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Cost-Effective Use of the Surgical Intensive Care Unit

Steven D. Eyer, M.D., and Frank B. Cerra, M.D.

Departments of Surgery, St. Paul-Ramsey Medical Center, St. Paul, and the University of Minnesota Hospitals, Minneapolis, Minnesota, U.S.A.

The intensive care unit (ICU) continues to be a large user of resources. There is a continued need for a balance of cost-effective utilization and quality patient care. A data base of information currently exists that defines those groups of patients in whom reasonable success in resource allocation can be anticipated. In other cases, attempts are being made to define variables that adequately predict survival so they can be used to effect care decisions. Although some progress has been made, considerable work is needed to achieve both of these.

For surgeons, the ICU has become an essential "part of the knife." It is a necessity in modern high-technology care and has become an essential element in surgical training programs. The use of the ICU for currently conceived high-risk patients is now commonplace. A growing database supports this preoperative use of ICU resources. Techniques are now available to make ICU care more cost-effective. Tools such as not having routine orders, daily rewriting of all orders, review of drug orders, and the utilization of the laboratory and radiographic resources have already reduced significantly the real cost of using these life-saving facilities.

In 1981, total health costs in the United States were one-quarter trillion dollars. This astronomical figure approximated 10% of the gross national product (GNP). One-half this sum was attributed to hospitals costs. Intensive care unit (ICU) costs varied regionally, accounting for 10–20% of hospital costs. Projections for 1985 estimate total health care and ICU costs to be 11% and 1% of the GNP, respectively.

Hospital costs in the United States have risen exponentially since 1935. The rate of rise continues to exceed the inflation rate. This half century of bludgeoning health costs have complex origins, of which at least 4 have been identified [1]: (a) increase in the number of hospitalized patients, (b) increase in technology utilized per patient, (c) increase in the personnel:patient ratio, and (d) increase in costs of hospital goods.

Per capita hospitalizations have increased 119% since 1935. The largest increase has involved the elderly, whose numbers have risen 300% in the last 25 years. These and other high-risk patients contribute significantly to high surgical intensive care unit (SICU) costs. This cost is augmented by medicine's expensive reliance on sophisticated technology. Surgical intensive care units, by concentrating critically ill patients, utilize a variety of costly high-technology support systems—ventilators, monitoring, dialysis, and aortic balloon counterpulsation, for example. Diagnostic and laboratory procedures, expensive ancillary therapies, prolonged stays, multiple operations, and pharmaceuticals all contribute to high SICU costs.

Reprint requests: Frank B. Cerra, M.D., Department of Surgery, Box 42, University of Minnesota Hospitals, Minneapolis, Minnesota 55455, U.S.A.

Does the ICU Reduce Morbidity and Mortality?

With rising costs and decreasing dollars, maintaining intensive care will require more scrupulous patient selection. Ideally, only those who benefit from intensive care should receive it. The data base determining who benefits from intensive care, so that a decision to treat can be made prior to ICU treatment, is only currently being collected. Surgeons have intuitively used SICU's for all high-risk and critically ill patients. A small percentage of these patients incur the largest proportion of ICU costs. Many high-risk patients admitted for postoperative monitoring could be as well managed with lesser degrees of care. In other settings, the ICU in the early postoperative period can be "part of the operative surgery," e.g., open heart surgery or major thoracic and abdominal surgery.

Data are available on the overall results of ICU treatment. Such experience reflects state-of-the-art management techniques and indicates reasonable overall acute and follow-up survival [2]. These kinds of data, however, do not provide a great deal of insight into which disease categories can benefit from ICU care, what selection criteria can be used to administer ICU care, and what criteria can be used to stop administering ICU care. An evolving data base, however, is occurring from modern ICU's in which there is significant input into patient care by practitioners trained in the art and science of critical care. Assuming a uniformity of skill in all patient care settings, patients with several diseases and conditions have been shown to experience a definite ICU impact on their morbidity and mortality. These include burn patients [3], those with complicated myocardial infarctions [4], high-risk neonates [5, 6], victims of trauma [7] and other hypermetabolic states [8], postoperative critically ill patients [9], individuals with acute respiratory failure [10], and high-risk patients undergoing preoperative physiologic assessment [11, 12]. Disease categories for which ICU benefit has either not been shown or is contested include pneumococcal pneumonia [13], postoperative monitoring of anterior cervical laminectomies [14], pulmonary edema

