

PDA data capture based on a form template

Outline of a PDA program for Acute Pain Services

Version 1.00

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1 Introduction

The Analgesia Safety Checklist is a form we designed as an adjunctive safety measure to be used within Acute Pain Services.

Although it would seem attractive to simply have an electronic version of the form 'online' (or on a tablet computer), we believe there is significant advantage to having a Personal Digital Assistant (PDA) version. Strangely enough, the relatively small size of the user interface can be used to advantage. This is because selective and sequential presentation of information focuses the user's attention on particular sub-tasks. Such focus decreases the risk that the user will skip steps and leave out vital information. In this document we provide an overview of such translation from form to PDA.

2 Layout

It is intended that the schematic PDA pages contained in this document will correspond moderately well to the final user interface on the PDA. In order to minimise error, we have generally tried to adhere to certain conventions. Note however that this document is a sketch of a much more complex set of programs, and it mainly intended to provide an *outline!*

2.1 Conventions

Conventions within the user interface are:

- A necessary minimum of information is presented on each screen. Screens should remain uncluttered, where possible;
- Items presented on a particular screen should be related;
- The screen header should state the intent of the screen, as well as containing relevant 'localising' information such as the ward or patient ID number;
- *Buttons* at the bottom of the screen are used to navigate between pages. A button in the bottom left corner will generally allow the user to go back (or abort the transaction), while one in the bottom right corner of the screen will allow progress (flow) to the next logical screen.
- Where possible, buttons, checkboxes or lists should be used rather than text or numeric input;
- Important actions should be confirmed.

In the schema below (Table 1), on your left you can see the basic user screen. To the right of this is a generic ‘confirmation screen’ which allows the user to confirm an action by clicking on ‘Yes’ (or deny the action by clicking on ‘No’).

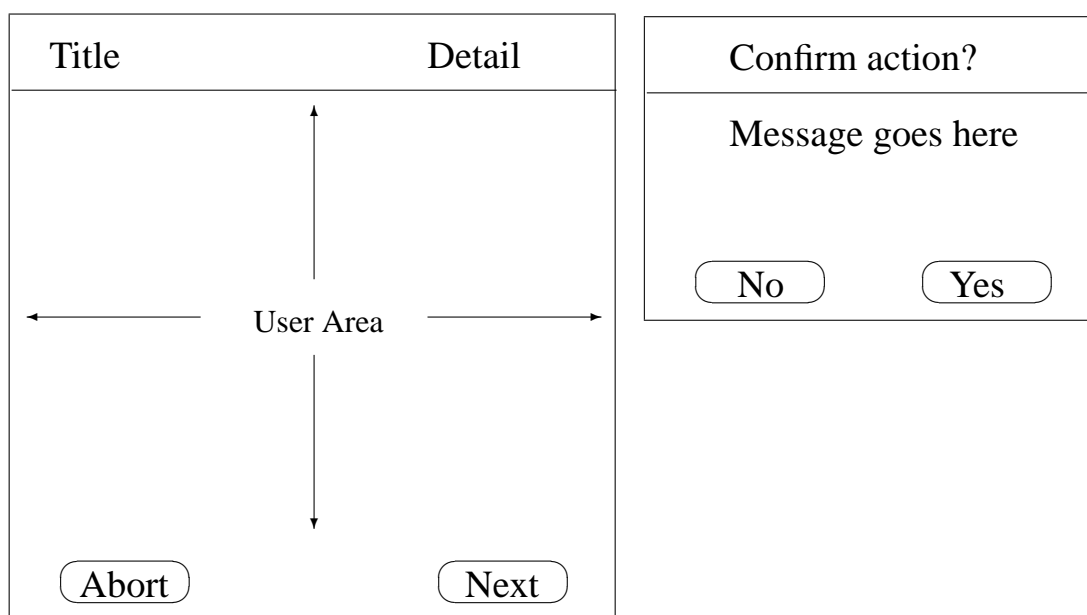


Table 1: Generic user screen

We can comfortably put about eight lines of text into the ‘user area’ of the PDA display (nine at a pinch). This is good, because generally with more than about seven lines on a screen, the user’s attention¹ tends to wander a bit!

