

# A Simple Four Templates Guide to Programming Android Cell Phones for Use in Clinical and Other Trials Requiring Participant Feedback.

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**Thomas Francis Hartley BSc(Hons), PhD.**

Formerly of

School of Health Sciences, College of Health and Medicine

Newnham Campus, University of Tasmania

Launceston, Tasmania 7250, Australia.

and

Department of Pathology,

Royal Hobart Hospital

Hobart, Tasmania 7000, Australia.

Contact : [medlabstats@inet.net.au](mailto:medlabstats@inet.net.au)

Also on ResearchGate and [LinkedIn](#).

## About the Author

*Dr Tom Hartley is a clinical biochemist with over 40 years experience in Hospital Pathology Laboratories (Leeds General Infirmary, St Mary's Hospital Portsmouth, Institute of Medical and Veterinary Science Adelaide, Royal Hobart Hospital Tasmania) and 12 years in University based research and lecturing (University of Tasmania). He has specialised in the biochemistry of clinical nutrition, statistical methods of laboratory data analysis, instrumental methods of analysis, quality systems (ISO15189), and laboratory computing including Laboratory Information Systems and bespoke programming in the Windows, Linux and Android environments. He has a website devoted to these interests a [www.medlabstats.com](http://www.medlabstats.com)*

## ABSTRACT

The author describes how clinical and other participatory trial teams can exploit the Android cell phone as an economic platform for the gathering of data from trial participants. The aim has been to provide a 'how to guide' that had the shortest possible learning curve for members who are comfortable with setting up web pages. The additional requirement is that they extend their skills to the installation of a local webserver on the cell phone and then use one simple HTML and four simple PHP templates to construct the data collection and processing forms. Data so collected is automatically written to local csv files on the cell phone - there is no need for connection to a wireless network or mobile phone carrier for this functionality to work 24/7. These csv files can be retrieved from the device by a team member simply by plugging the cell phone into their desktop PC during a routine consulting sessions with the participants. They access the cell phone memory in just the same way as they would a USB memory stick. The guide also includes a list of recommended Android Apps that have to be installed and setup to ensure a stable combination that is likely to be easily used by all trial participants regardless of their individual skill levels. The author has made a limited 'useability trial' of this approach and satisfactory feedback was received. The author has concluded that this approach will reward participatory trial teams with the ownership of robust solutions that are well proportioned for use on the small screens of cell phones. Additionally it will provide more transcription free data when compared to the conventional error prone and poor compliance prone 'paper based - written response - manual transcription' cycle.

## KEYWORDS

- research participant experience recording
- personalised electronic data diary
- personalised private webserver
- research data integrity
- PHP scripts
- HTML scripts

## 1 : BACKGROUND

When clinical and other trials are carried out amongst the wider community the paper questionnaire and more recently the internet questionnaire have been the tools of choice for gathering ongoing information from participants. Today participatory trials teams cannot ignore the uptake of cell/mobile phones by the communities they are working with. The challenge is for them to exploit this phenomenon to their advantage and with the minimum of effort. There are ample examples in the literature where the cell phone has been used in clinical research but the author did not encounter any that had addressed the underlying problem of how to build such Apps. This paper was an attempt to provide some guidance in this area.

The literature provided many examples where mobile phones had been used by patients in clinical environments. The majority appeared to fall into one of three categories:

- Dietary : diaries for diabetic and obese patients eg. Carter et al.
- Sexual Health : diaries for unsafe activities and retroviral medication adherence eg. Perera et al.
- Chronic Diseases – diaries for symptoms eg. Gaertner et al.

Overall the impression was that they had proved superior to the previously employed approaches for data gathering but there was generally a sparsity of information about how the mobile phone had been programmed. This makes it difficult for other researchers to build and/or independently evaluate both the Apps and the concept in their local research environments. The author concluded that the current challenge to the non-programmer trials researcher was one of how to take ownership of their research data collection Apps. The obvious solution was to become the authors of their own Apps.

The author had been familiar with building websites for teaching and research projects and using simple PHP scripts behind webpages to do some or all of the data processing. This paper describes what techniques, items and skills a trials team would need to harness in order to apply this solution in their environment.

## 2 : AIMS

- To provide an App authorship guide that was suitable for uptake by trial teams who had some experience with the writing HTML web pages and who were prepared to advance to adding 'server side' processing of data input using simple PHP scripts. The target devices were inexpensive Android phones and Android tablet PCs.
- To demystify the idea that Bespoke Apps on the Android platform for participatory trials could only be realised via the services of a professional programmer.

### 3 : MATERIALS AND METHODS

At the time of writing it was possible to purchase 3G and 4G cell phones at heavily discounted prices (less than \$US45). These cell phones were locked to a designated telecommunications carrier, however, this did not preclude them from being deployed to the participants as a standalone Android tablet PCs. The author has devised a solution to using these phones in any intervention style project where there is a requirement to gather 24/7 feedback from participants. The intention would be that these pre-programmed phones are issued to the participants for the duration of the project. Investigators can download the data from the phones at any mutually convenient opportunity.

**3.1 : Hardware :** ZTE T815 3G cell phones running Android Version 4.4.2 and marketed in Australia as Telstra Tempo (\$29 from Australia Post Shop, locked to Telstra Network). (Kernel Version 3.4.67, 1.27 GB memory, 4 inch screen).

**3.2 : Android Specific Software :** In order to avoid the need for high level programming skills The author discounted approaching the problem via any of the usual Android programming packages or languages. Instead The author opted for setting up the system as a self-contained 'The web site' on the cell phone itself. This idea stemmed from the recognition of a body of existing solutions on the www that have used a combination of 'web browser + cascading style sheets + Java Script' to create an impression with the user of dynamic interactivity; Stark et al. The author did experiment with this for a while and came to three conclusions. The first two were that :

- Java Script is not a trivial language to learn or implement
- The HTML5 Document Object Model, (DOM), is similarly a complex

Those approaches were unnecessarily complex for the task the author was addressing and certainly would not be transferable to others without a significant 'learning curve' on their part.

The third factor in our decision was that we realised that 'browsers plus Java Script' solutions are intentionally designed to make any writing back of permanent data on the 'client' device difficult because of the longstanding security reasons that have surrounded unsecure browsing of the internet. It was then that the author realised that the only simple approach that would work would be to install a web server and website on the phone and use the simple HTTP request on the phone's browser "localhost:8080/" to interact dynamically with that site. The author knew from previous work that the execution of many types of data manipulation and storage within the web server environment using the PHP language would be successful. PHP is a simple text language and the author had used it to build simple Forms as web pages and then write the returned data back to simple comma delimited files (.csv files). Those were amenable to being downloaded off the phone via USB cable or Bluetooth into a team members PC. The file .csv file type is compatible for import into Excel or more advanced packages such as SPSS and Stata etc.

