Solucient s Ratio-of-Cost-to-Charge Method for Estimating Costs

Patient-level data collected from billing systems often has total charges and detailed charges for each patient but cost information is not reported on a per-patient basis. Solucient s RCC method uses each patient s detailed charge data as the starting point for an estimate of the patient s costs. This method can be used with UB-92 data, MedPAR data and data where charges are categorized using Solucient s proprietary International Classification of Clinical Services ICCS.

Although the charge data on the patient s bill does not necessarily reflect what is actually paid for the patient s care (because Medicare pays hospitals according to the DRG payment schedule and private payers often negotiate discounts or capitated arrangements), billed charges do reflect the services that a patient received and the hospital s retail charges for those services.

In addition to the patient s charge data, the RCC method uses hospital-level ratios of costs-to-charges that hospitals report each year to Centers for Medicare & Medicaid Services (CMS) in their official Cost Reports. The ratios for detailed categories (such as MRI, Pharmacy, ICU, diagnostic radiology) are matched with the detailed charges. Fully allocated costs and charges from Worksheet C, Part I, columns 5 and 6 are used to calculate the ratios.

For each patient, the estimated cost for a detailed revenue center, such as drugs, is equal to the patient s detailed charge times the hospital s ratio of cost-to-charges for that detailed area. For example:

Estimated Drug Cost for Patient A in Hospital M = Patient A s Drug Charges *times* (Hospital M s Drug Costs / Hospital M s Drug Charges).

The total estimated cost for each patient is the sum of all the detailed costs. If the patient has inadequate detailed charge data, then the patient s cost is estimated using the hospital s overall cost-to-charge ratio. The table below shows the detailed cost categories that are used to create the patient s total cost estimate. It also shows the UB-92 revenue codes for the charges that are matched with each cost category. The cost categories are chosen from categories found in the CMS cost reports. Detailed costs for each of the cost categories are also available.

CMS Cost Report Category used to Estimate Cost	UB-92 Revenue Codes
Adults & Peds – Routine	10x, 11x-16x, 18x, 22x, 23x
Nursery	170-174,176-179
ICU	20x, 175
CCU	21x
Total Ancillary	24x, 28x, 46x, 50x, 53x, 54x, 55x, 56x, 75x, 81x, 89x, 99x
Drugs	25x, 63x
IV Therapy	26x
Supplies	27x, 29x, 62x, 946, 947
Lab	30x, 31x, 920, 923, 925, 929
Diagnostic Radiology	32x, 40x, 483, 921
Therapeutic Radiology	33x
Radioisotope	34x
CAT Scan	35x
Operating Room	36x, 481, 49x, 79x, 901
Anesthesia	37x

CMS Cost Report Category used to Estimate Cost	UB-92 Revenue Codes
Whole Blood	38x
Blood Storage	39x
Respiratory Therapy	41x
Physical Therapy	42x
Occupational Therapy	43x, 900, 902-909, 941
Speech Pathology	44x, 47x
Outpatient - Emergency Room	45x, 70x, 76x
Electrocardiology	480, 482, 489, 73x
Outpatient Clinic	51x, 52x, 91x, 922, 924, 940, 942-945, 949
MRI	61x
Recovery	71x
Labor/Delivery	72x
Electroencephalogram	74x
Renal Dialysis	80x, 82x-88x

The table below shows the cost categories that are used with Medicare data from the MedPAR files. MedPAR files do not report the UB-92 revenue codes. More aggregate charge categories are available on this data. These aggregate categories have been mapped to the CMS cost report categories as consistently as possible with the mapping of the UB-92 data. For example, the MedPAR operating room charge includes both operating room and recovery room charges, whereas the cost reports provide separate values for operating and recovery room. In order to estimate the cost associated with the MedPAR operating/recovery room charge, we use the hospital s operating room plus recovery room charges divided by the hospital s operating room plus recovery room costs. This creates a weighted average RCC for the operating and recovery rooms.

