

***Computer BEACH***  
**A general practice computerised active  
data collection validation study**

**Final report**  
to

**the Western Sydney Division of General Practice**

*and*

**The Royal Australian College of General  
Practitioners**

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OF SYDNEY**

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**A/Professor Helena Britt, Dr Graeme Miller  
Lisa Valenti, Janice Charles, Tim Chambers**

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## **Conflict of interest**

The authors have no conflict of interest in the conduct of this study or in the preparation of this report.

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# EXECUTIVE SUMMARY

## Background

The BEACH (Bettering the Evaluation and Care of Health) program is a continuous National study of general practice activity. It began in April 1998 and is now entering its sixth year. A rolling random sample of approximately 1,000 GPs participate each year, each GP providing details of 100 consecutive encounters. BEACH provides an ongoing measure of current GP activity and of changes occurring in morbidity or its management in general practice.

BEACH is a paper based collection system, where each encounter is detailed on a structured paper encounter record. With increasing computerisation of general practice BEACH cannot move to a fully computerised data collection program because not all GPs have a computer (nullifying the sampling process) and there are no standards on clinical system which would allow passive data collection from computerised medical records. Privacy issues also impact on the viability of data collection from a random sample of GPs in this manner. In any case there has been far less validation done on computerised data collection than on paper-based collection and studies that have been done raise concerns regarding the reliability of the data collected, completeness and accuracy, and sample bias.

However, it was thought that if an active data collection program could be designed and plugged into any computer (independent of software) on a GPs desk, GPs could be given the option of whether to record it on paper or on computer.

This project aimed to develop and test such a system, and investigate the reliability and validity of data generated through active data collection, its acceptability to GPs and the feasibility of collection of data through this method as part of the national BEACH program.

## Aims

- To demonstrate that electronic data collection system can be used for the systematic collection of general practice activity data.
- To assess the validity and reliability of data collected in this manner by comparison to paper-based collection.
- To assess the acceptability and feasibility of data collection by this mechanism for use in the National program, for use by divisions of general practice and for use in GP training program evaluation and assessment.

## Hypotheses

- A computer system can be used for active collection of general practice activity data
- Such a form of electronic data collection will provide data that does not significantly differ from that collected in paper-based active recording system.
- This form of electronic data collection will be acceptable to GPs
- This form of data collection will be a feasible method of data collection in the future.

## **Method**

Systemedica designed the software for the active GP entry of BEACH data. The software had to align with the normal BEACH database to allow its adoption on a broader scale in National BEACH if the trial proved successful. Instructions for data entry were prepared by the FMRC.

The GPs in Western Sydney Division of General Practice who had completed Paper BEACH during the previous 12 months were identified (n=67). These GPs were first approached to participate in Computer BEACH. GPs were approached by letter and followed up by telephone recruitment. The response rate was lower than anticipated and the sample was extended to a wider area around Western Sydney and GPs from those areas who had participated in BEACH were approached. In total 156 GPs were approached of whom 148 were contactable, Of these 64 agreed to participate (41.0%) but only 28 completed the process and one of these returned the data but was five encounters short of the full 100 records. This GPs data was not used in the comparative analyses of results.

The statistical methods adjusted for the cluster effect around the GP and relied on a matched pair approach where each GPs Computer BEACH data were compared with their Paper BEACH data. Significance of paired differences was tested using 95% confidence intervals around the estimates of events that can occur more than once per encounter Differences normally distributed were tested using a paired t-test, differences non-normally distributed were testes using the non-parametric sign rank test.

## **Results**

### **ACCEPTABILITY TO GPS**

The poor response rate suggested only partial acceptance of this method of data collection by GPs. It would have been expected that this group of GPs would be more likely to participate than the normal sample approached, since they had previously agreed and completed BEACH on paper. However, the initial response rate was comparable to that of the National BEACH program (48.7% of contacted c.f. 46.4% of contacted in Paper BEACH). O the 80 GPs who declined to participate 33 (41% of those who declined and 23% of those contacted) did so because it was on computer.

There was also a far higher dropout rate than in Paper BEACH. Of the 64 GPs who agreed to participate 56% failed to start or failed to complete (c.f.23% drop out in Paper BEACH). Some of these dropouts were due to technical problems, such as blocks on computer servers against the addition of 'outside' software, incompatibility of the Computer BEACH program with some of the base software being used by the GPs. Others appeared to be due to an inherent fear of 'getting started' in some GPs who failed to even attempt to get the first record in. Others dropped out because they said it took too long to enter the information.

Follow-up questionnaires from GPs who completed (25 returned) and those who dropped out (10 returned) showed that:

- 14 (56%) would prefer , or be happy to, complete BEACH on computer rather than paper in future
- 15 (60%) felt that Computer BEACH was more time consuming than Paper BEACH

The response to follow-up questions about Computer BEACH had little relationship to the GPs self assessed proficiency on computers generally.

## **VALIDITY AND RELIABILITY OF DATA COLLECTED IN COMPUTER BEACH**

### **Completeness of data.**

A semi forced entry of patient characteristics resulted in extremely complete data sets for each of the characteristics investigated: age, gender, health care card status, non-English speaking background status, Veterans' Affairs Cared status and patient status to the practice (new/seen before). Whereas many of these data elements have a response rate of less than 80% in Paper BEACH, missing data in Computer BEACH for these elements was extremely rare.

In contrast the completeness of the remainder of the data elements was not good.

When compared with Paper BEACH, Computer BEACH had significantly lower recording rates of almost all variables including: patient reasons for encounter, problems managed, medications, other treatments, pathology tests ordered imaging ordered and referrals. The majority of these differences were very large: for example—124 problems per 100 encounters compared with 143 per 100 in Paper BEACH. Extrapolated to an average 5,000 consultations per year per GP this generated a difference of –25,000 problems managed in one year purely for this sample of 27 GPs.

### **Distribution of data**

Investigation of the types of encounters recorded (item numbers), the age and sex distribution of the patients, the distribution of the patient RFEs, and of those problems managed that were recorded suggested the GPs were not being particularly selective in the encounters they chose to record. Rather there was a general move to record fewer cases of every event. For example, while the rank order of the problems managed was consistent with that of data from these GPs in Paper BEACH, in most cases the relative rate of reported management of each problem was considerably lower than in Paper BEACH.

Further, even where the management actions were considered in terms of the number of problems managed it was apparent that while the GPs were no less likely to record at least one of any specific management action (e.g. at least one medication per problem, at least one clinical treatment etc) they recorded significantly fewer management activities per problem. This means that while they were recording at least one, they were less likely to record multiple management events of one type, per problem.

In summary, while the distribution of the data for each element remained relatively parallel to that of Paper BEACH, relative rates of management of adoption of a management action were significantly less than that for Paper BEACH.

The above results suggest that the Computer BEACH does not provide a reliable and valid measure of GP activity and could not be adopted as an acceptable alternative to paper based data collection methods currently being used.

## **FEASIBILITY**

The low recruitment rates, the low completion rates and the low recording rates of specific data elements would suggest that it is not feasible to provide GPs participating in the National BEACH program with the option of completing BEACH on this active computerised data collection program.

## **Discussion**

These results provide a picture of split acceptance of active computerised data collection methods for BEACH, with a group ready and willing to adopt such methods, some of whom are able to cope with them. However they clearly demonstrate, that even with acceptance of the method the GPs record fewer events in all major data fields. While the forced entry of patient characteristics data resulted in very low missing data, the variable frequency data elements demonstrated that the GPs recorded fewer cases/events in all of these data element.

The lack of differences in distribution of results across classes would suggest that the GPs were not being selective in the encounters they entered, but rather they were recording the absolute minimum in all cases. Clearly this was influenced by the time taken to record data and the difficulties some individuals had with entering the data. However others found the system easy, though this was not dependent on self reported computer literacy levels. The results of this study have implications for any active data collection system which relies on additional software which runs independently of the main health record system on the GPs desk, particularly in terms of the interaction problems found to occur with different software systems and practice rules for outside software that became apparent during this study.

## **Conclusion**

This study has demonstrated that the collection of BEACH data through direct data entry though an active and independent piece of software is not yet feasible for the BEACH program. The method has relatively low acceptability within the GP community and even where it is acceptable, it results in under-recording of major data items such as patient reasons for encounter, problems managed, and the management techniques adopted. Certainly the complexity of the designed software contributed to this under-recording but the results suggest that the implications of the introduction of any active data collection systems, no matter how simple, should be considered with care.

# 1. BACKGROUND

The National Health and Medical Research Council recognised the importance of using general practitioners to collect data about community morbidity and its management by supporting with a grant a paper-based data collection methodology study in 1987 by the Division of General Practice at the University of Sydney<sup>1-3</sup>. The NH&MRC, in conjunction with the General Practice Evaluation Program, funded the Australian Morbidity and Treatment Survey<sup>4</sup> and the Country Metropolitan Comparison Study<sup>5</sup> conducted by the Family Medicine Research Unit established within the Division of General Practice. In 1998 the General Practice Statistics and Classification Unit (GPSCU) was established within the Family Medicine Research Centre in collaboration with the Australian Institute of Health and Welfare to undertake a continuous data collection program in general practice (the BEACH program). The GPSCU uses a paper-based methodology based on that developed as a result of the previous NH&MRC grants. The program is funded by a consortium of government departments and pharmaceutical companies.

Paper-based collection of patient encounter data from general practitioners and other ambulatory care providers has been used in many countries to explore the relationship between reasons for patient attendance, problems managed and treatments provided or prescribed. These data have been of great value in understanding the management of patient care by general practitioners, its quality, variance and cost effectiveness. The significant value of GP data collection in guiding changes in health care systems in the UK and New Zealand have been described by Miller and Britt<sup>6,7</sup>. Examples of these data collections are the National Ambulatory Health Care Survey in the United States<sup>8</sup>, the General Practice Morbidity Survey in England and Wales<sup>9,10</sup>, the WaiMedCa study in New Zealand<sup>11</sup>, the Australian Morbidity and Treatment Survey<sup>4</sup> and the Comparison of Country and Metropolitan General Practice<sup>5</sup>. Significant work has been undertaken by Fleming et al studying GP diagnostic variance<sup>12</sup>, and denominator issues<sup>13</sup>, and by Britt et al looking at reliability and validity<sup>14</sup>, comparison with medical record data collection<sup>15</sup>, sample size issues<sup>16</sup>, recruiting GPs<sup>17</sup>, and representativeness of the patient sample<sup>2</sup>. This research has validated the methodology used for paper-based data collection from general practice. The results of this work and the widespread use of the methodology justify regarding prospective paper-based recording of encounter data as the "gold standard" for validation of other data collection methods.

The increasing use of clinical computer systems in general practice has led to trials of data collection from electronic health records and from specialised data collection software particularly in the United Kingdom<sup>18,19</sup> and the Netherlands<sup>20</sup>. Considerably less validation has been done on computerised data collection than on paper-based collection and some of those studies that have been done raise concerns regarding the reliability of the data collected<sup>21</sup>, completeness and accuracy<sup>22</sup>, and sample bias<sup>23</sup>.

Data regarding patient encounters including morbidity and prescribing are currently being collected from general practitioners using a paper-based methodology on a national basis in Australia in the BEACH program undertaken by the Australian Institute of Health and Welfare General Practice Statistics and Classification Unit (GPSCU) at the University of Sydney. As part of the agreement between the AIHW and the University, the GPSCU is committed "to continue development and testing of data collection and analytical methods for gathering National data through electronic means". The increasing use of computerised prescribing in general practice has opened the possibility of collecting data from computer

systems to ultimately replace the paper-based system currently used in the BEACH program. The usefulness of data in monitoring general practice patient morbidity and treatment depends on its validity in representing general practice as a whole and the reliability with which the data can be collected. The paper-based systems used in BEACH and similar collections overseas have been extensively validated and have proved reliable methods of data collection as stated above. On the other hand attempts to collect data from electronic health records have presented problems of reliability of data quality and validity as a representation of general practice at large. This problem is compounded by the variety of computer systems currently in use and the lack of standardisation of data elements or data sets. The BEACH program is part of the National Health Information Program approved by the National Health Information Management Group and the data elements and set being collected for the program are being further defined for inclusion in the National Health Data Dictionary. It is appropriate therefore to use the BEACH data set as the minimum data set for collection of general practice data by electronic means.

## **2. AIMS**

- To demonstrate that electronic data collection system can be used for the systematic collection of general practice activity data.
- To assess the validity and reliability of data collected in this manner by comparison to paper-based collection.
- To assess the acceptability and feasibility of data collection by this mechanism for use in the National program, for use by divisions of general practice and for use in GP training program evaluation and assessment.

## **3. HYPOTHESES**

- A computer system can be used for active collection of general practice activity data
- Such a form of electronic data collection will provide data that does not significantly differ from that collected in paper-based active recording system.
- This form of electronic data collection will be acceptable to GPs
- This form of data collection will be a feasible method of data collection in the future.

## **4. METHOD**

The study comprises three stages:

1. Development of user friendly software that would be operable on any desktop PC, that reflected the data and structures of the elements collected in the paper-based BEACH program.
2. Conduct of a longitudinal cross-over trial with a group of GPs who had already participated in the BEACH paper-based data collection program
3. Comparison of the results gained through the paper-based BEACH and Computer BEACH, through matched GP comparison after adjustment for differences in the characteristics of patients seen by the GP.

## ***4.1. Designing the software***

In looking for the expertise required for a contract for development of software we looked for a person or organisation who was a practicing GP (so they held an understanding of the clinician's interface needs) who also held computer science qualification and experience in this type of software development. Only one organisation (Systemedica) with this combined expertise was readily identifiable. The principal of Systemedica, Dr David Rowed, has extensive experience in the development of software and has a continuing involvement in the Australian development of HL7, assists NSW Health in a consulting capacity to develop a GP IT strategy, was a senior GP consultant on the IBM project to develop a *General Practice Computing System Functional Specification* and on the Simsion Bowles project to develop a *General Practice Data Model and Core Data Set*.

While another well known GP software development company directed by a practicing GP may have been a possible competitor, the company closed at around the time that quotations were needed.

We therefore included the single quotation from Systemedica, in the project proposal to potential funding bodies. Both bodies were happy with the choice and the quotation.

It was impractical to attempt to gain competitive quotes for this work and therefore the University agreed to waive a call for other quotations for these professional services.

The dataset already applied to the BEACH program was provided to the Systemedica Pty Ltd to allow them to program a data collection module to operate on PC Computers in a GPs consulting room.

Systemedica was also supplied with a full copy of 'BEACHHEAD', the Access database currently used for secondary data entry the paper-based BEACH program.

Systemedica was instructed to ensure that

- the inter-relationships between the variables in the software were consistent with those of the paper-based BEACH data set.
- the output from the new software be identical to that of BEACHHEAD. This measure was required because, if the trial proves successful, the two systems must be able to work together with mixed responses – some from computerised collection and some from paper-based data collection.