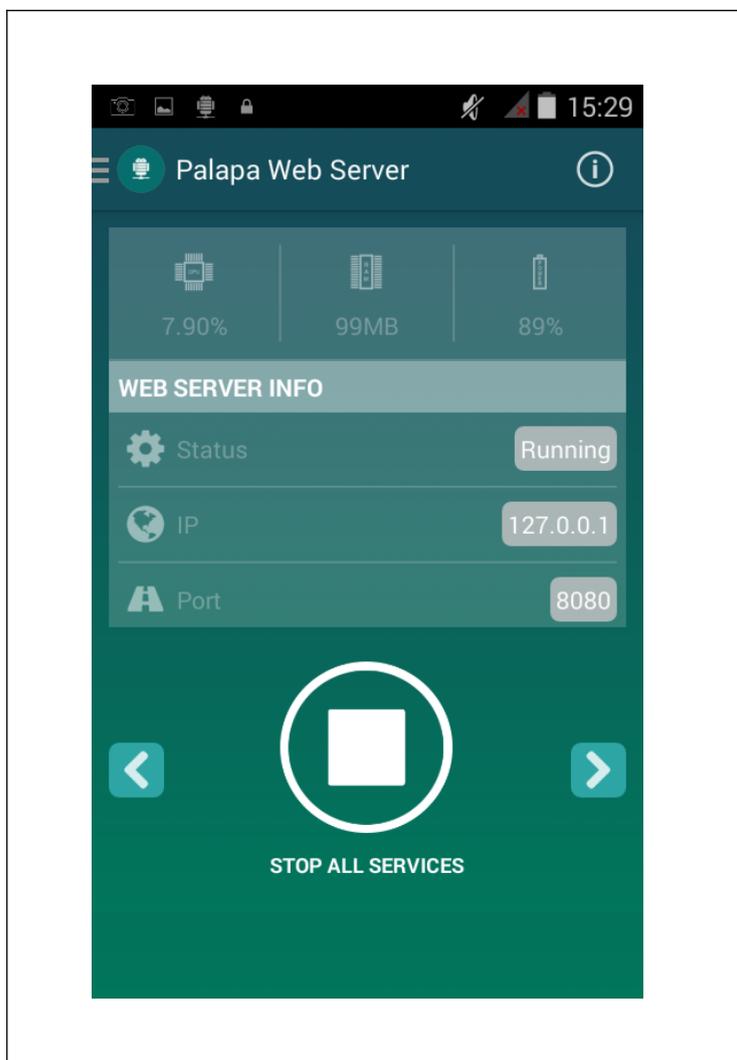
The combination of third party software packages that produced the required performance and simplicity were :

- Palapa Web Server : Version 2.1.1 from [alfanla.com/palapa-web-server](http://alfanla.com/palapa-web-server)
- Opera Web browser : Version 41.2.2246.111806 from [www.opera.com/mobile/operabrowser/android](http://www.opera.com/mobile/operabrowser/android)

- TouchPal Keyboard : Version 5.4.1.1 from [touchpal-keyboard.en.uptodown.com/android/old](http://touchpal-keyboard.en.uptodown.com/android/old)
- Adobe Acrobat Reader : Version 17.4.1.178813 from [www.adobe.com](http://www.adobe.com)

The Palapa Web server (Figure 1) was chosen because it was a free of charge Android application and loaded seamlessly in the background whenever the phones were turned on. The user was totally unaware that this was happening. Furthermore, it required no adjustment to its default settings in order to run as the author required.

**Figure 1 : Palapa webserver console screen**



The phone came preloaded with an Android generic browser as well as Google Chrome. Neither of these behaved well when required to browse the "localhost:8080". Instead The author loaded Opera as the default browser and this proved to behave consistently and rendered all the web pages immediately to full screen. It was also the best performing browser to use if for any reason, the author had wanted to present material in any non-HTML or simple text format. For example 'Help' material was best included as .pdf files. The Opera browser downloaded the pdf file and this file was then made readable via Adobe Reader.

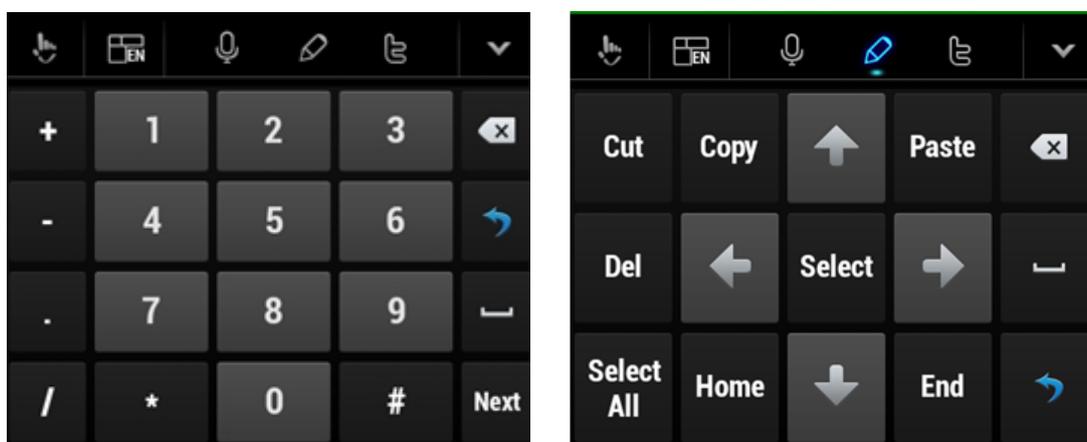
The author edited the Home Screen of the phone so that on power up it only showed the Opera web browser icon. Similarly The author edited the opening Speed Dialling page of Opera so that it only showed one shortcut and that was to the home page of the App.

All the web server files described here as templates were placed in a subdirectory of the Palapa Server's www directory.

The author intentionally removed the SIM card from the phones and would discourage users from activating the phone's WiFi. This was done because the author did not want participants to have to contend with various updates which could conceivably get 'pushed' onto the phone by Google and other App developers, including Opera and Adobe. The author wished to ensure that the platform left in a state that the author knew would perform correctly. The author was concerned that if any of these updates had been inadvertently loaded by the participant then there was a risk that the platform would not continue to run as had been designed/intended.

The cell phone chosen for this work had the option of two keyboards. The author chose to set the default keyboard in the phone's 'Settings' to the TouchPal option. The author did this for two reasons. Whenever an HTML Form was presented to the user that required numeric input then it presented a keyboard that was extremely clear and also included the decimal point (see left-hand panel of Figure 2). It is not unusual for default Android keyboards to miss out the decimal point and although this can be circumvented programmatically it was a complication the author wished to avoid in the interests of keeping the solution simple to deploy. The other feature was the 'tool' in the toolbar that looked like pencil. This opened up a pad which included a cursor pad (see right-hand panel of Figure 2). Moving the cursor on a small screen touch phone screen requires extremely good 'touch skills' and this 'tool' was regarded as being a definite advantage to users of our phones that were challenged when it came to moving a cursor back over some of their text that they needed to correct. The author would encourage the issuing and use of a stylus by all participants.

