Examining Quality of Care – How Poor Information Flow can Impact on Hospital Workflow and Affect Patient Outcomes

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Abstract

This paper argues that effective management of patient image data can enhance patient care. It examines the workflow and information flows involved in the search for image based data in a hospital department and the possible consequences for both patients and hospitals where information is not available at the point in the workflow process when it is expected.

In the system under study, an Australian public hospital Neurology Department, patient data is passed to medical consultants on request. When this data is delayed there is a potential delay in the workflow associated with the patient treatment episode. This paper looks at the negative impacts of interrupted workflow and information flow under a semi-automated process for transferring image data. It argues that where there is a disjunction between workflow and information flow, decision making can be delayed and the patient service episode extended. This leads to negative impacts for both the individual patient and the system as a whole.

Key words: Workflow; Information Management; Patient Care; Simulation; Medical-Image Data.

Introduction

While Information Technology (I.T.) has been used extensively in information-rich sectors to enhance the provision of Management Information Systems and Decision Support Systems this has so far not been the case in the area of direct health provision. This is perhaps understandable as it is only recently, with technological achievements in the areas of sensing and scanning, that deployment of technology beyond records management has been possible.

However, with an increase in I.T. support potential for the decision making process and the reducing cost of adoption of image systems, it is seen to be helpful to initiate studies in this area. In the Neurology department in the hospital under analysis in this report we found significant delays as a result of workflow interruption and difficulties in data management. We conclude that, in distinction to the benefits shown through research into information management in the records handling area, the application of I.T. to health systems in medical practice, such as Neurology, where high resolution scanning and sensing is used, can potentially lead to advances in patient care in hospitals, as well as economic benefits.

As medical advances in the technology used in Neurology Departments have moved from X-rays to MRI (Medical Resonance Imaging) to PET (Positron Emission Tomography) to MEG (magnetoencephalography) the prospective improvements in diagnosis have been hindered by problems in records integration, management of associated data volumes, workflow integration and cost considerations.

Much research has been done on the improved patient benefits that can result from improved workflow in hospitals. Buffone, Moreau and Beck claim that a focus on workflow “will enable (hospitals) to better coordinate the use of resources for diagnosis, treatment, and clinical management, allowing (hospitals) to preserve quality and control costs” [3].

Additionally, studies that examine the digital distribution of medical images have found “higher workflow efficiency leading to better patient care.” [6].

A significant piece of research by Arenson, Seshadri, Kundel et al specifically examined the issue of speed of workflow under digital and hard-copy film environments [1]. This research recognized the ability of digital medical image systems to “speed medical images to physicians, and other health-care professionals” and suggested that if prompt action improves a patient’s outcome, a positive effect on patient care will result from the immediate availability of radiographic images” [1]. The study looked at the number of hours it took for actions to be taken by physicians under the two environments. On average, there was just over a 30% reduction in time before a treatment action took place when the digitized database was used rather than the hard-copy film process [1]. It is suggested from this research that the use of a digitized database can alter workflow and work practices in the hospital environment. This occurs as a result of the workflow improvement that develops.
through all images and radiological reports being freely available, much reduced opportunities for data loss and reduced occurrence of the asynchronous receipt of multi-modal data.

Wilson et al [15] also indicates benefits that could result from reductions in data delay. He found that 16.6% of admissions to public hospitals lead to an “adverse event” resulting in disability or a longer hospital stay for patients. In further research Wilson et al [14] suggests that delays contributed to 20% of adverse events. Of these, delays in diagnosis accounted for 56.8% and treatment delays for 46.6% [14]. Both of these sources of delay can occur as a result of missing treatment and imaging records.

Adverse events associated with data loss are most marked in non-automated and semi-automated systems as a result of poor system control. In this research we define semi-automated systems as systems where some processes are performed manually and some are implemented automatically on a computerised system. While fully automated systems can be subject to corruption and data losses of a different nature to those found in manual or semi-automated systems, the latter can be expected to have more failure points. Data loss in an automated system is to some extent controllable through appropriate design features, and, in general, a well-designed computerized information system will have a lower rate of failure than a non-automated system or semi-automated system. What is most significant in non-automated and semi-automated medical-image file systems is a lack of synchronicity between information flow, the flow of diagnostic data, and workflow, the flow of patients past consultants and scanning equipment. This is caused by delay in locating files and file transfer as well as loss of files. These delays can in turn lead to delays in initiating treatment.

