

# Health smart cards: differing perceptions of emergency department patients and staff

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## Abstract

An analytical, cross-sectional survey of 270 emergency department patients and 92 staff undertaken in three tertiary referral hospital emergency departments was completed to compare the perceptions of patients and staff regarding the use of health smart cards containing patient medical records. The study recorded data on a range of health smart card issues including awareness, privacy, confidentiality, security, advantages and disadvantages, and willingness to use. A significantly higher proportion of staff had heard of the card. The perceived disadvantages reported by patients and staff were, overall, significantly different, with the staff reporting more disadvantages. A significantly higher proportion of patients believed that they should choose what information is on the card and who should have access to the information. Patients were more conservative regarding what information should be included, but staff were more conservative regarding who should have access to the information. Significantly fewer staff believed that patients could reliably handle the cards. Overall, however, the cards were considered acceptable and useful, and their introduction would be supported.

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## What is known about the topic?

Health smartcards have potential advantages including large memory capacity, owner identification, waterproofing of electronics, readability without computer network access and immediate access to a patient's medical history in an emergency situation. There is concern, however, regarding the security and confidentiality of smartcard information.

## What does this paper add?

Most respondents felt that the card offers more advantages than disadvantages and should be brought into use, that they would use one if offered, but that use should be optional.

## What are the implications for practitioners?

Emergency department patient and staff perceptions of health smart cards often differed significantly. Overall, however, the cards were considered acceptable and useful, and their introduction would be supported.

A SMART CARD is a plastic card containing a microchip that has a memory capacity superior to magnetic stripes and that can be updated readily.<sup>1-4</sup> The card can be equipped with a personal identification number (PIN), can require an authorised card reader system and can be configured to reveal certain information depending on the person seeking access.<sup>1,2,5</sup> It is one manifestation of the inexorable move to electronic documents and the ease with which they can be transported and shared. Indeed, smart card portability and improved access are compelling. Health smart cards have a number of potential advantages including large memory capacity, owner identification, waterproofing of electronics, readability without computer network access and immediate access to a patient's medical history in an emergency situation.<sup>3</sup> There is concern, however, regarding the security and confidentiality of smart card information as evidenced by the scrap-

ping of the Australia Card first proposed in 1986.<sup>5</sup>

The Consumers Health Forum of Australia Inc (CHF) helps shape health policy and program development and has an interest in the development of e-health.<sup>6</sup> Its research indicates that consumers want their health information available when and where they need it for best health outcomes.<sup>7</sup> Based on its 2005–06 E-Health Records Project activities, CHF recommended practical strategies related to privacy, governance, and shared decision-making between health providers and consumers.<sup>8</sup> Governmental agencies have also addressed these issues. The *HealthConnect* strategy, a partnership between the Australian, state and territory governments, will facilitate the adoption of common standards by all e-health systems so that vital health information can be securely exchanged between health care providers such as doctors, specialists, pharmacists and hospitals.<sup>9</sup>

Meanwhile, health smart technology is used in Australia. In 2004, the trial of a Medicare smart card was launched in Tasmania.<sup>10</sup> It includes data relating to the owner's organ donor and Medicare safety net status, immunisation records, and Pharmaceutical Benefits Scheme (PBS) expenditure data, and provides access to standard Medicare services.<sup>10</sup> This Medicare card allows access to the owner's records via *HealthConnect* but does not store these data itself.<sup>11,12</sup> The former Australian coalition government had proposed an Access card — a smart card which would hold the owner's name, address, date of birth and concession status.<sup>13</sup> Like the Medicare card, there was the option of storing health-related data such as allergies, health alerts, chronic illnesses, immunisation information or organ donor status.<sup>14</sup> The Access card may have replaced 17 health and social services cards, including the Medicare card.<sup>14</sup> However, the incoming Labour government has decided not to proceed with the Access card, in its current form.<sup>15</sup>

Given the widespread interest in health smart card technology, at both the public and political level, consideration should be given to confidentiality, the nature and currency of the stored

information and who should be allowed access.<sup>3,5</sup> It is appropriate to determine the perceptions of the stakeholders likely to be affected by such interventions. We surveyed patients and staff in the emergency department (ED) setting where immediate access to a patient's medical records, via a smart card, has the potential to greatly facilitate care and expedite management. The findings will provide stakeholder opinion that will help inform the use of health smart card technology through the determination of stakeholder acceptability, concerns and recommendations. This study was not designed to explore other important issues related to health smart cards, including data quality and reliability, health care professional liability and the technicalities of data access.