**Figure 2 : Numeric and cursor keypads available in TouchPal**



### 3.3 : Local Website Schema and Files :

The author précised a 'typical' clinical trial questionnaire down to five generic questions :

- What is your ID number ?
- What are your symptoms ?
- What was the date and time you experienced these symptoms ?

- How would you rate these symptoms ?
- What was your "Glucometer glucose reading" when this happened ?

The fifth question in this example was seemingly specific but the intent was to convey that at some point in any questionnaire a piece of objective/quantitative information would be required from the participant.

Because of the small screen size of a cell phone The author realised that the only way by which The author could provide a reasonable amount of space for responses was to place each question onto a cascading sequence of separate webpages. This then presented the problem of how to carry forward the responses given in the sequence of webpages to the final data filing and processing steps of the PHP form handling script. The solution was to exploit the 'sessions' facility on the web server and use unique session variables with each question so that they could be carried forward to the final PHP form handling script, ( see <http://www.html-form-guide.com/php-form/php-order-form.html> for a fuller explanation of this concept.)

The five questions the corresponding HTML snippets of code were composed as follows :

- What is your ID number ? ( required a numeric field )

```
Q1 : What is your ID number ?
<p>
<input name="idnumber" type="number">
```

- What are your symptoms ? ( required an area for some free text entry )

```
Q2 : What are your symptoms ?
<p>
<textarea name="symptoms" type="textarea" cols=30 rows=4>
</textarea>
```

- What was the date and time you experienced these symptoms ? ( required date and time formatted entry )

```
Q3 : What was the date and time you experienced these
symptoms ?
<p>
<input type='datetime-local' name='day'>
```

- How would you rate these symptoms ? ( required user selection of one option from a list of possible options )

```
Q4 : How would you rate these symptoms ?
<p>
<select name='rating'>
```

```
<option>None selected</option>
<option>Mild</option>
<option>Moderate</option>
<option>Severe</option>
<option>Very severe</option>
</select>
```

- What was your Glucometer glucose reading when this happened ? ( required a numeric field limited to one decimal place )

```
Q5 : What was your Glucometer glucose reading when this
happened ?
<p>
<input name='glucose' type='number' step=0.1>
```

These snippets have been placed in context of the rest of the scripts in the webpage HTML/PHP scripts in Table 1. The areas highlighted are those that would be edited by other users to suit their local requirements.

**TABLE 1 : The HTML and PHP Scripts that Formed the Templates for a Generalised Android Phone App.**

- Listing of q1.html : Template for the first question

```
<html>
<head>
<meta name="viewport" content="width=320"/>
</head>
<body>
<body bgcolor='green'>
<font size=3>
<font face='Arial'>
<font color='white'>

<h3>WATTAREN ANTI-INFLAMMATORY CLINICAL TRIAL
</h3>
```

Participant's Adverse events recording system

```
<p>
Use this form to record any adverse reactions during this
clinical trial of Wattaren
<p>
```

```
You should use this App to record these events as close as
possible
to the time at which they occurred
<p>
```

```
There are 5 questions which are presented one question at a
```

time .....

```
<form action="q2.php" method="post">
Q1 : What is your ID number ?
<p>
<input name="idnumber" type="number">
<p>
<input type="submit" name="Submit" value="Next question ..">
</form>
</body>
</html>
```

➤ Listing of qn.php : Template for the nth question

```
<?php
session_start();
$_SESSION['symptoms'] = $_POST['symptoms'];
?>

<html>
<head>
<meta name="viewport" content="width=320"/>
</head>
<body>
<body bgcolor='green'>
<font size=3>
<font face='Arial'>
<font color='white'>

<h3>WATTAREN ANTI-INFLAMMATORY CLINICAL TRIAL
</h3>
Participant's Adverse events recording system
<p>
<form action="qn+1.php" method="post">
Q3 : What was the date and time you experienced these
symptoms ?
<p>
<input type='datetime-local' name='day'>
<p>
<input type="submit" value="Next question ..">
</form>
</body>
</html>
```

➤ Listing of qN.php : Template for the Nth / Last question

```
<?php
session_start();
$_SESSION['rating'] = $_POST['rating'];
?>
```

```

<html>
<head>
<meta name="viewport" content="width=320"/>
</head>
<body>
<body bgcolor='green'>
<font size=3>
<font face='Arial'>
<font color='white'>

<h3>WATTAREN ANTI-INFLAMMATORY CLINICAL TRIAL
</h3>
Participant's Adverse events recording system
<p>
<form action="process.php" method="post">
Q5 : What was your Glucometer glucose reading when this
happened ?
<p>
<input name='glucose' type='number' step=0.1>
<p>

<input type="hidden" id="dmy" name="NOW" value="Content of
the extra variable" >

<script>
var d = Date();
document.getElementById("dmy").value = d;
</script>

<p>
<input type="submit" value="File your ansThe authorr s ..">
</form>
</body>
</html>

```

- Listing of process.php : Template for processing and filing the data from all N questions plus a time and date stamp

```

<?php
session_start();
?>

<html>
<head>
<meta name="viewport" content="width=320"/>
</head>
<body>
<body bgcolor='green'>
<font size=3>
<font face='Arial'>
<font color='white'>

```

```

<h3>WATTAREN ANTI-INFLAMMATORY CLINICAL TRIAL
</h3>
Participant's Adverse events recording system
<p>
Thanks for completing the Form ... here is what has been
recorded in your logfile...
<p>
<b>
<i>
Please note that if you have rated your symptoms as SEVERE
or VERY SEVERE then you must contact the Clinical Trials
Helpdesk via the phone number in your Study Participant's
Handbook.
</i>
</b>
<br>

<p>
<?php
$a = $_SESSION['idnumber'];
$b = $_SESSION['symptoms'];
$c = $_SESSION['day'];
$d = $_SESSION['rating'];
$e = $_POST['glucose'];
$f = $_POST['NOW'];

print "This is what has been written to your log file :";
print "<br>";
print "Your ID number : " . $a;
print "<br>";
print "Your symptoms : " . $b;
print "<br>";
print "Date and time this happened : " . $c;
print "<br>";
print "Severity of your symptoms : " . $d;
print "<br>";
print "Your blood glucose at around that time : " . $e;
print "<p>";
print "-----debugging-----";

print "<p>";

$x = $a . ", " . $b . ", " . $c . ", " . $d . ", " . $e . ",
" . $f . "\n";

print $x;
print "<p>";
print "-----";
$fp = fopen("generallogfile.csv", "a");
fputs($fp, $x);
fclose($fp);

session_unset();

```

```
session_destroy();
?>
</body>
</html>
```

There was an important piece of Java Script embedded in the final (nth) question which gathered the data and time at which the participant in the clinical trial unknowingly provided the date and time at which he/she completed the questionnaire. In any participatory trial it is important for trial team to know whether or not there was a significant time delay between the 'adverse/reportable' event and its reporting by the participant. Recall of details of any event can be expected to deteriorate with the length of delay between the 'event' and the time at which the questionnaire was actually completed. The portion of script responsible for collecting this important background data and time was :

```
<input type="hidden" id="dmy" name="NOW" value="Content of the
extra variable" >

<script>
var d = Date();
document.getElementById("dmy").value = d;
</script>
```

It should not be altered and "NOW" must not be used in any other HTML or PHP page; ie. NOW was a reserved variable name which could only be used in the final question PHP script page.