2.2 Implementation details

Menu implementation on the PDA is discussed in a separate document — *Analgesia safety checklist — PDA implementation details* — but it’s worthwhile noting the following here:

- We will represent the PDA concept of ‘selection lists’ or ‘popup menus’ as follows in the following screens:

- Although we adhere to our form convention of using , on the PDA we will be more conventional, and simply use a blank checkbox which doesn’t contain a ‘Y’, thus:

¹At least, when the user is the author!

3 Screen tour

Here we examine each user screen in turn, apart from the initial ‘log-on’ screen which we omit. Please note that although the menu system *appears* complex and lengthy on the first read, negotiating it should be rapid and involve a minimal number of stylus taps. We start with the:

3.1 Ward selection screen

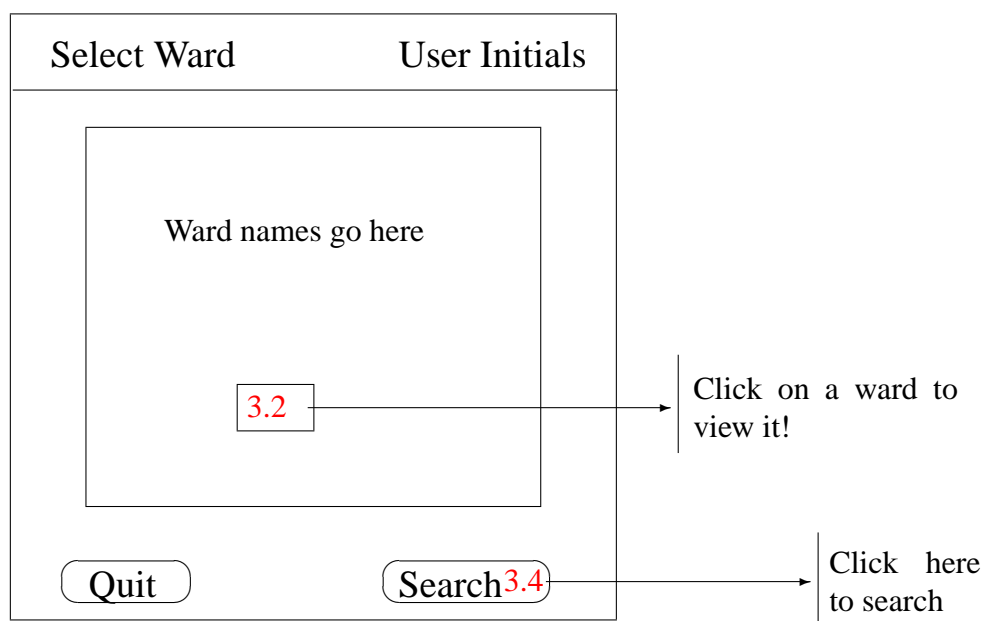


Table 2: Initial ward selection screen

By clicking on the name of a ward (shown schematically in the diagram above) the user can ‘enter’ that ward and acquire a list of all current pain patients within the ward.

The *Quit* button allows the user to quit the program entirely (with confirmation).²

The search button takes the user to a screen where entry of a name or hospital number allows the patient’s record to be located and displayed.

See how in our PDF document we’ve hyperlinked several items to allow you to follow the link — the circled number within the item refers to the number of the relevant table!

²It is a trivial matter to lock down the PDA and disable other functionality, but we will not do so in our initial implementation!