Choplin et al found that: “Timely management of medical imaging information is one of the greatest challenges facing medicine today... Simultaneous access to Radiological images may be needed for accurate interpretation. In addition, multiple physicians caring for a patient may want to review the images. As medical centers increase in size, the capacity of film based radiological systems to meet these demands decreases. Films are often unavailable or lost and film storage costs are high” [5].

Previous research suggests that what is important in the transfer of digital images is the time between when an image is ordered and the onset of an action initiated as a result of image information. It is assumed that a decrease in this time interval would have a positive effect on what are considered to be the most direct outcome measures, morbidity and mortality [2]. Results from research by Brickman, Khalsa et al [2] indicate that the time required to take some clinical actions decreased with the immediate availability of images on the digital display console. Getting a data item to a requesting physician quickly is the most significant treatment issue uncovered by other researchers, regardless of whether the data is available in hard or soft copy [13].

Health benefits are also said to accrue through the integration of the total patient record [7]. Medical images have a meaning associated with their context [7] and where a patient record is made up of many different modes of image data it is most valuable to view all images simultaneously. Where all images are not available when ordered, doctors often reschedule patients causing workflow interruption and preventing patients from moving through to completion of the patient episode.

Despite these findings, many large public hospitals in 2001 are still using semi-automated and non-automated processes to deliver image-based data. Hospital tours will uncover rooms full of hard-copy film and trolleys of data waiting to be delivered manually around the wards and to consulting suites.

**Objectives**

In this research we have attempted to analyze and model the degree of data delay and loss that occurs in the Neurology department of one large public hospital using a semi automated system. We then consider the contribution of the semi-automated system to a fragmented workflow leading to circumstances likely to contribute to adverse consequences for patients. By extension, we are examining the merit of implementing a fully digitized and automated medical image database to replace a semi-automated system.

**Research Method**

We examine these issues through a patient data survey completed by Neurology consultants as well as interviews with hospital medical consultants. These allow us to create a workflow and information flow model, and to model and simulate the semi-automated information delivery process currently existent in a hospital department.

A patient data survey (Appendix 1) was used to monitor delays in the receipt of both single and multi-modal patient data sought by a consultant (doctor) for outpatient (mainly) consultations to model patient workflow. In this case, we define multi-modal data is more than one data type – e.g a PET scan plus an MRI scan. In general, the information flow for the process under study included a standard delivery time for data of seven days, around which consultation times in the workflow were organized. This seven day delivery
process applied where a scan had been performed earlier and stored with seven days required to retrieve it from storage. The data was collected over a two month period by a Neurology Consultant in a 700 bed public hospital.

The patient data survey (Appendix 1) was divided into three sections. In question 1a the consultant was asked to indicate which data was sought (from a range of data modalities), then whether the data was available at the time of the consultation, and, in question 2, whether a treatment decision was then able to be made.

The patient data survey was designed with a number of aims in mind. If it was found in the consultant’s response that some data was not available to the consultant then the patient data survey looked at the subsequent consultant behavior and consultant’s belief about the impact of the missing scans.

In cases where the data was not available, the consultant was asked to indicate whether it was necessary to reschedule the consultation, possibly delaying treatment, and to consider whether or not the absence of the data effected the consultant’s capacity to make a treatment decision.

Results Derived from the Patient Data Survey

The results arising from data collected at 42 patient consultations were as follows:

• In 32 cases all the data that was sought was available within the benchmarked time (7 days).
• In 10 cases some or all of the data sought was missing and each set of data took between half an hour and fourteen days to find and between half an hour and one hour of the doctor’s own time to find.
• In 2 of these 10 cases the patient was an in-patient. In these 2 cases a treatment decision could not be made and the consultant felt that had the data been available he would have been able to make a treatment decision.
• Of the 8 outpatient cases where data was missing, in 3 of them it was necessary to reschedule the outpatient consultation.
• In 7 of these 8 cases it was felt that if the data was available it would have been easier to make a decision, but only in three of these cases was it possible to postpone making a decision.