The other pieces of 'quarantined' script appeared at the very beginning of each PHP scripted page between the tags

```
<?php
session_start();
.....
.....
?>
```

These were essential to the design and had to be carefully composed and always positioned at the very beginning of the PHP script. Further details have been given in the Results section.

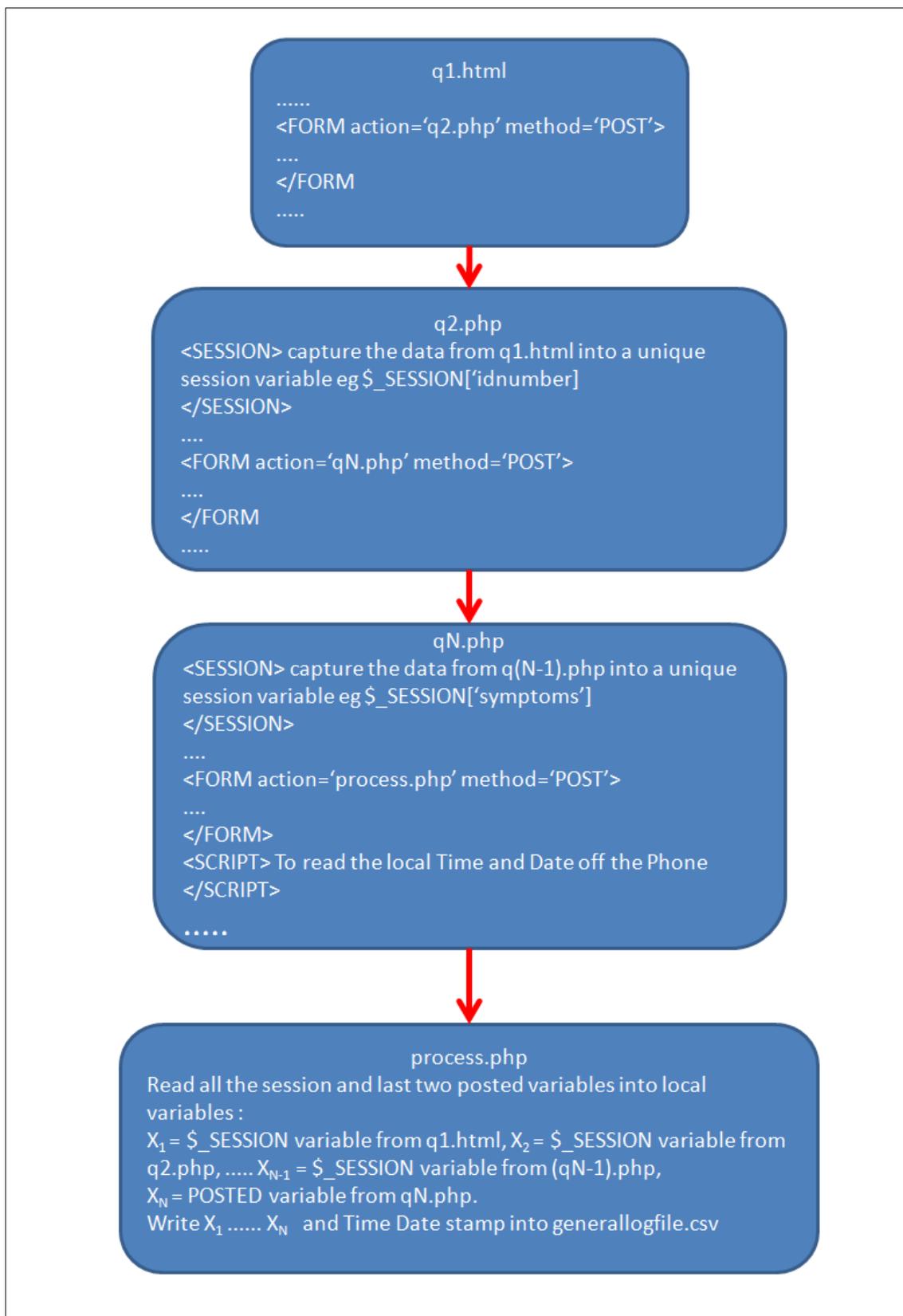
#### 4 : RESULTS

The simple 'demonstration' website reported here was composed of six files viz. one HTML file, five PHP files, and one CSV file. These accommodated the on screen formatting of the five questions, each of the five questions and the appending of all the 'time and date stamped' responses into a single CSV file for later examination by the trial staff.

'Question 1' had to be an HTML Form that 'POSTED' its response data to the 'Question 2' PHP file. That file recorded the posted information from Question 1 into a unique SESSION variable that persisted from question to question. The demonstration had only four session variables but if for example there was a requirement for ten questions then there would be a requirement for nine session variables. Figure 3 shows the schema of the logic and files required for a questionnaire of N questions long. Listings of q1.html, qn.php (this is the nth question in the series of a total of N questions), qN.php and process.php are given below. Trials teams can adapt these to their local requirements by editing the highlighted text accordingly. Some of the HTML syntax The author used were so called 'deprecated' elements

under the current HTML 5 standard. Nevertheless the Opera browser rendered these deprecated statements in accordance with the pre-HTML 5 specification. The questionnaire was modelled around the clinical trial of a fictional anti-inflammatory product called Wattaren.

**Figure 3 : Generalised schema for an ‘N’ questions feedback form.**



Other data input fields that can be used in HTML forms were readily available on the internet. The author used the website [www.w3schools.com](http://www.w3schools.com) to obtain the correct syntax for our input

types and this would be the recommend this approach for developers who are not confident in designing HTML forms beyond the templates that have been described here. For example the templates published here do not include one that used 'check boxes'. The search query 'check boxes' on the w3schools navigates the user to a page that has the absolute minimum HTML script needed to build a form with check boxes on it, see Table 2. The lines that have been highlighted by the author are the only lines that have to be cut and pasted into a copy of Template qn.php, then edited and added to as required by their project. An example of a typical edit from the original two check boxes to a total of six is shown in the middle panel of Table 2. The result of viewing the modified HTML script in the Opera web browser is shown in the bottom panel of Table 2.

**4.1 : The Screens** : The author found that the Opera Browser on a ZTE T815 cell phone – would always render our pages to full screen. As a precaution The author always used the following HTML tag to force the browser to a base screen size :

```
<meta name="viewport" content="width=320"/>
```

Figure 4 illustrates the opening HTML page of the questionnaire which provided a minimal introduction to the 'App' in the context of the fictional 'Wattaren Clinical Trial' and the first question. In the Opera browser as soon as the ID Number field was 'tapped' then a bold numeric keypad opened up as an overlay without rendering the first question and input box invisible.

