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Towards Understanding Apparent South Australian GP Resistance to Adopting Health Informatics Systems

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Abstract

This paper reports on a qualitative study of the attitudes of 23 South Australian practitioners in General Practice (GP) towards adopting an unspecified data amalgamating Health Informatics (HI) system. Findings suggest key areas of concern are associated with the potential for diminution of control over change and adoption was primarily influenced by a perceived need to protect the role and value of GPs. If change was seen as involuntary, uncertain or without demonstrable benefit to relevant patient outcomes, the prospect of change tended to manifest as passive or active GP resistance. Findings suggest increased exposure to use of HI systems influences GP perception of both the importance and certainty of potential implementation outcomes. It was concluded that discrete attitudes towards the use of HIS technology could be identified. Determined by contextual GP perceptions of competing managerial, technological and political factors, they are not mutually exclusive and more appropriately seen as a series of developmental and co-existing perspectives.

Keywords (Heading – minor)

Health Informatics, GPs, Resistance, Professionals, Sociotechnical change.

INTRODUCTION

Health Informatics (HI) 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). This paper explores why South Australian General Medical Practitioners (GP) appear to resist (or not) the implementation and adoption of such technology.

Although Australia's health expenditure in the financial year 2005–06 represented 9.0% of gross domestic product compared to 9.05% in 2004–05, it nonetheless increased $5.6 billion or 6.9% (Commonwealth of Australia 2007). The increasing government expenditure on healthcare delivery paralleling an increasingly aged population is projected to become unsustainable and a change in approach toward health and aged care is needed (Commonwealth of Australia 2002). Aimed at improving the efficiency and effectiveness of healthcare management, HI systems also include decision support and expert applications to potentially assist the medical practitioner in their tasks (Jones and Craig 2000). Implementing such technology is seen to have the potential to reduce the cost of chronic care while significantly raising the overall level of public health (Kelly 2000; Warren et al. 2001). The vital GP 'gatekeeper' role to the wider health system led the Federal Government to target them with funding initiatives, such as Practice Incentive Payments (PIPs) in order to facilitate their use of such technology (AMWAC Report 2005; Anderson 2008). Hence almost all GP practices nowadays have at least one computer, and some are seen to have designed their processes to increase the use of technologically supported systems in order to increase practice income (Powell-Davies and Fry 2005; Rudd and Watts 2005). Yet implementing HI systems potentially needs reengineering of traditional workflows and a study of Australian GPs between 2003 and 2005 found some who had access to computers and clinical software chose not to use them, and only a third kept all patient data in an electronic format (Ford et al. 2006; Henderson et al. 2006). International findings suggest technology perceived to reproduce accepted models of clinical reasoning or provide immediate patient benefit have generally been adopted, whereas systems aimed at improving the overall efficiency and effectiveness of healthcare appear to have been resisted (Arroll et al. 2002; Bolton et al. 1998; Walsh 2004). The need to identify factors affecting GP decision making is underscored by the rapid development of such systems and estimates that 76 percent of unintended events that could or did 'harm a patient' in Australian General Practice are preventable with such technology (Bhalsale et al. 1999; Chau and Hu 2002a). While policy makers question the 'need for gatekeepers' and disparage the term as belonging 'to an old debate', GPs, estimated to see 85 percent of healthcare consumers annually, continue to be seen as integral to delivering any comprehensive, coordinated and continuing healthcare strategy (Anderson 2008; Weller and Dunbar 2005). Yet understanding why people accept (or not) innovation, particularly in information systems

research, remains one of the most challenging and complex issues (Davis et al. 1989; Frambach and Schillerwaett 2002). Medical practitioners have additionally been cited as classic examples of 'professional' populations where understanding of innovation adoption has been especially problematic (Greenhalgh et al. 2004; Mintzberg 1979).

