A qualitative comparison between critical care sites which use a computerised information system and conventional data management.

Peer reviewed research paper

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Introduction

This is the last in a trio of articles sourced from an extended research project which explored aspects of the ways in which critical care nurses interact with computerised information systems (CIS). The first (Norrie 2003) identified those issues in data handling which the nurses saw as being of importance. These were identified as their '*primary aims*', which included anything which supported their ability to deliver high quality individualised care. The second (Norrie and Anthony 2004) used a Likert scale questionnaire to provide quantitative data, which showed clearly that CIS could be highly rated by the nurses who used them. This final contribution will present a qualitative source of evidence for discussion, and will summarise some of the main items to be identified across the project.

The questionnaire used in the second article also included four open ended items, in order to generate some non-prescriptive data. These are shown below. These were distributed at three sites, one of which used CareVue 9000 (a commercially available CIS), and two which used conventional data management and display methods. Full details of sampling and distribution are given in Norrie and Anthony (2004).

Open ended questions
Do you have any comments to make about the way in which you record patient information?
Strengths of your recording/charting system:
Weaknesses of your recording/charting system:
Other comments:

Analysis of open ended question responses

The responses were substantial, of a total of 101 completed questionnaires, 65 responded to the open ended items, a response rate of 64%.

The responses were analysed and coded using methods based upon grounded theory, in line with the principles of Glaser and Strauss (1967) and Smith and Biley (1997). To support reliability, an academic colleague independently reviewed the main themes which emerged. Consultation was then held and some minor changes were made to accommodate these comments. For clarity, the data from both non CIS sites have been amalgamated.

Strengths of your recording/ charting system

The most striking feature from the data was a number of spontaneous pieces of praise for the CIS: '*I enjoy using CareVue, it is fantastic*', '*CareVue is great*', '*really like CareVue, hate the thought of going back to charts*' and '*definitely miss using CareVue when working in other areas.*'

This warmth of feeling was not really evident elsewhere. The only corresponding comment to come from the non CIS sites is the somewhat pallid '*the best I have used*', which was reported by one member of staff at a non CIS site. The CIS therefore does seems to be able to produce an emphatically positive response in at least a proportion of staff.

Quality
A number of comments were given which related to adjectival qualities of the systems, whether computerised or not, that is they could be described as '*quicker*', '*more accurate*' '*more legible*' or '*easier to interpret*' and this forms the next theme to emerge.

At the CIS site a large number of respondents identified these benefits. There were nine reports

that CareVue was a quick system for recording information and nine reports that it was highly accurate. Some quotes contained a combination of positive elements, for example it was *'quick and accurate, easy to monitor changes.'* Six reports identified that it was more legible than hand completed charts and another six that it was easier to identify recordings such as blood pressures and heart rate form the data display. These positive attributes were spread widely amongst the responses. In addition a further six nurses identified that CareVue was able to have all the patient data readily available in one place. One nurse reported that data were:

'easily accessible, you don't have to look through the notes because it can be easily seen on CareVue.'

A limitation to the praise was however noted. A number of the responses had qualifying statements attached, 'it's clear, legible, *as long as* people record things accurately it is very reliable' (not original italics). This gives a signpost to one of the limitations of both computerised and non computerised systems, which will be discussed later in greater detail. CareVue was also described as being easy to use (three reports) and of providing data easily for review of the patient.

Comparison with the non CIS sites shows that some similar comments were made. Data recording was described as being clear: *'trends were clearly available at a glance'*, *'easy to use'* and *'information i.e. observations readily available and spaced out well'* and *'all the data were readily available for nursing and medical staff'* (a total of seven reports).

These positive comments almost unanimously referred to the large 24 hour chart used to record patient observations, as indicated by the items identified i.e. *'observations'*, *'observations chart'* and *'visually accessible to other disciplines.'* This focus of the comments represents a difference between the CIS and non CIS sites. At the CIS site, the positive comments refer to a broader range of items, including patient observations, laboratory results and other sources of data, whereas at the non CIS sites it was narrower, related to items contained within the observation chart itself.

Specific features

The second theme which emerged identified specific features of the charting and recording systems, i.e. specific items or functions which the staff felt were positive features of the way data were recorded. The CIS site reported many more of these than the non computerised sites, 16 different items were recorded at CIS site compared to an aggregate of six from the other two. However this may be because CareVue actually *has* a large number of features rather than because they are especially helpful or supportive to the nurses. The nurses also identified positive ways in which CareVue handled the large amount of data generated in the clinical area. This included the transfer of data from laboratories directly to the bedside, the ability to immediately obtain data on readmitted patients, and the feeling that *'complete data can be assured.'* This was also reported when it came to discharging patients, a notoriously lengthy process in terms of paperwork:

'(you) can retrieve patient history easily, especially consolidating all files from admission to discharge….(this is) very important in discharge.'