**Figure 4 : Opening page of the clinical trial participant's feedback form. Numeric response is required and the TouchPal numeric keypad opens automatically.**

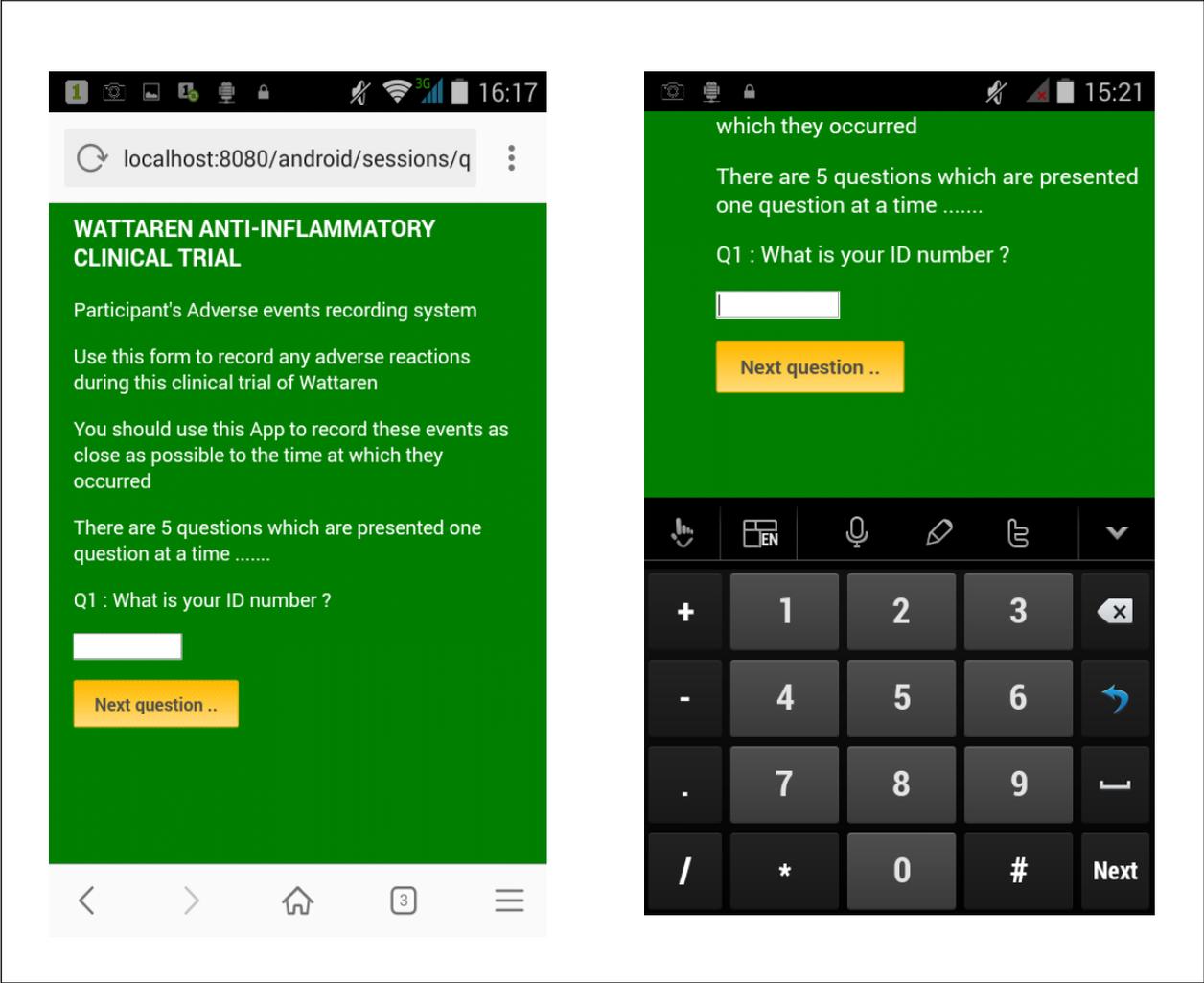


Figure 5 illustrates the screen presented by the first PHP scripted webpage. Again the author found the Opera browser popped up the QWERTY keyboard without obscuring the question. That keyboard also had the 'tool' that looked like a pencil and the right-hand screen shot in