3.2 Patient selection (within a ward)

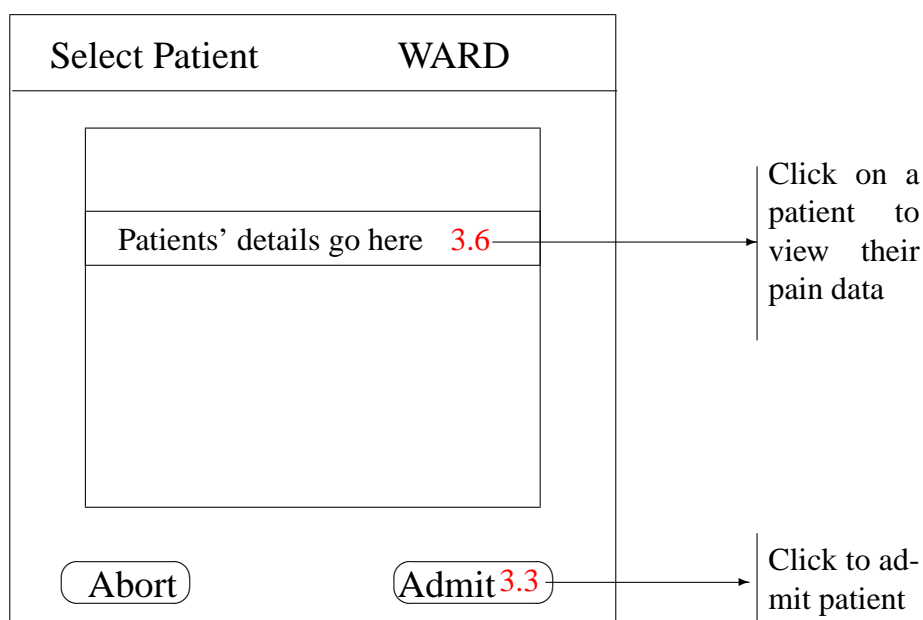


Table 3: Initial ward selection screen

Selecting a patient from a ward is very simple — just click on the relevant row. It will probably be best to make this a specific click on a unique identifier (the hospital number), and in addition allow the user to change the bed position of the patient (documented in the row) without having to view all of the pain data on that patient. Such an approach will permit rapidly moving patients' bed allocations around *before* seeing them.

If the patient is not recorded in the pain database and needs to be admitted, then things become more complex. Table 4 shows the data required.

3.3 Patient admission

Admit Patient	User initials
Surname	_____
Forename	_____
ID No.	_____
Sex	<input type="checkbox"/> M <input type="checkbox"/> F
ASA	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> E
<input type="button" value="Quit"/>	<input type="button" value="Done 3.6"/>

→ Admit

Table 4: Admitting a patient to the service

Basic patient information is entered here, allowing unique identification of the patient. A hospital number and surname are thus required. The reasonable assumption is made that the patient has already been admitted to the *hospital*, and allocated a unique reference number, so we don't have to indulge in complex maneuvers to identify 'Unknown Male Charlie'.

Desirable added information includes the patient's ASA (American Society of Anaesthesiologists) status, as well as their gender and first name. Although we at present limit the gender to male or female, the underlying database should have the capacity to (if required) upgrade to arbitrary complexity regarding gender classification.³

Our ultimate goal is to have almost all referrals recorded electronically, and transferred to the PDA at the time of synchronisation. This approach should minimise the need to 'laboriously' admit patients on the PDA.

³Overkill in the current pain database, but desirable in the more broad context in which this database is envisioned!

3.4 Finding a patient by number/name

Find Patient	User initials
Enter surname _____	
or	
Hospital No. _____	
<input type="button" value="Quit"/>	<input 291="" 517="" 534"="" 598="" data-label="Caption" type="button" value="Search<sup>3.5</sup></input></td> </tr> </tbody> </table> <p>Click to search</p> </div> <div data-bbox="/> <p>Table 5: Initial ward selection screen</p>

This section should be trivial, allowing the user to pull out one or more individuals. Searching by surname will potentially reveal more than one match, taking us to the screen shown in Table 6. As hospital numbers are unique, searching on a hospital number should move you directly to the relevant patient's pain data screen (Table 7).

