

## A survey of personal digital assistant use in a sample of New Zealand doctors

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### Abstract

**Aim** To gather information about handheld computing hardware and software usage by hospital based doctors in New Zealand (NZ).

**Method** An online tool (SurveyMonkey™) was used to conduct the survey from 27 June to 10 September 2010. Distribution of the survey was via an email to all NZ District Health Boards (DHBs).

**Results** There were 850 responses. About half of respondents (52%) used a personal digital assistant (PDA), 90% using it at least once daily. Usage varied greatly between DHBs (27–100%), perhaps related to institutional support. Among PDA users, the most common applications were the non-clinical; Scheduler (95%), Contacts (97%), and Tasks (83%). Users felt PDAs helped considerably with organisation and time saving. For non-users there were a range of barriers to usage, cost being a large factor. Another major barrier identified by both users and non-users was lack of organisational integration and support.

**Conclusions** Half of survey respondents used a PDA. PDA usage of responders from different DHBs varied considerably. Perceived barriers to PDA use included cost and lack of institutional support. A collaborative approach between clinical leadership and Information Technology teams to address barriers may result in increased utility and usage of PDAs in the NZ health system.

Personal digital assistants (PDAs), also known as smartphones, are hand-held computers which can perform a wide variety of functions including access to the internet, scheduler, task list, phone-book, reference storage, camera, and telephone. In the health sector, PDAs have been used by doctors for over a decade to store clinical data, medication databases, access and store patient information and provide communication between other health providers with more applications growing by the year.

PDAs are particularly useful for hospital doctors who often work in several different sites in their hospital or multiple hospitals—wards, office, clinic rooms, procedural suite, and operating theatre. The mobility of the current workforce presents a challenge for DHBs to provide a familiar information technology (IT) working environment across multiple locations. PDAs have a part to play in addressing this.

For junior doctors, white coats with large pockets previously contained their medical reference texts: drug references, local medical guidelines, local preferred medicines lists and medical references such as the Oxford Handbook of Clinical Medicine.<sup>1</sup> Now all these can be accessed via a PDA, with room to spare.

The past few years have seen considerable change in the handheld computing device area, and doctor's use of these devices. Up until January 2007 the PDA-smartphone market had three dominant operating systems (OS)—Palm<sup>®</sup> OS, Windows<sup>®</sup> Mobile (formerly Pocket PC), and Blackberry<sup>®</sup>. In 2007, Apple released the iPhone<sup>™</sup> and iOS (the OS used on the iPhone<sup>™</sup>), which has garnered strong sales. Also in 2007 the Android OS was unveiled. Palm<sup>®</sup> released a new OS called WebOS<sup>™</sup> mid-2009, and more recently Microsoft<sup>®</sup> has released Windows<sup>®</sup> Phone 7.

As well as changes in software, hardware has also changed substantially. Technological advances have occurred in each component that makes up a PDA, to give an overall improved user experience compared with previous. New or improved software and hardware features are allowing new applications in medical practice.

## Methods

Relevant literature<sup>2-5</sup> on PDA usage and attitudes to usage was reviewed. Most data was from North America. Questions for the current survey were designed taking into account previous surveys, to allow a degree of comparison.

The survey questions were entered onto an online survey tool – SurveyMonkey<sup>™</sup> ([www.surveymonkey.com](http://www.surveymonkey.com)).

Contact was made with all DHBs in New Zealand, requesting distribution of an email containing a hyperlink to the survey to all hospital based doctors in their DHB. The email contained introductory information about the survey, for both communication managers and doctors. The survey was conducted during the period 27 June 2010 to 10 September 2010.

Results were downloaded from SurveyMonkey<sup>™</sup>, compiled, and analysis performed.

## Results

There were 850 responses to the survey. Demographics of the respondents are shown in Table 1.

According to Medical Council of New Zealand (MCNZ) data<sup>6</sup> there were 6668 doctors who listed themselves as junior medical staff (medical officers, house surgeons, registrars) or specialists/consultants in 2008.