**Figure 5 : The webpage generated by the PHP script after the completion of the first question in the series**

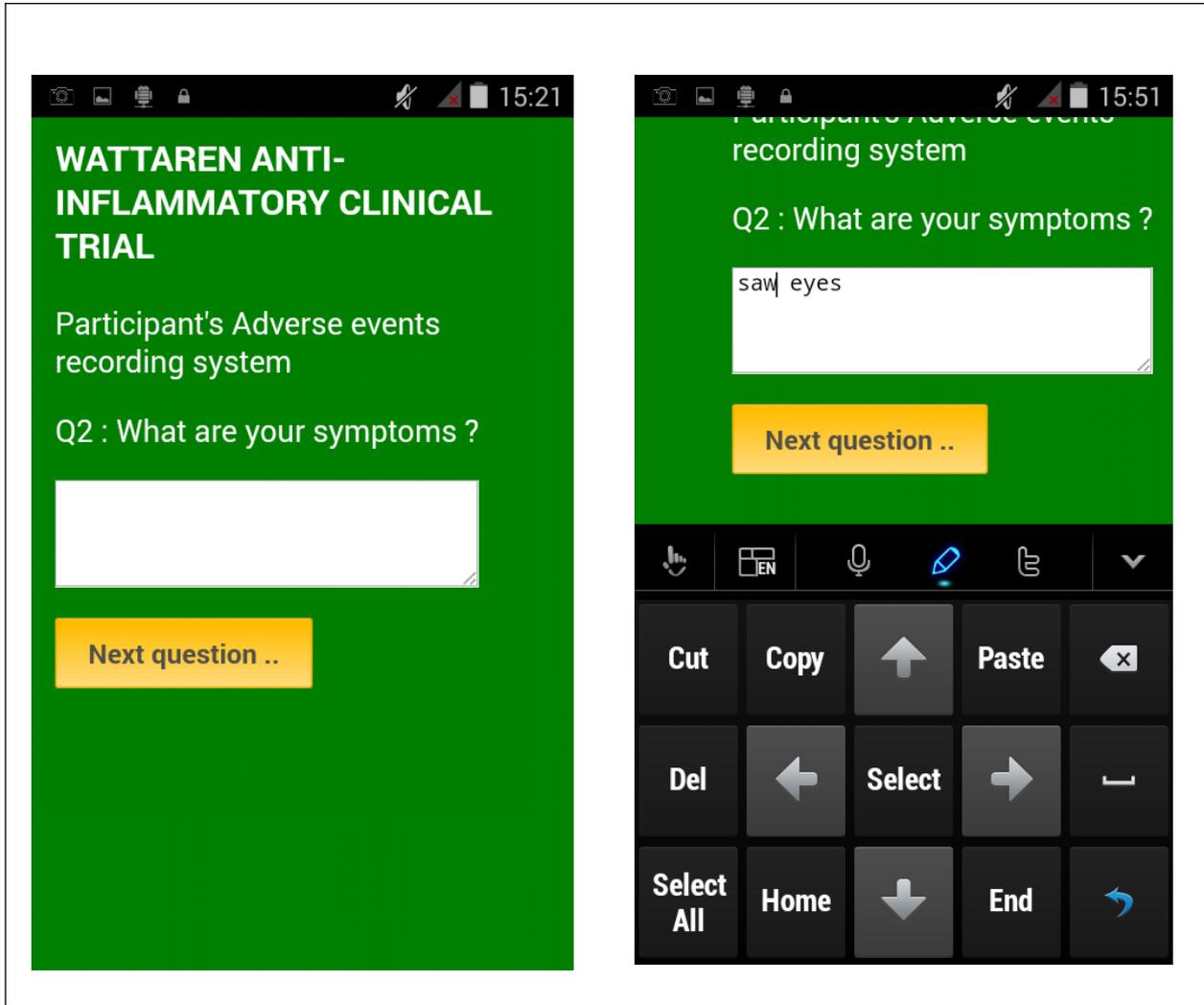
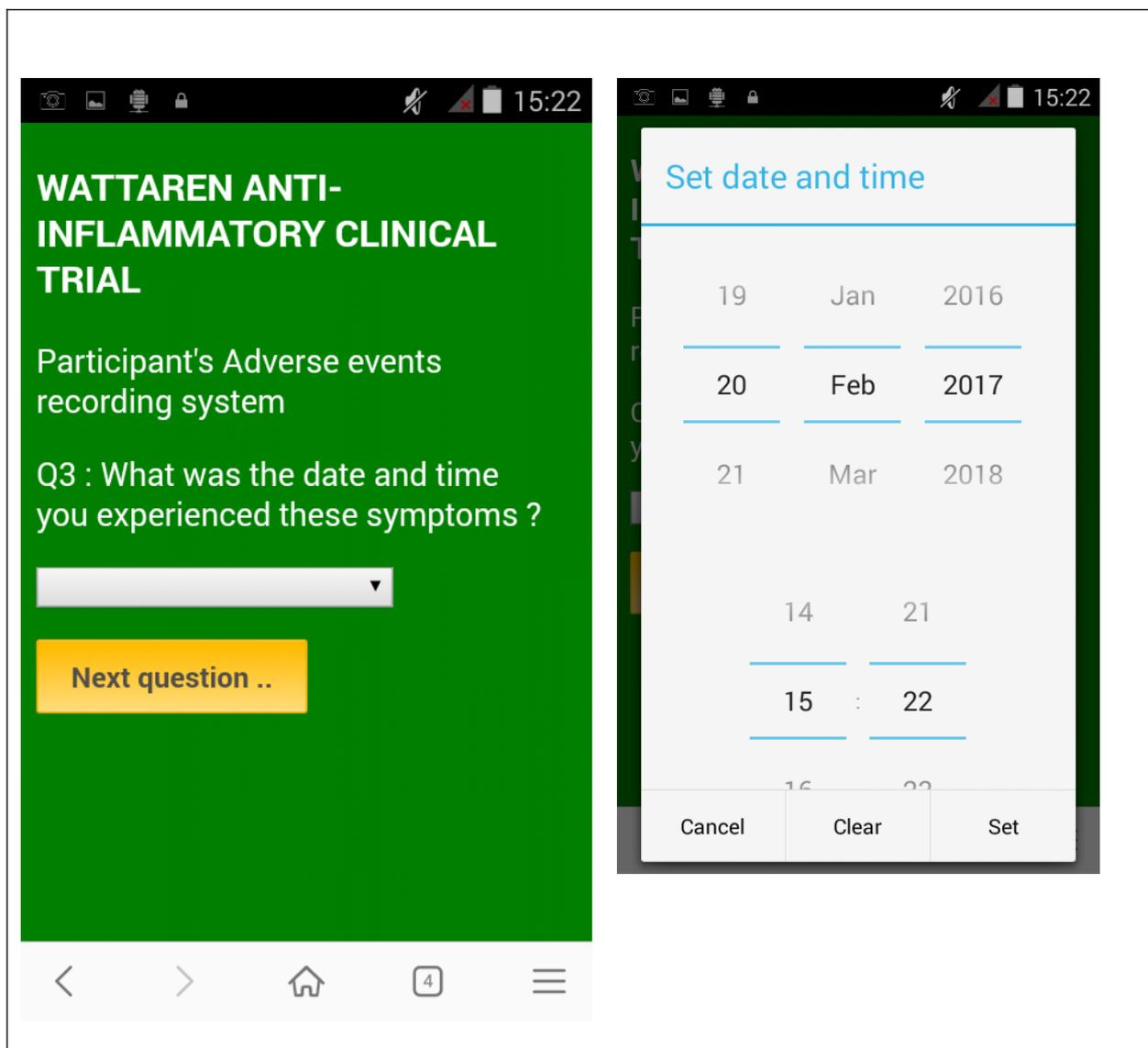


Figure 6 shows how useful this was for moving the cursor back to the position of a misspelt word – ‘saw’ instead of the intended ‘sore’.