Discussion of the Results of the Patient Data Survey

While this is a small patient sample in this process, other Neurology consultants interviewed from the same department as the model parameters were drawn, validated the results recorded with the patient data survey and felt that they were able to be generalized across consultants. The results from the patient data survey signal the following areas worth further investigation in the current semi-automated information management process:

1. There is evidence of treatment delay in a situation where data is delayed or goes missing. While deferring decision making may often be a positive step where requested data is missing, it is still a step which necessarily lengthens the patient episode. It does this by causing the patient to revisit an earlier node in the hospital workflow by either having extra consultations with the doctor or having a repeat scan performed.

In Figure 1, below, we see a representation of this workflow:

![Figure 1: Patient Workflow Representation](image)

Where there is a delay in the information flow at Point C, workflow is interrupted and the patient is unable to move through node A to node D.

2. Where it is not possible to delay decision making, there is a possibility of a higher error for margin on decisions taken.

3. Where data is missing or delayed and a consultation needs to be repeated, there is a cost in patient time and in doctor and administrative staff time.

We can presume that consultants do not frivolously request information that they do not think they will use. Where multi-modal data is sought, all parts of the data request are considered to be of some value in the patient treatment process. While doctors may be able to make valid and correct decisions in the absence of full information, on average, safer decisions with fewer margins for error may be possible the more that information that has been sought is made available.

A multi-step analytical process was put in place to examine these issues further:

1. Using the patient data survey results as a basis for discussion and consideration a
number of meetings with key staff were set up to create a model of the main information flows and where these flows intersect with the patient workflow.

2. The key features of the semi-automated process were abstracted to develop the main processes and procedures for a simulation model.

3. Further meetings were held to develop a set of simulation parameters, which were seen to accurately reflect the hospital experience and recreate a valid representation of hospital practice. Data from these meetings and the patient data survey were collected to aid in synthesizing a workflow and information flow model.

4. Using these parameters, a simulation model of the semi-automated process currently in place at the hospital was created. The simulation model, implemented in Micro-Saint application software, generated a sample of results based both on the patient data survey data and empirics suggested by the key staff.

5. Once the basic model outline was developed a validation process was implemented through meetings with key hospital staff. Once an initial sample of results was produced meetings were held with staff to validate the model parameters and see whether the outputs produced were consistent with real-life experience and with the inputs suggested at stage 3 above.

The Simulation Application

Using simulation we examined the impact of data loss on 1000 patients by tracking the associated simulated information flows. To create the simulation application, we worked out what tasks were required when a consultant sought two separate pieces of data and where the significant points of activity in the process occurred.

The simulation was built following extensive consultation with the service providers, the consultants. Both the process flow and associated probabilities and delays were extracted from interviews. In addition to a statistical verification, the simulation results were viewed by staff consultants at the hospital who felt the results were consistent with their experience.

Evidence gathered during meetings with hospital staff suggested the possible information search pathways for a data request through the tasks that we see in the Scan-Search process model in Figure 1.

Requesting different scan modalities, such as a PET scan and an MRI scan compounds the possibility of delay, although it is common hospital practice for a request for more than one data mode relating to a single patient to be made at the one time. Each request for a scan modality runs independently of any other request and, where patient records are not integrated, summaries and reports may be held in the Central File, for example, and physical scans in the Archives. All of these features of the scan retrieval process can contribute to delay in returning data requests.

Figure 2: The Scan-Search Process Model

A request for a single data mode (e.g., PET alone) carries with it a given probability of being delayed at all the points along the possible pathways seen in Figure 1. When a request for multi-modal data (e.g., both PET and MRI) is made, all scans will need to travel along their independent paths back to the consultant and may suffer their own separate degrees of delay.

Delay is compounded because each individual request for data follows the possible information search illustrated in Figure 2. At each node, if data cannot be retrieved, there is a possibility of workflow delay.