CMS Cost Report Category used to Estimate Cost	MedPAR Charge Category
Average of Drug and IV Therapy	Pharmacy
Average of Operating Room and Recovery	Operating Room and Recovery Room
Average Lab and Electroenceph	Laboratory
Average Diagnostic & Therapeutic Radiology & Radioisotope& CAT Scan	Radiology
Average Routine & Ancillary	Outpatient Services and Other
Adults & Peds – Routine	Routine Accommodation
ICU	ICU
CCU	CCU
Total Ancillary	Ambulance, Organ Acquisition
Supplies	Supplies, Durable Medical Equipment
Operating Room	Lithotripsy
Anesthesia	Anesthesia
Whole Blood	Blood
Blood Storage	Blood Services
Respiratory Therapy	Inhalation Therapy
Physical Therapy	Physical Therapy
Occupational Therapy	Occupational Therapy
Speech Pathology	Speech Therapy

CMS Cost Report Category used to Estimate Cost	MedPAR Charge Category
Outpatient - Emergency Room	Emergency Room
Electrocardiology	Cardiology
Outpatient Clinic	Clinic
MRI	MRI
Renal Dialysis	Dialysis

Return Code Usage:
Patients with a return code (rcceexcl) of 00 or 2911 have had no noticeable problems with the cost estimation process. It is perfectly reasonable to limit any costing analysis to patients with only these return codes. This way the analyst will be assured of the best possible estimate. Code 2911 identifies patients where the discharge date is more recent than the date of the cost report used to calculate the ratios. There is no other problem with the estimation process

Patients with return codes of 2901 through 2904 will have no costs estimated for them. These patients have either no data, or data that is outside a reasonable range of values for estimation to take place. This includes patients where the Medicare cost report data would be too old to be of value for this process. These patients should always be excluded from any cost analysis. Return codes 2901 and 2902 indicate that these patients might need to be excluded from any charge analysis also.

Return codes 2905 through 2908 indicate patients whose charge detail contains some calculation problem(s). This includes patients where no detail is available, the detail does not sum to approximate the total (within a 5% error range), or there is detail, but the majority of the detail is represented in only one RCCNO. Except for code 2907 (No detail charges available), these patients could be used in any detailed cost analysis, but a careful review of the results would be warranted.

Estimated costs are calculated for patients whose RCC ratios are either out of the trim range, or not available (codes 2909 and 2910). If the return code is 2910 (one or more RCC ratio details missing), a patient record will have one or more detail charges, but no associated costs. With return code 2909 (Ratio is out of trim range), estimated costs will exist for the detail charges but will be extremely higher or lower than the norm. Again these patients could be used in any detailed cost analysis, but a careful review of the results would be warranted

For any overall cost analysis it is recommended that cases with return codes (rcceexcl) of 2901, 2902, 2903, 2904, 2906, or 2909 be excluded.

Return Code	Return Code Description (rcceexcl)
0000	No problems with cost estimation
2901	Recorded total charges are equal to or less than zero (does not calculate total or detailed costs)
2902	Recorded total charges are greater than one million (does not calculate total or detailed costs)
2903	PAR record missing for requested pdisch record (do not calculate total or detailed costs)
2904	No RCC ratios found for hospital (does not calculate total or detailed costs)
2905	Detail charges do not add to within 95 percent of recorded charges (calculates all costs)
2906	More than 95 percent of detail charges are in one charge bucket (calculates all costs)
2907	All detail charges are zero (does not calculate detailed costs)
2908	After subtracting professional charges from the recorded total charge, the detail charges add to within 95 percent of recorded charges (calculates all costs)
2909	One or more RCC ratio(s) outside trim points (calculates all costs)

Return Code	Return Code Description (rcceexcl)
2910	One or more detail charges/RCC ratio(s) missing (calculates all costs)
2911	Patients discharge date is newer than the RCC reference year (calculates all costs)

The overall hospital cost to charge ratio could be greater than one. This may be caused by several factors including mistakes in the cost reports, one revenue center having a out of trim value skewing the results, or local pricing pressures keeping hospital charges lower. These should be rare occurrences. It is more common for one or more revenue centers to have costs exceeding charges. The hospital may account have low charges in one area but use it as a draw or feeder to another service. Routine room rates are usually an example of this. Or the hospital might have a low priced service that it provides as part of its mission. Outpatient clinics or inexpensive prenatal care are examples of these.

The literature on hospital costs has shown that costs calculated using the RCC method are a good approximation for true costs when groups of patients are compared (recommended comparisons include comparing costs of patients in a DRG in one hospital versus patients in that DRG in another hospital, or comparing groups of patients in one hospital with other groups of patients in that hospital). Caution should be used when looking at individual patients, however. The literature indicates that RCCs do not perform well as a tool to analyze the costs of individual patients.[1]

[1] Michael Shwartz, David Young, & Richard Siegrist, The Ratio of Costs to Charges: How Good a Basis for Estimating Costs? , *Inquiry* 32: 476-481 (Winter 1005/1996). Blue Cross and Blue Shield Association.