Accurate Charge Capture and Cost Allocation: Cost Justification For Bedside Computing

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ABSTRACT

This paper shows that cost justification for bedside clinical computing can be made by recouping charges with accurate charge capture. Twelve months worth of professional charges for a sixteen bed surgical intensive care unit are computed from charted data in a bedside clinical database and are compared to the professional charges actually billed by the unit. A substantial difference in predicted charges and billed charges was found. This paper also discusses the concept of appropriate cost allocation in the inpatient environment and the feasibility of appropriate allocation as a by-product of bedside computing.

INTRODUCTION

The benefits associated with computerized medical records is well documented in the literature. Computerization provides legible records, data accessibility from multiple locations, sophisticated data displays, data interpretation and decision support. There is, however, another benefit associated with bedside computerization that is often ignored. Bedside computing can be a powerful tool that can be used to change the current method of patient charging in the inpatient environment by significantly increasing the accuracy of clinical billing. Bedside computing also provides the ability to document costs more directly and thereby allocate patient charges and hospital costs more realistically. For bedside computing to provide this benefit, the method of reimbursement by third party payers must change to allow new charging algorithms. Even without third party changes, there is a great benefit to institutions to use clinical data for detailed cost allocation. For example, as managed care contracts become more critical to a hospital's survival, the detailed cost data becomes more crucial in negotiating realistically.

A current pressing concern is the rising cost of health care. Contributing to this process is the imprecision of accounting for clinical charges. How does one state the actual cost of health care when a number of different services are lumped into one? How can one accurately account for the costs of health care when nursing services are considered a fixed cost and not a billable item? On the Surgical Intensive Care Unit (SICU) at the Duke University Medical Center (DUMC), the basic charge associated with caring for each patients is a flat bed fee. The majority of the costs associated with the basic patient care on the SICU are wrapped up into a bed charge. This bed charge covers such items as nursing care, unit supplies such as dressing materials, and monitoring charges. The current billing algorithm to charge for this bed charge is that all patients on the unit at midnight are charged the bed fee. The algorithm does not charge patients accurately. Any patient on the unit at midnight is billed a full ICU bed charge, and those patients that were on the unit for any portion of a day but were discharged prior to midnight are not charged the SICU bed charge.

Currently, procedural and supply charges that are generated through an automated order entry mechanism represent the majority of patient charges that can be accurately captured and billed in the inpatient environment. The typical hospital information system (HIS) generates charges for items such as laboratory studies, ordered medications, and some supplies. However, the mechanisms to bill accurately for professional charges and unit supplies are not present. Along with the incomplete billing is the inaccuracy of charge representation. Most hospitals do not itemize the costs associated with care giving. They instead tend to create lumped charges to cover large spectrums of care. This is where bedside computing may provide the most benefit.

For optimal business efficiency and economy, the structure of these lumped charges, such as the

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SICU bed charge, should be changed. Currently, a SICU patient on the unit for post-op observation and a patient on the unit for intensive wound care are charged the same amount for the nursing activity and unit supplies, unless care-givers take it upon themselves to collect supply item stickers for later accounting purposes. Most nursing and unit supply charges are bundled into the bed charge and are not allocated based on actual use. Bedside electronic charting can provide the means to allocate these costs based on actual care provided and to generate bills that reflect the actual costs incurred.

This analysis uses professional charges as an example of a type of charge that can be billed accurately as a by-product of electronic clinical charting. Savings associated with lost charges are shown. In areas where the electronic data did not correctly predict charges, the data was analyzed to determine how better to capture the information. A model is also described to show how more sophisticated charging practices could be developed.

BACKGROUND

In the fall of 1987, the SICU at the DUMC began implementation of TMR as their bedside computing system. TMR is a modular computer-based medical record system that has been in development at the Department of Medical Informatics at DUMC since the early 70's [1,2]. Prior to implementation of TMR, the only computing tool utilized on the unit was the hospital information system. Initial TMR applications developed for the SICU were oriented around nursing activity. Nurses on the SICU have been charting on this system since the winter of 1989 [3]. New applications being developed are oriented around the medical staff and include physician order entry and on-line physician procedure notes.