3.5 A list of matching surnames

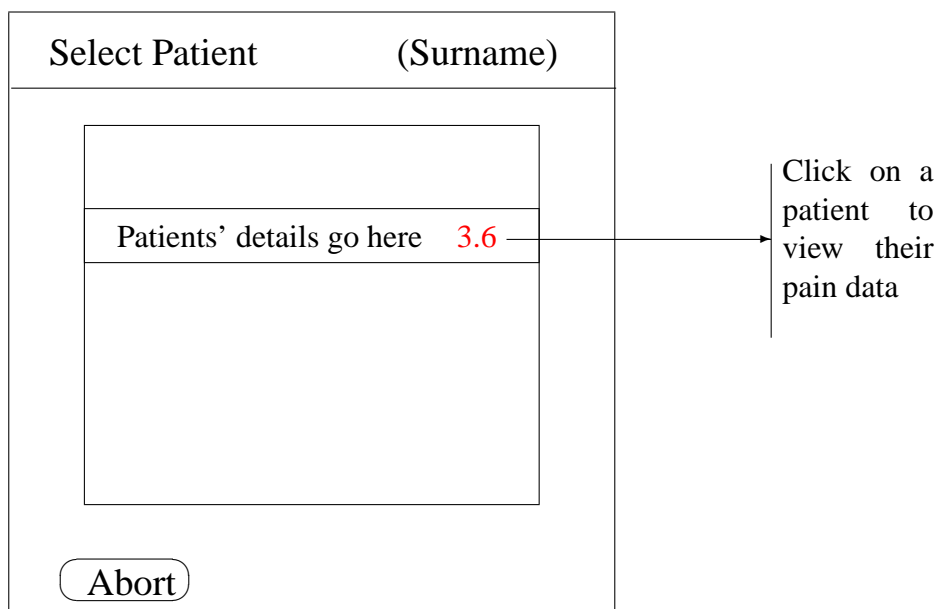


Table 6: Patient selection by surname

In the above screen, a search has provided one or more matching patients. The user clicks on the relevant row to enter the pain record for that patient, in a similar fashion to the search by ward (Table 2).

There is the potential here to speed things up if only one match is encountered, by taking the user to that patient's pain information directly. The catch is if this is *not* the desired patient, such second-guessing can then be very frustrating.

3.6 Pain information - Alert screen

Pain Alerts	Hospital No.
Surname: Wickramasinghe	ASA 5E
Forename: Fred	Ward <input type="text" value="65"/>
Major problems:	
renal <input type="checkbox"/>	heart <input type="checkbox"/> lung <input type="checkbox"/> liver <input type="checkbox"/>
anticoagulant <input type="checkbox"/>	coagulopathy <input type="checkbox"/>
chronic pain <input type="checkbox"/>	chronic opiates <input type="checkbox"/>
Note: _____	
<input type="button" value="Back"/>	<input type="button" value="Next 3.7"/>

Click to move on

Table 7: First pain screen — Alerts

This screen corresponds to the top section of our form, containing vital alerts. Having the user briefly glance over the alerts is useful, and shows the advantage of a PDA, where the attention of the user can be directed at important alerts!

The 'Ward' specification should be user-alterable, so that if we're on a ward but the patient is entered on the PDA as being in another ward, we can there and then re-allocate the patient to the correct ward.

Characterisation of problems of 'organ failure' affecting heart, kidneys etc. has already been explored in discussion of the associated paper form.⁴

Regarding the top two lines on the screen, it might be worthwhile swapping the positions 'Surname' and 'ASA' (and Forename and Ward on the next line) as long names would then overrun the right margin and not the subsequent information.

⁴Note how here we have chosen to refer to 'Major Problems' rather than using the term 'Failure', as we have *more* space on the PDA screen than on the form!

3.7 Pain data

Pain Data?	Hospital No.
Consultant <input type="text" value="?"/>	
Pain/10:	
rest <input type="text" value="?"/> moving <input type="text" value="?"/> cough <input type="text" value="?"/>	
regional iv pca orals other	
3.9 <input type="text" value="Y"/> <input type="text" value="N"/> 3.11 <input type="text" value="Y"/> <input type="text" value="N"/> 3.12 <input type="text" value="Y"/> <input type="text" value="N"/> 3.13 <input type="text" value="Y"/> <input type="text" value="N"/>	
Updatable operation data will go here	
<input type="button" value="Back"/>	<input #"="" type="button" value="Done 3.15"/> → Click to complete

Table 8: Pain data capture

This screen largely corresponds to the top line of the form, but we have used the PDA to subtly alter things once more! Because the PDA automatically timestamps all data capture, the user saves by not having to enter date and time. Each of the three major options in the left hand column of the form (regional, iv pca, orals) is now represented as a pair. This approach has the advantage that the user has to *make an assertion* as to whether the modality is present — they cannot simply copy from the previous day, and have to actually look and record whether the modality is present. This approach simply involves quick stylus clicks, and is not tedious. Click on the associated links ([3.9](#)–[3.13](#), in red) to visit these options.

There are two additional features. The first is an ‘other’ modality, which covers things such as transdermal, subcutaneous and rectal administration of drugs. It also covers infusions of ketamine, lignocaine and calcitonin.