### Characteristics of respondents

**Age and gender**—63% of respondents were male, 37% female. The mean age range was 36–45 years.

**Main work role**—51% were consultants, 45% either house surgeons or registrars. Other roles were medical officer special scale (MOSS; 3%) and other (1%). Main work type is shown in Table 1.

**Table 1. Main work type**

Internal medicine	227(27%)
Surgery – all	149(18%)
Anaesthesia	86(10%)
Paediatrics	82(10%)
Psychiatry	75(9%)
Emergency medicine	57(7%)
Radiology	36(4%)
Intensive care	20(2%)
Pathology	16(2%)
Other or unspecified	102(12%)
<b>Total</b>	<b>850</b>

**Primary employer**—88% of those that completed the survey had their primary employer as a public hospital. The remainder worked in a government department or agency (6%), private practice (3%), university or polytechnic (2%), or other/unspecified (1%). See Table 2.

**Table 2. District health boards (DHBs) respondents mainly employed in**

DHB	Responses	Response rate as a proportion of non GP doctors working in DHB in 2008 (MCNZ statistics <sup>6</sup> )
Auckland	205	12%
Bay of Plenty	29	11%
Canterbury	125	14%
Capital and Coast	24	3%
Counties Manukau	89	20%
Hawke's Bay	37	18%
Hutt	32	21%
Lakes	18	13%
Mid-Central	31	13%
Nelson Marlborough	39	24%
Northland	17	9%
Otago (Southern)	53	13%
South Canterbury	12	21%
Tairāwhiti	11	19%
Taranaki	1	1%
Waikato	14	2%
Wairarapa	0	0%
Waitamata	91	20%
West Coast	4	19%
Whanganui	5	8%
Other or unspecified	13	
<b>Total</b>	<b>850</b>	

Average response rate 15%.

## PDA usage

**Total**—51% (440/850) used a PDA or a mobile phone with PDA functions.

**Usage by gender**—59% of males and 38% of females used a PDA. Tables 3–5 show who uses them.

**Table 3. Usage by age**

Age ranges	Usage
16–25	17/45 (38%)
26–35	153/295(52%)
36–45	127/233(55%)
46–55	103/185(56%)
56–65	35/79 (44%)
66–75	3/11 (27%)

n=850.

**Table 4. Usage by main work role**

Main work role	Usage
House officer (including house surgeon, SHO)	57/123 (46%)
Registrar	123/251(49%)
Medical officer (including MOSS)	14/30 (47%)
Consultant/specialist	236/435(54%)
Other or unspecified	8/10 (80%)

n=849 (1 skipped question); SHO=senior house officer; MOSS=medical officer special scale.

**Table 5. Usage by main work type**

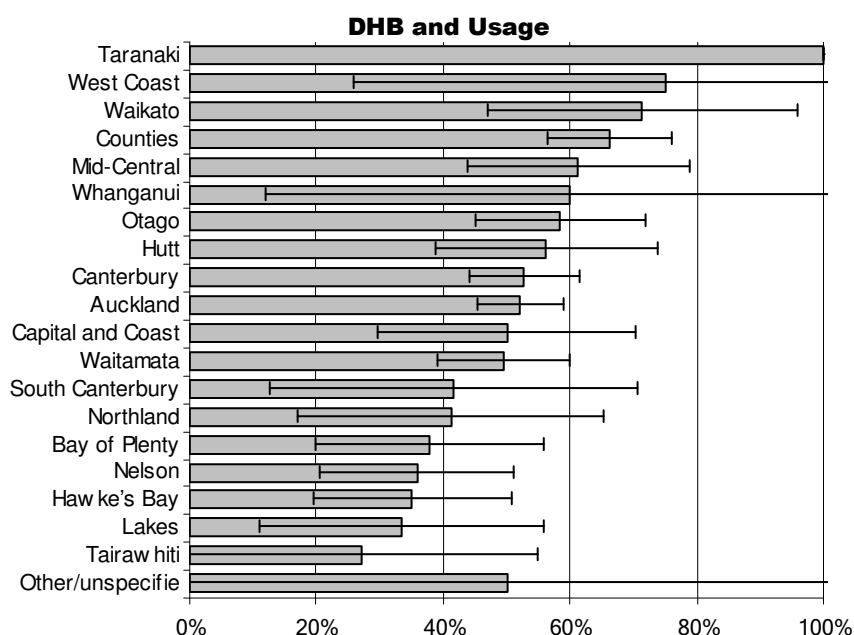
Main work type	Usage
Radiology	25/36 (69%)
Anaesthesia	54/86 (63%)
Emergency medicine	33/57 (58%)
Internal medicine	119/227 (52%)
Paediatrics	40/82 (49%)
Intensive care medicine	9/20 (45%)
Surgery—all	67/149 (45%)
Psychiatry	29/75 (39%)
Pathology	6/16 (38%)
Other or unspecified	45/79 (57%)