The project outline envisaged an 8 month time line including two months (maximum) software development time. This proved an impossible task within this time frame. There were delays incurred in signing off the agreement between Systemedica and the University of Sydney due to the considerable legal requirement of the University.

Further, the software development from initiation to completion to the Investigators' satisfaction was approximately six months.

- To a large degree this was due to the unexpected complexity of the project and to the increasing demands on the time of the Principal Consultant in Systemedica (Dr David Rowed). Dr Rowed is making a large major contribution to the development of Australian general practice computing systems (particularly through his international involvement of HL7 standards) and his other commitment in this area appeared to impinge on the timeframe for development of the project software.

## **Beta testing**

The software was initially developed and demonstrated to two of the Chief Investigators (Dr Graeme Miller and Professor Helena Britt), and representatives of the WSDGP. Some difficulties were identified and discussed

This version was also tested by:

- a secondary coder experienced in secondarily entering the paper-based BEACH data into BEACHHEAD
- a researcher who had little knowledge of the BEACH program, its structures or requirement.

The program was revised in response to the comments of the audience at the demonstration and in response to the comments from test users.

he revised software was then tested by

- Professor Helena Britt
- a health information manager with a thorough knowledge of BEACH data entry,
- the information technology officer in the Centre ( for technical assessment).

The instructions for data entry directly into the Remote BEACH software were developed by Professor Helena Britt. They were then checked by:

- Dr Graeme Miller and
- two research staff of the FMRC

while they actively worked through the final program.

As a result, some additions, corrections and minor changes were made to the instructions for the GPs.

## ***4.2. The longitudinal cross over study***

### **Sample size**

The aim was to ensure a final sample size of GPs who had completed paper-based BEACH and Computer BEACH. As a reasonably high drop out rate might be expected it was decided to try to recruit about 60 GPs to the project in order to ensure that 40 would complete the project and provide sufficient statistical power for comparison of results from paper and Computer BEACH. If more than 40 did complete this would only serve to increase the power of statistical analyses. Initially it was hoped that this sample size could be gained wholly in the WSDGP area, to provide the Division with a third measure of activity in the Division.

A group of 67 GPs in Western Sydney were identified in the paper-based BEACH database as having completed BEACH during the past two years. Of these, 12 had only recently completed the paper-based BEACH and had therefore already gained their Triennium 6 QA points, making it less likely that they would be interested in participating in Computer BEACH. However these 12 GPs had not yet completed the optional re-audit of smoking and alcohol consumption in their practice. By participating in Computer BEACH this re-audit occurred as part of the process, allowing them to earn a further 15 points (but not the initial 20 BEACH points) for participating in Computer BEACH.

The response rate in Western Sydney was 40.2%, 27 GPs agreeing to participate and 40 declining to participate.

The geographic area of the sample frame was therefore widened to include GPs from South Western Sydney area, and from Nepean, Blue Mountains, Hawkesbury and from Hornsby-Kuring-gai areas.

### **Recruitment of GPs**

The GPs who had participated in BEACH during the previous 12 months and whose practice address was in the WSDGP area were approached in the first phase. However, in total 156 GPs were approached by letter in groups of about 60 at a time. A copy of the approach letter is attached as Appendix 1.

Each GP was then contacted by phone 7–10 days later to request their involvement in the project. Where a GP agreed to participate they were then asked whether or not they had a computer on their desk in the surgery. Those who did not were then listed as willing to participate when a computer could be supplied to them. Those with a computer on their desk were sent the research pack a short time after the recruitment call. Those requiring loan of a computer were told they would be contacted when one became available. Later, arrangements were made at a time convenient to the GP to deliver the computer when one became available.

### **The research pack**

Each GP with a computer on their desk was sent the following:

- a covering letter (Appendix 2)
- several copies of a patient information sheet which they were asked to show each patient as they enter the waiting room (Appendix 3).
- a height and weight measure conversion (to metric) chart (Appendix 4)
- normal instruction as to how to complete the BEACH data required (Appendix 5)
- a pictorial standard drinks chart to help patients answer the questions on alcohol, (Appendix 6)
- instructions for completion of the electronic forms (Appendix 7)
- a CD ready for installation on their computer, with inbuilt installation instructions

Those relying on a “borrowed” computer received the computer (already set up with the program and GP ID number ready on the machine) with the research pack.

### **Data elements collected**

The data elements collected reflected those already included in the national paper-based BEACH program and included:

**THE CONSULTATION:** date; type

- *direct*; Medicare item number; workers comp paid; other paid; no charge)
- *indirect* (patient not seen)

#### **THE PATIENT:**

Date of birth: gender: status to the practice (new/seen before); home postcode; Health Care Card status (yes/no); Veterans' Affairs status. NESB (yes/no); Aboriginal (yes/no); Torres Strait Islander (yes/no); Reasons for encounter ( up to 3)

#### **PROBLEMS and THEIR MANAGEMENT AT THE ENCOUNTER**

**Morbidity/problems:** Diagnoses/problem managed at the encounter (up to 4); status of each problem (new to patient/managed before);

#### **Management for each problem**

- *Medications* prescribed/ OTCs advised and other drugs provided by the GP: brand name; form (where required); strength; regimen; status (new drug this problem this patient/continuation); number of repeats (status new/continuation).
- *Procedures, counselling and other treatments* (up to 2 per problem)
- *Referrals:* up to 2 per encounter
- *Pathology* (up to 5) and *Imaging* ordered (up to 3 per encounter).

#### **PATIENT BASED DATA**

A section on the bottom of each of the last 40 recording forms investigated other aspects of patient health or health care delivery in general practice not covered by consultation based information. The last 40 of each GP's electronic recording forms included questions to be asked of the patient including their BMI (self reported height & weight), usual alcohol intake and smoking status.

#### **GP follow-up**

Each GP was followed up by 'phone a week or two after the research pack had been sent, to check that they had started recording and to answer any questions.

On completion, the set of 100 electronic records (on disk) and (where applicable) the borrowed computer, are to be returned to the Research Centre.

#### **Start up calls and follow up**

As is the case with the National paper-based BEACH program GPs were telephoned after delivery of the research pack to ensure the pack had been received and offering to answer any questions the GP may have. They were also given a Freecall number to ring if they have any questions. The GPs who had not returned the data within several weeks were then followed up on a regular basis by a research assistant until finalisation – either the data are returned, or for one reason or another, the GP withdrew.

In the last few days of October the research team agreed that the project had to be finalised. A letter was sent to all GPs who had not yet completed, setting a final date of November 30 for data return (Appendix 8).

#### **GP reports**

As part of the BEACH process (whether on computer or paper) the GPs receive feedback about their results. This consists of an analysis of their results compared with those of nine other de-identified GPs who recorded around the same time, and against the National average of the National BEACH program for the previous annual data period.

The first 10 GPs' data were test analysed. Two mismatches between the data fields of Computer BEACH and those of BEACHEAD generated incorrect comparative data and changes need to be made in Access to overcome this problem. After this correction, reports were prepared and distributed to GPs as they came in batches of ten. For the last 8 GPs two earlier GP returns. Were added for comparative purposes.

Two different covering letters were used for these reports. One was sent to those GPs who participated in the National BEACH program in triennium 5 (see Appendix 9). The other was sent to GPs who participated in the National BEACH program in Triennium 6 (ie. 2002) ( Appendix 10). The only difference between these letters pertains to completion of the QA cycle and allocation of QA points.

### **Technical support for GPs participating in the project**

Due to the resignation of Mr Michael Ahearn, (the WSDGP support person specified in the University/WSDGP contract, to provide technical support to participating), and the unavailability of other WSDGP support personnel acceptable to the Investigators, technical support to GPs was provided by the FMRC IT support officer at cost to the FMRC.

### **Classification of data**

The software developed for this program included (in the back end), the classifications used in the National BEACH program (details below). The GP was not required to consciously code or classify the data elements but rather they were required to pick a term from pick lists (for such variables as patient reasons for encounter and problems managed) or to select the medication name/type/dosage and regimen from pick lists offered (as is usual in the secondary coding process adopted in National paper-based BEACH). The coding and classification was automatically applied. The classifications applied were

- ICPC-2 PLUS (an extended vocabulary of terms used in Australian general practice, classified according to the International Classification of Primary Care) will be used for: Patient reasons for encounter; problems managed; referrals, procedures; other treatments; pathology and imaging ordered. ICPC-2 PLUS provided the coding system and the terms lists from which the GP could choose. The terms in ICPC-2 PLUS have been derived from those recorded by GPs in more than one million encounter records over the past decade.
- Drugs prescribed, advised or provided by the GP will be classified according to CAPS, an in-house classification developed for and applied in the National data collection program. The classification is also mapped to the Anatomic Therapeutic Chemical classification (WHO).

### **Statistical methods**

The 27 GPs with complete data for both computer and Paper BEACH are described and analysed throughout this report. There was another GP who completed computer beach, but only entered details for 95, rather than the required 100 encounters, so was excluded from all analyses.

Rates per 100 encounters and rates per 100 problems were calculated used the GP as the unit of analysis. A paired difference was calculated for the 27 GPs. If the differences were normally distributed a paired t-test was used, but where the differences were non-normal the non-parametric sign rank test was used.

Percentage of encounter or percentage of population are reported and compared for computer and paper beach for many variables (eg number of problems per encounter, proportion of patients who are a HCC holder). The SAS surveyreg procedure was used to adjust for the cluster effect of the GP. The proportion and cluster adjusted 95% confidence intervals (CI) are reported. The CI is calculated as the rate estimate  $\pm$  (1.96 x standard error). and provides the means by which statistical differences in rates per 100 encounters or rates per 100 problems managed can be identified between the control and experimental groups

All statistical testing used an alpha level of 0.05. As such, 95% confidence intervals are reported when appropriate. SAS<sup>®</sup> V 8.2 software was employed in the analysis of this data.

## 5. RESULTS

### *5.1 Recruitment and completion rates*

The results of recruitment, and final completion rates are provided in Table 1. Of the 156 GP approached by letter 12 (7.7%) were overseas, had moved and were not traceable, or were not available for the period of the project (e.g. maternity leave). Of the remaining 144 GPs, 80 (55.6%) declined to participate. Of these 80 GPs, 33 (41.3%) did so because the data had to be entered on computer. These GPs said they would have been happy to participate if it had been a paper collection again. A further 5 said that they would participate but, being involved currently in other projects, could not do so until very late 2002 or early 2003. Due to the desired time frame for completion of the project, these GPs were thanked but not enrolled in the study (Table 1).

Agreement to participate was gained for 64 GPs (41.0% of those approached and 44.4% of those with whom contact was established.

#### **Comparison of recruitment and completion rates with Paper BEACH.**

When compared with the usual BEACH recruitment rate<sup>24</sup> (which are summarised for the 2001-02 BEACH year) Computer BEACH was comparable in terms of the proportion of those with whom contact was established, who agreed to participate (44.4% on computer and 41.7% in BEACH on paper).

However it must be remembered that GPs being approached were already a select group who had participated in the past, so the response could be regarded as 44% of 36% of the original sample (i.e. 16%).

However the major difference was in the rate of completion after initial agreement. Whereas in Paper BEACH 77.5% of those who agreed actually completed, in Computer BEACH the dropout rate was far higher, with less than half (43.8%) finally completing. This difference was reflected in the proportion of 'completed' in terms of all GPs with whom contact was established. In paper-based BEACH the final sample represented 30.0% of those contactable and in Computer BEACH completions represented 19.4% of those contactable (Table 1).

It was anticipated that the GPs who required the loan of a computer would be less likely to complete. However, this was not the case. Of the ten GPs to whom a laptop or desktop

computer was delivered, 8 completed (80.0%). Of the 44 who were to use their own desktop computer only 18 completed (40.1%).

**Table 1: Results of recruitment**

	Number	Per cent of approached	Per cent of contact established (N=144)	Per cent of declined or accepted
Approach letters sent out to GPs	156	100.0	—	—
Away for long period/moved and not traceable etc	12	7.7	—	—
Declined to participate	80	51.3	55.6	100.0
Because it is on computer	33	—	—	41.3
Busy on other project – would do later if could	5	—	—	6.3
Agreed to participate	64	41.0	44.4	100.0
Has computer on desk	54	—	—	84.4
Needs to borrow computer	10	—	—	15.6
Completed	28	17.9	19.4	43.8
<i>Paper based BEACH- (200102)</i>				
Agreed to participate	1,268	38.3	41.7	—
Completed		30.0	32.3	77.5

### Reasons given verbally for dropping-out of the project

During the course of Computer BEACH, messages and comments from the GPs were entered into the project database to facilitate communication between members of the research team. Among the messages from the 36 doctors who dropped out of the study were 44 comments about the reasons for their withdrawal.

Half of the comments (22 of the total 44) concerned the computer program, with 10 of these reasons being conflict with using other programs on the computers and seven citing difficulty in actually using Computer BEACH. Three reasons for withdrawal involved problems with installing Computer BEACH while two referred to practice policy preventing the installation of programs on the practice network.

Another major topic in 11 of the comments was the excessive time it took to record data using the program.

Nine of the comments were from GPs who did not start the study, mainly because they were too busy. The remaining two reasons for withdrawal involved personal reasons or not finishing in time for the deadline.

### Other issues leading to poor completion rates

#### RECRUITMENT OF GPs

Recruitment was expected to take one month. However, with the two stage approach taken in an effort to confine the sample to the WSDGP area, and then the decision (necessitated by poor response rates) to enlarge the sample frame to a wider geographic area some delays were incurred.

## **GP NEED FOR DESKTOPS OR LAPTOPS**

Other delays occurred because 10 GPs requested delivery of a computer to undertake the study, for they did not have one in their surgery or chose to have a separate machine for this project, from the computer on their desk. The Centre had one spare laptop and the WSDGP lent the project (as earlier agreed) one desktop and one laptop. These were delivered to the first three GPs who needed them. However the GPs delayed starting and took a long time to finish which delayed delivery to the remaining 7 GPs awaiting a computer.

On 20th October the Research Team agreed that the time line was unacceptable for the rotation of computers as earlier envisaged and that we should hire six lap top computers for a period of one month, at an additional cost to the project of \$1,400. These were delivered on 24<sup>th</sup> October so the GPs had about five weeks in which to complete their data entry before the closure of the project at the end of November.

## **Software upload issues**

Some of the issues of loading the software are of interest and have implications for the use of any additional electronic forms in general practice in the future.