## Methods

We undertook an analytical, cross-sectional survey of patients and staff in three tertiary referral EDs in Melbourne, between October 2006 and March 2007. These EDs have annual patient censuses ranging between 39 000 and 55 000. The study was authorised by the ethics committee at each site.

Patients aged 18 years or more were eligible for enrolment. They were excluded if they refused enrolment, were suffering from significant illness or had problems with communication (language difficulty, altered level of consciousness, mental disability, substance abuse), as determined by the attending staff. A convenience sample was enrolled comprising consecutive patients presenting to the ED on weekdays between 10:00 and 16:00 hours when two researchers (RMR, AD) were present.

Emergency physicians and registrars, triage and resuscitation nurses, and pharmacists working in the EDs were also eligible for enrolment. A convenience sample of these staff who attended meetings and teaching sessions, during a 3-week period at each site, were invited to participate. Participation was voluntary and anonymous.

The surveys employed self-administered questionnaires. Apart from basic demographic ques-

**I Perceived advantages and disadvantages of health smart cards**

	No. of patients (%)	No. of staff (%)	Difference in proportions % (95%CI)	P value
<b>Advantages</b>				
Useful in emergencies	237 (87.8)	85 (92.4)	4.6 (-2.8, 12.0)	0.30
Save staff time	234 (86.7)	74 (80.4)	6.2 (-3.6, 16.0)	0.20
Save patient's time	223 (82.6)	60 (65.2)	17.4 (5.9, 28.8)	<0.001
More accurate information	206 (76.3)	76 (82.6)	6.3 (-3.7, 16.3)	0.26
Help avoid confusion	196 (72.6)	76 (82.6)	10.0 (-0.1, 20.1)	0.08
Communication will improve	196 (72.6)	67 (72.8)	0.2 (-11.0, 11.5)	0.93
More complete information	193 (71.5)	68 (73.9)	2.4 (-8.8, 13.6)	0.75
Lessen staff workload	168 (62.2)	49 (53.3)	9.0 (-3.5, 21.4)	0.16
No advantages	8 (3.0)	1 (1.1)	1.9 (-1.8, 5.5)	0.54
Suggestions*	1 (0.4)	8 (8.7)	-	
<b>Disadvantages</b>				
Privacy issues	150 (55.6)	68 (73.9)	18.4 (6.9, 29.8)	<0.01
Patient forgets to carry card	136 (50.4)	72 (78.3)	27.9 (16.8, 38.9)	<0.001
Security issues	133 (49.3)	63 (68.5)	19.2 (7.3, 31.2)	<0.01
Confidentiality issues	130 (48.2)	66 (71.7)	23.6 (11.9, 35.3)	<0.001
Inaccurate information	86 (31.9)	53 (57.6)	25.8 (13.5, 38.0)	<0.001
Incomplete information	41 (15.2)	37 (40.2)	25.0 (13.4, 36.7)	<0.001
Unnecessary innovation	16 (5.9)	3 (3.3)	2.7 (-2.7, 8.0)	0.47
Increase staff work	13 (4.8)	12 (13.0)	8.2 (0.2, 16.3)	0.01
No disadvantages	53 (19.6)	2 (2.2)	17.5 (11.1, 23.8)	<0.001
Suggestions†	6 (2.2)	8 (8.7)	-	

\* *Patients' suggestions*: Helpful in future treatment (1). *Staff's suggestions*: Avoid repeating tests/investigations (2), avoid medical medication error and improve patient care (2), less reliance on patients and relatives (2), portable and legible information (2), reduce inter-hospital communication (1), avoid insurance frauds (1). † *Patients' suggestions*: Information accessed for non-medical reasons (2), not much information known about health smart cards (2), consequences of losing health smart cards (1), forgetting PIN number (1). *Staff's suggestions*: Fraud (2), reduce documentation in records (2), decreased patient/doctor interaction (2), consequences of losing health smart card (1), subject to "hacking" (1).

tions, the patient and staff questionnaires were identical. For the purposes of this study, a health smart card was defined as "a smart card containing the cardholder's electronic medical records". An expanded definition and details of the card's use were provided at the beginning of the questionnaire. Perceptions were then sought on a range of health smart card issues including privacy and security, access to information, awareness and attitude towards the cards, perceived advantages and disadvantages, and willingness to use. All questions were in closed, "tick box" format with respondents asked to select one (or more) given options. Respondents were also able

to suggest additional "open-ended" response options. Questions were derived from several sources. Some were designed by the researchers and others had been drawn from questionnaires employed in previously published studies.<sup>16,17</sup> The questionnaires were assessed for face validity, trialled and revised before use.