[15], and uncomplicated myocardial infarction [16]. Patients with negligible functional survival include moribund blunt trauma victims [17], specific comatose cardiac arrest patients [18–20], and patients with adult respiratory distress syndrome complicating malignant disorders [21]. Expert interpretation of electroencephalograms in patients with cerebral catastrophes can accurately predict negligible survival [22, 23] as can tables relating body surface area burned to age [24–26]. Two recent studies have defined subsets of patients with multi-system organ failure who have negligible survival [27, 28]. Taken together, these patients had at least 3 strictly defined and severe organ system failures unresponsive to 3 days of intensive treatment. Elderly patients required only 2 organ system failures unresponsive to treatment to have negligible survival.

Defining subsets of patients who benefit from ICU's and those with negligible survival is helpful, but still leaves the majority of critically ill patients who have an uncertain prognosis. There are many negative correlates with ICU survival. Examples are surgical emergencies with gastrointenstinal hemorrhage or associated malignant disease, acute oliguric renal failure, advanced age, and prolonged ICU stays. Despite a poor prognosis generally associated with these factors, they are nonetheless also associated with prognostic uncertainty. Intensive care is necessary to those that do survive. To provide some assistance in these grey areas, prognostic scoring systems have been devised.

These prognostic scoring systems, although highly predictive of disease severity and death, do not seem to provide sufficient mortality resolution to eliminate prognostic uncertainty. Their greatest value seems to be in stratifying disease groups by severity grade and identifying low-risk patients not requiring ICU admission [29]. They also seem to be able to identify patients in whom the outcome clearly appears hopeless. Whether these scores are any better than an experienced clinician is uncertain at present. In between the extremes, a predictive probability of outcome is provided. This prediction usually occurs after ICU admission, is frequently not of great utility in deciding to initiate care, and may or may not be of use in deciding to withdraw care. Organ failure scores in which the failure is unresponsive to aggressive intervention seem more useful in this latter regard. These indices, however, have some utility in that they are a quantitative record of severity and provide some insight in discussing prognosis with patients and families. The scores also enable data comparisons between various treatment centers.

The impact of intensive care on the morbidity and mortality of most disease categories needs better documentation. It is imperative in this time of economic restraint that we define which patients benefit from intensive care. This requires multicenter, prospective, randomized trials of specific disease categories with patients stratified to degree of physiologic impairment and managed by sound critical care treatment regimens. Such studies will reduce the number of patients requiring intensive care and allow the rational development of easily applied ICU admission and treatment withdrawal criteria. Patients should be identified who are equally well managed with lesser grades of care.

Cost Containment

One means of decreasing ICU costs is to withhold care. Intensive care should not be given to patients in whom treatment only prolongs death. It should be withheld in patients for whom functional survival is negligible. It is recommended to withhold care from patients with low probability survival when treatment limits capacity to treat others with more probable ICU benefit. With expanding prepayment and capitation programs, hospitals may be forced to cap ICU expenditures. Difficult decisions to limit or withhold care will be required. Objective definition of ICU benefit would help allay this crisis.

There are many practical measures to reduce SICU costs. ICU's overutilize many ancillary services. Considering and selecting only those services likely to improve patients care will reduce ICU expenditures. By adhering to the idea that "thinking, not widespread screening, discovers rare abnormalities," Civetta and Hudson-Civetta lowered ICU laboratory costs 40% with significant savings, without alteration in outcome or acuity of care [30]. Eliminating standing orders and requiring specific laboratory tests were mainstays of this study.

The sum of technical advancements in diagnostic and therapeutic services has improved patient care. Each small step gained, however, has been accompanied by large increases in cost. Without impeding progress, utilization of these services should be limited by patient selection. Defining subgroups of patients who benefit from high-technology services can be achieved by morbidity, mortality, and cost-benefit analysis of carefully designed prospective studies. These data should be used to develop criteria for service utilization, which would reduce costs and improve the yield of the service without patient detriment.

The personnel:patient ratio on the SICU is high. Developing a step down or high-dependency unit may help to relieve high ICU costs by selecting those patients adequately managed with 1:3 or 1:4 critical care nurse:patient ratios. Such patients should be stable and not requiring nurse intensive management other than monitoring of a specific high-risk system. Specific admission criteria and active director involvement are required. Hidden costs, such as nurse specialist training, may offset the benefits of this concept.

