

Computerisation in Australian general practice

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AIM To assess the current levels of computer use in Australian general practice, and identify clinical and administrative tasks for which computers are most commonly used by general practitioners.

METHODS A telephone survey of a nationally representative sample of Australian GPs in active practice ($n=1202$).

RESULTS The national response rate was 55.5%, with New South Wales, Tasmania and the Australian Capitol Territory recording lower than national rates, and Queensland, Western Australia and the Northern Territory recording higher rates. Australian general practices were highly computerised (86%). General practitioners practising in capital cities were less likely to be computerised than their rural colleagues ($p<.001$). There were no significant differences in general computerisation among practices in the Australian states and territories ($p>.05$). Three task sets for which computers were used were identified: general administrative functions, patient oriented administrative functions and clinical functions. Computers were more likely to be used for administrative than clinical tasks. Use for administrative tasks increased with the size of the practice ($p<.001$) and with years of computer use ($p<.001$).

DISCUSSION The results suggest that within two years 95% of Australian general practices will be computerised. While use of computers for clinical functions is less common than for administrative purposes, electronic script writing packages are widely employed. However, other theoretically valuable functions for improving clinical outcomes for patients, such as patient educational material and decision support systems, are the least commonly used.

During the late 1990s three powerful drivers emerged for the computerisation of Australian general practice: the promotion of computerisation by the General Practice Strategy Review Group,¹ government funding of the General Practice Computing Group (GPCG), and the inclusion of computerisation as a factor in the Practice Incentive Program (PIP).² Given these developments, the GPCG and the Commonwealth Department of Health and Aged Care (DHAC), commissioned a

study into the use of information technology in Australian general practice.³ This paper reports current national estimates of information technology use in Australian general practice arising from that research.

Previous research into computerisation in Australian general practice has tended to assess the degree to which computers are used for various clinical and administrative tasks including electronic health records, automatic recall, electronic prescribing, decision

support/reference, CME, feedback, and research or evaluation.⁴⁻¹¹ Unfortunately many previous studies are based on regional samples or unrepresentative national samples, and thus do not provide national prevalence estimates of computerisation, nor do they develop any sophisticated measures of usage.

The only previous national study, undertaken in late 1998 by AC Nielsen, estimated that computers were present in 31% of Australian general practices

Table 1. Population and sample characteristics, Australian general practices, 2001

State/ territory	Population	Population proportion	Requested sample	Useable sample (a)	Unweighted achieved sample (b)	Response rate (a/b)	Weighted achieved sample proportion
NSW	3066	0.3969	1093	822	416	50.6	0.3969
Vic	1713	0.2218	665	429	247	57.6	0.2218
Qld	1361	0.1762	530	382	226	59.2	0.1762
SA	590	0.0764	250	183	103	56.3	0.0764
WA	615	0.0796	250	200	130	65.0	0.0796
Tas	172	0.0223	100	82	43	52.4	0.0223
NT	76	0.0098	37	20	14	70.0	0.0098
ACT	131	0.0170	75	49	23	46.9	0.0170

($n=1018$; RR: 50% from the practices contacted).⁴ This figure seems to have changed little since the Royal Australian College of General Practitioners first surveyed a random selection of its members in 1988 and found that 41% of practices ($n=285$, RR: 30%) which responded used a computer 'for some aspect' of their practice (12:30). Similarly, in 1993 almost 40% of GPs surveyed responded that they had 'ever had a practice computer system' ($n=398$; RR: 62.4%) (6:1882).

Methods

The present research is based on a national telephone survey of vocationally registered general practitioners and their associated main practices. Data collection took place in May 2001. The study population consisted of vocationally registered GPs with at least 375 Medicare claims in the last quarter of 2000. This was also the population for the previous AC Nielsen study,⁴ and was required under the project brief by the DHAC. From this population a stratified random sample of 3000 GPs was extracted by the DHAC using the Health Insurance Commission (HIC) database.