- We had not envisaged that some practices would have a network system that did not include a hard disk on the clinician's desk, i.e. that the computer on the clinician's desk could not load the software. Three GPs tried to put it on the network to which their desktop was connected. The software had not been designed for networks and our data manager/computer technical staff member had to add a program which would allow the system to be loaded onto a network and accessed from the surgery. This additional programming was completed and the three GPs involved were sent a new CD containing the revised software. However this did not solve the problem for all three
- Two of these GPs then tried to load the system on the network and found that their system had been set up to reject any additional software not approved by management. These two GPs decided the process was all too difficult and dropped out. Several others who had agreed to participate also found that their desktops would not allow them to load any 'foreign' software and they also withdrew from the project.
- One instance was of further interest. The GP was never sure which of multiple surgeries s/he would be using on any one day. Having loaded the system onto the network s/he opened it on different desktops (in different surgeries) each day. The system saw him/her as a 'new' user each time s/he logged on to a different desktop and reverted him/her to the first encounter. This problem was overcome by agreement with this GP that s/he would only record when in one of the surgeries in the practice. This is not the answer for long term application of computerised BEACH and this problem would clearly need to be overcome if computerised data provision was to be openly offered in the future.
- Several GPs rang the Centre for advice when the software refused to save a record. These cases were dealt with over the phone and it was usually found that the system was working correctly and the doctor had failed to complete a required field (e.g. sex of patient). A warning about these required fields should be added in large letters in the instructions to GPs.

- One GP who had agreed to participate could not load the system and there was no apparent reason for this. Technical support was sent to the practice and it was established that the GP did not have sufficiently up-to-date software to allow Computer BEACH to run and the GP was not prepared to update.

### **Chosen form of data return by those who completed**

GPs were offered a range of methods by which the completed ‘forms’ could be returned to the Research Team:

- download to floppy disk and return by mail (programs for download are built into the Remote BEACH software);
- direct download through the internet (again the programs and instructions are unbuilt)
- download and send via email (directions and programs inbuilt).

The method chosen to return the data by the 28 GPs who returned, was:

- 14 on floppy disk (by post)
- 4 by Internet download (File transfer protocol)
- 8 on borrowed computer ( note that 6 of these also provided a floppy disk copy)
- 2 via email

## **5.2 Follow-up questionnaire–Computer Beach feedback from participants**

One of the aims of this study was to test the acceptability of this form of data collection to the GPs themselves. Some of this aspect will be measurable through comments made on recruitment (e.g. not if it’s on computer). Others need to be assessed through a follow up questionnaire.

Attached as Appendix 10 is a copy of the GP follow-up questionnaire. It includes questions about the GP’s use of, and ability with computers. This allowed the measurement of the extent to which acceptability of the method to GPs is dependent on their self assessed proficiency on the computer and/or to other factors.

A follow-up questionnaire was sent to all participants regardless of whether they completed the project. The purpose was to gain an understanding of the advantages or disadvantages of direct entry of BEACH data on computer by the GP.

A total of 35 completed questionnaires were returned. The study was completed by 28 GPs, 25 (89.3%) of whom returned the follow-up questionnaire. Thirty-six doctors withdrew from the study before completion and of these, 10 (28.0%) returned the follow-up questionnaire.

The doctors were first asked to rate their computer skills. Table 2 shows results divided into answers from GPs who completed Computer BEACH and from those who withdrew from the project before completion. The distribution of self-assessed ability did not differ very much between the two groups. Most doctors from both groups rated their computer ability as fairly high or slightly less capable. The remainder rated themselves either as an expert (1 GP) or not very computer literate (3).

**Table 2: GP self-assessed computer ability**

<b>Ability</b>	<b>GPs who completed (n=25)</b>	<b>GPs who withdrew (n=10)</b>	<b>All GPs (n=35)</b>
Computer expert	1	-	1
Use common programs	13	5	18
Can do some things	9	4	13
Not very computer literate	2	1	3

Twenty-five GPs (71.4% of all respondents) had a computer on their desks and 13 of them (37.1%) used computers for electronic health records but also used full paper records. There were 7 (20.0%) who used a computer only to generate scripts and 4 (11.4%) who employed fully paperless electronic health records.

There was little correlation between the self-assessed ability of the GPs and their response to the question on difficulty of Computer BEACH. Eight of the 19 more highly computer-skilled GPs found the project quite easy and one found it very easy, but ten found it hard or very hard. Seven of the less computer-skilled GPs found the project quite easy while another 6 found it hard or very hard. Of the 3 least computer-skilled, one found it quite easy and two quite hard.

A cross-tabulation of computer ability with comparison of Computer BEACH and Paper BEACH also gave mixed results. About half of the most computer-skilled GPs found Computer BEACH easier, about the same or slightly harder, while the other half found it much harder. Of the 16 less computer-skilled GPs, 13 (81.2%) found it harder or much harder than recording on paper.

Overall, self-assessed computer ability had little association with the responses to any questions, including all the following results.

Participants were asked if completing the computer based BEACH form took a longer or shorter time than a Paper BEACH form and results are shown in Table 3. Of the 25 respondents who completed the project, 9 felt it took a bit less or about the same amount of time, 8 thought it took slightly longer and 6 felt it took much longer to complete the computer form. Nine out of the 10 doctors who withdrew from the study said that it took much longer to complete a BEACH form on computer.

**Table 3: Time taken to complete Computer BEACH forms**

<b>Comparison with Paper BEACH</b>	<b>GPs who completed (n=25)</b>	<b>GPs who withdrew (n=10)</b>	<b>All GPs (n=35)</b>
Much less time	-	-	-
A little less time	6	-	6
About the same	4	-	4
A little more time	8	1	9
Much more time	7	9	16

A question about future participation in BEACH either on computer or paper drew the responses shown in Table 4. GPs who completed the project were fairly evenly divided as to which method they would choose in future. However, all of the GPs who withdrew said they would probably or definitely opt for the paper-based method if they were to do BEACH again.

**Table 4: GP choice between BEACH on computer or paper**

Choice	GPs who completed (n=25)	GPs who withdrew (n=10)	All GPs (n=35)
Definitely on computer	5	-	5
Probably on computer	4	-	4
Either	5	-	5
Probably on paper	4	5	9
Definitely on paper	7	5	12

GPs were asked to assess various aspects of Computer BEACH by judging them in a scale from no problems to many difficulties. In terms of loading the software onto their computers, more than two-thirds said there were no problems. Over half of the doctors also found there was no problem or just a slight problem with entering the information. Understanding the instructions and returning the data to the research centre also posed no problem or only a slight problem for the majority of participants (74.3% and 62.9% respectively). Finding the appropriate term to describe symptoms and diagnoses from a pick-list did however evoke responses ranging from some difficulty to many difficulties for the majority (74.3%) of participants.

The participants were also encouraged to write in free text any comments they wished to make about Computer BEACH. These comments were analysed in combination with any relevant information received by telephone, which had been entered into a database during the course of the project.

There were 29 participants who offered a total of 64 specific comments on various aspects of Computer BEACH. Only one GP found that there was little difference between computer and Paper BEACH.

The most frequent observations, which accounted for one third of all comments, concerned the computer program itself. Specifically, doctors had trouble installing the program on their machines (10%), switching between their regular computer program and BEACH (11%) or they generally found BEACH user unfriendly (11%).

The second most frequent observation, accounting for 28.6%, was that the project was too time-consuming.

The pull-down pick-lists for entering diagnoses and medications were cited as a problem a number of times, accounting for 17.2% of all comments. GPs referred to the difficulty of scrolling through long lists in order to enter a suitable term or the correct medication.

Data entry problems featured in 14.1% of comments. Half of these were non specific, the rest concerned such problems as difficulty entering the date of encounter, inability to correct a record, inability to record more than two problems per encounter and non-functioning tab keys.

## 5.3 The morbidity and therapeutic data collected

### Completeness of data

Of the 28 GPs who returned data from the Computer BEACH project one was removed from analysis because s/he had completed only 95 of the 100 encounter records. As the analysis was conducted on the basis of matched GP data the inclusion of the encounters from this GP would have skewed the results.

### PATIENT DEMOGRAPHICS

In paper-based BEACH the researchers have no control over the extent to which GPs actually complete each aspect of the form. In contrast, in Computer BEACH some control was set on a number of data filed.

For the patient demographics with Yes/No response Computer BEACH was programmed so that if a question was left blank a dialogue box came up when trying to save the record with a message—“*Yes/No Blank. Press 1 for intentional or enter an answer*”. As such the missing rates for computer Beach are likely to be nil or negligible due to the data entry method.

**Table 5: Completeness of semi-forced data elements**

Data element	Paper BEACH	Computer BEACH
	N=900*	N=2,700
	Missing (% of N)	Missing (% of N)
Item Number (N=2,700)*	137 (5.4%)	130 (5.2%)
Patient age (N=2,700)*	25 (0.9%)	7 (0.3%)
Patient sex (N=2,700)*	28 (1.0%)	0
HCC status	96 (10.7%)	1 (0.04%)
VA card status	197 (21.9%)	1 (0.04%)
Non-English speaking language	201 (22.3%)	1 (0.04%)
Aboriginal status	203 (22.6%)	0 (0%)
Torres Strait Islander status	203 (22.6%)	0 (0%)

\* The format for patient demographics changed in Paper BEACH between Year 3 and Year 4. Only year 4 data are used in this comparison, as the Year 3 data were not comparable in format.

The completeness of item number (where it was appropriate to provide one) was similar in both methods, about 5% being missing in both cases.

However, use of the reminder system on Computer BEACH resulted in a more complete data set for patient demographics than in Paper BEACH. The missing data for patient age and sex in Paper BEACH is very low (about 1% each), leaving little room for improvement. However the missing data for patient age in Computer BEACH was only 0.3% and patient sex was not missing in any records.

The completion rates for patient health care card status, Commonwealth Veteran’s affairs card status, Aboriginal and Torres Strait Islander status were all considerably better in Computer BEACH than in Paper BEACH. About 11% of encounters in Paper BEACH did not specify the patient’s health care card status, while missing data on language spoken at home (NESB), and Aboriginal and Torres Strait Islander status, each had about 22-23% missing data in Paper BEACH. In contrast, the completion rate for each of these variables in Computer BEACH was virtually 100%.

## ENCOUNTER BASED DATA

There could be no controls set in either Paper or Computer BEACH to force the GP to enter any particular number of each of the variable data elements. The Instructions for both studies requested that the GP record at least one patient reason for encounter and at least one problem managed.

As shown in Table 6 Computer BEACH included significantly fewer:

- patient reasons for encounter (117 per 100 encounters compared with 147 per 100 in Paper BEACH)
- problems managed ( 124 per 100 encounters compared with 143 per 100 in Computer BEACH)
- medications prescribed/advised or supplied) (78.1 per 100 compared with 1.4 per 1200 in Paper BEACH)
- other treatments (clinical and therapeutic procedures) (38.2 compared with 61.9 per 100 encounters)
- clinical treatments (24.3 compared with 47.5 per 100 encounters)
- pathology test orders (15 per 100 compared with 25 per 100 in Paper BEACH) and imaging orders(3 compared with 9 per 100 encounters)

There was also a marginally significant difference in the relative rate of recording referrals to other health professionals (8.7 referrals compared with 11.5 per 100 encounters in Paper BEACH). However there was no significant difference in the relative rate of procedural treatments recorded. (Table 6).

**Table 6: Completeness of variable data elements**

N=27 GPs	PAPER Rate per 100 encounters	COMPUTER Rate per 100 encounters	Difference	Normality of difference*	t-test or Signed Rank Test p-value*
RFEs	147.4	117.5	30.0	normal	<0.0001
Problems managed	142.9	124.2	18.7	Non-normal	<0.0001
Medications	103.9	78.1	25.8	Non-normal	<0.0001
Other treatments	61.6	38.2	23.4	Non-normal	0.0002
Clinical	47.5	24.3	23.2	Normal	0.0002
Procedural	14.1	13.9	0.1	Non-normal	0.31
Pathology	25.0	15.0	10.0	normal	0.0007
Referrals	11.5	8.7	2.8	normal	0.036
Imaging	8.6	5.2	3.4	Non-normal	0.0001

\* Paired t-test was used as the test of significance or difference where the distribution of the difference was normal.  
Signed rank test was used as the test of significance where the distribution of the difference was non-normal (see Methods)

### **Extrapolated effect on a full year activity for these 27 GPs.**

If we assume that the average GP has 5,000 consultations per year we can extrapolate to the annual work activity of these 27 GPs at their 135,000 encounter. This extrapolation demonstrates the enormity of the differences identified above. These 27 GPs would have recorded 40,000 fewer patient reasons for encounter, 25,000 fewer problems managed, 35,000 fewer medications, 32,000 fewer other treatments, 13,700 fewer pathology tests, 3,800 fewer referrals and 4,500 fewer Imaging test orders (Table 7).

**Table 7: Extrapolated results to a full year's work for these 27 GPs**

N=27 GPs	<b>PAPER BEACH</b>	<b>COMPUTER BEACH</b>	<b>Difference in estimated annual activity</b>
	<b>Number of cases (rounded)</b>	<b>Number of cases (rounded)</b>	
RFEs	199,000	159,000	-40,000
Problems managed	193,000	168,000	-25,000
Medications	140,000	105,000	-35,000
Other treatments	83,500	51,500	-32,000
Pathology	34,000	20,300	-13,700
Referrals	15,500	11,700	-3,800
Imaging	11,500	7,000	-4,500

**DISTRIBUTION OF THE DATA**

The lower numbers of recorded events of all types in Computer BEACH clearly throws into question the feasibility of gaining reliable data through Computer BEACH. The possible of this low recording level were considered. The questions that arose included—

- Were the GPs being selective in the encounters they chose to enter, perhaps in terms of selecting those with younger patients?
- Were the GPs therefore more likely to enter information about encounters involving only one problem?

If either of these selective processing occurred one would expect that:

- the distribution of item numbers may differ from Paper BEACH, with more Level A and fewer Level C and D consultations recorded.
- the patients at encounters included in Computer BEACH would be younger than those included in Paper BEACH.
- there would be a greater proportion of problem managed that were acute in nature and fewer problems managed that were of a chronic nature.
- the distribution across chapters of those patient reasons for encounter and the problems managed that were recorded should be distinctly different to the distribution of those in Paper BEACH.

**DISTRIBUTION OF ITEM NUMBERS**

The patient was seen and had a Medicare number recorded for the encounter at 88.9% of recorded encounters in Paper BEACH and 91.8% of those in Computer BEACH.

There were 21 different item numbers listed by these 27 GPs in Paper BEACH. The same 27 GPs listed 36 different item numbers when they completed Computer BEACH. There was no significant difference in the distribution of item numbers across the Medicare groups between the two studies. Standard surgery consultations accounted for 86.5% and 83.4% of all recorded Medicare items for Paper and Computer BEACH respectively (Table 8).

**Table 8: Item number distribution**

Medicare item type	PAPER BEACH		COMPUTER BEACH	
	Per cent distribution	95% CI	Per cent distribution	95% CI
A	1.1	0.4–1.8	1.4	0.0–3.0
B	86.5	83.3–89.8	83.4	78.6–88.3
C	10.3	7.1–13.4	10.7	7.0–14.5
D	1.2	0.2–2.1	2.0	0.3–3.8
Other	0.9	0.1–1.7	2.3	0.8–3.8
<b>Total</b>	<b>88.9</b>	—	<b>91.8</b>	—

**PATIENT CHARACTERISTICS**

The characteristics of the patients recorded on the paper forms and by computer are compared in Table 9. There was no significant difference in the sex distribution of the patients at encounters, 43.4% of those in Paper BEACH and 44.3% of those in Computer BEACH being male. There was also no significant difference in mean age of these patients (Table 9).