n=827 (23 skipped question).

## Main DHB

Usage varied by DHB, shown in Figure 1.

**Figure 1. Usage by DHB**



Whisker bars define 95% confidence interval.

Only 1 response from Taranaki DHB – confidence interval not able to be calculated.

## Hardware

In the 51% (440 users) who used a PDA, their hardware usage is outlined below.

**Table 5. PDA Operating Systems used by doctors**

Operating system	Usage
iOS (Apple®)	49%
Windows Mobile®	23%
Palm® ('old' Palm® OS)	10%
Symbian™ (Nokia & others)	5%
Blackberry®	4%
Android ("Google™ phone")	3%
WebOS™ ('new' Palm® OS)	1%
Other or not sure	6%

Of 440 users.

**Touch screen, camera**—87% of PDAs had a touch screen, 84% had a camera.

**Frequency of use**—Over 90% of PDA users used their PDA once a day or more

**Syncing (syncing or synchronising is the process of exchanging information with a host computer)**—33% synced once a day or more often. 36% synced once per week. 8% never synced.

**PDA reliability**—86% of respondents either never or seldom had their PDA or Phone/PDA ‘crash’ or become unusable (apart from flat batteries). About 5% had their PDA crash often or very often. Newer operating systems performed better than older ones.

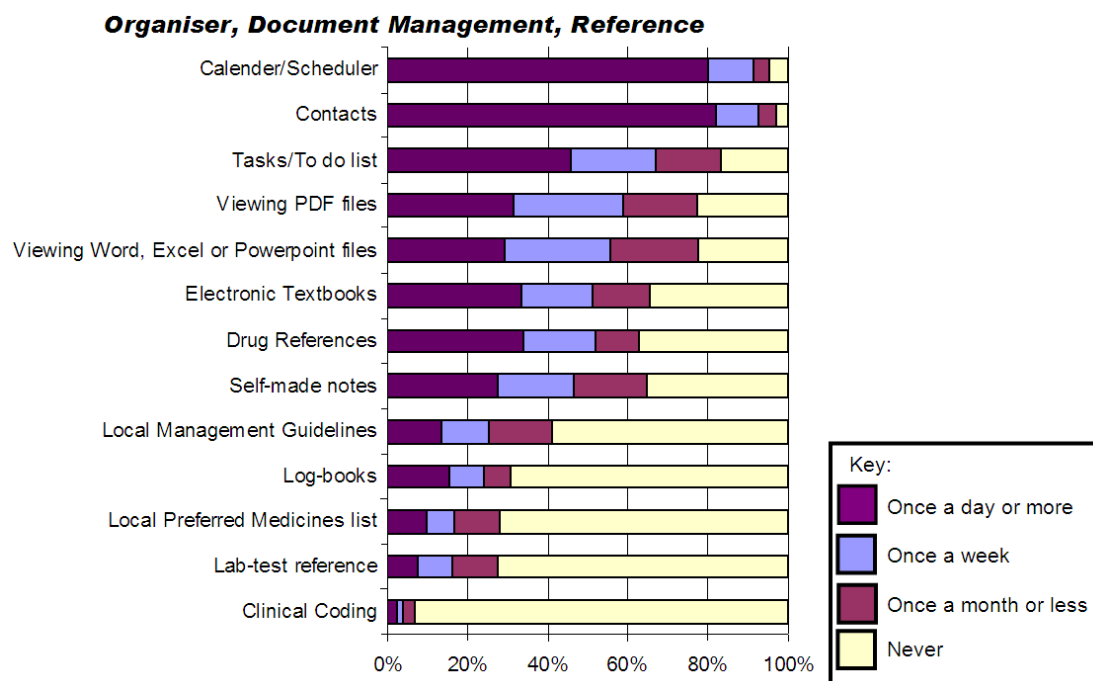
**Security**—26% (115 respondents of 440) had patient related data on their PDA, and 4% didn’t comment. Of those who had patient data on their PDA, 31% didn’t have any password protection for that data. This 31% was comprised of those that realised they should protect the data (19%) and those that didn’t know how (1%), didn’t want to or found it too much trouble (1%), or said the data didn’t need to be secured (1%).

