifications in such areas as Public Health, Obstetrics, Anaesthesiology and Doctor of Philosophy. The results reflect the views of 20 (of 2013) GPs from 20 (of 700) practices in South Australia (AMWAC Report 2005).

In depth interviews lasting between 30 and 90 minutes were used to increase the likelihood of identifying the seemingly diverse yet interrelated communication, care, context and control causes for potential barriers to HI system adoption (see for example Greenhalgh et al.’s 2004 conceptual model). Questions began with GP reaction to the topic and subsequent questions specifically probed deeply held attitudinal information and associated underlying tacit or informal knowledge (Sternberg and Horvath 1999). Initial answers determined the direction of further questions aimed at determining
individual, organisational and external sources of influence on the interviewee’s attitude, using a funnel sequence of questions to uncover information not as yet available from prior research (Cavana, Delahaye and Sekaran 2001). Specific demographic data were not collected to ensure participant confidentiality. To ensure that the full range of potential beliefs was canvassed, seven practitioners perceived by other interviewees to belong to practices of substantially above or below average technology use were purposively added to the initial sample. Each interview was later transcribed, delivering transcripts of almost 23 hours of talk which served as the unit of analysis. The transcriptions were analysed by manual content coding followed by NVivo to arrive at the key concerns/themes expressed (Bazeley and Richards 2000). The data was approached from a logic of discovery with no advance hypotheses or a priori categories (Strauss and Corbin 1998).

RESULTS AND DISCUSSION

All practices used technology to some degree and all interviewees were readily able to identify opportunities and weaknesses with aspects of organisational technology in use. However 5 who did not regard themselves as active organisational innovation decision makers tended to support existing technology strategies and express overall satisfaction with their current usage. Only one practice had no clinical software (and no computer on the GP’s desk), no broadband connection and no electronic pathology result capability. While 19 interviewees used clinical software for generating scripts or recording quantitative patient data to some extent, 4 did not record clinical notes electronically.

Many attributed slow HI system take up to be in part the result of little available time for GPs to spend addressing ‘non-medical’ issues. Continuing education, for example, was focused on ‘…saving lives rather than learning about computer programmes…’ The perceived need for electronic interaction with external entities varied with context, but all interviewees identified such interaction with specialists as an important driver. HI systems were generally recognised as an integral part of contemporary healthcare provision, however the lack of a public health management perspective was suggested by an attitude of ‘…no conceivable need for access to de-identified amalgamated data…’ Yet a desire to improve the holistic and longitudinal outcomes of patient healthcare was always expressed. There was little to no interest in potential usage of de-identified (not linked to a unique individual) and delinked
amalgamated medical data as this was perceived to offer ‘…nothing more than Medicare data could…’ However all interviewees recognised potential benefits from being able to access consolidated longitudinal patient records, and to a lesser extent linked statistical data. But a diverse range of barriers was also perceived, including conflicting perceptions of the need to standardise processes (5 interviewees raised this issue) and share clinical notes (16), the potential for competitive disadvantage (5), the resolution of ethical moral and legal issues (12), the availability of technology (6), and the motivations for political and policy decision making (17). A ‘closed book’ (where new patients are not automatically seen) practice was not unusual (7 interviewees operated like this in some form), and attracting numbers of patients was not generally perceived as a competitive issue. Concern was expressed for the loss of GPs (2 interviewees raised this) to other practices because the practice could ‘…only maintain revenue if the remaining GPs worked even longer and harder…’ The only GP interviewed who had changed practices recently cited the nature of work as the main reason. A consistent theme was the nature of the work had greater appeal to the GP than effective organisational use of technology. This was seen to be maintainable because the organisation was structured in order to underpin the GP performing their role.

While the sample was initially non-specific and voluntary (13) then subsequently more purposive (7) to ensure all degrees of initial positive attitudes were represented, it is nonetheless still possible that the results for this study are influenced by Practice Managers who negotiated GP interviews where their choice was generally ascribed to the technology champion status of the GP within that practice. The sample compared roughly with statistical South Australian GP data with 10% in solo practice (compared to 15.9% in the AMWAC Report 2005), 20% female (40.7%) and 35% Rural (25.3%).