The hypothesis that the fewer number of problems managed may reflect a very different patient mix in those patients encountered in Computer BEACH and those encountered in Paper BEACH was rejected.

**Table 9: Characteristics of the patient**

Patient characteristic	Paper BEACH		Computer BEACH *	
	Per cent of encounters	(95%CI)	Per cent of encounters	(95%CI)
Male	43.8	40.0–47.7	44.3	40.4–48.3
Patient age (Mean)	41.4	38.6–44.2	40.0	37.1–42.9
HCC Holder	34.6	23.3–45.9	25.6	18.4–32.7
VA card Holder	2.6	1.0–4.2	3.0	1.0–4.9
Concession card holder	36.6	25.1–48.0	28.3	20.9–35.6
Aboriginal person	0.2	0–0.5	0.5	0.1–0.9

- When investigating patient age in Computer BEACH we found that almost 5% of patients had a negative value for patient age (ranging from –6727 to –5 years). These have been removed from this comparative analysis. This negative count was found to be a software problem.

**Characteristics of patient reasons for encounter****DISTRIBUTION OF PATIENT REASONS FOR ENCOUNTER BY ICPC-2 CHAPTER**

As shown in Table 10, the distribution of the patient RFEs across ICPC-2 chapters differed marginally between the two studies, the proportion in each chapter being within +/- 0.5% in all chapters bar one. The exception was the skin chapter, which accounted for 17.0% of RFEs in Paper BEACH but only 13.4% of those in Computer BEACH.

It was earlier demonstrated that these were significantly fewer patient RFEs recorded in Computer BEACH than in Paper BEACH (117 per 100 encounters compared with 147 per 100) resulting in significantly less RFEs per 100 encounters in Computer BEACH. When the rates were considered by ICPC-2 Chapter this difference was particularly in the more commonly used chapters of respiratory and skin RFEs, those related to the musculoskeletal and circulatory system and of a general nature. The difference in relative rates gradually reduced in the less common chapters (Table 10).

#### **DISTRIBUTION OF REASONS FOR ENCOUNTER BY COMPONENT**

As shown in Table 11, the distribution of RFEs across ICPC-2 components differed markedly between the two studies. A greater proportion of RFEs recorded in Computer BEACH were described in diagnostic/disease terms (23.9% compared with 15.1% in Paper BEACH) and a lower proportion in symptomatic terms (47.2% compared with 55.8%). However equal proportions of RFEs were described in terms of the process of care (28.7% of Paper BEACH RFEs and 28.9% of Computer BEACH RFEs).

The rates per 100 encounters for each of the ICPC-2 Components was influenced by both the overall low rate of recording RFEs in Computer BEACH and the above difference in distribution. The combination resulted in very low relative rates of symptoms and complaints in Computer BEACH (55.4 per 100 encounters, 95% CI 75.2–89.5) compared with Paper BEACH (82.3 per 100, 95% CI 49.3–61.6) but a higher relative rates of diagnoses/diseases (28.0 per 100 Computer BEACH encounters compared with 22.3 per 100 Paper BEACH).

**Table 10: Distribution and rates per 100 encounters of patient RFEs by ICPC-2 Chapter**

ICPC-2 Chapter	PAPER BEACH			COMPUTER BEACH		
	Per cent of total RFEs	Rate per 100 encounters	95% CI	Per cent of total RFEs	Rate per 100 encounters	95% CI
Respiratory	20.5	30.3	26.0–34.5	21.7	25.5	19.3–31.7
Skin	17.0	25.0	20.4–29.6	13.4	15.7	13.3–18.1
Musculoskeletal	12.0	17.7	11.0–24.5	12.3	14.4	11.9–17.0
General & unspecified	11.4	16.8	14.1–19.6	12.3	14.4	7.7–21.2
Circulatory	7.4	10.9	9.2–12.5	7.4	8.7	7.4–10.1
Endocrine & metabolic	5.8	8.6	6.7–10.5	5.4	6.3	5.1–7.5
Digestive	4.5	6.7	5.0–8.3	5.0	5.9	4.1–7.7
Psychological	4.1	6.0	4.8–7.2	4.3	5.1	4.0–6.2
Female genital system	3.3	4.9	3.0–6.8	3.6	4.3	2.9–5.7
Ear	3.2	4.8	3.5–6.0	3.2	3.7	2.8–4.7
Neurological	2.7	3.9	2.6–5.3	3.0	3.6	2.7–4.4
Urology	2.0	2.9	2.3–3.5	2.2	2.6	0.3–4.9
Eye	1.8	2.7	1.9–3.4	1.8	2.2	1.6–2.7
Pregnancy & fam plan	1.6	2.4	1.7–3.1	1.8	2.1	1.0–3.1
Blood	1.4	2.0	1.2–2.8	1.7	2.0	1.4–2.7
Male genital system	0.7	1.1	0.0–2.7	0.6	0.7	0.2–1.2
Social	0.6	0.9	0.0–1.9	0.3	0.3	0.0–1.3
<b>Total RFEs</b>	<b>100.00</b>	<b>147.44</b>	<b>138.9–156.0</b>	<b>100.00</b>	<b>117.48</b>	<b>112.3–122.7</b>

**Table 11: Distribution of reasons for encounter by component**

ICPC-2 Component	PAPER BEACH			COMPUTER BEACH		
	Per cent of total RFEs (n=3,981)	Rate per 100 encounters	95% CI	Per cent of total RFEs	Rate per 100 encounters	95% CI
Symptoms & complaints	55.8	82.3	75.2–89.5	47.2	55.4	49.3–61.6
Diagnosis, diseases	15.1	22.3	17.6–26.9	23.9	28.0	21.3–34.7
Diagnostic,prevent procedures	14.6	21.5	16.4–26.6	15.5	18.2	14.9–21.4
Medications & therapeutics	6.8	10.0	7.3–12.7	8.2	9.7	7.1–12.2
Referral & other RFE	4.4	6.4	3.9–8.9	2.3	2.7	0.4–5.1
Results	2.8	4.1	2.3–5.9	2.2	2.6	0.7–4.6
Administrative	0.5	0.8	0.2–1.3	0.7	0.8	0.0–2.5
<b>Total RFEs</b>	<b>100.00</b>	<b>147.44</b>	<b>138.9–156.0</b>	<b>100.00</b>	<b>117.48</b>	<b>112.3–122.7</b>

## Characteristics of problems managed

It was earlier demonstrated that the number of problems managed at encounter was significantly lower at Computer BEACH encounters than at Paper BEACH encounters. It was hypothesised that the higher proportion of encounters involving management of only a single problem may reflect selective behaviour of the GP. The question was whether the participants were systematically selecting ‘easier’ encounters to record in Computer BEACH.

The characteristics of the problems managed in terms of their status to the patient and the proportion of chronic versus acute conditions were therefore investigated.

As shown in Table 12, the problems recorded in Computer BEACH were significantly more likely to be new problems to the patient (problems managed for the first time or first visit for the recurrence of an acute condition) than in Paper BEACH (55.8% in Computer BEACH and 41.3% in Paper BEACH).

However, while it was thought that this might result in a higher proportion of acute conditions, this was not the case, about 31% of problems in both studies being classed as chronic in nature.

**Table 12: Characteristics of problems managed**

Problem characteristics	PAPER BEACH		COMPUTER BEACH	
	Per cent of problems managed	95% CI	Per cent of problems managed	95% CI
New problem to patient	41.3	34.1–48.6	55.8	50.4–61.2
“Chronic” Problem	30.3	25.5–35.1	31.5	26.9–36.0

## Number of problems managed at encounter:

The low relative rate of problems managed per 100 encounters in Computer BEACH led to investigation of the distribution of problems across encounters. As shown in Table 13, the GPs were significantly more likely to enter only one problem on the computer (81.4%) than in Paper BEACH (68.7%) and significantly less likely to record two problems. There was also a trend for less frequent recording of three and four problems managed but due to the small sample size these differences failed to reach statistical significance.

**Table 13: Number of problems managed at encounter:**

Number of problems	PAPER BEACH		COMPUTER BEACH	
	Per cent of encounters	(95% CI)	Per cent of encounters	(95% CI)
One	68.7	(62.5–74.9)	81.4	(75.6–87.2)
Two	22.0	(18.8–25.2)	14.3	(10.6–17.9)
Three	7.0	(4.5–9.5)	3.1	(1.6–4.7)
Four	2.3	(0.6–4.0)	1.2	(0–2.7)

### **Distribution of problems by chapter**

Table 14 provides two views of the morbidity data recorded in the two studies. First the data are compared in terms of the distribution of problems recorded, across ICPC-2 chapters. Such analyses do not take into consideration the fewer problems recorded at Computer BEACH encounters, but can give an indication of the extent to which some types of morbidity may selectively be recorded in Computer BEACH or selectively be excluded.

The results demonstrate that while there were only 124.2 problems managed per 100 Computer BEACH encounters (compared with 142.9 per 100 in Paper BEACH, there was no significant difference in the distribution of these problems across ICPC-2 Chapters. The comparative results for the more common chapters are provided in graphic form in Figure 1 and demonstrate trends for lower proportions of respiratory, skin, and general/unspecified problems, and slightly higher proportions of endocrine/metabolic, digestive and skin problems, but none of these trends reached statistical significance. This may be due to the relatively small sample size involved in both studies.

The other comparison, rates per 100 encounters for each ICPC-2 chapter, also demonstrated no statistically significant differences between the two studies. The relative rates of the more common problem managed by chapter are presented graphically in Figure 2. The trend for fewer recorded problems in Computer BEACH was most apparent in the area of respiratory problems (recorded at a rate of 14.4 per 100 encounters in Computer BEACH and 16.4 in Paper BEACH).

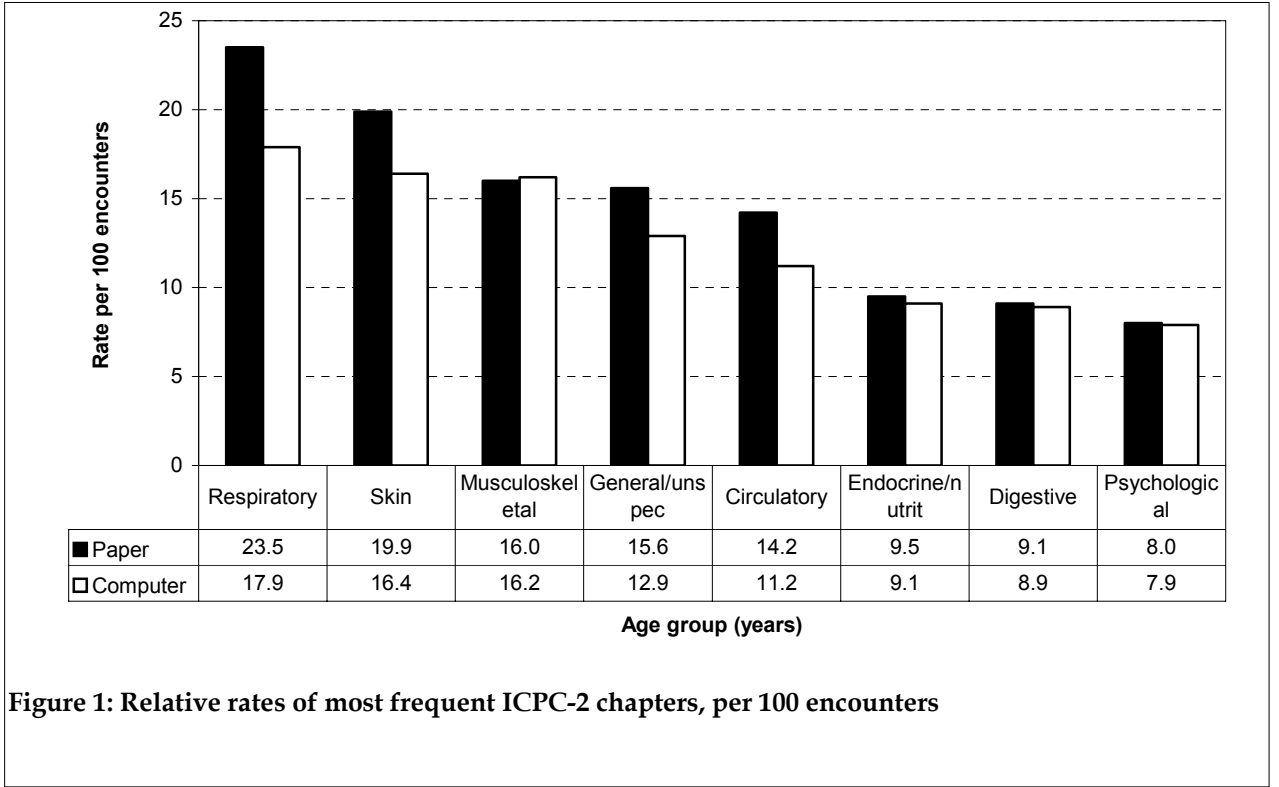
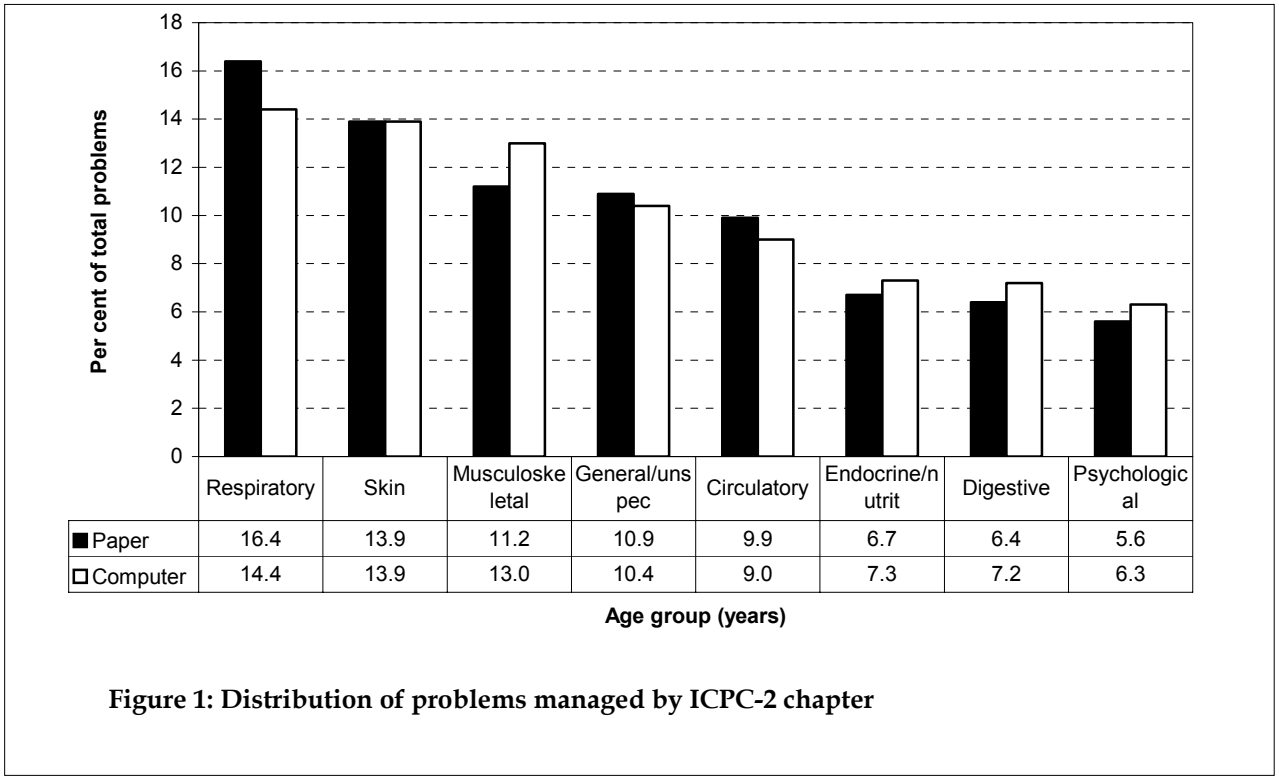
### **Extrapolated effect on a full years activity for these 27 GPs.**

While this difference failed to reach statistical significance it has a major impact on any extrapolations drawn from it. For example, if we assume that the average GP has 5,000 consultations per year we could extrapolate to the work activity of these 27 GPs. This extrapolation would suggest that:

- From Paper BEACH, these GPs would have managed an estimated 31,725 respiratory problems (range 26,460—37,000) in that year
- From Computer BEACH we would estimate these 27 GPs managed 24,200 respiratory problems (range 21,000—27,400) that year.