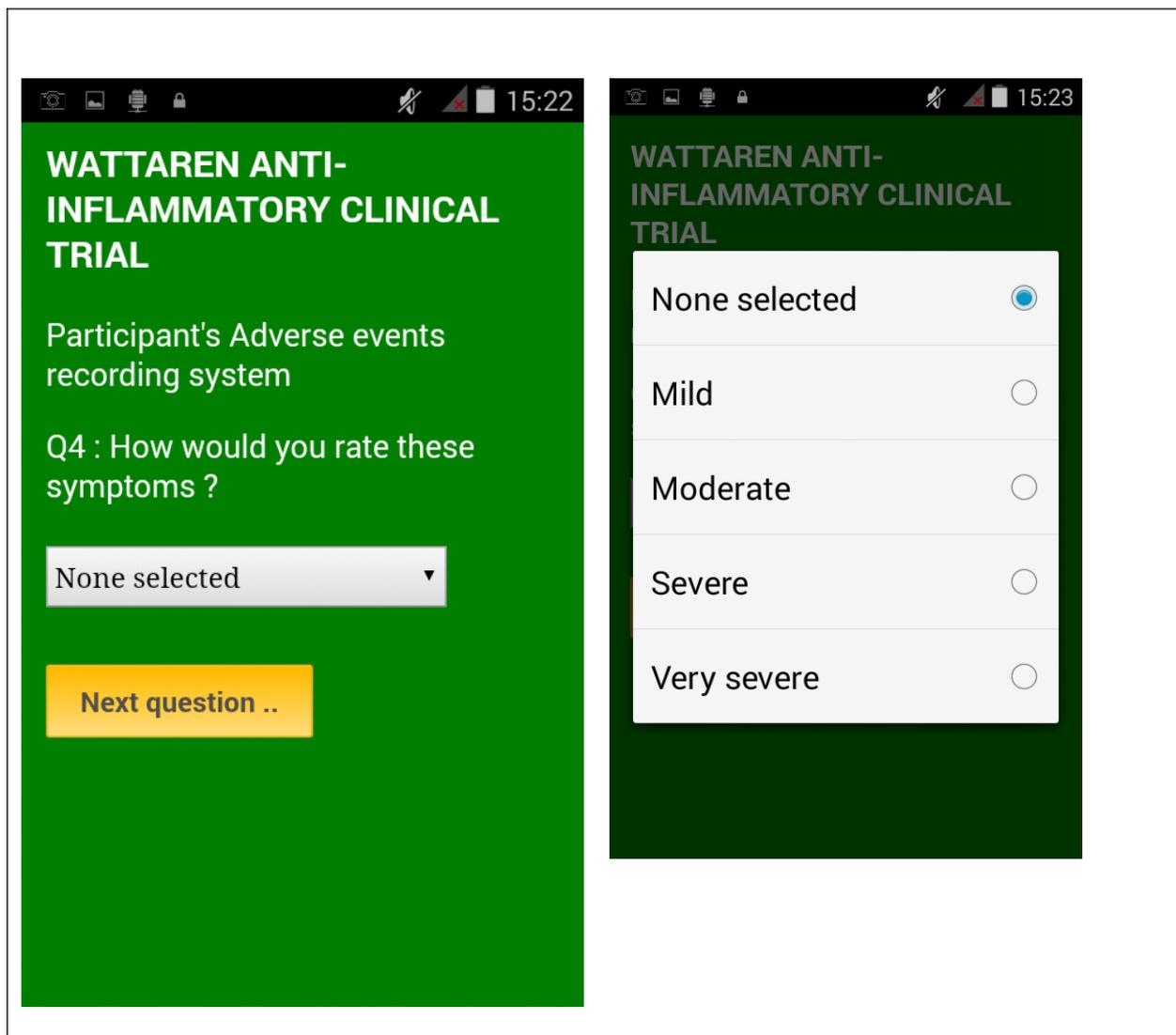
**Figure 6 : This page requires a date response. The TouchPal keyboard opens the calendar keypad automatically in anticipation of this requirement.**



Question 3 required the entry of a date on which the symptoms were experienced. Figure 6 shows that the Opera browser had rendered the date entry box with a downward arrow. As soon as this was tapped then the Opera browser overlaid a current date and time scrolling ‘chooser’. It defaulted to open at the then current date and time so if the user was making the entry at the time of the symptoms then simply tapping ‘set’ completed the date and time field. Moving to earlier dates and times was achieved by ‘swiping’ the zones in the calendar until the appropriate date and time was reached. Tapping the ‘set’ button completed the date and time field and closed the calendar overlay.

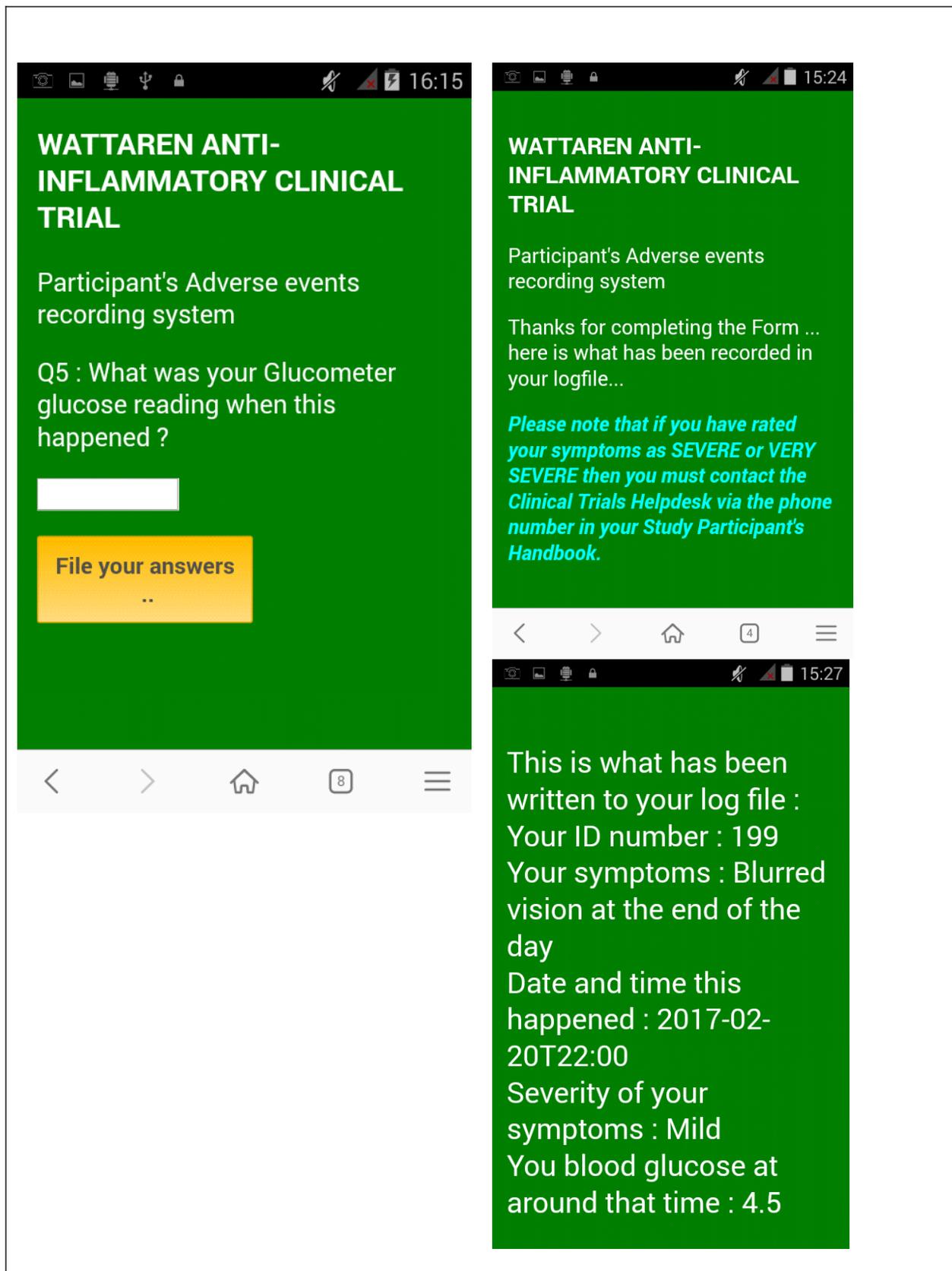
The responses to Question 4 could only be selected from a dropdown list. Figure 7 illustrates the Question 4 PHP generated screen and on the right the options in the dropdown list that the author had programmed. The user had to tap on their selection and then tap anywhere outside of the selection overlay for it to close and autocomplete the data entry field for this question.