Understanding technology acceptance behaviour has largely drawn on application of research models such as Innovation Diffusion Theory (IDT) or Behavioural Intention (BI) constructs (see for example Rogers 1995; Venkatesh et al. 2003). IDT views innovation adoption as a process of reducing uncertainty about outcomes rather than as a single event, whereas BI 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 (Bandura 1986; Fishbein et al. 1991). Thus the perception of an innovation's relative technological advantage may not by itself guarantee widespread adoption (Fitzgerald et al. 2002). However traditional frameworks are not necessarily seen to reflect the reality of innovation adoption and diffusion studies and BI studies in healthcare environments for example, have been criticised for lacking consistency with studies using non-professionals (Chau and Hu 2002b; Gallivan 2001; Greenhalgh et al. 2004). Earlier studies have similarly 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 2.5 GPs each (AMWAC Report 2005). Whereas technology rejection is not seen as simply the mirror image of adoption, limited relevant information systems research literature does attribute resistance to technological, individual, organisational and external factors (Enns et al. 2001; Gatignon and Robertson 1989). In particular, key inhibitors have been identified as uncertainty about future business models and perceptions of inadequate technical, legal and policy infrastructure (Debreceny et al. 2002).

Rather than in system or setting terms, resistance can be more precisely explained in terms of 'interaction' between characteristics of the people and the system, yet there is little diffusion research that examines the impact of organisational context (Larsen 2003; Markus 1983). The 'sociotechnical' and 'political' variants of the interaction theory hold that resistance is the outcome of different political and power interests. Thus decentralised structures are seen to resist redistribution of responsibilities towards centralised control, and systems seen to change the balance of power will be resisted by those who potentially lose it. Hence resistance arises from perceptions of potential system interaction with such contextual attributes as the prevailing culture. It therefore seems reasonable that the greater the perceived potential for sociotechnical and political change, the more change would be resisted. It also seems reasonable that technology adoption within General Practice may be influenced by structural and cultural complexities different even from other healthcare settings, while technology adoption models have arguably been generalised to a commonality of factors that lacks due regard for contexts and settings (Aarts et al. 2004; Kaplan 2001). Technology acceptance research has made only limited use of the literature from professional groups, yet early evidence suggests change perceived to impinge on professional autonomy (such as making skills programmable) triggers resistance (Mintzberg 1979; Swan and Newell 1996). Thus technological innovations are likely to be resisted if the change process, change agent, risks or outcomes are perceived to be incompatible with professional values, goals, skills or ways of working (Bayless 1996; Edwards et al. 2002). So even if the efficacy of the technological innovation is accepted, perceptions of anticipated implementation outcomes could still lead to resistance, rejection or non-adoption. Breaking down resistance emanating from a perceived potential to impact on existing relationships and protocols is seen to require such strategies as asking for only minimal commitment or delaying commitment to the future (Knowles and Linn 2004). Strategies aimed at increasing the motivation towards change are designated alpha strategies, whereas strategies aimed at minimising avoidance forces and reducing the motivation to move away from change (i.e. directly or indirectly addressing resistance) are designated omega strategies (Knowles and Linn 2004).

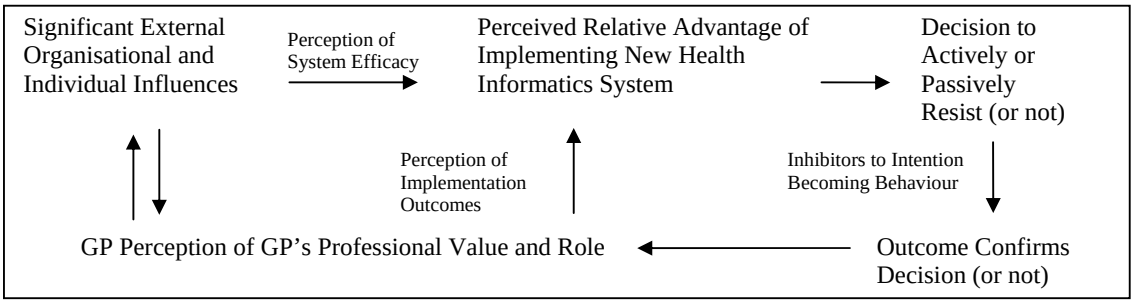

Figure 1: Research Model of Influences on GP Attitude towards a new Health Informatics System