The limited benefit of respiratory therapy does not justify the high cost of overutilization [31–34]. These costs, as well as other specific categories of ICU utilization, should be reviewed monthly by the director or cost containment committee of the SICU. Respiratory therapy should be reevaluated and reordered as needed every 24 hours. Bronchial drainage and pummeling is of little benefit in most settings. It is continued in patients with pulmonary consolidation only when responsive with increased sputum production [35–39]. Intermittent positive pressure breathing is of limited value. It is used in cooperative patients with atelectasis or decreased functional residual capacity and continued if the patient demonstrates improved respiratory parameters [40–42]. Objective response is necessary to warrant continuation of bronchodilation therapy. These policies will reduce ICU costs without detriment to the patient. Turn, cough, deep breathing, and early ambulation are as effective as other measures and incur little direct cost [43].

Physicians managing intensive care patients should be aware of common costs including laboratory, monitoring, and ancillary services. Monitoring lines are expensive and carry definite risks. They should be removed at the earliest possible time. Arterial blood gases can be limited and arterial lines removed in patients difficult to wean from a ventilator by using end expiratory CO_2 monitoring or transcutaneous oximetry. Feeding costs can be drastically reduced by utilizing the enteral rather than intravenous route. Strict culture policies will reduce costs. The number of blood cultures necessary to reliably detect bacteremia is controversial. Most true positive bacteremias are detected within the first few blood cultures drawn; multiple cultures increase the likelihood of identifying an infectious agent, but the increased yield is not cost-effective [44–47]. With selected exceptions (for example, recognition of septic hemodynamics without a fever spike), we obtain cultures with the first temperature spike and no more than once a day thereafter. Except for life-threatening sepsis, one should await positive cultures prior to starting antibiotics. With appropriate antibiotic sensitivities, the least expensive drug should be used.

Avoiding complications reduces ICU costs. This entails preoperative physiologic correction and sound surgical technique and judgment. The inherent complications of ICU's warrant earliest possible transfer of patients to lesser care units. Nosocomical infections are much increased on SICU's [48], a complication carrying significant cost (prolonged ICU stay, antibiotic and infusion costs, laboratory). Iatrogenic complications are not uncommon. These involve technical errors, inadequate data, and misinterpretation of data.

Application of basic physiologic principles to the pathophysiologic states of surgical disease have consistently lowered morbidity and mortality. Preventing morbidity and mortality is the most cost-effective means of reducing SICU (and surgical) costs. This can take the form of knowledgeable application of the principles of the metabolic response to injury: resuscitation, oxygen transport, and metabolic support. An example would be how hemodynamic monitoring with corrective criteria-based intervention of postoperative emergency surgery and trauma patients reduces morbidity and mortality [9], and thus cost. A second approach may be a preventive application—the preoperative physiologic assessment of high-risk surgical patients with preoperative manipulation and intra- and postoperative interventional monitoring.

Over 40 years ago, Cuthbertson described the ebb and flow phases of the metabolic response to surgery [49]. These phases correlate with anesthesia, the ebb phase beginning with anesthesia induction and the transition to the flow phase coinciding with lightening of anesthesia near the end of the operation. Clowes et al. confirmed these findings with perioperative cardiac output monitoring in 1960 [50]. Following the introduction of practical pulmonary artery catheterization in the late 1960's, all perioperative hemodynamic monitoring has confirmed Cuthbertson's ebb and flow phases. Achieving and maintaining the flow phase (cardiac output, oxygen delivery, oxygen consumption, minute volume ventilation) is necessary to postoperative survival. The purpose of preoperative physiologic assessment is to guarantee adequate intraoperative and flow phase hemodynamics and to recognize those individuals who will not be able to achieve the necessary responses. Such assessment permits corrective intervention, allows consideration of alternate therapies, and minimizes the risks when no other options are present.

Table 1. Cardiac risk index in patients undergoing noncardiac surgery.[a]

Factor	Points
Signs of congestive heart failure	11
Myocardial infarction within 6 months	10
Premature ventricular contractions (5/min)	7
Rhythm other than sinus	7
Age greater than 70 years	5
Emergency operations	4
Poor medical condition	3
Thoracic, upper abdominal, or vascular surgery	3
Aortic stenosis	3

[a]Modified from [53] with permission of publisher.