The sample included GPs with and without DHAC classified 'active' practices. General practitioners without active practices included doctors working in practices that were not PIP registered and locums. By including practitioners with

and without active practices, the sample design ensured a complete coverage of all practices, regardless of whether or not they were PIP registered. The sample was disproportionately stratified to over represent the smaller states and territories (Western Australia, South Australia, Tasmania, the Northern Territory and the Australian Capital Territory) and correspondingly to under represent New South Wales. This strategy provided larger stratum sizes in the smaller states and territories, enabling more reliable prevalence estimates. Table 1 shows the study population by state and territory, the requested sample under disproportionate stratification, the number of useable practices within the requested sample (ie. practices with valid phone numbers and the nominated GP present in the practice), the number of practices where interviews were achieved, and the consequent state and territory response rates. The overall response rate is 55.5% and varies by state and territory from 47% (ACT) to 70% (NT). Analyses were then poststratified to produce national estimates of level and type of computer usage. The stratum poststratification weight is \hat{s}_i/p_i where (\hat{s}_i is the relevant stratum population proportion and p_i is the corresponding unweighted stratum proportion. Weighted sample proportions, which equal population proportions

by design, are shown in the last column of Table 1. To maximise response rates, state based organisations of divisions of general practice promoted the study in local newsletters, introductory letters and information sheets were sent to GPs and practice managers in advance of data collection. Interviews were scheduled at times of convenience to respondents, and multiple callbacks were employed.

The questionnaire was administered to the nominated GP, the practice manager or receptionist, and asked about computer use within the practice. It covered such topics as the use of computers for clinical and administrative tasks, and the length of time a practice has been computerised or any plans to computerise. It also gathered information on the characteristics of the practice, such as size, location, number and gender of doctors. The project received ethical clearance from the University of Queensland Behavioural and Social Sciences Ethical Review Committee before commencement.

After describing the sample's representativeness, the paper presents descriptive findings about the level and kind of computerisation within general practice, and then describes the construction of three summated indices of computer use based on principal components analyses of the relevant

questionnaire items.¹³ These measure clinical computer use, patient oriented administrative computer use and general administrative use. Further findings based on the indices are then reported. Where appropriate, we present statistical significance tests of findings (Pearson chi-square tests for tabular data, F-tests followed by Bonferroni adjusted t-tests for pairwise group differences of means).

Results

Sample representiveness

Male GPs make up almost 72% of the sample, which is only slightly more than expected from AIHW figures for 2000.¹⁴ Therefore male GPs are slightly over represented in our sample (7%) and female GPs slightly under represented (2%). The respondents are located across the seven rural and remote, metropolitan areas (RRMA)¹⁵ categories in almost direct proportion to the distribution of the population. Therefore two-thirds of practices were in capital cities (65%), almost a tenth were in major metropolitan centres (9%), only 5% were in large rural centres, and the remaining 20% in other rural and remote centres. However, the sample consists of disproportionately more GPs aged 45 years and above (74%), with those aged 44 years and below less likely to be included (26%). Mid-to-late career GPs, by virtue of their mature practices and greater experience, may be more interested in contemplating present and future changes to the profession than their younger colleagues.

General computer use

National picture

Eighty-six percent of Australian practices reported having at least one computer. Of the remaining practices, almost half expect to acquire a computer in the next two years (48%), with the majority intending to use them for both clinical and administrative purposes (53%). This implies that only 7% of practices will not

Table 2. Administrative functions for which computers are used (n=1030)

	Always/ usually %	Sometimes/ never %	Don't know %
Wordprocessing	85	15	0
Recording patient details (administration only)	75	25	0
Issuing patient accounts/receipts including generating Medicare bulk bill forms	75	25	0
Managing the practice finances	70	28	2
Making electronic Medicare claims	56	43	1
Payroll	49	50	1
Scheduling appointments	43	57	2
Stock and stores control	11	88	1

Table 3. Clinical functions for which computers are used (n=1030)

	Always/ usually %	Sometimes/ never %	Don't know %
Writing prescriptions	71	29	0
Preparing referral letters for patients	57	43	0
Receiving or storing pathology results electronically	54	46	0
Running a recall or reminder system, eg. smear tests, immunisation	54	45	1
Generating health summaries	42	53	4
Recording progress notes	64	65	1
Accessing educational material for patients	29	66	5
Using decision support functions to help solve diagnostic problems or make decisions about dispensing or treatment	21	59	20

be computerised within two years (86 + 0.48 x 14 = 92.72% computerised).

Practice size

Larger practices are more likely to be computerised than smaller practices. Ninety-six percent of practices with three or more GPs are computerised, whereas only 80% of two doctor practices have computers. Slightly less than three quarters of solo practices are computerised (73%).