This research explores the question: - 'What do South Australian GPs perceive as barriers to implementing HI systems that can potentially routinely collect, analyse and redistribute information?' Drawing from the paradigms and the empirical studies cited above (Greenhalgh et al. 2004; Markus 1983; Rogers 1995; Venkatesh

et al. 2003), the authors developed a model to frame the research (see Figure 1). The model illustrates the process by which theory suggests GPs develop a perception of the relative advantage of adopting a particular HI system. This can be seen as the emergent outcome of individual and environmental characteristics and a perceived potential for change if the innovation is adopted. The model posits that the perceived relative advantage, behavioural intention and subsequent behaviour of a GP are influenced by perceptions of environmental antecedents and the value and role of GPs. There is a loop where the perceived advantage leads to a decision to resist or not. Subsequently the outcomes of the decision confirm or disconfirm the decision and flows back to GP perceptions.

RESEARCH METHODOLOGY

Interviews for this study were conducted between January and October 2007 with GPs in member practices of Divisions of General Practice in South Australia. All GP members of three Divisions sponsoring this research were offered the opportunity to participate in the study. Subsequently researcher contact was made for an in-depth interview with the nominated GP member of the practice. This accounted for thirteen of the GP sample. In depth interviews lasting between 30 and 90 minutes were used to increase the likelihood of identifying the interrelated communication, care, context and control causes for potential barriers to HI system adoption (see for example the conceptual model of Greenhalgh et al. 2004). The technology was described as able to record patient data as an electronic record within the practice, but also potentially able to facilitate the routine amalgamation and exchange of data outside the practice boundary. Questions began with GP reaction to the topic and subsequent questions were designed to probe deeply held attitudinal information and associated underlying tacit or informal knowledge (Sternberg and Horvath 1999). The questions focused on GP perceptions of the clarity or flexibility regarding the system design and implementation process, the lack of 'readiness' of the practice to implement such technology, any external influence of clinical or non-clinical opinion leaders and the potential for the technology to change the professional value, role and relationships, or encroach on professional autonomy of the GP. Whenever concern was expressed, follow up questions centred on what mechanisms the system would need to include to rebut GP concerns.

Although categories of questions to identify issues potentially relevant to GP concerns had been drawn from literature, GP answers determined how further questions were asked. So rather than asking structured questions, a funnel sequence of questions was utilised to uncover information not as yet available from prior research (Cavana et al. 2001). However, much redundancy was experienced after preliminary analysis of 13 interviews, indicating the data size was sufficient (Miles and Huberman 1994). Following a sampling strategy of seeking out the negative and exceptional case to ensure that the full range of potential beliefs was adequately canvassed, 10 practitioners perceived by other interviewees to represent substantially different views to GPs generally were purposively added to the initial sample (Miles and Huberman 1994). When interpretation of this information revealed no new significant insights to challenge existing understanding (data saturation), interviewing was stopped (Bowen 2008). Eventually 22 GPs from seven Divisions and one full-time locum were represented in the sample which delivered transcripts of more than 29 hours of talk and served as the unit of analysis. The transcripts were analysed by manual content coding followed by NVIVO (computerised text-based analysis) to arrive at the key concerns and themes expressed (Bazeley and Richards 2000). Analysis of the manual content coding was undertaken iteratively in four phases, with each phase informing the next. While the semi-structured interview question categories were suggested by literature, analysis of the interview data was approached from a logic of discovery with no advance hypotheses or a priori categories (Strauss and Corbin 1998).