The second feature is the ability (not present on the paper form) to record one or more surgical operations. The reason why this feature was *not* present on the paper form is that with referrals from theatre, the pain form should always come with an anaesthetic record (in our circumstances, printed by the IDAS Integrated Drug Administration System). However, without the paper form at hand, it will be necessary to record this information in summary on the PDA.⁵

⁵We anticipate that the normal mode of operation will be to capture such data from the computerised IDAS record, and then export these data to the PDA at the time of synchronisation, rather

3.8 Operation data

There are several possible methods of adding operation data. We believe that a quick and meaningful approach is to simply describe the operation according to site and nature, with an optional added free text area, rather than having a complex system of operations. A tentative menu is along the lines of:

Add operation	Hospital No.
Site	<input style="width: 100px;" type="text" value="?"/>
Type	<input style="width: 100px;" type="text" value="?"/>
Comment	<input style="width: 200px;" type="text"/>
<input type="button" value="Abort"/>	<input type="button" value="Done"/>

Table 9: Adding operation details

The 'Site' option would be a list of anatomical regions, and the 'Type', the nature of the surgery, for example plastics, orthopaedic, neurosurgery, cardiac, and so on. Software checks could be used to prevent absurd combinations (ophthalmic operations on the heart, or whatever)!

than the user having to enter every operation.

3.9 Regional anaesthesia — decision making!

The logic on entering this menu is interesting. If the **N** box is tapped with the stylus, and the PDA is unaware of any current regional infusion, then the tap is simply recorded. If however, the PDA has a record of a current infusion, it must ask the user whether this infusion has been discontinued, and respond appropriately:

Confirm action?	
Has the regional infusion been discontinued?	
No	Yes

Table 10: Confirmation: stopping of regional infusion

A ‘No’ response will take the user to the regional menu (Table 3.10), but a ‘Yes’ will force termination of the regional (as recorded by the PDA).

Conversely, if the **Y** box is tapped, the PDA will go straight to the regional menu if it has a record of a current regional infusion. If there is no such record, then the user will be prompted to start a regional infusion, using an alert similar to the one above. The only addition will be the ability to state the type of regional (for example, epidural, brachial plexus infusion, interscalene infusion, or whatever).

Confirm action?	
Start regional. . .	
?	→ Click to choose type and confirm
Cancel	

Table 11: Start regional infusion

3.10 Regional menu

Epidural D1	Hospital No.
Mix	<input style="width: 100px;" type="text" value="?"/>
OK: motor	<input type="checkbox"/> Y <input type="checkbox"/> N
pressure	<input type="checkbox"/> Y <input type="checkbox"/> N
block	<input type="checkbox"/> Y <input type="checkbox"/> N
site	<input type="checkbox"/> Y <input type="checkbox"/> N
Rate (ml/hr)	<input style="width: 50px;" type="text" value="?"/> Top-ups <input style="width: 50px;" type="text" value="?"/>
PCEA: tries	<input style="width: 50px;" type="text" value="?"/> good <input style="width: 50px;" type="text" value="?"/>
<input style="width: 80px;" type="button" value=""/>	<input type="button" value="Done 3.6"/>

Click to
move on

Table 12: Regional anaesthesia — data

The regional anaesthesia menu will be minimally populated with information — only the day and type of anaesthesia will be indicated (in the example, ‘Epidural D1’). This is because confirmatory selection of mix, rate and so forth is an important safety check. The user actually has to check this information, and cannot simply copy it from past information!

There is potential in this PDA menu to easily ‘augment’ data capture over and above that on the form, by popping up a detailed menu if the user clicks N for any of the four items motor... site. At minimal extra time cost, details of the problem can readily be recorded.

We should probably provide the ability within this menu to start or discontinue the use of PCEA. An appropriately labelled button might be inserted in the top right corner of the user area to allow for such an action. In addition, a button permitting termination of the epidural might be inserted, either above the ‘stop/start PCEA’ button, or in between the ‘Abort’ and ‘Done’ buttons.⁶

Finally, clicking on ‘Done’ will take the user back to the Pain data menu (Table 7).