Regional and state factors

Those in large rural centres and all other

rural areas are substantially more likely to be computerised (91%) ($p < .001$). Levels of computerisation vary by state and territory. South Australia is the most highly computerised state (97%) and NSW the least (82%) ($p < .01$), with figures for the NT being based on too few cases to be reliable ($n = 11$). There are no significant differences in levels of computerisation in Victoria (87%), Queensland (88%), WA (88%), Tasmania (89%) or the ACT (85%), all of which show rates at about the national average.

Table 4. Items and factor loadings from principal components analysis (Varimax rotation) of computer tasks within Australian general practices

Item	Component 1 clinical	Component 2 general administrative	Component 3 patient oriented administrative
Generating health summaries	0.802		
Recording progress notes	0.774		
Using decision support functions	0.719		
Writing prescriptions	0.719		
Accessing educational material	0.704		
Receiving or storing pathology results electronically	0.665		
Preparing referral letters for patients	0.608		
Running a recall or reminder system	0.528		
Managing the practice finances		0.706	
Payroll	0.702		
Stock and stores control*		0.667	
Word processing		0.443	
Scheduling appointments		0.434	0.406
Issuing patient accounts generating bulk bill forms			0.747
Making electronic Medicare claims			0.721
Recording patient details			0.473
Cronbach alpha	0.865	0.657	0.638

* This item was omitted from component 2 because further reliability analyses of the items comprising component 2 revealed that a stronger scale would be obtained if this item was omitted.

Table 5. Scales of computer use for clinical functions, patient oriented and general administrative functions (see text)

Index score	Clinical functions	Mean usage Patient oriented administrative functions	General administrative functions
Overall mean	5.07	6.32	6.93
Practice size			
Solo	4.57	4.62	5.28
Two doctors	5.03	5.51	6.27
Three-eight doctors	5.35	7.28	7.85
More than eight doctors	5.13	8.27	8.45
Geographical location			
Capital city	4.87	6.15	6.90
Other metropolitan area	4.97	6.78	7.10
Large rural centre	5.55	6.53	6.99
Other rural and remote area	5.56	6.59	6.91

Use of computers for administrative and clinical functions

Tables 2 and 3 describe administrative and clinical usage patterns respectively, within computerised practices. Computers are more likely to be used for administrative than clinical tasks. Whereas 85% of computerised practices report using word processing 'always' or 'usually', script writing packages, the most highly reported clinical function, is reported as being used 'always' or 'usually' by only 71% of computerised practices.

Administrative functions concerned with the collection of patient details and the issue of bills and receipt of payment are the most highly computerised tasks after word processing. For clinical functions, writing prescriptions, preparing referral letters for patients, receiving or storing pathology results electronically and running a recall or reminder system, are all reported by more than half the sample. However, less than one-third of computerised practices access educational material for their patients or use the decision support systems available on computers.

To assess the extent to which practices use computers for similar clusters of tasks a principal components analysis of clinical and administrative task items was conducted (Table 4). This reveals three distinct components or task sets, relating to clinical functions, general administrative functions and patient oriented administrative functions. As can be seen from Table 4, 'scheduling appointments' has almost equal factor loadings on components 2 and 3. However, reliability analyses using Cronbach's alpha suggest it is most appropriately located in component 3, with the other items relating to patient oriented administrative functions.

Levels of computerisation

Based on the above factors, three indices were constructed by summing relevant responses and rescaling total scores between 0 and 10. A high score on an

Table 6. Computer use for clinical and administrative activities by state (see text)

State	Clinical functions	Mean usage	
		Patient oriented administrative functions	General administrative functions
NSW	4.64	5.76	6.31
Vic	5.12	6.60	7.52
Qld	6.01	7.00	7.22
SA	5.22	6.28	7.05
WA	4.73	6.84	6.88
Tas	5.31	7.30	7.83
NT*	5.20	4.72	7.84
ACT	4.54	5.29	7.63

* Subsample less than 15 respondents

index indicates more frequent computer use across a range of clinical or administrative tasks, while a low score indicates less frequent use and a more restricted range of tasks. Means for each index are presented in Table 5. Computer usage is greatest for general administrative activities, somewhat less for patient oriented administrative activities and least for specifically clinical functions.

Variations in use by practice size

General and patient oriented administrative computer use varies more across different sized practices than clinical computer use does (Table 5), with larger practices tending to have higher computer use. Table 5 presents mean scores on the three indices by practice size. Using computers for patient oriented administrative functions increases directly with practice size, with larger practices having significantly higher levels of patient oriented administrative computer use than smaller practices. There are statistically significant differences in mean patient oriented use among all practice categories in Table 5, according to Bonferroni adjusted t-tests ($F_{3,1063}=65.49$, $p<0.0001$).