RESULTS

While specific demographic data were not collected to ensure participant confidentiality, multiple attributes of the practice (see table 1) and the GP (see table 2) were revealed through interviews with practice managers or GPs. Although not available for all GPs and their practices, such data were used to populate a 'casebook' of attributes. Practices varied in billing practices (gap charged over Medicare rebate), experience of National Primary Care Collaboratives (NPCC) or Practice Health Atlas (PHA) as examples of data amalgamation technology use, accreditation, capability (for site medical service provision), designation, size, structure and choice of billing and clinical software. All practices used billing technology and only one practice had no clinical software, GP computer, broadband connection or electronic pathology result capability. 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. However 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, and 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 organisations were structured in order to underpin the GP performing their role.

Table 1: Attributes of GP Practice

GP	Billing	NPCC	PHA	Accred	Capab	Desig	Size	Struct	Billing	Clin
1	5	No	No	No	1	3	1	1	8	10
2	3	No	No	Yes	1+2+3	2	4	2+3+4	2	2
3	4	Yes	Yes	Yes	1	3	1	1	3	2
4	6	No	No	Yes	1+2+3	1	5	2+3	3	2
5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	3	No	Yes	Yes	1+2+3	1	2	2	2	2
7	5	Yes	Yes	No	1	1	2	2+3	3	2
8	5	Yes	Yes	Yes	1	2	4	2+4	7	2
9	3	Yes	No	Yes	1+2+3+4	3	4	2+3+4	3	1
10	1	No	No	No	1	1	3	2	6	2
11	2	No	No	Yes	1+2+3	1	4	2+6	1	2
12	1	No	No	No	1	1	2	4+5	2	2
13	5	No	No	Yes	1+2+3	3	4	2+3	4	4
14	4	Yes	Yes	Yes	1+4	3	4	2	2	2
15	2	No	No	Yes	1	3	3	2+4	1	2
16	5	NA	NA	No	1	1	2	2	4	4
17	2	Yes	Yes	No	1+3	1	1	1	4	2
18	4	Yes	Yes	Yes	NA	3	4	2	1	2
19	NA	No	No	Yes	1+2+3+4	3	6	2	9	9
20	NA	Yes	Yes	NA	NA	1	4	2+6	4	4
21	4	Yes	Yes	Yes	1+2+3+4	1	3	2+3+4	3	2
22	3	No	Yes	No	1+2+3	3	2	4+5	2	2
23	3	No	No	Yes	1+2+4	2	4	2+3+4	5	4

	Billing Practice Gap	Capability	Desig	Size	Structure	Software
1	Bulk Bill all	GP	Metropolitan	Solo	Solo	ZedMed
2	to $15	Path Collect	Outer Metro	2-3	Partnership	MD<3
3	to $20	Allied Health	Rural	4-5	Associates	PracSoft
4	to $25	Procedural		6-10	Salaried	MD3
5	to $30			<15	Corporate	Practics
6	> $30			>15	Income Share	Health Point
7						Medical Spectrum
8						Medical Windows
9						MedTech
10						None

GPs (19 male) varied in experience as a GP and qualifications ranged from overseas trained Doctor awaiting Australian recognition to post graduate qualifications in areas of medicine as well as in computer systems analysis, agriculture, music and Doctorate of Philosophy. GPs also varied in their practice role, use of software and 'champion' status concerning technology use within the practice. All 22 GPs with access used clinical software to some extent for tasks such as generating scripts, however 4 routinely chose to not record clinical histories electronically and 1 practice to not use electronic appointments. Anecdotally such selective GP adoption of implemented technology was not uncommon within a practice, however 6 interviewees claimed they routinely accessed their electronic practice data remotely. Six interviewees who did not regard themselves as organisational innovation decision makers tended to support existing technology strategies and expressed overall satisfaction with their current usage. Nonetheless, all interviewees were readily able to identify opportunities and weaknesses with aspects of organisational technology in use. Many attributed slow HI system take up rate to be in part due to little available time for GPs to spend addressing 'non-medical' issues. Whereas continuing GP education was generally focused on '…saving lives rather than learning about computer programmes…' recent graduates had not been introduced to clinical software as part of their university medical training. The perceived need for electronic interaction with external entities varied, but all interviewees identified electronic interaction with specialists and receiving discharge information from hospitals as important drivers. HI systems were generally recognised as an integral part of contemporary healthcare provision and all interviewees recognised potential benefits of consolidated patient records. However the lack of a public health perspective was also suggested by an attitude of '…no conceivable need for access to de-identified amalgamated data…' There was little interest in delinked (not linked to other data such as demographic) amalgamated medical data as this was perceived to offer '…nothing more than Medicare data…' However a diverse range of barriers was also perceived including conflicting perceptions of the need to standardise processes and share clinical notes, the potential for competitive disadvantage, the resolution of ethical moral and legal issues, the availability of appropriate technology and the motivation for political and policy decision making.