**Table 14: Distribution of problems managed by ICPC-2 Chapter**

ICPC-2 Chapter	PAPER BEACH			COMPUTER BEACH		
	Per cent of total problems	Rate per 100 encounters	95% CI	Per cent of total problems	Rate per 100 encounters	95% CI
Respiratory	16.4	23.5	19.6–27.4	14.4	17.9	15.6–20.3
Skin	13.9	19.9	13.0–26.8	13.9	16.4	9.7–23.1
Musculoskeletal	11.2	16.0	13.7–18.3	13.0	16.2	13.2–19.1
General & unspecified	10.9	15.6	12.7–18.4	10.4	12.9	10.3–15.6
Circulatory	9.9	14.2	10.4–18.0	9.0	11.2	8.2–14.1
Endocrine & metabolic	6.7	9.5	8.1–10.9	7.3	9.1	7.3–10.9
Digestive	6.4	9.1	7.0–11.1	7.2	8.9	7.4–10.4
Psychological	5.6	8.0	6.1–9.9	6.3	7.9	5.7–10.0
Female genital system	4.0	5.7	3.8–7.5	4.4	5.5	3.9–7.2
Ear	3.7	5.3	3.9–6.7	3.6	4.4	3.6–5.3
Neurological	2.6	3.7	2.4–4.9	3.2	4.0	3.0–4.9
Urology	2.3	3.3	2.4–4.1	2.2	2.8	1.9–3.6
Eye	2.0	2.8	2.2–3.4	2.1	2.6	2.2–3.1
Pregnancy & fam plan	1.8	2.6	2.0–3.3	1.9	2.3	1.5–3.1
Blood	1.0	1.5	0.5–2.5	0.9	1.1	0.3–1.9
Male genital system	1.0	1.5	0.5–2.4	0.6	0.7	0.2–1.3
Social	0.6	0.8	0.0–2.4	0.3	0.4	0.0–1.1
<b>Total problems</b>	<b>100.00</b>	<b>142.93</b>	<b>132.5–153.3</b>	<b>100.00</b>	<b>124.22</b>	<b>114.9–133.5</b>



### **Most common individual problems managed**

The problems most frequently managed from the Paper BEACH are shown in decreasing order of frequency in Table 15. The rankings for these same problems in Computer BEACH are provided together with the parallel percent of total problems managed and the relative rate of management per 100 encounters.

The most frequently managed problems reported in Paper BEACH were also the most common four in Computer BEACH and their Ranked position remained the same. The problems that ranked 5-9 inclusive also remained in the same relative position. However, in Computer BEACH osteoarthritis was managed at less than half the rate of Paper BEACH and dropped to Rank 19 compared with Rank 5 on paper. Dermatitis was also managed at half the rate in Computer BEACH than in Paper BEACH, ranking 30<sup>th</sup> most common problem on computer and number 10 on paper. While these differences may be simple ‘flukes’ in this small sample, the overall low rates of management of all the top problems would provide lower estimates of annual management rates than estimates based on Paper BEACH. Examples from the top 4 problem management rates, based on an estimated 135,000 encounter per year for the 27 GP participants are as follows:

- Paper BEACH would provide an estimated 11,700 occasions on which URTI was managed – Computer BEACH would estimate 8,000
- Paper BEACH would provide an estimated 10,500 occasions on which hypertension was managed – Computer BEACH would estimate 7,500
- Paper BEACH would provide an estimated 7,000 occasions on which immunisation/vaccination was managed – Computer BEACH would estimate 3,800
- Paper BEACH would provide an estimated 4,500 occasions on which depression was managed – Computer BEACH would estimate 3,400.

It is interesting to note that the major differences in relative frequencies of management are related to the top few problems and that less frequent events show far smaller and fewer differences in rates between the two methods of data collection.

**Table 15: Most common recorded individual problems managed**

Problem managed	PAPER BEACH				COMPUTER BEACH			
	Per cent of total problems	Rate per 100 encounters	95% CI	Rank	Rank	Per cent of total problems	Rate per 100 encounters	95% CI
Upper respiratory infection, acute	6.1	8.7	6.3–11.0	1	1	4.7	5.9	3.7–8.0
Hypertension*	5.5	7.8	5.6–10.0	2	2	4.4	5.5	4.2–6.8
Immunisation all*	3.7	5.2	2.1–8.4	3	3	2.8	3.5	2.1–4.9
Depression*	2.3	3.3	2.2–4.5	4	4	2.5	3.1	2.2–4.0
Osteoarthritis*	2.1	3.0	2.0–4.0	5	19	1.0	1.3	0.7–1.9
Asthma	2.0	2.9	1.7–4.0	6	6	2.0	2.5	1.6–3.4
Lipid disorder	2.0	2.8	1.5–4.1	7	7	2.0	2.5	0.9–4.1
Sprain/Strain*	1.6	2.3	1.4–3.3	8	10	1.4	1.7	0.9–2.6
Diabetes*	1.4	2.0	1.2–2.9	9	9	1.5	1.8	1.2–2.4
Dermatitis, contact/allergic	1.4	2.0	1.4–2.7	10	30	0.8	1.0	0.7–1.3
Back complaint*	1.3	1.9	0.5–3.2	11	5	1.4	1.7	1.2–2.2
Oesophagus disease	1.2	1.8	1.1–2.5	12	**	**	**	**
Malignant neoplasm skin	1.2	1.8	0.0–10.3	13	24	0.9	1.1	0.0–4.9
Prescription all*	1.2	1.7	0.4–2.9	14	**	**	**	**
Acute otitis media/myringitis	1.2	1.7	0.5–2.8	15	11	1.4	1.7	1.2–2.2
General check-up*	1.1	1.6	0.6–2.6	16	28	0.8	1.0	0.3–1.7
Gastroenteritis, presumed infection	1.1	1.6	0.9–2.2	17	16	1.1	1.4	0.6–2.2
Female genital check-up*	1.1	1.5	0.0–3.2	18	18	1.0	1.3	0.4–2.2
Acute bronchitis/bronchiolitis	1.1	1.5	0.8–2.2	19	8	1.6	2.0	1.1–2.9
Anxiety*	1.0	1.5	0.4–2.5	20	21	1.0	1.2	0.2–2.1
Subtotal	39.6					32.4		
<b>Total problems</b>	<b>100.00</b>	<b>142.93</b>	<b>132.5</b>			<b>100.00</b>	<b>124.22</b>	

\*\* outside the top 30 problems and therefore less than 0.8 per 100 encounters

Note: Shading indicates statistically significant differences between the results of Paper BEACH and Computer BEACH

## Management of problems

With the fewer problems managed at Computer BEACH encounters, it is not surprising that there were significantly lower rates of management (all types) per 100 encounters. The management data for the two studies was therefore compared in relation to the number of problems managed. This investigates the hypothesis that the lower number of treatments recorded purely reflects the fewer problems managed, and is not in itself an indication of additional missing data in each of these data fields.

Table 16 shows that the likelihood of at least one medication being prescribed/advised/supplied for a problem did not differ between the studies, approximately 56% of problems managed generating at least one medication action. The likelihood of the GP recording at least one other treatment, at least one pathology test, at least one referral and at least one imaging order also did not significantly differ though there was a general tendency for slightly lower proportions of problems to have each of these management types applied.

These results indicate that when the GPs were recording on computer they were not significantly less inclined to record a single management action of each type for an individual problem but were significantly less inclined to record multiple actions of any type for the management of an individual problem.

**Table 16: Presence of management type per 100 problems managed**

Management type	PAPER BEACH		COMPUTER BEACH	
	Per cent of problems managed	95% CI	Per cent of problems managed	95% CI
At least 1 medication	56.5	51.8–61.2	55.6	49.5–61.8
At least 1 other treatment	35.7	27.6–43.8	28.9	20.1–37.6
At least 1 pathology	10.2	8.1–12.3	8.1	5.9–10.3
At least 1 referral	7.8	6.2–9.4	6.8	4.9–8.6
At least 1 imaging	5.3	3.9–6.7	4.0	2.9–5.1

This hypothesis was tested by comparing the relative rate of each management event per 100 problems managed and the results are presented in Table 17.

The results demonstrate the hypothesis to be true for all management types but particularly medication management. GPs recorded medications at a rate of 71.8 per 100 problems managed in Paper BEACH but only 62.6 per 100 problems in Computer BEACH.

**Table 17: Management rates in relation to problems managed**

Management type	PAPER BEACH Rate per 100 problems	COMPUTER BEACH Rate per 100 problems	Difference	Normality of Difference*	t-test or Signed Rank Test p-value*
Medications	71.78	62.56	9.22	Non-normal	<0.0001
Other treatments	43.52	29.06	14.46	Non-normal	0.0001
Clinical	32.9	17.9	15.0	Normal	0.0007
Procedures	10.4	11.2	0.76	Non-normal	0.31
Pathology	17.3	11.5	5.8	normal	0.0079
Referrals	8.14	6.77	1.37	normal	0.17
Imaging	6.17	4.04	2.13	Non-normal	0.0001

\* Paired t-test was used as the test of significance or difference where the distribution of the difference was normal. Signed rank test was used as the test of significance where the distribution of the difference was non-normal (see Methods)

## MEDICATIONS

### Medications by form of supply

The distribution of medications by form of supply is compared for Paper and Computer BEACH in Table 18. There was no significant difference between the studies in the proportion of medications that were recorded as prescribed (83.4% in Paper BEACH and 78.0% on Computer BEACH). There were also no significant differences in the proportion said to be advised for patient over-the-counter purchase or the proportion provided directly by the GP, though there was a trend for a higher proportion of GP supplied in Computer BEACH (11.2%) compared with Paper BEACH (5.2%) which failed to reach statistical significance in this relatively small sample.

In terms of the rate of medication per 100 problems managed there was also no significant difference in rates of medications prescribed, supplied or advised. However when the rates were considered in terms of the number of encounters, the fewer problems recorded in Computer BEACH led to a significant difference in the relative rate of prescribed drugs. In Paper BEACH GPs recorded 86.6 prescribed medications per 100 encounters (95% CI: 74.3–99.0) compared with 61.7 per 100 (95% CI: 50.6–72.2) in Computer BEACH.

This difference leads to very large discrepancies in extrapolated results. If we again assume an average 5,000 encounters per year per participating GP, Paper BEACH would suggest an annual 116,900 prescribed medications for these 27 participating GPs and Computer BEACH would suggest an annual prescribed medication count of 83,300 for these GPs.

### Distribution of prescribed medications by class

The distribution of the prescribed medications across CAPS classes are compared in Table 19. While there were some minor variations in the medications distribution across classes (*Per cent of scripts*), the classes fell in the same rank order in both studies, with antibiotics the most commonly prescribed medication.

Relative rates of each pharmacological class per 100 problems managed and rates per 100 encounters demonstrated only one significant difference between the studies: skin medications were recorded significantly less often in Computer BEACH when compared with Paper BEACH, both in terms of their rates per 100 problems managed (1.8 per 100 problems in Computer BEACH compared with 3.3 per 100 in Paper BEACH, and in terms of rates per 100 encounters (2.2 per 100 encounters in Computer BEACH and 4.7 per 100 in Paper BEACH). This is probably a reflection of difference in rates of management of skin problems, managed at a rate of 13.9 per 100 Computer BEACH encounters and 19.9 per 100 Paper BEACH encounters.