Two senior nurses also identified it as a useful system for monitoring standards of care within the unit, because CareVue could review two or more sets of data at a time. In addition one nurse specifically identified that *'we definitely chart more information than we used to.'*

In addition to this flow of data management, a number of more applied advantages were identified. Five nurses reported that continuous recording allowed them to concentrate on patient care rather than recording during crises. No matter what was taking place, CareVue kept a record of ongoing events. Similarly it was felt that it was easy to get information concerning specific incidents from CareVue. However, the same caveat was identified as before, by four nurses: *'as long as'* people use it correctly it will be reliable and accurate, suggesting that this was not always the case.

Corresponding items were also found at the non computerised sites. Firstly the layout and physical availability of the charts was identified as being useful. Three nurses highlighted that the charts were *'readily available for nursing and medical staff.'* One of the benefits of a two by three foot piece of paper is that it is large e.g. *'visually accessible'* and can be written on, wherever the

nurse feels is relevant. Seven nurses identified this flexibility and the ability to add free comments and prompts as being valuable. Similarly, in comparison to the large amounts of data that CareVue could amass, it was identified that the nurse at the bedside was a useful editor of data so that only relevant information was charted, i.e. there was a cognitive step in data recording. This implies that spurious information due to artefact could be rejected at the discretion of the nurse.

It would seem therefore that both systems of data management had a number of strengths. Numerically these were greater at the computerised site, which seems appropriate as it is a more sophisticated manager of data than the conventional paper chart. What is less certain is whether this could have a beneficial effect upon nursing practices or patient care.

Direct help in patient care
At the CIS site four nurses stated that CareVue allowed them more time to care for their patients, it *'leaves more time to focus on the practical aspects of patient care'*, in addition it was identified that the system allowed the nurse to *'easily identify changes in the patient's condition.'* Both of these are very positive statements, indeed it could be argued of all that has gone before, these are the most applied and hence the most relevant to nursing care.

In contrast, at the non computerised sites, although nine identified that their charts allowed easy recognition of changes in the patient's condition, no comments were made about time management, at least not identifying it as a strength.

Weaknesses of your recording/ charting system
Training
CareVue is a highly complex piece of computer technology, especially when compared to the traditional critical care chart and so it would be surprising if no mention were made of training issues from the CIS site. However, reports of problems in learning, or not being able to use the system effectively were surprisingly few in number, and could be interpreted as being notable for their absence. To paraphrase Sherlock Holmes (Conan Doyle 1892), they can be described as the *dogs which did not bark,* and their omission is of significance, suggesting a straightforward

acceptance of the CIS. Indeed only one mention is directly made of training: it *'takes a while to get to use it and then you love it!'*, which suggests that the nurse who reported this felt that the effort in learning to use it was well worth while.

As might be predicted, training was not seen as an issue at the non CIS sites, suggesting that the traditional chart was at least as easy to learn to use as CareVue. There is however one final strand of evidence to suggest that CareVue was seen as being a very useful system by the nurses who used it, and this will be discussed under the heading of the next theme which emerged.

Issues relating to care planning
As discussed in Norrie and Anthony (2004), although CareVue has a care planning facility it had never been used at the CIS site, therefore the data relating to care planning could not directly relate to the difference between computerised and non computerised sites. From a cursory glance at the comments made regarding care planning, it was clear that a proportion of staff at all three sites were unsatisfied with the care planning they used. At the non CIS sites it was described as repetitious, time consuming and requiring a lot of paperwork (three reports). At the CIS site a number of nurses made similar comments too, but most significantly, no fewer than 13 nurses stated that they *wished* care planning was undertaken using CareVue. Because such a large group of nurses wished it had been included on CareVue, this strongly suggests that they believed computerisation of this process would result in a form of documentation that was more satisfactory than a conventional written one. In effect this represents a very positive statement about the general principles of using a CIS and of CareVue in particular, supporting the generally positive estimation of it thus far.

Weaknesses of the system
No system however is perfect, and a number of items were identified with CareVue that the nurses felt were less satisfactory. Two nurses mentioned that they felt confidentiality was an issue, because patients could be viewed remotely at other bed stations. Two were concerned that the system might crash. It was pointed out that not all information such as lab results and fluid administration devices were automatically accessed and this limited the effectiveness of the system. A number of nurses felt that the printouts from the system were not clear and this could be a

hindrance when it came to transferring patients to ward areas. As one nurse stated:

'I find the printouts of the observations/ labs etc. quite confusing which must make the ward nurses extremely confused….. I have found myself on many occasions spending longer on the wards explaining where to find information on the chart than actually handing over the patient.'

Amongst specific features, two nurses felt that the drug prescription feature was not *'user friendly'* and it was reported that only one person could use CareVue at a bedside at a time. These appear to be fairly minor weaknesses though.

