Health Information Management in a Critical Care Environment

By:

Jeffrey W. (Bill) Gregory
B00080970
jgregory@cs.dal.ca
Bill.Gregory@cdha.nshealth.ca

Performed at:

Capital District Health Authority - Department of Medicine, Division of Critical Care
Victoria General Site

In partial fulfillment of the requirements of the Master of Health Informatics Program,
Dalhousie University
HINF 7000

Report of Internship for the period January 25 – April 25, 2005

Date Submitted: April 28, 2005

This report has been written by me and has not received any previous academic credit at this or any other institution.

I would like to thank Dr. Stephen Beed for his kind mentoring, frank nature, and open mind, Linda Rouleau and Marlene Murphy for their constant encouragement, wisdom and coffee, Bob Kanygin for helping me see the big picture and Gail Blackmore for placing me in a very interesting and challenging environment.

Jeffrey W. (Bill) Gregory B.A.

Table of Contents:

1. CDHA, Department of Medicine, Division of Critical Care
2. The need for Health Informatics Support
3. Work Objectives
4. Project Impact Database
5. The Original ICU Database
6. Health Informatics Approach
7. Role of Health Informatics Specialist
8. Health Informatics Solution
9. Conclusions and Future Work

Appendices:
A) ICU Data Collection Sheet
B) Invasive Procedure Form
C) ICU Database Sample Report
D) Intubation Procedure Form
E) ICU Patient at a Glace Form

This internship report involves the reworking of the data collection processes for the Division of Critical Care in the Capital District Health Authority. With attention to Health Informatics methods, interview processes were used to extract key aspects of clinical practice within the ICU to feed an existing proprietary Database and several independent databases. The resulting data collection forms have begun testing and intentions are for them to be used throughout the Capital District Health Authority. Possible future developments are also discussed.

CDHA, Department of Medicine, Division of Critical Care

The internship occurred in the Capital District Health Authority, Department of Medicine, Division of Critical Care. The Capital District Health Authority is one of seven district health authorities in the province of Nova Scotia. The Capital District encompasses the Victoria General Hospital, Halifax Infirmary, Dartmouth General, Cobequid Multi-Service and Hants Community Hospital and other sites and is responsible for the delivery of health care to the population in Halifax and surrounding areas.

The Department of Medicine is associated with Dalhousie University and the C.D.H.A. The department is comprised of sixteen divisions, with 133 Physicians/Scientists, 79 residents, 124 administrative support staff and 85 full-time Research and Technical Staff. Each division of the Department of Medicine is concerned with the treatment of patients, research development and training of their specific concentration of medicine ranging from Cardiology to Rheumatology.

As the name suggests, the Division of Critical care is responsible for the Intensive Care of the sickest patients in the Province. The Division consists of a multidisciplinary group of healthcare specialists with members from anesthesiology, medicine, surgery and emergency medicine. The division started with nine physicians at the beginning of the internship and dropped to eight by its conclusion. Considering the nature of the patients seen in the Division of Critical Care, the stress level and burn out rate tend to be very high, making the careful management of all resources especially important. The division delivers patient care and specialist training in several locations within the Capital District. Each unit is specially tailored to care for patients in specific situations:

3A - Located in the Victoria General site, 3A Medical/Surgical ICU usually cares for patients whose conditions have progressively worsened within the hospital and who require surgery or who have already had surgery.

5.2 - Located in the Halifax Infirmary site, 5.2 Medical/Surgical/Neurological ICU frequently deals with the care of patients who come from the Emergency Department.

5.2 MSN ICU is more likely to have trauma cases from accidents and is located close to the Emergency Department to ease patient transfer difficulties.

Dartmouth General ICU – The Dartmouth General Medical/Surgical/Cardiac Intensive Care Unit, located in Dartmouth General Hospital was the most recent addition to the Division and now has a "closed" unit with dedicated intensive care staff.

The need for Health Informatics Support

Because of the emotionally charged, fast-paced and stress-filled nature of the ICU environment, the level of specialist burn out is quite high. The shortage of intensive care specialists is a problem nationally as well as locally, so the importance of the training of new staff can not be underestimated. The Department of Medicine's role in the training of new specialists is essential to the long term wellbeing of the Nova Scotia Healthcare System.
Meeting critical patient needs with a shortage of precious and essential ICU resources requires careful and efficient management to be operational. As in many aspects of life, the critical factors of time and money are involved in the resources that must be carefully managed. Frequently saving time means saving money and lives.

The head of the Division of Critical Care is Dr. Stephen Beed. Dr. Beed is a progressive thinking individual who embraces change and is himself and instrument of change on a daily basis. As he is responsible for the successful operation of the Division of Critical Care, he is open to procedural and technological advances that may improve the management of critical care resources. In stressful workplaces some staff tend to fear change as a potential source of greater stress, whereas Dr Beed welcomes the opportunity to benefit his patients and students by giving new ideas a chance. This kind of attitude is essential to practitioners of Health Informatics as the field is still in its infancy.