The primary study endpoints were the perceived advantages and disadvantages in the use of health smart cards in the ED. The secondary endpoints were whether ED staff and patients would be willing to use health smart cards and who should be allowed access to the card information.

## 2 Perceptions of health smart card content

	No. of patients (%)	No. of staff (%)	Difference in proportions % (95%CI)	P value
Allergies	246 (91.1)	91 (98.9)	7.8 (3.1, 12.5)	0.02
Medications	231 (85.6)	89 (96.7)	11.2 (4.9, 17.5)	<0.01
Past medical record	228 (84.4)	88 (95.7)	11.2 (4.5, 17.9)	<0.01
Personal details	228 (84.4)	86 (93.5)	9.0 (1.7, 16.4)	0.04
Test results	181 (67.0)	66 (71.1)	4.0 (-6.8, 16.2)	0.48
Consultation records	168 (62.2)	62 (67.4)	5.2 (-6.8, 17.1)	0.45
Suggestions*	10 (3.7)	25 (27.2)	–	

\* *Patients' suggestions:* Medical conditions (3), blood type (2), other relevant information (2), next of kin (1), occupation (1), other private medical providers (1). *Staff's suggestions:* Next of kin (8), NFR (not for resuscitation) status (6), ECG (4), organ donor status (4), local general practitioner and pharmacy (3), alerts (2), family medical history (2), blood type (1), power of attorney (1), history of attendances and admissions (1).

## 3 Professionals who should have access to all information on health smart cards in emergencies

	No. of patients (%)	No. of staff (%)	Difference in proportions % (95% CI)	P value
Doctor	265 (98.2)	91 (98.9)	0.8 (-2.6, 4.2)	0.98
Nurse	242 (89.6)	78 (84.8)	4.9 (-4.1, 13.8)	0.29
Pharmacist	170 (63.0)	42 (45.7)	17.3 (4.9, 29.7)	<0.01
Hospital administrator	159 (58.9)	23 (25.0)	33.9 (22.5, 45.2)	<0.001
Physiotherapist	116 (43.0)	21 (22.8)	20.1 (9.0, 31.3)	<0.001
Social worker	98 (36.3)	28 (30.4)	5.9 (-5.9, 17.6)	0.37
Suggestions*	15 (5.6)	7 (7.6)	–	

\* *Patients' suggestions:* Next of kin (6), paramedics (6), police/local authority (2), mental health professionals (1). *Staff's suggestions:* Paramedics (4), police/local authority (4).

The sample size calculation was based upon expected responses to one representative and important question, "Overall, do you think the advantages of health smart cards outweigh the disadvantages?" In order to demonstrate a clinically significant difference of 20% in affirmative responses between the patients and staff (eg, 80% versus 60%), at least 237 and 79 had to be enrolled in each group, respectively (patient : staff ratio of 3 : 1, level of significance 0.05, power 0.9). Therefore, enrolment of 90 patients and 30 staff at each of the three participating EDs was planned.

Data were entered onto an electronic spreadsheet by a single researcher (RMR). A second

researcher (DT) examined a random selection of 15% of cases and confirmed the accuracy of the data entry. Descriptive analyses were undertaken with 95% confidence intervals fitted around simple proportions, and the Chi-square test was used for comparisons of proportions (level of significance, 0.05). SPSS for Windows software<sup>18</sup> was used for all data analysis.

## Results

Of 294 patients approached, 270 (91.8%) participated (90 at each ED). One-hundred and fifty-nine (58.9%; 95%CI, 52.8–64.8) patients were male, 108 (40.0%; 95%CI, 34.2–46.1) were aged

>50 years, and 181 (67.0%; 95%CI, 61.0–72.6) were Australian born. Of 119 staff approached, 92 (77.3%) participated including 62 (67.4%; 95%CI, 56.7–76.6) doctors, 26 (28.3%; 95%CI 19.6–38.8) nurses and four (4.4%; 95%CI 1.4–11.4) pharmacists.