**Table 18: Medications by form of supply**

Medication status	PAPER BEACH			COMPUTER BEACH		
	Per cent of medications (95% CI)	Rate per 100 problems (95% CI)	Rate per 100 encounters (95% CI)	Per cent of medications (95% CI)	Rate per 100 problems (95% CI)	Rate per 100 encounters (95% CI)
Prescribed	83.4 (78.8–88.0)	60.6 (53.5–67.8)	86.6 (74.3–99.0)	78.0 (66.5–89.5)	49.5 (41.8–57.2)	61.7 (50.6–72.2)
GP supplied	5.2 (2.9–7.5)	3.8 (1.9–5.7)	5.4 (2.4–8.4)	11.2 (0.5–21.9)	7.1 (0.0–17.6)	8.9 (0.0–22.6)
OTC Advised	11.4(7.9–15.0)	8.3 (5.9–10.7)	11.9 (8.2–15.6)	10.8 (7.3–14.3)	6.9 (4.3–9.4)	8.5 (5.1–11.9)

Note: Shading indicates statistically significant differences between the results of Paper BEACH and Computer BEACH

**Table 19: Distribution of prescribed medications by class**

Medication Class	PAPER BEACH					COMPUTER BEACH				
	Per cent of scripts	Rate per 100 problems	95% CI	Rate per 100 encs	95% CI	Per cent of scripts	Rate per 100 problems	95% CI	Rate per 100 encs	95% CI
Antibiotics	18.0	10.9	8.7–13.2	15.6	12.7–18.5	22.6	11.2	8.6–13.8	13.9	11.0–16.8
Cardiovascular	16.0	9.7	6.9–12.6	13.9	9.2–18.6	14.5	7.2	5.2–9.2	9.0	5.9–12.0
CNS	9.7	5.9	4.4–7.3	8.4	6.1–10.7	8.9	4.4	3.2–5.6	5.5	3.8–7.2
Respiratory	8.9	5.4	3.6–7.2	7.7	5.1–10.4	8.7	4.3	3.2–5.4	5.4	3.9–6.8
Psychological	6.6	4.0	3.1–5.0	5.7	4.4–7.1	7.4	3.6	2.3–5.0	4.5	2.8–6.3
Musculoskeletal	6.5	3.9	2.8–5.0	5.6	4.1–7.1	6.4	3.2	2.4–4.0	4.0	2.9–5.0
Hormones	6.1	3.7	2.6–4.8	5.3	3.7–6.9	5.7	2.8	1.6–4.0	3.5	1.9–5.1
Allergy, immune system	6.1	3.7	2.0–5.4	5.3	2.8–7.8	4.6	2.3	1.6–3.0	2.8	2.0–3.7
Skin	5.5	3.3	2.6–4.1	4.7	3.7–5.8	3.6	1.8	1.2–2.4	2.2	1.5–3.0
Digestive	4.1	2.5	1.7–3.3	3.6	2.5–4.7	3.6	1.8	0.0–4.2	2.2	0.0–5.2
Ear, nose topical	2.4	1.5	1.0–1.9	2.1	1.4–2.7	2.9	1.4	0.7–2.1	1.8	1.0–2.6
Blood	2.1	1.2	0.5–2.0	1.8	0.6–2.9	2.7	1.3	0.6–2.1	1.7	0.6–2.7
Urogenital	1.9	1.1	0.5–1.8	1.6	0.7–2.6	2.5	1.2	0.9–1.6	1.5	1.1–1.9
Contraceptives	1.9	1.1	0.7–1.6	1.6	1.0–2.3	1.7	0.9	0.5–1.3	1.1	0.5–1.7
Eye medications	1.6	1.0	0.3–1.6	1.4	0.6–2.2	1.7	0.8	0.3–1.4	1.0	0.2–1.8
Nutrition, metabolism	1.4	0.9	0.3–1.4	1.2	0.3–2.1	1.5	0.7	0.5–1.0	0.9	0.5–1.3
Miscellaneous	0.6	0.4	0.0–1.3	0.6	0.0–1.9	0.4	0.2	0.0–0.7	0.3	0.0–1.1
Anti neoplastics	0.4	0.3	0.0–0.7	0.4	0.0–1.1	0.2	0.1	0.0–1.4	0.2	0.0–1.6
Surgical preparations	0.2	0.1	0.0–1.0	0.1	0.0–1.6	0.1	0.1	0.0–1.2	0.1	0.0–1.4

Note: Shading indicates statistically significant differences between the results of Paper BEACH and Computer BEACH

## 6. DISCUSSION

This study has revealed some interesting issues in relation to active computerised data collection of the BEACH dataset by GPs, and more general issues related to the acceptability and feasibility of the introduction of any data collection software introduced as an independent module on a GPs clinical system.

The rate of agreement to participate in Computerised BEACH was expected to be higher than the usual recruitment rate in the National sample. The GPs being approached had already agreed and participated in the paper based BEACH program and therefore could be classed as 'friendly'. However, the 'agreement to participate' rate was the same as that normally experienced in the national BEACH program and this was largely due to a very definite rejection of computerised collection by about one in five GPs approached. This indicates that while many industries are fast becoming highly dependent on computers for their operations, general practice is not, as a profession, fully accepting of this mode of data collection.

Further, the 'failure to complete' rate in Computer BEACH was far higher than normally experienced in Paper BEACH. This was due to a number of factors including technical problems at some practice sites such as incompatible software, blocks to the addition of new software on the practice server, lack of a full PC on the GPs desk into which the software could be placed as well as difficulties with the software itself and the time taken by some GPs to enter the data.

The proportion of GPs who agreed to participate but who requested a computer for the purpose was somewhat surprising. It had been thought that GPs who were not using a computer on their desk would be unlikely to agree to participate. Eight of the ten GPs who requested the loan of a computer actually completed. This suggests that the GPs with a computer on the desk may have been going through a triple data collection process – once for generating of computer scripts +/- indication, once in a paper based record and then again in the BEACH data collection program. Those without were perhaps in general reliant on paper based records and BEACH was only a single addition to their data recording of their clinical activity.

While the delivery of a computer to these GPs proved feasible (though relatively expensive) in this localised study it is clear that such a lending process would not be feasible in a National data collection program. Considering that the high completion rate of these GPs meant they accounted for 25% of the sample, in relative terms this would mean lending computers to perhaps one hundred GPs a years and transporting them too and fro across the country.

Software issues certainly affected completion rates. The major complaint of the GPs who completed the follow-up questionnaire was the difficulty they had with the 'pick lists'. These are lists of terms accessed through a key word system in ICPC-2 PLUS or through entry of the drug prescribed through CAPS. GPs who use ICPC-2 PLUS in their clinical systems (through such EHR providers as Medial Spectrum and MedTech) do not have a problem with the pick lists. The difference is probably due to the fact that the BEACH computerised data collection software was designed in Visual Basic and was required to fit with the structure of the current paper based BEACH database. As a result the ICPC-2 PLUS did not work in the same user-friendly manner that occurs in EHR software. This was said (by the software developer) to be the result of a limitation of Visual Basic within the confines of the BEACH database requirements.

The results of the follow-up questionnaire to GPs suggested a broad range of experiences with the software. While some GPs felt the process was faster than writing the information down in Paper BEACH, others found it more time consuming. The answers from respondents who had dropped out suggested that some had found it far too time consuming to continue. Why some found the process easy and others hard cannot be explained from this study. It was not related to the GPs self-assessed computer skills.

The information collected about the characteristics of the patients was far more complete than that obtained consistently in the BEACH Paper based program. This was because there was a software reminder to the GP if they had failed to select either a 'yes' or a no', or to complete date of birth and gender of the patient when attempting to leave the record. The GPs was allowed to leave these options blank but had to specify each of the omissions was intentional, not accidental. This method resulted in virtually no missing data for each of the variables in patient characteristics, compared with an approximate figure of about 1-2% missing age and sex and about 1 in 5 missing for each of the other patient variables in Paper BEACH.

However, irrespective of this excellent result for patient characteristic data, the extent to which the remaining data can be said to be complete is a major test of the reliability and validity of the data collected through this method. The results demonstrate that compared with paper BEACH there was a significant and uniform decrease by these GPs in the number of patient RFEs, the number of problems managed, the number of medications, other treatments tests, investigations and referrals reported when they entered the data on computer.

Investigation of the distributions of the recorded data for each data element suggested that the GPs were not consciously selecting young patients, encounters with few RFEs, few problems or few management actions. Rather the under-recording was across the board, irrespective of the patient, RFE or problem. For example, the number of encounters including at least one RFE, at least one problem did not differ between the data collection methods. What differed was the proportion of encounters at which multiple RFEs and/or multiple problems were recorded. In parallel, the number of problems generating at least one medication action did not differ between Paper and Computer BEACH, but the relative rate of multiple medication actions per problem did. In Computer BEACH the GPs were inclined to stop at one medication, or one clinical treatment rather than complete details of multiple medications or multiple clinical treatments. Extrapolation of these results for these 27 GPs from their Paper BEACH and Computer BEACH records demonstrated the very large discrepancy in the numbers of each data element recorded.

For the analysis of the data we had planned to adjust for differences in the characteristics of the patients seen by each GP in the two methods, and to adjust for differences in morbidity patterns between the two studies if they were apparent. This did not prove to be necessary since there were not significant differences in the characteristics of the patient seen by each GP when they were matched between Paper and Computer BEACH, and there was no significant difference in the distribution of problems managed at the encounter.

The implications of the results of this study for other active modular data collection system are many. Clearly such systems will be acceptable to some but not all GPs. The trend for placing blocks on practice file server which disallow any 'foreign' software to be added together with the fact that some practices have 'dumb' terminal on the GPs desk (thus discounting the possible addition of the foreign software on a desk PC), will increasingly affect the chances of GP adoption of external data collection systems.

The excellent completion rates on patient characteristic data augers well for collection of simple structured tick box data elements. However the low recording rate for more complex data elements such as problems managed and medication prescribed/advised/ supplied suggest that reliability will only be gained if very simple information is requested.

The low recording rates of clinical information also puts some doubt on the completeness of the health records kept on the majority of clinical systems. Very few GPs are paperless so very few rely totally on the their EHRs for a complete record of the patient. The length of time it takes to enter the data will clearly influence the extent to which the data are complete.

## **7. CONCLUSION**

The research hypothesis tested in this study must all be rejected. The results demonstrate that while a computer system can be used for active collection of general practice activity data this form of data collection provides data that significantly differs from that collected in the paper-based active recording system. We can also suggest that active electronic data collection in an add-on module such a Computer BEACH is acceptable to less than half the GPs.

We can conclude that this form of data collection will not be a feasible method of data collection for national general practice activity data in the near future. Other methods of automated data collection will need to be investigated in the future. This may include the testing of software that interfaces with the GP's current EHR, saving double entry of common data elements. However, this would require high levels of co-operation from multiple software providers as such the interface software would need to be incorporated into each of the available EHR/prescribing systems. The alternative is the development and wide acceptance of a standardized interface module that would allow extraction of data collected in the electronic health records. However, the extent to which the records are complete would still effect the outcomes. The associated module would therefore need to activity question the GP about the completeness of each data element prior to closure of the record. It would not be a matter of providing a disk or emailing a program to the GP in the hope that it would interface with his/her current software.

This study would also suggest that the use of small and simple data sets is essential if data collected through electronic means is to be complete, reliable and a valid measure of the action being recorded.

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## APPENDICES

- Appendix 1: GP Approach letter*
- Appendix 2: Cover letter to GPs agreeing to participate*
- Appendix 3: Patient information sheet (normally laminated)*
- Appendix 4: Height and weight conversion charts.*
- Appendix 5: Normal BEACH GP instructions*
- Appendix 6: Standard drinks chart*
- Appendix 7: Instructions for entering data on the Computer BEACH software*
- Appendix 8: Cover letter for results and follow up questionnaire for triennium 5 GPs*
- Appendix 9: Cover letter for results and follow up questionnaire for triennium 6 GPs*
- Appendix 10: Follow-up questionnaire to GP participants*

## *Appendix 1: GP Approach letter*

«Letter»

«DOCID»

«Title» «Firstname» «Surname»

«Address1»

«Address2»

«Suburb» «State» «Pcode»

Dear «Title» «Surname»

**Computerised BEACH**

### **BETTERING THE EVALUATION AND CARE OF HEALTH**

**A controlled trial of BEACH data collection by direct active computerised data entry by the GP at the time of the encounter**

You kindly participated in the BEACH national data collection program during the last tri-ennium, completing paper based forms about 100 consecutive encounters.

**The RACGP and the Western Sydney Division of General Practice** have together funded a project to test active computerised data collection for BEACH. We are looking for 40 GPs in the Western Sydney Division who have already done BEACH on paper, and who would like to try collecting the information on computer. We need to include people who have already done BEACH on paper so we can directly compare the results of the two methods, without influence of differences in the characteristics of the two GP samples.

**We are now in a new Quality Assurance triennium. Participation in this testing of computerised BEACH<sup>®</sup> earns you 20 Clinical Audit points. A further 15 CA points can be gained by completing an optional simple re-audit of some patients' smoking and alcohol consumption (on paper) six months later.**

**What would you need to do?** We would post you a disk with a stand-alone computer program for entry of the standard BEACH data set. If you have any trouble with setting it up in your computer the Division will send some technical support upon request. If you do not have a computer on your desk, we will lend you one for the study period and set it up ready for your entry of information.

You will need to complete a record for each of 100 consecutive encounters, recording such details as patient date of birth and sex, their reasons for encounter, problems managed, medications and other treatments provided. You will not need to type words in to describe patient reasons for encounter and problems etc, as you can select terms from pick lists provided when you enter a key word (such as OA, BP, diab etc). At the bottom of each of the last 40 records there are questions to ask the patient: self reported height and weighted, alcohol consumption and their smoking status (just like the paper based sub-study you completed last time). We will also ask you to complete a brief assessment of the acceptability of this approach.

An example of a recording form is enclosed just to remind you of the information you will need to record—though it will be on computer this time.

**What would you gain from the study?** As with the paper based BEACH study, in return for your time you will receive a report containing a detailed profile of your practice, a comparison with nine other de-identified participants in computerised BEACH trial in Western Sydney and the average results from the 40 trial participants.

You will need to fill in a short questionnaire about this report. The RACGP will then allocate 20 CA points. We will also provide resource material on alcohol consumption and smoking plus some tally sheets which you can use six months later if you wish to take part in the final stage of BEACH<sup>®</sup>, worth another 15 CA points.

*page 1 of 3 Computer BEACH<sup>®</sup>*

**Why do we need to carry out this study?** GPs often ask if they can enter the data for BEACH on their computer. However no one has ever tested the extent to which such a change in data collection method affects the data recorded. We aim to assess whether computerised collection is both acceptable to GP participants, and that it produces the same overall results as the paper based method. The results can also be applied more generally to other conversions from paper to computer collection.

### General information about the study.

The General Practice Statistics and Classification Unit is a collaborating Unit of the University of Sydney and the Australian Institute of Health and Welfare. The Unit's major objective is to ensure sufficient information is available about the problems managed and treatments provided in general practice in Australia. The GPSCU is also committed 'to continue development and testing of data collection and analytical methods for gathering National data through electronic means'. This study of electronic data collection is part of that commitment.

### Study aims:

- To demonstrate that an electronic data collection system can be used for the systematic collection of general practice activity data.
- To assess the validity and reliability of data collected in this manner by comparison to paper based collection.
- To assess the acceptability and feasibility of data collection by this mechanism for use in the National program, for use by divisions of general practice and for use in training program evaluation and assessment.

### Hypotheses:

- A computer system can be used for active collection of general practice activity data
- Such a form of electronic data collection will provide data that does not significantly differ from that collected in paper based active recording system.
- This form of electronic data collection will be acceptable to GPs
- This form of data collection will be a feasible method of data collection in the future.

### Uses to which the results will be put

The results from the computerised data collection from Western Sydney will be aggregated and no individual GP or patient identifying information (such as date of birth or postcode) will be released. The aggregated results will be compared with those collected from the same group of GPs on paper in last triennium and conclusions drawn about the reliability, acceptability to GPs, and the feasibility of this method of collection for future BEACH participants. A report will be provided to the Western Sydney Division and the Outcomes Evaluation Unit of the RACGP and considered by the BEACH Advisory Board for its implications for future BEACH national data collection systems. A paper will be prepared for publication in a recognised journal. You can visit our web site at [www.fmrc.org.au](http://www.fmrc.org.au) for more information about our publications.

A research assistant from the Centre will soon contact you by telephone to ascertain your availability and willingness to take part in the study. If you prefer, please ring us on our toll free number **1800 62 73 75**.

Thank you for taking the time to read this letter. We would greatly appreciate your involvement in this project.