Work Objectives

As the role of Health Informatics Specialist has not yet been universally defined to all people in healthcare, there was a certain degree of flexibility inherent in the tasks of the internship. This flexibility was somewhat enhanced by the educational role of the Department of Medicine. The Department of Medicine is a very rich learning environment with ample opportunity to learn and explore varied schools of thought. Essentially, Dr. Beed wanted to be shown what kind of influence a Health Informatics Specialist might have to offer the Division of Critical Care. One of the things he wanted was an analysis of an existing, in-house ICU Database and its integration with a somewhat newly implemented North American Critical Care Database called Project Impact.

The initial task for this internship seemed simply the data-mining of the existing ICU Database for knowledge regarding invasive procedures such as arterial line insertions, intubations and critical incidents as well as learning about and integrating with the proprietary software Project Impact.

"It is impossible to manage what you do not measure" Dr. Sonny Marche 2005

As there was no existing Health Informatics Specialist working for the Division of Critical Care, the first task was to determine the efficacy of the existing practices and learn the working environment.

Project Impact Database

Project Impact is a proprietary database that allows intensive care units to do collaborative research and get support from a central location in the United States. Project Impact is a product of the Cerner Corporation. Due to confidentiality issues no one other than the "Informatics Nurses" was able to have computer access to the Project Impact database. This was a very discouraging setback as it directly interfered with my ability to do my job. It was also discouraging because it was an example of how some health professionals view Health Informatics; they see danger in the change Health Informatics brings. It was a difficult discouragement to overcome mentally. The first Health Informatics specialists are trailblazers and we have to expect to encounter this kind of opposition and work around it.

The only data that goes into Project Impact comes directly from the official patient record. By Project Impact rules, no other data is allowed. Because sometimes patients stay on the ICU for a long time and have many tests, it takes a long time for the data to be entered. The data capture capacity of the ICU at the beginning of the work term was 50%.

The Original ICU Database

A data collection form (Appendix A) had been used for approximately a year, collecting general ICU data under the categories Radiology, Invasive Procedures, Airway/Ventilation, Status at 8, Critical Incidents and Consults. Each field of the form was intended to capture data that was important to the Critical Care physicians for various reasons, most of which ultimately involved resource management. Some of the fields, if used together, might yield additional information. The database was created in Microsoft Access.

The radiology section was meant to manage machine usage. The number of times a machine was used could influence care if the patient needs to be moved to the machine or vice versa.

The Invasive Procedures section attempted to capture all aspects of arterial lines and tubes inserted into patients. The person performing the procedure and where on the patient's body the needle or tube was located was intended to be captured by this section. This data could yield an idea of how many procedures were being carried out by residents and where they were being done.

The Airway/Ventilation section captured where and by whom a patient was intubated and what kind of airway support they were receiving.

The "Status At 8" section captured the level of care the patient was in need of on a given day. Sometimes patients on the ICU could be moved to another level of care but were not able to be moved for various reasons. This section was very valuable to determine bed resource management.

The Critical Incident section could be used in conjunction with some of the other sections to indicate when a given procedure generates common problems that might need to be corrected. An excess of critical incidents could indicate a training or machinery problem that would need to be addressed.

The Consults section would capture when consulting Doctors visited the patient's bedside and how long it took them to get there from the time they were requested.

Health Informatics Approach

At the beginning of the internship, there were 1100 records in the database. Several hundred records remained to be entered. In order to gain possible insight into the quality of the data and the nature of the database, I personally entered 500 records. The experience of entering some of the records was extremely valuable from a holistic Health Informatics perspective. The data entry process revealed an extreme weakness in the data collection process and helped create an intimate understanding of the data, the data collection processes, the stakeholders and the direction the database was supposed to be going.

An extremely important aspect of the internship was developing an understanding of the work environment, knowledge of the stakeholders and their objectives and getting a clear mental picture of the current ICU information processes. Attending rounds was not required as part of the internship but for an understanding of the work environment it was an extremely valuable practice. As a result of observing rounds it became obvious that the responsibilities of a Health Informatician do not end at the computer. To properly understand the data being used, one should try and see the whole picture. By interviewing physicians, nurses, respiratory therapists and pharmacists during rounds, it was possible to determine their information needs and begin to come up with a Health Informatic solution to their needs.

Upon analysis of the data already collected in the existing ICU database, coupled with personally participating in the entry of 500 records, it was obvious to me that the current data collection process was not effective. This was a large setback at first because the initial task was to deliver a report from the dataset provided and begin finding a way to integrate into Project Impact. Once it was determined that the data would yield faulty

conclusions, it was imperative to discover why the data was incorrectly collected before reporting the flawed data.

From interviews with ICU staff during and after rounds, it was quickly obvious that user buy-in was to blame for the inconsistency of the data. The people tasked with collecting the data did not know why they were the ones collecting it, were not shown how to fill out the form properly, resented collecting data regarding procedures they didn't participate in, and didn't know what the data was for. The data collection form was not sufficiently user friendly to allow efficient time management and maximum data capture. Essentially the ICU data collection processes had not been managed because there was no one with the job of managing it and all the staff was too busy to notice.