The first phase of analysis sought to identify recurrent issues that GPs raised as relevant to their attitude formation towards this type of technology. This served to reduce the data into manageable groupings of data 'issues' categorised (in order of source frequency of coding) as 'Profession' (i.e. related to practicing medicine as a General Practitioner); 'Internal' (i.e. related to GP practice competitiveness, processes and personnel); 'External' (i.e. related to the policies, strategies and systems in environments beyond the GP's practice); 'Data' (i.e. related to the collection, use and control of data in GP medicine); and 'Patient' (i.e. related to the patient relationship with the GP and other entities in the Healthcare delivery system). The second phase of analysis

sought to gain understanding of how issues influence GP attitude by recoding the 'grouped' issues for interpretations of apparent influence. In this way coding the data led to themes emerging from the data. The key sources of 'influence' seen to stimulate or engender GP resistance were associated with GP perceptions or attitudes toward unwanted functionality of Data (e.g. don't want/need), inadequate attributes of the Practice (e.g. capability and receptivity), or undesirable impact on the GP's Role (e.g. on GP autonomy, status, control or workflow). Of the 80 'issues' identified, 23 were found to be a marginally positive 'influence' on the GP sample's attitude in terms of coding frequency, while 40% of total 'influence' coding was seen to be positive. So while the technological 'issues' raised by GPs made identification of potentially relevant concerns possible, issue, theme or construct was never an exclusively positive influence and only once an exclusively negative influence (i.e. unremunerated practice cost) on emergent GP attitude towards such technology use.

Table 2: Attributes of GP

GP	Gender	GP Exp	Full Time	Qual Medical	Qual Other	Status	Soft. Use	Champ
1	M	4	Yes	1+6	NA	1	1	1
2	F	1	Yes	1+4	3	2	1+2+3	2
3	M	5	Yes	1	NA	1	1+2+3	4
4	M	5	Yes	1+8	4	5	1+2	4
5	F	2	No	1+7	NA	3	1+2	2
6	M	5	Yes	1	NA	5	1+2+3+4	4
7	M	3	No	1+5	4	5	1+2	4
8	M	1	Yes	1+3	NA	3	1+2+3	3
9	M	5	Yes	1+8	NA	7	1+2+3+4	3
10	M	4	Yes	1	NA	5	1+2+3	3
11	M	7	Yes	NA	NA	6	1+2+3+4	4
12	F	6	Yes	1+3	NA	2	1+2+3	2
13	M	5	Yes	1+8	1	5	1+2+3+4	2
14	M	6	No	1+2	4	5	1+2+3	4
15	M	1	Yes	1+3	NA	4	1+2+3+4	2
16	M	6	No	1+8	5	5	1+2+3	4
17	M	7	Yes	1	NA	1	1+2+3	4
18	M	5	Yes	1	1	6	1+2+3	3
19	M	7	Yes	1+8	1	6	1+2+3	3
20	F	4	No	NA	NA	3	1+2	3
21	M	6	Yes	NA	NA	8	1+2+3	4
22	M	2	Yes	1+3	NA	2	1+2+3	2
23	M	6	Yes	1+8	5	7	1+2+3+4	3