General administrative use also increases directly with practice size, with

the highest levels of use being found in practices with three or more doctors. Levels of general administrative use do not differ in the two largest practice categories, but all other pairwise differences are statistically significant ($F_{3,1057}=58.34$, $p<0.001$). With respect to clinical computer use however, there are virtually no differences by practice size, except that practices with 3–8 doctors have significantly higher levels of clinical use than solo practices ($F_{3,1061}=34.28$, $p=0.0044$).

Regional and state differences in computer use

Differences with respect to geographical location are not marked. There are no significant differences in computer use for patient oriented and general administrative functions between urban and rural practices and only one significant difference between rural and remote practices and capital city practices in clinical use (Table 5). Rural and remote practices have higher levels of clinical use than capital city practices however, this difference is substantively very small ($F_{3,1061}=4.13$, $p=0.0063$).

Table 6 presents computerisation levels on the indices across states and territories. State and territory differences in computer

Table 7. Length of time of computer use for administrative and clinical purposes

Length of use	Administrative purposes %	Clinical purposes %
Less than two years	29	47
Two to less than four years	19	28
Four to less than eight years	29	14
Eight years and more	19	3
Not sure	5	8
N	1030	976

use are few, with Queensland having significantly higher levels of clinical use than NSW, Victoria and SA ($F_{7,1057}=4.66$, $p<0.0001$) and NSW having significantly lower levels of both general ($F_{7,1053}=4.47$, $p<0.0001$) and patient oriented administrative use ($F_{7,1059}=4.73$, $p<0.0001$) than either Queensland or Victoria. No other significant differences exist.

Length of time computerised

Respondents in computerised practices were asked to estimate how long they had been using computers for administrative and clinical purposes (Table 7). Computers are used first for administrative purposes. Nearly half the sample (48%) reported they have used computers for administrative purposes for four or more years while less than one-fifth (19%) have used them for clinical purposes for this length of time. At the other end of the continuum, while just 29% of practices had commenced using computers for administrative purposes less than two years ago, almost half (47%) commenced using them for clinical purposes in the past two years.

Conclusion

As would be expected, given the strong leadership shown by the profession and the financial incentives provided by the government, Australian general practices are highly computerised. Previous research estimated computerisation levels between 30–40% as recently as the past 3–4 years.^{4,7} Our data suggest that rates have more than doubled in this period with over 85% of practices computerised. The fastest growth has been with respect to clinical use. Almost half (47%) of the practices in Australia which use computers for administrative activities computerised in the past four years, but three quarters of practices (76%) using them clinically began doing so only in the past four years. Computers are used for both clinical and administrative purposes, but are more commonly and extensively used for general and patient oriented administration than clinical reasons. Larger practices tend to use computers more for patient oriented activities than smaller ones, arguably reflecting the economies of scale achievable by practices managing a larger throughput of patients.

Use of computers for clinical functions is less common, with the exception of script writing (used by 74% of computerised practices). The popularity of script writing is not surprising given the financial incentives provided by the government to encourage GPs to adopt this function⁶ and the immediately realisable benefits of legibility, patient safety and time reduction. Preparing referral letters, receiving test results electronically and running recall or reminder systems are all used by more than 50% of computerised GPs. Generating health summaries, recording progress notes, accessing educational material for patients and using decision support systems are the least commonly used functions. Theoretically the last two functions have considerable scope for improving the clinical outcome for the patient.

Some of the key factors shaping the uptake of information technology are perceptions of the usefulness of that technology,³ and feelings of anxiety or trepidation surrounding computer use.³ In subsequent papers we intend exploring the determinants of these attitudes and perceptions and their impact on practitioners' use of computers in their own clinical practice.

Acknowledgments

This research was commissioned by the General Practice Computer Group and funded by General Practice Branch, Commonwealth Department of Health and Aged Care (DHAC). We thank the GPs and their staff who participated in the survey, the IT officers of the state based organisations of the divisions of general practice who recruited GPs for the pretest and promoted the survey to their members, Carolyn Fredericks from DHAC, who drew the sample for us, and finally NCS-Pearson, Queensland, who undertook the data collection.

Conflict of interest: none declared.

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