Thus if a consultant is waiting for two scans and needs both scans to make a treatment decision, the wait will be equal to the time it takes for the longest delayed scan to be returned. Each of the nodes in Figure 2 carries a given time weighting with a sample of node weightings displayed in the table below:

<table>
<thead>
<tr>
<th></th>
<th>DAYS</th>
<th>ST.DEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>File request</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Go to Central File</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Search Central File</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>PET Center</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Radiology Archive</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Rescan (PET)</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Exit process (all scans)</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1: Days expended at each task node in the information Search
The possibility of a particular information search path being followed was established through interviews with hospital staff and was based on the following probabilistic paths through individual task nodes:

<table>
<thead>
<tr>
<th>Task Node</th>
<th>Probability of Scan being Found</th>
<th>Prob. of Search Moving to Next Data Repository</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central File</td>
<td>.8</td>
<td>.2</td>
</tr>
<tr>
<td>PET Centre/Radiology Dept</td>
<td>.7</td>
<td>.3</td>
</tr>
<tr>
<td>PET Archive/Radiology Archive</td>
<td>.95</td>
<td>.05</td>
</tr>
</tbody>
</table>

**Table 2: Probabilistic paths through each task node in the Information Search**

While we can see in Table 2 that the probability of a scan being found in the radiology archive is high, the small likelihood (.05%) of the search having to move onto the rescan node carries a high cost (20 days: Table 1).

Examining the various possible paths in Figure 1 and accounting for the probabilities of these being followed, we found a weighted average of nearly 6.5 days for all information paths.

In comparison, the time to traverse the shortest path, straight from the central file area to the consultant, is 5.5 days. Thus, on average, the increase in service time resulting from interrupted information flow does not appear to present a high cost to the system as a whole. However, for those individual patients whose data follows the longest route, the costs can be very significant.

Problems for the hospital system result where information loss necessitates certain nodes in the workflow required to complete the patient episode being revisited, which can add to hospital queues and cause a ripple lengthening effect through the entire workflow.

**Results of the Simulation**

What was modeled in this simulation was a request covering two data modalities, an MRI and a PET scan. We sought to examine the spread or dispersion of the times of return of the information sought.

If patients are to be generally recalled to see a consultant after approximately 7 days wait then it is pertinent to examine the rate of data return after 7 days in the simulation model.

The output of the simulation model for a request for two items of patient data is shown in Table 3.

The data fulfillment is separated into “early” and “late” arrivals. In order to check the statistical significance of the results in Table 3 we ran multiple simulations and calculated the standard error of the difference for the two sample means from Table 3, early and late. The observed difference is highly significant. Therefore we have a high level of confidence in both the early and late means and the percentages achieved.

<table>
<thead>
<tr>
<th>Days elapsed</th>
<th>% of “early” (1st) data items returned within 7 days</th>
<th>% of “late” (2nd) data items returned within 7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 days</td>
<td>93.78</td>
<td>68.26</td>
</tr>
</tbody>
</table>

**Table 3: Percentage of Files Returned to Consultant Within 7 days**

While the hospital is most concerned about the rate of information return by the benchmarked seven days it is also interesting to note the rate of return after this time, illustrated in Table 4.

<table>
<thead>
<tr>
<th>Days elapsed</th>
<th>% return of 1 data item</th>
<th>% return of two data items</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 days</td>
<td>98.56</td>
<td>83.25</td>
</tr>
<tr>
<td>20 days</td>
<td>100</td>
<td>99.65</td>
</tr>
</tbody>
</table>

**Table 4: Percentage of Files Returned to Consultant Before and After 9 and 20 days**

**Discussion of the Results of the Simulation**

As presented above, using the figures from (Table 3), we could estimate that if a consultant saw a patient approximately one week after their scans were done then in 93.78% of cases the earlier scan would have arrived and in 68.26% of cases the later one would have arrived. In this we have presumed a request for two data modes, so, if a doctor wanted to use this data to determine a treatment plan after one week, it is likely that in more than 6% of cases he would have no data on which to do so, and in over 31% of cases he would have only one piece of data.
Discussion of the Impact of the Results of the Patient Data Survey and the Simulation

Looking back at the findings from the patient data survey, we can try and gauge the impact of the simulation results. We need to examine the full consequence of up to 6.4% of patients not having any data available at all at the benchmark patient return time of one week. In regarding a thousand file requests as corresponding to 1000 patients for whom requests are made, we can examine the impact in terms of patient care and use of hospital resources of 64 of these patients not having any data available on their first return visit to their doctor, and 320 having only one item of data available:

The Consultant using the patient data survey recorded that in 20% of the cases where some of the data was missing from an information request, a treatment decision could not be made at the time of the consultation. Looking at the simulation results this would mean that in 20% of 320 cases, 64 cases out of 1000, a treatment decision was likely to be delayed and the patient unable to continue through the workflow to the end of their treatment episode. Instead of moving on through the treatment process these patients would need to see the consultant again when the data became available, reentering the same workflow node.