	Experience	Qual Med	Qual other	Status	Software Use	Champion
1	0-5	GP	Diploma	Solo	Billing	None
2	6-10	Anaesthesiology	Bachelors	Salaried	Quantitative	Others are
3	11-15	OTD	Honours	Income Sharing	Clinical history	One of
4	16-20	Nutritional Medicine	Masters	Registrar	Remote Access	Champion
5	21-25	Public Health	Doctorate	Partner		
6	26-30	Counselling		Senior Partner		
7	>30	Emergency Medicine		Managing Partner		
8		Multiple		Principal		

The third phase of analysis sought to identify common themes between issues and their apparent influence. By considering the number of times a theme was indicated, particularly by different interviewees, the thematic patterns in the different data categories were refined. While text analysis identified issues seen to potentially influence GP perception of the relative advantage of such technology, different and even the same GP could raise different concerns about the same issue from different contexts. A positive perception of amalgamated patient longitudinal electronic Health Data for example, reflected an appreciation of the potential to improve the functionality of patient health data. However, behavioural intention in terms of adoption was constrained (or not) by GP concerns regarding the generation, transparency and/or access to such data, perceptions of voluntariness and aim of implementing such technology and whether this was in the context of the GP Practice. That is, whether the implementation of such technology is seen to be primarily aimed at improving GP generated data for primary (e.g. GP patient) or secondary (e.g. population health or GP performance management) use. While change in the socio-political, system of healthcare delivery or Profession context was generally perceived as outside the immediate control of the GP, the impact of such change to their practice or role was generally perceived to be in some measure within their control. Hence the perceived basis for incentives promoting the use of such technology (e.g. PIPs) can manifest in GPs not adopting the change and forgoing increased revenue. Thus perception of undesirable technologically facilitated change to their practice or role beyond their control can be seen as major inhibitor to the GP adopting such technology. By inference, non-adoption would forestall such change. Hence the legitimacy of implementing and adopting such technology was seen to be mediated by the GP's perception of their 'professional' and 'managerial' roles. So even if the GP acknowledged the potential of the technology to improve patient outcomes it may still not be implemented, or implemented and not adopted.

Table 3: Influence of positive issue influence coding on individual GP attitude

GP	Interview Order	%+ve INCode	Influence of Issues
1	14	12%	Mostly Negative
2	5	17%	Mostly Negative
3	4	18%	Mostly Negative
4	10	25%	Mostly Negative
5	23	31%	Mostly Negative
6	22	33%	Mostly Negative
7	12	36%	Mostly Negative
8	11	40%	Mostly Negative
9	15	40%	Mostly Negative
10	9	42%	Mostly Negative
11	20	43%	Mostly Negative
12	16	48%	Mostly Negative
13	6	49%	Mostly Negative
14	2	50%	Mostly Negative
15	3	50%	Mostly Negative
16	18	50%	Mostly Negative
17	21	50%	Mostly Negative
18	1	50%	Mostly Positive
19	17	50%	Mostly Positive
20	13	53%	Mostly Positive
21	19	55%	Mostly Positive
22	8	56%	Mostly Positive
23	7	65%	Mostly Positive

The fourth phase of analysis, summarised in table 3 and discussed below, sought to associate themes of influence arising from issues with GP and practice attributes. The results for this study may be limited because Practice Managers generally negotiated an interview with the GP and their choice was often ascribed to the technology champion status of the GP in that practice. Also the results reflect the views from just 23 of 1785 practitioners from 22 of 700 practices in South Australia and may not necessarily reflect the profile of General Practitioners in Australia (Britt et al., 2007; Sims and Bolton, 2005). For example, GPs in solo practice (13% c.f. 13% nationally), female (17.4% c.f. 34.0%), full time (78.3% c.f. 63.3%) and non-metropolitan (39.1% c.f. 27.1%).