The data were further analysed through NVivo in order to educe common themes or concerns. Four discrete GP attitudes towards new HI systems were able to be identified. They are not mutually exclusive and are more appropriately seen as a series of developmental and even co-existing perspectives influenced by the GPs’ perception of their role and value, the GP’s need for self-validation of existing processes, and the GP’s exposure to utilising HI systems as part of their workflow. These attitudes are summarised in Table 1 and discussed below. [Insert Table 1 here].
Passive or Active Resistance

While billing was computerised, a sole GP with a ‘loyal’ patient base and an ‘…almost spiritual…’ patient care philosophy for example, could identify no adequate incentive nor potential for improved patient outcomes from adopting clinical software. On the other hand, an unwanted change in the clinical note taking process and a potential reliance on technical support were seen as unacceptably impinging on the GP’s ability to appropriately dispense medical knowledge. Nevertheless, voice recognition software was being considered because it ‘…can potentially record my thoughts faster than I can write them…’ Such software was not intended to be utilised in front of the patient and had been trialled in the past but found to be inadequate. This GP attitude was identified from a diverse range of technologically aware practices and GPs. A practice which perceived itself to be ‘paperless’ for example, did not utilise electronic appointments because they were considered to be wanting in comparison to the traditional appointment book for each GP. This attitude also manifested as clinical histories being recorded by hand and the electronic patient database being maintained only for specific reasons, such as chronic disease management or script writing. GP attitude to the clinical history notes (c.f. summaries) was possessive with little to no desire to share these outside of the practice. Despite general recognition and even advocacy for technology utilisation associated with this attitude, the utilisation of particular technologies was seen to be a process too far removed from the GP’s ‘style’ of ‘thinking’, ‘reflecting’, ‘observing’ or ‘recording.’ The primary inhibitor to adoption was seen to be unwanted change in the GP’s ways of working. In this instance it is argued the GP will adopt the technology only if there is perceived to be a clear and certain advantage to the GP performing their role. Hence improved patient outcomes (health and attitude) must be clearly perceived to outweigh any need for the GP to adapt to new ways of working.

A tool to support individual processes

A practice justified implementation of clinical software for example, on the basis this would improve revenue and reduce the costs of maintaining patient records. While all GPs subsequently utilised electronic prescribing for example, some GPs (both decision making and non-decision making) actively and passively resisted full adoption of the application. A consistent outcome of this attitude
was the need for a practice structure able to support both electronic and manual processes for the same task. This attitude manifested in the need for patient files in one practice to be physically transported despite a Virtual Private Network between sites. The progressive implementation of different vendor systems was also seen to increase the likelihood of new software being perceived as less intuitive and incompatibility leading to overall system instability. In this instance it is argued the GP perceives benefits of technology adoption as a clear and certain potential for organisational advantage. However fundamental to this attitude is costs are perceived primarily in terms of the cost of changing organisational processes and not as changes to individual GP workflows or autonomy.

**A tool to integrate current processes**

This attitude manifested to some degree in most practices as the strategic acquisition of hardware and systematic upgrading of clinical software and more integrative billing software. Also planned was integrating electronic readings (such as ECG) directly into patient files, and patient access to appointments through the internet. The adoption of more complex, less understood, less available and potentially more integrative systems was aligned with concerns about the need for change in the organisational ways of working by autonomous members, migrating existing systems, and system reliability and capability. Those who had recently changed existing clinical software were generally looking to integrate billing and clinical software for ‘greater system stability’. However this was also seen to create tension with GPs reluctant to consider changing vendors or existing ways of software use. This attitude was generally associated with GPs that had access to experience (both inside and outside the practice) of technology use in their environment who recognised the need for change in processes or workflows as potential adoption outcomes. In this instance it is argued the GP primarily perceives benefits of technology adoption in terms of the potential for improvement in individual workflow or organisational process and hence for patient outcomes, and costs in financial terms.

**A tool to transform processes**

This attitude tended to manifest in practices with GPs active in medical activities outside of the practice, including professional organisations. Of those interviewees associated with scoping external
projects, GPs identified the existing need for multiple activities to be duplicated in order to satisfy the requirements of all stakeholders involved in healthcare delivery. Concern was consistently expressed about trust in other entities, the paucity of sanctioned software and apparent indifference of software vendors, and a perceived onus to use in-house resources to provide ‘…different solutions to the same problem…’ Major inhibitors to adoption were perceptions of unresolved, changing or ambiguous policy issues (e.g. legal, ethical and data control) and in particular the ‘top down’ yet ‘piecemeal’ approach of governments to technological solutions. Examples cited included the government provider of electronic pathology results using a communication protocol different from that the Open Architecture Clinical Information System uses to link public hospitals, and the non-standardised applications for communication with external entities (e.g. specialists, pathologists and Medicare). This attitude was generally associated with GPs that had access to detailed experience of technology use in similar environments and who perceived themselves and their organisation to be technologically capable. The potential to improve individual patient health outcomes through improved use of healthcare delivery system resources was the dominant driver. While change in individual workflow and/or organisational process was seen to be acceptable outcomes, change was primarily perceived in terms of the need to transform external entities. In this instance it is argued the GP is not only pursuing individual or organisational relative advantage, but is also adopting a less isolationist perspective of the quality and management of individual healthcare. However healthcare entity interoperability was also seen to be complex and difficult and to generate the least immediate concern for GPs in general.