*Yours sincerely*

**Dr Helena Britt**

**A/Professor & Director**

General Practice Statistics and Classification Unit, The University of Sydney

page 2 of 3 Computer BEACH<sup>©</sup>

The Royal Australian College of General Practitioners encourages GP participation in *Beach*<sup>®</sup>.

The *Beach*<sup>®</sup> program is endorsed by the Australian Medical Association.

- This project has been approved by the Health Ethics Committee of the Australian Institute of Health and Welfare and the Human Ethics Committee of the University of Sydney.
- The data is being collected under the AIHW ACT 1987 and in accordance with the Privacy Act 1988.
- *BEACH*<sup>®</sup> is overseen by a Program Advisory Board comprising representatives of the University of Sydney, the AIHW, each contributing organisation, the RACGP, the AMA, Divisions of General Practice and the Consumer Health Forum.

**Organisations contributing** to the considerable cost of the *BEACH*<sup>®</sup> program are:

◆The Commonwealth Department of Health and Ageing ◆AstraZeneca Pty Ltd (Aust) ◆Roche Products Pty Ltd ◆Janssen-Cilag Pty Ltd ◆Merck Sharp & Dohme (Australia) Pty Ltd

*Research Team: Dr Helena Britt    Jan Charles    Joan Henderson    Lisa Valenti    Ying Pan*  
Dr Graeme Miller    Stephanie Knox    Chris Harrison    Clare Sutton

Any person with concerns or complaints about the conduct of this study can contact the Manager of Ethics and Biosafety Administration, University of Sydney on (02) 9351 4811

## *Appendix 2: Cover letter to GPs agreeing to participate*

25<sup>th</sup> October 2002

«DOCID»  
«Title» «Firstname» «Surname»  
«Address1»  
«Address2»  
«Suburb» «Pcode»

Dear «Title» «Surname»

### **Computerised BEACH**

#### ***BETTERING THE EVALUATION AND CARE OF HEALTH***

A controlled trial of BEACH data collection by direct active computerised data entry by the GP at the time of the encounter

Thank you for agreeing to take part in this trial of computer entry of the BEACH data. You can start recording as soon as you can and continue until you have completed the 100 consecutive consultations.

- We have your GP profile from last time so will not ask you to complete it again.
- At no time will we release your name or any other identifying information to anyone. Some of these anonymous data will appear in your report together with that of the nine other doctors in your “batch” so that you will have an idea of the basic characteristics of the other doctors.
- We will analyse your results and provide a report just like the one you received when you did the paper-based BEACH. Again, you complete a questionnaire on interpretation of the results in this report.

A feature of this questionnaire is an emphasis on lowering risk factors among your patients.

A reply paid envelope for its return will be sent to you with your report.

When we receive the completed material we will notify the RACGP who will allocate you 20 Clinical Audit points, send you a certificate and some educational intervention materials on smoking and alcohol consumption. **If you wish to take part in a short, optional BEACH Re-Audit of patient smoking, drinking and BMI six months later which is worth an extra 15 CA points, please retain the laminated Patient Information Cards.** Note that this re-audit will be on paper rather than on computer.

Computer BEACH page 1/2

Computerised BEACH (cover letter continued)

**BETTERING THE EVALUATION AND CARE OF HEALTH**

## **Enquiries**

- **Freecall 1800 62 73 75** (When you introduce yourself please specify that you are doing Computer BEACH) for:
  - questions about the project
  - advice and support on data entry issues
  - advice and support when getting the data out to return to us
  - hardware/software problems such as installation or overall software operating problems.

Please return the Computerised BEACH data as soon as you have completed it. You will receive your results about two months later. Once again our thanks for your participation, which is a valuable contribution to this controlled trial of data collection via active computerised data entry by the clinician.

Yours sincerely

### **Chief Investigators**

**Dr Graeme Miller**  
Medical Director

**Dr Helena Britt**  
A/Professor & Director

**Computer BEACH page 2/2**

## INFORMATION FOR PATIENTS

### *Computerised BEACH Project*

Today your doctor is taking part in a survey of general practice called Computer BEACH<sup>®</sup> (*Bettering the Evaluation and Care of Health*). This study is being done by the General Practice Statistics and Classification Unit, University of Sydney, with the Australian Institute of Health and Welfare.

Your Doctor will be recording information into a computer about each patient he/she sees (age, gender etc), the problems that you see the Doctor about and the treatments given to you. **There are no names released with this information so you cannot be identified.** The information about today's visit to the doctor will be one record in a set of about 4,000 records collected in general practices in selected areas of Sydney.

**This information will be used by researchers to compare collection of information on computer with collection of the same information on paper.** We are responsible for a National continuous study of general practice activity called BEACH (*Bettering the Evaluation and Care of Health*). At the moment, GPs who participate in BEACH collect the information on paper. We now want to test whether GPs find it acceptable to use a computer for this data collection and whether we get the same results as we do on paper. If the results for the group are the same, in future GPs will have the choice to use paper or a computer to record their data when participating in the BEACH National Survey of general practice activity.

We will never know your name. No information will ever be released which could possibly let anyone know who you are.

If you do not wish your doctor to record any unidentified information about you or your visit in this special computer program **please tell your Doctor as soon as you go in.** Such a decision will not affect the care your doctor is providing in any way.

SEE OVER FOR PROJECT DETAILS

*(page 1 / 2)*

## **Computerised BEACH<sup>©</sup> Project Details**

This project has been approved by the Ethics Committees of the University of Sydney and the Australian Institute of Health and Welfare (AIHW). The data are being collected under the AIHW ACT 1987 and in accordance with the Privacy Act 1988 (Amended 2001).

### **Chief Investigators**

Dr Graeme Miller, Medical Director

Associate Professor Helena Britt, Director

### **AIHW GP Statistics and Classification Unit, University of Sydney.**

**Organisations contributing financially to the conduct of this study are:**

- ◆ **The Royal Australian College of General Practitioners**
- ◆ **The Australian Divisions of General Practice (through Western Sydney Division of General Practice).**

### **FURTHER INFORMATION:**

**General Practice Statistics and  
Classification Unit  
The University of Sydney  
Acacia House, Westmead Hospital,  
Westmead 2145**

**Phone: (02) 9845 8150  
Fax: (02) 9845 8155  
Email: [helenab@med.usyd.edu.au](mailto:helenab@med.usyd.edu.au)  
Web: <http://www.fmrc.org.au>**

Any person with concerns or complaints about the conduct of this study can contact the Manager of Ethics and Biosafety Administration, University of Sydney on (02) 9351 4811.

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## *Appendix 4: Height And weight conversion chart*

Weight Conversion Chart - Stone/pounds (st lbs) - Kilograms (kg)

Weight		Weight		Weight		Weight		Weight		Weight	
st lbs	kg	st lbs	kg	st lbs	kg	st lbs	kg	st lbs	kg	st lbs	kg
1'	6	4'	25	7'	44	10'	64	13'	83	16'	102
1'1"	7	4'1"	26	7'1"	45	10'1"	64	13'1"	83	16'1"	102
1'2"	7	4'2"	26	7'2"	45	10'2"	64	13'2"	83	16'2"	103
1'3"	8	4'3"	27	7'3"	46	10'3"	65	13'3"	84	16'3"	103
1'4"	8	4'4"	27	7'4"	46	10'4"	65	13'4"	84	16'4"	103
1'5"	9	4'5"	28	7'5"	47	10'5"	66	13'5"	85	16'5"	104
1'6"	9	4'6"	28	7'6"	47	10'6"	66	13'6"	85	16'6"	104
1'7"	10	4'7"	29	7'7"	48	10'7"	67	13'7"	86	16'7"	105
1'8"	10	4'8"	29	7'8"	48	10'8"	67	13'8"	86	16'8"	105
1'9"	10	4'9"	29	7'9"	49	10'9"	68	13'9"	87	16'9"	106
1'10"	11	4'10"	30	7'10"	49	10'10"	68	13'10"	87	16'10"	106
1'11"	11	4'11"	30	7'11"	49	10'11"	68	13'11"	88	16'11"	107
1'12"	12	4'12"	31	7'12"	50	10'12"	69	13'12"	88	16'12"	107
1'13"	12	4'13"	31	7'13"	50	10'13"	69	13'13"	88	16'13"	108
2'	13	5'	32	8'	51	11'	70	14'	89	17'	108
2'1"	13	5'1"	32	8'1"	51	11'1"	70	14'1"	89	17'1"	108
2'2"	14	5'2"	33	8'2"	52	11'2"	71	14'2"	90	17'2"	109
2'3"	14	5'3"	33	8'3"	52	11'3"	71	14'3"	90	17'3"	109
2'4"	15	5'4"	34	8'4"	53	11'4"	72	14'4"	91	17'4"	110
2'5"	15	5'5"	34	8'5"	53	11'5"	72	14'5"	91	17'5"	110
2'6"	15	5'6"	34	8'6"	54	11'6"	73	14'6"	92	17'6"	111
2'7"	16	5'7"	35	8'7"	54	11'7"	73	14'7"	92	17'7"	111
2'8"	16	5'8"	35	8'8"	54	11'8"	73	14'8"	93	17'8"	112
2'9"	17	5'9"	36	8'9"	55	11'9"	74	14'9"	93	17'9"	112
2'10"	17	5'10"	36	8'10"	55	11'10"	74	14'10"	93	17'10"	112
2'11"	18	5'11"	37	8'11"	56	11'11"	75	14'11"	94	17'11"	113
2'12"	18	5'12"	37	8'12"	56	11'12"	75	14'12"	94	17'12"	113
2'13"	19	5'13"	38	8'13"	57	11'13"	76	14'13"	95	17'13"	114
3'	19	6'	38	9'	57	12'	76	15'	95	18'	114
3'1"	20	6'1"	39	9'1"	58	12'1"	77	15'1"	96	18'1"	115
3'2"	20	6'2"	39	9'2"	58	12'2"	77	15'2"	96	18'2"	115
3'3"	20	6'3"	39	9'3"	59	12'3"	78	15'3"	97	18'3"	116
3'4"	21	6'4"	40	9'4"	59	12'4"	78	15'4"	97	18'4"	116
3'5"	21	6'5"	40	9'5"	59	12'5"	78	15'5"	98	18'5"	117
3'6"	22	6'6"	41	9'6"	60	12'6"	79	15'6"	98	18'6"	117
3'7"	22	6'7"	41	9'7"	60	12'7"	79	15'7"	98	18'7"	117
3'8"	23	6'8"	42	9'8"	61	12'8"	80	15'8"	99	18'8"	118
3'9"	23	6'9"	42	9'9"	61	12'9"	80	15'9"	99	18'9"	118
3'10"	24	6'10"	43	9'10"	62	12'10"	81	15'10"	100	18'10"	119
3'11"	24	6'11"	43	9'11"	62	12'11"	81	15'11"	100	18'11"	119
3'12"	24	6'12"	44	9'12"	63	12'12"	82	15'12"	101	18'12"	120
3'13"	25	6'13"	44	9'13"	63	12'13"	82	15'13"	101	18'13"	120

# BEACH

Height Conversion Table - Feet/inches (ft in) -  
Centimetres (cm)

Height		Height		Height	
ft in	cm	ft in	cm	ft in	cm
1'	30	3'	91	5'	152
1"	33	1"	94	1"	155
2"	36	2"	97	2"	157
3"	38	3"	99	3"	160
4"	41	4"	102	4"	163
5"	43	5"	104	5"	165
6"	46	6"	107	6"	168
7"	48	7"	109	7"	170
8"	51	8"	112	8"	173
9"	53	9"	114	9"	175
10"	56	10"	117	10"	178
11"	58	11"	119	11"	180
2'	61	4'	122	6'	183
1"	64	1"	124	1"	185
2"	66	2"	127	2"	188
3"	69	3"	130	3"	191
4"	71	4"	132	4"	193
5"	74	5"	135	5"	196
6"	76	6"	137	6"	198
7"	79	7"	140	7"	201
8"	81	8"	142	8"	203
9"	84	9"	145	9"	206
10"	86	10"	147	10"	208
11"	89	11"	150	11"	211

*Appendix 5: Normal BEACH GP instructions (hard copy only)*

*Appendix 6: Standard drinks chart*

## STANDARD DRINKS

Because drinks vary a lot in strength, it is useful to know how much alcohol is in each common drink. A STANDARD DRINK is one which contains about 10 grams of alcohol. In the table below, you can see that common servings of different kinds of alcoholic drinks in fact contain about the same amount of alcohol.



**Instructions to GPs using Remote BEACH:  
How to load the software and how to enter the information**

***Need support?***

For any problems or support re data entry or data download when complete:- ***Freecall: 1800 62 73 75***

This document only summarises the computer aspects of this program. If you wish to refresh your memory regarding the process (e.g. informing the patient, using the alcohol drinks chart etc) or if you wish to re-read the definitions (which are only briefly summarised in this document), please refer to the GREEN BEACH instruction to GPs.

**1. Loading the Remote BEACH software on your machine:**

- Close all other programs (except Windows)
- Put the Remote BEACH CD in the CD Rom drive and close the drive
- The program will start loading and a message will appear on the screen “Copying files please stand by”
- The next message will warn you that you should not have any other programs open. Click on the picture of the computer.
- Installation will be completed automatically.

*Want a practice run?*

You can go into the first record and work your way through the instructions (starting at point 2 below), using an ‘imaginary patient’. You can ‘save within the problem data box as you go BUT at the end of the record exit without saving!

Do NOT HIT the ‘SAVE’ button on the right hand side of the screen. This is to be used ONLY when you enter real records. Instead, hit ‘**Cancel**’ on the right hand side of the screen – you will not have saved your imaginary encounter!

**2. When ready to start on the first encounter**

- click on ‘start’ in Windows
- select ‘programs’.
- click on “Remote BEACH”

**Screen 1:** BEACH Photo: click on ‘*encounters*’

**Screen 2:** hit ‘OK’ if ready to enter a record

### *Entering a record*

**Hint:** *rely on moving the mouse to move to the next field, Only use 'tab' to move between fields in the Pharmaceutical section of the record.*

- **Encounter number and date of encounter:** automatically generated by the program.
- **DoB**—enter patient's date of birth (dd/mm/yy) (*including the slashes*)
  - **Year:** remember that if the patient was born in 2000, 2001, 2002 or 1899 you will need to enter all FOUR digits of the year – other wise we will assume it is 1901, 1902 etc.
  - **If uncertain** of date of birth enter 01/07/ and your best estimate of year of birth
- **Patient identifier:** you can enter a name or initials in case you need to identify the patient later during the recording period. This is for your purposes only and will not be saved with the final data you send back to us – we can never read anything you enter in this field.
- **Sex:** click on arrow and select *male* or *female*
- **Postcode:** enter postcode of patient's usual residential address
- **Patient situation and billing**
  - Click in the box under *Y* (for Yes) or under *N* (for No) for each of the patient characteristics listed. If you make a mistake and wish to change a yes to a no—just click in the correct box (only one option will be accepted for each characteristic).
  - The program will not let you leave this field until you have responded to EACH of the characteristics question.
- **Definitions:** (More detailed definitions: see page 3 on the green BEACH instructions)
  - **New patient:** If this is the patient's first visit to this PRACTICE – tick new.
  - **NESB** = Non-English speaking background: the patient's primary language spoken at home is NOT English
  - **Aboriginal and Torres Strait Islander:** ask the patient “Are you of Aboriginal or Torres Strait Islander origin? (*note a patient can be both of these*).
- **Patient seen:** select box next to *Yes* or *No*
- (you should be completing an encounter record for all patients whom you actually physically see and those whom you do not see but provide a service which should normally be recorded in your medical records)
- Medicare item number: (more details see page 3 on the green instruction sheets)
- If a Medicare item number applied to this encounter (no matter who you are billing for it) hit the arrow and select the appropriate item number.
- If no item number applies leave it as '*unstated*' (the default)
- If a Medicare item number applies but you are charging DVA for this encounter, also tick the DVA billed box.
- If you are billing the encounter against another source tick where appropriate.
- If no charge is made for this encounter – tick '*no charge*'

This question is not about whether or not you bulk bill or privately bill the patients – it is about the rebate payer!