DISCUSSION

Implementation of incoming electronic pathology result applications met little resistance from most GPs because they are perceived to enhance data collection, value and use while facilitating the performance of the GP role. Yet outgoing data is perceived to facilitate a hitherto unseen transparency of the GP and their organisation's practices, and to need a certain (yet unclear) change to organisation processes, data nature and the GP role and workflow. On the other hand, the electronic sharing of linked (identifiable) data outside the practice boundary was also seen to need substantial change to the medico-legal and socio-political environments that is unlikely in the near term, and although essentially perceived to be beyond the GP's control, engenders little resistance 'in principle'. Interview content identifies that while a perceived need to protect political interests was the primary inhibitor to adoption, context and appreciation of managerial and technological factors were consistently seen to both diminish and reinforce emergent attitude favouring adoption. While GPs in some manner perceive their primary role to be 'best practice' management of patient outcomes, they also perceive their role (and hence need for data functionality or practice capability) from an individual, practice, profession or Healthcare delivery system perspective. Hence any manifestation of resistance to such technology can be similarly characterised. In particular data identifiability, GP control over use of their data and whether change in data functionality is aimed at primary or secondary use of the data. Although interview content identifies the existence of discrete GP attitudes towards the use of HIS technology, they are not mutually exclusive and more appropriately seen as a series of developmental and co-existing perspectives determined by GP perceptions of competing factors.

Passive or Active Resistance

Barriers of resistance to adopting an innovation have been divided into active or passive (Petrini and Hultman 1995). Active barriers manifest as behaviour such as fault finding, appealing to fear and manipulating information, while passive barriers involve less obvious behaviour such as feigning ignorance or withholding public agreement so that adoption does not result. Thus a GP might readily acknowledge a clear and certain advantage to the performance of their role by adopting such technology yet resist because the perceived resultant change in patient outcomes and GP and practice ways of working not being clearly perceived as a relative advantage. This attitude was identified from a diverse range of technologically aware practices and GPs where barriers could manifest for example, in having little to no desire to behave in such a way as to facilitate the sharing of in-house data outside the practice. Despite recognition for the potential and even advocacy of the

technology, the utilisation of such technologies is seen to be a process too far removed from that GP's 'style' of 'thinking', 'reflecting', 'observing' or 'recording.' In this instance, a weak appreciation of technological and managerial factors is arguably overwhelmed by a strongly perceived need to protect political interests. Thus the primary inhibitor to adoption was seen to be unwanted change in the GP's ways of working. On the other hand there are repeated incidences where the potential for sharing data is deliberately constrained by the database being overtly maintained for only specific non-qualitative data. This attitude manifests in the need for a practice structure able to support both electronic and manual processes for the same task. GP behaviour reflected concern for trust in other entities, the paucity of sanctioned software, the apparent indifference of software vendors, and a perceived onus to use in-house resources to provide '…different solutions to the same problem…' Major barriers to implementation and adoption articulated included 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 HI technology use. In this case a strong appreciation of managerial and technological factors in multiple contexts is arguably countered by a strong perceived need to protect political interests into the (uncertain) future. This has led to behaviour that both underpins the potential for control over any future need to share in-house data yet undermines ongoing efficiency and effectiveness at a practice level.

Attitude toward HIS technology as a tool to support individual processes

A consistent outcome of this attitude is also the need for a practice structure able to support both electronic and manual processes for the same task. Interview content for example, identifies repeated incidences where the potential for sharing data is constrained by the specific data that the GP is prepared to generate electronically. Here the GP mostly perceives benefits of such technology adoption as a business case for organisational advantage and costs are perceived in terms of changing organisational processes and not as changes to individual GP workflows or autonomy. A practice justified implementation of clinical software for example, on the basis this would improve revenue and reduce the costs of maintaining patient records. Some GPs (both decision making and non-decision making) actively and passively resisted full adoption of the application. These attitudes manifested in the electronic patient database being maintained by only some GPs and only for specific reasons, such as script writing. However the non-strategic implementation of different vendor systems increased the likelihood of new software being perceived as less intuitive, with incompatibility between different operating systems leading to overall system instability reinforcing a poor opinion of such technology. In this instance appreciation of managerial factors is arguably constrained by a weak appreciation of technological factors and a strong albeit covert need to protect political interests within the practice context.