Respondents used a variety of encryption or password protection methods.

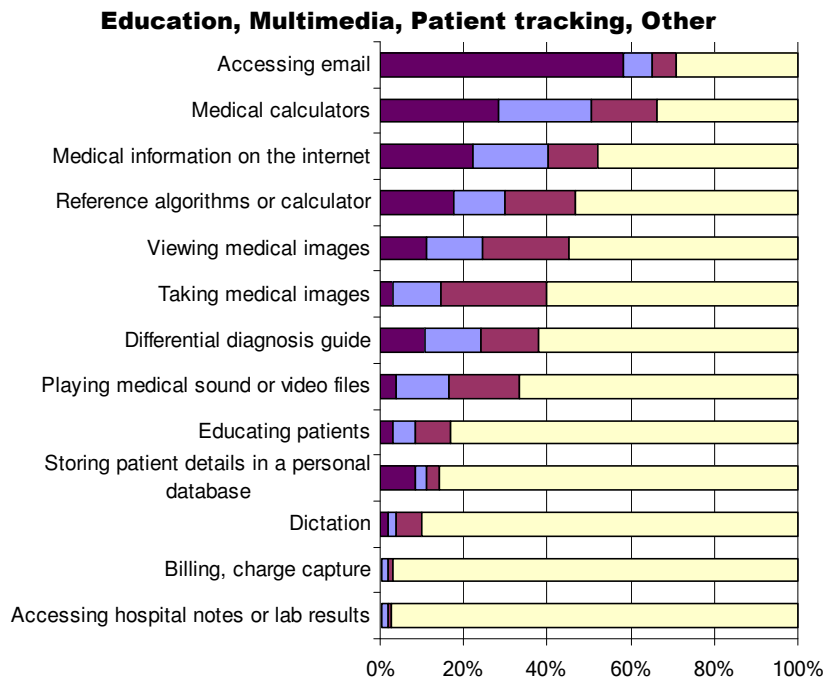
### Software usage

The figures below show software usage in users of PDAs.

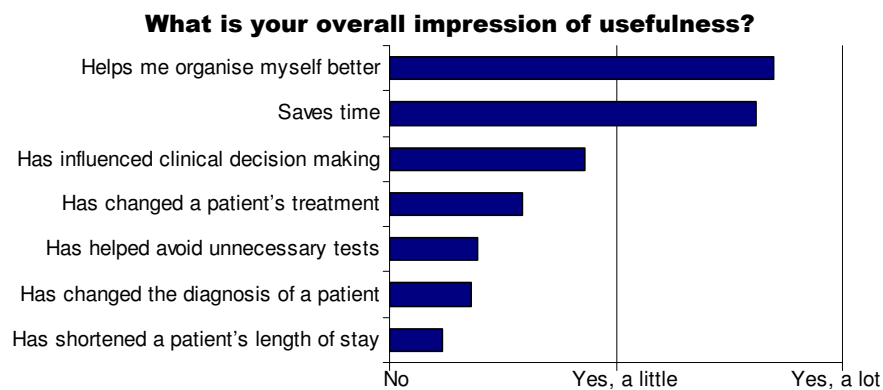
**Figure 2. Usage of organiser, document management and reference software in PDA users**