Data from the on-line nursing assessments are used for a variety of studies and unit quality assurance monitoring. The TMR nursing assessment application is a dictionary-controlled set of screen definitions and data entry elements organized in a hierarchial manner. Both the data entry elements and the responses are coded. Currently, the data dictionary contains over 750 data entry elements and over 1200 standardized responses. In addition the system supports free text entry. Each of the assessments contain between 100 to over 450 coded observations, depending on patient acuity [3].

In the winter of 1992, the SICU director approached the TMR staff and suggested that the electronically available clinical data be used to generate SICU's professional bills. The existing process of billing for professional fees required that the unit director be manually notified of professional procedures and that the unit director be notified of all admissions and discharges. This paper describes the comparison of the charges actually billed for and those predicted by analyzing the clinical database.

STUDY

Data for the 20 most frequently billed professional charges were analyzed for the period spanning July 1, 1991, to June 30, 1992. During this period there were 1475 admissions to the sixteen-bed surgical intensive care unit. These 20 professional charges were chosen because they represent the most common professional charges, and because they were all manually collected and reported. No automated billing took place. The charges were also chosen because the reporting was a responsibility of the SICU medical staff, and no outsiders were involved in charge capture. The charge data reported during this period was kept in a Paradox database by the unit director. In order to compare the actual charges to the predicted charges, a program was written to audit the on-line patient encounters and nursing assessments in order to calculate the professional charges for the same twenty items. Figure 1 shows the twenty items that were analyzed.

Data to predict the unit charges for one year were gathered by electronically auditing the patient encounters and nursing assessments entered on the TMR bedside clinical database. There are two 12 hour nursing shifts on the SICU. The nurses document their assessments electronically on 12 hour flowsheets. The nurses document a full assessment at the beginning of their shift and then chart by exception during the shift[3].

The critical care professional charges were predicted using admission/discharge data. These charges were straight forward to predict. TMR databases include an encounter list for each patient. All patient encounters were audited and admission date, admission time, discharge date, and discharge time were reported. Unit billing practices are that

TOP TWENTY CHARGES

1. Critical Care (after 1/92)
2. Continued Assisted Ventilation
3. Critical Care, Follow-up (prior to 1/92)
4. Cardiac Output Measurement, Subsequent
5. Initial Assisted Ventilation
6. Establish Access to Artery
7. Cardiac Output Measurement, Initial
8. Critical Care, First Hour (prior to 1/92)
9. Insertion of Catheter, Central Vein
10. Insert/Place Pulmonary Catheter
11. Insertion of Tracheal Airway
12. GI Intubation with Fluoroscopy
13. Chest Tube Insertion
14. Drainage of Chest
15. Heart Electroconversion
16. Spinal Fluid Tap, Diagnostic
17. GI Intubation with endoscopy
18. Cardiopulmonary Resuscitation
19. Puncture, Peritoneal Cavity
20. Bronchoscopy, Clear Airways

Figure 1. Top Twenty Billed Professional Charges

all patients on the unit at the time of morning attending rounds are billed for professional critical care services. During the year July 91 - June 92 there were 2 separate rules regarding third party reimbursement of critical care professional charges. From July 91 - December 91 the critical care charges were divided between first day and subsequent days. From January 92 - June 92 there was a single critical care charge for each day. An item of note is that in the manual billing process, the change in billing practice did not take place until mid-January. Up to the middle of January, the manually generated charges were based on the charging algorithm that actually expired in 12/91. Figure 2 shows the actual and potential number of critical care charges. The charges included as critical care charges are charge numbers 1,3 and 8. The potential charge shows that $92,250 worth of critical care charges were dropped during the year.

Critical care charges were actually billed only for patients that were on the unit for morning rounds. That same criteria was used for the potential charges. If the potential charges are expanded to include all patients on the unit for morning or afternoon rounds the difference goes up by an additional $123,300.

Figure 2. Charge counts

Charge Number	# Billed	# Predicted
1	2002	2426
2	1579	1803
3	1972	1833
4	1149	1530
5	542	850
6	556	674
7	477	451
8	754	707
9	323	567
10	315	273
11	92	200
12	64	2
13	38	85
14	19	0
15	17	0
16	14	0
17	2	23
18	11	2
19	8	0
20	0	9

The procedural charges based on data from the nursing assessments were harder to capture. Each chargeable item had to be mapped to an item in the nursing assessment. This mapping should actually have been included in the initial design of the application . Ventilator management charges are an example of charges that were extracted based on data in the nursing assessment. Ventilator management charges (charges 2 & 5) were calculated by analyzing the nursing assessment at admission. If ventilator management was documented, the initial and continued charges were calculated until it was documented that the ventilator was discontinued. This same method of auditing the nursing assessment and tracking the changes in status was used to predict the remaining charges. The results are shown in Figure 3. In some cases the program did not extract charges correctly. The main reason the program was unable to extract charges was that some charting was done in the free text sections and not the coded sections.