High-risk surgical patients can be identified who will benefit from preoperative physiologic assessment and correction. Preoperative physiologic assessment is not cheap (ICU bed, patient costs of catheterization and monitoring) and carries the risks of Swan-Ganz pulmonary artery placement. To be cost-effective, patient selection is necessary. This is based on history, physical examination, and clinical judgment. The latter entails experience, knowledge of the physiologic responses to anesthesia and surgery, and the nature of the operation planned. Civetta and colleagues retrospectively studied 96 elderly patients according to a number of surgical risk factors [51]. Class I patients received no monitoring, had 1.4 risk factors/patient, and no mortality. Class II and III patients were monitored. Class II patients had normal-to-moderate hemodynamic dysfunction which was easily corrected. They had 3.6 risk factors/patient, and 29% died. Nine of eleven deaths followed prolonged hospital stays and were attributed to underlying medical conditions. Class III patients had severe hemodynamic dysfunction, 4.8 risk factors/patient, and a 26% mortality rate, the majority of deaths occurring in the immediate postoperative period. These researchers concluded that not all elderly patients require preoperative monitoring and that these patients can be identified on clinical grounds. For patients (6%) in whom oxygen delivery could not be increased above 700 ml/min (associated with low cardiac index, low left ventricular stroke work index, flat myocardial performance curve, and widened arteriovenous O_2 difference), high mortality (75%) warrants consideration of other options.

Risk factors in patients undergoing elective surgery in whom preoperative assessment should be considered are advanced physiologic age, chronic medical disease, symptomatic cardiopulmonary dysfunction, myocardial infarction within 6 months, severe atherosclerotic vascular disease, morbid obesity, and moderate-to-severe protein calorie malnutrition.

Advanced physiologic age, including most elderly patients and those prematurely aged by chronic medical conditions, have a 2- to 5-fold increase in mortality risk with elective major surgery [52]. Del Guercio and Cohn preoperatively monitored 148 consecutive patients with advanced physiologic age who had been cleared by medical consultation for surgery [11]. The therapeutic goals were adequate blood volume, cardiac index, oxygen delivery, and oxygen consumption, and best pulmonary wedge pressure determined by myocardial performance curves. Hemodynamic function was normal in 20 patients (13.5%) and there was no mortality. Ninety–four patients (63.5%) had mild-

Table 2. Incidence of reinfarction and mortality in relation to interval from previous infarction in patients undergoing elective and emergent noncardiac operations [12].

Interval between infarction anesthesia (months)	No. of patients[a]		No. of postanesthesia reinfarction (%)	
	Group 1	Group 2	Group 1	Group 2
0–3	11	52	4 (36)	3 (5.8)[b]
4–6	31	86	8 (26)	2 (2.3)
7–12	127	104	6 (5)	1 (1)
13–24	114	256	6 (5)	4 (1.56)
25	81	235	4 (5)	4 (1.7)
Total	364	733	28 (7.7)	14 (1.9)

[a]Group 1: historical unmonitored controls (1973–1976); group 2: close perioperative monitoring (1977–1982).
[b]Incidence of postanesthetic reinfarction compared with Group 1: $p < 0.05$; $p < 0.005$.

Table 3. Factors in preoperative pulmonary assessment.

1. Work–up
   History and physical examination (recognize high-risk patient)
   Pulmonary function tests
   Room air arterial blood gas
   Exercise testing
   Split function studies (selected pulmonary resections)

2. Postsurgical pulmonary response
   ↓ Total lung capacity
   ↓ Vital capacity
   ↓ Tidal volume
   ↓ Functional residual capacity
   Tachypnea, ↓ P CO_2
   ↓ P O_2 (↑ A-a gradient)

3. High-risk patients
   Chronic obstructive pulmonary disease
   Smokers
   Active infection
   Acute congestive heart failure (CHF)
   Upper abdominal and thoracic operations

4. Tune up (delay surgery)
   Stop smoking
   Treat infection
   Correct CHF
   Breathing exercises
   Bronchodilators
   Cardiopulmonary artery pressure by mask

Table 4. High–risk pulmonary parameters.