Every time data is not available at the predetermined appointment slot, there is the possibility of a second appointment needing to be made using up valuable consultant time, of ancillary staff time being expended searching for lost data and of equipment and staff resources being wasted if data cannot be found and scans need to be re-done.

We have been able to assign a dollar cost to some of the inefficiencies that result from this process. At a rescans rate of 5% of total patients we see 50 out of 1000 samples in our simulation requiring a rescans. Approximately 15 patients a day have a PET scan in the Neurology Dept under examination, so over 66 working days approximately 1000 scans are performed. At $AUD1000 a scan (Clinical Costing Standards Association of Australia standards) the rescans themselves add up to $50,000 every 100 days, or $130,500 per annum based on a five day week.

The above figure is only for PET scans. For dual scan requests we have an annual rate of nearly $130,500 per annum based on a five day week. In the patient data survey we saw that for 2 out of 42 inpatients, a treatment decision was delayed by lost data, presumably extending bed use. For the financial year 1999-2000 the cost per day of an average Neurology bed was $726 (total absorbed costs)(9). For many conditions, such as febrile convulsions, the bed cost per day was much higher ($4,689)(9). The Neurology department under examination treated 812 inpatients over the time period. Giving a possibly delay for 38 of these patients where one bed day is lost through this delay, we have an average cost in bed days of $27,588. The original questionnaire to the consultant’s administrative staff suggested that files which were actively sought often took 2-3 days to recover so this figure could be considerably increased.

Totaling up these few easily quantifiable system costs for dual scan requests we have an annual rate of nearly $500,000. This does not include the cost of lost scans that are not PET or MRI, it only includes one lost day for each inpatient with missing data and does not factor in the salaries of administrative staff searching for lost data or the overheads such as fax and telephone consumed in the data search. These additional costs could add hundreds of thousands of dollars to this amount.

Given that the cost of installing a prototype fully automated system in the Neurology Department under examination is estimated at only $300,000 these annual...
losses fully justify the installation in economic terms [9].

Additionally, in Australia where the study was done, as in many other parts of the world where Case-mix type systems are used, ineffective treatment plans and inefficient bed use result in decreased hospital funding. This decreased funding also has an inevitable flow-on impact on patient care and staff workloads.

What we want to emphasize, however, in this research, is that the increased hospital stay that results from the workflow interruptions observed, is also found to have significant non-economic effects. Health risks from infection associated with extended stay are significant as are rates of depression among extended stay patients [10]. Certainly in a busy public hospital system, every bed occupied for a day longer can mean a treatment delay for a non-acute patient waiting at home - potentially contributing somewhat intangible emotional as well as health costs.

From the simulation data we can see that it would take nearly two weeks for all of the earlier scans to arrive, at which point consultants would still be waiting for nearly 1.5% of the later scans to arrive. In cases where a new appointment has been rescheduled for 7 days later, a treatment decision could still not be made and all the earlier noted impacts would again manifest themselves.

By about 9 days a few scans would still not have been able to be located and a very few still unaccounted for after nearly 20 days. The only option, if this data were still required, would be to rescan. Again, this has a number of negative effects:

1. There is a physical cost to the patient in re-exposing them to possible scanning hazards [12].
2. There is possible physical effect on the patient of delayed treatment as indicated in Wilson’s research [14,15].
3. There is an effect on queuing and workflow throughout the whole system of returning any patient through the service mechanism, which can exacerbate the above, two impacts [9].

Correlating these results with the information the consultant recorded with the patient data survey and the research previously cited, one needs to consider the possible risks and costs to which all stakeholders are exposed under the semi-automated procedure.