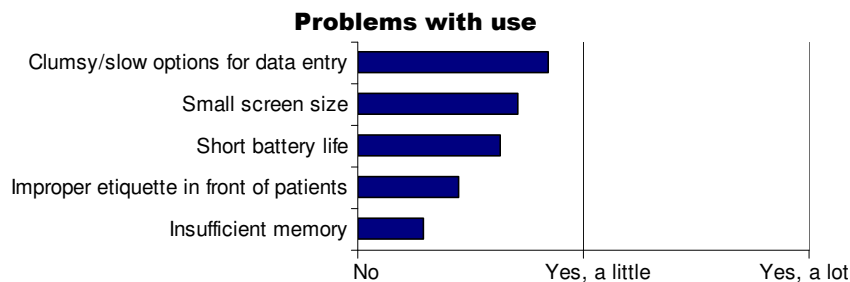
**Figure 3. Usage of Education, Multimedia, Patient tracking and other software in PDA users**



**Figure 4. Overall impressions for current users of PDAs**



**Figure 5. Problems with use for current users of PDAs**



## Non-users of PDAs

49% (410) of survey respondents didn't use a PDA, 35% of those that did not currently use a PDA had used one in the past. Barriers to use among non-users (multiple answers were allowed). See Table 6 below.

**Table 6. Barriers to PDA use identified by non-users or previous users of PDAs**

Reason	Responses
Too expensive	44%
Lack of integration and institutional supports	39%
Difficult to carry around, or too big	28%
PDA's function is performed by other hardware (e.g. PCs) or methods	28%
Data entry problems (clumsy/slow)	22%
I prefer manual method/paper	21%
No training available	20%
Screen size or buttons too small or fiddly	19%
No local expert or help desk	16%
Short battery life	13%
Applications or functions are unnecessary	9%
Difficult user interface	9%
I don't want to become too dependant on a PDA	8%
The PDA is too easy to break	8%
Not reliable enough	6%
The PDA's function is performed by other personnel	3%
I have tried PDAs before and it didn't agree with me	4%
Other	31%

## General comments—both users and non-users

Thematic analysis of the free text responses identified lack of DHB support as a major barrier to usage of PDAs among respondents. Comments were made about lack of software, hardware, and infrastructure (e.g. wireless data). Security concerns were identified as one of the possible reasons for lack of support by DHBs. Other barriers to usage identified by respondents included PDA technical issues and lack of useful software.

## Discussion

This study informs on PDA usage patterns in respondents to an email based survey of NZ hospital doctors. Partly because of the form of distribution of the survey, despite having a large sample size the response rate was low. It is also likely that factors associated with the use of technology and PDAs in particular influenced the response rate. The conclusions from the study therefore need to be restricted to those who responded. Because of this it was considered inappropriate to perform formal statistical analyses in the subgroups of the population from which the respondents came.



PDA's have become very much part of the clinical scene in New Zealand. In this study 52% of respondents reported using a PDA, with over 90% using their PDA more than once daily.

This falls within the range of previously reported studies. Usage rates among respondents to a survey of consultants in a British Hospital were 40% in the Horsley and Foster study "Handheld Computers in Medicine: the way forward"<sup>5</sup> published in 2005. McAlearney et al in 2003<sup>7</sup> describe a higher usage rate in a survey of a group of US physicians and resident doctors at 89%. A study by Morris et al in 2005<sup>8</sup> involving 410 physicians and residents on a Family Medicine Training Program in North America found usage rates of 87%. Usage rates in Japanese resident physicians may be lower, at 31% in a study published in 2010 by Jacobs et al.<sup>9</sup> Garritty and El Emam's literature review in 2006<sup>3</sup> identified usage rates among survey responder healthcare professionals ranging from 45 to 85% in various studies.