⁶Slightly inferior, despite a less busy screen, would be to hide this ‘stop’ action within the ‘Mix’ drop-down menu. Although convenient, such an approach would be non-intuitive to the first-time user.

3.11 Intravenous PCA

Decision making here is very similar to that used with regional anaesthesia. Disagreement between the user's YN choice and the current status recorded within the PCA will result in confirmatory prompts:

<p>Confirm action?</p> <hr/> <p>Has PCA been stopped?</p> <p><input type="button" value="No"/> <input type="button" value="Yes"/></p>	<p>Confirm action?</p> <hr/> <p>Start PCA...</p> <p><input type="button" value="Cancel"/> <input type="button" value="Yes"/></p>
---	--

Table 13: Confirmation: stopping and starting PCA

The major difference from the regional version is that starting the PCA is simply a yes/no decision. The menu is largely self-explanatory:⁷

IV PCA	Hospital No.
Type <input style="border: 1px solid black;" type="text" value="?"/>	
Bolus (mg) <input style="border: 1px solid black;" type="text" value="?"/>	Lockout <input style="border: 1px solid black;" type="text" value="?"/> min
PCA: tries <input style="border: 1px solid black;" type="text" value="?"/>	good <input style="border: 1px solid black;" type="text" value="?"/>
Taking orally? <input type="checkbox"/> Y <input type="checkbox"/> N	
Basal? <input type="checkbox"/> Y	
<input type="button" value="Abort"/>	<input type="button" value="Stop"/>
<input type="button" value="Done 3.6"/>	<div style="border-left: 1px solid black; padding-left: 5px; display: inline-block;">Click to move on</div>

Table 14: Regional anaesthesia — data

⁷Apart from noting that we must express bolus as either mg or μ g.

3.12 Orals

There are several differences in the decision tree with oral agents, when compared with IV PCA and regional anaesthesia. Any click on results in entry to the menu. The question posed if is selected in the face of a current record of oral therapy with one or more drugs is simply “Stop all oral therapy?”

The menu displays a *list* of oral drugs currently being administered. The user can document stopping each one of these drugs by tapping with the stylus on the relevant drug. A drop-down list is provided to permit *addition* of another oral agent. This approach is different from the one provided on the form, but has the advantage that further oral drugs can be added without the need to devote space to each drug.

Morphine and methadone, because of their status as ‘special’ opiates, might even be allocated their own areas.⁸

Oral agents	Hospital No.
<div style="border: 1px solid black; width: 100%; height: 100%; display: flex; align-items: center; justify-content: center;"> List of drugs </div>	morphine (mg/24hr)
	short-acting: <input type="text" value="?"/>
	long-acting: <input type="text" value="?"/>
	methadone (mg/24hr)
	<input type="text" value="?"/>
<input type="button" value="Add drug"/>	<input type="button" value="Done 3.6"/>

Click to
move on

Table 15: Oral agents

⁸Although this isn't done in the current implementation, we've shown how things might look if this option were chosen. Note that it would be fairly easy to modify the menu, allowing the user to record total doses of drugs other than these two, but such an approach might conceivably cause user fatigue and non-compliance. Ultimately we anticipate integration of the program with a pharmacy program detailing prescription, which might facilitate checking of drug administration!

3.13 Other drugs and modalities

This menu has the potential to be very complex. We will simplify things by having a table with just two columns — the left column will identify the drug, and the right the 24 hr cumulative dose. The menu will thus superficially resemble the ‘orals’ menu, and access to it will be similar.