At the non computerised sites a similar quantity but different spectrum of comments were identified. Recording of observations and laboratory results was felt to be time consuming. As a manual system it was identified that if the nurse was too busy, charting would not take place on the hour but would have to be completed retrospectively, increasing the likelihood of errors. In addition complaints were made again of repetitious documentation which was time consuming and resulted in too much paperwork. It was not always accurate, and it did not always reflect fluctuations in observations between hourly observations and so could give a false picture of the patient's stability.

'Only as good as'
This theme has been mentioned already. It describes a limitation in the way staff used the CIS and to a lesser extent the paper documentation. Put simply, the CIS was universally acknowledged as having many desirable features. However the extent to which these were used was determined by either the skills or knowledge or attitudes of the nurses who used it. The phrase which summed this interaction up was *'only as good as'* the nurse who uses it. This phrase, or one closely resembling, it was used by six nurses at CIS site, for example *'it is only as good as the person inputting data'*, *' the charting system is as good as the user.'* The example which was repeatedly used (by seven nurses) to show this was the use of default settings on CareVue.

In order to make a recording, the CIS suggests a reading (the default) which is then either verified by the nurses or rejected and changed. The temptation is to always select the default, since this

is the quickest and hence the easiest option. As one nurse put it '

'to accept defaults is always a tempting option and sometimes leads to charting errors.'

Other related examples were given. For example it was suggested that data were sometimes entered which were not always true and it was also suggested that too much reliance was made on CareVue at the expense of nursing skills, the example given related to relying on the CIS to carry out calculation of drug dosages.

The phenomenon of *'only as good as'* was also found at the other sites, therefore it is not unique to the use of a CIS. This is not a theoretical issue. The language used suggests that these were actual events relevant to patient care. At the CIS site one nurse wrote;

'changes (were) not recorded as it defaults to the last hour's observation or ridiculous blood pressure readings' ,

At one of the non CIS sites one nurse wrote:

'(the) quality of the documentation depends on the nurses'

and it

'depends on the person filling it in as to how comprehensive it is.'

What this suggests is that at all three sites, basically reliable systems of data recording were in place, but the accuracy of the recording was limited by the way they were used. The large proportion of responses at the CIS site seemed to identify this phenomenon more closely and specifically with CareVue rather than the paper charting at the other sites, suggesting that the more sophisticated system was more susceptible to the effect than its conventional counterpart.

Other comments
The final open ended item invited the nurses to put forward any other points which they wished to make. In support of CareVue, eight nurses finished by making what were effectively unsolicited positive statements about their system, a phenomenon which was not noted at all at the conventional sites. This effect has already been

discussed and was the only substantial theme which emerged from this section of the questionnaire. In comparison, perhaps the final word in this analysis should be given to a nurse at one of the non CIS sites who reported: *'I would welcome a computerised system!'*

Discussion

This final phase of the research project has helped to pull together a number of the phenomena identified in the earlier investigations. The quantitative phase (Norrie and Anthony 2004) showed that there was a measurable increase in satisfaction for the nurses between the site which used a CIS and those which used conventional charting. These responses to the open ended questions have helped explore why this is so, showing that aspects of efficient data management and time saving are all important to the nurses. This also triangulates well with the findings of the first phase, the formulation of the 'primary aims' of the nurses (Norrie 2003). This was reflected in perhaps the most striking finding from this current report, the spontaneous praise of the CIS and their clear linkage to practice and patient care.

Limitations were also identified, which again triangulate with the previous work. The phenomenon of '*only as good as*' is closely related to the '*cognitive step*', proposed in Norrie et al (2004). This suggested that the nurses needed to engage, or to participate actively, with the data to support their decision making. Without this step, redundant data could accumulate and not influence nursing care. Similarly, by allowing default settings to be accepted, the nurses can remain passive and distanced from this flow of data. Logically, it might be better for the CIS to employ a blank value rather than a default. It may be better to have no data than wrong data! This would also mean that the nurse would have to positively decide which data to enter, and so cognition *would* then become involved. Arguably, this could result in more accurate, or at least more representative, data being gathered.

These conclusions have dealt largely with the data collected from the CIS site. However, it should also be noted that there was consistent positive reporting about the manual charting, specifically the large 24 hour graphical charts. This was however less emphatic, and was more limited in the extent of information management it encompassed. This identified that conventional

data management could still work well, and although less glamorous than computerisation, a thorough overhaul of paper documentation may result in significant benefits at a fraction of the price. At the very least, before changing to a computerised system, it may be wise to critically evaluate and develop existing paperwork. As a warning, it might be worth bearing in mind the words of Firth (1985 p14) *'applying technology to a manual mess only results in a technological mess.'*

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