Parameter	High-risk patient	Mortality
Pa O_2 (room air)	<45 torr	
$PaCO_2$	>50 torr	
FEV_1	<1.0 L	
FVC	<2.0 L	20–45%
	<0.7 predicted	28%
FEV_1/FVC	<0.35	
FEF_{25-75} (MMEFR)	<1 L/sec	
Exercise testing		
Maximum voluntary ventilation	<50 L/min	
	<60% predicted	32%
	>50% predicted	0–5%
Maximum $\dot{V}O_2$	7 stages	0
	<4 min	↑ ↑
Mean PAP	>35 torr	
Pulmonary VR	>350 dynes-sec/cm^5	
$\dot{Q}s/\dot{Q}t$	>20%	

FEV_1 = forced expiratory volume one second, FVC = forced vital capacity, FEB_{25-75} = forced expiratory flow, midexspiratory, MMEFR = maximum midexspiratory flow rate, maximum $\dot{V}O_2$ = maximum oxygen consumption, mean PAP = mean pulmonary artery pressure, pulmonary VR = pulmonary vascular resistance, $\dot{Q}s/\dot{Q}t$ = pulmonary shunt function.

to-moderately severe hemodynamic function. These were largely correctable without delay in surgery and 8 (8.5%) of the 94 died. Thirty-four patients (23%) had advanced or uncorrectable dysfunction (room air PO_2 50 torr, low cardiac index, increased pulmonary shunting, elevated mean pulmonary artery pressure). Of these 34 patients, 19 operations were cancelled and 7 modified to lesser procedures without mortality. All 8 patients who underwent major operations died. The authors recommend that alternative treatment be considered in elective surgical patients with advanced or uncorrectable dysfunction.

The major factor affecting morbidity and mortality of surgery in the elderly and in patients with evidence of heart disease is perioperative myocardial infarction, with a reported mortality of 50–70%. High morbidity and mortality rates are strongly associated with sudden or prolonged drops in mean arterial pressure or the combination of tachycardia and hypertension. Cardiac risk can be determined by assessing Goldman's weighted risk factors (Table 1) [53]. If high-risk patients are considered for surgery, preoperative assessment should be performed. The purpose is to provide hemodynamic surgical clearance and to initiate perioperative maintenance without myocardial ischemia. This is achieved by maintaining a stable mean arterial pressure for coronary perfusion, avoiding hypoxia with high arterial oxygen saturation, establishing an adequate cardiac index, and limiting myocardial oxygen consumption by afterload reduction and avoiding tachycardia. Stable maintenance intraoperatively and in the early postoperative period is critical and requires a continuum of hemodynamic monitoring. Using these principles, Rao has reported marked reductions in postoperative myocardial infarction rates in patients with prior infarctions (Table 2) [12]. These data are encouraging but require further clinical confirmation.

Correct preoperative evaluation involves assessing cardiac, pulmonary, nutritional, and specific critical organ function

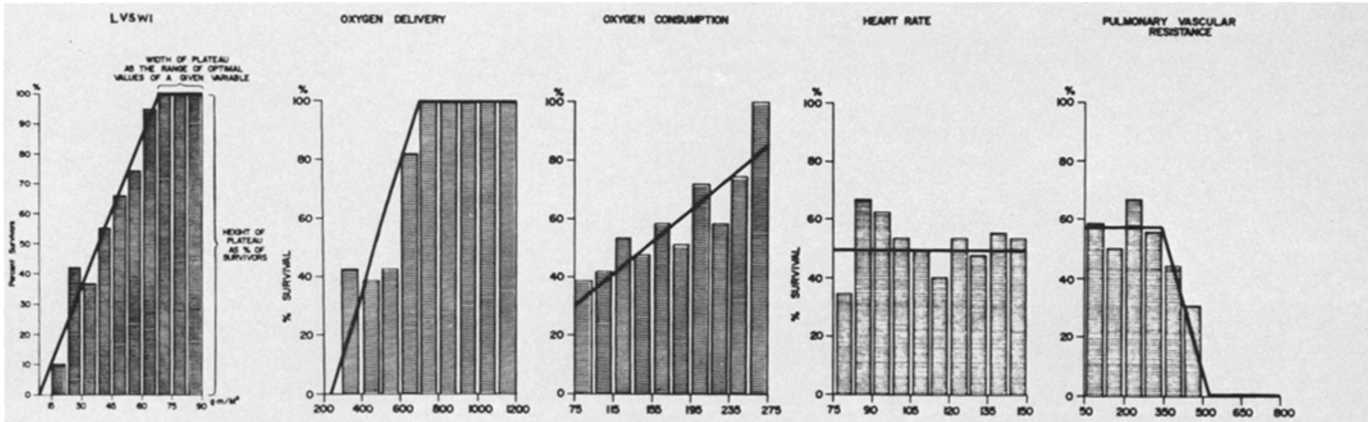

Fig. 1. Response first 8 hours after trauma or surgery in critically ill patients [58]. Reprinted with permission of publisher.