Significantly more staff (67 [72.8%]) than patients (101 [37.4%]) had heard of health smart cards previously (difference in proportions 35.4%; 95%CI, 23.9–46.9;  $P < 0.001$ ). Most respondents reported that there were a number of advantages with the card and only nine regarded them as not beneficial (Box 1). The majority of respondents considered that the cards would be useful in times of emergency or when a patient is unable to communicate. Few believed that a card could reduce the health professionals' workload, although significantly more patients believed that it could save the patient time.

Overall, the perceived disadvantages reported by the staff and patients were quite different. For all but one response option (unnecessary innovation) the staff reported significantly more disadvantages. Privacy, security and confidentiality issues predominated among both groups. Patients were significantly less likely to believe that patients would forget to carry their cards. Furthermore, significantly more patients (167 [61.9%]) than staff (42 [45.7%]) believed that patients would be reliable in handling their smart card (difference in proportions, 16.2%; 95%CI, 3.8–28.6;  $P = 0.01$ ).

Significantly more patients (252 [93.3%]) than staff (74 [80.4%]) believed that patients should know what information is recorded on their smart card (difference in proportions 12.9%; 95%CI, 3.5–22.3;  $P < 0.001$ ). Also, significantly more patients (196 [72.6%]) than staff (50 [54.3%]) believed that patients should be able to choose what is recorded (difference in proportions, 18.2%; 95%CI, 6.0–30.5;  $P = 0.002$ ). Box 2 shows perceptions of what information should be recorded on the card. The patterns of patient and staff responses were similar, with the majority of both groups reporting that allergies, medications, past medical record, personal details, test results and consultation records should be recorded.

Overall, however, the patients were more conservative regarding what should be recorded.

More patients (196 [72.6%]) than staff (56 [60.9%]) reported that patients should be able to choose the information that could be accessed by different health professionals (difference in proportions 11.7%; 95%CI, –0.3 to 23.8;  $P = 0.05$ ). Box 3 shows which professions should be allowed to access all information on a patient's card in times of emergency. The large majority of both patients and staff reported that doctors and nurses should have access. For most other professions, however, the staff were much less willing to allow access.

Regarding overall perceptions of the smart card, the responses of patients and staff were similar (Box 4). A very large proportion of all respondents reported that the card has more advantages than disadvantages and should be brought into use. A slightly higher proportion of

#### 4 Respondents' overall perceptions of health smart cards

	No. of patients (%)	No. of staff* (%)	P value
<i>More advantages than disadvantages</i>			
Yes	203 (75.2)	73 (80.2)	0.48
No	25 (9.3)	5 (5.5)	
Not sure	42 (15.5)	13 (14.3)	
<i>Should be brought into use</i>			
Yes	205 (75.9)	66 (71.7)	0.26
No	19 (7.0)	4 (4.4)	
Not sure	46 (17.1)	22 (23.9)	
<i>Would use one if offered</i>			
Yes	221 (81.8)	72 (78.3)	0.55
No	22 (8.2)	11 (11.9)	
Not sure	27 (10.0)	9 (9.8)	
<i>Health smart cards should</i>			
Be optional	162 (60.0)	47 (52.8)	0.56
Be mandatory	64 (23.7)	23 (25.8)	
Be considered in future	37 (13.7)	17 (19.1)	
Not be introduced	7 (2.6)	2 (2.3)	

\* Variable staff response rate to some items.

respondents would use health smart cards if offered, although the majority believed that cards should be optional. For these overall perceptions, considerable proportions of respondents were not sure of their response.

## Discussion

The finding that considerable proportions of both staff and patients were not aware of health smart cards was surprising. They have been an issue in the media over recent years and, more recently, in medical newsletters and magazines. The greater staff awareness is likely the result of their exposure to a wider range of health industry issues. It is noteworthy that the staff awareness was similar to that of South Australian general practitioners in a 1993 study.<sup>19</sup> While it might appear that awareness has not improved since 1993, local factors (eg, impending health smart card introduction) may affect this awareness considerably. The relatively poor patient awareness is concerning, especially with the recent media discussions related to the Access card.<sup>14,15</sup>

Overall, both patients and staff reported positive responses towards the cards and the majority agreed that they were associated with a range of potential advantages. Overall, fewer respondents reported concern with potential disadvantages, with patients significantly less likely to do so. This particularly related to privacy and security issues, with about half the patients being concerned. This might reflect the patients' trust in health care professionals to treat their medical records responsibly. Incomplete and inaccurate information was a particular concern of the staff. It is well known that patient medical records are frequently incomplete. If the health smart card is developed into a "gold standard" medical record, an absolute reliance upon its information may be misleading,<sup>20</sup> especially if mechanisms for validating the information are not available.