CONCLUSION

All GPs interviewed represented their role to some degree as dispensers of complex health knowledge that was irreplaceable by technology or other disciplines in medicine. Inherent in this perception was a tension between efficiently and effectively (in terms of GP time and patient outcomes), and holistically managing a patient’s longitudinal health. The data from this sample suggest GP attitudes towards implementing HI innovations to this end were influenced by concerns relating to the potential for changes in the GP role and value and perceptions of organisational and external antecedents. While GP decision makers commonly perceived the relative advantage of implementing future technological
innovations in terms of financial and time cost, task performance, patient outcomes and organisational revenue, this was influenced by perspectives of the GPs’ role and value, need for self-validation of existing processes and exposure to utilising HI systems as part of their workflow. Despite consensus on the inevitable increase in technology use to deliver healthcare in a General Practice context, the pressure to implement technology was seen to be influenced by exposure to utilising HI systems and whether the GP adopted an individual, organisational or healthcare system perspective of potential implementation outcomes. Yet this research did not seek to focus on adoption per se, but rather on what GPs perceive as barriers to HI system innovation. An individual, organisational or healthcare system perspective of a potential for undesirable change in the GP value and role was seen to be the primary trigger for active or passive resistance to adoption. Resistance was seen to be exacerbated by an unfamiliarity associated with a lack of exposure to utilising HI systems as part of the GP’s workflow. Resistance and the propensity to experiment were seen to be positively influenced by an increased exposure to HI systems use, which in turn led to an increased awareness of the implementation and adoption issues involved. The ability for the GP to easily source ‘appropriate’ information was also seen to facilitate a more favourable attitude towards adoption and willingness to experiment. A similar development of an attitude of willingness to experiment and the significance of social networks on decision making has been noted in social and consumer psychology literature (Ajzen and Fishbein 1980; Reed II, Wooten and Bolton 2002). The GP’s sense of professionalism was seen to moderate both resistance towards and information about HI system implementation.

This research provides a theoretical grounding for, and empirical evidence of directions for future investigations of GP acceptance of technological innovations, and hence the development of counteracting strategies to overcome resistance and improve adoption in this context. The research may also be of value to change practitioners by helping to predict potential adopter barriers and professional concerns regarding new technology. By providing an alternative perspective of adoption the research also has relevance to improving diffusion of other new technologies among other professional groups, and contributes to change management literature and particularly diffusion of innovations literature as to why and how the professional forms an opinion about and the decision to
implement (or not) innovations in different contexts and settings. This research potentially benefits researchers and assists in explaining technology rejection in a variety of contexts and addresses the calls for research in this regard from authors such as Frambach and Schillerwaett (2002). Finally, the research may also benefit professionals themselves by allowing them to understand the barriers to technology adoption at different levels and settings of their organisation, and to understand that these barriers are not necessarily attributable to the technology.

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Figure 1: Research Model of Influences on GP Attitude towards a new HI System

Table 1: Attitudes Adopted towards HI Systems by GPs

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Resist unless Certain and Demonstrable Individual Advantage</th>
<th>Use to Support Existing Individual and Organisational Processes</th>
<th>Use to Integrate Existing Individual and Organisational Processes</th>
<th>Use to Transform Healthcare System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manifests as: -</td>
<td>Lack of technology or available technology not used</td>
<td>Available technology not used: Electronic and manual processes</td>
<td>Strategic acquisition of hardware and more integrative software</td>
<td>Practice active in activities external to the practice</td>
</tr>
<tr>
<td>Benefits perceived primarily in terms of: -</td>
<td>Individual Patient Outcomes</td>
<td>Organisational Advantage</td>
<td>Organisational Capability</td>
<td>Organisational capability as part of a healthcare delivery system</td>
</tr>
<tr>
<td>Costs perceived primarily in terms of: -</td>
<td>Changes in individual workflows</td>
<td>Financial Terms</td>
<td>Financial Terms</td>
<td>Financial Terms</td>
</tr>
<tr>
<td>Other Concerns in considering Relative Advantage</td>
<td>‘unreimbursed’ time commitment; patient expectations; patient trust;</td>
<td>Costs are perceived primarily in terms of the cost of changing organisational processes and not as changes to individual GP workflows or autonomy</td>
<td>Change in organisational ways of working by autonomous members; Migrating existing systems; System reliability and capability</td>
<td>Trust in other entities; paucity of sanctioned software; indifference of software vendors; onus to use in-house resources; unresolved, changing or ambiguous policy issues; ‘top down’ yet ‘piecemeal’ approach of government</td>
</tr>
<tr>
<td>Adoption if: -</td>
<td>Improved patient outcomes (health and attitude) clearly perceived to outweigh the need for the GP to adapt to new ways of working</td>
<td>Clear and certain potential for organisational advantage</td>
<td>Improved individual workflow or organisational process (and hence for patient outcomes) clearly perceived to outweigh financial costs</td>
<td>Facilitates the transforming of external entities and improves own organisational interoperability</td>
</tr>
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