There was surprisingly little variation in PDA usage with age and work role. There was however a moderate variation in usage dependent on main work type, with those working in specialties such as radiology and anaesthesia using PDA's considerably more compared with specialties such as psychiatry and pathology. Different specialties may have intrinsic factors which may make PDA's more or less useful for them.

Gender also influenced the uptake of PDA's in respondents, with males more likely to use a PDA than females.

Uptake varied considerably between DHB's. It is possible that the local DHB policies of PDA supply and support are responsible for this large variation in usage.

While respondents used their PDA's for a wide variety of different functions, there were some core functionalities that were used by almost all PDA users. Scheduler, Contacts, and Tasks software had high usage rates. Accessing email was also used by the majority of PDA users.

Users felt that PDA's made a large difference to organising themselves better, and saving time.

In their report<sup>5</sup> Horsley and Forster also note that the most popular PDA applications were the standard PDA functions of address book, diary, memo pad, and calculator.

Drug references and electronic textbooks are two of the most common clinical references used. Local management guidelines have been produced by some DHB's for portable usage, and are used by a large number of respondents. Reference material is an area where PDA's have a strong advantage in that a large amount of information can be stored. Users generally agreed that PDA's had made a moderate contribution to clinical decision-making.

Doctors in North America may have higher usage of drug references on PDA than their New Zealand counterparts. A study of 2130 Paediatricians in the USA in 2002<sup>10</sup> noted 80% usage of drug references on PDA, compared with just over 60% in the current study.

Regarding the impact of patient encounters on clinical care, this study's findings are similar to those of Dee et al,<sup>11</sup> who found a reasonably high proportion of doctors

agreeing that a PDA had influenced their clinical decision-making or changed a patient's treatment.

Improvements in portable device technology have allowed some uses that were not previously possible; multimedia functions are a good example. Multimedia functions have progressed markedly over the past 5–10 years, and PDAs now provide a satisfactory platform for taking and viewing medical imaging, and playing medical sound or video files. Approximately 30% of respondents used these functions.

How useful a device is to doctors is partly dependent on what medical software is available for use.

Software usage rates are affected by supply and demand. Given that the most used OS in this survey has been available for less than 5 years, low software availability may be affecting uptake and usage rates.

Expense was seen by both users and non-users of PDAs as a major barrier to uptake. Currently the cost of a PDA can range to over NZ\$1000. At present in NZ the purchase cost of a PDA is not reimbursed for house-surgeons or registrars, and reimbursement for consultants varies between DHBs.

Lack of institutional support and integration was also seen as a problem, with 39% of non-user respondents reporting this as a barrier.

Thirty-six percent of non-users reported either lack of training or lack of local help desk support as a barrier to use. In their review of handheld computing adoption in healthcare in 2004<sup>4</sup> Lu et al. also found technical and organisational support to be a barrier to handheld computer use.

Of note is the wide variation of respondent PDA usage among DHBs ranging from 25% to 100%, which may suggest varying organisational approaches to the use of PDAs.

Given the perceived benefits for respondent PDA users in the areas of personal organisation, time saving, and clinical decision-making, a coordinated strategy to support PDA use would likely enhance utility and usage. DHBs and central governmental agencies have an opportunity to play a role in this.

One of the difficulties faced by DHBs is that PDA operating systems and usage have experienced large changes over the past 10 years. When planning software provision DHBs need to choose a careful path between multi-platform and OS-specific solutions.