The finding that most respondents believed that patients should know what information is recorded on the card was expected and consistent with a Canadian study.<sup>16</sup> Almost all patients believed they had this right and the majority

believed they should be able to choose what is recorded. These responses may reflect the perception that the patients' medical records are their property and that they should be aware of how they are used.

Despite the significant difference between the staff and patient groups, the majority of patients thought that a wide range of personal detail should be recorded on the card. If a health smart card is to be of use, such information would be required. The difference in responses between the staff and patients may relate to the experiences of these groups. It is likely that the staff better appreciate the potential advantage of having this information readily available, especially at the time of an emergency. The card may avoid circumstances where management decisions are made in a "vacuum" — that is, without relevant information at hand. This assumes that health professionals would actually use the smart card data in this setting. Indeed, this may not be the case, especially if data quality is thought to be suspect, incomplete or out of date.

Interestingly, while the patients were more conservative about what should be recorded on the card, they were less conservative about who could have access to this information. While most respondents thought that doctors and nurses should have access, the patients were more prepared to allow access to other hospital staff. Again, the differences between the groups may reflect the better staff understanding as to what information is required, and by whom, in an emergency. For example, staff understand that hospital administrators are unlikely to require such access. The differences may also relate to exactly the nature and extent of information that is held on the card.

Overall, the respondents had a positive attitude towards the health smart card the majority reporting that the advantages outweigh the disadvantages, that the cards should be brought into use, and that they would use one if offered. Notwithstanding these responses, many respondents were undecided on these issues and the majority thought the cards should be optional. In comparison, a 2001 Canadian study reported that health

care professionals would not adopt health smart cards in their practice if their use was made optional to patients.<sup>16</sup> In this regard, it appears that consumer control is being challenged and that providers are concerned about consumers determining what information is available and how it is made accessible. The same study reported that 59% of the public believed the voluntary element of the health smart card should be abandoned.<sup>16</sup> While these differences may reflect social, health care or temporal factors, they do indicate that local investigation of this issue is required.

This study had limitations. The determination of perceptions is dependent upon the respondents being informed about the issue under examination. In this study, considerable proportions of respondents had not previously heard of health smart cards and, despite the provision of a clear definition, could not be considered fully informed. Accordingly, the apparent differences between the staff and patient groups may have been a function of ignorance rather than informed opinion. While response rates were high, the convenience sampling may have introduced selection bias. Furthermore, the exclusion criteria precluded the survey of patient groups who may have benefited most from smart card use. Although the questionnaires were extensively trialled before use, measurement bias may have resulted from differing interpretations of some questions, especially given the finding that many respondents were unfamiliar with health smart cards. Although this study was undertaken in three EDs, it may lack external validity as the respondents may not have been representative of all demographic subgroups. Furthermore, the patients were surveyed during an episode of ED care and their responses may have differed had they been surveyed in good health. Ideally, the reference point would be the issues of privacy and confidentiality of *any* medical record. Paper records can be just as poor as smart cards, and in some cases less effective, in protecting privacy. While the patients in this study were concerned about privacy of the smart card, similar concerns may have been expressed regarding existing paper records.

The apparent health smart card ignorance of many respondents indicates the need for greater public awareness. The privacy and security issues associated with smart card technology should be fully explored in open forums. It is recommended that other population groups be surveyed. This study examined narrow population groups that, although most likely to be affected by the introduction of the cards, may not be representative of the general population. Furthermore, a re-survey of ED patients upon their recovery may indicate a change of opinion dependent upon their immediate circumstance.

The extensive use of health smart card technology is likely to be the true test of its advantages and disadvantages. It may be that the concerns surrounding this technology are either confirmed or dispelled. Accordingly, mechanisms to monitor such concerns, particularly those relating to privacy, security, access and the accuracy of the card information, should be established in advance.

## Conclusion

This study found that considerable proportions of both ED staff and patients had not previously been aware of health smart cards. The patients were more conservative about the nature of the information recorded on the cards but less so with regard to who should have access to this information in times of emergency. The majority of respondents thought that the advantages outweigh the disadvantages of the card, that the card should be brought into use but should be optional, and that they would use one if offered. There is a need for greater public awareness of health smart cards and further investigation of the issues of concern.

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## Competing interests

The authors declare that they have no competing interests.

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