(renal, hepatic, immunologic, etc.). This is accomplished with a complete history and physical examination. High-risk patients should be recognized preoperatively and supplementary testing performed. Considerations necessary to preoperative pulmonary function are given in Table 3.

Pulmonary function studies are helpful in determining high-risk patients (Table 4); however, no study has successfully correlated specific preoperative pulmonary function scoring to morbidity and mortality with sharp discrimination [54]. Abnormal mean pulmonary artery pressure, pulmonary vascular resistance, and pulmonary shunt or alveolar-arterial oxygen gradient are high-risk pulmonary factors that argue against undertaking major operative procedures [11, 51, 55]. These values can only be obtained by pulmonary artery catheterization. When these are present, alternatives to elective major surgery should be considered. A rise in pulmonary artery pressure in response to exercise should also be included in this group [56], although this study is rarely obtained in preoperative assessment.

Assessing cardiac function in high-risk patients requires pulmonary artery catheterization. When a patient has evidence of hypovolemia, resuscitation should precede catheterization to minimize risk of cardiac arrhythmias. Correction of hypothermia and establishing adequate volume (preload) will produce optimal function in most patients and should always precede use of inotropic or vasoactive drugs. Although normal pulmonary wedge pressure (PWP) (8–12 torr) is adequate for normal patients, in high-risk patients adequate preload (PWP) should be based on myocardial (or Sarnoff) performance curves. Patients with depressed cardiac function or failure should knowledgeably receive vasodilator and/or inotropic support. Patients with advanced or uncorrectable dysfunction should have alternative treatments considered.

The importance of establishing correct volume status deserves further emphasis. In preoperative studies of high-risk patients, the incidence of hypovolemia has been high [11, 51, 57]. A variety of causes predisposes high-risk patients to hypovolemia. These same studies show that myocardial depression or heart failure preoperatively is not uncommon [11, 51]. This is the most weighted of Goldman's cardiac risk factors, and argues against unmonitored preoperative volume loading.

Conventional measures [blood pressure, heart rate, urine output, central venous pressure (CVP)] are unreliable in optimizing preoperative hemodynamic function in high-risk patients. Bush et al. studied perioperatively patients undergoing elective abdominal aneurysm surgery [57]. The mean age was 67 years. Cardiovascular risk factors were present in all but 1 patient. Pulmonary artery catheters were placed in all patients, but half were managed by CVP (10–15 torr) and half by PWP (10–12 torr). There was a general correlation (r = 0.7) between CVP and PWP, but standard deviations were large. Although no major operative complications occurred in either group, patients managed by CVP had significant falls in systolic blood pressure on induction of general anesthesia and with aortic cross-clamping. Although clinical acute renal failure did not occur, CVP-managed patients had a significant increase in serum creatinine and decrease in the renal function index. A CVP is a poor substitute for pulmonary artery catheterization in high-risk patients.

Table 5. Data that change risk-benefit ratio.

1. CI < 2.2 L/min per m^2
2. PVR > 350 dynes-sec/cm^5
3. mean PAP > 35 torr
4. $\dot{D}O_2 < 700$ ml/min
5. LVSWI < 50 g–m/m^2
6. $\dot{Q}s/\dot{Q}t > 20\%$
7. A-a gradient > 250 torr
8. $PaO_2 < 45$ torr (room air)
9. $PaCO_2 > 50$ torr
10. $D(A\text{-}V)O_2 > 5.5$ vol%

CI = cardiac index, PVR = pulmonary vascular resistance, mean PAP = mean pulmonary artery pressure, $\dot{D}O_2$ = oxygen delivery, LVSWI = left ventricular stroke work index, $\dot{Q}s/\dot{Q}t$ = pulmonary shunt function, A-a gradient = alveolar-arterial oxygen gradient, $D(A\text{-}V)O_2$ = arterial-venous oxygen difference.