The possible personal and health costs to these patients can be very high. The loss of productivity of the patients involved, and the long term community and individual costs of permanent disability from adverse events are all difficult to quantify yet from the simulation data we can at least see that on an annual basis a significant number of patients could be exposed to very real losses.

**Conclusion**

To conclude, the simulation results taken with previous analysis have illustrated the possible contribution of the semi-automated process in delaying data return. This can interrupt workflow where information flow and patient workflow fail to intersect as planned, and consequently impede both decision making with regard to patient care and patient throughput. This may impose a health cost on patients where the “adverse events” occur that have been discussed previously in research identifying data loss and delay as impacting on patient care.

Additionally, the diversion of funds to sustain inefficient processes, inevitably impacts on funds available for patient care.

Under a fully automated data management system, in both inpatient and outpatient situations total treatment times could possibly be reduced or contained if data was available when expected (or as needed in an on-line system). Instead, with a semi-automated system, treatment times are extended with possible health consequences as patients wait for appropriate treatments to be determined from the requested data.

Because consultants in Neurology departments in public hospitals often order multi-mode data, the delay in the receipt of one data item can prevent the fully effective use of the other data items. Where one data item arrived much later than the other, the first arriving item is devalued in its role in decision support. The consultant completing the patient data survey and the other consultants interviewed, suggested that this could constrain their decision-making ability. Consultants have expressed concern not just about time expended seeking lost or delayed data, but about the impact on their own decision making of data delay and the flow-on health-care impact on patients where all elements of a multi-mode data request do not arrive in reasonable time adjacency.

The late arrival of one item can cause workflow havoc. It can cause patient appointments to be cancelled, patient timeslots to go unfilled, and treatment to be delayed. This can cause health care consequences and costs, which extend far beyond the repeating of the individual scan or patient consultation.

Additionally, where rescans are necessary as a result of data loss, the health cost has been well documented. In addition to the general impact of treatment delay the dangers of radiation are known and attempts are always made in clinical practice to reduce the additional
radiation exposure of patients that results from rescanning [12].
Thus we have multiple impacts where a rescan is necessary- the impact of the delay in waiting for a new scan, the impact of being scanned twice- as well as the potential effects of delay in treatment.
Looking at all of these health consequences which may stem from information delay, we see the possible value, worthy of further examination, in hospitals taking advantage of available systems improvement tools which fully automate the delivery of medical image data to reduce workflow interruption and bring workflow and information flow into closer alignment.

Further Research
This research should provide a case for further examination of the workflow costs in inefficient hospital information management practices and more extensive quantification of the real benefits with regard to patient care of implementing fully automated medical image database systems.

References

Appendix 1: Patient Data Survey for Consultant
1.a. Which of the following data items were sought and available in the present patient consultation?

<table>
<thead>
<tr>
<th></th>
<th>SOUGHT</th>
<th>AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
<tr>
<td>MRI</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
<tr>
<td>PET</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
<tr>
<td>Thallium</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
<tr>
<td>OTHER</td>
<td>YES/NO</td>
<td>YES/NO</td>
</tr>
</tbody>
</table>
Answer YES or NO to Questions 1b to 2f.
1 b. If all the data that was sought was available were you able to make a treatment decision?

2a. Where requested information was unavailable, was it necessary to reschedule the patient consultation?

If the answer to 2a is YES you can go to question 2e. (You do not need to complete the next 3 questions (2b-d).
If the answer to 2a is NO, answer 2b-d, and leave out 2e and 2f.

2b. Where the consultation took place with requested data items missing, were you able to make a treatment decision?

2c. If the missing data items had been present, would they have made it easier to make a treatment decision?

2d. Was it possible to delay making a treatment decision until the missing item(s) was (were) found?

2e. Where it was necessary to reschedule the patient consultation was another patient available to fill the set consultation time slot?

2f. If no other patient was available, were you able to use your time for patient care?

You will need to answer the following question, when the information becomes available.

3. Where a data item was unavailable
   a. How long was it until the missing data item subsequently became available?

   _______ Hours ________ Days

   b. How much of your own time do you estimate was spent attempting to locate and retrieve the missing data?

   _______ Hours ________ Days