**Figure 7 : Question 4 requires the participant to make a selection from a dropdown list. The TouchPal keyboard anticipates this requirement by displaying the list full screen.**



The final question required a numeric input for the participant's blood glucose concentration. Again the numeric keypad opened up as soon as the data entry cell was tapped (see Figure 8). This time the usefulness of having a numeric keypad with a decimal point on it was realised because blood glucose concentrations are always measured to the first decimal place when using mmol/L units for glucose. On the right-hand side of Figure 9 is the closing screen presented after the 'File your answers' button had been tapped at Question 5.

Figure 8 : The final data entry screen and farewell message screen.



## 4.2 : Results of a limited Peer Review :

The concepts and design were presented to peer staff in the *School of Health Sciences* at a seminar. On arriving at the seminar attendees were handed a short questionnaire on a piece of card, see Table 3.

**TABLE 3 : Questionnaire Given to Staff at the Seminar**

- What make is your mobile phone ?
- What is the screen size (measured in inches across the diagonal) ?
- What was your score out of 10 for the questionnaire all on ONE webpage ?
- What was your score out of 10 for the questionnaire on SEPARATE webpages ?

The presentation covered the issues of ergonomics viz.

- How easy is it to fill in a questionnaire with only 5 questions on a 4 inch screen?

The small screen size makes for difficult data entry and it was proposed that this would lead to poor compliance if there was poor design. This would have been compounded by considerations of user dexterity that could lead to participants reporting widely varying experience when asked about ease of use etc.

The presentation included a demonstration of both the single page design and the multipage design built according to the templates described in this paper. It was at this point in the presentation when The author invited those who wanted to complete the questionnaire in Table 2. They used whatever cell phone they had with them at the time to go to the author's website where the two different style questionnaires had been set up viz.

- for the single page : [www.medlabstats.com/seminar/q.html](http://www.medlabstats.com/seminar/q.html)
- for the cascading pages described in this paper : [www.medlabstats.com/seminar/q1.html](http://www.medlabstats.com/seminar/q1.html).

( These demonstration web pages are still accessible to readers of this paper.)

These users all had Android cell phones of various makes. They gave the cascading pages App a median score of 9 out of 10 (N=6) compared to a median score of 7 out of 10 (N=7) for the single webpage presentation.

**TABLE 2 : HTML script provided by the w3schools site in response to the 'check boxes' search query on that site. Middle and bottom panels show results of user edits and extension of that basic HTML script to suit a local requirement – the gathering of gender and specific medication use information.**

```
<!DOCTYPE html>
<html>
<body>
<form action="">
<input type="checkbox" name="vehicle" value="Bike">I have a
bike<br>
<input type="checkbox" name="vehicle" value="Car">I have a
```

car

```
</form>  
</body>  
</html>
```

```
<!DOCTYPE html>  
<html>  
<body>  
<form action="">  
<input type="checkbox" name="male" value="gender1">I am a  
male<br>  
<input type="checkbox" name="female" value="gender2">I am a  
female<br>  
<input type="checkbox" name="aspirin" value="aspirin">I am  
taking Aspirin<br>  
<input type="checkbox" name="warfarin" value="warfarin">I am  
taking Warfarin<br>  
<input type="checkbox" name="rivarox" value="rivarox">I am  
taking Rivaroxaban<br>  
<input type="checkbox" name="coversil" value="coversil">I am  
taking Coversil<br>  
</form>  
</body>  
</html>
```

- I am a male
- I am a female
- I am taking Aspirin
- I am taking Warfarin
- I am taking Rivaroxaban
- I am taking Coversil

## 5 : DISCUSSION

Using this approach of HTML and PHP templates busy participatory trial teams should be able to put together useful Apps in a short period of time. The cell phone is well integrated into our communities so the training time to bring a participant up to speed will be short. From a cost perspective the 'locked' mobile phones are cheap and cost competitive with printed questionnaires when you take into account the costs of printing questionnaires, mail outs, mail backs and time spent by the team members transcribing the data from the questionnaire into the database etc . Data cleansing is a perennial problem in participatory trials and it often hinges around the legibility of the participant's hand writing on the forms. Electronic typos by participants using this cell phone approach can be expected to be less ambiguous and the decision by the team members to exclude or include a questionable entry can be expected to be easier, quicker and more consistent.

This paper described only a limited useability trial which primarily focussed upon the ergonomic advantage of using cascading web pages on small handheld Android devices to present questionnaires. There was no useability trial of the ease of editing and adapting the templates provided. This would have required access to staff with the time and some previous HTML/PHP coding experience.

Because of the author's background consideration of the recommendations of the Royal College of Physicians (UK) regarding 'Medical Apps', was of particular relevance in assessing this solution. Interestingly the first part of their R. C. P. (UK) questionnaire focusses on 'Who developed the app, and what's inside it?'. The guide published in this paper fulfils all the requirements of that section because by default the HTML and PHP scripts used by the author are visible to the end user of the App; it just requires the user to open the scripts in a text editor instead of a browser. In contrast any App sourced from a repository such as Google Apps has all the underlying coding and logic obscured from the user. In reality the provenances of all such Apps are unknown. In contrast the HTML and PHP scripting approach described in this guide does provide the author and user with the security of providing/using 'Open Source Code'.

By completely removing the need to connect to a phone or internet service this solution will accept and store user input without delay. The user need have no concerns that the device will fail to perform as designed at any time or place when their need to use it arises.

Many research teams work on and design participatory trial logistics in an 'IT infrastructure rich' campus in a metropolitan area. This may cause them to loose sight of the fact that a proportion of their 'trial participants' live and work in environments where the infrastructure is likely to be 'poor'. So although more sophisticated "24/7 online" solutions exist around the latest innovations such as the 'Cloud' are available, it is important to confirm that going down any higher technology path has a 100% up time for the intended participants/users/clients.

## **6 : CONCLUSION**

Cheap mobile phones / cell phones can be exploited by any participatory trials team member who has basic HTML and PHP skills. The first step is to load a suitable web server App, a suitable browser App and an enhanced touch screen keyboard App. Templates for the HTML and PHP data collection forms have been provided that are sufficient to most needs. Code snippets to provide functionality not covered by the templates can be obtained from web sites such as w3schools.com. Sizing of the screen is critical to the ergonomics; it is better to have more cascading web pages than to condense more data entry fields per screen. Because of the local webserver design, the phones and per se the Apps run independently of the surrounding communications infrastructure. The extraction of data is as straight forward as reading a USB memory stick into a desktop PC. This can be done periodically during any routine appointments with the participants. Because the solution is 100% script based, there is no barrier to authors and collaborators familiarising themselves with all aspects of the Apps functionality. Self assessment of any App developed using these templates that is intended for use in a clinical environment should be first assessed by the authors against the R.C.P. (UK) guidelines.

## **7 : CONFLICTS OF INTEREST**

The author has a personal professional website; [www.medlabstats.com](http://www.medlabstats.com)

## **8: ETHICS**

This work did not involve clinical intervention activities on human subjects. All health data collected during all evaluations were simulated. Information displayed in the screenshots of this App is fictional.

## **9 : FUNDING**

This research received no specific grant from any funding agency in the public, commercial or not for profit sectors.

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