The role of a Health Informatics Specialist began to become clear at this point.

Role of the Health Informatics Specialist

Once a clear understanding of the situation and work environment had been reached, Dr. Beed was informed of the data quality problem and suggested the report be delivered to the Management Committee. Before meeting with the Management Committee, a possible Health Informatic solution began to develop involving altering the data collection form, getting buy-in from the data collectors and properly managing the change to the new forms.

Once the situation was presented to the Committee, further problems with the data collection form and process began to be expressed. A total revamping of the data collection process for the ICU became the obvious Health Informatic solution. One of the most important aspects of the solution was to achieve buy-in from the data collectors.

After the Management Committee meeting, through continual contact with the various managers and stakeholders, a new form began to take shape from the original form. The new form was developed using a Health Informatics approach. The new form was designed to be easily entered into a database. By taking into consideration the needs of all of the stakeholders from all of the various disciplines involved and by collecting and integrating their suggestions in the creation of the form, proper buy-in becomes possible.

Health Informatics Solution

One of the key problems with the original system was that nurses were required to fill out the Invasive Procedures section. The invasive procedures were by definition the responsibility of the resident and attending doctors. The nurses did not feel they were accurately capturing the information required because they were not the people doing the procedure and there were significant concerns that the form being filled out was not a part of the health record and could therefore not be entered into Project Impact.

The solution to this was to make the form part of the permanent health record of an ICU patient. That makes the document official. The second part of the solution was to remove the Invasive Procedures section from the original form and create an entirely new Invasive Procedures form. (Appendix B) The new form was developed by an interview process with Dr. Beed where all the pertinent information regarding the invasive procedures was collected, organized by process and arranged in such a way that filling out the form would be intuitive, fast and accurate. Once the draft was created, feedback was gathered from all the stakeholders specific to that form. Anyone who did invasive procedures was consulted. The form went through at least 20 drafts before testing.

The key element that will make this project work where the other failed is the change management strategy is solid. Because the source of the problem was systematically discovered it can just as systematically be avoided. Too many of the data collectors had not sufficiently bought into the idea of the data collection form, and that is something that needed to be addressed, but also it was important to show the data collectors who did the data collection properly that their efforts were not wasted. If there were no fruits from their labours there would be a high likelihood they consciously or unconsciously sabotage the new data collection processes. In order to show the data collectors that their work had accomplished something, an unofficial report was drawn up to show them an example of what kind of output their collection efforts could generate. (Appendix C)

Conclusions and Future Work

As soon as the ICU staff saw the Invasive Procedures form, the feedback was greatly encouraging. Nearly immediately a Respiratory Therapist suggested an Intubation Procedure form for airway procedures could be created in the same way. This suggestion had great promise in the eyes of the physicians as it could potentially be used by the operating room, Emergency Department and anywhere else intubations take place. These kinds of forms have the additional benefit of potentially being directly entered into a palm device or other electronic format rather than taking the long route of paper to database. At this point, the technology is not in place for such an application.

Using the same methods with the Respiratory Therapist as with Dr. Beed, the workflow for an intubation procedure was collected and turned into a workflow checklist form (Appendix D) to be entered into its own database. This form was also sent to all involved parties, feedback collected and integrated in a number of drafts to produce a trial draft.

With the new Invasive Procedures form and Intubation form, there were still many missing links in the information needs of the ICU staff that were covered with the original database. The physicians specifically wanted to be able to quickly assess a patient's current condition without having to dig through the chart for a long time. The ICU Data Collection form became the ICU Patient at a Glance form (Appendix E) with the intention of the final version being made a permanent part of the health record like the other two forms. This would answer all the difficulties previously mentioned by the staff and data collectors. The data would be taken seriously and therefore collected properly

and it would be simple for the Project Impact data entry nurses to find data and therefore speed up their data collection.

Once the Invasive Procedures section was removed from the original form the space left was filled in with "Positive Cultures Resulting in Treatment Change". Previously, the nurse that was entering data into Project Impact had to look through the patients chart through many pages of progress notes to find the information to enter into the Project Impact Database. The positive cultures were mixed with the negative results (of which there are very many). As part of the chart this new form will leave the pertinent information in a very easy to access location in the chart.

Once the forms were completed and customized to the satisfaction of all parties, the change management process continued with meetings with the data collectors to ensure buy-in. The data collectors are informed why they are collecting the data, how they are to collect the data and when they are to collect the data.

Because this is a project too big for the internship period my position has been extended with an increase in pay. The new forms begin testing on May the 2nd and after two weeks of data have been collected the progress will be reported on and the data quality measured.

Once tested and approved the forms need to be put through a "Forms Committee" to become a permanent part of the patient record. Once this has happened, the speed of the data collectors for Project Impact should increase because a great deal of the data they need will be in a much easier to access location. Once the data capture rate is sufficiently high, the Project Impact Database will become useful and the information needs of the ICU staff will be met.

This was a very successful internship and the future for Health Informatics seems very bright indeed.