**Reasons for encounter:**

*These are the reasons the PATIENT gives for attending (in response to a question such as 'what can I do for you today?' – these are not your labels for the problems you manage at the encounter)*

- Right click in white section
- Select 'Add'

**A new screen will appear with the curser waiting in left-hand box.**

- Enter a few letters to access key words (or hit down arrow for full pick list).  
*(Note: a full list of the available key words is provided on the PINK sheets in your research pack).*

*Hints: Entering letters such as BP will take you straight to the key word BP*

*Entering 'hyper' will get you down near hypertension, hyperglycaemia etc.*

*Using a site ( e.g. 'wrist') rather than general descriptors such as 'pain' will give you a shorter pick list. If patient says they have pain in the wrist entering 'wrist' will be quicker in the long run than entering 'pain', a word associated with many areas of the body.*

- Hit down arrow (note 'return' will take you back to the previous screen)
- Select the key word.(e.g. hypertensi, BP; arthritis; pain) by clicking on it
- On the right side of the screen will appear a list of all the terms connected to that key word.
- Select the term that is closest to the description of the patient's reason for encounter.

*Hints: If patient says 'about my diabetes', then select 'diabetes mellitis – do not specify the type because you know that it is NIDDM, or IDDM – this is about what the patient said – not about your problem/diagnostic label.*

- Hit OK – you will be immediately returned to the previous screen

If you want to add another RFE – repeat the above process.

*Hint: If you want to change what you have selected a right click on the RFE field also offers the option of 'Review' as well as 'add'.*

When you have entered all the patient reasons for encounter they described, then go to the next field.

**Problems managed**

- Go to Problem field with your curser:
  - Right click
- A new screen appears:
  - Hit 'Select'
  - Enter a few letters or a key word
  - Hit down arrow
  - Select required keyword
  - Go to right hand side and select from the list of problem labels you are presented with
  - If what you want isn't there – try another key word
- When you have found the problem label you want, select it and hit OK

- **Problem status:**
  - Click in the box next to “*New*” if this is the first consultation by any medical practitioner for this problem for this patient (or first visit for a recurrence of a problem)
  - If it is not a new problem to the patient click in the box next to ‘old’
- **Work related:**
  - Click on this box if (in your opinion) this problem is likely to be work related. Otherwise leave blank.

If you want to add another problem that you managed at encounter– repeat the above process.  
*Hint: If you want to change what you have selected a right click on the problem field offers the option of ‘Review’ as well as ‘add’.*

When you have entered all the problems managed at the encounter, then go to the next field.

### *Medication*

You can move between fields within medications, using either the mouse or ‘tab’ key.

If you prescribe, provided to the patient or advised medication for over –the– counter purchase for THIS problem –

- Right click in the white section under ‘Medication’
- Select ‘Add medication’

You will be offered a new screen

- Start to enter medication name (either by brand or generic label – just as you prescribed it). The computer will try to complete the name for you. When it reaches the right one you want, stop typing. In most cases it will offer you a strength as well. Some options provided do not

If the medication is correct but a different strength is wanted

- hit the *arrow* or *F4* and look through the pick list to find strength you want – select.

If it is the correct one offered in the first place (e.g. Amoxil 250 mg) just move to next field.

*Note: In the list you will be offered such names as ‘Amoxicillin NOS’ – try not to select these. ‘NOS’ means ‘Not otherwise stated’, so this choice would not automatically record form and strength. These should only be selected where a new medication has become recently available and is not yet in the database.*

#### **Dose and units**

- Enter *dose:* in this example either 250 or 1
- Enter *Units:* in this example either *mg* or *tablet/capsule* (available from pick list offered when you hit down arrow)

Regimen:

- Enter the number of times (e.g. 2) in Times box and select the interval (from the pick list) in the Interval box) (e.g daily)

*Note: that if you have prescribed/provided/recommended a suspension or other liquid medication (e.g. Ceclor suspension 125 mg in 5 ml it will also complete for you the ‘strength’ and ‘Volume’. You will still need to enter a response for ‘Dose’ and ‘Units’*

Number of repeats: enter number. If no repeats you must enter “0”. The program will not allow you to leave this screen without a response to this item.

New or continuation: click on box for *new* or on the box for *continuation*.  
New = a new medication for this patient for this problems

### **OTC, GP dispensed/supplied**

If you did NOT write a script for this medication, but advised the patient to purchase it over-the-counter,

- click on OTC

If you supplied it yourself (e.g. GP held vaccines and samples etc),

- click on the box next to GP dispensed.

When all the details for this medication are complete hit “accept”  
You will be returned to the previous screen.

### **More medications this problem?**

If another medication is prescribed/advised/supplied for this problem ( at this encounter)– repeat the above procedure, until all medications for this problem provided at this encounter are complete.

### **Other treatments for this problem**

This is for treatments for this problem, other than medication.

Other treatments may include therapeutic procedures of counselling and advice.

Please follow the same process as that described above, starting with a right click in this field.

### **Referrals, tests and investigations**

When you have entered all other treatments for this problem go to the tests and investigations field – right click etc.

*Note: that because pathology and imaging etc can be associated with multiple problems under management you have to enter the problem(s) associated with the test or imaging order. There are limits to the number of pathology tests, imaging orders and referrals that can be entered per encounter record. These are:*

- *Up to 5 pathology orders*
- *Up to three imaging ordered*
- *Up to two referral*  
*If there are more than these limited numbers, please include those that represent the greatest breadth.*
- When all is complete for this record hit SAVE on the right hand side of the screen
- You will be given the next encounter record to fill in.

*Note: If you exit BEACH at the end of a record and then open it again later you will find yourself on the next available encounter record.*

*Note: you can return to an earlier record by clicking on the buttons in the upper right hand section of the screen. The computer will allow you to add to a record or review an entry on a record, only on the record IMMEDIATELY prior to the current record.*

**Patient Risk Factors**: BMI, Alcohol consumption and smoking status.

- On each of the last 40 encounter records you will be asked to complete the SAND patient risk factor section. This section is self explanatory

*Notes:*

*You are not required to measure or weigh the patient – their self reported height and weight is enough.*

*Show the patient the alcohol card when asking about standard drinks, to get a more reliable measure of their alcohol consumption.*

### **Finished?**

When all 100 encounters are completed the records need to be returned to us:

### **Sending the data back to us**

1. When you exit the last record you will be returned to the BEACH picture.
2. Hit 'exit' on the BEACH picture.
3. Open 'BR Transfer'  
Click on 'Start' in Windows (left hand bottom of screen)  
Slide mouse up to 'Programs'  
Go to the list of programs that appears on the right and select (click on) 'BR Transfer'  
which should be just under Remote BEACH on the list offered)
4. The program will export the required data to a separate file ready for transmission.  
Click 'OK' to continue
5. *Follow the instructions provided. These allow you three methods of download and transmission:*
  - **1. Save to a floppy disk (provided in research pack) and post**  
Follow the directions to Copy the data file to the A (floppy) drive (copy time about 1 minute) so you can post it to us in the pre-paid envelope provided.OR
  - **2. FTP upload.**  
Ensure you have connected to the Internet and then follow the directions to transmit the data direct to our computer from yours. Upload takes about 2 minutesOR
  - **3. Email the file as an Email Attachment to us**  
Follow the directions to email to our database manager Tim Chambers on [timc@med.usyd.edu.au](mailto:timc@med.usyd.edu.au)

**Please do not delete the program from your computer until we have confirmed receipt of your data. We will contact you to confirm receipt and will send you a brief questionnaire so you can tell us what you think about computerised BEACH compared with paper based BEACH.**

## ***Appendix 8: Cover letter for results and follow up questionnaire for Triennium 5 GPs***

31st January 2003

«DOCID»  
«Title» «Firstname» «Surname»  
«Address1»  
«Address2»  
«Suburb» «Pcode»

Dear «Title» «Surname»  
**Computerised BEACH<sup>®</sup>**

### **BETTERING THE EVALUATION AND CARE OF HEALTH**

**A controlled trial of BEACH data collection by direct active computerised data entry by the GP  
at the time of the encounter**

You recently participated in the longitudinal controlled trial of computerised BEACH. Thank you for participating and for returning your disk to us. We have now processed your data and enclose a report of your results compared with nine other de-identified GPs who collected data in computer BEACH, and with the National BEACH average (collected on paper). We hope they provide you with some helpful and interesting information.

The enclosed Follow-up Computer Beach questionnaire will help us with this controlled trial. It asks how you felt about collecting the data on computer and your opinion of the program design. It also includes a few questions about your proficiency on a computer as we wish to measure the extent to which proficiency affects the program's acceptability and ease of use. Completing this will take only about 5 minutes and you can fax it to us if you wish (on 9845 8155) or return it with the normal BEACH questionnaire (see below) in the enclosed self-addressed envelope.

To complete the final stage of this 4-step audit section of BEACH, will you please answer the enclosed questionnaire, omitting Question 12. This is not a test nor will your practice methods be assessed, as each doctor practises in a different environment with a different patient population. The purpose is to ensure you have read and interpreted the data in your report.

When you have answered the questions, please return the questionnaires in the reply-paid envelope provided. Remember to fill in your QA number to facilitate the allocation of 20 Clinical Audit points by the RACGP. **Please retain this report if you wish to take part in the optional Re-audit of BMI, smoking and alcohol consumption of 40 patients six months later.** The Re-audit is less time-consuming than the earlier part of BEACH and is worth a further 15 CA points. It is a paper-based activity in which you record and calculate the risk factors, comparing them with the results in this BEACH report to see if the interventions you have undertaken have had an effect. Material for the Re-audit, which includes tally sheets and smoking and alcohol information, will be sent to you with your certificate of completion of this 4-step section when you send back the enclosed questionnaires. Thank you once again for taking part.

Yours sincerely

Dr Graeme Miller  
Medical Director

Dr Helena Britt  
A/Professor & Director

***Appendix 9: Cover letter for results and follow up questionnaire for  
Triennium 6 GPs***

19 December 2002

«DOCID»  
«Title» «Firstname» «Surname»  
«Address1»  
«Address2»  
«Suburb» «State» «Pcode»

Dear «Title» «Surname»

**Computerised BEACH<sup>®</sup>**

**BETTERING THE EVALUATION AND CARE OF HEALTH**

**A controlled trial of BEACH data collection by direct active computerised data entry by the GP at the time of the encounter**

You recently participated in the longitudinal controlled trial of computerised BEACH. Thank you for participating and for returning your disk to us. We have now processed your data and enclose a report of your results compared with nine other unidentified GPs who collected data in computer BEACH, and with the National BEACH average (collected on paper). We hope they provide you with some helpful and interesting information.

The enclosed Follow-up Computer Beach questionnaire will help us with this controlled trial. It asks how you felt about collecting the data on computer and your opinion of the program design. It also includes a few questions about your proficiency on a computer as we wish to measure the extent to which proficiency affects the program's acceptability and ease of use. Completing this will take only about 5 minutes and you can fax it to us if you wish (on 9845 8155) or return it in the enclosed self-addressed envelope.

We ask that you examine your report and compare results of your patients' BMI, smoking and alcohol consumption rates with those in the report from your earlier paper-based BEACH participation to see if the intervention material has led to improvement. However, you do not need to use the Re-audit tally sheets as Computer BEACH has completed your Re-audit requirements and we will now inform the RACGP who will allocate your 15 Clinical Audit points.

Please do not forget to send back the questionnaire and we thank you once again for taking part in this trial of computerised BEACH data collection.

Yours sincerely

Dr Graeme Miller  
Medical Director  
Director

Dr Helena Britt  
A/Professor &

## ***Appendix 10: Follow up questionnaire to GP participants***

### **FOLLOW-UP QUESTIONNAIRE FOR GPs IN COMPUTER BEACH TRIAL**

**DOCID** \_\_\_\_\_

***1. How would you rate your ability on the computer overall***

- I am a computer whiz
- I can use most common programs well
- I can do some things on the computer
- I am not very computer literate

***2. Do you use a computer on a regular basis at home?***

- Yes
- No

***3. Do you have a computer on your desk in your surgery?***

- Yes
- No (go to question 4)

***IF YES: To what extent do you rely on it for your medical records? (tick only one box)***

- I have paperless, electronic health records
- I always enter information in the electronic record but also use full paper records
- I only use the computer on my desk to generate scripts and write some notes/letters
- I don't use the computer on my desk at all

***4. Overall, how hard was it to complete the BEACH program on the computer  
(tick only one box)***

- Very easy
- Quite easy
- Quite hard
- Very hard

***5. How did it compare with recording the BEACH information on paper as you did  
previously? (tick only one box)***

- Much easier than paper BEACH
- A little easier
- About the same
- A bit harder
- Much harder than paper BEACH

**P. T. O**

6. *On average did completing a single computer based BEACH form take less or more time than completing a single paper based BEACH form? (tick only one box)*

Completing a computer BEACH form took me:

- much less time than paper BEACH  
 a bit less time than paper BEACH  
 about the same time as paper BEACH  
 a bit more time than paper BEACH  
 much more time than paper BEACH

7. *If you were to do BEACH again (say in the next triennium) would you choose to do it on paper or on computer? (tick one box only)*

Next time I would do BEACH

- definitely on computer  
 probably on computer  
 I would not care – paper or computer  
 probably on paper  
 definitely on paper

8. *Please rate each of the following aspects of the Computerised BEACH program. Circle one number in each row*

	1 No problems	2	3	4	5 Many difficulties
Loading the software onto the computer and getting it to open	1	2	3	4	5
Actually entering the information	1	2	3	4	5
Finding a desired term from pick-lists	1	2	3	4	5
Understanding the instructions for entering information on the computer	1	2	3	4	5
Getting the data from your computer back to the Research Team.	1	2	3	4	5

*Please comment further on any aspect of the computerised BEACH process.*

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*Thank you for completing this questionnaire.*

*Please send it back in the enclosed pre-paid envelope.*