Improvements in the areas of education, security and software provision would also be beneficial. Training on PDA device use is noted by respondents as a significant need. More awareness and training in current clinical software could increase use. Teaching on device security could enhance privacy. More support of software development could encourage novel software of benefit in medical decision support. Central coordination and cooperation between DHBs is essential for the development of a cohesive nationwide strategy. This may also be more cost effective than individual DHBs trying to address these issues locally.

However, it must be acknowledged that PDAs do not work for all people. There are variations in doctor's work types, locations and personal factors which may mean handheld devices are not useful for a particular doctor, or in a particular situation.

It was difficult to ascertain the overall response rate for this survey. Using the number of non-GP doctors working in a DHB in 2008 (Medical Council of New Zealand<sup>6</sup> statistics) as a denominator gave an overall response rate of 15%. Those who were interested in PDA use may have responded disproportionately to the survey. Since the survey used digital distribution, this would select out those who had low usage of technology in general. The response rates also were strongly dependent on staff at DHBs distributing the survey email, and the effectiveness of email distribution at DHBs. This was a hospital doctor survey and as such General Practitioners were not represented.

In conclusion, 52% of respondents in this sample of hospital based doctors in New Zealand report using PDAs. Of PDA users, over 90% report using them at least once daily. Overall, users felt PDAs helped them significantly with organisation and time saving, but had a more moderate effect on clinical decision-making. For non-users there were a range of barriers to usage with cost being a major factor. For both users and non-users, institutional support was also perceived as a barrier to use.

DHBs and medical staff need to work collaboratively to maximise the potential benefits of PDAs in the clinical setting. Suggested areas to pursue include software provision, device support and education. Decisions should be made by clinical leadership teams in conjunction with senior IT management to ensure a shared vision for the future.

**Competing interests:** None declared.

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**Acknowledgements:** We thank Katherine Rock and other DHB communication managers for help with distribution of this survey; Dr Nigel Miller for his review of the manuscript; and 'HM' for proofreading assistance.

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## References:

1. Longmore M, Wilkinson I, Turmezei T, et al. Oxford Handbook of Clinical Medicine. Oxford University Press 2008 ISBN9780198568377.
2. Lindquist AM, Johansson PE, Petersson GI, et al. The use of the Personal Digital Assistant (PDA) among personnel and students in health care: a review. *J Med Internet Res.* 2008 Oct 28;10(4):e31.
3. El Emam KJ. Who's using PDAs? Estimates of PDA use by health care providers: a systematic review of surveys. *Garrity C, Med Internet Res.* 2006 May 12;8(2):e7.
4. Lu YC, Xiao Y, Sears A, Jacko JA. A review and a framework of handheld computer adoption in healthcare. *Int J Med Inform.* 2005 Jun;74(5):409-22.
5. Horsley A, Forster L. Handheld computers in medicine: the way forward. *Postgrad Med J.* 2005 Jul;81(957):481-2.
6. The New Zealand Medical Workforce in 2008 – Medical Council of New Zealand. [http://www.mcnz.org.nz/portals/0/publications/workforce\\_2008.pdf](http://www.mcnz.org.nz/portals/0/publications/workforce_2008.pdf)

7. McAlearney AS, Schweikhart SB, Medow MA. Doctors' experience with handheld computers in clinical practice: qualitative study. *BMJ* 2004 May 15;328(7449):1162.
8. Morris CG, Church L, Vincent C, Rao A. PDA usage and training: targeting curriculum for residents and faculty. *Fam Med*. 2007 Jun;39(6):419-24.
9. Jacobs JL, Takahashi O, Ohde S, et al. PDA usage by Japanese resident physicians is low: a cross-sectional survey. *Methods Inf Med*. 2009;48(5):475-9. Epub 2009 Jun 5.
10. Carroll AE, Christakis DA. Pediatricians' use of and attitudes about personal digital assistants. *Pediatrics* 2004; 113: 238–42.
11. Dee CR, Teolis M, Todd AD. Physicians' use of the personal digital assistant (PDA) in clinical decision making. *J Med Libr Assoc*. 2005 Oct;93(4):480-6.