Shoemaker et al. have reported prognosis according to hemodynamic variables in the first 8 hours after trauma or surgery in critically ill patients [58]. Heart rate was not predictive. Oxygen delivery, oxygen consumption, and left ventricular stroke work index predicted survival, while pulmonary vascular resistance was predictive of death (Fig. 1).

Preliminary preoperative physiologic data have identified several variables which, when abnormal, portend high morbidity and mortality. Further study is required for exact resolution of variable limits. If the following preoperative conditions exist after optimal management (Table 5), strong consideration should be given to modifying the planned procedure and considering alternative methods of management. Major surgery and general anesthesia are too costly in both morbidity and mortality. Avoiding surgery in this small subset (6–25%) of high-risk patients can more than repay the cost of preoperative assessment.

Summary and Conclusions

1. SICU care is expensive.
2. SICU care can reduce morbidity and mortality.
3. Criteria for selection exist for some clinical settings; appropriate studies need to be done to develop them in other settings.
4. Cost-containment measures can and should be introduced now. These include: no routine orders, knowledgeable selection of diagnostic tests, and knowledgeable use of hemodynamic monitoring and respiratory therapy.
5. Prevention is the best way to reduce morbidity, mortality, and cost. Prevention occurs through the application of the principles of surgical critical care.
6. Preoperative preventive therapy through assessment, corrective intervention, and knowledgeable intraoperative and postoperative care can further reduce overall ICU utilization through reduction in morbidity and mortality.

Résumé

L'unité de soins intensifs reste un service très onéreux. Il est donc indispensable d'établir un juste équilibre entre les coûts et les services rendus efficacement. Une accumulation de données permet de définir les groupes de malades chez qui il est possible d'escompter le bon emploi des investissements engagés. D'autre part, des essais sont entrepris pour définir les variables qui permettent de prédire de manière adéquate la survie et ainsi d'orienter les décisions thérapeutiques. Bien que des progrès aient été réalisés en ce sens, un travail considérable reste à entreprendre pour atteindre ces deux buts.

Pour le chirurgien, le traitement dispensé à l'unité des soins intensifs est devenue une partie essentielle du traitement chirurgical. Il constitute une part indispensable du traitement par une haute technologie moderne et il est devenu une part essentielle de l'enseignement chirurgical. L'emploi courant des soins intensifs pour les malades considérés comme des patients à haut risque est maintenant un lieu commun. Des données croissantes appuient l'emploi pré-opératoire des ressources des soins intensifs. Des techniques sont dès maintenant disponibles pour rendre les soins moins onéreux. Il en est ainsi de la suppression des soins de routine et de la prescription des soins au jour le jour, de la remise en cause également des prescriptions médicamenteuses et de l'utilisation des données biologiques et radiologiques. Ces mesures ont déjà réduit significativement le coût réel des soins vitaux.

Resumen

La unidad de cuidado intensivo (UCI) sigue siendo un gran consumidor de recursos. Hay una necesidad permanente de lograr un equilibrio entre una utilización costo-efectiva y la calidad de la atención al paciente. Ya existe acúmulo de información para definir aquellos grupos de pacientes en los cuales se pueda anticipar un razonable éxito en cuanto a la asignación de recursos. En otras situaciones se hacen esfuerzos para definir variables capaces de predecir adecuadamente la supervivencia, en tal forma que puedan ser utilizadas para la toma de decisiones relativas a manejo. Aunque considerable progreso ha sido logrado, todavía es necesario realizar trabajo adicional para su plena implementación.

Para los cirujanos, la UCI ha venido a convertirse en parte de la operación; es una parte necesaria de la moderna atención de alta tecnología y es parte esencial de los programas de adiestramiento quirúrgico. El uso de la UCI para pacientes considerados de alto riesgo es común. Un creciente cuerpo de información da apoyo a este uso preoperatorio de los recursos de la UCI. Ya hay técnicas disponibles para hacer la atención de UCI más efectiva. Factores tales como no tener órdenes rutinarias, reescribir diariamente la totalidad de las órdenes, la revisión de las órdenes de drogas, y la utilización de los recursos de laboratorio y radiográficos, ya han reducido significativamente el costo real de estas facilidades salvadoras de vidas.

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