For example, the charges for pulmonary artery (PA) catheter insertions were not as high as those actually billed. There were 315 billed PA catheter insertions and only 273 extracted insertions. If in the nursing assessment a PA catheter was documented at admission, the program assumed that the catheter was placed prior to admission. When a random sample of the electronic charts where a PA catheter insertion was not extracted correctly were examined, it was found that the fact that the catheter was a new insertion was documented only in the free text section and not in the coded section. Again, if the PA catheter section of the nursing assessment had been designed to capture the date and time of insertion as a coded field, the program would have been able to count the number of insertions correctly. For other items, such as a bronchoscopy, there was no specific item in the nursing assessment with which the procedure could be associated.

Figure 3. Amount of Predicted Charge Increase

Charge Number	Increase Predicted in Charges
1	$127,200
2	22,400
3	(20,850)
4	28,575
5	61,600
6	21,240
7	28,575
8	(14,100)
9	54,900
10	(21,000)
11	28,620
12	(6,944)
13	19,975
14	(2,945)
15	(4,505)
16	(2,100)
17	14,950
18	(3,375)
19	(1,200)
20	4,050
NET	$210,991

Figure 3 shows that there were a total of $210,991 worth of potential charges extracted by the program that were not actually billed. There is one clarification that must be made related to the figure. In the nursing assessment, there is currently no coded format to identify the physician that actually performed the service. Although SICU physicians perform the majority of procedures on the unit, there are some procedures that may be performed by a consulting physician. Much less than 20% of the charges were generated by a non-SICU physician. If 20% is used as that upper limit and is then applied to the $210,991 the potential charges come down to $168,793. This combined with the $92,250 of dropped charges associated with critical care services, totals a net of $261,043 of dropped charges. This amount is only based on the twenty charges that were selected for the study. When all possible charges are considered, the actual amount of dropped charges is likely to be even larger. In addition, the predicted charges were based on data already available in the system. As the system is changed to capture charge data up front, the number of dropped charges will be dramatically reduced.

DISCUSSION

The detail associated with inpatient care delivery that is found in a clinical database can easily be exploited to provide patient charge data. This charge information is most easily made available when the design of the database application is done with charge capture in mind. In this example all charge data was generated based on data charted in nursing assessments. This was used only as an example of how on-line clinical data can be exploited. The most ideal situation for charge capture would be that physician charges be generated based on physician charting. Coded physician procedure notes would be ideal to capture the professional charges and the responsible physician/service accurately.

The professional charge example described in this paper can easily be adapted to capture detailed charge data currently not available in the inpatient environment. For example, if dressing changes are no longer considered a unit cost and are billed for individually instead of as a portion of a bed fee, health care professionals would have some realistic idea of what wound management costs. Nurses on the SICU currently document every dressing change that is done. If dressing supplies were grouped into

kits based on the amount of dressing material necessary, a new item could be added to the assessment to ask the number and type of kits used. Once documented by the nurse, the unit director would then know how much dressing supply was used by each patient, each patient group, each nurse etc. The potential of such detailed cost allocation is unknown. In the short term, this type of cost allocation would give unit and hospital administrators realistic patient care cost data. This data could be grouped for patients with the same diagnoses or for patients that with the same procedures to realistically predict the cost of care. In the long term, if third party payers changed to accept new billing alternatives, the existing lumped patient charges may be replaced by the actual charges incurred by the patient. Overall costs could ultimately be reduced by more accurately itemizing individual charges. Ultimately, the cost effectiveness of these individual costs could be more objectively evaluated by comparing patient outcomes of patients in whom questionable cost items were used to matched patients in whom those items were not used.

CONCLUSION

Before the rising costs of health care can be dealt with, the actual cost of health care must be understood. One method for accurately calculating the cost of health care is capturing charges and allocating the costs appropriately. The allocation of cost can best be done at the time of service and not in a retroactive mode. Bedside clinical databases are an ideal method for capturing such costs.

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