Attitude toward HIS technology as a tool to integrate current processes

This attitude manifests as the strategic acquisition of hardware and systematic upgrading of clinical software and more integrative billing software. The adoption of more complex, less understood, less available and potentially more integrative systems was aligned with appreciation of the need for change in the organisational ways of working by autonomous members, migrating existing systems, and system reliability and capability. This attitude was generally associated with GPs that had access to experience of technology use inside and outside the practice and identified change in processes as potential outcomes of adoption. Hence the GP primarily perceives benefits of technology adoption in the practice context more holistically in terms of the potential for improved individual workflow or organisational process leading to improved practice patient outcomes, and costs in financial terms. This attitude manifested to some degree in most practices already utilising such technology and was seen to create tension with GPs reluctant to consider changing vendors or existing ways of software use. Here it is argued the GP primarily perceives investment in such technology as a business case as well as improving patient outcomes. In this instance a strong appreciation of technological and managerial factors is arguably not inhibited by a weak perceived need to protect political interests within the practice context.

Attitude toward HIS technology as a tool to transform processes

This attitude tended to manifest in practices with GPs active in medical activities outside of the practice, including professional (i.e. political) organisations. Interviewees identified for example, the need for multiple activities to be duplicated in order to satisfy the requirements of all stakeholders in healthcare delivery. This attitude was generally associated with GPs that had access to detailed experience of technology use in similar environments and who perceived themselves or their organisation to be technologically and administratively capable. While the potential for transforming individual workflow and organisational process was appreciated, change was primarily perceived in terms of the need to transform external entities to facilitate interaction with their practice. In this instance the GP arguably adopts a less isolationist perspective of the quality and management of healthcare delivery. Yet healthcare entity interoperability is complex and difficult and generates the least concern for GPs in general, thus diminishing the need for immediate concern for political interests. Hence, the constraint of a need to protect political interests on a strong appreciation of technological and managerial factors is not necessarily tested.

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. GP resistance towards an unspecified data amalgamating HI system can be seen as an emergent outcome of negative GP perceptions of the technology's ability to provide only meaningful functional data, to be readily assimilated by the practice and to produce only desirable outcomes for the GP's role in a particular context. These include the GP perceptions of their role and value, need for self-validation of existing processes and exposure to utilising HI systems as part of their workflow. The potential for undesirable change in the GP value and role was seen to be the primary trigger for active or passive resistance to adoption. Though this research did not seek to focus on adoption per se, GP support for HIS technology can nonetheless be seen to stem from the potential for direct (e.g. 'technologically' improved health data functionality) and indirect (e.g. improved 'management' of healthcare processes) benefit to patient outcomes. Yet such support is constrained by the GP's need to defend against any perceived threat to their professional role in that context. While the majority of the sample understood the relative financial and time cost, task performance, patient outcomes and organisational revenue advantage of implementing such technological innovations, they were in turn concerned about the potential negative impact on the role and value of GPs. Despite consensus on the inevitable increase in such technology use to deliver healthcare in a General Practice context, any immediacy to implement technology was seen to be influenced by whether the GP adopted an individual, organisational or healthcare system perspective toward potential implementation outcomes. This was influenced by exposure to existing HI systems as part of the GPs' current workflow. Data indicated that adoption would be facilitated if GPs were to be convinced that adoption had positive consequences that were closely aligned to improvement in relevant patient outcomes and their own workflow, there was a clear and certain potential to advantage the practice, and GP interaction with outside entities would be streamlined. Any resistance was seen to be exacerbated by low previous exposure to utilising HI systems as part of the GP's workflow. The findings highlight the desirability of ensuring the importance and certainty of potential HI system implementation outcomes are associated with benefits to the practice and the patient while addressing any perceived need for the practitioner to protect their political interests. Finally, recurrent themes and concerns identified in this study will be used to develop a 'concern' dictionary as the basis for a confirmatory survey that will explore strategies to reduce resistance.

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