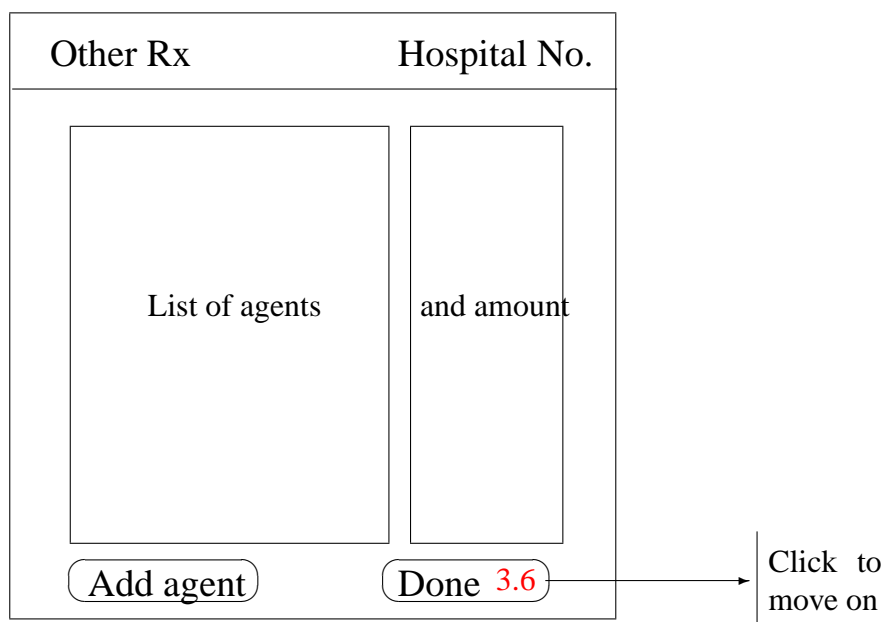


Table 16: Other therapy - SC, PR, transdermal, IV infusions

3.14 Prompts to add drugs

Adding an oral drug

This tiny menu is very simple:

Confirm action?	
Add drug...	
<input style="width: 150px;" type="text" value="?"/>	Click to choose drug and confirm
<input type="button" value="Cancel"/>	

Table 17: Start oral drug

It is similar to the ‘start regional’ menu used to determine the mix for regional infusion. Slightly more complex is...

Adding another modality

In the case where we have to add not only an agent but also the route of administration (iv infusion, rectal, subcutaneous, transdermal), there are two possibilities: select the agent and then the route (shown in the tentative menu of Table 18), or the somewhat more solid approach we finally took of having a button for each modality, and *then* selecting from a list.

Confirm action?	
Add agent:	
<input style="width: 150px;" type="text" value="?"/>	
route:	
<input style="width: 150px;" type="text" value="?"/>	
<input type="button" value="Cancel"/>	<input type="button" value="Done"/>

Table 18: Start other modality

3.15 The ‘final’ screen

Once we have documented all current pain modalities, we press the ‘Next’ button in the pain data menu. This takes us to the last menu:

ALERTS	Hospital No.
Alerts:	<input type="text" value="Comment"/>
low BP	<input type="checkbox"/> Y <input type="checkbox"/> N
sedation	<input type="checkbox"/> Y <input type="checkbox"/> N
nausea	<input type="checkbox"/> Y <input type="checkbox"/> N
pm review	<input type="checkbox"/> Y <input type="checkbox"/> N
Quality control	
near miss	<input type="checkbox"/> Y <input type="checkbox"/> N
error	<input type="checkbox"/> Y <input type="checkbox"/> N
<input type="button" value="Back"/>	<input type="button" value="Discharge"/> <input type="button" value="Done"/>

Table 19: Final Screen

Compared with the paper form, the most significant change on this screen is the introduction of an overall quality control assessment. This section as initially conceived had two components, giving the user the ability to document both management errors, and ‘near misses’. It is clear that the PDA format lends itself to exploration of such issues, as clicking on the relevant button can be used to bring up a detailed enquiry. In the actual implementation, we chose the perhaps less confrontational option of simply asking whether there is ‘any substantial problem’!

Another alteration is the addition of a ‘pm review’ entry, as the PDA format permits ready searching for patients targeted for later review.

Here is the discharge screen⁹ which lets us say where the patient went:

Confirm action?
Alive at discharge: <input type="checkbox"/> Y <input type="checkbox"/> N
Discharge to: <input <="" td="" type="text" value="?"/>
<input type="button" value="Cancel"/> <input type="button" value="Done"/>

Table 20: Start other modality

4 Availability

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The companion document on which the above text is based (The Analgesia Safety Checklist), and the L^AT_EX source for that page are made available under the GNU Public Licence (GPL) at the following URL:

<http://www.anaesthetist.com/analgesia/>

Details of the actual PDA implementation of the form are contained in a third, longer document entitled *Analgesia safety checklist — PDA implementation details*, and available in two parts from the same source, together with the source code of the actual PDA program and Perl implementations of the program.

⁹The 'final' screen wasn't that final!